

State of California  
AIR RESOURCES BOARD

# **Public Hearing to Consider the Proposed Amendments to the Commercial Harbor Craft Regulation**

## **Staff Report: Initial Statement of Reasons**

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California Air Resources Board  
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## List of Abbreviations and Acronyms

°C	Degrees Celsius
µg/m <sup>3</sup>	Microgram per Cubic Meter
AB	Assembly Bill
ACE	Alternative Control of Emissions
ADPF	Active Diesel Particulate Filter
AQMP	Air Quality Management Plan
ASD	Azimuth Stern Drive
ASTM	American Society for Testing and Materials
ATB	Articulated Tug Barge
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
BC	Black Carbon
bhp	Brake Horsepower
Board	California Air Resources Board
C Plans	Oil Spill Contingency Plans
CAA	Clean Air Act
CAAP	Clean Air Action Plan
CAECS	CARB Approved Emission Control Strategy
CalEPA	California Environmental Protection Agency
CAPP	Community Air Protection Program
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CERP	Community Emissions Reduction Plan
CFR	Code of Federal Regulations
CH <sub>4</sub>	Methane
CHC	Commercial Harbor Craft
CHE	Cargo Handling Equipment
CNG	Compressed Natural Gas
CMA	California Maritime Academy
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon Dioxide Equivalent
CPCN	Certificate of Public Convenience and Necessity
CPFV	Commercial Passenger Fishing Vessel
CPUC	California Public Utilities Commission
CSC	Community Steering Committee
DAC	Disadvantaged Community
DECS	Diesel Emission Control Strategy
DEF	Diesel Exhaust Fluid
DMV	Department of Motor Vehicles
DOF	Department of Finance
DPF	Diesel Particulate Filter

DPM	Diesel Particulate Matter
EA	Environmental Analysis
ECA	Emission Control Area
ECM	Emission Control Module
EEZ	Exclusive Economic Zone
EF	Emission Factor
EGR	Exhaust Gas Recirculation
EIAPP	Engine International Air Pollution Prevention
EO	Executive Officer
EU	European Union
FCC	Federal Communications Commission
FCF	Fuel Correction Factor
g/bhp-hr	Gram Per Brake Horsepower-Hour
g/kW-hr	Gram Per Kilowatt-Hour
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GSP	Gross State Product
GT	Gross Tonnage
GT ITC	Gross Tonnage in Conventional International Measurement System
GWP	Global Warming Potential
H <sub>2</sub> O	Water
HC	Hydrocarbons
HDVIP	Heavy-Duty Vehicle Inspection Program
HFC	Hydrofluorocarbon
HIN	Hull Identification Number
Hp	Horsepower
HRA	Health Risk Assessment
HSC	Health and Safety Code
I/M	Inspection and Maintenance
IAPP	International Air Pollution Prevention
IMO	International Maritime Organization
IPT	Incidence Per Ton
ISO	International Organization for Standardization
ISOR	Initial Statement of Reasons
ITU	International Telecommunication Union
IWA	Inland Waterway Auxiliary
IWP	Inland Waterway Propulsion
kW	Kilowatt
L/cylinder	Liter Per Cylinder
LCFS	Low Carbon Fuel Standard
LF	Load Factor
LNG	Liquefied Natural Gas
LOA	Length Overall
MCAS	Maritime Clean Air Strategy
Mg	Milligram



MMSI	Maritime Mobile Service Industry
MT	Metric Ton
MTPY	Metric Tons Per Year
MY	Model Year
N2	Nitrogen Gas
N2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NJDEP	New Jersey Department of Environmental Protection
NLS	Noxious Liquid Substance
Nm	Nautical Mile
NO	Nitric Oxide
NO2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NTIA	National Telecommunications and Information Administration
OEHHA	Office of Environmental Health Hazard Assessment
OEM	Original Equipment Manufacturer
OGV	Ocean-Going Vessel
OSPR	Office of Spill Prevention and Response
PEMS	Portable Emissions Measurement System
PERP	Portable Equipment Registration Program
PM	Particulate Matter
PM2.5	Fine Particulate Matter ( $\leq 2.5$ micrometer in diameter)
POLA	Port of Los Angeles
POLB	Port of Long Beach
ppb	Parts Per Billion
ppm	Parts Per Million
ppmdv	Parts Per Million - Dry Volume
PSIP	Periodic Smoke Inspection Program
PUC	Public Utilities Code
PUCTRA	Public Utilities Commission Transportation Reimbursement Account
PVA	Preliminary Verification Application
R100/R99	100 or 99 Percent Renewable Diesel
RCW	Regulated California Waters
Reefer	Refrigerated Cargo Vessel
REMI	Regional Economic Models, Inc.
ROG	Reactive Organic Gases
Ro-Ro	Roll On-Roll Off Vessels
RRP	Risk Reduction Plan
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SC-CO2	Social Cost of Carbon
SCR	Selective Catalytic Reduction
SIMW	Spark-Ignition Marine Watercraft
SIP	State Implementation Plan
SLCP	Short-Lived Climate Pollutant

SO <sub>2</sub>	Sulfur Dioxide
Soot	Black Carbon
SO <sub>x</sub>	Oxides of Sulfur
SRIA	Standardized Regulatory Impact Assessment
TAC	Toxic Air Contaminant
TEU	Twenty-Foot Equivalent Unit
TPY	Tons Per Year
U.S. EPA	United States Environmental Protection Agency
ULSD	Ultra-Low Sulfur Diesel
USCG	United States Coast Guard
UVI	Unique Vessel Identifier
VCC	Vessel Common Carrier
VDECS	Verified Diesel Emission Control Strategy
VEE	Visual Emissions Evaluation
VMAP	Vessel Mutual Assistance Plan
VOC	Volatile Organic Compound
WETA	Water Emergency Transportation Authority
WHO	World Health Organization
WOEIP	West Oakland Environmental Indicators Project
ZEAT	Zero-Emission and Advanced Technology

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## Executive Summary

### A. Purpose of the Rulemaking

California Air Resources Board (CARB) staff is proposing to amend the Commercial Harbor Craft (CHC) Regulation. Since the original adoption of the CHC regulation in 2008, and its amendment in 2010, CHC vessel owners have replaced older engines with newer and cleaner engines, which reduced the emissions of air pollutants including diesel particulate matter (DPM), fine particulate matter (PM<sub>2.5</sub>), oxides of nitrogen (NO<sub>x</sub>), oxides of sulfur (SO<sub>x</sub>), reactive organic gases (ROG), and greenhouse gases (GHG). After the Current Regulation is fully implemented by the end of 2022, there will be additional needs to reduce emissions from CHC.

In response to Assembly Bill (AB) 617 (Garcia, Chapter 136, Statutes of 2017), CARB created the Community Air Protection Program (CAPP) to address the environmental and health inequities from air pollution experienced by certain disadvantaged communities (DAC) in the State. The CAPP Blueprint contains a list of statewide actions that should be undertaken to achieve reductions in these disproportionately burdened communities.<sup>1</sup> Many CHC operate in or adjacent to DACs, and emission reductions from these vessels will directly benefit these communities experiencing cumulative exposure burden.

Additionally, Governor Newsom's Executive Order N-79-20 directed CARB and other State agencies to transition off-road vehicles and equipment to 100 percent zero-emission by 2035 where feasible. To address this, staff proposes provisions to accelerate deployment of Zero-Emission and Advanced Technologies (ZEAT), which includes requiring all short-run ferries to switch to zero-emissions propulsion and auxiliary power systems, and for new excursion vessels to be equipped with zero-emission capable hybrid systems. There are other use cases of CHC operations that can be transitioned to zero-emission over the coming decade. Therefore, in response to Executive Order N-79-20, CARB staff has proposed amendments that creates compliance flexibility for introducing zero-emission technology into the marine market.

The Proposed Amendments will assist California to achieve its National Ambient Air Quality Standards (NAAQS) set by the U.S. Environmental Protection Agency (U.S. EPA). Most of the emission reductions expected from the adoption of the Proposed Amendments will occur in areas with significant challenges with air quality, and reductions will assist the State to attain the NAAQS.

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<sup>1</sup> CARB, Community Air Protection Blueprint, October 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-03/final\\_community\\_air\\_protection\\_blueprint\\_october\\_2018\\_acc.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/final_community_air_protection_blueprint_october_2018_acc.pdf).

While achieving emission reductions through cleaner combustion and zero-emission technologies, the Proposed Amendments are expected to provide significant health benefits, avoid premature death and mortality, and protect workers and on-vessel passengers from exposure to diesel and other combustion-generated air pollutants.

## **B. Summary of Proposal**

The Proposed Amendments would apply more stringent requirements to in-use and new vessels, expand the regulatory requirements to vessel categories that were previously exempt from in-use vessel requirements, and apply reporting, infrastructure, and other requirements onto facilities, such as seaports, terminals, marinas, and harbors that conduct business with CHC. Amending the Current Regulation would further reduce emissions from harbor craft by establishing expanded and more stringent requirements for CHC engines and mandates for accelerated deployment of ZEAT. The following is a summary of the key provisions introduced in the Proposed Amendments.

### **1. In-Use and New-Build Vessel Emissions Performance Standards**

Staff proposes more stringent engine emissions performance standards for NO<sub>x</sub> and particulate matter (PM). To meet the required emissions performance standards, vessel owners and operators could choose to repower and retrofit engines on in-use vessels or obtain a new-build vessel. For engines rated less than or equal to 600 kilowatts (kW), the Proposed Amendments would require a performance standard equivalent to Tier 3 engine plus a diesel particulate filter (DPF), or Tier 4 plus a DPF if there is an available engine model certified to Tier 4 by the compliance date of the engine. Engines rated greater than 600 kW would need to meet a performance standard equivalent to a Tier 4 engine plus a DPF. Staff is proposing a performance standard that is more stringent than the U.S. EPA standards for marine Tier 3 and marine Tier 4 engines. It is important to note that in the Proposed Amendments to the CHC Regulation, CARB is not proposing new emission standards for marine engine manufacturers selling engines in California.

### **2. Expanded Vessel Categories**

Subjecting additional CHC vessel categories to in-use requirements would achieve additional emission reductions that are needed in the areas where CHC operate. Staff is proposing to add the following vessel categories to the in-use requirements of the Proposed Amendments: commercial passenger fishing vessels (CPFV), commercial fishing vessels, all tank barges, pilot vessels, and workboats. Including these categories will regulate 2,095 more vessels out of the approximately 3,159 CHC that are estimated to operate in Regulated California Waters (RCW) in 2023. RCW is defined as waters within 24 nautical miles (nm) of the California mainland coastline (not 24 nm beyond islands).

### **3. Mandates for Zero-Emission and Advanced Technologies**

The Proposed Amendments include ZEAT mandates where technology is more feasible: new excursion vessels would need to be zero-emission capable by 2025, and new and in-use short-run ferries to be zero-emission by 2026. In addition, CARB staff propose a regulatory incentive framework that would encourage adoption as ZEAT technology advancements are made in the marine sector. If a vessel owner or operator adopts ZEAT early or where not otherwise required, additional compliance time could be granted to other engines or vessels within the fleet.

### **4. Renewable Diesel**

The Proposed Amendments would require vessels to use renewable diesel when operating in California beginning on January 1, 2023. Renewable diesel is a drop-in fuel that is already being used widely in diesel engines across the State, including those in the marine sector. The use of renewable diesel will achieve immediate NO<sub>x</sub> and PM emission reductions, resulting in health benefits for workers and residents. Additionally, substituting fossil diesel with renewable diesel will reduce the State's GHG emissions and help California achieve its climate targets.

### **5. Low-Use Compliance Pathway**

The Current Regulation provides a low-use compliance pathway that exempts engines from in-use requirements if engine hours do not exceed an annual threshold of 80 hours for dredges and barges, and 300 hours for all other regulated in-use vessel categories. The Proposed Amendments would change this pathway to reflect the distinctions between engine tiers, in order to provide flexibility to stakeholders who have already upgraded to cleaner engines, while continuing to remove engines with the lowest emissions performance standards. Pre-Tier 1, Tier 1, Tier 2 and Tier 3 or 4 engines will be exempted from in-use requirements if they operate below a threshold of 80, 300, 400, and 700 hours, respectively. If vessels operate in Disadvantaged Communities, the annual threshold is halved (to 40, 150, 200, and 350 hours, respectively) to ensure that emission reductions are prioritized in these areas.

### **6. Proposed Compliance Extensions**

Staff is proposing several compliance extensions in the Proposed Amendments to allow for more time for compliance in cases of scheduling, feasibility, or infrastructure challenges. Most of these extensions will expire by the end of 2034. Passenger carrying vessels, including ferries, CPFVs, and excursion vessels, if subject to vessel replacement to meet emissions performance standards, would be eligible to receive an additional two-year feasibility extension due to potential impacts from the global situation that began in 2020.

## **7. Alternative Control of Emissions**

Staff is also proposing to modify the Alternative Control of Emissions (ACE) by which vessel owners and operators could comply with the Proposed Amendments. The ACE currently allows and would continue to allow vessel owners and operators to comply with the Proposed Amendments through an alternative means other than directly complying with the calendar year schedule for engine or vessel compliance. Under an ACE, an applicant would be able to comply by receiving approval from the Executive Officer (EO) to pursue an alternative that includes, but is not limited to, any combination of engine modifications, exhaust treatment control, engine repowers, use of alternative fuels or additives, fleet averaging, or any other measures that, when implemented, will sufficiently reduce emissions equivalent to the emissions performance standards identified in the Proposed Amendments.

## **8. Facility Owner and Operator Responsibilities**

Staff also proposes adding new requirements on facility owners and operators that conduct business with CHC. Facilities would be required to report information about vessels that use those facilities, which will improve data quality and compliance, and clarify facility owner and operator responsibilities to support shore power and infrastructure to support ZEAT vessels.

### **C. Potential Impacts of the Proposal**

#### **1. Potential Environmental Impacts**

The Proposed Amendments are expected to reduce emissions of PM<sub>2.5</sub>, DPM, NO<sub>x</sub>, ROG, and GHGs beyond levels achieved under the Baseline (Table ES-1). Emission reductions would begin in 2023 when the Proposed Amendments impose new emission reduction requirements. Staff estimated that from 2023 through 2038, the Proposed Amendments would further reduce cumulative statewide emissions by approximately 1,610 tons of PM<sub>2.5</sub>, 1,680 tons of DPM, 34,340 tons of NO<sub>x</sub>, 2,460 tons of ROG, and 415,060 metric tons (MT) of GHG, relative to the Baseline.

**Table ES-1. Projected Annual and Total PM2.5, DPM, NOx, ROG, and GHG Emission Reductions Resulting from the Proposed Amendments from 2023 through 2038**

<b>Year</b>	<b>PM2.5 (Tons)</b>	<b>DPM (Tons)</b>	<b>NOx (Tons)</b>	<b>ROG (Tons)</b>	<b>GHG (MT)</b>
2023	42	44	584	21	339
2024	53	56	941	53	4,781
2025	62	64	1,239	75	9,139
2026	71	74	1,568	96	15,963
2027	77	80	1,767	110	18,876
2028	83	87	1,906	120	20,204
2029	90	94	2,046	131	21,313
2030	103	108	2,328	164	22,539
2031	117	122	2,585	201	25,342
2032	125	131	2,767	217	29,784
2033	133	139	2,845	222	39,598
2034	136	142	2,853	222	40,709
2035	134	140	2,805	216	41,063
2036	131	138	2,756	210	41,429
2037	129	135	2,703	203	41,804
2038	126	132	2,648	196	42,180
<b>Total</b>	<b>1,610</b>	<b>1,680</b>	<b>34,340</b>	<b>2,460</b>	<b>415,060</b>

These emission reductions benefit individuals by reducing incidence of premature death, hospital admissions, and emergency room visits, as well as reducing criteria pollutants and GHGs. Overall staff estimated the Statewide valuation of health benefits from avoided adverse health outcomes due to the Proposed Amendments at \$5.25 billion between 2023 and 2038, far exceeding the direct economic costs of \$1.79 billion for the same time period during implementation of the Proposed Amendments.

At a local level, these emission reductions will reduce air pollution-related health issues in communities in high-risk areas near seaports, marinas, harbors, and other waters are exposed to higher PM2.5 concentrations from harbor craft than other California residents. In addition, ZEAT requirements would require the use of quieter zero-emission and other advanced technologies on ferry and excursion vessels that would decrease the noise levels that passengers and crew are exposed to on traditional diesel-fueled harbor craft.

Note, in this Staff Report, which has been prepared pursuant to the California Administrative Procedure Act, the term “baseline” refers to the Current Regulation scenario. Note that the term “baseline” carries a different meaning under the California Environmental Quality Act (CEQA), which is addressed in the Draft Environmental Analysis (EA) included as an Appendix D to this Staff Report. As explained in that document, for purposes of the Draft EA, the term “baseline” refers to the existing environmental conditions at the time the environmental review process commenced, in this case representing 2020 existing environmental conditions.



## **2. Potential Economic Impacts**

The CHC Proposed Amendments will have a range of impacts on the California economy. Regulated vessel fleets and facility owners and operators will experience direct costs to comply with the regulation. On the other hand, demand to many sectors such as shipyard services, construction industry, and engine equipment manufacturing will increase in response to the Proposed Amendments, which may lead to increases in economic output and/or employment in these sectors.

The macroeconomic impacts of the regulation are relatively small in relation to the California economy. Staff's analysis indicates that the Proposed Amendments are unlikely to have a significant impact on the overall California economy. Overall, California's Gross State Product (GSP), jobs, and output will continue to grow under the Proposed Amendments, and the changes in the growth of jobs, GSP, and output are projected to not exceed 0.01 percent of the baseline.

## **I. Introduction and Background**

Commercial Harbor Craft (“CHC” or “harbor craft”) are a vital part of California’s economy, and are essential for moving cargo and providing services to Ocean-Going Vessels (OGV) and various seaports, harbors, and marinas throughout California. While these vessels are reliable and operationally efficient, many of them are powered by and utilize diesel engines that emit significant amounts of air pollutants, including diesel particulate matter (DPM), fine particulate matter (PM<sub>2.5</sub>), oxides of nitrogen (NO<sub>x</sub>), oxides of sulfur (SO<sub>x</sub>), reactive organic gases (ROG), and greenhouse gases (GHG). Coastal areas throughout the State continue to be impacted by emissions generated from 3,159 CHC operating near California seaports and marine terminals. More emission reductions are necessary from CHC to further protect Californian’s public health and welfare, and to achieve the National Ambient Air Quality Standards (NAAQS).

The Airborne Toxic Control Measure for Diesel Engines on Commercial Harbor Craft (“Original Regulation”) was adopted in 2008 to reduce emissions of DPM, NO<sub>x</sub>, and ROG from diesel engines used on CHC operated in RCW. The Original Regulation was then amended in 2010 (becoming the “Current Regulation”) to include additional vessel categories, including crew and supply, barge, and dredge vessels. The Current Regulation (Title 17, California Code of Regulations (CCR) § 93118.5) will be fully implemented by the end of 2022. This Initial Statement of Reasons (“ISOR” or “Staff Report”) provides the basis for the California Air Resources Board (CARB) staff’s proposal to amend the Current Regulation to further reduce emissions from harbor craft in impacted communities.

Amending the Current Regulation would further reduce emissions from harbor craft by establishing expanded and more stringent requirements for CHC engines and mandates for accelerated deployment of Zero-Emission and Advanced Technologies (ZEAT). The Proposed Amendments to the Commercial Harbor Craft Regulation (“Proposed Amendments”) would apply more stringent requirements to in-use and new vessels, expand the regulatory requirements to vessel categories that were previously exempt from in-use vessel requirements, and apply reporting, infrastructure, and other requirements onto facilities, such as seaports, terminals, marinas, and harbors that conduct business with CHC.

### **A. CARB’s Authority to Regulate and Reduce Air Pollution from CHC**

CARB has been granted broad and extensive authority under the Health and Safety Code (HSC) to adopt the Proposed Amendments. CARB is authorized to adopt standards, rules and regulations needed to properly execute the powers and duties granted to and imposed on CARB by law (HSC § 39600 and 39601). HSC § 43013 and 43018 broadly authorize and require CARB to achieve the maximum feasible and cost-effective emission reductions from new and in-use non-vehicular and mobile sources, including, to the extent permitted by federal law, the adoption of regulations for marine vessels, (HSC § 43013(b)). HSC § 43013(h) directs CARB to expeditiously

reduce NOx emissions from diesel marine vessels and other vehicular and mobile sources “which significantly contribute to air pollution problems.” HSC § 43108(a) directs CARB to achieve “the maximum degree of emission reduction possible” from both vehicular and other mobile sources.

Section 209(e)(1) of the federal Clean Air Act (CAA) preempts all states from adopting or enforcing standards or other requirements relating to controlling emissions from new nonroad engines less than 175 horsepower (hp) used in farm and construction equipment and vehicles, new engines used in locomotives, or new locomotive engines. Neither the Original CHC Regulation, the Current Regulation, nor the Proposed Amendments affect the engines listed in CAA § 209(e)(1).

CAA § 209(e)(2) allows California to adopt and enforce separate state nonroad emission standards or emission related requirements for all other new and in-use nonroad engines. CARB obtained an authorization from the United States Environmental Protection Agency (U.S. EPA) to enforce the Original CHC Regulation, including new and in-use engine emission limits on December 13, 2011.<sup>2, 3</sup> In addition, U.S. EPA granted authorization for CARB to implement the Current Regulation on January 19, 2017.<sup>4</sup>

CARB is further mandated to reduce emissions of toxic air contaminants (TAC) under California’s air toxics laws. HSC § 39666 directs CARB to adopt Airborne Toxic Control Measures (ATCM) to “reduce emissions of toxic air contaminants from nonvehicular sources,” such as the DPM emitted from CHC.

CARB is also charged by HSC § 38500 et seq. to monitor and regulate sources of GHG emissions and is directed by HSC § 38560 to adopt regulations to “achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from sources or categories of sources, subject to the criteria and schedules set forth in this part.”

HSC § 39730 directs CARB to develop a comprehensive strategy to reduce emissions of short-lived climate pollutants (SLCP), such as black carbon (BC) emitted by CHC in

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<sup>2</sup> U.S. EPA, Federal Register, Vol. 76, No. 239, California State Nonroad Engine Pollution Control Standards; Commercial Harbor Craft Regulations; Notice of Decision, December 13, 2011, last accessed June 28, 2021, <https://www.govinfo.gov/content/pkg/FR-2011-12-13/pdf/2011-31916.pdf>.

<sup>3</sup> CARB, Regulatory Advisory, Advisory Number: 310, Implementation of the Commercial Harbor Craft Regulation, last accessed June 28, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/enf/advs/advs310.pdf>.

<sup>4</sup> U.S. EPA, Federal Register, Vol. 82, No. 12, California State Nonroad Engine Pollution Control Standards; Commercial Harbor Craft Regulation; Notice of Decision, January 19, 2017, last accessed June 28, 2021, <https://www.govinfo.gov/content/pkg/FR-2017-01-19/pdf/2017-01261.pdf>.

the state, and HSC § 39730.5 directs CARB to begin implementing that strategy no later than January 1, 2018.

## **B. Background on Affected Watercraft, OGVs, and CHC**

CARB has enacted several regulations to reduce emissions from watercraft and marine vessels, which are described below in more detail. Although recreational watercraft and OGVs are not subject to the requirements in the Current Regulation or the Proposed Amendments, it is important to delineate between these categories to provide further clarity on the regulatory differences.

### **1. Recreational Watercraft**

CARB regulates exhaust emissions from new spark-ignition engines that are designed to propel marine vessels in Title 13 CCR § 2440 through 2448. These vessels consist of inboards, sterndrives, outboards, personal watercraft, jet drives, and hovercraft, and are typically used for recreational purposes, such as water skiing and motoring.

The first exhaust emission standards for spark-ignition marine engines in California began in 2001 and required outboard engines and personal watercraft engines to comply with progressively more stringent hydrocarbon (HC) and NO<sub>x</sub> standards in 2001, 2004, and 2008. A rating system was adopted for these engines, and the vessels in which they were used, to indicate relative emissions levels. Vessels with engines certified to the 2001 standard were required to display a "1 STAR" label indicating that the engine was 75 percent cleaner than previously uncertified engines. Vessels with engines certified to the 2004 standard were required to display a "2 STAR" label indicating that the engine was 20 percent cleaner than a "1 STAR" engine. Lastly, vessels with engines certified to the 2008 standard were required to display a "3 STAR" label indicating that the engine was 65 percent cleaner than a "1 STAR" engine. Certification and warranty provisions were also adopted at that time.

Inboard and sterndrive engines were first regulated in 2003 with a combined HC and NO<sub>x</sub> standard of 16 gram per kilowatt-hour (g/kW-hr) and a "3 STAR" label being required. In 2008, the HC and NO<sub>x</sub> standard for inboard and sterndrive engines was reduced to 5 g/kW-hr, which necessitated the adoption of a "4 STAR" label indicating that the engine was 90 percent cleaner than a "1 STAR" engine. The "4 STAR" standards generally required the incorporation of a three-way catalytic converter. Hovercraft and jet drive vessels generally fall into this category of standards. A voluntary "5 STAR" label also exists for engines that are certified to HC and NO<sub>x</sub> levels 50 percent lower than the "4 STAR" standard.

At the time of their adoption, the outboard regulations estimated a reduction of ozone-forming HC and NOx emissions by 161 tons per day on average in 2020.<sup>5</sup> Similarly, the inboard and sterndrive regulations estimated a summer weekend reduction of HC and NOx emissions by 56 tons per day on average in 2020.<sup>6</sup> In addition to reducing air pollution, the exhaust emission regulations have also helped minimize water contamination for various lakes. Older two-stroke marine engines would dump significant quantities of unburned fuel into the surrounding water, often damaging fish estuaries and the purity of the local drinking water supply. It is common today for many California lake authorities to ban the use of vessels with less than a “1 STAR” or “2 STAR” emissions rating.

In 2015, the Board set standards for Spark-Ignition Marine Watercraft (SIMW). For all new boats, model year (MY) 2018 and later, CARB certified components such as low-permeation fuel houses and tanks, along with carbon canisters and pressure relief valves, must be installed to reduce evaporative emissions. Due to CARB’s regulations in place for recreational watercraft, there have been significant reductions in air and water pollution over the years.

## **2. Ocean-Going Vessels**

OGVs are large commercial vessels that are designed to transport cargo or passengers between seaports. OGVs are generally greater than 400 feet long, weigh more than 10,000 gross tons (GT), have per-cylinder engine displacement of greater than 30 liters, and can be a U.S. or foreign-owned vessel. Most OGVs are owned by foreign companies due to the international nature of shipping but are still subject to California’s OGV regulations.

OGVs docked at berth must run auxiliary engines to produce electricity for cargo operations. As a result, these vessels constantly emit TACs, criteria pollutants, and GHGs at berth. CARB’s At-Berth Regulation<sup>7</sup> requires vessels to reduce emissions at berth by plugging into shore power or using capture and control technologies. Shore power allows vessels to plug into grid-based power and release zero emissions at the stack.

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<sup>5</sup> CARB, Staff Report: Public Hearing to Consider Adoption of Emission Standards and Test Procedures for New 2001 and Later Model Year Spark-Ignition Marine Engines, October 23, 1998, last accessed June 28, 2021, <https://ww3.arb.ca.gov/regact/marine/isor.pdf>.

<sup>6</sup> CARB, Staff Report: Public Hearing to Consider Adoption of Emission Standards and Test Procedures for New 2003 and Later Spark-Ignition Inboard and Sterndrive Marine Engines, June 8, 2001, last accessed June 28, 2021, <https://www.arb.ca.gov/regact/marine01/isor.pdf>.

<sup>7</sup> CARB, Final Regulation Order: Control Measure for Ocean-Going Vessels At Berth, 2020, last accessed June 28, 2021, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/fro.pdf>.

Since 2014, emissions from container, refrigerated cargo (“reefer”), and cruise vessels have been controlled at berth through CARB’s 2007 At-Berth Regulation.<sup>8</sup> This Regulation was predicted to achieve an 80 percent reduction of emissions from those vessel types (around 4,000 visits) by 2020<sup>9</sup>. While the 2007 At-Berth Regulation has achieved reductions in DPM and NOx, there are no additional measures to continue reducing the remaining health burdens associated with OGVs at berth. For this reason, CARB adopted a new At Berth Regulation in 2020 that built upon the significant emission reductions that were achieved with the 2007 Regulation by adding roll-on/roll-off (“ro-ro”) and tanker vessels, and requiring all OGVs that visit a terminal receiving 20 or more vessel visits per calendar year to reduce emissions at berth.

In addition to the At Berth Regulation, OGVs must also comply with the Vessel Fuel Regulation which has been in place since 2008. This regulation requires all OGVs to use cleaner distillate marine fuels to reduce DPM, PM, NOx, and SOx from OGV main propulsion diesel engines, auxiliary diesel engines, diesel-electric engines, and auxiliary boilers. Vessels must switch to CARB compliant distillate marine fuels anytime the vessel is within RCW, or within 24 nautical miles (nm) of the California coast (including islands).<sup>10</sup> The At Berth and Fuel Regulations have significantly decreased emissions from OGVs, which has led to reductions in the number of premature deaths, hospital admissions, and emergency room visits for residents in California, especially for those that live in portside communities.

### **3. Commercial Harbor Craft**

CHC consist of any private, commercial, government, or military marine vessel including, but not limited to, passenger ferries, excursion vessels, tugboats, ocean-going tugboats, towboats, push-boats, crew and supply vessels, workboats, pilot vessels, supply boats, fishing vessels, research vessels, U.S. Coast Guard (USCG) vessels, emergency response harbor craft, and barge vessels that do not otherwise meet the definition of OGVs or recreational vessels.

Although CHC are used throughout California harbors, bays, and other coastal waters, they are heavily concentrated at the commercial seaports, harbors, and marinas, such

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<sup>8</sup> CARB, Final Regulation Order: Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port, 2007, last accessed June 28, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-04/finalregulation\\_ADA.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-04/finalregulation_ADA.pdf).

<sup>9</sup> CARB, Staff Report: Initial Statement of Reasons, Public Hearing to Consider the Proposed Control Measure for Ocean-Going Vessels At Berth, October 15, 2019, last accessed June 28, 2021, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/isor.pdf>.

<sup>10</sup> 17 CCR, §93118.2, Airborne Toxic Control Measure for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline, Amended October 27, 2011, last accessed June 28, 2021, <https://ww3.arb.ca.gov/ports/marinevess/documents/fuelogv17.pdf>.

as the Port of Long Beach (POLB), Port of Los Angeles (POLA), Port of Oakland, etc. In 2023, there will be an estimated 3,159 harbor craft operating in California that fall into the vessel categories subject to the Proposed Amendments.

The Current Regulation includes requirements for both new and in-use diesel engines used on CHC operating in RCW. Specifically, all harbor craft must:

- Install a non-resettable meter to measure operating hours on each engine, if not already installed.
- Use CARB diesel or an approved alternative fuel.
- Submit an initial report to CARB providing vessel and engine information.
- Maintain and update these records and keep copies on the vessel or at its homebase office.
- Meet “new engine emission standards” when replacing engines on existing vessels or installing engines on newly built vessels.

### **C. Basics on CHC Operations**

This section introduces harbor craft operations and the various types of CHC that visit California seaports, marinas, and harbors.

#### **1. Barges**

Barges are cargo transporting vessels that are generally towed or tugged along with other vessels. Since barges are typically not self-propelled, they require tugboats or towboats to be moved. Barges often have a flat-bottomed rectangular hull with sloping ends that can be built with or without a propulsion engine. Barges come in a wide variety of configurations and some barge configurations and vocations may have significant emissions if they are supporting fuel-bunkering operations. Depending on the type of barge, there may be a number of auxiliary engines aboard for pumping fuel or petrochemicals off the barge, powering hydraulic actuators for mechanical barge dumping, or generating electricity for running lights.

##### **a. Articulated Tug Barges**

An Articulated Tug Barge (ATB) is a petrochemical tank barge that is mechanically linked with a paired tugboat that functions as a tug-barge combination. Unlike an OGV oil tanker, the ATB tug and barge can separate into two distinct harbor craft, even if they do not commonly operate independently. ATBs conduct similar operations as tugs pulling tank barges with cables, are similar in design and equipment to CHCs, and are classified as such in the Proposed Amendments. The fact that ATBs are considered two distinct harbor craft, circumvents some of the applicable USCG subchapter rules governing the operation of OGV tankers allowing operation with a crew of 8 rather than 20 or 23 compared to a similar size/capacity OGV tanker. The barge is considered a separate unmanned vessel even when pinned to the pusher tug

and is subject to requirements of both 46 Code of Federal Regulations (CFR) Subchapters D<sup>11</sup> (Tank Vessels) and O<sup>12</sup> (Certain Hazardous Bulk Flammable/Combustible Petrochemical Cargoes listed in table 46 CFR § 30.25-1) as they existed as of May 24, 2021.

Loaded ATBs typically transit up and down the California coastline in offshore shipping lanes. ATB operators are typically in contract with the refineries and their vessel activities are scheduled by other entities. While slower and less efficient than an OGV tanker, ATBs are still more efficient than towing double-hull petrochemical barges on a wire with older tow boat equipment.

When the ATB is docked at a terminal, the main propulsion engines are typically shut down and the barge engines are operated to run deck equipment and transfer product out of the barge. It can take a full day or more to pump out one product while being loaded with another. Most ATBs, and several other petrochemical tank barges, are longer than 400 feet, which exempts them from the Current Regulation. Some operators may already use CARB Ultra-Low Sulfur Diesel (CARB ULSD) and operate engines certified to newer U.S. EPA certification standards than what is required; however, CARB does not have any existing requirements on ATB barges or tank barges. Since tank barges and the barge portion of an ATB are currently unregulated, this presents an opportunity to further reduce emissions from harbor craft.

CARB staff recognizes that there are operational similarities between ATBs, tugs pulling barges with a towline, and some types of OGV tanker operations. Given that OGV tankers have requirements to control emissions at berth in CARB's At-Berth Regulation, the Proposed Amendments provide an ACE option applicable to all CHC, including ATBs, to comply with the Proposed Amendments in lieu of meeting emissions performance standards. The ACE allows an owner or operator to control auxiliary engine emissions (including from tank barges), similar to the controls used for ships at berth if equivalent or additional reductions are achieved relative to meeting emissions performance standards. The At-Berth regulation requires all OGVs to utilize a CARB Approved Emission Control Strategy (CAECS) or shore power to control emissions while at berth. For example, it may be possible, if ATB owners and operators opt to control their auxiliary emissions on tugs and barges using a CAECS or shore power, to demonstrate that emissions are equal or lower than directly complying with the regulation by following the MY schedule for each engine, and if CARB approves the ACE, then ATBs would only have to reduce emissions from the main engines on the tugs while in transit under the Proposed Amendments. Figure I-1

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<sup>11</sup> 46 CFR Subchapter D – Tank Vessels, last accessed June 28, 2021, <https://www.gpo.gov/fdsys/pkg/CFR-2008-title46-vol1/pdf/CFR-2008-title46-vol1-chapl-subchapD.pdf>.

<sup>12</sup> 46 CFR Subchapter O – Certain Bulk Dangerous Cargoes, last accessed June 28, 2021, <https://www.gpo.gov/fdsys/pkg/CFR-2011-title46-vol5/pdf/CFR-2011-title46-vol5-chapl-subchapO.pdf>.



shows a Kirby Corporation ATB tug interfaced into the back of its ATB barge departing the Bay Area.

**Figure I-1. Kirby Corp. ATB Departing the San Francisco Bay Area**



### **b. Double-Hull Petrochemical Tank Barges**

Double-hull petrochemical tank barges may contain large quantities of fuel or petrochemicals. Similar to ATB barges, these barges utilize a number of power generators, auxiliary engines to pump products, and power hydraulic pumps for deck equipment such as anchor winches or hose handling booms. Pictured in Figure I-2 is the double-hulled fuel barge *Alesa Bay*, which has a length of 349 feet. This particular tank barge is already subject to the Current Regulation since it is less than 400 feet long, and therefore meets the definition of a barge.

**Figure I-2. Sause Bros. Ocean Double Hull Fuel Barge, *Alesa Bay***



### **c. Double-Hull Fuel-Bunker Barges**

The double-hull fuel-bunkering barges are used for fueling OGVs either at berth or at anchor and are considerably smaller than the ATB or petrochemical tank barges. The fuel capacity of a typical bunker barge in California is 20,000-50,000 barrels, or roughly

1/3 to 1/5 the capacity of a relatively small 550 Class ATB. Additionally, bunker barges are not equipped with ballast water tanks.

The engines aboard bunker barges are used for pumping fuel, powering deck equipment, and generating electricity. Most bunker barges would have at least two product pumping engines aboard, with most operations occurring within RCW. However, CARB staff does not have data regarding the portion of fuel bunkering that occurs at berth versus at anchor. Figure I-3 shows the *Bernie Briere* double-hull fuel-bunker barge at the Port of San Francisco.

**Figure I-3. Bernie Briere Double Hull Fuel Bunker Barge at Port of San Francisco**



#### **d. Other Barges**

The Other Barge vessel category includes deck barges, derrick or crane barges, and construction barges. Construction barges make up the majority of the “Other Barge” category in California and are used to transport oversized materials including machinery, grain, coal, fuel, and many other commodities. Construction barges may utilize a permanently affixed generator for running lights, which would be subject to the CHC regulations, but most emissions from the operation of these barges occur from the tugboat moving the barge, or other equipment temporarily located on the barge that would be controlled by other CARB regulations. Figure I-4 is an image of a flat top construction barge.

**Figure I-4. Flat Top Construction Barge with Characteristic Tapered Ends**



## **2. Commercial Fishing Vessels**

Commercial fishing vessels are used to catch fish in the sea, lake, or river and may operate their engines at the dock while loading supplies. Commercial fishing vessels transit to various offshore locations to collect fish, sometimes with trips lasting a few days. Most of the smaller commercial fishing vessels are powered by one main engine and have an auxiliary generator engine for powering vessel refrigeration, lighting, deck equipment, and icemakers for preserving fish. Vessel propulsion is accomplished by single or twin-screw fixed-pitch propellers, but some larger commercial fishing vessels may have more main engines and twin-screw propulsion. Figures I-5a and I-5b are images of commercial fishing vessels that are recovering trawl nets.

**Figure I-5a and Figure I-5b. Commercial Fishing Vessels Recovering Trawl Nets**



## **3. Commercial Passenger Fishing Vessels**

Commercial passenger fishing vessels (CPFV) consist of any coastal or offshore vessel used for sport fishing, charter fishing, or any other type of fishing activity where individuals, other than the owners, operators, or employees of the vessel, are onboard the vessel to perform fishing activities. This is including but is not limited to operations that provide both day and overnight trips, such as those that may voyage periodically in and out of RCW to target migratory species.

CPFVs are certificated by the USCG to carry dozens of passengers out onto the ocean for fishing day-trips. These vessels may idle at their docks while preparing for departure and loading passengers and equipment. CPFVs then transit at high speeds out to fishing grounds in the open ocean where they troll at low speeds or maintain a constant position. Figure I-6 is an image of the vessel *Freelance*, which is located in Newport Beach, California.

The Current Regulation has not required CPFVs to meet Tier 2 or 3 engine standards and does not have any reporting or fuel use requirements for uninspected CPFVs that carry six passengers or less. However, CARB staff recognizes that both inspected and uninspected CPFVs compete for the same business, may operate in similar locations, and use similar types of vessels and diesel engines. Chapter III of this Staff Report outlines CARB staff's proposed changes to the Current Regulation, which would subject the uninspected diesel-powered vessels to the Proposed Amendments.

Figure I-6. CPFV *Freelance*, operating out of Newport Beach, CA



#### 4. Crew and Supply Vessels

Crew and supply vessels are self-propelled vessels that are used for carrying personnel and/or supplies to and from offshore and in-harbor locations, including but not limited to offshore work platforms, construction sites, islands, and other vessels. Ocean-going crew and supply vessels are regularly used to service offshore drilling platforms and assist in towing and repositioning drilling platforms. Often available for charter, these vessels perform any number of specialized offshore maritime work required of them, including ocean towing, engineering project support, and research project support.

Offshore crew and supply vessels are large harbor craft often over 150 feet in length and have up to four powerful main propulsion engines. The vessels characteristically have a flat and extended main deck, often with a large hydraulic crane for cargo or machinery handling. Figures I-7a and I-7b are images of the *Maersk Transporter* and the *NRC Quest* crew and supply vessels, respectively.

Figure I-7a and Figure I-7b. *Maersk Transporter* and *NRC Quest* Offshore Crew and Supply Vessels



Figures I-8a and I-8b show a high-speed crew and supply vessel, *Mr. Steven*, which is under contract with Space X to recover rocket fairing equipment.

Figure I-8a and Figure I-8b. Fast crew and Supply Vessel, *Mr. Steven*



## 5. Dredges

Dredges are vessels designed to remove earth from the bottom of waterways, by means of a scoop, a series of buckets, or a suction pipe. Dredging vessels excavate underwater debris from shipping channels by utilizing mechanical, hydraulic, or a combination of both methods. Dredging operations are accomplished either by barge-mounted heavy equipment or custom-built harbor craft.

### a. Mechanical Dredges

Mechanical dredges come in a number of different arrangements, including barge-mounted hydraulic excavators with back-hoe or clamshell-type buckets, bucket wheel excavators, and cutter-suction dredges. Figures I-9a, I-9b, and I-10 are images of hydraulic excavator and back-hoe type dredges.

Figure I-9a and Figure I-9b. Hydraulic Excavator with Clamshell Bucket and a Cutter Suction Dredge for Dredging Harder Materials like Rock and Corral



Figure I-10. Barge Mounted Back-Hoe Type Dredge



### b. Hydraulic Dredges

Hydraulic dredging vessels utilize large, high-volume, debris-resistant water pumps to pump a combination of water and debris either to the side of the excavation area, into a pipeline to pump a short distance away, or into a self-contained hopper or “scow” (dumping hopper barge) to transport long distances. Hydraulic suction dredges are better suited for removing softer debris such as sand and mud. These vessels often run their main engines at full power through a gearbox power take-off to pump massive quantities of water and debris. Figures I-11a and I-11b are images of suction hopper-type dredge vessels.

Figure I-11a and Figure I-11b. Suction Hopper Type Dredge Vessels



## 6. Excursion Vessels

Excursion vessels are self-propelled vessels that transport passengers for excursions such as dinner cruises, sight-seeing tours, scuba diving expeditions, parasailing, or whale-watching tours. Most excursion trips are 60 or 90 minutes and are associated with lower vessel transiting speeds (~10 knots). CARB staff is aware of some design similarities between excursion vessels and low-speed ferries and that some ferries also perform excursion activities as a secondary use. Figure I-12 is an image of the Bay Area excursion vessel, *Old Blue*, operated by Blue and Gold Fleet.

Figure I-12. Blue and Gold Fleet Excursion Vessel *Old Blue*



Due to the cyclical nature of excursion trips, trip frequencies, and the low-power requirements and transit speeds, excursion vessels are one sector of CHC activity in California where the application of zero-emission propulsion technologies is a viable option for certain vessels. For example, *Enhydra*, Red and White Fleet's new plug-in hybrid 600-passenger battery/diesel-electric excursion vessel, is capable of running 100 percent zero-emission excursion trips in the San Francisco Bay. Figure I-13 is an image of the Red and White Fleet's *Enhydra* vessel.

Figure I-13. Red and White Fleet's Battery Plug in/Diesel Electric Bay Area Excursion Vessel, Enhydra



## 7. Ferries

Ferries can transport deck passengers or vehicles, operating between two points over the most direct water route. Ferries also include vessels operated by public or private companies to transport passengers commercially, on both regularly scheduled and on-demand bases.

### a. Short-Run Ferries

CARB staff has identified a subset of ferries that operate on shorter runs, referred to as "short-run ferries". Short-run ferries include vessels that provide regularly scheduled ferry service between two points that are less than three nm apart. Vessels that provide ferry round-trip service between two points that are less than 3 nm apart but provide less than 20 percent of the service trips from one fleet between those two points during a given calendar year, are not considered short-run ferries. This definition also excludes short-hop or interlining vessels but includes circular routes that may include one-way trips slightly longer than 3 nm. Vessels that make multiple stops in a single round-trip, where half of more of the single-trip lengths are less than 3 nm, and the longest single-trip length is less than 6 nm, are considered short-run ferries. The Proposed Amendments would require zero-emission operations for all short-run ferries.

### b. High-Speed Ferries

High-speed ferries are designed to be light and fast, utilizing engines at high engine loads for extended time intervals. Operating the engines at a high loads continuously while transiting requires larger and/or higher power-density engines. Figure I-14 is an image of the Water Emergency Transportation Authority (WETA) high-speed ferry, *Hydrus*.



Figure I-14. WETA High Speed Ferry, *Hydrus*.



### c. Low-Speed Monohull Ferries

Similar to excursion vessel designs, low-speed ferries are older vessels with single-hull designs. The typical transit speed of a low-speed ferry is 10-14 knots. Some low-speed ferry operators run their vessels for excursions seasonally. See Figure I-15 of the Bay Area's Blue and Gold Fleet, *Bay Monarch* vessel, which can hold up to 788 passengers.

Figure I-15. Blue and Gold Fleet Low Speed Ferry, *Bay Monarch*



## 8. Pilot Vessels

Pilot vessels are designed for transferring and transporting maritime pilots to and from OGVs while they are underway, anchored, or docked. Pilot vessels are generally designed to transit at high speeds (20+ knots) and are highly maneuverable and stable for handling rough seas and dangerous pilot transfer maneuvers next to large OGVs transiting on the ocean. In some cases, pilot vessels are designed to serve as "station boats" where they operate at lower loads for extended periods of time while a crew of pilots remains on standby until OGVs are in need of pilots for navigational assistance. Because local vessel pilots need to navigate ships into the San Francisco Bay and larger harbors in the South Coast, these vessels must quickly transport the pilots to the

OGVs that these seaports serve. Figure I-16 is an image of the San Francisco Bar Pilot's run boat, the *P/V Golden Gate*.

**Figure I-16. San Francisco Bar Pilots 67' Run Boat, *P/V Golden Gate***



## **9. Research Vessels**

Research Vessels are any vessel subject to the requirements of 46 CFR Subchapter U (Oceanographic Research Vessels) as it existed as of May 24, 2021.<sup>13</sup> Research vessels include, but are not limited to, vessels with highly advanced mobile research stations, and vessels that provide stable platforms from which explorers can deploy equipment, divers, or submersibles. Research vessels are typically used in the instruction of oceanography or limnology including those for purposes of seismic, gravity meter, magnetic exploration, and other research. Figure I-17 is an image of the Scripps Institute of Oceanography's *Robert Gordon Sproul* which is a regional general-purpose research vessel that serves research and education missions off-shore California and the U.S. West Coast.

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<sup>13</sup> 46 CFR Subchapter U—Oceanographic Research Vessels, last accessed June 28, 2021, <https://www.govinfo.gov/content/pkg/CFR-2012-title46-vol7/pdf/CFR-2012-title46-vol7-chapI-subchapU.pdf>.

Figure I-17. Scripps Research Vessel *Robert Gordon Sproul*



## 10. Tugboats

CARB defines tugboats as any self-propelled vessel in the service of pulling, pushing, maneuvering, berthing, or hauling barges or other vessels in harbors, over the open seas, or through rivers and canals. They are also used to tow barges or other floating structures. Tugboats generally can be divided into three groups: ship assist/escort tugboats, push/tow tugboats, and ATBs. The term “tugboat” is interchangeable with “towboat” and “push boat” when the vessel is used in conjunction with barges.

### a. Ship Assist Tugboats

A ship assist tugboat is a highly maneuverable tug that primarily assists ATBs and OGVs while docking and undocking. Escort tugs (described in section 10.b. below) typically work with ship assist harbor tugs to dock or undock their escorted ATBs or OGVs.

Ship assist and escort tugs have a highly variable duty cycle. They have powerful main propulsion engines but only operate at maximum load for very brief periods. Commonly, ship assist tugs remain on standby waiting for ships or transit between jobs at lower loads. Ship assist tugs are typically smaller 70 to 80-foot tractor tugs that are used to safely maneuver large container ships and/or tankers. For container ships, car carriers, and bulk cargo vessels, the ship assist tug would intercept, attach a line, and then assist the ships in transiting, making turns, and docking. The larger size of modern container ships may require additional ship assist tugs to maneuver it inside dredged shipping channels and when docking. The number of tugs required to safely assist a ship is different for each harbor due to tides, length of shipping channel turns, the number of turns, and weather conditions. Up to five tugs might be necessary to assist a larger ship. Figure I-18 is an image of ship assist tugboats maneuvering a ship to shore.

Figure I-18. Ship Assist Tugboats Maneuvering a Ship to Shore



### b. Escort Tugboats

Escort tugboats intercept and escort ATBs and OGVs entering the vicinity of a seaport region, with the purpose of providing maneuvering or stopping assistance in case of loss of propulsion or steering power while en route to or from docks and terminals. In the San Francisco Bay Area, escorting typically consists of intercepting the ship outside the Golden Gate Bridge where the tug attaches a line to the ship.

After escorting the ship to a terminal (in the case of a tanker or ATB), the escort tug then can perform ship assist duties to dock the ship and stays on standby at the terminal with the tanker or ATB that is loading or offloading product. If there is a fire or emergency, the escort tugs are available to assist in moving the ship to safety, and if equipped with water pumps, may work to extinguish the fire. When the OGV is ready to depart, the escort tug returns to assist the harbor tugs by maneuvering the vessel off the dock and out of the seaport or harbor. Figures I-19a and I-19b are images of the Bay Area escort tug, *Caden Foss*.

Figure I-19a and Figure I-19b. Bay Area Escort Tug, *Caden Foss*



### c. Push and Tow Tugboats

Push and tow tugboats are often repurposed older ship assist tugboats. These vessels have winches and fendering, but have less bollard pull and maneuverability compared to modern tractor tugs. Unlike escort and ship assist tugs, push and tow tugboats operate their engines at higher loads for extended time intervals. The average load factors for these pushing and towing tugs are estimated to be 40 to 50 percent (similar to a larger ATB push tug). Figures I-20a and I-20b are images of near-shore pushing tugboats.

Figure I-20a and Figure I-20b. Near Shore Pushing Vessels



Ocean-going towing tugboats are similar to the older near-shore pushing and towing tugboats in that they are often older repowered vessels, but these coastal or ocean-going tugs are typically much larger, in the range of 100 to 130 feet in length and have 70,000 to 120,000-gallon diesel fuel tanks for extended-range towing. Similar to ATB tugs and nearshore push boats, ocean-going towing vessels operate their main engines at high loads for extended time intervals and have a higher continuous load. Figure I-21 is an image of the *Pacific Falcon* ocean towing tug.

Figure I-21. Pacific Falcon Ocean Towing Tug



## 11. Workboat/Emergency Response Vessel

Workboats are self-propelled vessels that are used to perform any duty not specifically listed by another category, including but not limited to duties such as firefighting/rescue, law enforcement, hydrographic surveys, research, training, spill response, debris removal, cable laying, construction support (including construction drilling or diving support), and emergency response. Workboats can include vessels owned by public, private, and non-profit organizations. The workboat sector encompasses a wide variety of CHC tasked with supporting various maritime construction or infrastructure development projects.

Multi-purpose workboats consist of vessels capable of doing light towing or pushing to move construction barges, waiting on standby to assist during construction projects, and transporting equipment and small numbers of passengers out to equipment working on barges. Lacking specialized vessel designs to accommodate deck equipment other than a material-handling boom, these vessels are capable of switching between general use workboat vocations quickly and easily. Figure I-22 is an image of a general use workboat, equipped with full protective fendering for light pushing and safety railings, and lacking specialized deck equipment.

Figure I-22. General Use Workboat



### D. Air Pollution from CHC

Emissions from CHC include criteria pollutants (such as PM<sub>2.5</sub> and NO<sub>x</sub>), TACs such as DPM, and GHGs. A summary of the different forms of air pollution emitted from CHC engines is discussed below.

#### 1. Near-Source Toxics

Diesel engines on CHC emit a complex mixture of air pollutants that pose serious health concerns to nearby communities. Diesel exhaust includes gaseous TACs, a mixture of toxics in the particulate phase, such as DPM, and other pollutants that have health impacts due to near-source exposure, such as carbon monoxide (CO). DPM is particulate matter (PM) emitted from diesel-fueled engines and is composed of carbon

particles, such as BC (“soot”), and over 40 known cancer-causing organic substances (TACs), such as arsenic polycyclic aromatic HCs, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene.

Long-term exposure to DPM can increase the risk of lung cancer and many of the same noncancer health effects resulting from exposure to PM<sub>2.5</sub>,<sup>14</sup> such as premature death, asthma, increased respiratory symptoms, decreased lung function in children, and hospitalizations and emergency room visits for exacerbated chronic heart and lung disease. Those most vulnerable to noncancer health effects are children whose lungs are still developing and the elderly, who often have chronic health problems. In addition to its health effects, DPM significantly contributes to smog and haze, reducing visibility.

In 1998, CARB identified DPM as a TAC that can cause cancer, birth defects, other serious illnesses, and leads to an increase in mortality. In 2002, U.S. EPA conducted its first comprehensive review of the potential effects from exposure to diesel engine exhaust.<sup>15</sup> This hazard assessment determined that diesel engine exhaust emissions are a likely human carcinogen, and the World Health Organization (WHO) has classified diesel emissions as carcinogenic to humans.<sup>16</sup>

## 2. Criteria Pollutants

PM, including DPM, is emitted from a vessel’s exhaust stack as a complex mixture of suspended particles and aerosols varying in size, shape, and chemical composition. These particles can either be directly emitted into the atmosphere (primary particles) or formed by chemical reactions of gases (secondary particles) from natural or man-made sources such as sulfur dioxide (SO<sub>2</sub>), NO<sub>x</sub>, and certain organic compounds. PM can be inhaled into the upper airways and lungs, creating respiratory ailments leading to public health concerns. Exposure can increase premature mortality, hospital admissions for cardiopulmonary causes, acute and chronic bronchitis, asthma attacks, and respiratory symptoms, and the health effects are of particular concern for sensitive groups such as infants, children, the elderly, and those with preexisting heart or lung disease.<sup>17</sup>

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<sup>14</sup> CARB, Overview: Diesel Exhaust & Health, last accessed June 28, 2021, <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>.

<sup>15</sup> U.S. EPA, Health Assessment Document for Diesel Engine Exhaust, May 2002, last accessed June 28, 2021, [https://ofmpub.epa.gov/eims/eimscomm.getfile?p\\_download\\_id=36319](https://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=36319).

<sup>16</sup> IARC, WHO, Diesel and Gasoline Engine Exhausts and Some Nitroarenes, Volume 105, 2012, last accessed June 28, 2021, [https://www.who.int/ipcs/assessment/public\\_health/IARC\\_mono105.pdf](https://www.who.int/ipcs/assessment/public_health/IARC_mono105.pdf).

<sup>17</sup> CARB, Inhalable Particulate Matter and Health (PM<sub>2.5</sub> and PM<sub>10</sub>), last accessed June 28, 2021, <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>.

NO<sub>x</sub> consists of highly reactive gases, including nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>). NO<sub>x</sub> emissions from diesel engines can undergo chemical reactions in the atmosphere leading to the formation of PM<sub>2.5</sub> and ozone, which have harmful effects on the respiratory system.<sup>18</sup> The majority of NO<sub>x</sub> emissions from diesel engines are in the form of NO, even in the presence of catalyzed Diesel Particulate Filter (DPF) aftertreatment where NO/NO<sub>x</sub> ratios have shown to range between 0.67 to 0.82.<sup>19</sup> Both NO and NO<sub>2</sub> are formed by combining gaseous nitrogen and oxygen in the atmosphere under the high temperature and pressure conditions in the cylinder. Short-term exposure to elevated concentrations of NO<sub>x</sub> is known to irritate the respiratory system and aggravate respiratory diseases, particularly asthma, leading to hospital admissions, visits to emergency rooms, and respiratory symptoms such as coughing, wheezing, or difficulty breathing.

NO<sub>x</sub> is a precursor to ozone which is formed in combination with volatile organic compounds (VOC) in the presence of heat and sunlight. Ozone can damage the tissues of the respiratory tract, causing inflammation and irritation, and result in symptoms such as coughing, chest tightness and worsening of asthma symptoms. Exposure to ozone can reduce the volume of air that the lungs breathe in and cause shortness of breath. CHC currently operate in several air basins, including but not limited to, the South Coast, the San Francisco Bay Area, and the San Joaquin Valley (primarily at the Port of Stockton) Air Basins. Each of these areas has varying levels of ozone pollution, and none of these areas are in the attainment of the 2008 or 2015 8-hour ozone health-protective standards. Because the South Coast and San Joaquin Valley Air Basins are designated as extreme nonattainment areas for the 2008 and 2015 8-hour ozone standards, NO<sub>x</sub> emissions must be further reduced from CHC.

### **3. Greenhouse Gases and Short-Lived Climate Pollutants**

CHC also emit GHGs and SLCPs (such as BC). GHGs contribute to the greenhouse effect by absorbing reflected solar energy and warming the Earth's atmosphere which contributes to global climate change.<sup>20</sup> Presently, the maritime industry as a whole accounts for around 2 percent of global GHG emissions, but its emissions of GHGs is projected to increase by up to 250 percent by 2050 due to industry growth associated

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<sup>18</sup> U.S. EPA, Nitrogen Dioxide (NO<sub>2</sub>) Pollution, 2016, last accessed June 28, 2021, <https://www.epa.gov/no2-pollution/basic-information-about-no2#>.

<sup>19</sup> Quiros, et al., Real-World Emissions from Modern Heavy-Duty Diesel, Natural Gas, and Hybrid Diesel Trucks Operating Along Major California Freight Corridors, July 19, 2016, last accessed June 28, 2021, <https://link.springer.com/content/pdf/10.1007/s40825-016-0044-0.pdf>.

<sup>20</sup> IMO, Greenhouse Gas Emissions, last accessed June 28, 2021, <https://www.imo.org/en/OurWork/Environment/Pages/GHG-Emissions.aspx>.



with increasing global trade demands.<sup>21</sup> California has set a GHG emission reduction goal of 40 percent below the 1990 levels by 2030,<sup>22</sup> and this target is expected to enable California to reach the ultimate goal of reducing GHG emissions by 80 percent from the 1990 levels by 2050.

Reducing CHC emissions would help to achieve California's goals in reducing both GHG emissions and SLCPs. SLCPs are powerful climate forcers that can have an immediate and powerful impact on climate change, compared to longer-lived GHGs such as carbon dioxide (CO<sub>2</sub>). Methane (CH<sub>4</sub>) is a SLCP that is emitted from CHC engines. CH<sub>4</sub> has an average lifetime of 12.4 years and a global warming potential (GWP) that equals 25 times higher than CO<sub>2</sub> emissions over a 100-year time horizon.<sup>23</sup> CARB is proposing a CHC performance standard for CH<sub>4</sub> to ensure liquefied natural gas (LNG) and compressed natural gas (CNG) engines are not used without adequate controls to limit methane slip. Nitrous oxide (N<sub>2</sub>O) is also a potent GHG with a longer lifetime (121 years) and a GWP of 298 over a 100-year time horizon.<sup>24</sup> Each GHG pollutant has a different GWP potential value, with CO<sub>2</sub> having a GWP of 1. N<sub>2</sub>O is not only a heat-trapping pollutant, but also the largest known remaining anthropogenic threat to the stratospheric ozone layer. Although the Selective Catalytic Reduction (SCR) systems used on Tier 4 engines reduces NO<sub>x</sub> emissions, this system has been shown to increase N<sub>2</sub>O emissions; however, this increase is minor relative to the CO<sub>2</sub> emissions itself, and has been considered in the overall GHG emissions impacts as discussed in Appendix H.

The overall goal of the Proposed Amendments is to lower community health risk, attain regional air quality standards, and reduce GHG emissions. For more information on the impact that CHC emissions have on air quality in California, refer to Chapter VI of this Staff Report.

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<sup>21</sup> Stefanini, Sara, Countries Inch Towards 'Bare Minimum' Climate Target For Shipping, April 10, 2018, last accessed June 28, 2021, <https://www.climatechangenews.com/2018/04/10/countries-inch-towards-bare-minimum-climate-target-shipping/>.

<sup>22</sup> HSC § 38566, Division 25.5, Senate Bill No. 32, September 8, 2016, last accessed June 28, 2021, [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160SB32](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32).

<sup>23</sup> Quiros, et al., Greenhouse Gas Emissions from Heavy-Duty Natural Gas, Hybrid, and Conventional Diesel On-Road Trucks During Freight Transport, Atmospheric Environment, Volume 168, November 2017, <https://www.sciencedirect.com/science/article/pii/S1352231017305794>.

<sup>24</sup> Myhre, G. et al., Anthropogenic and Natural Radiative Forcing, 2013, last accessed June 28, 2021, [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_Chapter08\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf).

## **E. Current Regulations and Programs**

This section discusses the various regulations in place within the U.S. and California to reduce emissions from harbor craft.

### **1. Requirements of the Original and Current Regulation**

On November 15, 2007, CARB approved the Original Regulation for CHC that established in-use and new engine emission limits for both auxiliary and propulsion diesel engines on ferries, excursion vessels, tugboats, and towboats. The Original Regulation became effective on January 1, 2009, and was amended in 2010 (becoming the Current Regulation) to include in-use engine emission requirements for engines on crew and supply vessels, barges, and dredges. The Current Regulation has reduced NO<sub>x</sub> and DPM emissions from diesel engines by requiring certain CHC to meet specific engine standards established by U.S. EPA (e.g., Tier 2 or Tier 3 standards) for main and auxiliary engines.

The Current Regulation requires that in-use Tier 1 and earlier propulsion and auxiliary diesel engines on a CHC vessel operating as a ferry, excursion vessel, tugboat, towboat, crew and supply vessel, barge, or dredge meet emission limits equal to or cleaner than U.S. EPA standards (Tier 2 or Tier 3) in effect at the time the engine is brought into compliance. The compliance dates span through December 31, 2022, depending on the engine MY and annual operating hours. There are four compliance schedules in the Current Regulation: one for vessels with their home seaports outside of the South Coast Air Quality Management District (SCAQMD), an accelerated schedule for vessels with their home seaports in the SCAQMD, a statewide schedule for crew and supply vessels, and another for barges and dredges. Each of these compliance schedules is based on the MY and hours of operation of the engine, and are designed to replace the oldest, highest-use engines first.

For vessel categories subject to in-use requirements, the Current Regulation contains low-use provisions, which allows owners and operators to comply with the regulation by demonstrating that the engine has not, and would not, operate more than 80 or 300 hours per year, depending on the vessel category.

The Current Regulation also subjects owners and operators of all CHC operating in RCW (within 24 nm of the California coast) to reporting, recordkeeping, hour meter, and fuel use requirements. All CHC owners and operators are required to keep records for each vessel, install a non-resettable meter to measure annual hours of operation on each engine, and use ULSD (15 parts per million (ppm) sulfur) to fuel their engines. CHC owners and operators need to submit a report to CARB if they acquire a CHC vessel or engine or if there is a change in the engine hours of operation.

New ferries carrying 75 passengers or more must meet Tier 4 engine requirements or use Tier 2 or 3 engines in conjunction with the Best Available Control Technology

(BACT). The Current Regulation does not impose in-use requirements on workboats, pilot vessels, water taxis, commercial passenger fishing, the “other” category, and all barges (towed or pushed) over 400 feet in length or otherwise meeting the definition of an OGV. Since many, but not all, double-hull fuel/petrochemical barges exceed 400 feet in length, they are not subject to the Current Regulation.

## **2. Regulations on Vessel Common Carriers by the California Public Utilities Commission**

Vessel Common Carriers (VCC) are defined by the California Public Utilities Commission (CPUC) as carriers that transport persons or property between points within the State. Examples are commute ferry services in the San Francisco Bay and services between California mainland points and Catalina.<sup>25</sup> This does not include sightseeing vessels, governmental agencies, tank vessels, specialty barges, or military transportation. More information on common carrier classifications can be found in Public Utilities Code (PUC) § 211 & 212.

CARB’s definition of “ferry” includes, but is not limited to, vessels subject to the VCC requirements set forth by the CPUC.

### **a. Certificate of Public Convenience and Necessity**

Pursuant to PUC § 1007-1008, VCCs may not operate without first obtaining a certificate from the CPUC declaring that public convenience and necessity require the operation unless CPUC has declared an operator exempt from VCC requirements.

To obtain a Certificate of Public Convenience and Necessity (CPCN), the applicant must provide information about their intended operation including routes, fixed termini, points to be served, fares to be charged, proposed discounted fares, frequency of service, financial ability to render the service, and facts showing that the proposed operation is required by public convenience and necessity.<sup>26</sup>

### **b. Fees**

Vessel operators applying to obtain, sell, mortgage, lease, assign, transfer or encumber a CPCN are subject to a one-time fee of \$75.

In addition to any fees related to CPCN applications, fees imposed upon each common carrier are deposited into the Public Utilities Commission Transportation Reimbursement Account (PUCTRA), pursuant to PUC § 421. This PUCTRA fee for

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<sup>25</sup> CPUC, Passenger Stage Corporation & Vessel Common Carrier, last accessed June 28, 2021, <https://www.cpuc.ca.gov/pscvcc/>.

<sup>26</sup> CPUC, Rules of Practice and Procedure, California Code of Regulations Title 20, Division 1, Chapter 1, April 1, 2018, last accessed June 28, 2021, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K618/209618807.PDF>.

VCCs is currently 0.0033 times the gross revenue per reporting period, plus a minimum \$10 quarterly fee or \$25 annual fee, depending on the operator's annual revenue.<sup>27</sup>

Operators whose annual gross California intrastate passenger revenues are \$100,000 or more must report their revenue and pay fees on a quarterly basis. Operators whose annual gross California intrastate passenger revenues are less than \$100,000 must report their revenue and pay fees on annual basis.<sup>28</sup>

For example, a ferry operator generating \$50 million in revenue per year would be required to report revenues and pay fees on a quarterly basis. If this operator generates \$12.5 million per quarter, it would be responsible for paying \$41,250 of this reported revenue each quarter, plus a \$10 quarterly fee to the CPUC.

If a ferry operator generates \$90,000 in revenue per year, it would be required to report revenues and pay fees on an annual basis. This operator would be responsible for paying \$297 of this reported revenue each year, plus a \$25 annual fee to the CPUC.

### c. Rates

CPUC regulates the rates of VCC in the following ways:

- Operators may not establish a rate less than the maximum reasonable rate for the transportation of property for the purpose of meeting the competitive charges of other carriers (PUC § 452).
- Operators shall not change any rate or alter any classification, contract, practice, or rule resulting in any new rate, except upon a showing before the commission and a finding by the commission that the new rate is justified. The proposed rate change does not become effective until it has been approved by the commission (PUC § 454).
- Before engaging in the transportation of persons or property, every common carrier shall file with the commission and shall print and keep open to the public schedules showing the rates, fares, charges, and classifications for the transportation between termini within this State (PUC § 486, 493).
- Every common carrier shall afford all reasonable facilities for the prompt and efficient transfer of passengers between the lines owned, operated,

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<sup>27</sup> CPUC, Resolution M-4838, February 5, 2019, last accessed June 28, 2021, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M264/K682/264682931.PDF>.

<sup>28</sup> CPUC, Instructions for Filing the PUC Transportation Reimbursement Account (PUCTRA) Fee Statement, June 2019, last accessed June 28, 2021, [https://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Public\\_Website/Content/Licensing/Regulatory\\_Information/Instructions%20for%20Filing%20PUCTRA%20\(VCC\).pdf](https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Licensing/Regulatory_Information/Instructions%20for%20Filing%20PUCTRA%20(VCC).pdf).

controlled, or leased by it and the lines of every other common carrier (PUC § 556).

- Nothing shall limit or modify the duty of a common carrier to establish joint rates, fares, and charges for the transportation of passengers and property over the lines owned, operated, controlled, or leased by it and the lines of other common carriers, or the power of the commission to require the establishment of such joint rates, fares, and charges (PUC § 559).
- The commission shall, upon a hearing, determine the kind and character of facilities operations necessary to reasonably and adequately meet public requirements, and shall fix and determine the just, reasonable, and sufficient rates for such service. Whenever two or more common carriers are furnishing service in competition with each other, the commission may, after hearing, prescribe uniform rates, classifications, rules, and practices to be charged, collected, and observed by all such common carriers (PUC § 730).
- No common carrier shall receive a different compensation for their service than the applicable rates, fares, and charges filed with the commission and specified in its schedules pursuant to PUC § 494, except when approved by the commission pursuant to PUC § 523-525, 529-531, & 533.
- No operator shall by any means knowingly report false information pursuant to PUC § 458 & 459.

In 2000<sup>29</sup> and 2004<sup>30</sup>, in response to significant increases in fuel prices in California, the CPUC approved resolutions granting VCCs temporary authority to adjust their fares and rates by up to 15 percent without specific Commission authorization.

#### **d. Other Oversight**

VCCs are also required to provide evidence of liability insurance to the CPUC. CPUC responds to and investigates complaints of unsafe, unlicensed, and uninsured passenger carriers, and responds to complaints against licensed carriers concerning carrier fitness, overcharging, discriminating in service, failing to provide service, failing to respond to customer complaints, or violating any of the oversight rules set forth by the CPUC. CPUC staff initiates enforcement action through the Commission and through the California courts. They also coordinate closely with other law enforcement

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<sup>29</sup> CPUC, Resolution TL-18989, March 6, 2002, last accessed June 28, 2021, [https://docs.cpuc.ca.gov/published/Final\\_resolution/13913.htm](https://docs.cpuc.ca.gov/published/Final_resolution/13913.htm).

<sup>30</sup> CPUC, Resolution TL-19042, June 9, 2004, last accessed June 28, 2021, [https://docs.cpuc.ca.gov/published/Agenda\\_resolution/36583.htm](https://docs.cpuc.ca.gov/published/Agenda_resolution/36583.htm).

and regulatory agencies in ensuring that only safe, legal, and properly inspected carriers transport passengers in California.<sup>31</sup>

### **3. Federal Regulations**

As discussed below in Section G.1, U.S. EPA has established marine engine standards as defined in 40 CFR Parts 94 and 40 CFR 1042. CARB has not established separate marine engine standards for engines sold in California; at this time, CARB staff is not proposing any requirements on engine manufacturers.

### **4. Other States**

#### **a. Texas**

The Texas Commission on Environmental Quality offers incentive grants for marine vessels to replace or repower their vessels to cleaner engines that must be certified to emit at least 25 percent less NOx than the engine being replaced.<sup>32</sup> Marine vessel owners utilizing these funds must commit to using the vessel at least 75 percent of the total annual hours of operation in the Texas portion of the Gulf Intercoastal Waterway or bays adjacent to an eligible county and agree to submit annual usage seaports.

#### **b. New Jersey**

On July 30, 2020, the New Jersey Department of Environmental Protection's (NJDEP) Clean Air Council held a public hearing to provide recommendations to the Commissioner to help better understand the extent of air pollution and GHG emissions around seaports and airports and their surrounding communities in the State of New Jersey. In a report outlining the recommendations for the NJDEP to address the air quality issues around the seaports and airports,<sup>33</sup> recommendations were made to adopt the current and proposed California regulations for cargo handling equipment (CHE), spark-ignition marine engines, and CHC, and to evaluate the feasibility of shore power and bonnet control systems to capture and reduce hoteling emissions at berth was also made. However, at this time, NJDEP has decided not to pursue further action to adopt the CHC regulation in the near-term. CARB staff continues to track activities of, and engage with other states on, measures that would reduce emissions from CHC.

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<sup>31</sup> CPUC, Passenger Carriers Enforcement, last accessed June 28, 2021, <https://www.cpuc.ca.gov/General.aspx?id=3009>.

<sup>32</sup> Texas Commission on Environmental Quality, Emissions Reduction Incentive Grants (ERIG) Program, Webinar Presentation, Air Grants Division, November 2020, last accessed June 28, 2021, [https://www.tceq.texas.gov/assets/public/implementation/air/terp/erig/FY21/FY20\\_ERIG\\_Workshop\\_Presentation\\_Final.pdf](https://www.tceq.texas.gov/assets/public/implementation/air/terp/erig/FY21/FY20_ERIG_Workshop_Presentation_Final.pdf).

<sup>33</sup> New Jersey Clean Air Council, Public Hearing July 30, 2020, Past, Present, and Future: Air Quality Around Our Ports and Airports, last accessed on June 28, 2021, <https://www.state.nj.us/dep/cleanair/pdfs/cac2020report.pdf>.

## **5. Seaport and Community Programs**

### **a. Assembly Bill 617**

The State of California has also recently placed additional emphasis on protecting local communities from the harmful effects of air pollution through the passage of Assembly Bill (AB) 617 (Garcia, Chapter 136, Statutes of 2017). AB 617 is a significant piece of air quality legislation that highlights the need for further emission reductions in communities with high cumulative exposure burdens, such as those near seaports and harbors. Additional information on AB 617 can be found in Chapter II and Chapter VIII of this Staff Report. AB 617 requires CARB to pursue new community-focused and community-driven actions to reduce air pollution and improve public health in communities that experience disproportionate high cumulative burdens from exposure to air pollutants. In response to AB 617, CARB created the Community Air Protection Program (CAPP). CAPP is tasked with achieving emission reductions in disproportionately burdened communities as directed by AB 617 and includes new statewide actions as a core element of the program. These statewide actions reflect a coordinated suite of strategies including new regulations, new incentive grant funding, and new exposure reduction resources and tools.

### **b. State Implementation Plans**

The federal CAA requires the U.S. EPA to establish NAAQS for pollutants considered harmful to public health, including PM<sub>2.5</sub> and ozone. States that cannot demonstrate attainment with NAAQS must develop State Implementation Plans (SIP). SIPs identify the emissions control requirements that the states and air districts will develop and implement to attain and maintain compliance with NAAQS. If U.S. EPA finds that a state has failed to submit the required SIP or that the air quality standard is not achieved by the date designated by U.S. EPA, nonattainment areas can face sanctions such as the removal of Federal highway funding and 2:1 required emissions offsets for any new or modified stationary sources or emission units that require a permit.

### **c. Community Emissions Reduction Plans**

Through CARB's implementation of AB 617, the Board annually selects communities to collaborate with in order to develop and implement community monitoring programs and/or new locally-focused Community Emissions Reduction Plans (CERP).

Emissions generated from CHC are one of the primary areas of concern in a number of coastal communities currently developing CERPs due to their substantial level of toxic and criteria air pollution emissions. Currently, the Stockton, West Oakland, Wilmington/West Long Beach/Carson, and San Diego AB 617 communities all have developed or are developing CERPs that discuss their concerns with the emissions generated from CHC and the effect it has on public health. Since CHC operations in the State are largely situated in the vicinity of at-risk communities, these communities

would directly benefit from localized reductions of DPM, NO<sub>x</sub>, and PM emissions from the Proposed Amendments.

#### **d. Seaport Programs**

Seaports throughout California, such as the Port of San Diego, San Pedro Bay, and the Port of Oakland, have developed their own programs to improve the local air quality and reduce emissions from seaport activity. For more information on these programs, see Chapter II, Sections D.3, D.4, and D.5.

### **6. Portable Engine Air Toxic Control Measure and the Portable Equipment Registration Program**

Engines permanently attached to CHC are subject to the Current Regulation, and engines that are detached but operate on vessels like barges are subject to the Portable Engine ATCM. The purpose of the Portable Engine ATCM is to reduce DPM emissions from portable diesel-fueled engines having a rated brake horsepower (bhp) of 50 and greater ( $\geq 50$  bhp). Whether engines are regulated under the Current Regulation or the Portable Engine ATCM, local air districts can still require permits for auxiliary engines.

The Portable Equipment Registration Program (PERP) is a voluntary statewide program, established in 1997 that provides an alternative path to registration for portable equipment owners who operate in multiple air districts. Without the uniform statewide program, equipment owners would have to obtain an operating permit from each air district where the engine or equipment unit operates, potentially leading to multiple permits for one piece of equipment. Portable equipment registered in PERP may operate throughout the State without obtaining multiple local air district permits.

### **7. Off-Road Diesel Regulation**

There is little overlap between the CHC Regulation and the Off-Road Diesel Regulation, except in certain situations such as a forklift or tractor operating on a barge. All self-propelled off-road diesel vehicles 25 hp or greater used in California and most two-engine vehicles (except on-road two-engine sweepers) are subject to the Regulation for In-Use Off-Road Diesel-Fueled Fleets (“Off-Road Diesel Regulation”).<sup>34</sup> The overall purpose of the Off-Road Diesel Regulation is to reduce emissions of NO<sub>x</sub> and PM from off-road diesel vehicles operating within California.

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<sup>34</sup> CARB, Final Regulation Order: Regulation for In-Use Off-Road Diesel-Fueled Fleets, 2011, last accessed June 28, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/ordiesel/documents/finalregorder-dec2011.pdf>.



## **F. Progress to Date**

The Current Regulation requires vessel categories such as ferries, tugboats, crew and supply, barges, dredges, and other vessel types with older Pre-Tier 1 or Tier 1 engines to be repowered with engines meeting Tier 2 or Tier 3 standards. After full implementation, the Current Regulation was estimated to have achieved a 75 percent reduction in DPM and a 60 percent reduction in NO<sub>x</sub>, when compared to 2004 CHC emissions.<sup>35</sup> However, a comparison between CARB's self-reported harbor craft database and USCG's Merchant Vessel list indicates that about one-third of the State's harbor craft have not satisfied the reporting requirements of CARB's regulation. Unreported vessels may have non-compliant engines, and CARB is unable to locate, identify, and ensure that such vessels are compliant with the regulation or are achieving the intended emission reductions. For this reason, it is difficult for CARB to quantify the actual emission reductions achieved from the Current Regulation. The Proposed Amendments require enhanced vessel reporting and new facility reporting requirements, which will help increase compliance.

## **G. Current Emission Control Technologies for CHC**

California is home to a wide variety of CHC, with different engine and vessel configurations, and operational needs. This section briefly describes the current emission control technologies for CHC. Aftertreatment technologies to reduce NO<sub>x</sub> and PM emissions may be retrofitted to in-use engines where feasible or may be built into newly manufactured engines. For more detailed information regarding the CHC emission control technologies available, see Appendix E of this Staff Report.

### **1. U.S. EPA Marine Tier 3 and 4 Standards**

Marine engine emission standards are set in place under international treaties, and Federal regulations. International standards<sup>36</sup> apply to all international vessels; Federal standards apply to U.S. vessels; U.S. EPA certifies all new marine engines sold and offered for sale in the United States, including in California, as California does not have a separate new marine engine certification program at this time. The marine engine certification standards that are set by U.S. EPA regulate the amount of PM (including BC), HCs, CO, and NO<sub>x</sub> that can be emitted from marine engines. The stringency of standards for these pollutants increases with tier number.

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<sup>35</sup> CARB, Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments for Commercial Harbor Craft, September 2007, <https://ww3.arb.ca.gov/regact/2007/chc07/isor.pdf>.

<sup>36</sup> U.S. EPA, MARPOL Annex VI and the Act to Prevent Pollution from Ships (APPS), last accessed June 28, 2021, <https://www.epa.gov/enforcement/marpol-annex-vi-and-act-prevent-pollution-ships-apps#marpol>.

In 2008, U.S. EPA set Tier 3 and Tier 4 marine engine emission standards<sup>37</sup> to reduce pollution from newly built and remanufactured propulsion and auxiliary marine diesel engines below 30 liters per cylinder (L/cylinder) displacement (Referred to as Category 1 and 2 engines). The Tier 3 emission standards for new and rebuilt engines phased in from 2009 to 2014, and the aftertreatment-based Tier 4 standards phased in from 2014-2017. Marine Tier 4 standards apply to engines above 600 kilowatts (kW) (805 hp), which are often used in ferries, tugboats, and other high-power vessels. The specific levels and implementation dates for the Tier 3 and Tier 4 standards vary by MY, engine category, power output, and cylinder displacement of the engine. Marine Tier 3 and Tier 4 standards are codified in 40 CFR Part 1042.

On April 30, 2010, U.S. EPA finalized emission standards for the largest new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines) installed on U.S. vessels. The NO<sub>x</sub> emission standards for U.S. EPA Tier 4 engines are equivalent to International Maritime Organization (IMO) Tier III, which achieves an 80 percent reduction in NO<sub>x</sub>. To achieve the 80 percent NO<sub>x</sub> reduction required to meet the Tier 4 standard, the majority of engine manufacturers have chosen to use SCR exhaust aftertreatment technology, but this is still being discussed for Category 3 engines. Since the majority of CHC are considered Category 1 (~95 percent) and Category 2 (~4 percent) engines, the Proposed Amendments focus on reducing emissions from these categories.

SCR is a commonly-used technology for meeting stricter NO<sub>x</sub> emissions standards in diesel applications worldwide. SCR reduces NO<sub>x</sub> to nitrogen gas (N<sub>2</sub>) and water (H<sub>2</sub>O) by injecting a urea-based solution into the exhaust gas stream through a special catalyst. SCR systems have been used in conjunction with other strategies to meet 90 percent lower NO<sub>x</sub> emission standards. When IMO Tier III engines are operated in Emission Control Areas (ECA), SCR units are active, meaning that urea is injected into the exhaust to facilitate catalytic reduction of NO<sub>x</sub> emissions. In some cases, SCR has provided moderate reductions in PM emissions, but SCR performance and efficiency are highly dependent on the exhaust temperature. During engine certification over the International Organization for Standardization (ISO) 8178 E3 and D2 cycles, U.S. EPA reviews emission factors over a wide range of engine loads from 10 to 100 percent of maximum power.

SCR is not the only way to meet the Tier 4 standards. Manufacturers may choose a combination of other in-cylinder technologies, such as fuel-water emulsification, direct water injection, intake air humidification, or exhaust gas recirculation (EGR). In addition, spark-ignited Otto cycle engines can be used to meet the Tier 4 NO<sub>x</sub>

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<sup>37</sup> U.S. EPA, Federal Register, Vol. 73, No. 126, June 30, 2008, Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder, last accessed June 28, 2021, <https://www.gpo.gov/fdsys/pkg/FR-2008-06-30/pdf/R8-7999.pdf>.

standard of 1.8 g/kW-hr through careful engine calibration and the use of a three-way catalyst.<sup>38</sup>

After establishing Tier 4 standards and beginning to certify engine platforms, U.S. EPA was made aware that manufacturers of vessels for certain high-speed commercial applications were facing some challenges associated with finding any available engines certified to the Tier 4 engine standards. These vessels have performance needs for achieving substantial propulsion power from a light-weight engine, but newly built vessels had no engines certified to Tier 4 standards that met these performance criteria. For these reasons, in August 2020, U.S. EPA amended 40 CFR Part 1042 to delay Tier 4 engine certification requirements for high-power density engines until 2022 or 2024.<sup>39</sup> This delay provides more time for engine manufacturers to develop and certify high-power density Tier 4 engines used in some high-speed vessels that are not commonly used in California. CARB staff does not expect these delays to impact meeting Tier 4 plus DPF emissions performance standards by the proposed compliance dates.

## 2. CARB Verified Retrofit Diesel Particulate Filters

A Verified Diesel Emission Control Strategy (VDECS) is an emissions control strategy evaluated and verified by CARB, pursuant to the verification procedure laid out in Title 13, CCR § 2700-2711. The use of these control strategies reduces either PM, NO<sub>x</sub>, or both. A DPF is the most common type of VDECS, which uses a mechanical filter to trap soot particles and oxidizes them through a process called regeneration.

There are two main categories of DPFs: active and passive. Active devices require heat from an outside energy source, such as diesel fuel or electricity, to induce chemical reactions needed to burn off the soot accumulated during operation. Passive devices remove soot while the engine operates. Often an oxidation catalyst is used to lower the activation energy needed to initiate chemical reactions to burn off the soot. The exhaust gas must be sufficiently hot for a certain percentage of the operation time to make passive regeneration possible.<sup>40</sup>

CARB has verified Rypos, Inc.'s Active Diesel Particulate Filter (ADPF) as a Level 2 Plus VDECS for use with marine CHC, indicating it can reduce DPM emissions by more than

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<sup>38</sup> UCR, Final Report: Ultra-Low NO<sub>x</sub> Near-Zero Natural Gas Vehicle Evaluation ISX12N 400, April 2018, last accessed June 29, 2021,

<https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/5b9ff77eb8a045bc3da9ab05/1537210247037/Ultra-Low+NOx+Near-Zero+Natural+Gas+Vehicle+Evaluation.pdf>.

<sup>39</sup> U.S. EPA, Federal Register, Vol. 85, No. 192, Amendments Related to Marine Diesel Engine Emission Standards, 40 CFR Part 1042, October 2, 2020, last accessed June 29, 2021,

<https://www.govinfo.gov/content/pkg/FR-2020-10-02/pdf/2020-18621.pdf>.

<sup>40</sup> CARB, Frequently Asked Questions: Regulation for In-Use Off-Road Diesel-Fueled Fleets (Off-Road Regulation), December 2015, last accessed June 29, 2021,

<https://ww3.arb.ca.gov/msprog/ordiesel/faq/vdecsfaq.pdf>.

50 percent during regular operation of the system.<sup>41</sup> Although Level 2 VDECS are successful at reducing DPM emissions from CHC, they are only verified to reduce DPM by at least 50 percent. Due to the immediate need of emission reductions and the availability of Level 3 control at 85 percent or more, a Level 3 VDECS must be developed and used by CHC owners to further reduce DPM emissions.

There are over 50 approved Level 3 VDECS available for on-road and off-road uses.<sup>42</sup> Although there are no Level 3 VDECS currently available for marine engines, the Proposed Amendments should incentivize VDECS manufacturers to accelerate the transfer of technology to marine applications to achieve additional emission reductions from CHC. In order for an applicant to receive CARB's Executive Officer's (EO) approval and verification of a Level 3 VDECS, the applicant must follow the requirements in Title 13, CCR § 2700-2711 as well as submit an application to the EO including a preliminary verification application (PVA or test plan), and a final verification application (final test results).

### **3. European Stage V Standards for Inland Waterway Engines**

The European Stage V Standards<sup>43</sup> refer to European Union (EU) legislation for air pollution prevention, which specify limits on PM emissions from diesel engines. The Stage V Standards limit the overall mass of PM in exhaust gases as well as the number of particles. European Stage V requirements took effect from 2019 to 2020, depending on the engine power subcategories. Emission limits for inland waterway vessels were significantly lowered under the Stage V regulation. The Stage V limits are found in Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016 [Stage V Regulation (EU) 2016/1628].<sup>44</sup>

The EU Stage V requirements for engines over 300 kW include solid particle number standards, effectively requiring the use of a DPF, beginning January 1, 2020. These engines may meet CARB proposed Tier 4 plus DPF emissions performance standards; however, the engines need to be certified by U.S. EPA before they can be legally sold and operated in the United States. These Stage V marine emission standards apply to inland waterway propulsion (IWP) and inland waterway auxiliary (IWA) engines above 19 kW, including engines of all types of ignition. All EU Stage V engines MY 2020 and newer are anticipated to be equipped with a wall-flow DPF for power subcategories

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<sup>41</sup> CARB, Executive Order DE-09-006, April 17, 2009, last accessed June 29, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic//diesel/verdev/pdf/executive\\_orders/de-09-006.pdf](https://ww2.arb.ca.gov/sites/default/files/classic//diesel/verdev/pdf/executive_orders/de-09-006.pdf).

<sup>42</sup> CARB, Verification Procedure: Currently Verified, last accessed June 29, 2021, <https://ww2.arb.ca.gov/verification-procedure-currently-verified>.

<sup>43</sup> International Council on Clean Transportation, European Stage V Non-Road Emission Standards Policy Update, November 2016, last accessed June 29, 2021, [https://theicct.org/sites/default/files/publications/EU-Stage-V\\_policy%20update\\_ICCT\\_nov2016.pdf](https://theicct.org/sites/default/files/publications/EU-Stage-V_policy%20update_ICCT_nov2016.pdf).

<sup>44</sup> Official Journal of the European Union, Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016, September 14, 2016, last accessed June 29, 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1628&from=EN>.

300 kW or greater. For more information regarding the EU Stage V emission standards, see Appendix E.

#### **4. Zero-Emission and Advanced Technologies**

ZEAT refers to cleaner technologies, including zero-emission capable hybrid and zero-emission equipment. To accelerate the deployment of ZEAT in the marine sector in California, the Proposed Amendments include zero-emission mandates where technology is most feasible and establishes a regulatory incentive framework to encourage adoption everywhere else.

For purposes of the Proposed Amendments, ZEAT technologies are grouped as follows:

- Zero-Emission Capable Hybrid Vessels, which include vessels in certain CHC sectors that can demonstrate that 30 percent or more of combined main propulsion and auxiliary power in a calendar year is derived from a zero-emission tailpipe emission source. Examples include diesel-powered vessels with battery plug-in hybrid propulsion systems capable of being charged from the grid, or vessels with hydrogen fuel cells.
- Zero-Emission Vessels, which include vessels in certain categories that do not and would not use an internal combustion engine to generate propulsion or auxiliary power. Combustion engines may exist for an emergency, safety, or other incidental or unforeseen purposes, but would not be permitted for use during normal operation of the vessel.

## **II. The Problem That the Proposal is Intended to Address**

Communities located near California's seaport complexes bear a disproportionate health burden due to their proximity to the emissions generated from freight activity associated with the seaports, including truck, train, and vessel traffic in and around the seaports and harbors. Despite regulations already in place to reduce emissions at seaports, the diesel-powered freight sources that operate in and around California's seaports still heavily impact many disadvantaged communities (DAC) around California seaports and harbors. To further protect communities most heavily impacted by California's freight sector, additional emission reductions are necessary at seaports, including emissions from harbor craft vessels.

Urban growth of coastal regions is expanding significantly not only within California, but also throughout the United States. With over 68 percent of California's population density being within coastal counties, there is an ever-increasing need for reductions in maritime sectors.

### **A. Need to Reduce Exposure in Impacted Communities**

CARB staff recognizes that under the Current Regulation, CHC owners have made considerable investments to replace older engines with newer, cleaner engines. In addition, some CHC owners not subject to in-use requirements have voluntarily replaced their engines utilizing CARB's Carl Moyer Program administered through local air districts.

Despite substantial progress in reducing emissions from CHC over the last decade, CHC continue to impact nearby communities, including those in ozone and PM<sub>2.5</sub> nonattainment areas. In addition, the DPM emissions from CHC impact communities located adjacent to those operations, as well as people living and working miles away. DPM is a TAC that can substantially increase the risk of developing cancer and other health problems such as increased respiratory illnesses, risk of heart disease, and premature death. In addition, emissions from CHC engines are expected to become even more significant due to the continued operation of CHC while emissions from other mobile sources are decreasing due to more stringent regulations and cleaner technologies. The emissions from CHC impose uncompensated health and environmental costs to the nearby communities and this risk must be reduced as much as possible.

In 1998, the Board identified DPM as a TAC with no Board-specified threshold exposure level, pursuant to HSC § 39650 through 39675. A needs assessment for DPM was conducted between 1998 and 2000 pursuant to HSC § 39658, 39665, and 39666. This resulted in CARB staff developing, and the Board approving, the Risk Reduction Plan (RRP) to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and

Vehicles (“Diesel RRP”)<sup>45</sup> in 2000. The Diesel RRP presented information on the available options for reducing DPM and recommended regulations to achieve these reductions. The Diesel RRP’s scope was broad, addressing all categories of mobile and stationary engines. It included control measures for all off-road diesel sources, such as those covered by the Proposed Amendments. The ultimate goal of the Diesel RRP is to reduce, by 2020, California’s DPM emissions and associated potential cancer risks by 85 percent from the 2000 levels.

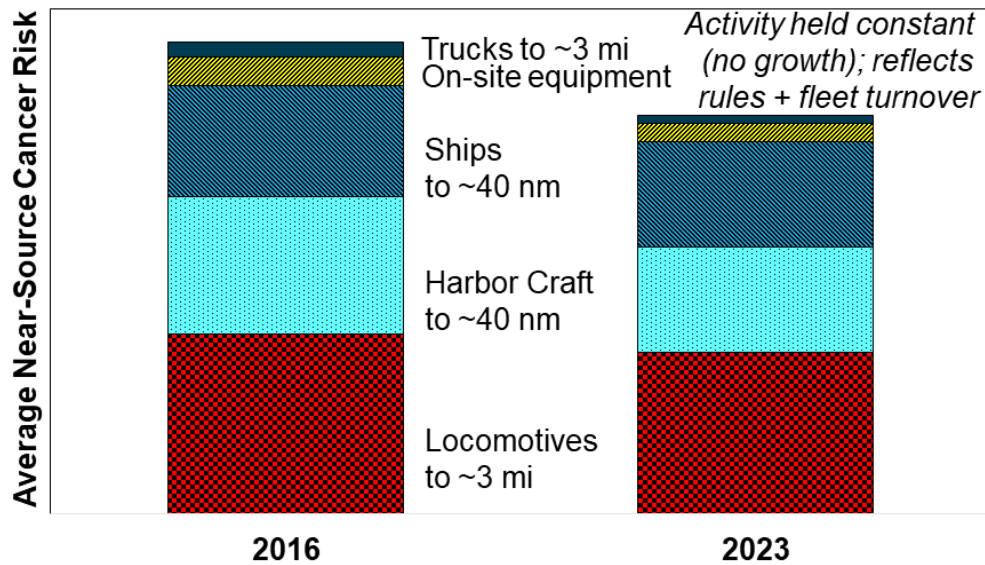
In 2018, CARB staff presented a scoping evaluation for POLA and POLB.<sup>46</sup> This scoping evaluation showed that CHC were still one of the top contributors to near-source cancer risk in 2016 and would contribute an even larger proportion in 2023 (see Figure II-1). As a result, CARB staff proposed at the March 2018 Board Hearing to develop regulations to further reduce emissions from CHC and other freight sources including OGVs, CHE, and drayage trucks. Note, data in Figure II-1 was obtained from reference 46 and updated as of August 2021 to reflect the latest projections of emissions in 2023 for OGVs and locomotives. These measures would also achieve emission reductions needed to attain NAAQS and combat climate change. The South Coast Air Basin is classified as an extreme nonattainment area for the eight-hour ozone standard, and serious nonattainment for the PM2.5 standard. More reductions are necessary to attain these air quality standards. Because the Current Regulation will be fully implemented at the end of 2022, CARB staff is proposing to further reduce emissions from CHC starting in 2023. The Proposed Amendments would have final compliance deadlines in 2032 with compliance extensions expiring by December 31, 2034.

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<sup>45</sup> CARB, Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, October 2000, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/diesel/documents/rrpfinal.pdf>.

<sup>46</sup> CARB, Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed July 6, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).

Figure II-1. Seaport Contribution to Near Source Cancer Risk



The communities and neighborhoods that reside in and around California’s seaports and harbors experience environmental and health inequities in part due to their close proximity to high levels of air pollution from seaport activities. Seaport activity includes not only CHC, but also cars, diesel trucks, CHE, OGVs, and locomotives coming and going around the seaports. Many of these communities are classified as disadvantaged by the California Environmental Protection Agency (CalEPA), using the California Communities Environmental Health Screening Tool (“CalEnviroScreen”), Version 3.0, developed by the Office of Environmental Health Hazard Assessment (OEHHA).<sup>47</sup> CalEnviroScreen uses various factors to score California communities based on environmental pollution burden and socio-economic indicators. Exposure to DPM is the main contributor to many seaport communities scoring in the top 10<sup>th</sup> percentile for high levels of air pollution statewide on CalEnviroScreen. The elevated air pollution burden in these communities can be measured. For example, while exposure to cancer-causing diesel particles has decreased substantially across all communities statewide in California, exposure to diesel particles in DACs is on average twice that experienced in non-DACs.<sup>48</sup> Emissions from harbor craft vessels are a significant contributor to air pollution and associated health impacts in many impacted seaport communities.

DPM is a TAC containing PM<sub>2.5</sub> particles that easily penetrate the airways and lungs, where they may produce harmful health effects such as the worsening of heart and

<sup>47</sup> OEHHA, CalEnviroScreen 3.0, last accessed July 6, 2021, <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30>.

<sup>48</sup> CARB, Draft Community Air Protection Blueprint For Selecting Communities, Preparing Community Emissions Reduction Programs, Identifying Statewide Strategies, and Conducting Community Air Monitoring, June 7, 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-06/draft\\_community\\_air\\_protection\\_blueprint.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-06/draft_community_air_protection_blueprint.pdf).



lung diseases. The risk of these health effects is greatest in the elderly and very young children. Exposure to elevated concentrations of PM is also associated with increased hospital and doctor visits and increased numbers of premature deaths. The pollution from CHC diesel engines, specifically DPM, contributes significantly to public health impacts including higher localized potential cancer risk.

Health analyses are conducted to quantify the excess cancer risk posed by the concentration of diesel-fueled engines operating in and around California's seaports. While developing the Proposed Amendments, staff performed a health risk assessment (HRA) to evaluate the localized cancer risk impacts solely attributed to CHC emissions in the South Coast and Bay Area regions. Staff selected these regions to ensure that the analyses reflected some of the higher impacted areas of the State. The HRA estimates the increase in potential cancer risk that would result under a business-as-usual scenario (see Appendix G). The results of the HRA highlight the need for further emission control from CHC diesel engines to provide public health benefits and reduce the cancer risk burden to the communities surrounding California's seaports and harbors.

Current Regulations, port, and privately owned CHC initiatives, and incentive programs have already resulted in emission reductions from CHC. However, more action is necessary to further reduce DPM and the localized cancer risk in communities surrounding seaports, marinas, and harbors, and marine terminals, lower NOx and PM2.5 emissions to support regional attainment of health-based air quality standards for ozone and PM2.5 and reduce the GHG emissions that contribute to global climate change.

To address these concerns, the Proposed Amendments would help act to further protect public health and reduce the air quality impacts from CHC throughout the State by:

- Reducing exposure in communities most impacted by air pollution as required under AB 617. For more information on AB 617, see Section D.2. of this chapter below and Chapter VIII.
- Minimizing near-source exposure and health risk from identified TACs, including DPM, produced by fuel combustion pursuant to the Toxic Air Contaminant Identification and Control Act, which established California's program to reduce exposure to air toxics.<sup>49</sup>
- Attaining the NAAQS for Ozone and PM in all regions of California, as required by the federal CAA.

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<sup>49</sup> CARB, AB 1807 Toxic Air Contaminant Identification and Control, last accessed July 6, 2021, <https://ww3.arb.ca.gov/toxics/background.htm>.

## B. Need to Attain Air Quality Standards

Substantial progress has been achieved in reducing NOx emissions from mobile sources statewide through the implementation of CARB's existing programs. These programs are expected to continue providing further emission reductions through 2031, helping the State to meet necessary air quality standards. However, challenges remain in meeting the NAAQS for ozone and PM2.5 throughout many regions of the State. Two areas of the State in particular face the most critical air quality challenges – the South Coast Air Basin and the San Joaquin Valley Air Basin. The South Coast Air Basin has the highest ozone levels in the nation, while the San Joaquin Valley Air Basin has the greatest PM2.5 challenge. To meet the 2023 and 2031 NAAQS for ozone, the South Coast Air Basin will require an approximate 70 percent NOx reduction from current levels by 2023 and an overall 80 percent NOx reduction by 2031.<sup>52</sup>

Because NOx is a precursor to both ozone and to secondary PM2.5 formation, reductions in NOx emissions will also provide benefits for meeting the PM2.5 standards. In addition, in October 2015, U.S. EPA adopted a more stringent 70 parts per billion (ppb) ozone standard with an attainment date of 2037. This ozone standard will likely result in additional areas being classified as nonattainment areas and requiring even further emission reductions in California's existing nonattainment areas.<sup>50</sup>

Mobile sources, such as cars, trucks, locomotives, and off-road equipment (including CHC) are the largest contributors to the formation of ozone, PM2.5, and DPM emissions in California. They are responsible for approximately 80 percent of smog-forming NOx emissions, and 90 percent of DPM emissions. Although engine standards have become more stringent over time, existing equipment tends to remain in operation for a long period of time, which slows the rate of potential emission reductions.

Overall NOx emissions from sources that are primarily regulated by the federal government, such as vessels, aircraft, and locomotives, have not kept pace with NOx reductions in other sectors, and are projected to decrease by approximately 20 percent by 2031 without additional regulations. For example, by 2023, vessel NOx emissions in the South Coast Air Basin are projected to increase to 23 tons per day.<sup>51</sup> As such, emission reductions from vessels and other federally regulated sources are essential to achieve California's ambient air quality standards.

Under the California Clean Air Act, California is required to submit air quality management plans (AQMP) for areas that exceed the health-based NAAQS illustrating

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<sup>50</sup> CARB, Staff Report: Public Hearing to Consider the Proposed Advanced Clean Trucks Regulation, October 22, 2019, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2019/act2019/isor.pdf>.

<sup>51</sup> CARB, Mobile Source Strategy, May 2016, last accessed July 6, 2021, <https://www.arb.ca.gov/planning/sip/2016sip/2016mobsr.pdf>.

how the State will attain the standards by certain dates. The current standards are 80 ppb 8-hour ozone by 2023, 75 ppb 8-hour ozone by 2031, 12 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) annual PM<sub>2.5</sub> by 2021 to 2025, and lastly the new federal ozone standard of 70 ppb with attainment dates through 2037.<sup>52</sup> As part of the 2016 AQMP, CARB included a SIP Strategy approved by U.S. EPA that describes CARB's commitment to achieving the mobile source and consumer products reductions needed to meet federal air quality standards over the next 15 years.<sup>53</sup> This Strategy provides CARB's commitment to bring proposed statewide control measures to the Board for adoption and to achieve the NO<sub>x</sub> and ROG reductions needed for attainment by 2023, 2031, and 2037. While the Proposed Amendments are not included in the SIP, these reductions are additional and necessary for the State to attain its ambient air quality standards.

CHC contribute a large share of emissions to various Air Basins throughout the State. Some of these areas do not have air quality levels that meet the Federal NAAQS and are designated as nonattainment areas. U.S. EPA classifies areas of ozone nonattainment (e.g., "extreme," "severe," "serious," "moderate," or "marginal") based on how much an area exceeds the standard. For PM<sub>2.5</sub>, nonattainment areas can either be designated as Moderate or Serious, based on the level of PM<sub>2.5</sub>. This classification affects the required date that such areas need to attain the relevant standard(s). More time is allowed to demonstrate attainment for areas with higher nonattainment classifications in recognition of the greater challenge involved. However, the higher classifications are also subject to more stringent requirements.

California has five air basins or counties that are affected by CHC emissions and are nonattainment for the Federal PM<sub>2.5</sub> and ozone NAAQS. For geographical reference, Figure II-2 shows the 35 air quality districts within California.

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<sup>52</sup> CARB, Revised Proposed 2016 State Strategy for the State Implementation Plan, March 7, 2017, last accessed July 6, 2021, <https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf>.

<sup>53</sup> CARB, Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed July 6, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).

Figure II-2. California Air Districts



Table II-1 outlines the Air Districts/Basins in California where CHC operate which are nonattainment areas for the various ozone and PM2.5 standards and their designation status. Nonattainment areas in California that are impacted by CHC emissions include the San Francisco Bay Area, the San Joaquin Valley, Ventura County, South Coast, and San Diego Air Basins.

California has two areas with the most critical air quality challenges in the nation: The South Coast Air Basin and the San Joaquin Valley Air Basin. Although the San Joaquin Valley is not located on the Coast, the Port of Stockton is located in the San Joaquin Valley and is impacted by emissions from CHC. The near-term targets for these areas include a 2023 deadline for attainment of the 80 ppb 8-hour ozone standard, a 2024 deadline for the 35 µg/m<sup>3</sup> 24-hour PM2.5 standard, and a 2025 deadline for the 12 µg/m<sup>3</sup> annual PM2.5 standard. There are also mid-term attainment years of 2031 and 2037 for the more recent 8-hour ozone standards of 75 ppb and 70 ppb, respectively. In 2018, U.S. EPA designated the South Coast Air Basin as an extreme nonattainment area for the 2015 8-hour ozone standard.

**Table II-1. California Non-Attainment Area Classifications for the Ozone and PM2.5 NAAQS: National Ambient Air Quality Standard Classifications California Non-Attainment Areas**

Nonattainment Area	2008 Ozone	2015 Ozone	2006 PM2.5	2012 PM2.5
San Francisco Bay Area	Marginal	Marginal	Moderate	*n/a
San Joaquin Valley	Extreme	Extreme	Serious	Moderate
Ventura County	Serious	Serious	n/a	n/a
South Coast	Extreme	Extreme	Serious	Moderate
San Diego	Serious	Moderate	n/a	n/a

\*n/a means that an area is unclassified or in the attainment of the relevant air quality standard.

The South Coast Air Basin has implemented many new and more stringent regulations to reduce emissions over the years, but the Basin still exceeds federal NAAQS for both ozone and PM2.5 and still experiences some of the worst air pollution in the nation. To meet the upcoming deadlines for attaining federal ozone standards, significant NOx reductions are necessary (45 percent and 55 percent beyond all Current Regulations by 2023 and 2031, respectively). OGVs combined with CHC, would be the largest source of NOx emissions in the South Coast Basin in 2023, so it is essential to maximize both early and long-term reductions from these sources. Both CARB and SCAQMD have shown that CHC would continue to contribute a significant amount of DPM to the community if regulations are not developed to further reduce emissions from CHC and other freight sources including OGVs, CHE, and drayage trucks.

The CHC rulemaking is one of several actions CARB is undertaking additional to SIP commitments, and it is intended to collectively reduce community health risk, attain regional air quality standards, and mitigate climate change while pushing forward the adoption of ZEAT.

On May 16, 2016, CARB staff released the 2016 State Strategy for the SIP, which described CARB’s proposed commitment to achieve the mobile source and consumer products reductions needed to meet federal air quality standards over the next 15 years.<sup>52</sup> Federal clean air laws require areas with unhealthy levels of ozone, PM, CO2, NOx, and SOx to develop SIPs. SIPs describe how an area will attain NAAQS. While the Proposed Amendments are not included in the SIP, these reductions are additional and necessary for the State to attain its ambient air quality standards.

### **C. Need to Reduce GHG and BC Emissions**

CHC engine exhaust contains various GHG emissions that contribute to the greenhouse effect and climate change. Anthropogenic climate change is a significant and growing problem that must be addressed to avoid more serious effects in the near future. Aside from requiring cleaner tiered CHC engines to reduce criteria and toxic air pollutants, AB 32<sup>54</sup> requires California to reduce its GHG emissions to 1990

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<sup>54</sup> HSC, Assembly Bill No. 32, September 27, 2006, last accessed July 6, 2021, [http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_0001-0050/ab\\_32\\_bill\\_20060927\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf).

levels by 2020. In addition, under Senate Bill (SB) 32,<sup>55</sup> California set a GHG emission reduction goal of 40 percent below 1990 levels by 2030. This target is expected to enable California to reach the ultimate goal of reducing emissions by 80 percent under 1990 levels by 2050 per Executive Order S-03-05.

BC, or soot, is emitted from burning fuels such as coal, diesel, and biomass, as well as from various forms of non-fuel biomass combustion. BC is classified as a SLCP, a category that also includes CH<sub>4</sub> and fluorinated gases (F-gases, including hydrofluorocarbons, or HFCs). SLCPs are powerful climate forcers that can have an immediate and significant impact on climate change, compared to longer-lived GHGs such as CO<sub>2</sub>. SLCPs are estimated to be responsible for about 40 percent of the current net climate forcers. SB 605 (Lara, Chapter 523, Statutes of 2014) requires CARB to develop a plan to reduce emissions of SLCPs, and SB 1383 (Lara, Chapter 395, Statutes of 2016) requires the Board to approve and begin implementing the plan by January 1, 2018. SB 1383 also sets targets for statewide reductions in SLCP emissions of 40 percent below 2013 levels by 2030 for CH<sub>4</sub> and HFCs, and 50 percent below 2013 levels by 2030 for BC.<sup>56</sup>

To reduce the mounting impacts of climate change, it is important to lower emissions of GHG and SLCPs, such as BC, from vessels. Presently, the maritime industry as a whole accounts for around 2 to 3 percent of global GHGs, but its emissions of GHGs is projected to increase by up to 250 percent by 2050, due to industry growth associated with increasing global trade demands.<sup>57</sup> California has set a GHG emission reduction goal of 40 percent below 1990 levels by 2030.<sup>55</sup> This target is expected to enable California to reach the ultimate goals of carbon neutrality by 2045 and reducing GHG emissions by 80 percent under 1990 levels by 2050. Together, these efforts align with scientifically established levels to limit global warming below 2 degrees Celsius (°C).<sup>58</sup>

Since CHC are primarily powered by and use diesel-fueled engines, they contribute to statewide BC emissions levels. Climate scientists agree that global warming and other shifts in the climate system observed over the past century are caused by human

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<sup>55</sup> HSC, Senate Bill 32, September 8, 2016, last accessed July 6, 2021, [http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb\\_0001-0050/sb\\_32\\_bill\\_20160908\\_chaptered.html](http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb_0001-0050/sb_32_bill_20160908_chaptered.html).

<sup>56</sup> CARB, Short-Lived Climate Pollutant Reduction Strategy, March 2017, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-12/final\\_slcp\\_report%20Final%202017.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-12/final_slcp_report%20Final%202017.pdf).

<sup>57</sup> Stefanini, Sara, Countries Inch Towards 'Bare Minimum' Climate Target for Shipping, 2018, last accessed July 6, 2021, <https://www.climatechangenews.com/2018/04/10/countries-inch-towards-bare-minimum-climate-target-shipping/>.

<sup>58</sup> UNFCCC, The Paris Agreement, United Nations Climate Change, 2017, last accessed July 6, 2021, <https://unfccc.int/process/the-paris-agreement/what-is-the-paris-agreement>.

activities. These recorded changes are occurring at an unprecedented rate.<sup>59</sup> According to new research, unabated GHG emissions could cause sea levels to rise up to ten feet by the end of this century—an outcome that could devastate coastal communities in California and around the world.<sup>60</sup> California is already feeling the effects of climate change, and projections show that these effects will continue and worsen over the coming centuries. The impacts of climate change on California have been documented by OEHHA in Indicators of Climate Change in California,<sup>61</sup> which details the following changes that are occurring already:

- A recorded increase in annual average temperatures, as well as increases in daily minimum and maximum temperatures.
- An increase in the occurrence of extreme events, including wildfire, drought, and heatwaves.
- A reduction in spring runoff volumes, as a result of the declining snowpack.
- A decrease in winter chill hours, necessary for the production of high-value fruit and nut crops.
- An increase in ocean acidification on marine organisms, and changes in the timing and location of species sightings.

The Proposed Amendments are expected to achieve additional GHG reductions helping the State to make progress with its reduction goals and reduce the impacts of climate change by promoting an increase in the number of CHC vessels using ZEAT at California ports and harbors and by requiring that CHC use renewable diesel fuel.

Emissions must be reduced from all sources of air pollution in California to not only meet the federal standards, but to minimize negative health effects in the State's most impacted and DACs, and to lessen climate impacts. To that end, much needs to be accomplished. Figure II-3 illustrates the multitude of standards, targets, and goals for the State of California that would need to be met over the next 30 years.

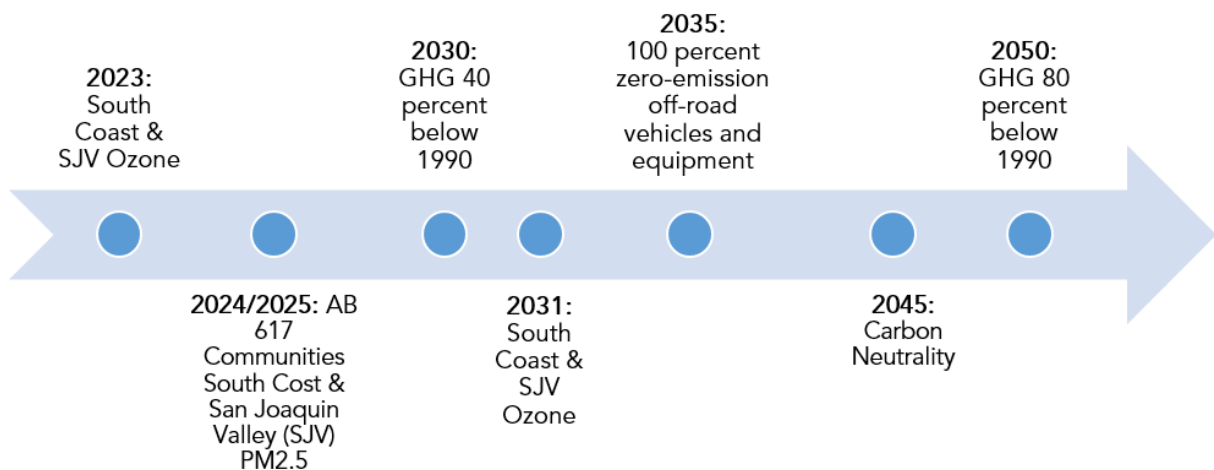
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<sup>59</sup> Cook, J., et al., Consensus on Consensus: a Synthesis of Consensus Estimates on Human-Caused Global Warming, *Environ. Res. Lett.* 11 (2016) 048002, April 13, 2016, last accessed July 6, 2021, <http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002/pdf>.

<sup>60</sup> California Ocean Protection Council Science Advisory Team Working Group, *Rising Seas in California: An Update On Sea-Level Rise Science*, April 2017, last accessed July 6, 2021, <https://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf>.

<sup>61</sup> OEHHA, *Indicators of Climate Change in California*, May 9 2018, last accessed July 6, 2021, <https://oehha.ca.gov/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf>.

Figure II-3. California’s Air Quality Targets and GHG Reduction Goals



#### D. State Policy and Plans Direct CARB to Secure Further Reductions from Harbor Craft

State and local agencies over recent years have made numerous plans and commitments to reduce air pollution from freight sources.

##### 1. AB 32 and SB 32

In 2006, California enacted AB 32 to address global climate change by requiring cost-effective reductions in GHG emissions and by codifying a target of reducing California GHG emissions to 1990 levels by 2020. AB 32 directed CARB to continue its leadership role on climate change and to develop a scoping plan identifying integrated and cost-effective regional, national, and international GHG reduction programs.<sup>64</sup> In 2015, Governor Brown issued Executive Order B-32-15,<sup>62</sup> which set a goal of reducing statewide GHG emissions to 40 percent below 1990 levels by 2030. In 2016, the Legislature passed, and Governor Brown signed, SB 32, which codified the 40 percent reduction goal from 1990 levels by 2030.<sup>63</sup>

##### 2. AB 617

Under AB 617, CARB has been directed to place additional emphasis on protecting local communities from the harmful effects of air pollution (Garcia, Chapter 136, Statutes of 2017). AB 617 requires CARB to pursue new community-focused and

<sup>62</sup> Office of Governor Edmund G. Brown, Executive Order B-32-15, April 29, 2015, last accessed July 6, 2021, <https://www.ca.gov/archive/gov39/2015/07/17/news19046/>.

<sup>63</sup> HSC, Senate Bill No. 32, September 8, 2016, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160SB32](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32).



community-driven actions to reduce air pollution and improve public health in communities that experience disproportionate burdens from exposure to cumulative air pollutants. CHC typically operate in areas with a high percentage of low-income and minority populations, who are disproportionately impacted by higher levels of diesel emissions.

Several of the regions affected by the Proposed Amendments are located in and around communities that have been selected for developing community air monitoring systems, CERPs, or both in order to improve air quality in their communities.<sup>64</sup> Several seaport communities have developed CERPs including the Wilmington, Carson, West Long Beach community, and the West Oakland community. The San Diego Portside Environmental Justice Neighborhoods (Barrio Logan, West National City, Logan Heights, and Sherman Heights) is currently working to develop a CERP for their community.

#### **a. Wilmington, Carson, West Long Beach CERP**

The Wilmington, Carson, West Long Beach CERP<sup>65</sup> is a plan for achieving air pollution and exposure reductions within the Wilmington, Carson, West Long Beach community, and is tailored to address the community's air quality priorities.

This CERP was drafted by the Community Steering Committee (CSC), which is made up of people who live, work, own businesses, and/or attend school within the community, local agencies, and elected community officials, in partnership with the SCAQMD, and CARB. The CERP includes targeted actions, including developing and enforcing regulations, providing incentives to accelerate the adoption of cleaner technologies, and conducting outreach to provide useful information to support the public in making informed choices. The Wilmington, Carson, West Long Beach community identified the following air quality priorities to be addressed by this plan: refineries, seaports, neighborhood truck traffic, oil drilling and production, railyards, schools, childcare centers, and homes. Under the seaport action items, the CERP specifically calls out zero and near zero-emission technologies as a community air quality priority to reduce air pollution from seaport sources including harbor craft.

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<sup>64</sup> CARB, Community Air Protection Program- 2018 Community Recommendations Staff Report, Revised September 11, 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-09/2018\\_community\\_recommendations\\_staff\\_report\\_revised\\_september\\_11.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-09/2018_community_recommendations_staff_report_revised_september_11.pdf).

<sup>65</sup> SCAQMD, Community Emissions Reduction Plan- Wilmington, Carson, West Long Beach, September 2019, last accessed July 6, 2021, <http://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/wilmington/cerp/final-cerp-wcwlb.pdf?sfvrsn=8>.

## **b. Owning Our Air: The West Oakland Community Action Plan**

The West Oakland CERP was developed by the Bay Area Air Quality Management District in partnership with The West Oakland Environmental Indicators Project (WOEIP) and the West Oakland CSC. This community-led plan, which is titled, *Owning Our Air: The West Oakland Community Action Plan* sets ambitious goals to protect the health of the West Oakland community. By 2025, the plan sets a goal for all neighborhoods in West Oakland to experience the entire area's average air quality, meaning no neighborhood experiences worse air quality than today's average for West Oakland. By 2030, all neighborhoods in West Oakland would have air that is as clean as today's least polluted West Oakland neighborhood.<sup>66</sup> Key strategies in the plan help to achieve these goals include moving polluting businesses and activities away from residents and moving toward a zero-emission seaport including funding cleaner tugboats and clean trucks, cleaning up the industry, reducing car trips and road dust, and stopping backyard burning.

## **3. Port of San Diego Climate Action Plan**

In 2013, the Port of San Diego developed their "Climate Action Plan"<sup>67</sup> which aims to provide actions and policies to reduce GHG emissions by 10 percent less than 2006 levels by 2020 and by 25 percent less than 2006 levels by 2035. Some of the advanced technologies mentioned in the plan include increasing the use of alternative-powered vessels, shore power for tugs and OGVs, electrification of docks and marinas, and promoting best vehicle maintenance and operational best practices for CHC, including routine engine monitoring. The plan identifies policies and measures to reduce GHG emissions. These measures include implementing programs to increase the use of alternative-powered vehicles and vessels, advanced technologies, and best practices. Many strategies apply to harbor craft: shore power for OGVs and tugs, new technologies related to the electrification of docks and marinas, promoting operational best practices for harbor craft, including routine engine monitoring, and supporting vessels to achieve the lowest emissions possible, and using a mix of alternative fueled, electric or hybrid technology.

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<sup>66</sup> Bay Area Air Quality Management District, WOEIP, *Owning Our Air: The West Oakland Community Action Plan-A Summary*, October 2019, last accessed July 6, 2021, <https://www.baaqmd.gov/~/media/files/ab617-community-health/west-oakland/100219-files/owning-our-air-plan-summary-pdf.pdf?la=en>.

<sup>67</sup> Unified Port of San Diego, *Port of San Diego Climate Action Plan*, 2013, last accessed July 6, 2021, <https://pantheonstorage.blob.core.windows.net/environment/Port-of-San-Diego-Climate-Action-Plan.pdf>.

The Port of San Diego is also currently developing a Maritime Clean Air Strategy (MCAS)<sup>68</sup> to address emission sources that contribute to DPM and other pollutants in portside communities, including from CHC. The MCAS would assess the Port's current state of emission reduction technologies and strategies and evaluate the cost and operational feasibility. The MCAS would also analyze how to further reduce emissions from these tugs and ferries.

#### **4. San Pedro Bay Clean Air Action Plan**

In 2006, POLA and POLB took an unprecedented joint action to improve air quality in the South Coast Air Basin by adopting the Clean Air Action Plan (CAAP), a plan aimed at significantly reducing the health risks posed by air pollution from port-related mobile sources, specifically ships, trains, trucks, terminal equipment and harbor craft, such as tugboats. The CAAP was a landmark air quality plan that established the most comprehensive, far-reaching approach to improve air quality in the Ports region and to reduce health risks from maritime goods-movement-related activities.<sup>69</sup>

The CAAP was updated in 2017, highlighting the fact that CHC are still the third-largest source of DPM, comprising 21 percent of the Ports' DPM emissions, and reflecting strategies to continue the air quality improvement and health risk reduction as well as significantly advance the push toward zero-emissions in support of the State's GHG reduction goals. Specifically, the 2017 CAAP Update set the targets of a 40 percent reduction in GHG emissions in 2030 and an 80 percent reduction in GHG emissions in 2050, compared to 1990 levels. Strategies outlined in the CAAP apply to CHC, such as investing in technology development projects for harbor craft through the joint Technology Advancement Program, expanding infrastructure that allows harbor craft operators to plug into shore power while at berth, and providing incentives for harbor craft operators to upgrade to the cleanest available engines or low-emission hybrid systems in the short-term, and to upgrade with advanced technologies in the long-term. In addition to the specific strategies, the CAAP states that the Ports are committed to advocate for and support a new fleet turnover requirement for harbor craft.

To further reduce emissions from CHC, the CAAP mentions incentives for CHC operators to upgrade to the cleanest available engines and low-emission hybrid systems in the short term, and advanced technologies (e.g., fuel cells and alternative fuels) in the long term. The CAAP recommends reducing emissions through additional

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<sup>68</sup> Port of San Diego, Maritime Clean Air Strategy Subcommittee Presentation, September 29, 2020, last accessed July 6, 2021, [https://www.sandiegocounty.gov/content/dam/sdc/apcd/PDF/AB\\_617/Port%20of%20San%20Diego%20MCAS%20Subcommittee%20Presentation\\_09.29.20.pdf](https://www.sandiegocounty.gov/content/dam/sdc/apcd/PDF/AB_617/Port%20of%20San%20Diego%20MCAS%20Subcommittee%20Presentation_09.29.20.pdf).

<sup>69</sup> POLA and POLB, San Pedro Bay Ports Clean Air Action Plan, November 2017, last accessed July 6, 2021, <http://cleanairactionplan.org/documents/final-2017-clean-air-action-plan-update.pdf/>.

incentives such as through grants or more favorable lease terms for CHC operators that have cleaner fleets.

## **5. Port of Oakland Seaport Air Quality Plan**

In 2019, the Port of Oakland finalized the Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions, which is the Port of Oakland's master plan for achieving its vision of a zero-emission seaport.<sup>70</sup> The plan's goals and strategies are designed to complement concurrent and future plans and studies by federal, State, and regional regulatory agencies and organizations to address air quality, community health risk, and climate change. The plan's building blocks are its strategies and implementing actions. The strategies include a focus on equipment, fuel, and operational actions to reduce GHG emissions and localized exposure to criteria air pollutants and TACs, as well as addressing the infrastructure needs of transitioning to a zero-emission seaport. While the Port's influence is limited in regard to sources like CHC, the Port is committed to partner and collaborate with regulatory, resource, and public health agencies in advocating for cleaner vessels and fuels in order to achieve its vision of a zero-emission seaport.

The Plan seeks to reduce air pollutants including criteria pollutants, TACs, including DPM, and GHG. CHC contribute a large share of emissions at the Port of Oakland, being the second largest contributor of DPM in the Port's emission inventory, behind OGVs. Tugboats alone contribute 10 percent of the total Port-related DPM emissions. Potential measures to reduce emissions from CHC are briefly discussed in the Port of Oakland's Seaport plan including providing CHC engine retrofit incentives, hybrid retrofits, plug-in hybrids, fuel cells, LNG-powered tugs, and shore power for tugs.

### **E. Impacts of the Global Situation That Began in 2020 on CHC Operations in California**

Staff has received questions and comments during development of the Proposed Amendments regarding the global situation that began in 2020. During development of the Proposed Amendments, staff worked with, and provided flexibility to, stakeholders on the timeline and approach for providing input due to operational impacts of the situation on their organizations. Due to the diverse nature of CHC operations, data suggest that activity increased for some vessel categories while it decreased for others.

Generally, container throughput at California seaports initially decreased and then increased after the global situation began. As an example, the Twenty-foot Equivalent Unit (TEU) container throughput (imports and exports) at the POLA and POLB are

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<sup>70</sup> Port of Oakland, Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions, June 13, 2019, last accessed July 6, 2021, <https://www.portofoakland.com/files/PDF/2020%20and%20Beyond%20Plan%20Vol%20I.pdf>.

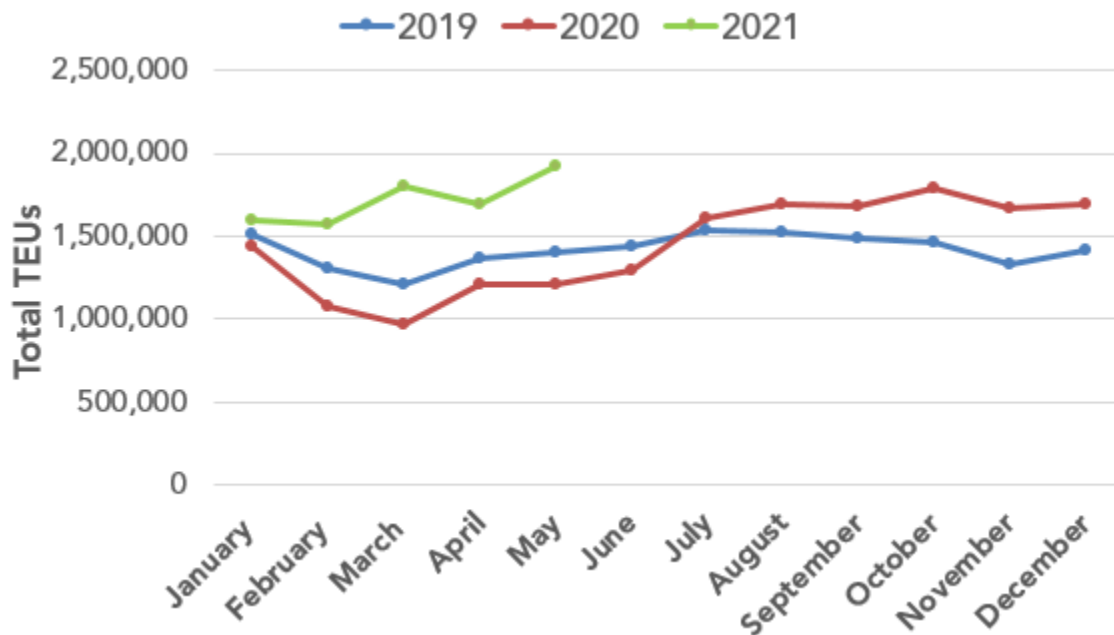
shown in Figure II-4 from January 2019 through June 2021. Between January 2020 and July 2020, TEU throughput was lower relative to the same time period during 2019; however, average throughput between August to December 2020 was 18 percent higher than the same time period during 2019. The trend of increased container throughput continued through June 2021, where both ports separately broke cargo throughput records.<sup>71, 72</sup> As of May 2021, TEU throughput was 26.9 percent higher than during May 2019. TEUs are transported on OGV container ships, which directly require ship assist tugboats for maneuvering into berths at terminals and pilot vessel services. Increased cargo throughput may also positively impact operations of other CHC categories, such as tugs, barges, dredges, workboats, and other marine construction equipment due to their indirect support of the freight system and movement.

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<sup>71</sup> Littlejohn, Donna, Port of LA Continues Breaking Cargo Records in Historic 7-Month Surge, March 16, 2021, last accessed July 6, 2021, <https://www.dailybreeze.com/2021/03/16/port-of-la-continues-breaking-cargo-records-in-historic-7-month-surge/>.

<sup>72</sup> Littlejohn, Donna, Long Beach Port Sees Largest February Cargo Flow in Its 110-Year History, March 10, 2021, last accessed July 6, 2021, <https://www.presstelegram.com/2021/03/10/long-beach-port-sees-largest-february-cargo-flow-in-its-110-year-history/>.

Figure II-4. Total TEUs (Imports and Exports) Through the Ports of Los Angeles and Long Beach Combined from January 2019 through May 2021<sup>73, 74</sup>



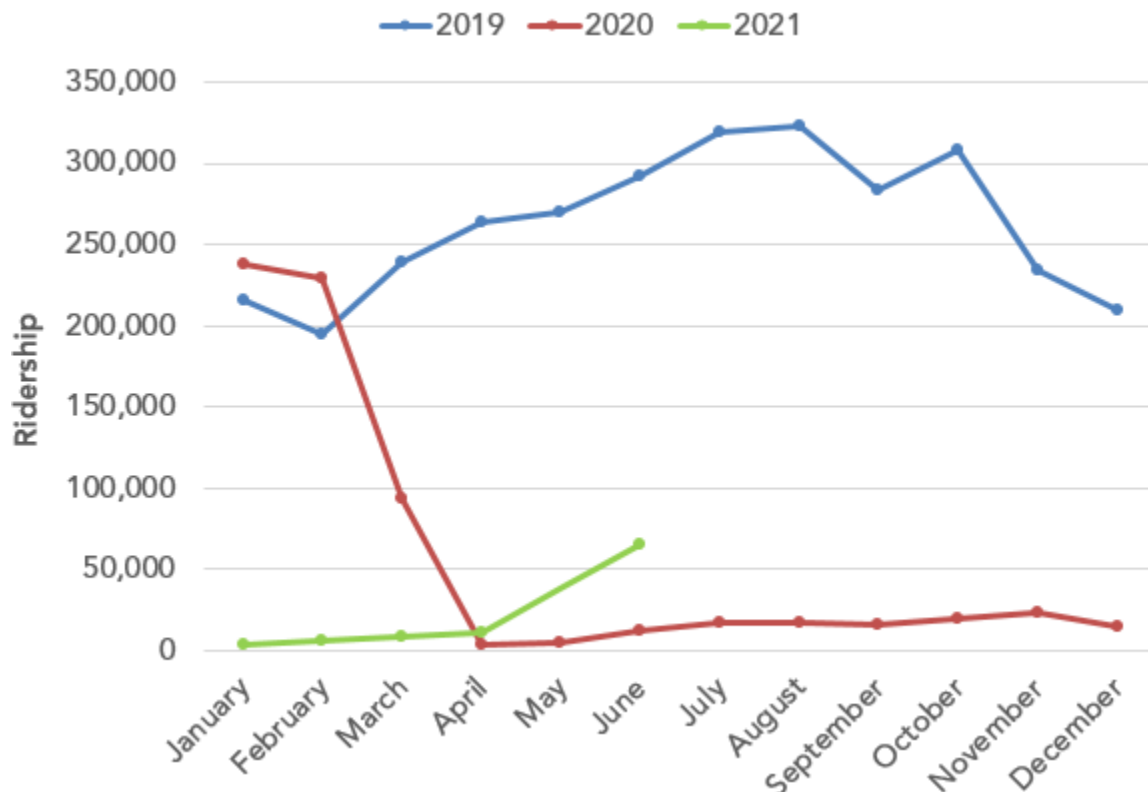
There are other CHC sectors where data suggest activity and operations decreased following the onset of the global situation that impacted California beginning in March 2020. Vessels designed to primarily carry passengers for transportation and leisure were likely more impacted than other sectors that required workers, but not paying passengers onboard. Figure II-5 below shows ridership data for the same period of January 2019 through June 2020 for WETA, a major ferry operator which provides ferry service throughout the San Francisco Bay Area. As shown in Figure II-5, data indicate a precipitous decline in ridership beginning in March 2020, where ridership remained below 10 percent of seasonal 2019 levels for the remainder of the 2020 calendar year. As of June 2021, ridership increased slightly, but remained 77 percent below ridership levels of June 2019.<sup>75</sup> Ridership may continue to trend upward later in 2021; however, it is too soon to determine to what extent the upward trend will continue or whether ridership will return to pre-2020 levels.

<sup>73</sup> POLA, Container Statistics, 2019-2021, last accessed July 7, 2021, <https://www.portoflosangeles.org/business/statistics/container-statistics>.

<sup>74</sup> POLB, Port Statistics, 2019-2021, last accessed July 7, 2021, <https://polb.com/business/port-statistics/#teus-archive-1995-to-present>.

<sup>75</sup> Emails between Tim Hanners (WETA) and David Quiros (CARB) dated June 21, June 28, and July 7, 2021.

Figure II-5. Systemwide WETA Ridership from January 2019 through June 2021<sup>76</sup>

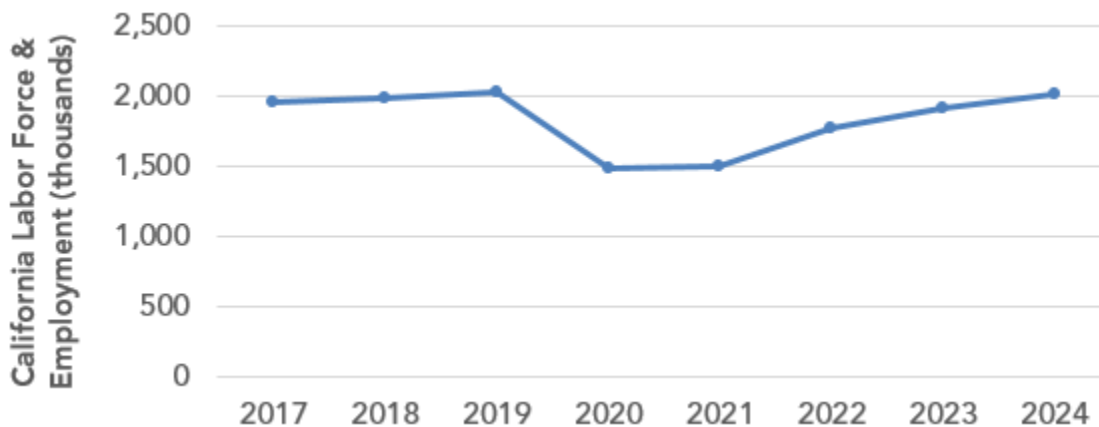


There are two other passenger-carrying vessel categories where members of the public can purchase tickets to board vessels: CPFVs and excursion vessels. CARB staff was not able to obtain a longitudinal time series of monthly passenger or activity data for the 2019, 2020, and 2021 calendar years for these sectors. However, a limited time period of CPFV ridership data was available and used for calculate the cost to individuals for the Standardized Regulatory Impact Assessment (SRIA, see Appendix C). Data suggested that CPFV ridership for months near the end of 2020 was approximately 75 percent of vessel capacity for vessels offering overnight accommodations. Whereas no data were available for angler counts prior to the global situation that began in 2020, as a comparison, ridership for ferry vessels as shown by the blue line in Figure II-5 above reflected a ridership of approximately 45 percent of vessel maximum capacity during 2019 operations. Therefore, it is possible the impacts of the global situation were not as significant for CPFVs as for ferries where data suggest ridership dropped to less than 5 percent of vessel capacity on average after the global situation began in 2020 (calculated by a 90 percent reduction from an average of a 45 percent capacity baseline in 2019).

<sup>76</sup> Email between Tim Hanners (WETA) and David Quiros (CARB) dated April 20, 2021. Some data in 2021 was imputed to approximate monthly totals where not directly provided by WETA.

CARB staff requested, but did not receive, any data for ticket sales or passenger capacities of excursion vessels. CARB received comment letters, such as this one in November 2020, indicating that impacts of the global situation were ongoing.<sup>77</sup> To predict the future impacts and recovery of the excursion vessel sector, CARB staff evaluated the Leisure and Hospitality forecast provided by the Department of Finance (DOF) Economic Forecast for California to potentially evaluate the extent of the impacts to the excursion vessel industry. Data shown in Figure II-6 suggest that after 2021, labor force and employment within this sector will increase and return to pre-2020 levels by 2023 to 2024. Although initial vessel compliance deadlines will not start until December 31, 2023, CARB staff has proposed a number of compliance extensions, including an explicit provision for vessels with compliance dates on or before December 31, 2024 to provide relief if disruptions from the global situation that began in 2020 remain longer than expected.

Figure II-6. DOF Economic Forecast for the Leisure and Hospitality Sector<sup>78</sup>



<sup>77</sup> Comment letter from Hornblower to CARB sent via email on November 1, 2020 in response to CARB’s public workshop on September 30, 2020.

<sup>78</sup> DOF, Economic Forecasts, U.S. and California, last accessed July 7, 2021, [https://www.dof.ca.gov/Forecasting/Economics/Eco\\_Forecasts\\_Us\\_Ca/](https://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/).



### **III. Description of the Proposed Amendments**

#### **A. Emission Reductions**

The Original Regulation was adopted in 2008 to reduce emissions of DPM, NO<sub>x</sub>, and other TACs from diesel engines used on CHC. The Original Regulation was then amended in 2010 (becoming the Current Regulation) to include additional categories of vessels including crew and supply, barge, and dredge vessels. The Current Regulation will be fully implemented, requiring that regulated in-use vessels have engines meeting Tier 2 or 3 standards, by the end of 2022.

CARB staff acknowledge that Tier 3 and Tier 4 could mean many things. To clarify, for the purposes of this ISOR, Tier 3 means Tier 3 marine or Tier 3 off-road engines. Tier 4 in this ISOR means Tier 4 marine or Tier 4 Final off-road engines.

The Proposed Amendments to the Current Regulation aim to further decrease DPM and NO<sub>x</sub> emissions from CHC by expanding vessel categories subject to in-use requirements, establishing more stringent requirements for both newly acquired and in-use vessels, and pushing for the adoption of ZEAT. CARB staff estimates that the Proposed Amendments will achieve an 89 percent reduction in DPM and 52 percent reduction in NO<sub>x</sub> by the end of 2038, three years after when the Proposed Amendments would be fully implemented.

#### **B. Affected Vessel Categories**

In-use requirements are needed for as many vessel categories as possible to maximize DPM and NO<sub>x</sub> emission reductions.

The Proposed Amendments would expand the vessel categories subject to in-use vessel requirements to include tank barges, pilot vessels, workboats, research vessels, CPFVs, and commercial fishing vessels. CARB is also proposing a change to the recreational vessel definition to no longer include passenger capacity thresholds. This would bring diesel-powered 6-passenger or "6-pack" vessels engaged in commercial service into the regulation. Table III-1 outlines each vessel category, whether they are subject to the Current Regulation, and whether they would be subject to the Proposed Amendments.

**Table III-1. Changes to Regulated In-Use Vessel Categories**

<b>Vessel Category</b>	<b>Regulated Under Current Regulation</b>	<b>Regulated Under Proposed Amendments</b>
Ferry	Yes	Yes
Tugboat	Yes	Yes
Barge	Yes	Yes
Dredge	Yes	Yes
Crew & Supply	Yes	Yes
Tugboat on ATB	Yes	Yes
Excursion	Yes	Yes
Pilot Vessel	No	Yes
Tank Barge	Under 400 feet and 10,000 GT only	Yes – all
Research Vessel	No	Yes
Workboat	No	Yes
Commercial Fishing	No	Yes - sets Tier 2 minimum
Commercial Passenger Fishing - Inspected	No	Yes
Commercial Passenger Fishing – Uninspected or “6-pack” vessel	No	Yes – diesel-powered only
Historic	No	No
USCG/ Military	No	No
Temporary Replacement	No	Yes - sets Tier 2 minimum
OGV	No	No
Dedicated Emergency Vessel	No	No

Dedicated emergency use vessels would not be subject to the in-use engine performance standard, vessel labeling, engine idling, or fee provisions in the Proposed Amendments. A vessel would be considered a dedicated emergency use vessel if it is used to perform fire suppression, police response, or emergency rescue as its primary specified vocation.

### **C. Emissions Performance Standards and Vessel Requirements**

#### **1. In-Use and New-Build Vessel Emissions Performance Standards**

CARB staff is proposing the use of the cleanest available marine certified engines combined with verified retrofit DPFs. DPFs are widely commercialized and proven

technology on light-duty and heavy-duty equipment that have been used in on-road, off-road, and seaport applications for more than a decade.<sup>79, 80, 81</sup>

The Proposed Amendments require engines rated less than or equal to 60 kW to meet a performance standard equivalent to meeting U.S. EPA:

- Tier 3 engine standards plus a DPF; or
- Tier 4 engine standards plus a DPF if there is an available engine model certified to Tier 4 standards.

Engines rated greater than 600 kW would be required to meet a performance standard equivalent to a Tier 4 engine plus a DPF.

CARB staff anticipates that the most common pathway for meeting this performance standard would be repowering or rebuilding engines and installing a CARB-verified Level 3 DPF (achieving greater than an 85 percent DPM reduction). In addition, demonstrating that engines otherwise meet the performance standard as listed in Tables III-2 through III-4 would also be a compliant pathway.

In some cases, engine and DPF retrofits may not be feasible. Vessels must then be retired and replaced for operators to comply with the Proposed Amendments. Because new-build vessels can be designed around the cleanest available equipment and present the best opportunity for cost-effectively reducing emissions from harbor craft in California, the same requirements outlined for in-use vessels would apply to new-build vessels. CARB staff expects the Proposed Amendments to result in 269 vessel replacements.

Tables III-2 through III-4 below outline the proposed performance standard for engine emissions in grams per brake horsepower-hour (g/bhp-hr) by engine category, displacement in L/cylinder, power in kW, and MY.

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<sup>79</sup> CARB, Final Statement of Reasons for Rulemaking for the Adoption of a Proposed Regulation to Reduce Emissions from In-Use On-Road Diesel Vehicles, 2008, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2008/truckbus08/pt2revfsor.pdf>.

<sup>80</sup> CARB, Final Statement of Reasons for Rulemaking: Public Hearing to Consider Proposed Amendments to the Regulation for Mobile Cargo Handling Equipment, 2011, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2011/cargo11/cargofsor.pdf>.

<sup>81</sup> CARB, Final Statement of Reasons for Rulemaking: Public Hearing to Consider the Adoption of Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements, 2010, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2010/offroadlsi10/lisifsor.pdf>.

**Table III-2. Emissions Performance Standards\* for Propulsion and Auxiliary Marine Engines – Tier 4 + DPF**

Category	Displacement (L/cylinder)	Maximum Engine Power (kW)	Tier 4 Engine Model Year	NOx (g/bhp-hr)	PM (g/bhp-hr)
C1 Commercial	All	kW < 1,400	2017+	1.3	0.005
C1 Commercial	All	1,400 ≤ kW < 2,000	2016+	1.3	0.005
C1 Commercial	All	2,000 ≤ kW < 3,700	2014+	1.3	0.005
C1 Commercial	< 7.0	≥ 3,700	2014-2015	1.3	0.010
C1 Commercial	< 7.0	≥ 3,700	2016+	1.3	0.010
C2 Commercial	All	600 ≤ kW < 1,400	2017+	1.3	0.005
C2 Commercial	All	1400 ≤ kW < 2,000	2016+	1.3	0.005
C2 Commercial	All	2,000 ≤ kW < 3,700	2014+	1.3	0.005
C2 Commercial	< 15.0	≥ 3,700	2014-2015	1.3	0.010
C2 Commercial	15.0 ≤ disp < 30.0	≥ 3,700	2014-2015	1.3	0.030
C2 Commercial	All	≥ 3,700	2016+	1.3	0.010

\*Emissions performance standards are emissions measured when tested on CARB diesel, not R100

**Table III-3. Emissions Performance Standards\* for Propulsion and Auxiliary Marine Engines – Tier 3 + DPF**

Category	Displacement (L/cylinder)	Maximum Engine Power (kW)	Tier 3 Engine Model Year	HC+NOx (g/bhp-hr)	PM (g/bhp-hr)
C1 Commercial < 75 kW	< 0.9	< 8	2009+	5.6	0.045
C1 Commercial < 75 kW	< 0.9	8 ≤ kW < 19	2009+	5.6	0.045
C1 Commercial < 75 kW	< 0.9	19 ≤ kW < 37	2009-2013	5.6	0.034
C1 Commercial < 75 kW	< 0.9	19 ≤ kW < 37	2014+	3.5	0.022
C1 Commercial < 75 kW	< 0.9	37 ≤ kW < 75	2009-2013	5.6	0.034
C1 Commercial < 75 kW	< 0.9	37 ≤ kW < 75	2014+	3.5	0.034
C1 Commercial Engines with ≤ 35 kW/L power density	< 0.9		2012+	4.0	0.016
C1 Commercial Engines with ≤ 35 kW/L power density	0.9 ≤ disp < 1.2	All	2013+	4.0	0.013
C1 Commercial Engines with ≤ 35 kW/L power density	1.2 ≤ disp < 2.5	< 600	2014-2017	4.2	0.010

Category	Displacement (L/cylinder)	Maximum Engine Power (kW)	Tier 3 Engine Model Year	HC+NOx (g/bhp-hr)	PM (g/bhp-hr)
C1 Commercial Engines with $\leq 35$ kW/L power density	$1.2 \leq \text{disp} < 2.5$	$< 600$	2018+	4.2	0.010
C1 Commercial Engines with $\leq 35$ kW/L power density	$2.5 \leq \text{disp} < 3.5$	$< 600$	2013-2017	4.2	0.010
C1 Commercial Engines with $\leq 35$ kW/L power density	$2.5 \leq \text{disp} < 3.5$	$< 600$	2018+	4.2	0.010
C1 Commercial Engines with $\leq 35$ kW/L power density	$3.5 \leq \text{disp} < 7.0$	$< 600$	2012-2017	4.3	0.010
C1 Commercial Engines with $\leq 35$ kW/L power density	$3.5 \leq \text{disp} < 7.0$	$< 600$	2018+	4.3	0.010
C1 Commercial Engines with $> 35$ kW/L power density	$< 0.9$	$\geq 75$	2012+	4.3	0.017
C1 Commercial Engines with $> 35$ kW/L power density	$0.9 \leq \text{disp} < 1.2$	All	2013+	4.3	0.010
C1 Commercial Engines with $> 35$ kW/L power density	$1.2 \leq \text{disp} < 2.5$	All	2014+	4.3	0.010
C1 Commercial Engines with $> 35$ kW/L power density	$2.5 \leq \text{disp} < 3.5$	All	2013+	4.3	0.010
C1 Commercial Engines with $> 35$ kW/L power density	$3.5 \leq \text{disp} < 7.0$	All	2012+	4.3	0.010
C2	$7.0 \leq \text{disp} < 15.0$	$< 600$	2013+	4.6	0.010
C2	$15.0 \leq \text{disp} < 20.0$	$< 600$	2014+	5.2	0.038
C2	$20.0 \leq \text{disp} < 25.0$	$< 600$	2014+	7.3	0.030
C2	$25.0 \leq \text{disp} < 30.0$	$< 600$	2014+	8.2	0.030
C3	$> 30.0$	All	2016+	2.5 (rpm $< 130$ )	0.010
C3	$> 30.0$	All	2016+	$6.7 \times N^{-0.20i}$ (130 $\leq$ rpm $< 2,000$ )	0.010
C3	$> 30.0$	All	2016+	1.5 (rpm $\geq 2,000$ )	0.010

\*Emissions performance standards are emissions measured when tested on CARB diesel, not R100.

**Table III-4. Emissions Performance Standards\* for Propulsion and Auxiliary Off-Road Engines – Tier 4 Final + DPF**

Rated Power (kW)	Tier 4 Engine MY	NMHC (g/bhp-hr)	NMHC + NOx (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)
kW < 8	2008+	-	5.6	-	0.045
8 ≤ kW < 19	2008+	-	5.6	-	0.045
19 ≤ kW < 37	2013+	-	3.5	-	0.005
37 ≤ kW < 56	2013+	-	3.5	-	0.005
56 ≤ kW < 75	2014+	0.14	-	0.30	0.005
75 ≤ kW < 130	2014+	0.14	-	0.30	0.005
130 ≤ kW < 225	2014+	0.14	-	0.30	0.005
225 ≤ kW < 450	2014+	0.14	-	0.30	0.005
450 ≤ kW < 560	2014+	0.14	-	0.30	0.005
560 ≤ kW < 900	2015+	0.14	-	2.61 / 0.50 a	0.005
kW > 900	2015+	0.14	-	2.61 / 0.50 a	0.005

\*Emissions performance standards are emissions measured when tested on CARB diesel, not R100.

a. The NOx standard for generator sets is 0.50 g/bhp-hr.

The PM performance standard of 0.005 g/bhp-hr, or 5 milligrams (mg) per bhp-hr harmonizes with the Omnibus Heavy-Duty Engine rule.<sup>82</sup> A 5 mg/bhp-hr performance standard for PM is achievable with baseline Tier 3 or Tier 4 engines when using a Level 3 DPF. Therefore, in cases where a U.S. EPA-certified engine to Tier 4 (or Tier 3 if engine power is less than or equal to 600 kW) and a CARB verified DPF retrofit is used, the vessel owner or operator would not need to provide any additional mathematical demonstration. If engines meet the performance standard without a DPF, a demonstration of engine emissions would be required. This may include reporting to U.S. EPA or CARB engine family information that documents the emissions levels are below the emissions performance standards.

In addition to the emissions performance standards outlined in Tables III-2 through III-4, CH<sub>4</sub> emissions must not exceed 1.0 g/bhp-hr when using a fuel other than diesel.

## 2. Zero-Emission and Advanced Technologies

California remains a leader in advanced transportation, freight, and other clean-air technologies. To continue promoting the use of clean technologies in the marine sector, CARB is proposing mandates and regulatory credits for the adoption of ZEAT in the Proposed Amendments.

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<sup>82</sup> CARB, Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, 2020, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2020/hdomnibuslownox/isor.pdf>.

**a. Mandates for ZEAT**

The Proposed Amendments would require the adoption of ZEAT wherever feasible, as shown in Table III-5.

Under the Proposed Amendments, new excursion vessels would be required to be built with zero-emission capable hybrid technology starting December 31, 2024. Both new-build and in-use short-run ferries would be required to be zero-emission by December 31, 2025.

**Table III-5. Proposed Mandates for Zero-Emission and Advanced Marine Technologies**

<b>Marine Technology Type</b>	<b>Vessel Category Requirement</b>	<b>Mandate Phase-In Date</b>
Zero-Emission Capable Hybrid	New Excursion Vessels	December 31, 2024
Zero-Emission	New, Newly Acquired, and In-Use Short (<3 nm) run ferries	December 31, 2025

Short-run ferries include vessels that provide regularly scheduled ferry service between two points that are less than three nm apart. Vessels that provide ferry round-trip service between two points that are less than 3 nm apart but provide less than 20 percent of the service trips from one fleet between those two points during a given calendar year, are not considered short-run ferries.

In some situations, ferries provide service between three or more locations. CARB staff intend to require zero-emission vessels to be used for as much operation with one-way trips less than three nm as possible. However, operators need flexibility to provide short-run service as part of a larger multi-point routes, and also swap vessels between routes due to operational concerns. Therefore, CARB staff proposes that short-run ferries also include vessels servicing routes with three or more stops if two criteria are met: (1) half or more of the single trip lengths are less than 3 nm, and (2) the longest single trip length is less than 6 nm.

Combustion engines onboard short-run ferries must meet the Tier 3 or 4 engine emissions performance standards outlined in Chapter 3 - Section C.1 but would not be required to have a DPF. These engines would not be permitted to operate more than 20 hours per year unless performing emergency operations, which must be documented and reported to CARB. Full zero-emission vessels must not use an internal combustion engine to generate propulsion or auxiliary power for the normal operation of the vessel unless the engine meets the emission limits for distributed generation or is exclusively used during emergency operations.

The Proposed Amendments define a Zero-Emission Capable Hybrid as a vessel that derives less than 70 percent of its total onboard power (main propulsion and auxiliary) from an onboard combustion source.

Before adopting ZEAT, a vessel owner or operator must submit an application to and receive approval from CARB’s EO. This application must be submitted at least

18 months prior to the compliance date or when ZEAT will be deployed. The application must include the applicant’s contact information, and information specific to the harbor craft and engines on which ZEAT will be used. It must also include certification documentation, a detailed engineering analysis, design information, and other information required to demonstrate meeting the emissions performance standards required. CARB staff intend for these approval processes to apply in the absence of a separate or dedicated approval process or regulation that is established more broadly for marine or off-road equipment. Therefore, if a certification, verification, or other approval process becomes available or is adopted for ZEAT on marine vessels, the equipment would be approved under that forthcoming process.

**b. ZEAT Credit**

To further encourage early adoption of ZEAT in California, the Proposed Amendments would incentivize early adoption of ZEAT where not required by providing additional compliance time for an engine in the same fleet as the ZEAT vessel.

The ZEAT credit may also be allotted for the adoption of ZEAT in advance of, or in addition to, the requirements of the Proposed Amendments. The ZEAT credit can be applied to another vessel within their fleet, operating within the same air district. Three extra years would be granted for zero-emission capable hybrid vessel deployment, and seven years would be granted for full zero-emission vessel deployment, as shown in Table III-6. Allowing additional compliance time for other engines or vessels through this ZEAT credit is intended to incentivize early adoption or further development of ZEAT in the marine market.

**Table III-6. ZEAT Credit Time for Adoption When Not Required**

<b>Marine Technology Type</b>	<b>Maximum Additional Compliance Time</b>
Zero-Emission Capable Hybrid	3 Extra Years
Zero-Emission	7 Extra Years

The ZEAT credit would apply for repowers, replacements, and newly-built ZEAT vessels. The credit would be limited to vessels with Tier 2 or cleaner engines, to prevent engines with the least stringent emission standards to continue to operate in RCW. The credit must be granted to a single vessel and may not extend past December 31, 2034. The credit may not be applied to any vessel that is part of an ACE as described in Chapter 3, Section F but can be combined with feasibility compliance extensions.

To ensure that DACs would not experience a higher burden than other communities, the ZEAT credit may not be applied to a vessel with a homebase (a facility where a vessel is anchored or docked the majority of the time within a calendar year) in a DAC, unless the ZEAT vessel is also deployed in a DAC. A DAC is designated by the CalEPA



for the purpose of SB 535<sup>83</sup> (HSC 39711)<sup>84</sup> using the most current version of CalEnviroScreen by OEHHA. DACs include all wharfs, docks, berths, and slips within a seaport, marina, harbor, or other terminal facilities if any portion of the facility is located within a DAC. A vessel is considered to be operating in a DAC if its homebase or any regularly scheduled stops are within two miles of a DAC. CARB staff is proposing a distance of two miles to provide at least some additional buffer for vessel activity hotspots that are not located within, but adjacent to, DACs. CARB staff acknowledges that emissions from CHC impact a much larger geographic region, as shown by dispersion modeling results presented in Appendix G. However, the proposal would require additional control of emissions for vessels that are impacting DACs most significantly.

New and in-use short-run ferries and new excursion vessels, are eligible for this additional compliance time credit if ZEAT is adopted at least three years prior to the ZEAT compliance date.

### **3. Removing Exemptions for Engines Under 50 Horsepower**

The Current Regulation exempts engines with a power rating of less than 50 hp. CARB staff estimates 24 percent of auxiliary engines are rated below 50 hp, and emissions from engines under 50 hp contribute approximately 9 percent of total auxiliary engine DPM emissions.

Compliance costs were modeled per hp to allow a wide range of engine power to be considered. These models show a proportional cost effectiveness of reductions for larger and smaller engines alike.

To maximize emission reductions and remove any incentive to install a greater number of smaller engines under 50 hp, the Proposed Amendments would expand in-use engine standards to engines of all sizes and power displacements.

#### **D. Low-Use Compliance Pathway**

The Current Regulation provides a low-use compliance pathway. Engines do not need to meet in-use requirements as long as the engine's hours do not exceed an annual threshold of 80 hours for dredges and barges, and 300 hours for all other vessel categories. These thresholds would remain in effect through December 31, 2022.

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<sup>83</sup> OEHHA, SB 535 Disadvantaged Communities, June 2017, last accessed July 6, 2021, <https://oehha.ca.gov/calenviroscreen/sb535>.

<sup>84</sup> HSC § 39711, Division 26, 2019, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=HSC&division=26.&title=&art=2.&chapter=4.1.&article](https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=26.&title=&art=2.&chapter=4.1.&article).

Moving forward, vessel owners and operators would still need to receive EO approval to comply with performance standards using a low use exception. The Proposed Amendments would change the annual operating hour limits of engines eligible for low-use to reflect the distinctions between engine tiers. Lower tier (i.e., older engines) would have more stringent low-use limits, and higher tier (i.e., newer engines) would have less stringent low-use limits. This approach provides flexibility to stakeholders who have already upgraded to cleaner engines, while continuing to remove engines with the least stringent emissions performance standards. Each fleet would have no more than five vessels eligible for low-use compliance; however, vessels with a homebase in California would not be counted toward this cap. The new annual hour thresholds are developed considering vessel category weighted assumptions about whether a vessel would need to be repowered versus replaced to meet emissions performance standards, and cost per weighted ton thresholds used in the Carl Moyer Memorial Air Quality Standards Attainment Program.<sup>85</sup>

To further reduce emissions in DACs, the Proposed Amendments would require more stringency for low-use compliance in areas that qualify as a DAC. The low-use compliance thresholds in DACs would be half that in other areas of the State. The low-use thresholds for each engine tier in DACs and other areas are outlined in Table III-7, and would apply to all vessels, regardless of category.

**Table III-7. Annual Low-Use Hours Limits for Engines on Regulated In-Use Vessels Based on Engine Tier**

Engine Tier	Pre-Tier 1	Tier 1	Tier 2	Tier 3 or 4
DACs (hours/year)	40	150	200	350
All Other Areas (hours/year)	80	300	400	700

Newly acquired in-use vessels are not eligible for low-use exemptions or the compliance extensions detailed in Chapter III, Section E. Applicants must submit a renewal application every three years.

## **E. Compliance Extensions**

### **1. Temporary Replacement Vessel Exemptions**

The Current Regulation limits the approval of a temporary replacement vessel to no more than 12 months out of 24 months for a single California vessel being replaced. During implementation of the Current Regulation, CARB staff received a number of comments concerning competitiveness within a vessel category and region as a result of some operators receiving approval for temporary replacement vessels after passing compliance deadlines. With the intent of providing uniform flexibility, the Proposed Amendments retain temporary replacement vessel provisions, but with modifications.

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<sup>85</sup> CARB, The Carl Moyer Program Guidelines, 2017, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017\\_cmpgl.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf).

Moving forward, temporary replacement vessels would still be allowed to operate for 12 months at a time in California to assist with downtime in replacing or upgrading the existing fleet. However, they would not be approved to replace vessels taken out of service after their nominal compliance deadlines for the purpose of upgrading their engines to meet the in-use emissions performance standards. In addition, temporary replacement vessels would also be limited to those with main and auxiliary engines certified to Tier 2 marine or off-road or newer standards.

A request to use a temporary replacement vessel must be submitted to CARB at least one year prior to any compliance deadlines of engines aboard the vessel. This request must demonstrate that the temporary replacement vessel would no longer be needed to maintain business operations by the compliance deadlines of engines aboard the vessel being replaced.

## **2. Sunsetting Compliance Extensions**

The Current Regulation includes a compliance extension titled “Change in Annual Hours of Operation” as listed in subsection (e)(6)(E)1 of the Proposed Amendments. This compliance extension provides a one-year extension if a vessel owner or operator determines the engine’s compliance date using its expected hours of operation and the hours of operation increase significantly thus accelerating the compliance date. The compliance deadlines under the Proposed Amendments are not dependent on annual operating hours. The Proposed Amendments would sunset this compliance extension after December 31, 2022.

The Current Regulation includes a compliance extension titled “No Suitable Engine Replacement for Harbor Craft” as listed in subsection (e)(6)(E)2 of the Proposed Amendments. This compliance extension provides a one-year renewable extension if there is no suitable Tier 2 or Tier 3 marine engine available anywhere that can be used in the owner’s vessel, and the owner cannot otherwise meet the required performance standard. Due to the wide availability of Tier 2 and Tier 3 engines, and the requirement to use Tier 3 or 4 engines and DPF control technology instead, the Proposed Amendments would sunset this compliance extension after December 31, 2022 and create feasibility extensions outlined below.

## **3. Proposed Compliance Extensions**

CARB staff is proposing three categories of compliance extensions in the Proposed Amendments for infrastructure, feasibility, and scheduling.

### **a. Infrastructure**

Infrastructure may be a challenge in some circumstances. This extension would provide flexibility if infrastructure challenges arise. This extension would be combinable with any other extension group (feasibility or scheduling).

The infrastructure compliance extension of the Proposed Amendments would:

- provide a one-year extension,
- be renewable once for a total of two years,
- be for any vessel or engine technology requiring infrastructure, and
- is due to unforeseen circumstances outside of the owner's or operator's control that prevents the installation or use of shore power or zero-emission charging infrastructure.

### **b. Feasibility**

The feasibility compliance extension of the Proposed Amendments would provide a renewable two-year extension, for the following circumstances:

- Tier 4 engines or DPFs are not available.
- Engines or DPFs will not fit and a replacement vessel cannot be afforded, limited to six years or to December 31, 2034, except:
  - workboats, which have no limit to the number of extensions; and,
  - ferry, excursion, or CPFVs, which are limited to eight years if they have an initial compliance deadline on or before December 31, 2024.
- Tier 4 engines on a vessel have no fitment for a DPF and operate below 2,600 hours/year (or 1,300 hours/year if operating in a DAC).

This extension category would provide flexibility for all operators if the technology required by the Proposed Amendments is not available in the marine sector. If a vessel has an engine meeting Tier 4 standards and there is a DPF available for another engine family meeting Tier 4 standards, but not the unique engine already installed in a vessel, CARB staff do not intend to require the CHC owner or operator to replace the existing Tier 4 engine to accommodate the DPF, and this extension may be used. However, if both an engine and DPF combination is available from any engine or DPF manufacturer, which can be used in a vessel with any extent of modifications or reconfigurations, the CHC owner or operator would be required to use the available engine and DPF technology.

CARB staff understands that vessel replacements may be necessary for some operators to comply with the Proposed Amendments. CARB staff anticipates the most common use of the feasibility extension to be for operators that must replace a vessel and cannot afford the cost of a vessel replacement without additional time to secure funding. Under this extension, CARB staff propose no limit to the number of extensions eligible for dedicated workboats, and up to eight years of extensions for excursion, ferry, and CPFVs that have compliance deadlines on or before December 31, 2024 for the reasons discussed in Chapter II.E. For all other regulated in-use vessel categories, this renewable extension may not be combined to exceed six years or extend past December 31, 2034.

The feasibility compliance extension would also prevent owners and operators from having to replace an entire vessel already equipped with Tier 4 engines if meeting Tier 4 plus DPF emissions performance standards is not technically feasible, and the

vessel has not and will not operate above 2,600 hours/year (or 1,300 hours/year if operating in a DAC). An engineering analysis of fitment would be required for a feasibility extension and would need to consider all possible modifications or vessel reconfigurations. Modifications requiring the vessel length to be extended or passenger capacity reduced by more than 25 percent are not considered feasible. For barge and barge-mounted dredge vessels to be eligible for a feasibility extension due to annual operating hours below 2,600 hours per year (or 1,300 if operating in a DAC), all auxiliary engines must meet Tier 4 standards, but main propulsion engines would not need to meet this standard. For all other vessel categories to be eligible for this extension, all main propulsion engines must meet Tier 4 standards, but auxiliary engines would not need to meet this standard.

### **c. Scheduling**

The Proposed Amendments include a one year, one time extension for one of the following:

- Equipment manufacturer or installation delays; or
- Multiple engines with same compliance dates; or
- Multiple engines on the same vessel with different compliance dates.

Each engine would only be able to receive up to one year of extensions from any of the three pathways above.

The scheduling compliance extension provides some flexibility for applicants that run into unforeseen delays. Examples include ordering new replacement equipment for compliance at least six months prior to the compliance date but being unable to use the compliant equipment in operation due to manufacturing delays or excessive difficulties encountered during installation.

CARB staff recognizes that vessels would need to be removed from service in order to be repowered or retrofitted with compliant equipment. To prevent multiple vessels being pulled from service simultaneously, this extension provides flexibility for applicants that:

- have two or more engines on a single vessel that have the same compliance date;
- have two or more engines on another vessel; or
- have one engine on three or more vessels that have the same compliance date.

These extensions are uniquely important for the Proposed Amendments because CARB staff is anticipating a compliance response to include removing some vessels from service and replacing them with new or newly acquired vessels. Allowing some flexibility to align compliance deadlines on engines that need to be replaced at the

same time would aid in the business and operational decisions of CHC owners and operators.

## **F. Alternative Control of Emissions**

CARB staff is proposing an Alternative Control of Emissions (ACE) option that would allow owners and operators to comply with the Proposed Amendments by implementing alternative emission control strategies that achieve equivalent or additional emission reductions relative to requirements of subsection (e)(6.1) of the Proposed Amendments.

The ACE would provide a compliance option if an applicant implements an alternative emission control strategy that has CARB's EO approval. Strategies may include, but are not limited to, any combination of engine modifications, exhaust treatment control, engine repowers, use of alternative fuels, fleet averaging, or any other measures that sufficiently reduce emissions. The use of grid electricity while at dock or the use of renewable diesel would not be valid strategies for an ACE, as they would already be required by the Proposed Amendments. ACE allows owners and operators flexibility in choosing their own strategies, while maintaining the same "gram for gram" requirements for emission reduction over the compliance period and supporting the development of effective technologies. The most common strategy in an ACE would likely be fleet averaging, early compliance, or deploying ZEAT to achieve equal or greater emission reductions than the MY compliance schedule.

The emissions evaluation period, where the ACE would need to show equal or greater emission reductions than the Nominal Compliance Baseline, would be from January 1, 2023, through December 31, 2034. The MY compliance schedule establishes the emission reductions that are achieved by direct compliance with no extensions applied. The Nominal Compliance Baseline, to which the ACE would be compared, would be the MY compliance schedule with a maximum of two years of feasibility-based compliance extensions applied. This is because feasibility extensions are specific to the availability of engines in the future, which would likely change as the compliance dates approach. CARB staff is proposing to limit feasibility extensions to two years to avoid approving extensions that would not have been granted if operators were directly complying with the rule. Vessel owners and operators would apply for the compliance extensions for the baseline comparison along with the ACE application. In addition, the applicant would be required to demonstrate that DACs would not experience a higher burden than other communities as a result of implementing an ACE. The application would need to be submitted to CARB by December 31, 2025.

Emission reductions funded either partially or fully through public air quality or emission reduction incentive programs may not count toward the projected reductions in an ACE application. This is to avoid a situation where air quality programs meant to incentivize upgrades through funding end up paying for partial or full compliance of an engine or vessel with the CHC regulation. An applicant receiving funding or grants

unrelated to air quality can include vessels and engines receiving that funding in an ACE application.

## **G. Implementation Timeline**

Table III-8 specifies the compliance dates for each vessel category, engine tier, and engine MY. The compliance dates range from 2023 to 2032, with lower engine tiers and older MYs having earlier compliance dates. CARB staff analyzed the emissions per vessel considering the average age, size, load, and activity of engines. Vessels with higher emissions per vessel were prioritized for earlier compliance dates.

Consequently, vessel categories that previously were not subject to regulated in-use vessel requirements are the first group of vessels that have compliance dates beginning on December 31, 2023.

Any Pre-Tier 1 or Tier 1 engines on vessels other than commercial fishing vessels would have a compliance date between 2023 and 2025 to upgrade to Tier 3 or Tier 4, and another compliance date between 2024 and 2031 to upgrade to Tier 3 or Tier 4 plus a DPF.

Tier 2, Tier 3, and Tier 4 engines on ferries (except short-run) and tugboats would have compliance dates between 2024 and 2029 to meet the Tier 3 or Tier 4 plus DPF emissions performance standards.

Tier 2, Tier 3, and Tier 4 engines on pilot boats would have compliance dates between 2025 and 2029 to meet the Tier 3 or Tier 4 plus DPF emissions performance standards.

Tier 2, Tier 3, and Tier 4 engines on research vessels, CPFVs, and excursion vessels would have compliance dates between 2026 and 2030.

Tier 2, Tier 3, and Tier 4 engines on dredges, barges, crew and supply, and workboats would have compliance dates between 2028 and 2031.

Any Pre-Tier 1 or Tier 1 engines on commercial fishing vessels would have a compliance date between 2030 and 2032 to upgrade to Tier 2 or cleaner engines.

In addition to these requirements for diesel combustion engines, the Proposed Amendments would also require all new-build excursion vessels to be zero-emission capable hybrid vessels by December 31, 2024. A zero-emission capable hybrid vessel must derive 30 percent or more of its total work from main propulsion and auxiliary engines averaged over a calendar year from a zero-emission tailpipe source. In addition, all new-build and in-use short-run ferries would be required to be zero-emission by December 31, 2025.

Table III-8. Major Compliance Requirements of Existing and Proposed Amendments

Current Regulation		Proposed Amendments (Implementation Dates) – December 31 <sup>st</sup> of compliance year										
2021 & Earlier	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
<b>IN-USE VESSEL REQUIREMENTS</b>												
Tier 2 or 3 (Tugs, Ferries, Excursion, Crew & Supply, Barge, Dredge)	<b>Any Pre-Tier 1 and 1 → Tier 4*</b> (generally Workboats, Research, Pilot, Tank Barges, and CPFV)											
	≤ MY 1993	MY 1994-2001	MY 2002-2006									
	Tier 2, 3, 4 → Tier 4*+DPF** Ferries (Except Short Run), Pilot***, All Tugs											
	MY 2007-2009	MY 2010-2012	MY 2013-2015	MY 2016-2019	MY 2020-2021	MY 2022+						
	Tier 2, 3, 4 → Tier 4*+DPF** Research, CPFV, Excursion											
	MY 2007-2010	MY 2011-2012	MY 2013-2014	MY 2015-2017	MY 2018+							
	Tier 2, 3, 4 → Tier 4*+DPF** Dredges, Barges, Crew & Supply, Workboats											
	MY 2007-2009	MY 2010-2013	MY 2014-2017	MY 2018+								
										Any Pre-Tier 1 and 1 → Tier 2 or Cleaner <i>Commercial Fishing</i>		
										≤ MY 1987	MY 1988-1997	MY 1998+
<b>Other VESSEL REQUIREMENTS</b>												
Tier 2, 3, or 4 All New Vessels Tier 3 + BACT New Ferries Carrying 75+ Passengers	New Excursion: Zero-Emission Capable (e.g., Plug-in Hybrid) 30% or more of power must be derived from a zero-emission tailpipe source											
	New and In-Use Short-Run Ferries: Zero-Emission											

\*All engines ≥600 kW would be required to be certified to Tier 4. For engines <600 kW, a Tier 4 certified engine would be required if certified by U.S. EPA or CARB and available by the compliance date.

\*\*Retrofit DPF requirements would apply to all Tier 3 and Tier 4 engines.

\*\*\*Pilot vessels at Tier 2, 3, or 4 with MY 2007-2009 would not need to comply until December 31, 2025



## **H. Other Vessel Requirements**

### **1. Main Idling and Auxiliary Engine Operating Limits**

CARB staff has observed and received complaints from the public about extended main engine idling and auxiliary engine operation while harbor craft are at dock. Staff's analysis of electronic engine records indicates that for some vessels, up to 40 percent of all operational hours over the lifetime of the engines were at idle. Idling reduction by shutting off engines or plugging into shore power would reduce operator fuel expenses, GHG and criteria pollutant emissions, and near-source exposure to DPM and NOx.

On-road heavy-duty truck idling is restricted to five minutes under title 13 CCR § 2485. Diesel-powered off-road equipment idling is also restricted to five minutes under title 13 CCR § 2449. The proposed idling restriction for CHC allows for an idling period—15 to 30-minute idling limits—relative to other diesel-powered equipment idling restriction regulations due to the size and more complex procedures required for vessels with multiple engines.

Beginning January 1, 2024, vessels subject to the Proposed Amendments may not idle propulsion engines or operate auxiliary generator engines for more than 15 minutes when docked, berthed, or moored, or 30 minutes for the initial start-up of each day or new working shift. Main propulsion engines would be limited to idling restrictions when they are not generating any useful work beyond keeping the engine turning and pumps running. Auxiliary engines would be limited to operating restrictions unless connected to shore power.

These idling limits would not apply to the following: idling or operation for testing, servicing, repairing, or diagnostic purposes, idling necessary to accomplish work for the vessel's intended use (e.g., ship-assist tug vessels in position to maneuver another vessel), operation of direct-drive or other non-generator specialty auxiliary engines, idling or operation that meets the definition of emergency operations, operating of auxiliary engines if accessible locations at the facility are not equipped with shore power, and idling or operation at facilities where shore power is not required pursuant to vessel visit thresholds outlined in Section I of this chapter.

Quick engine accelerations or restarting the engine while otherwise idling in order to circumvent this requirement would still be considered continuous idling. This concept allows 30 minutes of idling after coming to dock at the end of a work period, and 30 additional minutes prior to initial operation in a subsequent work period after engines are restarted. CARB defines a new work period to begin when main engines have been shut off for 4 hours or longer.

### **2. Renewable Diesel (R99)**

The Proposed Amendments require the use of at least 99 percent Renewable Diesel (R99 or R100) as a drop-in fuel (no changes to infrastructure or fuel necessary) to

achieve reductions on top of Tier 3 or Tier 4 plus DPF requirements. Because the use of R99 is required by the Proposed Amendments, it cannot be used as a strategy for emission reductions under an ACE. Demonstrations of emissions performance standards under an ACE should be performed using standard CARB ULSD.

Renewable diesel is a fuel substitute produced from non-petroleum renewable sources, including vegetable oils and animal fats. It is different than biodiesel, which is a methyl ester compound that should not be used in high quantities with retrofit aftertreatment. Because renewable diesel conforms to the Standard Specification for Diesel Fuel Oils (American Society for Testing Materials (ASTM) D975), and meets CARB's requirements for ULSD, its use would not cause any engine performance problems as a result of switching to R99.

CHC are forecasted to use approximately 55 million gallons of fuel in 2023. Discussions with renewable diesel producers as well as recent news of large oil companies transitioning their refineries to produce solely R100<sup>86</sup> has confirmed that there will be enough renewable diesel available to accommodate the increase in demand from the requirements of the Proposed Amendments.

Staff has performed Portable Emissions Measurement System (PEMS) testing to quantify emissions impacts of R100 for an in-use excursion vessel operation. Preliminary results confirm laboratory testing data from on-road trucks. Emission benefits are on the order of 30 percent for DPM and 10 percent for NOx.<sup>87</sup> For more detail, refer to Appendix E.

### 3. Opacity Testing

CARB staff has received complaints about harbor craft emitting visible emissions in several areas of the State. The Current Regulation does not have any mechanism that allows CARB to require a harbor craft operator to identify the cause of excess emissions and take corrective action. CARB's heavy-duty in-use inspection and maintenance (I/M) programs are currently limited to on-road trucks, namely the Heavy-Duty Vehicle Inspection Program (HDVIP) and Periodic Smoke Inspection Program (PSIP), and Cargo Handling Equipment (CHE) operating at seaports and intermodal rail yards. Both trucks and CHE are subject to periodic smoke opacity testing according to procedures defined in SAE J1667.<sup>88</sup> CARB staff is proposing that

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<sup>86</sup> Bryan, Tom, Renewable Diesel's Rising Tide, January 12, 2021, last accessed July 6, 2021, <http://www.biodieselmagazine.com/articles/2517318/renewable-diesels-rising-tide>.

<sup>87</sup> CalEPA, Staff Report: Multimedia Evaluation of Renewable Diesel, last accessed July 6, 2021, [https://ww3.arb.ca.gov/fuels/multimedia/meetings/renewabledieselstaffreport\\_nov2013.pdf](https://ww3.arb.ca.gov/fuels/multimedia/meetings/renewabledieselstaffreport_nov2013.pdf).

<sup>88</sup> California Council on Diesel Education and Technology, Applying the SAE J1667 Snap Acceleration Test Procedure to RTG Cranes, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/ports/cargo/documents/091118saej1667rtg.pdf>.

all main propulsion diesel engines operating on harbor craft be required to perform opacity testing and meet applicable opacity limits whenever the test procedure is administered.

By March 31, 2024, and every even calendar year thereafter, all main propulsion diesel engines, including swing engines and low-use engines, operating on in-use vessels subject to the Proposed Amendments must perform opacity testing biennially and submit results to CARB along with other reporting information. Engines with MY 2020 and newer would not need to perform biennial testing until the calendar year four years after the MY of the engine. For example, a MY 2021 engine is exempt until 2025, and the first opacity test of the engine must be performed and reported to CARB by March 31, 2026. CARB would retain authority to perform opacity testing in the field or audit opacity test records at any time.

Opacity would be tested after a DPF (if installed) but before the muffler or any seawater injection into the exhaust. The vessel operator would transit to a safe location in open waters, clutch-in with engines at idle, and transition controls from idle to full load within two seconds. Opacity would be measured for 15 seconds or until engines reach full power, whichever is longer, and the test would be repeated five more times. The final opacity measurement would be the average of the 0.5-second maximum of the last three accelerations. For more information on opacity testing procedures, see Appendix E.

Vessels must not exceed the smoke opacity levels provided for the engine type of the tested engine. Engines meeting the Tier 3 plus DPF or Tier 4 plus DPF performance standard must not exceed 5 percent smoke opacity. Engines without DPFs must not exceed 40 percent smoke opacity. Staff analyzed over 800 tests of engines in CHE, and 60 tests on marine engines in harbor craft to inform opacity limits.

Auxiliary engines would be subject to the same opacity limits but would not need to test biennially due to the variety of applications, and the complexity and potential costs of periodic testing. CARB staff may test auxiliary engines upon receiving a complaint of excess visible emissions. If at dock, CARB staff may either apply SAE J1667 testing procedures or use EPA Method 9 Visual Emissions Evaluation (VEE).<sup>89</sup>

If a main engine fails an opacity test, the owner or operator has 30 calendar days to repair the engine, retest, and retain records of the passed opacity test, or the engine must be taken out of service. If an auxiliary engine fails an opacity test, the owner or operator has 30 calendar days to repair the engine and notify CARB.

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<sup>89</sup> U.S. EPA, Visual Emissions Field Manual EPA Methods 9 and 22, December 1993, last accessed July 6, 2021, <https://www.epa.gov/sites/production/files/2020-08/documents/vefieldmanual.pdf>.

## 4. Vessel Reporting

Analysis of vessels reported to CARB, and data from the California Department of Motor Vehicles (DMV) and USCG indicate that more than one-third of vessels subject to the CHC regulation and operate in RCW are not reported to CARB, as required by the Current Regulation. Based on enforcement inspections through mid-2020, the compliance rate of reported vessels was approximately 92 percent based on inspections of mostly reported vessels.<sup>90</sup> To increase compliance, especially for non-reported vessels that may have lower compliance rates, CARB is proposing new vessel reporting requirements.

The Current Regulation requires vessels to report to CARB only periodically, such as after repowering engines or as compliance deadlines approach. To ensure that CARB's records are current, and the regulation can be effectively implemented, the Proposed Amendments would make changes to the information vessel owners and operators are required to report and would require annual reporting.

Vessel owners and operators would be required to report to CARB the percentage of time a vessel is used in each vessel use category, vessel homebase, primary area(s) of vessel operation in RCW, new owner contact information when a vessel is sold, engine tier, and engine MY. If an engine is equipped with an SCR system, owners and operators would also be required to report the quantity of diesel exhaust fluid (DEF), such as ammonia or urea, consumed. If a vessel is used in emergency operations, the owner or operator would be required to report the hours of operation and documentation of the emergency operation. If a zero-emission vessel with a diesel engine is operated more than 20 hours per year, or if the total amount of work done by a zero-emission capable hybrid vessel with a combustion engine is more than 70 percent annually, the owner or operator would need to report that information to CARB. For each vessel adopting ZEAT, the owner or operator must keep records of the infrastructure type, manufacturer, serial number, installation date, equipment type supported, number of equipment supported, capacity (fuel/energy storage volume), amperage, voltage, public or private use, and number of plugs for the landside ZEAT infrastructure. In addition, CARB staff is proposing reporting requirements for facilities where CHC operate, which is discussed more in Section I of this chapter.

## 5. Vessel Labeling

Although many agencies already require various forms of labeling, there is no common identifier for all vessels in California subject to the Proposed Amendments. Below are the vessel labeling requirements from other agencies.

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<sup>90</sup> CARB, Public Workshop for the Draft Proposed Amendments to the Commercial Harbor Craft Regulation, September 30, 2020, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/2020-09/CHC%20Workshop%20September%202020.pdf>.

Vessels are currently required to register with the USCG if they are five or more net tons, 30 feet or more in length and used in fishing activities in navigable waters of the U.S., if they operate in the Exclusive Economic Zone (EEZ), or if they are used in coastwise trade. Vessels that register with the USCG are assigned an official number that is required to be permanently affixed to the vessel.<sup>91</sup>

The DMV registers all sail-powered vessels over eight feet in length and all motor-driven vessels that are not documented by the USCG but are used on California waterways. The DMV assigns a Permanent Vessel Number ("CF" Number) and a Hull Identification Number (HIN) for the owner or operator to affix to the vessel.<sup>92</sup>

The California Department of Fish and Wildlife (CDFW) issues Fish and Game License numbers that permit a person to take fish, mollusks, crustaceans, invertebrates, amphibians, or reptiles in inland or ocean waters. These license numbers are required to be displayed on the vessel.<sup>93</sup>

IMO issues a number for propelled sea-going merchant ships of 100 GT and above that must be permanently affixed to the vessel.<sup>94</sup>

The National Telecommunications and Information Administration (NTIA) for federal users issues a Maritime Mobile Service Industry (MMSI) number for vessels owned and operated by a federal entity. For nonfederal users (civilians), the MMSI number is assigned by the Federal Communications Commission (FCC). The MMSI number is also registered with the International Telecommunication Union (ITU) and is programmed into the radio equipment on-board the vessel.<sup>95</sup>

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<sup>91</sup> USCG, National Vessel Documentation Center FAQ, last accessed February 5, 2021, <https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/National-Vessel-Documentation-Center/National-Vessel-Documentation-Center-FAQ/>.

<sup>92</sup> DMV, Boat/ Vessel Registration, last accessed July 6, 2021, <https://www.dmv.ca.gov/portal/vehicle-registration/new-registration/register-your-boat-vessel/>.

<sup>93</sup> FGC § 7880-7892, Division 6, 1997, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=FGC&division=6.&title=&part=3.&chapter=1.&article=4](https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=FGC&division=6.&title=&part=3.&chapter=1.&article=4).

<sup>94</sup> IMO, IMO Identification Number Schemes, last accessed July 6, 2021, <https://www.imo.org/en/OurWork/MSAS/Pages/IMO-identification-number-scheme.aspx>.

<sup>95</sup> U.S. Department of Homeland Security, Maritime Mobile Source Identity, last accessed July 6, 2021, <https://www.navcen.uscg.gov/?pageName=mtmmsi>.

To increase reporting compliance, CARB Unique Vessel Identifiers (UVI) would be issued under the Proposed Amendments. All CHC would need to have their identifier affixed to the vessel by January 1, 2024.

The CARB UVI would be a unique set of letters and numbers in the format of "CARB 01234." Letters and numbers must be readily legible during daylight hours. Each character of the CARB UVI must be at least 5 inches in height and 2.5 inches in width. Letters and numbers must be black on a lime green background with decimal code (R, G, B) - (0, 255, 0). The green background must measure at least 40 inches in width and 10 inches in height and have a one-inch border surrounding the black UVI letters and numbers on all sides. The UVI must be affixed to both sides of the pilothouse in a visible location while not obstructing the captain/pilot view.

Registered historic vessels would be allowed to install a cast bronze, brass, carved wooden plaque, or other UVI format that matches their vessel's theme, but would need to meet the other specifications for size and location of the UVI.

### **I. Facility Compliance, Infrastructure, and Recordkeeping Requirements**

As advanced and alternative technologies emerge for the harbor craft sector, CARB staff is taking into consideration the infrastructure needed to support them. There are some vessels operating in California that are capable of zero-emission operation, but limited infrastructure is available to maximize the use of zero-emission operation and reduce emissions. Additionally, the introduction of zero-emission power systems is expanding, from both new and established marine powertrain manufacturers. As of today, there is insufficient infrastructure available to support widespread deployment of zero-emission and other advanced technologies.

The majority of facilities have docks or slips that are equipped with shore power capabilities that enable harbor craft auxiliary engines to operate using electricity while at dock. However, there are still facilities and vessels that do not have shore power capabilities. CARB is proposing that facility owners and operators be jointly responsible for the installation and maintenance of shore power infrastructure of up to 99 kW to support the power requirements of visiting vessels by January 1, 2024.

This would apply to owners (an entity that owns the property, also called "landowner" or "property owner") and operators (entity directing daily operations, also called "tenant" or "facility tenant") of facilities that receive more than 50 vessel visits per year. A vessel visit is defined as a period of time lasting between one and 24 hours during which period a vessel idles its main engines or operates any auxiliary engines at a facility. For example, 50 different vessels operating two hours each, or one single vessel operating consecutively for 50 days, would each equal 50 visits for a given facility.

The threshold of 99 kW was selected because auxiliary generators are typically not rated above 99 kW, unless they are used for the designed purpose or function of a

vessel, such as generators installed on a petrochemical tank barge used to run product pumps. To avoid requiring facilities to pay for costs associated with high power infrastructure, CARB is proposing that vessel owners and operators be responsible for installing and maintaining any shore power infrastructure above 99 kW. This will prevent vessel owners and operators from using facility-owned shore power as a compliance strategy.

Furthermore, if shore power is provided by a source other than the grid, CARB is proposing that distributed generation emission limits must be met. Distributed generation is any electrical generation technology that produces electricity near the place of use. The Proposed Amendments would establish emission standards for electricity generated through distributed generation to ensure that the emission reductions from its use would be similar to the emission reductions of using grid electricity. If distributed generation is used to supply shore power, the electricity generated must meet the following emission standards:

- NO<sub>x</sub> emissions no greater than 0.03 g/kW-hr.
- PM emissions equivalent to the combustion of natural gas with a fuel sulfur content of no more than 1 grain per 100 standard cubic-foot.
- GHG emissions must be grid-neutral (emitting no more than if powered by the grid); and
- Ammonia emissions no greater than 5 parts per million on a dry volume basis (ppmdv) if SCR is used.

Vessel owners would also be responsible for the installation and maintenance of infrastructure to support zero-emission or zero-emission capable hybrid vessels. Facility owners and operators would be required to allow vessel owners to install infrastructure to facilitate ZEAT deployment. Facility owners and operators must work with vessel owners and operators to accommodate ZEAT infrastructure including but not limited to providing slips/berths that are best suited for the installation of fast-charging equipment, or for hydrogen trucks coming to dock. Facility owners and operators would be responsible for all applicable permitting for the installation of ZEAT infrastructure. Table III-9 outlines the various requirements, and associated responsibilities for facility and vessel owners and operators to comply with the Proposed Amendments.

**Table III-9. Proposed Infrastructure Installation and Maintenance Responsible Party**

<b>Proposed Requirement</b>	<b>Vessel Owner/ Operator Responsible</b>	<b>Facility Owner Responsible</b>	<b>Facility Operator Responsible</b>
Installation and Maintenance of Infrastructure to Support Shore Power Requirement – Less than or Equal to 99 kW		X	X
Installation and Maintenance of Infrastructure to Support Shore Power Requirement – Greater than 99 kW	X		
Installation and Maintenance of Infrastructure to Support the Use of Zero-Emission or Zero- Emission Capable Hybrid Vessels (e.g., Hydrogen Fueling or Rapid Charging Infrastructure)	X		
Permitting the installation of Infrastructure to Support the Use of ZEAT Vessels		X	X

To further increase reporting compliance, the Proposed Amendments require facilities to report to CARB quarterly, starting January 1, 2023. Facilities would be required to report the applicable facility contact information such as name and address of facility and facility owner, as well as the contact information for each vessel owner or operator, the vessel’s CARB UVI, start date of facility use agreement, and the dock, berth or slip location or number. If the vessel does not have a CARB UVI, the USCG, DMV, MMSI, or another identification number must be provided.

Facilities with shore power infrastructure must report the infrastructure type, manufacturer, serial number, installation date, type of equipment supported, number of vessels supported, number of plugs, plug configuration, amperage, and voltage for each connection. Starting January 1, 2023, facilities would also be required to maintain daily records of the date, local time, and position (e.g., slip number) for each vessel tenant.

### **J. Compliance Fees**

CARB is authorized under HSC § 43019.1 to develop a fee schedule to recover costs associated with compliance of off-road or non-vehicular engines and equipment. This would include, but not be limited to, receiving and processing vessel owner or operator and facility reports, including outreach and follow-up with regulated parties, review and approval of compliance extension requests, and statewide enforcement of the regulation.

Staff developed a draft fee schedule based on costs of personnel, equipment, and administration for implementation and enforcement equaling \$2.1 million per year (includes currently budgeted and future personnel costs). Fees are assessed based on the number of main engines and number of vessels. Fees are not assessed for auxiliary engines operating on harbor craft. Using projected vessel and engine populations for 2023, the fee amounts in Table III-10 were calculated to fully recover this cost, while



providing a 25 percent lower fee for fleets operating only one vessel and assessing a 50 percent higher fee for low-use compliance engines due to additional staff time to review demonstrations and applications. Fees would be payable to CARB's EO by September 1 of each calendar year beginning in 2023. Vessels and engines for which fees are not collected by this date would be subject to the late fees, due by December 31 of each calendar year, outlined in Table III-10 in addition to the per-vessel and per-engine fees already applicable.

**Table III-10. Annual Fees for Owners or Operators of Regulated In-Use Vessels**

<b>Category</b>	<b>Fee Amount</b>
Per vessel, for single-vessel fleets	\$364
Per vessel, for all other fleets	\$486
Per engine, for single-vessel fleets	\$297
Per engine, for all other fleets	\$396
Per engine, if complying by low-use pathway	\$594
Late fee, per vessel	\$130
Late fee, per engine	\$86

For example, for a vessel in a multi-vessel fleet with two main engines, the vessel owner or operator would pay a total of  $\$486 + (\$396 \times 2) = \$1,278$  per year for that vessel. If the operator failed to pay this amount by December 31 of each calendar year, an additional  $\$130 + (\$86 \times 2) = \$302$  would be required for this vessel. For a fleet with only one vessel with three main engines total, one of which is a low-use engine, the vessel owner or operator would pay a total of  $\$364 + (\$297 \times 2) + \$594 = \$1,552$  per year for that vessel. If the operator failed to pay this amount by December 31 of each calendar year, an additional  $\$130 + (\$86 \times 3) = \$388$  would be required for this vessel.

## **IV. The Specific Purpose and Rationale of Each Adoption, Amendment, or Repeal**

CARB has adopted numerous regulations to control emissions from many different sectors, including CHC. However, the need for further emission reductions from the marine sector is still urgent. While all sources of PM and NOx emissions are important, the CHC sector remains a large contributor of emissions in California, despite the Current Regulation requiring CARB diesel fuel to be used in marine engines and establishing requirements for cleaner diesel engines.

Numerous changes and additions to the Current Regulation, which was adopted under Title 17 CCR § 93118.5 and Title 13 CCR § 2299.5, are necessary in order to increase the emission reductions from CHC operating in RCW.

CARB staff is proposing that the Board approve adoption of the Proposed Amendments to Title 13, California Code of Regulations (CCR) § 2299.5, and Title 17, CCR § 93118.5, pursuant to its authority under HSC §§ 38505, 38510, 38560, 38566, 38580, 39600, 39601, 39650, 39658, 39659, 39666, 39730, 41511, 43013, 43018, and 43019.1. The Proposed Amendments would be effective beginning January 1, 2023.

Throughout the text of the Proposed Amendments, CARB staff is proposing an effective date of January 1, 2023, to convey the date that several new requirements and provisions would go into effect. This date was chosen as it would be the day after the Current Regulation would be fully implemented. Accordingly, there are several places where CARB staff proposes that certain sections of the Current Regulation are no longer in effect. The date of December 31, 2022, was added to provisions in the regulatory text to explicitly state when older provisions would no longer be applicable so the regulated community has record of past requirements, current/new requirements, and the effective dates of the change.

The information in this chapter provides information regarding CARB staff's determination that each provision of the Proposed Amendments is: (1) reasonably necessary to carry out the purpose of the regulation; and (2) reasonably necessary to address the problem for which the regulation is proposed.

### **A. Title 13, California Code of Regulations Section 2299.5. Fuel Requirements, Emission Limits and Other Requirements for Commercial Harbor Craft**

#### Purpose of Section 2299.5

This section was included to notify anyone viewing section 2299.5 that the Current Regulation has been amended, including replacing the low sulfur fuel requirement with a renewable diesel fuel requirement, and other requirements for CHC to further reduce emissions. Additional authority and reference sections were incorporated.

### Rationale of Section 2299.5

This section is necessary for CARB to notify the public regarding how the Current Regulation was amended to ensure that members of the public viewing those sections are aware of those changes and understand the applicability of those subsections in the Proposed Amendments. Additional authority and reference sections are necessary because the Proposed Amendments would achieve GHG reductions through use of cleaner engines and ZEAT technology, and also rely on new fee authority to recover costs associated with compliance of off-road equipment.

### **B. Title 17 CCR, Section 93118.5. Airborne Toxic Control Measure for Commercial Harbor Craft**

#### Purpose of Section 93118.5

This section was included to notify anyone viewing section 93118.5 that the Proposed Amendments supersede the Current Regulation, as specified. The section also provides severability clauses for subsections being newly added by the Proposed Amendments.

#### Rationale of Section 93118.5

This section is necessary for CARB to notify the public regarding how, and which subsections of the Proposed Amendments would supersede the Current Regulation. To ensure that members of the public viewing those sections are aware that the Proposed Amendments supersede the Current Regulation, CARB has amended those sections to describe how those sections are affected by the Proposed Amendments. In addition, this section clarifies that if the Proposed Amendments are repealed or invalidated, that the requirements of the Current Regulation become operative again.

### **C. Subsection (a) Purpose and Intent**

#### Purpose of Subsection 93118.5(a)

This subsection describes the purpose and intent of the Proposed Amendments, which is to reduce criteria pollutants, TACs, and GHG emissions from CHC that operate in RCW to reduce health impacts on California's seaport communities, and to ensure that harbor craft are meeting visible emissions standards as specified in HSC § 41701. The specific need for additional emission reductions from CHC is detailed in Chapter II of this ISOR.

This subsection also specifically identifies which pollutants and emissions would be reduced from CHC vessels while operating in RCW and establishes that the reductions achieved by the Proposed Amendments contribute to California's health and air quality goals.

This subsection also clarifies that "this section" refers to section 93118.5 in its entirety.

#### Rationale of Subsection 93118.5(a)

**D. This subsection is necessary to set forth the purpose and intent of the requirements of the Proposed Amendments. CARB fleet rules contain purpose subsections and the inclusion of this is consistent with other CARB regulations contained in the CCR. This subsection is also necessary to clarify that the term "section" refers to the entirety of section 93118.5 as opposed to subsections within section 93118.5 to avoid confusion and distinguish between the terms section and subsection. Subsection (b) Applicability**

#### Purpose of Subsection 93118.5(b)

This subsection establishes the applicability of the Proposed Amendments by specifying who must comply with the Proposed Amendments and which vessel categories and engines are subject to the Proposed Amendments.

#### Rationale of Subsection 93118.5(b)

Each of the provisions within subsection 93118.5(b) is necessary to establish who and which vessel categories and engines are subject to the Proposed Amendments.

#### Purpose of Subsection 93118.5(b)(1)

This subsection establishes that any new or in-use harbor craft is subject to the Proposed Amendments regardless of fuel type. This subsection is being amended to clarify that all CHC, regardless of fuel type (diesel, natural gas, hydrogen, battery-electric) are subject to the Proposed Amendments beginning January 1, 2023.

#### Rationale of Subsection 93118.5(b)(1)

The scope of the regulation needs to be expanded to all fuel types to ensure that all CHC vessels comply with the Proposed Amendments. Without this provision, diesel-powered vessels could be modified to use an alternative non-diesel fuel, and be exempted from the regulation and not meet applicable requirements.

#### Purpose of Subsection 93118.5(b)(2)

The amendment to this subsection moves text clarifying that the requirements of Section 93118.5 supersede other control measures adopted by CARB.

#### Rationale of Subsection 93118.5(b)(2)

The amendments to this subsection were non-substantive and for clarification purposes only.

#### Purpose of Subsection 93118.5(b)(4)

This subsection establishes that the Proposed Amendments also apply to ATB tug-barge combinations, and petrochemical tank barges. This subsection also updates the references to sections pertaining to control requirements for OGVs that do not apply to the types of harbor craft regulated under this section.

#### Rationale of Subsection 93118.5(b)(4)

Because some ATBs and petrochemical tank barges meet the definition of an OGV as defined by weight, length, or engine size, it is necessary to clarify that petrochemical tank barges and ATBs are subject to the Proposed Amendments instead of control measures for other OGVs. It is also necessary to update the code sections that apply to OGVs but not these classes of harbor craft because the OGV requirements for fueling and operation within Regulated California Waters and At Berth have been amended since the Current CHC Regulation was last amended.

### **E. Subsection (c) Exemptions**

#### Purpose of Subsection 93118.5(c)

This subsection establishes certain situations in which CHC vessels are not subject to the requirements of the Proposed Amendments.

#### Rationale of Subsection 93118.5(c)

This subsection is necessary to define the CHC vessels that are not subject to the requirements of the Proposed Amendments.

#### Purpose of Subsection 93118.5(c)(2)

This subsection establishes that in the Proposed Amendments, both main and auxiliary engines on temporary replacement vessels must meet Tier 2 or newer marine or off-road emission standards. This section also clarifies that temporary replacement vessels can be used to replace both zero-emission and combustion vessels, but not after the compliance deadlines for vessels if the engines have not been upgraded.

#### Rationale of Subsection 93118.5(c)(2)

This subsection is new, which was not included in the Current Regulation. It is necessary to exempt the temporary replacement vessels from the performance standards in (e)(10) and (e)(12) as California requires more stringent emission standards than other states in the harbor craft sector. However, requiring engines meeting Tier 2 or newer emission standards is necessary to protect backsliding of emissions controls for temporary vessels brought into California for temporary work. It is also critical to ensure that temporary replacement vessels are not brought into RCW to replace a vessel after its compliance deadline. For example, if a vessel owner or operator needs

a temporary replacement vessel while upgrading their primary vessel, they need to take it out of service and bring in a temporary vessel prior to applicable compliance deadlines. If temporary replacement vessels are approved for vessels after their compliance deadline, the emission benefits of the Proposed Amendments would not be achieved on time.

#### Purpose of Subsection 93118.5(c)(3)

This subsection clarifies that this provision is only applicable until December 31, 2022.

#### Rationale of Subsection 93118.5(c)(3)

This subsection establishes exemption requirements for a temporary replacement vessel used to replace a vessel homeported in SCAQMD in the Current Regulation. Under the Proposed Amendments, vessels operating in SCAQMD are subject to the same requirements as in other air districts. As such, this subsection is only applicable until December 31, 2022, which is the date of full implementation of the Current Regulation.

#### Purpose of Subsection 93118.5(c)(6)

This subsection clarifies that dredges, petrochemical tank barges, and ATBs are not exempt from the Proposed Amendments.

#### Rationale of Subsection 93118.5(c)(6)

There is confusion about whether petrochemical tank barges, ATBs, or dredges above 400 feet long or equipped with engines having 30 L/cylinder displacement are subject to CHC regulation or control measures for OGVs. It is necessary to clarify that petrochemical tank barges, ATBs, and dredges are subject to the Proposed Amendments.

#### Purpose of Subsection 93118.5(c)(7)

This subsection establishes that a registered historic vessel is exempt only from subsection (e)(6) and (e)(12).

#### Rationale of Subsection 93118.5(c)(7)

The Proposed Amendments establish performance standards requirements in subsection (e)(12), which replace in-use engine requirements in subsection (e)(6) of the Current Regulation. It is necessary to establish that a registered historic vessel is exempt from subsection (e)(12) as well as (e)(6).

#### Purpose of Subsection 93118.5(c)(10)

This subsection establishes that engines rated less than 50 hp are not exempted from the Proposed Amendments.

#### Rationale of Subsection 93118.5(c)(10)

This subsection is necessary to achieve the greatest emission reductions in the harbor craft sector. CARB staff estimates 24 percent of auxiliary engines are rated below 50 hp, and emissions from engines under 50 hp contribute approximately 9 percent of total auxiliary engine PM emissions. Therefore, to maximize emission reductions, and remove any incentive to install a greater number of smaller engines under 50 hp, all engine sizes need to be included.

#### Purpose of Subsections 93118.5(c)(11)(B) through 93118.5(c)(11)(D)

These subsections establish that vessel owners and operators must notify CARB prior to removing a near-retirement vessel from service, and provides updates to sentence structure over a list of requirements.

#### Rationale of Subsections 93118.5(c)(11)(B) through 93118.5(c)(11)(D)

CARB enforcement and implementation staff recognize that many vessel owners and operators did not submit associated information after taking near-retirement vessels out of service. It is necessary to emphasize this reporting requirement to ensure CARB maintains accurate records.

#### Purpose of Subsection 93118.5(c)(12)

This subsection establishes that a dedicated emergency use vessel is exempt from performance standards requirements in subsection (e)(12), opacity testing requirements in subsection (k), and compliance fee requirements in subsection (l).

#### Rationale of Subsection 93118.5(c)(12)

A dedicated emergency use vessel is a type of vessel performing fire suppression, police response, or emergency rescue tasks. To be consistent with CARB's other regulations in which emergency use equipment or vehicles are exempted, the Proposed Amendments propose that dedicated emergency use vessels be exempt from performance standards requirements, idling requirements, opacity testing requirements and compliance fee requirements.

#### Purpose of Subsection 93118.5(c)(13)

This subsection establishes that commercial fishing vessels are exempt from performance standards requirements in subsection (e)(12) and compliance fee requirements in subsection (l).

#### Rationale of Subsection 93118.5(c)(13)

Commercial fishing vessels are exempt from the performance standards requirements and compliance fee requirements due to the small profit margins in the industry and the inability to establish new prices to recover costs of compliance, demonstrated lack of feasibility for Tier 4 repowers and retrofits, and competition with out of State and global markets.

#### Purpose of Subsection 93118.5(c)(14)

This subsection establishes that vessel owners and operators and facility owners and operators have a short-term exemption from applying during a force majeure event.

#### Rationale of Subsection 93118.5(c)(14)

This subsection and exemption is necessary to provide administrative and legal clarity to regulated entities of their compliance obligations during a force majeure event. The provision also ensures that this only applies in situations where the regulated entity has attempted to comply and mitigate the air quality impacts of their non-compliance.

### **F. Subsection (d) Definitions**

#### Purpose of Subsection 93118.5(d)

This subsection establishes that all definitions from HSC § 39010 through 39060 apply to the Proposed Amendments, except as otherwise specified in this section.

#### Rationale of Subsection 93118.5(d)

This subsection is necessary for CARB to define terms with particular meanings in the Proposed Amendments that differ or are not included in HSC § 39010 through 39060. This subsection is also necessary for establishing definitions that were not included in the Current Regulation or have been significantly modified. Inclusion of the Definitions subsection is consistent with existing CARB off-road vehicle regulations contained in the CCR, including the Current Regulation.

This subsection also establishes which definitions in the Proposed Amendments are modified or new definitions from the Current Regulation. The amendments to this subsection also remove the numbering of definitions, which are now included in alphabetic order as a stylistic change.



## **1. Air Basin**

### Purpose for Air Basin

Subsection 93118.5(d) defines “Air Basin” as a land area with generally similar meteorological and geographic conditions throughout. This is a new definition, which was not included in the Current Regulation.

### Rationale for Air Basin

“Air Basin” is applied to several requirements, including fleet definition and subsection (e)(11) of ZEAT Credit for early or surplus deployments. “Air Basin” is used to replace “Air District” in the Proposed Amendments. This is necessary to provide flexibility for fleets to develop compliance plans that consider vessels in different air districts but within the same air basin.

## **2. Alternative Diesel Fuel**

### Purpose for Alternative Diesel Fuel

This subsection keeps the same content but makes edits on punctuation.

### Rationale for Alternative Diesel Fuel

The amendments to this subsection were non-substantive and for clarification purposes only.

## **3. Annual Hours of Operation**

### Purpose for Annual Hours of Operation

Subsection 93118.5(d) defines “Annual Hours of Operation” as the total number of hours, rounded to the nearest whole hour, a vessel engine is used for all commercial purposes in Regulated California Waters in the calendar year (January 1 to December 31) immediately prior to the engine’s compliance date set forth in subsection (e)(6)(D). For example, if a vessel is used for commercial fishing and commercial non-fishing purposes, the total number of hours combined for both uses shall be the total annual hours of operation for that vessel. On and after January 1, 2023, any use of a commercial vessel for non-commercial purposes must be documented based on recordkeeping requirements in subsection (m)(4), otherwise the annual hours of operation for commercial purposes will be based on records from the non-resettable hour meter.

### Rationale for Annual Hours of Operation

This definition is updated from the Current Regulation. CARB is modifying this term to clarify that non-commercial activities must be documented and would not be counted

toward the operation hours when applying for low-use exceptions or situations where operation hours is used as a basis to determine compliance status. In addition, reporting period is revised to reflect the annual reporting requirement in the Proposed Amendments.

#### **4. Articulated Tug Barge**

##### Purpose for Articulated Tug Barge

Subsection 93118.5(d) defines “Articulated Tug Barge (ATB)” to mean a petrochemical tank barge that is mechanically linked with a paired tug that functions as a tug-barge combination.

##### Rationale for Articulated Tug Barge

The definition is a new definition, which was not included in the Current Regulation. This definition is necessary to specifically establish that ATBs will be subject to the Proposed Amendments. Because some ATBs are the same size as OGVs, it is important to clarify and clearly define what makes a large vessel of an ATB and therefore subject to the requirements of the Proposed Amendments.

#### **5. Battery Plug-in Hybrid Propulsion System**

##### Purpose for Battery Plug-in Hybrid Propulsion System

Subsection 93118.5(d) defines “Battery Plug-in Hybrid Propulsion System” to mean a harbor craft main propulsion system utilizing energy from two or more different energy sources, one of which includes a battery energy storage system that is designed to periodically be swapped or charged by an external energy source.

##### Rationale for Battery Plug-in Hybrid Propulsion System

This is a new definition, which was not included in the Current Regulation. The Proposed Amendments require ZEAT to be used for short-run ferries and new-build excursion vessels. Battery plug-in hybrid propulsion systems are anticipated to be one of technologies utilized to meet ZEAT requirements. Consequently, CARB is defining this term to establish the scope of a battery plug-in hybrid propulsion system. This definition is necessary for vessel owners and operators to understand what a battery plug-in hybrid propulsion system is in order to utilize a battery plug-in hybrid propulsion system for compliance with the Proposed Amendments.

#### **6. Barge**

##### Purpose for Barge

Subsection 93118.5(d) defines “Barge” to mean a vessel having a single or double hull that is typically flat-bottomed, but may have a rounded hull form and built with or

without a propulsion engine. Barges include but are not limited to deck barges, derrick or crane barges, dredging scow barges, autonomous drone barges, towed or pushed petrochemical tank barges, or barges operating as part of an ATB combination.

#### Rationale for Barge

This definition is updated from the Current Regulation. CARB is modifying this term to specify the types of barges included and clarify that petrochemical tank barges and barges operating as part of an ATB combination belong to barge category and are subject to the Proposed Amendments.

### **7. Based Outside of Regulated California Waters (RCW)**

#### Purpose for Based Outside of Regulated California Waters

Subsection 93118.5(d) defines “Based Outside of RCW” to mean operating more than 50 percent of the time outside of RCW in the previous calendar year.

#### Rationale for Based Outside of Regulated California Waters

This definition was not included in the Current Regulation but was added to the Proposed Amendments to provide clarity. It is essential to establish what “based outside of RCW” means for the reader to understand the requirements of the Proposed Amendments.

### **8. Berth**

#### Purpose for Berth

Subsection 93118.5(d) defines “Berth” to mean a vessel’s allocated place at a wharf, pier, or dock. For the purpose of this section, berth and slip can be used interchangeably.

#### Rationale for Berth

This definition was not included in the Current Regulation but was added to the Proposed Amendments to provide clarity. It is essential to establish what a berth is in order for the reader to understand the requirements of the Proposed Amendments.

### **9. California Department of Motor Vehicles CF Number**

#### Purpose for California Department of Motor Vehicles CF Number

Subsection 93118.5(d) defines “California Department of Motor Vehicles (DMV) CF Number” to mean a permanent registration number (CF number) assigned upon registration of undocumented vessels in California. In accordance with the national

vessel registration system, the registration number consists of the letters CF, four numbers, and a two-letter suffix (for example, CF 1234 AB).

#### Rationale for California Department of Motor Vehicles CF Number

This is a new definition, which was not included in the Current Regulation. If applicable, a California DMV CF Number is required in the reporting requirements in both the Current Regulation and Proposed Amendments. It is a unique identifier which can be used to identify certain types of vessels; as such, it is necessary to establish this term to ensure that the vessel owner or operator is able to identify and report the correct information.

### **10. California Fish and Wildlife License Number**

#### Purpose for California Fish and Wildlife License Number

Subsection 93118.5(d) defines “California Fish and Wildlife License Number” to mean an identification number assigned by the California Department of Fish and Wildlife, which is displayed on vessels on contrasting background in a format of FG 12345.

#### Rationale for California Fish and Wildlife License Number

This is a new definition, which was not included in the Current Regulation. If applicable, a California Fish and Wildlife License Number is required in the reporting requirements in both the Current Regulation and Proposed Amendments. It is a unique identifier and able to be used to identify a vessel; as such, it is necessary to establish this term to ensure that the vessel owner or operator is able to identify and report the correct information.

### **11. Call Sign Number**

#### Purpose for Call Sign Number

Subsection 93118.5(d) defines “Call Sign Number” to mean a unique identifier to a vessel containing both characters and numbers most often used in radio transmissions.

#### Rationale for Call Sign Number

This is a new definition, which was not included in the Current Regulation. If applicable, the call sign number is required in the reporting requirements in both the Current Regulation and Proposed Amendments. It is a unique identifier and is able to be used to identify a vessel; as such, it is necessary to establish this term to ensure that the vessel owner or operator is able to identify and report the correct information.

## **12. CARB Approved Emission Control System**

### Purpose for CARB Approved Emission Control System

Subsection 93118.5(d) defines “CARB Approved Emission Control System (CAECS)” to mean a method of reducing emissions to a satisfactory level for compliance with Title 17, CCR § 93130 through 93130.20, which is approved by CARB in this section as providing the same or greater reductions as applied to harbor craft.

### Rationale for CARB Approved Emission Control System

One of the emissions control strategies in subsection 93118.5(f) of the Proposed Amendments is to use a CAECS to reduce emissions from a vessel. As such, this definition is necessary to establish what constitutes a CAECS. This definition was not included in the Current Regulation as it was not a control strategy in the Current Regulation, but a CAECS is allowed if approved in an ACE compliance plan in the Proposed Amendments. As such, it is necessary to define what this term is to ensure that vessel owners and operators understand the method and apply for it appropriately.

## **13. CARB Diesel Fuel**

### Purpose for CARB Diesel Fuel

Subsection 93118.5(d) defines “CARB Diesel Fuel” to mean any diesel fuel that meets the specifications of vehicular diesel fuel, as defined in Title 13 CCR, § 2281 and 2282.

### Rationale for CARB Diesel Fuel

The Current Regulation requires vessel operators to use CARB diesel fuel. However, the Proposed Amendments require renewable diesel R100 or R99 to fuel harbor craft. To ensure vessel operators meet the fuel requirements, it is necessary to clarify what CARB diesel fuel is to differentiate CARB diesel fuel from R100 or R99.

## **14. Charter**

### Purpose for Charter

Subsection 93118.5(d) defines “Charter” to mean an agreement or contract where one person or company rents, leases, hires, or uses CHC vessels from another person or company to convey or transport goods or passengers.

### Rationale for Charter

This definition was not included in the Current Regulation but was added in the Proposed Amendments to provide clarity. The requirements of the Proposed

Amendments apply to parties who charter harbor craft vessels. As such, this definition is necessary to establish which parties are involved in chartering a vessel.

## **15. CHC Reporting System**

### Purpose for CHC Reporting System

Subsection 93118.5(d) defines “CHC Reporting System” to mean a reporting system that utilizes a web-based portal, fillable forms or other approved means of meeting reporting requirements of this section.

### Rationale for CHC Reporting System

This term was not included in the Current Regulation, as it did not exist during the implementation of the Current Regulation. This definition is necessary to specify that the CHC reporting system may include a variety of methods for reporting. Options could include a web-based portal reporting system, fillable forms, or other approved means to facilitate vessel owners and operators meeting reporting requirements of the Proposed Amendments.

## **16. Commercial Harbor Craft**

### Purpose for Commercial Harbor Craft

Subsection 93118.5(d) defines “Commercial Harbor Craft” to mean the same as “Harbor Craft.”

### Rationale for Commercial Harbor Craft

Adding this definition in the Proposed Amendments provides convenience for readers who may be searching for the definition of Commercial Harbor Craft instead of Harbor Craft.

## **17. Commercial Passenger Fishing or Charter Fishing or Sportfishing**

### Purpose for Commercial Passenger Fishing or Charter Fishing or Sportfishing

Subsection 93118.5(d) defines “Commercial Passenger Fishing” (also called “Charter Fishing” or “Sportfishing”) to mean any coastal or offshore vessel used for sport fishing, charter fishing, or any other type of fishing activity where individuals other than the owners or operators of the vessel are on board the vessel to perform fishing activities in exchange for payment to the vessel owner or operator. CPFVs include but are not limited to operations that provide both day and overnight trips, including those that may voyage periodically in and out of RCW.

## Rationale for Commercial Passenger Fishing or Charter Fishing or Sportfishing

Charter Fishing Vessel was defined as part of the Fishing Vessel category in the Current Regulation. In the Proposed Amendments, to be consistent with the maritime industry, the definition of Commercial Passenger Fishing or Sportfishing Vessel is now defined for clarification. In addition, in the Proposed Amendments, CPFVs are subject to different requirements than the Commercial Fishing vessel category. As such, it is necessary to clearly define Commercial Passenger Fishing to ensure vessel owners and operators of Commercial Passenger Fishing understand what requirements apply.

### **18. Compliance Date**

#### Purpose for Compliance Date

Subsection 93118.5(d) defines "Compliance Date" to mean the date by which time a vessel engine must meet the requirements set forth in subsection (e). The "compliance date" prior to January 1, 2023 for a vessel engine is set forth in Table 7, Table 8, Table 9, or Table 10 in subsection (e)(6)(D), whichever is applicable. The "compliance date" on and after January 1, 2023 is set forth in Table 12, Table 17, Table 18, or Table 19 in subsection (e)(12), or the extension is set forth in (e)(12)(E), whichever is applicable.

#### Rationale for Compliance Date

This is an updated definition from the Current Regulation. The Proposed Amendments provide new compliance schedules and new tables outlining compliance dates for vessel categories. The updated definition is necessary to outline where the updated compliance tables can be found.

### **19. Crew and Supply Vessel**

#### Purpose for Crew and Supply Vessel

Subsection 93118.5(d) defines "Crew and Supply Vessel" to mean a self-propelled vessel used for carrying personnel and/or supplies to and from off-shore and in-harbor locations (including, but not limited to, off-shore work platforms, construction sites, islands, and other vessels).

#### Rationale for Crew and Supply Vessel

This is an updated definition from the Current Regulation, adding "islands" as one example of locations that crew and supply vessels travel to and from. This adds clarification in the Proposed Amendments.

## **20. Dedicated Emergency Use Vessel**

### Purpose for Dedicated Emergency Use Vessel

Subsection 93118.5(d) defines “Dedicated Emergency Use Vessel” to mean a vessel that is used to perform fire suppression, police response or activities to protect public safety, or emergency rescue as its only specified vocation reported to CARB. Vessels performing training or certification for, or actual operations in oil spill response, are not dedicated emergency use vessels. Vessels operated by the California Department of Fish and Wildlife to enforce provisions of the California Fish and Game Code or California Fish and Game regulations are not dedicated emergency use vessels, even if they may be called upon to enforce other California laws.

### Rationale for Dedicated Emergency Use Vessel

This is a new definition, which was not included in the Current Regulation. Dedicated emergency use vessels are generally a subcategory of workboats that are exempt from certain requirements including performance standards requirements in subsection (e)(12), opacity testing requirements in subsection (k), and compliance fee requirements in subsection (l). As such, it is necessary to clearly define what vessels are considered dedicated emergency use vessels. In the Current Regulation, workboats do not have requirements to meet more stringent engine standards, and therefore it is necessary to clarify the scope of dedicated emergency use vessel requirements. It is necessary to clarify that there are other types of vessels that provide necessary functions for public service that do not meet the dedicated emergency use vessel definition, in order to maximize emission reductions and protect public health.

## **21. Diesel Emission Control Strategy**

### Purpose for Diesel Emission Control Strategy

Subsection 93118.5(d) defines “Diesel Emission Control Strategy (DECS)” to refer to a technology that reduces air pollution from diesel engine exhaust before it is emitted into the air.

### Rationale for Diesel Emission Control Strategy

This is a new definition, which was not included in the Current Regulation. The term is used in the Current Regulation, but not formally defined. The Proposed Amendments would require the use of Verified DECS, or VDECS, and will not allow the use of DECS for compliance. Therefore, it is necessary to establish the difference between a DECS and VDECS so that owners and operators can distinguish between the two to comply with the Proposed Amendments.



## **22. Diesel Engine System**

### Purpose for Diesel Engine System

Subsection 93118.5(d) defines “Diesel Engine System” to mean a system, including diesel engines and DPFs, used to meet CARB’s performance standards as set forth in subsection (e)(9).

### Rationale for Diesel Engine System

This is a new definition, which was not included in the Current Regulation. In the Current Regulation, DPFs are not required. The Proposed Amendments require certain regulated in-use vessels to meet performance standards which are equivalent to Tier 3 (or 4) plus DPF emission standards depending on the engine tier availability. To simplify, we define the combination of an engine plus a DPF as a diesel engine system. It is necessary in the Proposed Amendments to define a diesel engine system as including diesel engines and DPFs to meet performance standards requirements of the Proposed Amendments.

## **23. Diesel Exhaust Fluid**

### Purpose for Diesel Exhaust Fluid

Subsection 93118.5(d) defines “Diesel Exhaust Fluid (DEF)” to mean a liquid reducing agent (other than engine fuel) used in conjunction with SCR to reduce NOx emissions. DEF is generally understood to be an aqueous solution of urea conforming to the specifications of ISO 22241.

### Rationale for Diesel Exhaust Fluid

This is a new definition, which was not included in the Current Regulation. Because DEF is an aqueous chemical compound that is used to support SCR system, and its consumption is required to be reported, the Proposed Amendments define the term and specification.

## **24. Diesel Particulate Filter**

### Purpose for Diesel Particulate Filter

Subsection 93118.5(d) defines “Diesel Particulate Filter (DPF)” to mean an emission control technology that reduces diesel PM emissions in engine exhaust gases by trapping the particles in a flow filter substrate and periodically removing the collected particles by either physical action or by oxidizing (burning off) the particles in a process called regeneration. On and after January 1, 2023, DPF means a CARB Level 3 VDECS.

## Rationale for Diesel Particulate Filter

This term is updated from the Current Regulation to clearly specify that in the Proposed Amendments, DPF refers to CARB Level 3 VDECS. DPF is a retrofit device, which is a general term, but in this section a DPF is a Level 3 VDECS and needs to be used to comply with the performance standard requirements. Because it is used repeatedly throughout the Proposed Amendments, it is necessary to clarify what a DPF is.

## **25. Direct Control**

### Purpose for Direct Control

Subsection 93118.5(d) defines “Direct Control” to mean owning, operating, having a contract, lease, or other arrangement to operate a harbor craft. For facilities, “Direct Control” means to control the affairs of facility operations, which includes but is not limited to collecting payment from independent operators for use of dock space, using facility property to moor, dock, service, or maintain a person’s own vessels, and being responsible for the majority of commercial activity at a given location.

### Rationale for Direct Control

This definition is expanded from the Current Regulation, adding what direct control means for facilities. The Proposed Amendments established requirements for facilities. It is necessary to clarify the meaning of direct control for facilities to ensure related parties including facility owners or facility operators clearly understand their responsibilities respectively.

## **26. Disadvantaged Communities**

### Purpose for Disadvantaged Communities

Subsection 93118.5(d) defines “Disadvantaged Communities (DAC)” to mean census tracts or applicable tribal data designated by the CalEPA for the purposes of SB 535 (HSC § 39711) using the most current version of CalEnviroScreen by the Office of Environmental Health Hazard Assessment (OEHHA). DACs include all wharfs, docks, berths, and slips within a port, marina, harbor or other terminal facility if any portion of the facility is located within a DAC. Additional requirements apply for vessels with a homebase or any regularly scheduled stop within two miles of a DAC.

### Rationale for Disadvantaged Communities

This term is a new definition, which was not included in the Current Regulation. The Proposed Amendments establish lower annual operating hours thresholds in low-use exceptions and compliance extensions for vessels operating in DACs to further reduce emissions and protect public health equally throughout California, especially in areas suffering from disproportionately high pollution levels and the resulting adverse health

and environmental impacts. As such, it is necessary to clearly define what areas are considered DACs.

## **27. Distributed Generation**

### Purpose for Distributed Generation

Subsection 93118.5(d) defines “Distributed Generation” to mean electrical power generation technologies and equipment (including but not limited to on-shore combustion engines at a dock and barge-mounted combustion engines moored to a dock), or methods that produce electricity at or near the place of use. Stationary generators meeting the definition of an emergency standby generator used for emergency operations for harbor craft are not subject to distributed generation requirements. The electricity generated must meet the following emissions standards:

- NO<sub>x</sub> emissions no greater than 0.03 g/kW-hr;
- PM emissions equivalent to the combustion of natural gas with a fuel sulfur
- content of no more than 1 grain per 100 standard cubic foot;
- Distributed generation GHG emissions must be grid-neutral; and
- Ammonia emissions no greater than 5 ppm<sub>dv</sub> if SCR is used.

### Rationale for Distributed Generation

This is a new definition, which was not included in the Current Regulation. The Proposed Amendments require facilities to supply shore power to allow vessels to meet idling requirements, and require ZEAT on short-run ferries and excursion vessels. As such, it is essential to define what distributed generation is so that any parties using it to supply electrical power are aware of the emission standards they would be required to meet to comply with the Proposed Amendments.

## **28. Dock**

### Purpose for Dock

Subsection 93118.5(d) defines “Dock” to mean the state of being secured to a facility (to dock), or the permanent structure to which a vessel can be secured.

### Rationale for Dock

This is a new definition, which was not in the Current Regulation. This term is used repeatedly throughout the Proposed Amendments; as such it is necessary to establish what “dock” means to ensure readers interpret compliance requirements correctly, especially regarding engine idling and operation limits.

## **29. Dredge**

### Purpose for Dredge

Subsection 93118.5(d) defines “Dredge” to mean a vessel designed to remove earth from the bottom of waterways, by means of including, but not limited to, a scoop, a series of buckets, or a suction pipe. Dredges include, but are not limited to, hopper dredges, clamshell dredges, or pipeline dredges. On and after January 1, 2023, dredges also include, but are not limited to, suction hopper dredges, barge mounted dredges, and dredges with engines having a per cylinder displacement above 30 liters.

### Rationale for Dredge

This term was expanded from the Current Regulation, adding dredges of any type that have per-cylinder displacement over 30 L. This definition clarifies that all dredges, even if they would otherwise meet the definition of an OGV, are subject to the Proposed Amendments.

## **30. Emergency Operation**

### Purpose for Emergency Operation

Subsection 93118.5(d) defines “Emergency Operation” to mean performing emergency response duties such as responding to a stricken vessel, participating in activities as required by a Vessel Mutual Assistance Plan (VMAP), transporting displaced persons and first responders in response to a regional emergency, unannounced drills that are part of California Department of Fish and Wildlife (CDFW) Office of Spill Prevention and Response (OSPR) validation of Oil Spill Contingency Plans (C Plans) or U.S. Coast Guard requirements, providing response effort to an oil or petrochemical spill event, or use of combustion engines onboard vessels meeting ZEAT requirements in the event of an electrical utility power outage. The operating hours within RCW during emergency operation can be excluded from performance requirements for ZEAT in subsection (e)(10), and annual limits as set forth in subsection (e)(14) and (e)(12)(E)(4) if documented according to recordkeeping requirements in subsection (m)(19)(C) and reported according to subsection (o). The operating hours within RCW during emergency operation can be excluded from performance requirements for ZEAT in subsection (e)(10), and annual limits as set forth in subsection (e)(14) and (e)(12)(E)(4) if documented according to recordkeeping requirements in subsection (m) and reported according to subsection (o).

### Rationale for Emergency Operation

This term is a new definition, which was not included in the Current Regulation. Under the Proposed Amendments, operating hours are a key factor in determining the applicability of certain requirements. It is essential to clearly specify what types of operation are considered emergency operations so that they can be properly

excluded from any applicable hour-limited requirements, such as compliance by low-use.

### **31. Engine Family**

#### Purpose for Engine Family

Subsection 93118.5(d) defines “Engine Family” to mean an identifier assigned by the U.S. EPA or CARB to every engine certified to Tier 1 emission standards or higher. Engine family names generally contain 11 to 12 digits for off-road or marine certified engines.

#### Rationale for Engine Family

This term was used but not defined in the Current Regulation. Engine family is one of the parameters required in the reporting requirement to identify the engine. It is necessary to define it in the Proposed Amendments to ensure that readers understand what an engine family is and what constitutes an engine family.

### **32. Escort Tugboats**

#### Purpose for Escort Tugboats

Subsection 93118.5(d) defines “Escort Tugboats” to mean a tugboat with a primary vocation involving intercepting and escorting ATBs, or any OGV entering or departing RCW with the purpose of providing maneuvering or stopping assistance in case of loss of propulsion or steering power while in-route to or from docks and terminals. Escort tugs will typically work with ship assist harbor tugs to dock or undock their escorted ATBs or OGVs. Escort tugs may also stay with ATBs or ocean-going tanker vessels while they are offloading or loading petrochemical product for fire suppression assistance or emergency undocking.

#### Rationale for Escort Tugboats

This term is a subcategory of tugboats. To be consistent with marine industry, it is necessary in the Proposed Amendments to establish a definition for escort tugboats to clarify that it is a type of tugboat.

### **33. Excursion Vessel**

#### Purpose for Excursion Vessel

Subsection 93118.5(d) defines “Excursion Vessel” to mean a self-propelled vessel that transports passengers for purposes including, but not limited to, dinner cruises; harbor, lake, or river tours; scuba diving expeditions lessons, or training; parasailing expeditions; any type of for-hire charters for pleasure purposes; and whale watching

tours. "Excursion Vessel" does not include crew and supply vessels, ferries, and recreational vessels.

#### Rationale for Excursion Vessel

This term is expanded from the Current Regulation by adding parasailing expeditions as examples of excursion vessel activities. In addition, this updated term emphasizes that any type of for-hire charters for pleasure purposes would be considered excursion vessels. It is necessary to provide clarity for vessel owners and operators so they have a clear understanding of what constitutes commercial excursion activity versus recreational activity for pleasure, which is not regulated.

### **34. Facility**

#### Purpose for Facility

Subsection 93118.5(d) defines "Facility" to mean, but is not limited to, any port, marine terminal, oil terminal, marina, harbor, and land with docks for allowing CHC to dock, moor, or otherwise conduct commerce.

#### Rationale for Facility

This is a new definition, which was not included in the Current Regulation. The Proposed Amendments set requirements for facilities, including facility shore power, infrastructure, and reporting requirements. As such, this definition is necessary to establish what type of facility has compliance obligations under the Proposed Amendments.

### **35. Facility Operator**

#### Purpose for Facility Operator

Subsection 93118.5(d) defines "Facility Operator" to mean any person or company in direct control of daily facility operations and if applicable, responsible for the collection of CHC vessel operators' compensation to dock, moor, or otherwise conduct commerce. For purpose of this section, "Facility Operator" is interchangeable with the "Tenant" or "Facility Tenant."

#### Rationale for Facility Operator

This definition was not included in the Current Regulation, as there were no requirements for facilities. Facility operators have obligations under the Proposed Amendments; as such, this definition is necessary to establish what defines this entity. Facility operators are jointly responsible for requirements with facility owners, defined separately. Therefore, it is important to distinguish what constitutes a facility operator. This definition also clarifies that facility operators include those who collect monetary

compensation as well as those that do not collect monetary compensation but allow vessels to dock at their location.

### **36. Facility Owner**

#### Purpose for Facility Owner

Subsection 93118.5(d) defines “Facility Owner” to mean any person, company, municipality, or port authority that owns the property of the facility. “Facility Owner” is interchangeable with “Land Owner” and “Property Owner”. In some cases, including but not limited to port authorities, “facility owner” may also be the “facility operator.”

#### Rationale for Facility Owner

This definition was not included in the Current Regulation, as there were no requirements for facilities. Facility owners have obligations under the Proposed Amendments. As such, this definition is necessary to establish what defines this entity. Facility owners are jointly responsible for requirements with facility operators, defined separately. Therefore, it is important to distinguish what constitutes a facility owner.

### **37. Ferry**

#### Purpose for Ferry

Subsection 93118.5(d) defines “Ferry” to mean a harbor craft having provisions only for deck passengers or vehicles, operating on a short run, on a frequent schedule between two points over the most direct water route, and offering a public service of a type normally attributed to a bridge or tunnel. On and after January 1, 2023, “Ferry” means a harbor craft having provisions only for deck passengers or vehicles, operating between two points over the most direct water route, and offering a public service of a type normally attributed to a bridge or tunnel. “Ferry” also includes vessels operated by a public or private company to transport passengers commercially, on a regularly scheduled or on-demand basis, which is not for pleasure. Ferry vessels include, but are not limited to, water taxis and any vessel subject to VCC requirements as set forth by the CPUC.

#### Rationale for Ferry

This is an updated definition from the Current Regulation. Additional clarification for ferry was added to the definition to ensure that vessels owned/operated by private companies that provide on-demand passenger service, as opposed to posted schedules over defined routes, are also considered ferries. In addition, the new definition for ferries removes short-run ferries, which are separately defined and have a separate schedule and requirements for emissions reduction.

## **38. Fishing Vessel**

### Purpose for Fishing Vessel

The definition of “Fishing Vessel” is revised to clarify that on and after January 1, 2023, fishing vessels do not include CPFVs, and that vessels that are used for hire by the general public and dedicated to the search for and collection of, fish for the purpose of general consumption are separate from the general term “fishing vessel” and “commercial fishing vessel.”

### Rationale for Fishing Vessel

This is an updated term from the Current Regulation. Under the Current Regulation, fishing vessel includes both commercial fishing vessel and charter fishing vessel. The Proposed Amendments separate CPFVs (commercial passenger fishing vessels) from fishing vessels, and the term fishing vessel only represents commercial fishing vessels. This update is necessary as commercial fishing and CPFVs have separate requirements in the Proposed Amendments.

## **39. Fleet**

### Purpose for Fleet

Subsection 93118.5(d) defines “Fleet” to mean the total number of harbor craft owned, rented, or leased by an owner or operator in an air district or distinct locale within RCW; or, the statewide population of a specific vessel type. On and after January 1, 2023, “fleet” also includes chartered harbor craft and extends to harbor craft in an air basin.

### Rationale for Fleet

This is an updated term from the Current Regulation to clarify a fleet can consider any vessel within an air basin instead of air district. This change is necessary to provide fleet owners and operators more flexibility when complying with the regulation by deploying ZEAT or using ACE to comply with the regulation.

## **40. Force Majeure**

### Purpose for Force Majeure

Subsection 93118.5(d) defines “force majeure” to mean a sudden and unforeseeable event involving a clear danger, demanding action to prevent or mitigate the loss of, or damage to, life, health, property, or essential public services, arising from causes beyond the control of the vessel or facility owner or operator, which delays or prevents the performance of any obligation under this section, despite best efforts to fulfill the obligation. The definition clarifies that negligence or financial inability to comply are not considered a force majeure.



## Rationale for Force Majeure

This definition was not included in the Current Regulation. This definition is necessary because the Proposed Amendments establish an exemption for force majeure events for vessel and facility owners and operators. This exemption provides more certainty and administrative clarity to the legal compliance obligations for a regulated entity under an unforeseen event, such as the global situation that began in 2020, should it occur in 2023 or after.

### **41. Grid Neutral**

#### Purpose for Grid Neutral

Subsection 93118.5(d) defines “Grid Neutral” to mean emitting no more GHG emissions than if equipment were powered by the California grid as represented in the most recent eGRID Summary Table for State Output Emission Rates as the California carbon dioxide equivalent (CO<sub>2</sub>e) emissions rate.

#### Rationale for Grid Neutral

This is a new definition as GHG emission reduction was not required in the Current Regulation. The Proposed Amendments require that the electric power produced by technologies other than the California grid, including distributed generation, must be grid-neutral for the year that the technology is used. As such, this definition is necessary to define what that grid-neutral standard means.

### **42. Harbor Craft**

#### Purpose for Harbor Craft

Subsection 93118.5(d) defines “Harbor Craft” (also called “Commercial Harbor Craft” or “CHC”) means any private, commercial, government, or military marine vessel including, but not limited to, passenger ferries, excursion vessels, tugboats, ocean-going tugboats, towboats, push boats, crew and supply vessels, workboats, pilot vessels, supply boats, fishing vessels, research vessels, barge and dredge vessels, CPFVs, oil spill response vessels, USCG vessels, hovercraft, emergency response harbor craft, and barge vessels that do not otherwise meet the definition of OGVs or recreational vessels.

#### Rationale for Harbor Craft

This is an updated definition from the Current Regulation, which includes additional specific examples of harbor craft that were omitted from the definition in the Current Regulation. Barge and dredge vessels, CPFVs, and oil spill response vessels are common examples of harbor craft and are included to provide a more comprehensive list of examples.

### **43. Homebase**

#### Purpose for Homebase

Subsection 93118.5(d) defines “Homebase” to mean the facility located in RCW where a vessel is anchored, docked, or moored the majority of the time within a calendar year.

#### Rationale for Homebase

This is a new term to replace the homeport definition in the Current Regulation. CARB staff intent is to provide a definition for homebase that considers where a vessel is located most often while in the State; however, CARB staff has received comments that homeport is often used synonymously with the USCG term “hailing port,” which defines where a vessel is registered. To minimize potential confusion with industry terms, CARB staff is proposing to use the term “homebase” when referencing where a vessel is typically docked in RCW.

### **44. Hydrocarbon**

#### Purpose for Hydrocarbon

Subsection 93118.5(d) defines “Hydrocarbon (HC)” to mean the hydrocarbon group on which the emission standards are based for each fuel type, as described in 40 CFR § 1042.101(d) and § 1042.104(a).

#### Rationale for Hydrocarbon

This is a new definition, which was not included in the Current Regulation. As HC is one of the pollutants targeted for reductions in the U.S. EPA emission standards in the Current Regulation and in the performance standards in the Proposed Amendments, it is necessary to define the pollutant.

### **45. Hydrogen Fueling Infrastructure**

#### Purpose for Hydrogen Fueling Infrastructure

Subsection 93118.5(d) defines “Hydrogen Fueling Infrastructure” to mean the necessary infrastructure required to safely transfer compressed or liquid hydrogen directly from a truck or on-site storage facility to a CHC.

#### Rationale for Hydrogen Fueling Infrastructure

This is a new definition; the Current Regulation does not have a ZEAT requirement, and therefore has no need to establish a definition for hydrogen fueling infrastructure. The Proposed Amendments require that some vessel owners or operators must adopt ZEAT, such as fuel cell technology, on short-run ferries and new-build excursion

vessels. As such, hydrogen fueling infrastructure may be needed to deploy ZEAT vessels, and because information must be reported to CARB, it is necessary to define the scope of the fueling infrastructure subject to requirements.

#### **46. Idling**

##### Purpose for Idling

Subsection 93118.5(d) defines “Idling” to mean operating main propulsion or auxiliary engines when the net torque generated by the engine is at the operational minimum for the configuration of an engine connected to propulsion or other auxiliary vessel systems. Idling typically occurs when the vessel is at dock.

##### Rationale for Idling

The Proposed Amendments sets forth idling limits for main propulsion engines and auxiliary generator engines. It is necessary to define what idling means for a vessel owner/ or operator to determine whether their operation is idling and subject to the limit. Without specificity, the general term of idling could imply any type of engine operation while a vessel is at dock, even if the engine is performing useful work, such as to keep the vessel firmly positioned against the dock by powering a propeller or water jet. CARB staff intent is to set a limit to idling operation of engines when they are not performing a functional purpose. This is a new definition; the Current Regulation does not have an idling limit, and therefore has no need to establish an idling definition.

#### **47. International Maritime Organization Number**

##### Purpose for International Maritime Organization Number

Subsection 93118.5(d) defines “International Maritime Organization (IMO) Number” to mean an identification number made up of the three letters "IMO" followed by a unique seven-digit number assigned to all ships by IHS Markit (formerly known as Lloyd's Register-Fairplay) when constructed.

##### Rationale for International Maritime Organization Number

This is a new definition, which was not included in the Current Regulation. If applicable, the IMO Number is required in the reporting requirements in both the Current Regulation and Proposed Amendments. It is a unique identifier and can be used to identify certain types of vessels in the absence of a CARB-issued UVI; as such, it is necessary to establish this definition to ensure that the vessel owner or operator is able report the correct information.

## **48. Line Towing**

### Purpose for Line Towing

Subsection 93118.5(d) defines “Line Towing” to mean towing another OGV, barge, or harbor craft with a trailing towline as opposed to hauling alongside.

### Rationale for Line Towing

This is a new definition, which was not included in the Current Regulation. This term is used in the definition of tugboat. As such, it is necessary to establish what line towing means to help regulated parties understand the tugboat definition.

## **49. Low-use**

### Purpose for Low-use

Subsection 93118.5(d) defines “Low-use” to mean the operation of any compression-ignition engine associated with a harbor craft vessel for less than the total annual hours of operation in RCW, based on the immediately preceding calendar year, that the EO deems the engine is subject to the in-use requirements in subsection (e). The definition was updated to reference the new limits that would apply after January 1, 2023.

### Rationale for Low-use

This definition is updated from the Current Regulation by specifying the low-use hour limits for both the Current Regulation and Proposed Amendments. The low-use exception provides flexibility for vessel owners and operators operating engines under low-use hour limits without needing to upgrade engines or install DPFs to meet performance standards. Thus, it is necessary to update the definition so that the low-use limits as applied to engines are defined with the updated thresholds as defined in subsection (e)(14) Table 22.

## **50. Military Tactical Support**

### Purpose for Military Tactical Support

Subsection 93118.5(d) amends “Military Tactical Support” to clarify that vessels operated by contractors working for the military do not meet this definition.

### Rationale for Military Tactical Support

Military tactical support vessels are exempt from the Current Regulation and Proposed Amendments. Therefore, it is necessary to clarify that the contractors working for the military still have compliance obligations under the Current Regulation and Proposed Amendments.

## **51. Moor**

### Purpose for Moor

Subsection 93118.5(d) defines “Moor” to mean any permanent structure to which a vessel may be secured, or the act of securing a vessel to a permanent structure or facility.

### Rationale for Moor

This is a new definition, which was not in the Current Regulation. This term is used repeatedly throughout the Proposed Amendments; as such it is necessary to establish what moor means to ensure readers interpret compliance requirements correctly.

## **52. Newly Acquired Harbor Craft**

### Purpose for Newly Acquired Harbor Craft

Subsection 93118.5(d) defines “Newly Acquired Harbor Craft” to mean a harbor craft that a person did not own or operate as of January 1, 2023.

### Rationale for Newly Acquired Harbor Craft

Section 93118.5 sets specific requirements on newly acquired and new build vessels. It is necessary to define what is considered a newly acquired vessel so that vessel owners and operators can comply with the applicable requirements when obtaining a newly acquired vessel. Without including newly acquired harbor craft in the requirements that apply to new harbor craft, a person could purchase a used vessel to circumvent meeting a more stringent performance standard that applies to “new harbor craft”. Therefore, this definition is necessary to clarify that a newly acquired vessel includes any vessel that was not owned or operated inside of California prior to January 1, 2023.

## **53. Ocean-Going Vessel**

### Purpose and Rationale of Subsection 93118.5(d)(83)

Subsection 93118.5(d) adds a clarification “Ocean-going Vessels (OGV)” must be self-propelled, in addition to meeting requirements for length, weight, or per-cylinder engine displacement.

### Rationale of Subsection 93118.5(d)(83)

This is an updated definition from the Current Regulation, emphasizing that OGVs are self-propelled. It is necessary to clarify that non-self-propelled vessels such as barges do not belong to OGV category even if they meet any of the other criteria of the OGV definition.

## **54. Ocean-going Tugboats and Towboats**

### Purpose for Ocean-going Tugboats and Towboats

Subsection 93118.5(d) defines “Ocean-going Tugboats and Towboats” to mean tugboats and towboats with a “registry” (foreign trade) endorsement on their USCG certificates of documentation, or tugboats and towboats that are registered under the flag of a country other than the United States.

### Rationale for Ocean-going Tugboats and Towboats

This term is included in the Current Regulation but was relocated to this subsection in the Proposed Amendments to consolidate all definitions into the same subsection, which is subsection 93118.5(d).

## **55. Oil Spill Response Vessel**

### Purpose for Oil Spill Response Vessel

Subsection 93118.5(d) defines “Oil Spill Response Vessel” to mean a type of workboat that is dedicated to providing oil or fuel spill response cleanup. For the purpose of this section, oil spill response vessels are not dedicated emergency use vessels.

### Rationale for Oil Spill Response Vessel

This definition is new, which was not included in the Current Regulation. Oil spill response vessels and dedicated emergency use vessels are subject to different requirements under the Proposed Amendments. As such, it is critical to add this definition to the Proposed Amendments to clarify.

## **56. Opacity**

### Purpose for Opacity

Subsection 93118.5(d) defines “Opacity” to mean the fraction of a beam of light, expressed in percent, which fails to penetrate a plume of smoke as measured over a five-inch path length in accordance with SAE J1667.

### Rationale for Opacity

This definition was not included in the Current Regulation, as there were no opacity testing requirements specified in the Current Regulation. The Proposed Amendments set forth opacity testing requirements; as such, it is necessary to define what opacity means for readers to understand the requirements. It is specifically important to clarify that in this section, opacity is defined over a 5-inch path length in accordance with SAE J1667, which differs from other types of opacity measurements performed visually from stationary sources.

## **57. Operate**

### Purpose for Operate

Subsection 93118.5(d) defines “Operate” to mean steering or otherwise running the vessel or its functions while the vessel is working, underway, moored, anchored, or at dock.

### Rationale for Operate

This is an updated definition from the Current Regulation, adding working as one example of an operating function. It is necessary to clarify to ensure correct interpretation of “operate” in the context of the regulation.

## **58. Operator**

### Purpose for Operator

Subsection 93118.5(d) defines “Operator” to mean a person who operates a vessel under a contract agreement.

### Rationale for Operator

Both the Current Regulation and Proposed Amendments set obligations for operators and this term is repeatedly used; as such, this definition is necessary to be added in the Proposed Amendments to establish what defines this entity.

## **59. Performance Standards**

### Purpose for Performance Standards

Subsection 93118.5(d) defines “Performance Standards” to mean PM and NO<sub>x</sub> emission standards defined by CARB, set forth in Table 7, Table 8 and Table 9 in subsection 93118.5(e)(9), that must be met to comply with the in-use requirements of the CHC regulation.

### Rationale for Performance Standards

This definition was not included in the Current Regulation. The Proposed Amendments require regulated in-use vessels to meet the performance standard requirements. As such, it is necessary to establish what the performance standards are for owners and operators to understand what emissions criteria they need to meet to comply with the requirements. CARB staff has chosen the term “performance standard” to avoid confusion with the term emission standard, which in many cases applies to engine manufacturers when selling a new engine. The “performance standards” must be met by vessel owners and operators, which can be achieved through using an engine

certified to levels below the performance standards, or through other compliance approaches.

## **60. Petrochemical Tank Barge**

### Purpose for Petrochemical Tank Barge

Subsection 93118.5(d) defines “Petrochemical Tank Barge” to mean a non self-propelled double-hull tank barge constructed to transport petrochemicals, fuels, or other combustible or noxious liquid substances and designed to either be pushed by a designated tug utilizing a proprietary retractable pin connection system forming a temporary ATB combination or towed on a wire by tugboat.

### Rationale for Petrochemical Tank Barge

This definition was not included in the Current Regulation. Petrochemical tank barges are a subcategory of the barge category and perform different functions than other types of barges. As such, it is necessary to clearly define what a petrochemical tank barge means to delineate this term from other barge vessels.

## **61. Physical Constraint**

### Purpose for Physical Constraint

Subsection 93118.5(d) defines “Physical Constraint” as an unavoidable barrier at a terminal to provide a service due to the layout of a terminal or waterway where a state or federal public agency with jurisdiction over the resources effected by this section has made a safety determination that prevents the use of shore power.

### Rationale for Physical Constraint

Vessel or facility owners and operators may be granted a maximum of two years of compliance extensions for infrastructure delays due to a physical constraint that cannot be controlled. As such, it is necessary to define “physical constraint” to enable vessel or facility owners and operators to determine eligibility for infrastructure extensions.

## **62. Pilot Vessel**

### Purpose for Pilot Vessel

Subsection 93118.5(d) defines “Pilot Vessel” to mean a vessel designed for, but not limited to, the transfer and transport of maritime pilots to and from OGVs while such vessels are underway, at anchor, or at dock.



### Rationale for Pilot Vessel

This term is updated from the Current Regulation by clarifying that pilot vessels also include vessels that are used to transport marine pilots to OGVs that are at anchor or at dock.

## **63. Portable Equipment Registration Program**

### Purpose for Portable Equipment Registration Program

Subsection 93118.5(d) defines "Portable Equipment Registration Program (PERP)" to mean the statewide program designed to promote the use of clean portable engines and equipment units in California, as provided for in Title 13, CCR § 2450 through 2465. Once registered in the program, portable engines and equipment units can operate throughout the State without being required to obtain individual permits from each air pollution control or air quality management district in which they operate.

### Rationale for Portable Equipment Registration Program

This definition is updated from the Current Regulation by clarifying that the PERP applies to portable equipment units, and that the program only applies to engines that are portable. The clarification is necessary to ensure that the PERP definition is accurate and consistent with the current requirements of the PERP program. In some instances, auxiliary engines are registered in PERP or permitted by local air districts as portable engines. In cases where they are permanently affixed to a CHC, they remain subject to the requirements of this section, regardless of whether they are issued a permit through the local air district.

## **64. Propulsion Engine**

### Purpose for Propulsion Engine

Subsection 93118.5(d) defines "Propulsion Engine" to mean an engine that provides power to move a vessel through the water or directs the movement of a vessel. For purposes of this section, "Propulsion engine" is interchangeable with "Main" engine.

### Rationale for Propulsion Engine

This definition is expanded from the Current Regulation by clarifying that propulsion engine and main engine are synonymous. Propulsion engine and main engine are used interchangeably in the Proposed Amendments; as such, it is necessary to clarify this definition in the Proposed Amendments to avoid confusion.

## **65. Rebuild**

### Purpose for Rebuild

Subsection 93118.5(d) defines “Rebuild” to mean an overhaul to an engine using both new and re-conditioned parts while following repair procedures that have been approved by the manufacturer. When engine repairs require replacement of the engine block, the engine is considered to be repowered, not rebuilt.

### Rationale for Rebuild

This is a new definition, which was not included in the Current Regulation. During implementation of the Current Regulation, CARB staff recognized there is confusion between rebuild and repower. An engine repower is subject to the performance standards in subsection (e)(8), where engines can be rebuilt to their current standard. As such, it is necessary to distinguish the terms to clarify under what circumstances engines must meet more stringent standards.

## **66. Recreational Vessel**

### Purpose for Recreational Vessel

Subsection 93118.5(d) defines “Recreational Vessel” to mean a vessel that is intended by the vessel manufacturer to be operated primarily for pleasure or leased, rented, or chartered to another for the latter’s pleasure, excluding the following vessels: (1) vessels of less than 100 GT that carry more than 6 passengers, (2) vessels of 100 GT or more that carry one or more passengers, and (3) vessels used solely for competition. On and after January 1, 2023, “Recreational Vessel” means a vessel that is used solely for personal use, which excludes diesel-powered vessels that are operated as a charter or hired to carry any number of passengers.

### Rationale for Recreational Vessel

This term is updated from the Current Regulation to clarify that in the Proposed Amendments, recreational vessels no longer include diesel-powered vessels carrying six passengers or less for commercial activity. Recreational vessels are not subject to the CHC Regulation; as such, it is necessary to clarify that all diesel-powered vessels, regardless of passenger limits, engaging in commercial service are not considered recreational vessels.

## **67. Regularly Scheduled**

### Purpose for Regularly Scheduled

Subsection 93118.5(d) defines “Regularly Scheduled” to mean any vessel activity planned to occur repeatedly on an on-going basis with constant or defined time intervals.

## Rationale for Regularly Scheduled

Regularly scheduled is used in the definitions of ferry, short-run ferry, and DACs. In addition, it is referenced in other circumstances of the Proposed Amendments. As such, it is essential to establish the meaning of regularly scheduled for readers to understand the definitions and associated requirements.

### **68. Regulated California Waters or RCW**

#### Purpose for Regulated California Waters

Subsection 93118.5(d) amends “Regulated California Waters” to clarify the boundaries of the waters subject to this section.

#### Rationale for Regulated California Waters

This term is updated from the Current Regulation, and update the boundary coordinates in the Proposed Amendments to ensue boundary limits of RCW are within 24 nautical miles as accurate as possible.

### **69. Regulated In-Use Vessel**

#### Purpose for Regulated In-Use Vessel

Subsection 93118.5(d) defines “Regulated In-Use Vessel” to mean a vessel that operates as one of the vessel categories subject to in-use engine standards in subsection (e)(6). On and after January 1, 2023, this applies to vessels subject to performance standards requirements in subsection (e)(12).

#### Rationale for Regulated In-Use Vessel

This is an updated definition from the Current Regulation. The in-use engine standards applicable to regulated in-use vessels in subsection (e)(6) in the Current Regulation was replaced with performance standards (e)(12) in the Proposed Amendments. As such, it is necessary to update what regulated in-use vessel means and to what requirements regulated in-use vessels are subject.

### **70. Renewable Diesel, or R100, or R99**

#### Purpose for Renewable Diesel or R100, or R99

Subsection 93118.5(d) defines “Renewable Diesel” or “R100” or “R99” to mean a diesel fuel substitute produced from non-petroleum renewable sources, including vegetable oils and animal fats. Renewable diesel meets the federal registration requirements for fuels and fuel additives and ASTM specification D975, which are incorporated by reference herein.

## Rationale for Renewable Diesel or R100, or R99

This is a new definition, which was not included in the Current Regulation. It is necessary to define Renewable Diesel to distinguish it from ULSD, as Renewable Diesel in blends of 99 percent or greater in volume (R99) must be used beginning January 1, 2023 by all vessels operating in the State. The term "Renewable Diesel," can mean either a blend of 99 percent "R99," or 100 percent "R100" renewable diesel by volume.

### **71. Repower**

#### Purpose for Repower

Subsection 93118.5(d) defines "Repower" to mean replacing a used engine with a brand new or reconditioned engine meeting current emission standards in effect at the time of repower, including but not limited to major engine repairs on a damaged engine requiring a new engine block.

#### Rationale for Repower

This is a new definition, which was not included in the Current Regulation. During implementation of the Current Regulation, CARB staff noticed the confusion between rebuild, repower, and remanufacture. As such, it is necessary to define what repower means to clarify the confusion as repowering engines is one of options to meet performance standards of the Proposed Amendments.

### **72. Research Vessel**

#### Purpose of Research Vessel

Subsection 93118.5(d) defines "Research Vessel" to mean all vessels subject to requirements of 46 CFR Subchapter U, plus any others that have highly advanced mobile research stations, and vessels that provide dedicated platforms from which explorers can deploy equipment, divers, or submersibles.

#### Rationale for Research Vessel

This is a new definition, which was not included in the Current Regulation. The Proposed Amendments require research vessels to comply with the performance standards requirements in subsection (e)(12). It is necessary to clarify that research vessels are a type of workboat, and the extent of vessel types that CARB staff intends to include as Research Vessels.

### **73. Retrofit**

#### Purpose for Retrofit

Subsection 93118.5(d) defines “Retrofit” to mean to install new or modified parts or equipment in or onto a vessel or engine.

#### Rationale for Retrofit

This is a new definition, which was not included in the Current Regulation. There is general confusion with the terms retrofit, repower, rebuild and remanufacture. It is necessary to define what retrofit means to help readers understand what retrofitting DPFs onto engines means.

### **74. Selective Catalytic Reduction**

#### Purpose for Selective Catalytic Reduction

Subsection 93118.5(d) defines “Selective Catalytic Reduction (SCR)” to mean an emission control system that reduces NOx emissions through the catalytic reduction of NOx in diesel exhaust by injecting nitrogen-containing compounds into the exhaust stream, such as ammonia or urea.

#### Rationale for Selective Catalytic Reduction

This term is new, which was not included in the Current Regulation as engines meeting Tier 4 emission standards were not required in the Current Regulation but required in the Proposed Amendments. Under the Proposed Amendments, some engines are equipped or retrofitted with SCR systems to reduce NOx emissions from harbor craft in order to meet the performance standard requirements in subsection (e)(12). As such, it is necessary to establish a definition for SCR.

### **75. Ship-Assist Tugboat**

#### Purpose for Ship-Assist Tugboat

Subsection 93118.5(d) defines “Ship-Assist Tugboat” to mean a harbor tug having a primary vocation of assisting ATBs and OGVs while docking and undocking.

#### Rationale for Ship-Assist Tugboat

This definition was not included in the Current Regulation but is added as a subcategory of tugboat in the Proposed Amendments. As such, it is necessary to clarify that ship-assist tugboats are a type of tugboat and therefore have compliance requirements under the Proposed Amendments.

## **76. Shore Power**

### Purpose for Shore Power

Subsection 93118.5(d) defines “Shore Power” (also called “Harbor Craft Shore Power”) to refer to electrical power provided by either the electric utility or distributed generation to a vessel at dock that can be used to provide house load or any other on-board auxiliary power normally provided by onboard diesel generators.

### Rationale for Shore Power

The Proposed Amendments establish shore power as a method for meeting main engine idling and auxiliary engine operating limit requirements in subsection (h) to further reduce emissions from harbor craft while at berth, at dock, or mooring. As such, it is necessary to establish what constitutes shore power.

## **77. Short-Run Ferry**

### Purpose for Short-Run Ferry

Subsection 93118.5(d) defines “Short-Run Ferry” to mean a vessel dedicated to provide regularly scheduled round-trip ferry service between two points that are less than three nm apart. Vessels that make multiple stops in a single round-trip, where half or more of the single trip lengths are less than three nm, and the longest single trip length is less than six nm, are considered short-run ferries. Vessels that provide ferry round-trip service between two points that are less than three nm apart, but account for less than 20 percent of the service trips from one fleet or operator between those two points during a given calendar year, are not considered short-run ferries.

### Rationale for Short-Run Ferry

This is a new definition, which was not included in the Current Regulation, as short-run ferries were not considered or regulated separately from non-short-run ferries in the Current Regulation. The Proposed Amendments places specific requirements on “Short-Run Ferry” that require a transition to zero-emission by December 31, 2025. As such, the definition is necessary to determine which vessels are subject to separate and more stringent requirements.

## **78. Slip**

### Purpose for Slip

Subsection 93118.5(d) defines “Slip” to mean the same as berth.

## Rationale for Slip

This is a new definition, as there were no facility requirements in the Current Regulation. The term slip is used by industry and is used in the Proposed Amendments to establish facility infrastructure, recordkeeping, and reporting requirements. Slip can be used interchangeably with berth. As such, it is necessary to establish what slip means to help readers understand the associated facility requirements.

## **79. Supply Vessel**

### Purpose for Supply Vessel

Subsection 93118.5(d) defines “Supply Vessel” to mean a self-propelled vessel used for carrying crew and supplies to and from off-shore and in-harbor locations including, but not limited to, off-shore work platforms, construction sites, islands, and other vessels.

### Rationale for Supply Vessel

This is an updated definition from the Current Regulation that clarifies that supply vessels can carry crews and that islands could be one example of a location to which supply vessels can travel. It is necessary to update this definition to make it clear for the readers and vessel owners and operators.

## **80. Tank Barge**

### Purpose for Tank Barge

Subsection 93118.5(d) defines “Tank Barge” to mean a non-self-propelled vessel constructed or adapted primarily to carry, or that carries, oil, petrochemicals, sewage, or other noxious liquid substances. Tank barges also include both petrochemical tank barges and barges carrying gaseous or liquid fuels, such as those performing fuel bunkering services.

### Rationale for Tank Barge

This definition is expanded from the Current Regulation to include additional examples of tank barges that fall into the vessel category. It is necessary to clarify that petrochemical tank barges and barges carrying gaseous or liquid fuels are classified as tank barges, so that owners and operators of petrochemical barges and barges carrying fuels understand compliance requirements.

## **81. Temporary Emergency Rescue/Recovery Vessel**

### Purpose for Temporary Emergency Rescue/Recovery Vessel

Subsection 93118.5(d) defines “Temporary Emergency Rescue/Recovery Vessel” to mean a self-propelled vessel that performs duties including, but not limited to, policing harbor areas, firefighting, rescue operations, oil spill prevention, and on-water oil removal that is brought into California for the immediate use of emergency rescue or recovery and leaves California at the conclusion of its emergency rescue/recovery mission.

### Rationale for Temporary Emergency Rescue/Recovery Vessel

This term is updated from the Current Regulation to remove reference to the word homeport, which on and after January 1, 2023, is not referenced or used to establish compliance requirements in the Proposed Amendments.

## **82. Temporary Replacement Vessel**

### Purpose for Temporary Replacement Vessel

Subsection 93118.5(d) defines “Temporary Replacement Vessel” to mean a self-propelled vessel that is brought into service to temporarily replace a California vessel that has been temporarily taken out of service. Prior to January 1, 2023, “temporary replacement vessel” includes only the following:

- a) vessels that are used in the SCAQMD but have a homeport in California outside of the SCAQMD; and
  - vessels that are used anywhere in California, including the SCAQMD, but have a homeport outside of California.

### Rationale of Temporary Replacement Vessel

The Proposed Amendments remove the accelerated compliance for SCAQMD, thus homeport location is not applicable in the Proposed Amendments. As such, it is necessary to clarify that provisions (A) and (B) are only applicable in the Current Regulation.

## **83. Tier 4 Final Off-Road or Nonroad Emission Standards**

### Purpose for Tier 4 Final Off-Road or Nonroad Emission Standards

This subsection makes a minor change by moving the word “Final” after “Tier 4.”



#### Rationale for Tier 4 Final

This definition remains the same, with only a minor change of the name of the definition to ensure that all engine Tier level definitions remain together when sorted alphabetically, making them easier to compare for readers.

### **84. Tier 4 Interim Off-Road or Nonroad Emission Standards**

#### Purpose for Tier 4 Interim

This subsection makes a minor change by moving word “Interim” after “Tier 4.”

#### Rationale for Tier 4 Interim

This definition remains the same, with only a minor change of the name of the definition to ensure that all engine Tier level definitions remain together when sorted alphabetically, making them easier to compare for readers.

### **85. Tugboat**

#### Purpose for Tugboat

Subsection 93118.5(d) defines “Tugboat” to mean any self-propelled vessel engaged in, or intending to engage in, the service of pulling, pushing, maneuvering, berthing, or hauling alongside other vessels, or any combination of pulling, pushing, maneuvering, berthing, or hauling alongside such vessels in harbors, over the open seas, or through rivers and canals. Tugboats generally can be divided into three groups: harbor or short-haul tugboats, ocean-going or long-haul tugboats, and barge tugboats. “Tugboat” is interchangeable with “towboat” and “push boat” when the vessel is used in conjunction with barges. On and after January 1, 2023, “tugboats” also include three types of vessels: ship assist and escort tugboats; ocean-going ATB and line towing tugboats; and, near-shore pushing and towing tugboats.

#### Rationale for Tugboat

This term is updated from the Current Regulation by regrouping the tugboat subcategories to be consistent with marine industry. The basic definition is unchanged from the Current Regulation. It is necessary to reclassify the subcategories to avoid confusion and align with marine industry terminology.

### **86. U.S. Coast Guard Documentation Number (USCG Number)**

#### Purpose for U.S. Coast Guard Documentation Number (USCG Number)

Subsection 93118.5(d) defines “U.S. Coast Guard Documentation Number (USCG Number)” to mean a national form of registration. Documentation provides conclusive evidence of nationality for international purposes, provides for unhindered commerce

between the states, and admits vessels to certain restricted trades, such as coastwise trade and the fisheries.

#### Rationale for U.S. Coast Guard Documentation Number (USCG Number)

USCG Number, if applicable, is required to be reported to CARB in the recordkeeping and reporting requirements to identify a vessel; as such, it is necessary to establish a definition for USCG Number to allow for vessel owners and operators to identify the number and report the information correctly.

### **87. Vessel Tenant**

#### Purpose for Vessel Tenant

Subsection 93118.5(d) defines “Vessel Tenant” to mean a CHC vessel which docks or moors for seven or more days in a calendar month at a facility.

#### Rationale for Vessel Tenant

This is a new definition which was not included in the Current Regulation as the Current Regulation did not set requirements on facilities. The Proposed Amendments require facility owners and operators to report a list of vessels who dock or moor for a certain amount of days at a facility. As such, it is necessary to define after what length of time a vessel remaining at a facility becomes a tenant.

### **88. Water Taxi**

#### Purpose for Water Taxi

Subsection 93118.5(d) defines “Water Taxi” to mean a ferry including USCG uninspected passenger vessels carrying six or less passengers for hire or USCG inspected passenger vessels that carry seven or more passengers for hire that transits paying passengers to any destination rather than operating over a fixed route and schedule.

#### Rationale for Water Taxi

This is a new definition, which was not included in the Current Regulation. It is necessary to define this term by specifying that water taxi is a ferry and would be subject to requirements set forth by the Proposed Amendments for the ferry category.

### **89. Workboat**

#### Purpose for Workboat

Subsection 93118.5(d) defines “Workboat” to mean a self-propelled vessel that is used to perform duties such as fire/rescue, law enforcement, hydrographic surveys, spill/response, research, training, and construction (including drilling). On and after

January 1, 2023, “Workboat” means a self-propelled vessel that is used to perform any duty not specifically listed by another category of CHC, including but not limited to duties such as hydrographic surveys, spill/response, school training, marketing (such as advertising), and construction (including drilling). Workboats can include vessels owned by public, private, and not-for-profit organizations.

#### Rationale for Workboat

This is an updated definition from the Current Regulation. This definition specifically points out that any vessels used for commercial activity that are not included in other specific vessel categories would be classified as a workboat. It is necessary to make this clarification for vessel owners and operators to correctly interpret and meet compliance dates accordingly.

### **90. ZEAT**

#### Purpose for ZEAT

Subsection 93118.5(d) defines “ZEAT” to refer to Zero-Emission and Advanced Technology, which collectively includes zero-emission capable hybrid, and zero-emission vessels.

#### Rationale for ZEAT

This is a new term, which was not included in the Current Regulation because there were no requirements for adopting ZEAT. As such, it is necessary to define this term in the Proposed Amendments for vessel owners and operators to be able to meet the requirements of the Proposed Amendments and qualify for the additional compliance credits after deploying ZEAT in their fleets.

### **91. Zero-Emission**

#### Purpose for Zero-Emission

Subsection 93118.5(d) defines “Zero-Emission” to mean a propulsion system, auxiliary power system, and/or vessel utilizing a zero-emission propulsion and auxiliary power system that has no tailpipe exhaust emissions other than water vapor or diatomic nitrogen from the onboard source(s) of power.

#### Rationale for Zero-Emission

This is a new term which was not included in the Current Regulation because there were no zero-emission requirements. To meet CARB’s goal of reducing emissions, the Proposed Amendments would establish zero-emission vessel requirements where feasible. It is necessary to establish what zero-emission means for vessel owners and operators to utilize the appropriate technologies to achieve zero emissions.

## **92. Zero-Emission Capable Hybrid Vessel**

### Purpose for Zero-Emission Capable Hybrid Vessel

Subsection 93118.5(d) defines “Zero-Emission Capable Hybrid Vessel” to mean a CHC utilizing a hybrid power system with two or more onboard power sources, one or more of which is approved by CARB’s EO to be capable of providing a minimum of 30 percent of vessel power required for main propulsion and auxiliary power operation with zero tailpipe emissions when averaged over a calendar year.

### Rationale for Zero-Emission Capable Hybrid Vessel

This term is a new definition which was not included in the Current Regulation as zero-emission capable hybrid technology was not required on any type of vessel categories in the Current Regulation. The Proposed Amendments would require new and newly required excursion vessels to adopt zero-emission capable hybrid technology. CARB is defining this term to standardize and set a performance standard for zero-emission capable hybrid technology used in vessels. Specifically, this definition clarifies that a zero-emission capable hybrid vessel must derive 30 percent of its power from a zero-emission tailpipe source, which could differ from other common forms of operation where diesel engines can be temporarily turned off while deriving power from the combustion engines.

## **93. Zero-Emission Infrastructure**

### Purpose for Zero-Emission Infrastructure

Subsection 93118.5(d) defines “Zero-Emission Infrastructure” to mean installed dockside infrastructure necessary to support the operation of a ZEAT vessel. For example, charging equipment for propulsion system batteries, or on-dock hydrogen storage tanks, and fueling infrastructure.

### Rationale for Zero-Emission Infrastructure

This term is a new definition which was not included in the Current Regulation as zero-emission technology is not required in the Current Regulation. The Proposed Amendments would require short-run ferries and new excursion vessels to transition to ZEAT, which must be supported with charging or fueling infrastructure. As such, it is necessary to define zero-emission infrastructure to ensure the construction of zero-emission infrastructure meet the needs of ZEAT vessels.

## **G. Subsection (e) Fuel Use and Engine Emission Requirements**

### Purpose of Subsection 93118.5(e)

This subsection establishes the fuel use requirement, the requirement for installing hour meters on all harbor craft, new and newly acquired engine and vessel

requirement, requirements for ZEAT on certain vessel categories, ZEAT credit for early or surplus deployment requirements, requirements for in-use engines, engine requirements on commercial fishing vessels and requirements for low-use engines. Modifications to existing requirements in this subsection were to clarify that some no longer apply after December 31, 2022. The subsection also will no longer include a plain English narrative prior to the requirements of the subsections.

#### Rationale of Subsection 93118.5(e)

The primary purpose of the Proposed Amendments is to further reduce emissions from harbor craft. This subsection is necessary to define the performance standards that combustion engines must meet and compliance methods to comply with the fuel and engine performance standards requirements. To meet emission reductions goals, it is necessary to establish expanded and more stringent requirements on regulated in-use vessels, add mandatory requirements on certain vessel categories and voluntary provisions on other vessel categories to accelerate the deployment of ZEAT in the marine sector. It is also essential to keep the requirements for low-use engines but make some changes on low-use thresholds and administrative processes. It is necessary to add engine requirements for commercial fishing vessels to further reduce emissions. The plain English narrative was omitted to avoid confusion and redundancy with the same requirement being discussed using slightly different wording in two places. Additional emphasis has been included for clarification in the subsections discussed next.

#### **1. Subsection (e)(1) All Harbor Craft – Low Sulfur Fuel Use Requirement (Applicable Until December 31, 2022)**

##### Purpose of Subsection 93118.5(e)(1)

This subsection establishes that the low sulfur fuel use requirement in the Current Regulation is no longer applicable after December 31, 2022.

##### Rationale of Subsection 93118.5(e)(1)

The Proposed Amendments set forth provisions requiring R99 renewable diesel fuel requirements in subsection (e)(7). As such, it is necessary to sunset the low sulfur fuel use requirement to ensure vessel owners and operators use renewable diesel to comply with the fuel requirements in the Proposed Amendments and clarify that the existing fuel requirements no longer apply.

#### **2. Subsection (e)(2) All Harbor Craft – Installation and Use of Non-Resettable Hour Meters**

##### Purpose of Subsection 93118.5(e)(2)

This subsection establishes that all harbor craft must install a non-resettable hour meter on each engine and allows reasonable personnel access to the hour meter

without impediment. This subsection newly establishes in the Proposed Amendments for owners and operators to replace and report information if an hour meter fails.

#### Rationale of Subsection 93118.5(e)(2)

This subsection is expanded from the Current Regulation by adding provisions to address instances when an hour meter is replaced for some reason, such as the hour meter not functioning properly. The expanded provision is necessary to allow for the replacement of a non-functioning hour meter to ensure engine operation activity is recorded accurately. It is also necessary for vessel owners and operators to report the hour meter replacement, date replaced, and hour meter readings of both the original and replacement meter for CARB to effectively implement and enforce the regulation. The 30-day timeframe for reporting is consistent with the other reporting components of the Proposed Amendments.

### **3. Subsection (e)(3) All In-Use Harbor Craft – Requirements for Newly Acquired Engines (Applicable until December 31, 2022)**

#### Purpose of Subsection 93118.5(e)(3)

This subsection establishes that the requirements for newly acquired engines for all in-use harbor craft in the Current Regulation is no longer applicable to the Proposed Amendments after December 31, 2022.

#### Rationale of Subsection 93118.5(e)(3)

The Proposed Amendments set forth requirements for new and newly acquired diesel engines in subsection (e)(8), which replaces the subsection (e)(3) in the Current Regulation. As such, it is necessary to sunset the requirements for newly acquired engines to ensure vessel owners and operators are purchasing engines certified with the latest emission standards to comply with the Proposed Amendments.

### **4. Subsection (e)(4) All New Harbor Craft (Including All New Ferries) – Requirements for Newly Acquired Vessels (Applicable until December 31, 2022)**

#### Purpose of Subsection 93118.5(e)(4)

This subsection establishes that the requirements for newly acquired vessels for all new harbor craft in the Current Regulation are no longer applicable after December 31, 2022.

#### Rationale of Subsection 93118.5(e)(4)

The Proposed Amendments set forth requirements for new and newly acquired in-use harbor craft in subsection (e)(9), which replaces the subsection (e)(4) in the Current Regulation. As such, it is necessary to sunset subsection (e)(4) to ensure vessel owners

and operators comply with subsection (e)(9) of the Proposed Amendments when acquiring new harbor craft and newly acquired in-use harbor craft.

**5. Subsection (e)(5) Selected New Ferries Only – Additional Requirements for All Newly Acquired Propulsion Engines (Applicable until December 31, 2022)**

Purpose of Subsection 93118.5(e)(5)

This subsection establishes that the requirements for selected new ferries in the Current Regulation is no longer applicable after December 31, 2022.

Rationale of Subsection 93118.5(e)(5)

Similar to the Current Regulation which establishes separate and more stringent requirements for selected new ferries, the Proposed Amendments set forth requirements for ferries, including new and newly acquired ferries, and short-run ferries. As such, it is necessary to sunset subsection (e)(5) to ensure vessel owners and operators comply with new requirements for ferries in the Proposed Amendments.

**6. Subsection (e)(6) In-Use Engines and Vessels – Schedules for Meeting Tier 2 or Tier 3 Standards (Applicable until December 31, 2022)**

Purpose of Subsection 93118.5(e)(6)

This subsection establishes that the in-use engine requirements for in-use engines and vessels in the Current Regulation is no longer applicable after December 31, 2022.

Rationale of Subsection 93118.5(e)(6)

The Proposed Amendments set forth performance standards for in-use engines and vessels in subsection (e)(12), which replaces subsection (e)(6) in the Current Regulation. As such, it is necessary to sunset subsection (e)(6) to ensure vessel owners and operators operating regulated in-use vessels meet the newly defined performance standards to comply with the Proposed Amendments.

**7. Subsection (e)(7) All Harbor Craft – Renewable Diesel Fuel Requirements (Applicable on and after January 1, 2023)**

Purpose of Subsection 93118.5(e)(7)

This subsection establishes the new R99 fuel requirements that all harbor craft must use when operating in RCW beginning on January 1, 2023.

#### Rationale of Subsection 93118.5(e)(7)

This subsection is necessary to ensure vessel owners and operators fuel vessels with 99 percent or greater blends of renewable diesel fuel that is required by the Proposed Amendments with the exceptions discussed in subsection (e)(7)(B).

#### Purpose of Subsection 93118.5(e)(7)(A)

This subsection establishes that beginning January 1, 2023, vessel operators shall only fuel a diesel engine with R99 or higher fuel blend, except to demonstrate compliance with engine and fuel standards.

#### Rationale of Subsection 93118.5(e)(7)(A)

Renewable diesel fuel is chemically identical to petroleum diesel and meets the same ASTM D975 fuel quality standards. Renewable diesel fuel can be used in existing engines without modifying the engines. An analysis by CARB staff showed that a 30 percent NOx emission reduction and a 10 percent PM emission reduction will be achieved by using renewable diesel fuel compared to the use of CARB diesel fuel. To meet emission reductions goals and protect public health, it is necessary to require renewable diesel fuel. Because the use of R99 or higher blends decreases emissions from diesel engines, it is necessary to create an exemption from using renewable diesel and to allow the use of CARB diesel when operating engines or performing diesel engines in support of new certification or determining compliance with the performance standards of this Proposed Regulation.

#### Purpose of Subsection 93118.5(e)(7)(B)

This subsection establishes that CARB diesel fuel is allowed in situations where renewable diesel fuel is not available in other states where harbor craft may originate, and records must be retained and submitted to CARB upon request.

#### Rationale of Subsection 93118.5(e)(7)(B)1.

This concept is carried over from the Current Regulation, which allows for the use of low sulfur fuel on vessels if operators are not able to access CARB diesel when a harbor craft is traveling from a seaport located outside of California. The concept has been updated to align with the newly proposed renewable diesel fuel requirements. It is necessary to establish this provision as availability of renewable diesel fuel is out of the vessel owner or operator's control. It is also necessary for vessel owners and operators to retain documentation of fuel purchases to demonstrate the lack of availability of renewable diesel fuel to CARB, and present such documentation to CARB upon request.



#### Rationale of Subsection 93118.5(e)(7)(B)2.

This subsection is newly created in the Proposed Amendments to create a temporary exception from using renewable diesel if the vessel operator has an existing fueling contract that is still valid with a low sulfur fuel supplier as of January 1, 2023. It is necessary to establish this provision because there may be public or private fleets who do not have the ability to change the terms of an existing contract that was in place prior to the Proposed Amendments being adopted. CARB staff worked with public and private fleet operators to determine that fueling contracts typically do not last more than three to five years, therefore the exception will end for all vessel owners and operators by December 31, 2025. CARB staff confirmed with fuel suppliers that for most existing contracts, there should be flexibility to substitute existing CARB diesel suppliers with R99 or higher blends without modifying the terms of the contract. Therefore, to take advantage of this exception, vessel owners or operators must provide a copy of an agreement (such as a contract) demonstrating the inability to use renewable fuel diesel.

#### **8. Subsection (e)(8) All Harbor Craft (Excluding Commercial Fishing Vessels) – Requirements for New and Newly Acquired Diesel Engines (Applicable on and after January 1, 2023)**

##### Purpose of Subsection 93118.5(e)(8)

This subsection establishes the requirements for new and newly acquired diesel engines intended for use on a new or in-use harbor craft except for commercial fishing vessels.

##### Rationale of Subsection 93118.5(e)(8)

This subsection is necessary for vessel owners and operators to understand what engine tier level they are allowed to sell, purchase, offer for sale, lease, rent, import, or acquire on a new and in-use harbor craft. These requirements apply to vessel owners and operators and prior to any phase-in dates for engines to meet more stringent performance standards. Requiring new and newly acquired engines meeting the most current emissions standards is one strategy that contributes to meeting emission reduction goals from the marine sector to protect public health.

##### Purpose of Subsection 93118.5(e)(8)(A)

This subsection establishes that new or newly acquired engines must meet the most current U.S. EPA emission standards at the time of engine acquisition, which could be Tier 3 or Tier 4 marine standards, Tier 4 Final off-road standards, or performance standards set forth in Tables 11, 12 or 13 in subsection (e)(9), if available.

#### Rationale of Subsection 93118.5(e)(8)(A)

This provision is necessary to ensure the cleanest available certified engines are installed on new or in-use harbor craft, which is one strategy that contributes to meeting emission reduction goals from the marine sector to protect public health.

#### Purpose of Subsection 93118.5(e)(8)(A)1.

This subsection establishes that Tier 4 marine engines are not required for engines rated below 600 kW if Tier 4 marine engines are not available at the time of engine acquisition.

#### Rationale of Subsection 93118.5(e)(8)(A)1.

This provision is necessary to explain when Tier 3 marine engines can be purchased and used after January 1, 2023. Clarifying that Tier 4 engines are required if available below 600 kW is necessary so that vessel owners and operators understand and comply with this requirement of subsection (e).

#### Purpose of Subsection 93118.5(e)(8)(A)2.

This subsection establishes that off-road engines are allowed for use only if engines meet Tier 4 Final emission standards and have been marinized to comply with 40 CFR § 1042.605.

#### Rationale of Subsection 93118.5(e)(8)(A)2.

This provision is necessary to clarify that if off-road engines are used to comply, then vessel owners and operators must install compliant off-road engines that are designed to operate in a marine application as required by U.S. EPA certification requirements.

#### Purpose of Subsection 93118.5(e)(8)(A)3. and 93118.5(e)(8)(A)3.a, b, c, d, and e.

This subsection establishes that engines rebuilt to Tier 3 or Tier 4 marine or Tier 4 off-road standards at the time of engine acquisition can be newly acquired for use on harbor craft subject to CARB approval. Requirements a. through e. list potential approval pathways for CARB to use when evaluating requests to use engines rebuilt to Tier 3 or 4 standards. This subsection also provides the EO discretion to approve or reject technical information submitted that is not based on good engineering judgment.

#### Rationale of Subsection 93118.5(e)(8)(A)3. and 93118.5(e)(8)(A)3.a, b, c, d, and e.

Rebuilding engines to current or more stringent emission standards is a common industry practice to extend the lifespan of an engine while not replacing the entire engine. Therefore, to provide financial relief or lower-cost options to upgrading engines, it is necessary to provide potential pathways for rebuilt engines to

demonstrate compliance with current emission standards in effect. In addition, there are other strategies such as using add-on diesel emission controls such as DPFs or SCR systems that can be used to achieve emissions control equivalent to using engines certified to Tier 3 or 4 standards. Therefore, it is necessary to outline the possible technical approaches, and examples of testing, certification, and verification procedures that can be used to demonstrate equivalence. Testing approaches are, in some cases, application specific. As such, EO engineering judgement and discretion is necessary to ensure emission reduction claims from vessel owners, vessel operators, engine manufacturers, and/or emission control device manufacturers are based on sound science and would achieve the intended emission reductions.

#### Purpose of Subsection 93118.5(e)(8)(B)

This subsection establishes that a 6 month “sell-through” period is allowed after the date that Tier 3, Tier 4 marine, or Tier 4 Final off-road standards have come into effect.

#### Rationale of Subsection 93118.5(e)(8)(B)

This provision was included in the Current Regulation and is applied to the Proposed Amendments. U.S. EPA amended the marine diesel engine certification requirements by providing additional lead time for implementing Tier 4 emission standards for high-power density engines used in certain high-speed vessels, which are extended through 2022 or 2024 depending on engine power output and power density. CARB staff acknowledges that most Tier 4 engine standards have been in effect for several years, but this provision may still apply to the Tier 4 engines with extended effective dates for the high-power density engines through 2024.

#### Purpose of Subsection 93118.5(e)(8)(C)

This subsection establishes that if an engine fails, CARB can approve a replacement engine meeting non-current, less-stringent emission standards. This provision incorporates a U.S. EPA requirement on engine manufacturers specifying when they can sell engines certified to less stringent standards. This provision establishes that CARB’s EO must approve replacement engines, and documentation to demonstrate that no engines meeting current emission standards are available must be provided. This provision also clarifies that replacement engines can never be certified to a less stringent standard than the engines being replaced.

#### Rationale of Subsection 93118.5(e)(8)(C)

This subsection has been expanded from the Current Regulation to include examples of engines certified to Tier 3 and 4 emission standards. The Proposed Amendments require engines to eventually meet performance standards; however, it is necessary to provide flexibility for engines that fail and need to be replaced prior to or after diesel engine systems are installed to meet the performance standards in the Proposed Amendments. Although engine manufacturers cannot sell new engines certified to less stringent standards unless meeting the requirements in 40 CFR § 1042.615, it is

necessary to clarify that this requirement applies so that used engines cannot be purchased and installed on in-use vessels. For consistency in the processing of replacement engines, it is also necessary for CARB to review and approve all replacement engines purchased that do not meet current standards, even if they are newly purchased from an engine manufacturer or dealer that has complied separately with U.S. EPA replacement engine requirements for marine engines.

#### Purpose of Subsection 93118.5(e)(8)(D)

This subsection establishes that engines that have been approved to operate as low-use can be replaced with engines certified to a more stringent emission standard than the engine being replaced.

#### Rationale of Subsection 93118.5(e)(8)(D)

The Proposed Amendments establish low-use hour thresholds in subsection (e)(14) that are dependent upon engine tier level. This provision allows vessel owners and operators to purchase cleaner engines and be allowed a greater number of hours (up to 700 hours/year for a Tier 3 engine) before needing to meet the Tier 3 or 4 + DPF performance standards. This provision provides a pathway for vessels and engines operated under a low-use threshold outlined in Table 22 to make lower cost upgrades to engines as compared to meeting performance standards, which may in some cases result in vessel retirement and replacement. In addition, this pathway allows operators who have the availability to install a newer and/or cleaner engine meeting a more stringent, but not current emission standard, to replace their engine and reduce emissions, while still remaining compliant with the requirements of subsection (e)(8).

### **9. Subsection (e)(9) All Harbor Craft (Excluding Commercial Fishing Vessels) – Requirements for New and Newly Acquired In-Use Harbor Craft (Applicable on and after January 1, 2023)**

#### Purpose of Subsection 93118.5(e)(9)

Except for commercial fishing vessels, this subsection establishes the requirements for new and newly acquired in-use harbor craft and defines the performance standards that new and in-use harbor craft must meet.

#### Rationale of Subsection 93118.5(e)(9)

This subsection is necessary to establish the performance standards that ultimately most harbor craft will need to meet by the end of 2031, unless granted an extension. It is necessary to clarify that after January 1, 2023, new vessels must meet these performance standards to minimize any additional turnover of vessels or equipment to newer technologies later during the phase-in schedule as set forth by subsection (e)(12). It is necessary for vessel owners and operators to know requirements when entering into a contract to sell, purchase, lease, rent, import, offering for sale, or acquiring or supplying a new or an in-use harbor craft.

#### **a. Subsection (e)(9)(A) Requirements for New Harbor Craft**

##### Purpose of Subsection 93118.5(e)(9)(A)1.

This subsection establishes specific requirements for all new build harbor craft, except for commercial fishing vessels, which require the tailpipe emissions from propulsion and auxiliary engines to meet the applicable performance standards set forth in Table 11, 12 or 13, and off-road engines must be marinized according to 40 CFR 1042.605.

##### Rationale of Subsection 93118.5(e)(9)(A)1.

This subsection is necessary to ensure that new build harbor craft meet the emission levels of performance standards, which are equivalent to the cleanest available marine standards (Tier 3 or Tier 4 depending on the availability based on engine power and duty cycle rating) plus a DPF, which ensures the lowest possible emissions from new build vessels.

##### Purpose of Subsection 93118.5(e)(9)(A)2.

This subsection establishes that if applicable Tier 4 marine engines are available for engines rated less than 600 kW, tailpipe emissions from engines on new-build vessels must meet Tier 4 + DPF performance standards set forth in Table 11.

##### Rationale of Subsection 93118.5(e)(9)(A)2.

This provision is necessary to ensure that the cleanest engines are used to achieve the greatest emission reductions. Although not required by U.S. EPA, some engine manufacturers have certified engines rated below 600 kW to Tier 4 standards. This is a key provision of the Proposed Amendments that will create additional incentive for engine manufacturers to develop and certify engines to cleaner standards than currently required by 40 CFR Part 1042.

##### Purpose of Subsection 93118.5(e)(9)(A)3.

This subsection establishes that CH<sub>4</sub> emissions must not exceed 1.0 g/bhp-hr when using a gaseous or liquid fuel other than diesel.

##### Rationale of Subsection 93118.5(e)(9)(A)3.

This subsection is critical to ensure that no excess CH<sub>4</sub> is emitted if vessel owners and operators adopt vessel technologies using gaseous or liquid fuel other than diesel fuel. CH<sub>4</sub> is a SLCP and potent GHG, and therefore CARB staff intends to maximize reductions by setting a limit on tailpipe emissions. Emissions testing on dual-fuel (LNG and diesel) ferry vessels operated in Canada, with compression-ignition diesel cycle engines, has indicated that CH<sub>4</sub> emissions can significantly increase the overall CO<sub>2e</sub> of the vessel's operation. CARB staff review of MY 2020 and newer on-road

heavy-duty natural gas engine certification data has suggested that engines are certified with measured CH<sub>4</sub> levels as low as 0.2 g/bhp-hr. In the absence of marine specific engine testing, CARB staff has proposed a 1.0 g/bhp-hr tailpipe CH<sub>4</sub> emissions limit.

Purpose of Subsection 93118.5(e)(9)(A)4.

This subsection establishes that new and newly acquired excursion vessels and short-run ferries are required to meet performance standards set forth in Table 11, Table 12, or Table 13 if acquired before ZEAT requirements take into effect.

Rationale of Subsection 93118.5(e)(9)(A)4.

This subsection is necessary to clarify that new excursion vessels and new short-run ferry vessels that are acquired between January 1, 2023 and the starting date of ZEAT requirements are subject to the cleaner combustion performance standards as set forth in subsection (e)(8), in addition to meeting any future ZEAT requirements for short-run ferries by December 31, 2025.

Purpose of Subsection 93118.5(e)(9)(A)5.

This subsection establishes the procedures and requirements for situations where there are no technologies available to meet performance standards for new-build vessels.

Rationale of Subsection 93118.5(e)(9)(A)5.

This subsection is necessary to provide clarification in situations where performance standards cannot be met due to unavailability of Tier 4 engines or DPFs. It is critical to clearly specify that vessel owners and operators have obligations to meet the performance standards when technologies are available by following the requirements set forth in subsection (e)(12), which include applying for applicable extensions every two years. It is also necessary to obtain EO approval for using engines not meeting performance standards to ensure accuracy and consistency in the implementation and enforcement of the Proposed Amendments.

**b. Subsection (e)(9)(B) Requirements for Newly Acquired In-Use Vessels**

Purpose of Subsection 93118.5(e)(9)(B)

This subsection establishes the requirements for newly required in-use vessels.

Rationale of Subsection 93118.5(e)(9)(B)

It is necessary to clarify that a newly required in-use vessel must meet the same requirements as a new-build vessel. This is different than a new-build vessel, because a

newly acquired vessel includes those that are already constructed or owned/operated by another person prior to becoming part of an existing fleet.

Purpose of Subsection 93118.5(e)(9)(B)1.

This subsection establishes that propulsion and auxiliary engines of a newly acquired in-use vessel must comply with the requirements for new build vessels.

Rationale of Subsection 93118.5(e)(9)(B)1.

It is necessary for vessel owners and operators to understand the requirements that vessels must meet prior to acquisition. This subsection is necessary to ensure a newly acquired vessel meets the same stringency as new vessels. Otherwise, vessel owners and operators could acquire used vessels to circumvent meeting the ZEAT requirements that are intended to apply to all new vessels entering an existing fleet after a given deadline.

Purpose of Subsection 93118.5(e)(9)(B)2.

This subsection establishes that low-use exceptions or compliance extensions approved for the previous owner of a vessel are not transferrable to the new owner of a vessel.

Rationale of Subsection 93118.5(e)(9)(B)2.

It is necessary to ensure emission reductions are achieved by limiting transferring low-use exceptions and compliance extensions. This provision directs investments of vessel owners and operators to newer and compliant engine technologies rather than perpetuating the use and resale of in-use vessels that are not compatible with the cleanest available engine technologies.

Purpose of Subsection 93118.5(e)(9)(B)3.

This subsection establishes that new owners of a newly acquired in-use vessel cannot apply for low-use exceptions and compliance extensions with exceptions of extensions (e)(12)(E)(2) and (e)(12)(E)(4).

Rationale of Subsection 93118.5(e)(9)(B)3.

The rationale of this subsection is identical to the rationale indicated immediately above for Subsection 93118.5(e)(9)(B)2. CARB staff propose allowing limited compliance extensions for engine or DPF unavailability and for vessels using Tier 4 engines with limited hours, because these factors are generally beyond the control of a vessel owner or operator.

#### Purpose of Subsection 93118.5(e)(9)(B)4.

This subsection establishes that relocated vessels from outside of RCW can still be considered in-use (instead of new or newly acquired) vessels only if documentation is provided to CARB.

#### Rationale of Subsection 93118.5(e)(9)(B)4.

It is necessary to clarify that relocated vessels would be considered in-use vessels and not newly acquired vessels because the requirements that in-use vessels and newly acquired vessel are subject to would be slightly different. For example, in-use vessels are eligible for low-use exceptions, but newly acquired vessels are not. As such, it is necessary to clarify what type of documentation through recordkeeping and reporting is required to be considered a relocated vessel.

### **10. Subsection (e)(10) Requirements for Zero-Emission and Advanced Technologies (ZEAT) for New, Newly Acquired and In-Use Short-Run Ferries, and New and Newly Acquired Excursion Vessels (Applicable on and after January 1, 2023)**

#### Purpose of Subsection 93118.5(e)(10)

This subsection establishes the requirements for ZEAT for new, newly acquired and in-use short-run ferries, and new and newly acquired excursion vessels, and the application process that applicants must follow.

#### Rationale of Subsection 93118.5(e)(10)

There is a wide range of technologies that are rapidly developing and emerging into the mobile source and marine vessel market. This subsection is necessary to ensure that certain vessel categories that can feasibly adopt zero-emission technologies start to deploy ZEAT on vessels to further reduce emissions and protect public health. This subsection establishes the minimum requirements, upon which vessel owners and operators can choose to adopt more ZEAT within their fleets. This subsection also establishes an application process to ensure ZEAT that is adopted is performed in a manner consistent with sound science and good engineering judgement.

#### **a. Subsection (e)(10)(A)**

#### Purpose of Subsection 93118.5(e)(10)(A)

This subsection establishes that new and newly acquired excursion vessels must adopt zero-emission capable hybrid technology starting on December 31, 2024, and new and in-use short-run ferries must adopt zero-emission technology starting on December 31, 2025.



#### Rationale of Subsection 93118.5(e)(10)(A)

This subsection is necessary to establish the minimum deployment date targets for certain sectors, and requirements for full zero-emission and zero-emission capable hybrid technology. Additionally, this subsection outlines the two targets of ZEAT that CARB staff has, through their investigation to support the Proposed Amendments, proposed as feasible and necessary targets to achieve emission reductions from the marine sector.

#### Purpose of Subsection 93118.5(e)(10)(A)1.

This subsection establishes that during revenue service the zero-emission vessels are not allowed to be pushed, towed, attached, or propelled by another non-zero-emission vessel.

#### Rationale of Subsection 93118.5(e)(10)(A)1.

This subsection is necessary to prevent the operation of a non-zero-emission vessel on a short-run ferry route during normal revenue service. Non-revenue service operations, such as being towed in the case of a zero-emission powertrain failure or for being transported to shipyards for maintenance and repairs is permitted.

#### Purpose of Subsection 93118.5(e)(10)(A)2.

This subsection establishes that a temporary replacement vessel operating on a dedicated zero-emission short-run ferry route must meet the requirements set forth in subsection (c)(2), which includes reporting requirements.

#### Rationale of Subsection 93118.5(e)(10)(A)2.

This subsection is necessary to clarify that temporary replacement vessels can be used to replace zero-emission vessels, but that they are still subject to all the requirements of subsection (c)(2), which includes meeting a Tier 2 minimum, reporting requirements, along with many other regulatory requirements.

### **b. Subsection (e)(10)(B)**

#### Purpose of Subsection 93118.5(e)(10)(B)1. through 3.

This subsection establishes the requirements of internal combustion engines on ZEAT vessels. Internal combustion engines on short-run ferries must meet the most stringent engine emission standards in effect on the compliance dates. This subsection also establishes the engine's annual hour operation limit allowed and reporting requirements if engines operate above the limit during emergency operations. Engines on excursion vessels must meet the performance standards of Tier 3 plus DPF or Tier 4 plus DPF depending on applicable engine ratings and duty cycle ratings.

### Rationale of Subsection 93118.5(e)(10)(B) 1. through 3.

This subsection is necessary to ensure engines on ZEAT vessels meet the highest emission standards available, and engines are operated under limited hours for zero-emission vessels, which would result in maximum emission reductions achieved on ZEAT vessels. CARB staff proposes more stringent (Tier 3 or 4 + DPF) requirements on combustion engines on zero-emission capable vessels (required for new and newly acquired excursion vessels) than zero-emission vessels (required for short-run ferries), because the engines are designed to operate and provide up to 70 percent of the annual work to the vessel. CARB staff proposes a 20 hours/year limit before triggering reporting requirements for emergency operations to provide a reasonable level of flexibility to operators to operate combustion engines in unplanned circumstances and for maintenance and testing purposes. Beyond 20 hours/year, additional emergency operations can be performed, but need to be documented according to recordkeeping and reporting procedures.

#### **c. Subsection (e)(10)(C)**

##### Purpose of Subsection 93118.5(e)(10)(C)

This subsection establishes that a person must submit an application and obtain approval before adopting ZEAT.

##### Rationale of Subsection 93118.5(e)(10)(C)

The submittal and approval of a ZEAT application prior to adopting ZEAT is necessary to ensure that the standards of zero-emission, and zero-emission capable hybrid vessels defined in subsection (d) are met, which is important to ensure the reliability and performance of the ZEAT adopted.

#### **i. Subsection (e)(10)(C)1 Application Process**

##### Purpose Subsection 93118.5(e)(10)(C)1.

This subsection provides an overview of the process for applying for ZEAT and defines the elements that must be included in the application. This subsection also establishes the timeframe for application submittal.

##### Rationale of Subsection 93118.5(e)(10)(C)1.

Submission of an application for adopting ZEAT is required; as such, it is necessary to establish the proper procedures for submitting an application. This subsection is necessary to ensure that the application package will provide CARB staff with the necessary information to evaluate the vessel design and technologies, as well as charging or fueling infrastructure to meet the ZEAT requirements of the Proposed Amendments. The minimum of 18 months provides applicants time to make

modifications on applications, and in their vessel designs, in the situation where an application is not approved.

Purpose of Subsection 93118.5(e)(10)(C)1.a.

This subsection requires applicants to provide contact information in a ZEAT application.

Rationale of Subsection 93118.5(e)(10)(C)1.a.

This information is necessary so that CARB staff is able to contact the applicant to ask questions and provide a response regarding the application's approval or denial.

Purpose of Subsection 93118.5(e)(10)(C)1.b.

This subsection requires applicants to identify the vessel and engines ZEAT would apply to, including the vessel name, applicable identifier(s), and engine information.

Rationale of Subsection 93118.5(e)(10)(C)1.b.

This information is necessary so that CARB staff is aware which vessel is adopting ZEAT.

Purpose of Subsection 93118.5(e)(10)(C)1.c.i and ii

This subsection specifies what must be included in the ZEAT application.

Rationale of Subsection 93118.5(e)(10)(C)1.c.i and ii

These subsections are necessary to establish that an application must contain a detailed engineering analysis, calculations, design information, certification documentation, battery or fuel cell capacities, typical trips or other information to demonstrate that the vessel meets ZEAT requirements. This information is essential for CARB staff to properly analyze the application to determine if it meets CARB ZEAT requirements. Analysis of the hybrid propulsion duty cycle is critical to ensuring the minimum 30 percent zero-emission tailpipe energy source requirement is met. It is necessary to allow zero-emission vessels to install internal combustion engines to provide power during emergencies or incidental situations. Requiring documentation of the use of internal combustion engines onboard is necessary to ensure engines are being operated in limited situations.

Purpose of Subsection 93118.5(e)(10)(C)1.d.

This subsection establishes that the ZEAT application must include information and plans for charging or fueling infrastructure.

#### Rationale of Subsection 93118.5(e)(10)(C)1.d.

Requiring this information is essential to ensuring that applicants coordinate with relevant parties (such as electrical utilities or other fueling providers) and purchase necessary equipment needed to build applicable infrastructure. Without necessary infrastructure, the proper operation of ZEAT vessels and their emission reductions will not be achieved.

#### Purpose of Subsection 93118.5(e)(10)(C)1.e.

This subsection establishes that the applicant must maintain the records used to demonstrate continued effectiveness of the ZEAT and report associated information according to reporting requirements in subsection (m)(19).

#### Rationale of Subsection 93118.5(e)(10)(C)1.e.

This provision is necessary to ensure that regulated parties maintain associated records for sufficient time for CARB staff to review compliance to effectively implement and enforce the Proposed Amendments. It is possible that an applicant would receive approval for a zero-emission capable hybrid system, but not operate the vessel consistently with their fueling or charging plan, and therefore not meet the minimum 30 percent requirement for fueling with a zero-emission tailpipe source.

### **ii. Subsection (e)(10)(C)2. EO Review and Final Decision-Making Process**

#### Purpose of Subsection 93118.5(e)(10)(C)2.a.

This subsection establishes the EO's review process and timeframe for making a final decision.

#### Rationale of Subsection 93118.5(e)(10)(C)2.a.

This provision is essential to advise the applicant that CARB staff has 30 days from the date of receipt to determine if the application is sufficient, and the applicant has 30 days to submit the supplemental documentation if the original application is incomplete for evaluation. CARB staff considers 30 days an appropriate amount of time to review the application for deficiencies and report to the EO if there are problems with the application.

#### Purpose of Subsection 93118.5(e)(10)(C)2.b.

This subsection establishes the EO's review process and timeframe for making a final decision.

### Rationale of Subsection 93118.5(e)(10)(C)2.b.

This provision is essential to advise the applicant that CARB staff has 60 days from the time the application is deemed complete to notify an applicant in writing of the approval or disapproval of the application. CARB staff consider 60 days an appropriate amount of time to review the application and draft a letter to be signed by the EO.

## **11. Subsection (e)(11) ZEAT Credit for Early or Surplus Deployments (Applicable on and after January 1, 2023)**

### Purpose of Subsection 93118.5(e)(11)

This subsection establishes that additional compliance time could be granted for early or surplus ZEAT deployments. In addition, this subsection establishes the applicability, the eligibility, and the requirements for receiving ZEAT credit, and outlines the process for obtaining ZEAT credit.

### Rationale of Subsection 93118.5(e)(11)

Compliance via deployment of ZEAT in vessel categories where ZEAT is not required is one pathway for meeting the performance standards requirements of subsection (e)(12) of the Proposed Amendments. The ZEAT credit is necessary for incentivizing surplus ZEAT adoption in vessel categories where ZEAT is not required and early ZEAT adoption in excursion vessels and short-run ferries. As such, this subsection is necessary to establish the applicability, the eligibility, and the requirements for receiving the ZEAT credit, and the application process that applicants must follow to obtain the ZEAT credit. Incentivizing early or surplus ZEAT deployments would further reduce emissions beyond the performance standards and help advance the marine sector toward zero-emission development to ultimately protect public health and improve air quality.

### **a. Subsection (e)(11)(A) Applicability**

#### Purpose of Subsection 93118.5(e)(11)(A)

This subsection establishes that if an excursion vessel or a short-run ferry deploys ZEAT three years prior to compliance dates required in Table 14 of (e)(10), or ZEAT is adopted in vessel categories where ZEAT is not required, additional compliance time in Table 15 of (e)(11)(A) will be granted to another vessel subject to subsection (e)(10) or (e)(12), provided the vessel is under the same person's direct control and operating within the same California air basin.

#### Rationale of Subsection 93118.5(e)(11)(A)

This subsection establishes a regulatory incentive framework to encourage adoption of ZEAT not only to excursion vessels and short-run ferries, but also to any other vessel categories. This is necessary to provide additional opportunities for ZEAT to enter the

marine market. The ZEAT mandates for short-run ferries and new excursion vessels in Table 14 indicate where CARB staff has demonstrated that technical feasibility exists today. CARB staff acknowledges that there are opportunities to deploy ZEAT for specific use cases in other categories of harbor craft, even if not feasible for all use cases of vessels in those categories. To maximize the adoption of zero-emission technology that is only feasible in some uses cases, CARB staff has proposed two ZEAT credits that would provide additional compliance time for other vessels in a person's fleet. Two lengths of credits are proposed depending on the classification of ZEAT; full zero-emission vessels would be eligible for a longer ZEAT credit than partial or zero-emission capable vessels.

#### **b. Subsection (e)(11)(B) Eligibility and Requirements for Receiving ZEAT Credit**

##### Purpose of Subsection 93118.5(e)(11)(B)

This subsection establishes the eligibility and requirements for a ZEAT credit application to be granted.

##### Rationale of Subsection 93118.5(e)(11)(B)

It is necessary to outline the criteria for vessel owners and operators to understand the requirements and determine whether their vessels or prospective vessels are eligible to receive or generate a ZEAT credit.

##### Purpose of Subsection 93118.5(e)(11)(B)1.

This subsection establishes that the ZEAT vessel that is generating the credit must be deployed and operational.

##### Rationale of Subsection 93118.5(e)(11)(B)1.

Requiring the vessel using ZEAT to be deployed and operational prior to generating a ZEAT credit is necessary to ensure additional compliance time is not granted prior to a vessel owner or operator making the full commitment and successfully deploying a vessel with ZEAT.

##### Purpose of Subsection 93118.5(e)(11)(B)2.

This subsection establishes that vessels included in an ACE plan are not permitted to generate a ZEAT credit.

##### Rationale of Subsection 93118.5(e)(11)(B)2.

This provision is necessary to prevent vessel owners and operators from using a single ZEAT deployment to generate more additional compliance time than the intended three or seven years per vessel. This subsection prevents vessel owners and operators

from receiving a ZEAT credit for deploying a ZEAT vessel and applying the emission reductions from the ZEAT vessel in an ACE plan. This would result in double counting the benefits of a vessel with ZEAT by receiving both a ZEAT credit and additional compliance time through the ACE plan provisions, for a single ZEAT deployment.

Purpose of Subsection 93118.5(e)(11)(B)3.

This subsection establishes that ZEAT vessels deployed using incentive funding are allowed to generate ZEAT credit if guidelines of the incentive funding do not have any restrictions preventing this.

Rationale of Subsection 93118.5(e)(11)(B)3.

Allowing ZEAT vessels receiving incentive funding to generate ZEAT credits, as long as incentive funding guidelines allow it, could encourage more ZEAT vessels to be deployed, resulting in more advanced technologies being used and more emission reductions achieved.

Purpose of Subsection 93118.5(e)(11)(B)4.

This subsection establishes that ZEAT vessels, deployed prior to or after January 1, 2023, are eligible to generate ZEAT credit.

Rationale of Subsection 93118.5(e)(11)(B)4.

It is necessary to give credit for ZEAT vessels deployed prior to January 1, 2023, the date that CARB staff expects the Proposed Amendments would take effect. This provision ensures that early and voluntary actions to deploy ZEAT is encouraged and not disregarded when implementing the requirements of the Proposed Amendments starting in 2023.

Purpose of Subsection 93118.5(e)(11)(B)5.

This subsection establishes that ZEAT credit can only be applied to vessels with engines certified to a minimum of Tier 2 emissions standards.

Rationale of Subsection 93118.5(e)(11)(B)5.

This provision is necessary to ensure the ZEAT credit does not apply to older and dirtier engines, which need to be replaced in early compliance dates to protect public health. CARB staff is not requiring an emissions analysis to demonstrate that delaying compliance three or seven years on another vessel in the fleet does not increase emissions overall. Instead of requiring such analysis, CARB staff is proposing that ZEAT credits can only be applied to engines that would have met the minimum engine requirements for regulated in-use vessels under the Current Regulation.

Purpose of Subsection 93118.5(e)(11)(B)6.

This subsection establishes that vessels receiving ZEAT credit are still eligible to apply for feasibility compliance extensions after the ZEAT credit has expired.

Rationale of Subsection 93118.5(e)(11)(B)6.

This subsection is necessary to clarify the eligibility of compliance extensions for vessels receiving the ZEAT credit. CARB staff deems it reasonable to allow for compliance extensions due to lack of engine or DPF availability and/or feasibility after the expiration of a ZEAT credit, because if these extension circumstances are applicable after the expiration of the ZEAT credit, these extensions would have been granted in the absence of a ZEAT credit.

Purpose of Subsection 93118.5(e)(11)(B)7.

This subsection establishes that any combination of multiple ZEAT credits and compliance extensions shall not extend the compliance date of any engine or vessel beyond December 31, 2034.

Rationale of Subsection 93118.5(e)(11)(B)7.

This provision is necessary to ensure emission reductions projected in the Proposed Amendments are achieved by setting a final compliance date for engines or vessels receiving ZEAT credit. This end date of December 31, 2034 is consistent with the final date allowed under an ACE plan in subsection (f) and is also the final date of expiration for most compliance extensions. The target date of 2035 for maximizing zero-emission technologies was also established by Governor Newsom's EO N-79-20.

Purpose of Subsection 93118.5(e)(11)(B)(8).

This subsection establishes that a ZEAT credit can only be applied to other vessels with a homebase or regularly scheduled stop within two miles of a DAC if the ZEAT vessel deployed to generate the ZEAT credit also has a homebase or regularly scheduled stop within two miles of any DAC.

Rationale of Subsection 93118.5(e)(11)(B)(8).

This provision is necessary to ensure that ZEAT deployed in non-DACs does not result in delayed compliance for vessels operating in DACs. The exception is where both the vessel generating and the vessel receiving the credit are both located in a DAC, even if they are not within the same community or region of the air basin.



#### Purpose of Subsection 93118.5(e)(11)(B)9.

This subsection establishes that analysis of emission reductions is not required in the ZEAT credit application unless zero-emission capable hybrid vessels are used generating the ZEAT credit.

#### Rationale of Subsection 93118.5(e)(11)(B)9.

This provision is necessary to clarify and distinguish the differences between deploying ZEAT and requesting a credit pursuant to subsection (e)(11) or applying the emission reductions quantitatively as part of an ACE plan in subsection (f).

#### Purpose of Subsection 93118.5(e)(11)(B)10.

This subsection establishes that the ZEAT credit is not renewable, is applied once a ZEAT vessel is constructed and put into service, and is not transferrable to another vessel or to a subsequent owner.

#### Rationale of Subsection 93118.5(e)(11)(B)10.

This subsection is necessary to prevent ZEAT credits from being used on more than one diesel vessel, and therefore producing surplus emissions generated from multiple non-compliant vessels in exchange for the deployment of one ZEAT vessel.

### **c. Subsection (e)(11)(C) ZEAT Credit Application Process**

#### Purpose Subsection 93118.5(e)(11)(C)1.

This subsection establishes that applicants must submit an application and obtain approval to be able to receive a ZEAT credit. It also provides an overview of the process for applying for a ZEAT credit and defines the elements that must be included in the application. This subsection also establishes the timeframe for application submittal.

#### Rationale of Subsection 93118.5(e)(11)(C)1.

CARB approval is necessary to ensure the ZEAT vessel in the application is deployed and operational and ZEAT credit is applied to an eligible vessel. As such, it is necessary to establish the proper procedures for submitting an application. This subsection is necessary to ensure that the application package will provide CARB staff with the necessary information to evaluate the eligibility of receiving ZEAT credit and whether the application meets the requirements for receiving ZEAT credit. The minimum of nine months provides applicants time to reconsider a compliance strategy for vessels involved if the ZEAT credit is not granted.

#### Purpose of Subsection 93118.5(e)(11)(C)1.a

This subsection requires applicants to provide contact information.

#### Rationale of Subsection 93118.5(e)(11)(C)1.a

This information is necessary so that CARB staff is able to contact the applicant, which enables CARB staff to follow up with the submitting party about any questions and provide a decision regarding the application.

#### Purpose of Subsection 93118.5(e)(11)(C)1.b and c

These subsections require applicants to identify the ZEAT vessel information, demonstrate the deployed ZEAT vessel meets the ZEAT requirements, and identify the vessel receiving the ZEAT credit.

#### Rationale of Subsection 93118.5(e)(11)(C)1.b and c

This information is necessary so that CARB staff can confirm the ZEAT vessel is deployed and operational, and so that staff is aware of which vessel is receiving the ZEAT credit for the extended compliance dates. This information would be critical for the successful implementation and enforcement of the Proposed Amendments.

#### Purpose of Subsection 93118.5(e)(11)(C)2.

This subsection establishes the EO's review process and timeframe for making a final decision.

#### Rationale of Subsection 93118.5(e)(11)(C)2.

This provision is essential to advise the applicant that CARB staff has 30 days from the date of receipt to determine if the application is sufficient, and the applicant has 30 days to submit the supplemental documentation if the original application is incomplete for evaluation. CARB staff considers 30 days an appropriate amount of time to review the application for deficiencies and for applicants to submit supplemental documentation if there are problems with the application.

#### Purpose of Subsection 93118.5(e)(11)(C)3.

This subsection establishes that if an approved application was found to no longer meet the criteria for a ZEAT credit, CARB's EO may modify or revoke the application.

#### Rationale of Subsection 93118.5(e)(11)(C)3.

This subsection is necessary to ensure that if changes were to be made to an approved ZEAT credit application, CARB could modify or revoke approval of the application. This provision is essential to ensuring the required emission reductions for the regulation are being achieved.

#### Purpose of Subsection 93118.5(e)(11)(C)4.

This subsection sets the timeline for retaining records and an expected delivery time of 30 days to supply CARB records when requested.

#### Rationale for Subsection 93118.5(e)(11)(C)4.

This provision is essential to ensuring that regulated parties maintain records for enough time for CARB to effectively implement and enforce the Proposed Amendments. The expected delivery of records within 30 days is consistent with other recordkeeping requirements of this section.

### **12. Subsection (e)(12) In-Use Engines and Vessels (Excluding Commercial Fishing Vessels) – Requirements for Meeting Performance Standards (Applicable on and after January 1, 2023)**

#### Purpose of Subsection 93118.5(e)(12)

This subsection establishes the requirements for in-use engines and vessels on all regulated in-use vessel categories (which excludes commercial fishing vessels). Requirements in this subsection include compliance methods, compliance dates, and compliance extensions.

#### Rationale of Subsection 93118.5(e)(12)

This subsection is essential and one of key elements to achieve the emission reduction goals of the Proposed Amendments.

#### **a. Subsection (e)(12)(A) Applicability**

#### Purpose of Subsection 93118.5(e)(12)(A)1. and 2.

This subsection establishes the applicability of subsection (e)(12) by specifying that an in-use regulated vessel operating above certain annual hours after January 1, 2023 is subject to the performance standards. This subsection also clearly specifies which vessel categories are in-use regulated vessels.

#### Rationale of Subsection 93118.5(e)(12)(A).1 and 2.

These subsections are necessary for vessel owners and operators to be aware if their vessels are subject to this subsection.

## **b. Subsection (e)(12)(B) General Requirements**

### Purpose of Subsection 93118.5(e)(12)(B)

This subsection establishes the general requirements that regulated in-use vessels must meet to comply with the performance standards requirements of the Proposed Amendments.

### Rationale of Subsection 93118.5(e)(12)(B)

This subsection is necessary for vessels owners and operators to clearly understand the general requirements that their regulated in-use vessels must meet to comply with the Proposed Amendments.

### Purpose of Subsection 93118.5(e)(12)(B)1

This subsection establishes that engines or diesel engine systems on regulated in-use vessels must meet the performance standards by compliance dates using the compliance methods set forth in subsection (e)(12)(C). This subsection also establishes that engines subject to in-use regulated vessel requirements prior to January 1, 2023, if complying by low use, must continue to meet those requirements until new compliance dates.

### Rationale of Subsection 93118.5(e)(12)(B)1.

This subsection is necessary to explain that vessel owners and operators are not allowed to own, operate, sell, purchase, offers for sale, rent, import, or otherwise acquire a regulated in-use vessel within RCW unless the engines on the vessel comply with the requirements of subsection (e)(12). It is necessary to clarify that low-use engines (pre-Tier 1 or Tier 1) must continue to operate as low use until new compliance dates, because pre-Tier 1 and Tier 1 engines would not have new compliance dates until December 31 of 2023, 2024, or 2025. Without this specification, pre-Tier 1 and Tier 1 engines would be legally allowed to operate an unlimited number of hours for up to three years because subsection (e)(6) would be amended to no longer be in effect starting on January 1, 2023.

### Purpose of Subsection 93118.5(e)(12)(B)2.

This subsection establishes that in-use engines rated below 600 kW shall not be repowered with engines meeting Tier 3 emission standards if Tier 4 engines are available, with the exception of situation where the in-use engines are repowered with Tier 3 engines on or after January 1, 2023 and Tier 4 engines are not available at the time of engine acquisition. In other words, if an engine is repowered to Tier 3 emission standards on or after January 1, 2023, then no further repower to Tier 4 emission standards is required even if Tier 4 engines become available for the horsepower and duty cycle rating at a later time.

#### Rationale of Subsection 93118.5(e)(12)(B)2.

This subsection is necessary to reduce financial burden for vessel owners and operators by not requiring vessels to repower twice (once to Tier 3, then again to Tier 4) after the Proposed Amendments take effect. CARB staff selected the threshold date of January 1, 2023 to differentiate between actions potentially taken to comply with the Current Regulation and to set a clear delineation after which repowers to Tier 3 vessels would be “permanent” under the Proposed Amendments.

#### Purpose of Subsection 93118.5(e)(12)(B)3.

This subsection establishes that Tier 3 engines rated below 600 kW that are repowered before January 1, 2023 are required to meet Tier 4 emission standards if applicable Tier 4 engines are available 12 months prior to the compliance date. If a Tier 4 engine is not available, but DPF is available by the compliance date, Tier 3 + DPF would meet compliance requirements and no further repower is needed.

#### Rationale of Subsection 93118.5(e)(12)(B)3.

This provision is necessary to clarify that Tier 3 engines rated below 600 kW repowered before January 1, 2023 can remain as Tier 3 engines if there are no Tier 4 engines available for their power and duty cycle rating and if they are retrofit with a DPF. The 12-month timeframe was selected to provide a reasonable time window between when a vessel owner or operator needs to select an engine for incorporation into a vessel and its compliance date. This provision is also critical to clarify under which circumstances installing DPF retrofits prior to compliance deadlines would be permanent, and not require replacement if the existing Tier 3 engines are still subject to a Tier 4 repower. The Verification Procedure as set forth in 13 CCR 2700 et seq. allows the manufacturers of DPFs to develop and propose their own policies regarding swapping and redesignating DPFs onto other engines after they have been installed. Therefore, because CARB staff cannot guarantee that a DPF purchased for a Tier 3 engine would be mechanically or legally compatible with any future Tier 4 engine purchases, this provision is critical to clarify and provide certainty to vessel owners and operators as they develop a compliance strategy for subsection (e)(12).

#### Purpose of Subsection 93118.5(e)(12)(B)4.

This subsection establishes that engines rated above 600 kW shall meet Tier 4 + DPF performance standards and are eligible for applicable compliance extensions.

#### Rationale of Subsection 93118.5(e)(12)(B)4.

This provision is necessary to ensure that maximum emission reductions are achieved for engines rated above 600 kW as U.S. EPA Tier 4 emission standards are applicable to engines in these power ratings. Notwithstanding any replacement engine exemptions that may exist for engine manufacturers to sell engines not meeting

current standards into in-use vessels, all engines rated above 600 kW still must meet Tier 4 + DPF performance standards by their applicable compliance deadlines.

#### Purpose of Subsection 93118.5(e)(12)(B)5.

This subsection establishes the compliance requirements for vessels operating in dual or multiple vocations. Vessels operating in secondary uses are subject to performance standards unless operated in other vessel categories less than low-use hour thresholds set forth in subsection (e)(14).

#### Rationale of Subsection 93118.5(e)(12)(B)5.

This provision is necessary to clarify the compliance requirements that dual or multiple-operation vessels are subject to; as such, vessel owners and operators would understand clearly their compliance obligations and comply accordingly. The total number of combined hours in any regulated in-use vessel category must be included and below the limits set forth in subsection (e)(14), otherwise the engines must meet the performance standards required by this subsection (e)(12).

#### Purpose of Subsection 93118.5(e)(12)(B)6.

This subsection establishes that non-compliant engines are not allowed to be kept on the vessel unless vessel owners and operators take actions to prevent the engines from operating.

#### Rationale of Subsection 93118.5(e)(12)(B)6.

This provision is necessary to provide flexibility for vessel owners and operators who are not able to remove the non-compliant engines to keep the engines on the vessel as long as they can ensure the engines are not being operated, which would ensure no extra emissions are emitted from the non-compliant engines.

#### Purpose of Subsection 93118.5(e)(12)(B)7.

This subsection establishes the requirements for selling a non-compliant vessel intended for operation outside of RCW.

#### Rationale of Subsection 93118.5(e)(12)(B)7.

This provision is necessary to allow for necessary operations when selling non-compliant vessels, including performing sea trials or transporting the vessel to its destination. Obtaining CARB's approval and requiring submitting a request including vessel/engine information, estimated operation hours, date and location, would help CARB track the activities of non-compliant vessels operated, and assist CARB to effectively implement and enforce the Proposed Amendments. Without this provision, it would not be possible to sell engines or vessels outside of California if they were kept inside California after their compliance deadlines.

### **c. Subsection (e)(12)(C) Compliance Methods**

#### Purpose of Subsection 93118.5(e)(12)(C)

This subsection establishes the compliance methods that vessel owners and operators may take to comply with subsection (e)(12).

#### Rationale of Subsection 93118.5(e)(12)(C)

This subsection is necessary for owners and operators to be aware of the available pathways for complying with the performance standards of the Proposed Amendments.

#### **i. Subsection (e)(12)(C)1. Method C1**

##### Purpose of Subsection 93118.5(e)(12)(C)1.

This subsection establishes that vessel owners and operators may replace the in-use engine with a U.S. EPA certified marine Tier 3 or Tier 4 engine or off-road Tier 4 Final engine that meets CARB performance standards in its certified condition by U.S. EPA or CARB at the time of the compliance dates to comply with subsection (e)(12) of the Proposed Amendments.

##### Rationale of Subsection 93118.5(e)(12)(C)1.

This subsection is necessary to ensure that the cleanest available engines that meet the CARB performance standards are installed to reduce emissions to meet the health and climate goals of the Proposed Amendments. This provision provides a pathway for engines certified by U.S. EPA or CARB that already meet the performance standards to take no further action to retrofit with a DPF. CARB staff expects the majority of engines following this pathway to be equipped with a DPF as part of the engine's certified condition.

#### **ii. Subsection (e)(12)(C)2. Method C2**

##### Purpose of Subsection 93118.5(e)(12)(C)2.

This subsection establishes that vessel owners and operators may replace the in-use engine with a U.S. EPA certified marine Tier 3 or Tier 4 engine or off-road Tier 4 final engine at the time of the compliance date that does not meet CARB performance standards and retrofit with a CARB verified Level 3 DPF to comply with subsection (e)(12) of the Proposed Amendments.

##### Rationale of Subsection 93118.5(e)(12)(C)2.

This subsection is necessary to provide a compliance option in situations where there are no U.S. EPA certified engines meeting the performance standards in their certified

condition. Requiring the cleanest certified engines that do not meet performance standards to retrofit with a CARB-verified Level 3 DPF will ensure the performance standards are met and emission reductions are achieved.

### **iii. Subsection (e)(12)(C)3. Method C3**

#### Purpose of Subsection 93118.5(e)(12)(C)3.

This subsection establishes that ACE plans in subsection (f) can be used to comply with subsection (e)(12) of the Proposed Amendments by using ACE pathways in subsection (f).

#### Rationale of Subsection 93118.5(e)(12)(C)3.

This subsection provides flexibility for compliance by allowing ACE pathways and encourages the adoption of ZEAT in the marine sector while achieving the same or a greater level of emission reductions.

### **iv. Subsection (e)(12)(C)4. Method C4**

#### Purpose of Subsections 93118.5(e)(12)(C)4.a. and 4.b.

These subsections establish that previously unregulated in-use vessels may choose to comply using a two-step phase-in method by repowering with the cleanest certified engines first according to compliance dates in Table 16, then retrofitting with DPFs by compliance dates in Table 17, Table 18 or Table 19 of (e)(12) based on the vessel category.

#### Rationale of Subsection 93118.5(e)(12)(C)4.a. and 4.b.

This subsection provides flexible compliance schedules for previously unregulated in-use vessels. Allowing pre-Tier 1 or Tier 1 engines on previously unregulated in-use vessels to comply by using a two-step phase-in method relieves the compliance burden on those vessels, and ensures the oldest engines removed in the early implementation years of 2023 through 2025. It is important to distinguish that this option is only available for pre-Tier 1 and Tier 1 engines because the repower of an engine would reset the compliance deadline of the newly repowered Tier 3 or Tier 4 engine according to subsection (e)(12)(D). CARB staff only intend for engines that previously did not repower to Tier 2 or 3 under the Current Regulation to have this flexibility. All other engines would need to repower to Tier 3 or 4 standards and install a retrofit DPF by the same compliance deadline.



#### **d. Subsection (e)(12)(D) Compliance Dates**

##### Purpose of Subsection 93118.5(e)(12)(D)

This subsection establishes the dates by which specific vessel types must comply with subsection (e)(12) and the methods for determining the actual or effective engine MY.

##### Rationale of Subsection 93118.5(e)(12)(D)

This subsection is necessary to identify the dates when compliance obligations begin. It is also necessary to establish methods to determine the engine MY under circumstances when the engine has been rebuilt or repowered. Compliance dates are set up based on the engine MY, which can be determined using one of many pathways.

The Proposed Amendments require new vessel categories to be subject to the performance standards in subsection (e)(12) that are not covered in the Current Regulation. Consequently, engines on vessel categories with no existing regulatory requirements (e.g., workboats, CPFVs, pilot vessels, research vessels, etc.) would need to repower to Tier 3 and Tier 4 earlier and be retrofit later during the implementation period.

CARB estimates that over 4,500 engines would need to apply a compliance option that would result in retrofitting or repowering engines. This includes engines subject to in-use requirements under the Current Regulation as well as engines that would be subject to performance standards requirements for the first time under the Proposed Amendments. The compliance schedule considers the population inventory of engines based on age to achieve approximately a constant number of engines repowered in a given calendar year over the nine-year period. Vessel categories with highest per-vessel emissions were targeted earlier in the compliance tables.

#### **i. Subsection (e)(12)(D)1. Method D1**

##### Purpose of Subsection 93118.5(e)(12)(D)1.a.

This subsection establishes that an engine's actual MY is considered to be the engine MY and can be used to determine the compliance dates in Table 16, Table 17, Table 18, or Table 19 of (e)(12).

##### Rationale of Subsection 93118.5(e)(12)(D)1.a.

This subsection is necessary to specify that if an original engine has never been upgraded to higher emission standards, then the engine's actual MY is the engine MY used to determine the compliance date.

#### Purpose of Subsection 93118.5(e)(12)(D)1.b.

This subsection establishes that with the exception of engines complying by subsection (e)(12)(C)(4)b, an engine's actual MY of the in-use engine that was installed in the in-use vessel as of December 31, 2022 is considered to be the engine MY and can be used to determine the compliance dates in Table 16, Table 17, Table 18, or Table 19 of (e)(12).

#### Rationale of Subsection 93118.5(e)(12)(D)1.b.

Certain compliance extensions require the cleanest available engines to be installed on the vessel in situations where performance standards are not able to be met at the time of compliance dates of the original engines. This provision clarifies that in those situations the MY of the new engines installed cannot be used to determine the compliance date. Instead, the actual MY of the original engine replaced is the correct MY to determine the compliance date. In other words, the compliance dates based on the original engine's MY remain, which is based upon the engine model year on the vessel as of December 31, 2022.

### **ii. Subsection (e)(12)(D)2. Method D2**

#### Purpose of Subsection 93118.5(e)(12)(D)2.a.

This subsection establishes that if an engine was rebuilt to Tier 2, Tier 3, or Tier 4 emission standards, the rebuilt year is determined to be the effective MY and used to determine the compliance dates in Table 16, Table 17, Table 18, or Table 19 of (e)(12).

#### Rationale of Subsection 93118.5(e)(12)(D)2.a.

This subsection is necessary to identify that the effective MY is based on the year in which the Tier 3, or Tier 4 rebuild occurred. Establishing rebuild year as the effective MY for determining the compliance dates allows vessel owners and operators to continue using rebuilt engines for the same amount of time that would have been granted under a repower. CARB staff provides this flexibility because an engine rebuild is intended to restore an engine to its "like new" condition.

#### Purpose of Subsection 93118.5(e)(12)(D)2.b.

This subsection establishes the information that needs to be submitted to CARB to demonstrate that the rebuilt engine meets Tier 3 or Tier 4 emission standards.

#### Rationale of Subsection 93118.5(e)(12)(D)2.b.

This information ensures that CARB staff has necessary information to be able to validate the emissions level from rebuilt engines.

#### Purpose of Subsections 93118.5(e)(12)(D)2.c. and 2.d.

These subsections establish CARB's review process and timeline needed to make an engine MY determination based on engine rebuilds.

#### Rationale of Subsections 93118.5(e)(12)(D)2.c. and 2.d.

These provisions are necessary to advise the applicant that CARB staff has 30 days from the date of receipt to determine if the documentation provided is sufficient. CARB staff considers the 30-day timeframe an adequate amount of time to review an application for determination. It is necessary for CARB to notify and confirm that the effective MY of the rebuilt engines is the MY used to determine the compliance date if the application meets the criteria required.

#### Purpose of Subsection 93118.5(e)(12)(D)2.e.

This subsection establishes that with the exception of engines complying by subsection (e)(12)(C)(4)b, an engine's actual MY of the in-use engine that was installed in the in-use vessel as of December 31, 2022 is considered to be the engine MY and can be used to determine the compliance dates in Table 16, Table 17, Table 18, or Table 19 of (e)(12).

#### Rationale of Subsection 93118.5(e)(12)(D)2.e.

Certain compliance extensions require the cleanest engines installed on the vessel in situations where performance standards are not able to be met at the time of compliance dates. This provision clarifies that in those situations the MY of the new engines installed cannot be used to determine the compliance date. Instead, the actual MY of the original engine replaced is the correct MY to determine the compliance date. In other words, the compliance dates are based on the original engine's MY as of December 31, 2022.

### **e. Subsection (e)(12)(E) Compliance Extensions**

#### Purpose of Subsection 93118.5(e)(12)(E)

This subsection establishes the compliance extensions that regulated entities may request in certain circumstances, and the application procedures and requirements for applying for each compliance extension.

#### Rationale of Subsection 93118.5(e)(12)(E)

This subsection is critical to provide regulated parties with compliance extensions in certain situations where complying by the compliance dates is not possible. This subsection clarifies how extensions can be combined but not extended beyond December 31, 2034. The end date, except for extensions subject to unlimited renewals, is critical to achieving emission reductions during the implementation

period. This subsection also specifies that renewals to extensions must include the same level of technical analysis as the original application and the same EO review process for analyzing information submitted for deciding to grant or deny the extension. The specific rationale of each compliance extension is discussed further in the following text.

**i. Subsection (e)(12)(E)1. Extension E1: Shore Power and ZEAT Infrastructure Delays**

Purpose of Subsection 93118.5(e)(12)(E)1.

This subsection establishes that the EO may grant a vessel or facility owner or operator required to install infrastructure to support shore power or ZEAT requirements a compliance extension for unforeseen circumstances that are out of the applicant's control. This subsection also establishes the eligibility and application process that applicants must follow to obtain the EO's approval.

Rationale of Subsection 93118.5(e)(12)(E)1.

CARB staff recognizes that with new infrastructure projects, there is a potential for delays from a variety of sources outside the control of the vessel or facility owner or operator. For example, there could be delays related to permitting and construction. As such, this subsection is essential to allowing the regulated parties to apply for compliance extensions due to infrastructure installation delays.

**ii. Subsection (e)(12)(E)1.a. Length of Extension**

Purpose of Subsection 93118.5(e)(12)(E)1.a.

This subsection establishes the length of extension that may be granted if approved by the EO.

Rationale of Subsection 93118.5(e)(12)(E)1.a.

This subsection is necessary to advise the applicants when the compliance extension is expired so that applicants can meet the compliance date without violating the regulation. CARB staff has proposed a one-year extension, renewable once, to ensure that infrastructure is installed as expeditiously as possible while providing reasonable flexibility for factors that are outside of a vessel or facility owner or operator's control.

### **iii. Subsection (e)(12)(E)1.b.i through iv. Eligibility and Application Package**

#### Purpose of Subsection 93118.5(e)(12)(E)1.b.i. through iv.

This subsection establishes the timeline for applicants to submit the extension application package, and the information that must be included in the application for CARB staff to review and make a decision on the request.

#### Rationale of Subsection 93118.5(e)(12)(E)1.b.i through iv.

This subsection is necessary to ensure that applicants are submitting appropriate information to CARB staff to determine whether the application is eligible for the compliance extension requested. CARB staff is requesting a description of the circumstances and what efforts would be undertaken in the future to minimize the need for future extension requests. The requirement to specify the exact timeframe of the needed extension should limit the extension periods to only the time needed to resolve infrastructure delays and deploy zero-emission vessel operations as soon as possible.

### **iv. Subsection (e)(12)(E)1.c. Renewal**

#### Purpose of Subsection 93118.5(e)(12)(E)1.c.

This subsection establishes the timeframe for requesting, and length of renewing an infrastructure compliance extension.

#### Rationale of Subsection 93118.5(e)(12)(E)1.c.

This subsection is necessary to ensure that applicants can renew infrastructure delay extensions if applicants can demonstrate that the infrastructure delays have not been improved, and the challenge of not having infrastructure installed by the expiration of the first compliance extension still exists. The timeline for the submission of a renewal application is consistent with the timeline established for the original extension application.

### **v. Subsection (e)(12)(E)2 Feasibility Extension E2 - No Certified Engines or DPFs Available**

#### Purpose of Subsection 93118.5(e)(12)(E)2.

This subsection establishes an extension if no engines or DPFs are certified or available for any engine or vessel, regardless of fitment.

#### Rationale of Subsection 93118.5(e)(12)(E)2.

CARB staff recognizes that there is a possibility that there could be no certified engines or verified DPFs available for some engines to meet performance standards by their nominal compliance deadlines. This subsection is necessary to allow eligible vessel owners and operators to comply at a later time when engines or DPFs meeting performance standards become certified, verified, and/or available.

#### **vi. Subsection (e)(12)(E)2.a. Length of Extension**

##### Purpose of Subsection 93118.5(e)(12)(E)2.a.

This subsection establishes that technology availability extensions would be granted for two years at a time if approved by EO.

##### Rationale of Subsection 93118.5(e)(12)(E)2.a.

This subsection is necessary to advise the applicants on the duration of a compliance extension so they can meet the compliance date by repowering and/or retrofitting, or requesting an additional extension, without violating the regulation.

#### **vii. Subsection (e)(12)(E)2.b Eligibility and Application Package**

##### Purpose of Subsection 93118.5(e)(12)(E)2.b.

This subsection sets a deadline for applicants to submit an extension request; information must be submitted nine to 12 months prior to the compliance deadline for the first request, and for a renewal. This subsection also establishes the information or documentation that must be included in the application for CARB staff to review and analyze to make a determination for the application, which includes review of certified engines, verified retrofit DPFs, and an engineering analysis to show nothing available can be made to be functional for a vessel.

##### Rationale of Subsection 93118.5(e)(12)(E)2.b.

It is necessary to require applicants to evaluate all U.S. EPA certified engines or CARB verified DPFs to demonstrate that there are no available certified engines or CARB verified DPFs meeting the performance standards. The detailed engineering analysis is essential for CARB staff to properly evaluate the availability of applicable engines or DPFs for specific engines, vessels, and/or in-use vessel operations.

#### **viii. Subsection (e)(12)(E)2.c. Renewal**

##### Purpose of Subsection 93118.5(e)(12)(E)2.c.

This subsection establishes the timeframe for requesting, and renewing a compliance extension pursuant to subsection (E)2.

#### Rationale of Subsection 93118.5(e)(12)(E)2.c.

As marine engine and aftertreatment control technology is evolving because of the efforts made by manufacturers of engines and aftertreatment companies, it is necessary to request applicants to re-evaluate the availability of certified engines and DPFs and renew the extension every two years. The timeline and information needed for renewal application is the same as what is required for the initial application.

#### **ix. Subsection (e)(12)(E)2.d. Additional Provisions**

##### Purpose of Subsection 93118.5(e)(12)(E)2.d.

This subsection establishes additional provisions that applicants must meet to obtain EO approval for an extension pursuant to this subsection.

##### Rationale of Subsection 93118.5(e)(12)(E)2.d.

The additional provisions, including "cleanest engine" requirements, and the provision to address availability of a DPF for different engine manufacturers or models, are necessary to ensure that all near-term actions to reduce emissions are taken even if Tier 4 engines and DPFs are not available for a vessel.

#### **x. Subsection (e)(12)(E)2.d.i. Cleanest Engine Requirement**

##### Purpose of Subsection 93118.5(e)(12)(E)2.d.i.

This subsection establishes that in situations where engines certified to current Tier 3 marine, Tier 4 marine, or Tier 4 Final off-road are available but CARB verified Level 3 DPFs are not available, the applicant must repower the vessel with the available Tier 3 marine, Tier 4 marine, or Tier 4 Final off-road engines and submit an engineering analysis to evaluate the availability of CARB verified Level 3 DPFs every two years.

##### Rationale of Subsection 93118.5(e)(12)(E)2.d.i.

This provision ensures that the cleanest available engines are installed on the vessel during the granted extension period. This subsection also sets a timeframe of six months for applicants to retrofit the engine after a DPF becomes available. CARB staff consider six months as sufficient for vessel owners and operators to order the DPF and have it installed on the vessel.

#### **xi. Subsection (e)(12)(E)2.d.ii Unavailability of a DPF for a Specific Engine Manufacturer or Model**

##### Purpose of Subsection 93118.5(e)(12)(E)2.d.ii.

This subsection establishes that if a verified Level 3 DPF is not verified for one manufacturer of marine or off-road engine but is verified for another manufacturer or

model of engine with the same power rating and engine tier, CARB does not require applicants to replace the existing engine with another engine with DPF retrofit available. However, if applicants repower an engine with a higher tier engine with the same power rating, applicants must install a higher tier engine with DPF retrofit available regardless of engine brand.

Rationale of Subsection 93118.5(e)(12)(E)2.d.ii.

This provision is necessary to ensure that PM emission reductions are achieved by requiring the use of any manufacturer, model, or brand of engine if a retrofit DPF is verified. This provision is also necessary to reduce the cost and financial burden by allowing the original engine to be retained if repowering the engine to a higher emission standard is not required, even if a retrofit DPF is available for another engine manufacturer, model, or brand.

**xii. Subsection (e)(12)(E)3 Feasibility Extension E3 - Engines or DPF not Feasible and Cannot Afford Vessel Replacement**

Purpose of Subsection 93118.5(e)(12)(E)3

This subsection establishes that an applicant may be granted a two-year extension, that can be renewed twice, for a total of up to six years of compliance extension in a situation where engines or CARB verified Level 3 DPFs are available, but vessels cannot be reconfigured or modified to meet performance standards without replacing the vessel, and the applicant cannot pay for a replacement vessel by the compliance date. This subsection also establishes the information and documentation that must be included in the application package, and EO review process and requirements for renewing an extension application.

Rationale of Subsection 93118.5(e)(12)(E)3

CARB staff understands that more stringent performance standards would present technical and financial challenges for many vessels. To better understand the extent of vessel modifications that may be required to accommodate Tier 4 engines or retrofit DPF and SCR aftertreatment, CARB contracted with the California Maritime Academy (CMA) to perform a feasibility and cost analysis for different vessel categories. Findings of this study indicated that some vessel categories would likely require substantial reconfiguration to accommodate newer engines or aftertreatment, and fitment of new equipment is dependent on the unique vessel configuration. Therefore, CARB staff establishes this compliance extension to accommodate the situation where vessel replacement is required to meet performance standards.



### **xiii. Subsection (e)(12)(E)3.a Length of Extension**

#### Purpose of Subsection 93118.5(e)(12)(E)3.a.

This subsection establishes that the feasibility compliance extension would last two years if approved by EO.

#### Rationale of Subsection 93118.5(e)(12)(E)3.a.

This subsection is necessary to inform applicants when the compliance extension would expire so they can meet the compliance dates without violating the regulation. In addition, the length of the extension provides vessel owners and operators certainty in their planning for the frequency of renewing or taking action to repower, retrofit, or replace their vessel to meet performance standards.

### **xiv. Subsection (e)(12)(E)3.b. Eligibility and Application Package**

#### Purpose of Subsection 93118.5(e)(12)(E)3.b.

This subsection sets a timeline of 18 months prior to compliance dates for applicants to submit their application. This subsection also establishes the criteria to be eligible for this compliance extension, and information or documentation that must be included in the application for CARB staff to review and analyze to make a decision on the request for an extension.

#### Rationale of Subsection 93118.5(e)(12)(E)3.b.

This provision is necessary to set a reasonable timeframe of a minimum of 18 months for application submittal. This provides the applicant time to take appropriate actions if the extension is denied. If the applicant expects more time is needed to take action to comply, such as building a new vessel, if the request is denied, the applicant may submit the application to the EO earlier. Because this evaluation is based less on availability of technology than Extension (e)(12)(E)(2), CARB can evaluate the application a greater period of time prior to the compliance deadlines.

#### Purpose of Subsection 93118.5(e)(12)(E)3.b.i.

This subsection establishes that an application must include a technical feasibility analysis demonstrating that no certified engine can be used to repower engines meeting performance standards on the vessel(s) for extensions to repower engines.

#### Rationale of Subsection 93118.5(e)(12)(E)3.b.i.

This provision is necessary to provide CARB staff sufficient information to evaluate the availability and suitability of certified engines for repower to determine whether or not to grant a compliance extension.

#### Purpose of Subsection 93118.5(e)(12)(E)3.b.ii.

This subsection establishes that an application must include a technical feasibility analysis demonstrating that no DPF can be used to retrofit Tier 3 or Tier 4 engines on the vessels for extensions for installing DPFs.

#### Rationale of Subsection 93118.5(e)(12)(E)3.b.ii.

This provision is necessary to provide CARB staff sufficient information to evaluate the availability and suitability of CARB verified DPFs for retrofitting Tier 3 or Tier 4 engines to determine whether or not to grant a compliance extension.

#### Purpose of Subsection 93118.5(e)(12)(E)3.b.iii.

This subsection establishes that an application must include a technical feasibility analysis provided by a third-party naval architect demonstrating that no modifications are feasible to repower and retrofit the vessel for extensions for repowering engines or installing DPFs.

#### Rationale of Subsection 93118.5(e)(12)(E)3.b.iii.

This provision is necessary to provide CARB staff sufficient information to evaluate whether no suitable engines or control technologies physically fit within the existing vessel structure, and no amount of modifications can be made to the vessel structure without compromising its structural integrity. Requiring a third-party naval architect performing a technical feasibility analysis ensures that the analysis is relatively fair, accurate and comprehensive which helps CARB staff with evaluating the application.

#### Purpose of Subsection 93118.5(e)(12)(E)3.b.iv.

This subsection establishes that extensions for repowering engines or installing DPFs, even if feasible, would be considered not feasible if the applicant can demonstrate that passenger capacity would be reduced by 25 percent or more and there is an increase of emissions in their operation as a result.

#### Rationale of Subsection 93118.5(e)(12)(E)3.b.iv.

This provision is necessary to ensure that CARB does not withhold granting a compliance extension if the only feasible modification to a vessel would result in a significant decrease in passengers, which would then increase emissions. For instance, a ferry operator may need to offer more scheduled runs after modifying an in-use vessel, which could increase fuel consumption and emissions from their operation relative to the baseline. Therefore, CARB staff is proposing that passenger reductions of 25 percent or more, combined with demonstration that this level of reduction would result in an increase of operational emissions, would be grounds for receiving a compliance extension for building a new vessel. A new build vessel could then be

designed to accommodate engines meeting performance standards and carry a sufficient number of passengers.

Purpose of Subsection 93118.5(e)(12)(E)3.b.v.

This subsection establishes that an application must include financial information where applicable, which includes at least three years of federal and State income tax documents, and Profit and Loss statements.

Rationale of Subsection 93118.5(e)(12)(E)3.b.v.

This subsection is necessary to provide necessary information for CARB staff to evaluate financial feasibility for vessel replacement. CARB staff considers a minimum three years of financial records is enough to make a sound financial analysis.

Purpose of Subsection 93118.5(e)(12)(E)3.b.vi.

This subsection establishes that an application must include a list of actions that the applicant has taken to comply or in anticipation to comply with the regulation at the earliest compliance date and supporting documentation to demonstrate that these actions have been taken.

Rationale of Subsection 93118.5(e)(12)(E)3.b.vi.

This subsection is necessary to demonstrate to CARB that vessel owners and operators have tried to comply with the Proposed Amendments. A key action is whether vessel owners and operators developed a new business structure after Board approval of the Proposed Amendments in 2022 to pass costs onto consumers or entities receiving their services in order to generate sufficient capital to comply. Other actions may include engine upgrades, and other technical, financial, or environmental assessments to assist CARB staff with evaluating the extension request.

Purpose of Subsection 93118.5(e)(12)(E)3.b.vii.

This subsection establishes that an application must include a list of engines for which the extension is requested, and a demonstration that all other engines within the fleet subject to the applicant's direct control meet the requirements of this section.

Rationale of Subsection 93118.5(e)(12)(E)3.b.vii.

This subsection is necessary to ensure CARB staff does not issue compliance extensions to non-compliant engines or fleets that are operating non-compliant engines.

## **xv. Subsection (e)(12)(E)3.c Renewal**

### Purpose of Subsection 93118.5(e)(12)(E)3.c.i. through 3.c.ii.

This subsection establishes that an additional two-year extension may be granted if applicants can demonstrate that Tier 4 Engines or DPFs continue to be not feasible, and applicants can continue to demonstrate they cannot afford a vessel replacement. This subsection also establishes that this compliance extension cannot be extended beyond December 31, 2034 or a maximum of six years with two exceptions: workboats that have no limits, and selected ferry, excursion, or CPFV vessels that are eligible for a total of eight years.

### Rationale of Subsection 93118.5(e)(12)(E)3.c. i. through 3.c.ii.

It is necessary to specify the total length of time that this extension can be renewed, and the end date for when all compliance extensions would expire. Workboats are not limited in the number of extensions they can be granted if vessel replacement is required because the cost per weighted tons of emissions reduced for this category was significantly higher than every other vessel category on average. Passenger-carrying vessels, including ferries, excursions, and CPFVs may have been more significantly impacted by the global situation that began in 2020 than other vessel categories that do not carry passengers. For vessels in these categories with compliance deadlines on or before December 31, 2024, who can also demonstrate continued lack of financial ability to pay for replacement, would be eligible for an additional two years, for a total of eight years extension under this subsection. Requiring a minimum Tier 3 engines on workboats for unlimited extensions would ensure the cleanest feasible engines are equipped on workboats during extensions period, which would ensure that the greatest emission reductions possible are achieved. The requirement to upgrade to Tier 3 would not apply until December 31, 2034 to allow for the opportunity for a feasible Tier 4 engine to become available.

## **f. Subsection (e)(12)(E)4. Feasibility Extension E4 – Tier 4 Engines with Limited Operating Hours and DPFs not Feasible**

### Purpose of Subsection 93118.5(e)(12)(E)4.

This subsection establishes the requirements of a compliance extension for vessels with Tier 4 engines operating limited hours if DPFs are not feasible without vessel replacement. Engines operating under 2,600 hours/year or 1,300 hours per year if within a DAC are eligible to receive this extension.

### Rationale of Subsection 93118.5(e)(12)(E)4.

This extension is necessary to provide vessel owners and operators flexibility to minimize the number of vessels replaced that are already operating with Tier 4 engines. The threshold of 2,600 hours/year was selected based on using existing cost

effectiveness thresholds of the Carl Moyer program, and this threshold is cut in half for vessels operating within 2 miles of a DAC.

#### **i. Subsection (e)(12)(E)4.a Length of Extension**

##### Purpose of Subsection 93118.5(e)(12)(E)4.a.

This subsection establishes that compliance extensions would be granted in two-year increments if approved by EO.

##### Rationale of Subsection 93118.5(e)(12)(E)4.a.

This subsection is necessary to advise the applicants on the duration of a compliance extension once received so they can prepare to apply for a renewal without violating the regulation.

#### **ii. Subsection (e)(12)(E)4.b. Eligibility and Application Package**

##### Purpose of Subsection 93118.5(e)(12)(E)4.b.

This subsection establishes that the application package must demonstrate that available DPFs do not fit the regulated in-use vessel based on feasibility analysis, and Tier 4 engines have not, and will not operate above the annual hour thresholds. This subsection also requires the application to be received within nine months of the engine's nominal compliance deadline.

##### Rationale of Subsection 93118.5(e)(12)(E)4.b.

This subsection is necessary to ensure that the application includes appropriate and sufficient information for CARB staff to properly evaluate the application. It is important that vessel owners and operators demonstrate and provide technical feasibility analysis supporting their request to ensure extensions are not granted when there are vessel design solutions that can be adopted to accommodate DPFs.

This subsection also establishes that applicants must submit extension requests nine months prior to, and no more than 12 months before, compliance dates or expiration of a previous extension. CARB staff considers the window of nine to 12 months an appropriate balance between giving the vessel owner or operator sufficient time to develop a new compliance strategy if the request for an extension is denied while keeping the window close enough to the compliance date to ensure the analysis reflects the most recent market of available DPFs.

### **iii. Subsection (e)(12)(E)4.c Renewal**

#### Purpose of Subsection 93118.5(e)(12)(E)4.c.

This subsection establishes that renewal requests must be submitted between nine and 12 months prior to an extension expiring. This subsection also specifies the information that must be included in the application for CARB staff to review in order to obtain CARB's approval.

#### Rationale of Subsection 93118.5(e)(12)(E)4.c.

This subsection is necessary to ensure that applicants can request and receive approval for a renewal to their two-year extension as long as they can demonstrate the situations for receiving approval of the original extension have not changed. The timeline for submission of a renewal application is consistent with the timeline established in the original extension application.

### **iv. Subsection (e)(12)(E)4.d Additional Provisions**

#### Purpose of Subsection 93118.5(e)(12)(E)4.d.

This subsection establishes additional provisions that applicants must meet to obtain EO approval for an extension pursuant to this subsection. This subsection also clarifies when the extension may be terminated if the vessel operates over the 1,300 or 2,600 hours/year limits.

#### Rationale of Subsection 93118.5(e)(12)(E)4.d.

This subsection is necessary to clarify which engines onboard a vessel, if not all, are certified to Tier 4 standards, and when the extension may be terminated. CARB staff has proposed that the dominant engines all need to be certified to Tier 4 standards to be eligible for this extension, which are the main propulsion engines on all vessel categories except for barges and dredges, where all auxiliary engines must be certified to Tier 4 engine standards.

### **v. Subsection (e)(12)(E)4.d.i Engine Type Determining Eligibility**

#### Purpose of Subsection 93118.5(e)(12)(E)4.d.i.

This subsection establishes that to be eligible for this extension, only auxiliary engines are required to meet the Tier 4 emission standards and operate below the operating hours threshold for barges and barge-mounted dredges, and only propulsion engines for all other regulated in-use vessel categories except for barges and barge mounted dredges.

#### Rationale of Subsection 93118.5(e)(12)(E)4.d.i.

Barges are not equipped with propulsion engines. As such, it is necessary to require only auxiliary engines on barges to meet Tier 4 marine or Tier 4 Final off-road emission standards. This provision is necessary to provide consistency on Tier 4 standard requirements across different vessel categories.

#### **vi. Subsection (e)(12)(E)4.d.ii Extension Termination**

#### Purpose of Subsection 93118.5(e)(12)(E)4.d.ii.

This subsection establishes the actions that applicants must take if Tier 4 engines operate above hour limits of 1,300 hours/year in a DAC or 2,600 hours/year elsewhere after receiving approval for a compliance extension. This subsection also clarifies that engines operated above the limits are no longer eligible for any future compliance extensions under (E)(4).

#### Rationale of Subsection 93118.5(e)(12)(E)4.d.ii.

It is necessary to clarify that if engines are operated over limits allowed by the extension, the compliance extensions are terminated, and the vessel owner or operator must stop operating vessels, notify CARB within 30 days, and perform another compliance option for the vessel. It is important to clarify that vessels are no longer eligible for this extension if they operate over the limits. CARB staff considers 30 days an appropriate amount of time for applicants to report to CARB, and it is consistent with other reporting requirements in the Proposed Amendments. These provisions ensure that no excess emissions are emitted beyond the approved extension allowed.

#### **vii. Subsection (e)(12)(E)5. Scheduling Extension E5**

#### Purpose of Subsection 93118.5(e)(12)(E)5.

This subsection establishes the requirements for the scheduling extension, which includes the extension period granted, eligibility, and information required to be included in the application package.

#### Rationale of Subsection 93118.5(e)(12)(E)5.

CARB staff recognizes some challenges that vessel owners and operators may come across when trying to comply with the Proposed Amendments as a fleet. This subsection is necessary to address compliance challenges associated with delays on ordering engines, scheduling work needing to be done at shipyards, and scheduling work on multiple vessels within a fleet. Together, this extension provides flexibility for vessel owners and operators.

### **viii. Subsection (e)(12)(E)5.a Length of Extension**

#### Purpose of Subsection 93118.5(e)(12)(E)5.a.

This subsection establishes the length of the extension of one year that may be granted if approved by EO.

#### Rationale of Subsection 93118.5(e)(12)(E)5.a.

This subsection is necessary to advise vessel owners and operators of the length of this compliance extension so they can meet the compliance date without violating the regulation.

### **ix. Subsection (e)(12)(E)5.b Eligibility and Application Package**

#### Purpose of Subsection 93118.5(e)(12)(E)5.b.

This subsection establishes the eligibility for this scheduling extension, including equipment manufacturer delays or installation difficulties, new build vessel delays due to shipyard capacities, multiple engines on multiple vessels with same compliance dates, or multiple engines on a single vessel with different compliance dates. In addition, this subsection establishes that requests must be submitted to the EO in advance of compliance dates.

#### Rationale of Subsection 93118.5(e)(12)(E)5.b.

This subsection is necessary to convey the possible ways that a vessel owner or operator can receive a one-year scheduling extension for engines on vessels in their fleet.

### **x. Subsection (e)(12)(E)5.b.i For Equipment Manufacturer Delays or Installation Difficulties**

#### Purpose of Subsection 93118.5(e)(12)(E)5.b.i.

This subsection establishes the requirements that a vessel owner or operator must meet to be granted an extension for equipment manufacturer delays or installation difficulties; engines must be ordered at least six months prior to compliance dates and the engines or equipment must not have been received.

#### Rationale of Subsection 93118.5(e)(12)(E)5.b.i.

This is not a new provision; it was included in the Current Regulation. CARB staff understands and recognizes that there is a potential for a delay in receiving equipment from an engine or DPF manufacturer, and additionally that there may be installation difficulties. It is necessary to a compliance extension if the applicant ordered new equipment six months before the compliance date, the new equipment has not been



received or installed due to manufacturing delays or excess difficulties, and the applicant has submitted all related documentation for CARB staff to review.

**xi. Subsection (e)(12)(E)5.b.ii for Equipment Manufacturer Delays or Installation Difficulties**

Purpose of Subsection 93118.5(e)(12)(E)5.b.ii.

This subsection establishes the requirement to enter into an agreement with a shipyard one year in advance of compliance dates to be eligible for a one-time, one-year extension due to shipyard delays. Additional documentation must be provided to CARB.

Rationale of Subsection 93118.5(e)(12)(E)5.b.ii.

As discussed in Appendix E, CARB staff acknowledges that shipyards need to have excess capacity for new builds to accommodate natural vessel turnover, any potential growth not accounted for or quantified in inventory projections, and new builds deployed in response to accelerated turnover to meet the performance standards. As such, there is a potential for delay from shipyard that is out of an applicant's control. To address such a possibility, it is necessary to allow for a compliance extension for new-build vessel delays due to delays at shipyards.

**xii. Subsection (e)(12)(E)5.b.iii for Multiple Engines Multiple Vessels with Same Compliance Dates**

Purpose of Subsection 93118.5(e)(12)(E)5.b.iii.

This subsection establishes that vessel owners and operators can qualify for a scheduling extension by having two or more regulated in-use vessels with two or more engines that have the same compliance date. This subsection also establishes the requirements for applying for the extension.

Rationale of Subsection 93118.5(e)(12)(E) 5.b.iii.

This is not a new provision, as this type of extension was included in the Current Regulation. This provision is necessary to relieve repower/retrofit burden for fleets that have multiple engines required to comply by the same compliance date. It is necessary for applicants to identify the engines and vessels with the same compliance dates in the application for CARB staff to determine whether they are eligible for this extension.

**xiii. Subsection (e)(12)(E)5.b.iv for Multiple Engines on Single Vessel with Different Compliance Dates**

Purpose of Subsection 93118.5(e)(12)(E)5.b.iv.

This subsection establishes that CARB staff may grant an applicant a one-time, maximum one year extension for fleets with multiple engines on a single vessel with different compliance dates. This subsection also establishes the requirements for applying for the extension.

Rationale of Subsection 93118.5(e)(12)(E)5.b.iv.

This is a new compliance extension that was not included in the Current Regulation. This provision would allow vessel owners and operators to plan repower/retrofit projects by considering drydock schedules or other operation or maintenance needs. Because the Proposed Amendments are expected to result in some vessel replacements, if the engine model year and therefore compliance dates of engines differ from each other, vessel owners and operators may need to plan to retire the vessel and all of its engines on a single date, rather than separately. It is necessary for applicants to identify the engines and vessels with the same compliance dates in the application for CARB staff to determine whether they are eligible for this extension.

**g. Subsection (e)(12)(F) Special Provisions Applicable to the Use of a Verified Diesel Emission Control Strategies (VDECS)**

Purpose of Subsection 93118.5(e)(12)(F)

This subsection establishes the requirements that vessel owners and operators must meet after installing and operating a retrofit DPF, or VDECS.

Rationale of Subsection 93118.5(e)(12)(F)

This subsection is not new; it was included in the Current Regulation. It is necessary for vessel owners and operators to be aware of the requirements that they must follow after installing DPFs and other VDECS on their vessels. The specific requirements are outlined in the following text.

Purpose of Subsection 93118.5(e)(12)(F)1.

This subsection establishes that the vessel owner or operator must follow the VDECS manufacturer's guidelines to operate and maintain the VDECS after it is installed on the vessel.

#### Rationale of Subsection 93118.5(e)(12)(F)1.

This subsection is necessary to ensure that VDECS are maintained in good working order and operated in accordance with the manufacturer's guidelines to achieve the original level of emission reductions intended by the VDECS manufacturer.

#### Purpose of Subsection 93118.5(e)(12)(F)2.

This subsection establishes the steps that the vessel owners and operators must take within 30 days of the failure of a VDECS.

#### Rationale of Subsection 93118.5(e)(12)(F)2.

It is necessary to require that within 30 days of a failure that vessel owners and operators repair the failed VDECS to good working condition, replace with another working VDECS, or employ another method that would achieve the original level of emission reductions. Detection of failures may coincide with a failure to meet opacity tests, which must be performed biennially or upon CARB audits as set forth in subsection (k). The 30-day timeframe to perform corrective action is consistent with the requirements of subsection (k)(1)(F) and (k)(3)(D).

#### Purpose of Subsection 93118.5(e)(12)(F)3.

This subsection establishes that only the VDECS manufacturer or an authorized dealer or installer can make a determination of whether a VDECS cannot be repaired.

#### Rationale of Subsection 93118.5(e)(12)(F)3.

This provision is necessary to ensure the determination of the reparability of a VDECS is made by authorized installers or the VDECS manufacturer themselves in order to ensure the proper determination is made.

#### Purpose of Subsection 93118.5(e)(12)(F)4.

This subsection establishes that if a VDECS is replaced within 30 days of failure, the original failed VDECS may only remain on the vessel if it is not connected to the exhaust manifold of the engine for which it was originally installed.

#### Rationale of Subsection 93118.5(e)(12)(F)4.

This provision provides flexibility and convenience for vessel owners and operators who need to have the failed VDECS remain on the vessel. CARB staff does not anticipate many failed VDECS to remain on vessels because the new replacement VDECS would likely be installed in the same physical location as the original VDECS. To address situations where failed VDECS do remain onboard the vessel, it is necessary to clarify that the failed VDECS cannot be connected to the exhaust manifold to ensure it is not operated, and to avoid excess emissions.

### **13. Subsection (e)(13) Engine Requirements on Commercial Fishing Vessels**

#### Purpose of Subsection 93118.5(e)(13)

This subsection establishes requirements for new and in-use commercial fishing vessels, which is that engines meet at minimum Tier 2 standards according to a phase-in schedule between 2030 and 2032.

#### Rationale of Subsection 93118.5(e)(13)

It is necessary to establish the requirements that engines on new and in-use commercial fishing vessels must meet to comply with the Proposed Amendments to ensure that the greatest emission reductions possible are achieved in the CHC sector. The requirements for commercial fishing vessels were established separately from regulated in-use vessel categories due to unique economic considerations, such as not being able to pass costs onto consumers. Specific requirements of this subsection are discussed in the following text.

#### **a. Subsection (e)(13)(A) In-Use Engines on In-Use Commercial Fishing Vessels – Requirements for Meeting Tier 2 and Higher Emission Standards**

#### Purpose of subsection 93118.5(e)(13)(A)

This subsection establishes that the engines on in-use commercial fishing vessels must meet U.S. EPA certified Tier 2 or higher emission standards according to the compliance dates set forth in Table 21 of (e)(13).

#### Rationale of Subsection 93118.5(e)(13)(A)

This subsection is necessary to ensure the greatest emission reductions possible are achieved from the CHC sector to meet the health and climate change goals. Without establishing requirements for commercial fishing vessels, the overall goals of the regulation would not be met. The requirement for pre-Tier 1 and Tier 1 engines to meet at a minimum Tier 3 or newer emission standards effectively requires that all engines will be meeting Tier 2 or newer standards by the end of 2032, unless they are eligible for and successfully receive approval for a low-use compliance exception.

#### **b. Subsection (e)(13)(B) Engines on New and Newly Acquired Commercial Fishing Vessels**

#### Purpose of subsection 93118.5(e)(13)(B)

This subsection establishes the engine requirements that new build and newly acquired commercial fishing vessels must meet to comply with the Proposed Amendments.

#### Rationale of Subsection 93118.5(e)(13)(B)

This subsection is necessary to require engines on new-build or newly acquired commercial fishing vessels meet the most stringent emission standards, which is Tier 3 or Tier 4 marine standards or Tier 4 Final off-road standards, to ensure the greatest level of emission reductions are achieved. New vessels are subject to more stringent requirements, including using Tier 4 engines, because they can be designed around the physical dimensions and characteristics of engines.

### **14. Subsection (e)(14) Low-Use Exceptions**

#### Purpose of Subsection 93118.5(e)(14)

This subsection establishes the requirements and application process for vessel owners and operators of regulated in-use vessels and commercial fishing vessels to request and receive approval for low-use exceptions.

#### Rationale of Subsection 93118.5(e)(14)

This low-use concept is not new; it is included in the Current Regulation. This subsection provides an option for vessel owners and operators to receive an exception from complying with performance standards for regulated in-use vessels in subsection (e)(12), cleaner engine requirements for commercial fishing vessels in (e)(13), or ZEAT requirements in subsection (e)(10). This provision is necessary to allow vessels to operate a limited number of hours without repowering/retrofitting engines/vessels to meet the proposed performance standards. The low-use compliance exception is also a pathway for vessel owners and operators to bring vessels into the State for a limited period of time for short-term projects that do not require a significant number of operating hours in RCW. It is necessary to establish an application process so that vessel owners and operators do not abuse the low-use compliance exception and only operate engines not meeting performance standards if they can demonstrate that they have, and will continue to operate engines on vessels in a limited capacity.

#### **a. Subsection (e)(14)(A) EO Approval**

#### Purpose of Subsection 93118.5(e)(14)(A)

This subsection establishes that EO approval must be obtained prior to an engine's compliance date set forth in subsection (e)(12)(D), or (e)(13), or (e)(10), or compliance dates extended from compliance extensions, or entering RCW if vessels come from outside of RCW.

#### Rationale of Subsection 93118.5(e)(14)(A)

This subsection is necessary to ensure that only engines meeting required emissions levels are allowed to operate above the low-use thresholds. Obtaining EO approval prior to operating an engine not meeting required emissions levels is critical to ensure

emission reductions are achieved and that operations of higher-emitting engines are carefully monitored. Newly proposed stringency for vessels operated in or surrounding DACs must also be carefully reviewed by CARB prior to granting approval to the vessel operator. The EO approval letter serves as guidance for the vessel owners and operators regarding reporting, recordkeeping, and other requirements they have to follow to remain in compliance while operating engines with a low-use compliance exception.

#### **b. Subsection (e)(14)(B) Requirements**

##### Purpose of Subsection 93118.5(e)(14)(B)

This subsection establishes the requirements that vessel owners and operators must meet to apply for low-use exceptions.

##### Rationale of Subsection 93118.5(e)(14)(B)

This subsection is necessary to inform applicants of the requirements to be able to be eligible for low-use exceptions, in order for applicants to determine whether their engines/vessels can apply for low-use exceptions.

##### Purpose of Subsection 93118.5(e)(14)(B)1.

This subsection establishes that to be approved as low-use engines, the applicable engine has not, and will not be operated more than the applicable low-use operation limits of 80, 300, 400, or 700 hours for pre-Tier 1, Tier 1, Tier 2, and Tier 3 or 4 engines, respectively. These limits are half of their values for vessels operated within two miles of a DAC.

##### Rationale of Subsection 93118.5(e)(14)(B)1.

It is necessary for the applicant to demonstrate that the applicable engine was able to be arranged to operate less than the low-use hour limit in the past; as such, CARB staff has more confidence to approve the low-use exception for the applicable engine because of the demonstration of past operation. It is also important to require past demonstration of low-use operation to avoid vessel owners and operators from lowering the operational hours on multiple vessels in a fleet rather than repowering to meet required emissions levels. It is necessary to require applicants to demonstrate that the in-use engine has the capability to remain low-use in subsequent years through an activity plan and/or making a commitment to prevent operations from exceeding limits and generating excess emissions. It is necessary to clarify what is defined as operating in DAC areas, because low-use limits are reduced to 50 percent in DAC areas compared to in non-DAC areas.

Purpose of Subsection 93118.5(e)(14)(B)2.

This subsection establishes that to obtain a low-use exception, the vessel owner or operator must be in full compliance with all requirements of the Proposed Amendments.

Rationale of Subsection 93118.5(e)(14)(B)2.

This provision is necessary to ensure CARB staff does not issue low-use exceptions to non-compliant engines or fleets that are operating non-compliant engines.

Purpose of Subsection 93118.5(e)(14)(B)3.

This subsection establishes that no more than five vessels within the applicant's direct control based outside of California shall be eligible for this exception per calendar year. This subsection clarifies that the limit of five vessels does not apply to a California based fleet.

Rationale of Subsection 93118.5(e)(14)(B)3.

This provision is necessary to prevent vessels based outside of California from rotating non-compliant vessels to work within RCW. Without five vessels cap, a large fleet based outside of California may keep operating different low-use vessels in California, which would result in excess emissions.

Purpose of Subsection 93118.5(e)(14)(B)4.

This subsection establishes that newly acquired in-use engines are not allowed to apply for low-use exceptions.

Rationale of Subsection 93118.5(e)(14)(B)4.

This provision is necessary to direct financial investments in newly acquired in-use vessels to those that have the ZEAT or diesel engine systems meeting applicable requirements. This requirement ensures older, higher-emitting engines are not operated in RCW after a person newly acquires a vessel.

**c. Subsection (e)(14)(C) Initial Low-Use Application for EO's Review**

Purpose of Subsection 93118.5(e)(14)(C)

This subsection establishes the documentation and information that must be included in the initial low-use application, and the timeframe to submit the application to the EO.

#### Rationale of Subsection 93118.5(e)(14)(C)

This subsection is necessary to inform applicants of the low-use application process and information required in the application so that applicants are aware of what must be submitted for CARB staff to process, approve or deny an application.

#### Purpose of Subsection 93118.5(e)(14)(C)1.

This subsection establishes that vessel owners and operators must submit an application package at least 60 days prior to an engine's compliance date or before vessels are scheduled to first enter RCW.

#### Rationale of Subsection 93118.5(e)(14)(C)1.

CARB staff considers 60 days adequate for CARB staff to review the application, verify the information submitted, request additional information if needed, and draft a final determination letter.

#### Purpose of Subsection 93118.5(e)(14)(C)2.

This subsection outlines the information and documentation that must be contained in the initial application.

#### Rationale of Subsection 93118.5(e)(14)(C)2.

Approval of a low-use application is required; as such, this subsection is necessary to establish the proper procedures for submitting the application. This subsection is essential to ensuring that the application will provide CARB staff with the necessary information to evaluate whether the application meets the requirements of low-use exceptions. The specific purpose and rationale of these criteria are included in the following text.

#### Purpose of Subsection 93118.5(e)(14)(C)2.a.

This subsection establishes that a request letter must include a table identifying applicable vessels and engines, including vessel name and UVI, engine type, engine make, engine MY, engine serial number and engine family name if applicable.

#### Rationale of Subsection 93118.5(e)(14)(C)2.a.

It is necessary to inform CARB staff of which engines and vessels are included in a request for a low-use exception. Using this information, CARB staff can verify whether the applicable engines are eligible for low-use exceptions.

#### Purpose of Subsection 93118.5(e)(14)(C)2.b.

This subsection establishes that the request letter must include current hour meter readings and evidence showing engines are equipped with a functioning



non-resettable hour meter. The low-use exceptions require the low-use engines to operate below the specified hours limit.

Rationale of Subsection 93118.5(e)(14)(C)2.b.

This provision is necessary to ensure non-resettable hour meters are functioning and accurate to monitor the operation hours after being approved for a low-use exception.

Purpose of Subsection 93118.5(e)(14)(C)2.c.

This subsection establishes that a request letter must include supporting documents to demonstrate that the engine has not operated more than the specified limits in the previous calendar year and is not expected to operate more than the specified limits in the calendar year for the demonstration.

Rationale of Subsection 93118.5(e)(14)(C)2.c.

This subsection is necessary for CARB staff to have sufficient information to verify whether applicable engines operate less than the limits for receiving a low-use exception.

Purpose of Subsection 93118.5(e)(14)(C)2.d.

This subsection establishes that the low-use request letter must include a future activity plan and/or commitment demonstrating that engines will not operate more than the limits in the subsequent years following the demonstration.

Rationale of Subsection 93118.5(e)(14)(C)2.d.

It is necessary to require the applicant to provide plans on how they will keep the in-use engine operating below low-use limits in the future. It is necessary to help CARB staff verify whether their plan sounds reasonable and realistic to make a final determination.

Purpose of Subsection 93118.5(e)(14)(C)2.e.

This subsection establishes if engines are used in capacities not for regulated work, these hours do not count toward the low-use hours limits, but only if they are clearly documented in logbooks for past operation and future activity plans demonstrate how future operation in regulated work will remain below applicable limits.

Rationale of Subsection 93118.5(e)(14)(C)2.e.

The purpose of the Proposed Amendments is to regulate commercial vessel use only. CARB staff recognizes that there are possibilities where vessels may be used for personal pleasure, it is necessary to not count these hours when assessing the annual low-use hours.

#### Purpose of Subsection 93118.5(e)(14)(C)2.f.

This subsection requires that vessel owners and operators who are applying for a low-use exception to provide a list of all vessels with an approved low-use exception that are operating in RCW.

#### Rationale of Subsection 93118.5(e)(14)(C)2.f.

Because vessel owners and operators are limited to five low-use exceptions for vessels that are based outside of California, it is necessary to provide CARB the latest information about which vessels remain operative in RCW.

#### Purpose of Subsection 93118.5(e)(14)(C)3.

This subsection establishes that the EO will rely on the information submitted by the applicant and utilize their engineering judgment to evaluate whether the information meets the criteria when making a decision on a low-use exception request.

#### Rationale of Subsection 93118.5(e)(14)(C)3.

This provision is necessary to advise applicants that approval of low-use exception requests is discretionary, but that the EO will review requests fairly using sound science, good engineering judgment, and without bias.

### **H. Subsection (f) Alternative Control of Emissions**

#### Purpose of Subsection 93118.5(f)

This subsection establishes the provision for an alternative plan referred to as an ACE. Language in this immediate subsection was relocated from subsection (f)(1) of the Current Regulation to clarify that ACE plans can be used to achieve equal or greater emission reductions than required by directly complying with subsection (e)(10), (e)(12), or (e)(13).

#### Rationale of Subsection 93118.5(f)

The ACE is not a new provision and was originally included in the Current Regulation. This subsection is necessary to clarify that ACE plans can be used instead of directly complying with the newly proposed requirements for regulated in-use vessels as defined in subsection (e)(10), (e)(12), or (e)(13).

#### **1. Subsection (f)(1) Requirements for ACE**

##### Purpose of Subsection 93118.5(f)(1)

This subsection establishes the requirements that an ACE application must meet to obtain EO approval of the alternative strategies to comply with the Proposed Amendments.

#### Rationale of Subsection 93118.5(f)(1)

This subsection is necessary for vessel owners and operators who are seeking alternative strategies for compliance to understand the criteria to be eligible for an ACE and what should be contained in the ACE application.

#### Purpose of Subsection 93118.5(f)(1)(A)

This subsection establishes that to receive EO approval, an ACE application must achieve equal or greater emission reductions than the Nominal Compliance Baseline. This provision also sets a time period between January 1, 2023 through December 31, 2034 to evaluate the emission reductions for the ACE. Strategies employed prior to this date, if surplus to the requirements of the Current Regulation, can be quantified for emission reduction after January 1, 2023. The provision clarifies that up to two years of a feasibility extension, if demonstrated, can be considered in an applicant's Nominal Compliance Baseline, to which the ACE will be compared. The Proposed Amendments would remove requirements for strategies to not increase other air pollutants by more than 10 percent.

#### Rationale of Subsection 93118.5(f)(1)(A)

This provision is necessary to ensure that by using chosen alternative emission control strategies, vessel owners and operators can propose ACE plans that would achieve the same or greater emission reductions, relative to the emission reductions required in certain subsections. The emission reduction requirement is critical to achieving the goals of the Proposed Amendments while providing compliance flexibility. The time period for the evaluation of emissions must be specified to ensure ACE plan emission reductions occur within the implementation period of the Proposed Amendments. It is important to allow strategies employed prior to the implementation of the Proposed Amendments to evaluate a vessel owner's or operator's overall efforts to reduce emissions from their operation. It is necessary to clarify whether compliance extensions are allowed when considering the fleet averaging plan. Obtaining CARB's approval on the fleet averaging plan would ensure that the emission reduction requirements are able to be met while providing flexibility to the vessel owner or operator.

#### Purpose of Subsection 93118.5(f)(1)(E)

This subsection lists examples of alternative emission control strategies that applicants could apply for, and outlines details for applying for CAECS. The Proposed Amendments would no longer allow the use of alternative fuels to be a strategy, and clarifies that ZEAT deployment can be used as a strategy to reduce emissions. The Proposed Amendments clarify that emission reductions from an ACE must come from other harbor craft within a person's fleet, and cannot be achieved from other source categories, whether mobile or stationary.

#### Rationale of Subsection 93118.5(f)(1)(E)

This subsection is expanded and modified from the Current Regulation to make the options consistent with other requirements of the Proposed Amendments. For example, it was brought to CARB staff attention that ATB owners and operators may elect to use CAECS instead of repowering and retrofitting engines. CAECS, which would be initially approved for use by OGV vessel operators to comply with the At Berth Regulation, would be required to be evaluated and tested to demonstrate effectiveness at controlling emissions from CHC. Alternative fuels would no longer be allowed to be used as an ACE strategy, because the Proposed Amendments would require the use of R99 on all diesel-powered vessels beginning on January 1, 2023. CARB staff is not aware of any additional emission benefits that would be achievable through fuel-based strategies. Allowing ZEAT to be an alternative compliance strategy could advance ZEAT development and deployment in the marine sector and further reduce emissions and protect public health. It is necessary to specify that the quantified emission reductions in the ACE plan must occur in the harbor craft sector only, which ensures the emission reductions are achieved from CHC themselves.

#### Purpose of Subsection 93118.5(f)(1)(F) through (H) and (J)

These subsections are updated from the Current Regulation with minor changes to clarify that a current ACE can apply after January 1, 2023, by replacing the term homeport with homebase, and clarifying that the ACE applies to the newly proposed requirements in subsections (e)(10), (e)(12), and (e)(13). All other requirements of the ACE from the Current Regulation would remain unchanged and become part of the Proposed Amendments.

#### Rationale of Subsection 93118.5(f)(1)(F) through (H) and (J)

It is necessary to update provisions of the ACE plan for the Proposed Amendments after January 1, 2023. The rationale for changing the term homeport to homebase can be found in section IV.F.44 of this report.

#### Purpose of Subsection 93118.5(f)(1)(I)

This subsection is expanded from the Current Regulation by clarifying that the ACE applications must not use equipment acquired by funds or grants that cannot be used to comply with State regulations, laws, or mandates.

#### Rationale of Subsection 93118.5(f)(1)(I)

This clarification is necessary to ensure that vessel owners and operators understand that emission reductions achieved through air quality incentive programs cannot be used in ACE plan. CARB staff intend to clarify that the requirements of the Proposed Amendments are not intended to undermine or reduce the impact of additional and surplus emission reductions achieved and paid through air quality incentive programs.

#### Purpose of Subsection 93118.5(f)(1)(K)

This subsection establishes that a vessel owner's or operator's ACE plan would not be permitted to result in a higher burden to DACs relative to other communities impacted by the emissions from their vessel operations.

#### Rationale of Subsection 93118.5(f)(1)(K)

This provision ensures that while an ACE plan may achieve overall emission reductions, that emissions are not concentrated into regions that are within two miles of a DAC. It is important that vessel owners and operators evaluate the geographic impact of their operations in the context of the impact to DACs. This is a key provision that CARB staff is proposing to include to promote environmental justice and ensure that cost effective alternatives do not result in unintentional impacts for communities already experiencing cumulative exposure burden.

### **2. Subsection (f)(2) Application Process for ACE**

#### Purpose of Subsection 93118.5(f)(2)

This provision establishes the application process that applicants and CARB would need to follow to submit, review and make a decision on an ACE application.

#### Rationale of Subsection 93118.5(f)(2)

This subsection is updated from the Current Regulation with minor changes for clarification. Specific changes are discussed in the following text.

#### **a. Subsection (f)(2)(A)**

#### Purpose of Subsection 93118.5(f)(2)(A)

Under the Current Regulation, an ACE application may be submitted by February 28 of the first year that compliance is required, which may span between 2009 and 2022. In the Proposed Amendments, CARB staff is proposing to consolidate all ACE plans within the first three years of implementation after January 1, 2023 and require applications to be submitted at least six months prior to the first compliance deadline.

#### Rationale of Subsection 93118.5(f)(2)(A)

It is necessary to require applications at least six months prior to the first date that compliance is required to ensure that applicants have sufficient time to reconsider a compliance plan if the request is not approved. CARB staff is proposing a shorter time window of January 1, 2023 through December 31, 2025 to review and make a decision on ACE plan request to consolidate alternative planning earlier during the implementation period.

## **b. Subsection (f)(2)(C) Completeness Determination**

### Purpose of Subsection 93118.5(f)(2)(C)

This subsection is updated from the Current Regulation by updating the CARB review time from 15 to 30 days, and clarifying that applicants have 30 days to submit the additional documents if an ACE application is incomplete.

### Rationale of Subsection 93118.5(f)(2)(C)

These updates are essential to advise applicants that CARB staff has 30 days to review the application package to determine if the application is sufficient and the applicant has 30 days from the date of receipt of notification to submit supplemental documentation to make the application package complete. CARB staff consider 30 days an appropriate amount of time to review the application, and for applicants to provide supplemental information.

## **c. Subsection (f)(2)(D) Notice of Completeness and 30-Day First Public Comment Period**

### Purpose of Subsection 93118.5(f)(2)(D)

This subsection is updated from the Current Regulation by establishing a timeframe of 30 days for CARB providing a 30-day public comment period to receive comments on ACE applications.

### Rationale of Subsection 93118.5(f)(2)(D)

This update is essential to provide more certainty to applicants regarding the expediency that CARB will take to perform the public review of ACE plans.

## **d. Subsection (f)(2)(F) Final Action**

### Purpose of Subsection 93118.5(f)(2)(F)

This subsection is updated from the Current Regulation by updating the CARB review time from 15 to 30 days, and clarifying that CARB has 30 days to take final action to either approve or deny an ACE application and shall notify the applicant accordingly.

### Rationale of Subsection 93118.5(f)(2)(F)

CARB staff considers 30 days an appropriate amount of time to make a final determination, draft a letter review, and notify applicants. The timeframe of 30 days is consistent with the review time that CARB needs for other applications and requests in the Proposed Amendments.

## **I. Subsection (g) Unique Vessel Identifier Requirement**

### Purpose of Subsection 93118.5(g)

This subsection establishes the unique vessel identifier (UVI) requirements for all harbor craft operating in RCW, including vessels coming from outside of California.

### Rationale of Subsection 93118.5(g)

This subsection is necessary because UVIs can assist facilities in implementing vessel reporting requirements, assist with identifying and reporting non-compliance by non-facility stakeholders or members of the public, and improve accountability and tracking of emission benefits.

This requirement is new; it was not included in the Current Regulation. There is currently no single identifier that can be used across all vessel types subject to the Current Regulation. California DMV and the CDFW require labeling outside of vessels, but most vessels are not registered with DMV or CDFW, and instead are registered with USCG only. USCG does not require visible identifiers on the outside of the hull of the vessel. The nautilus of a vessel is commonly on the outside of the hull but is not unique.

### **1. Subsection (g)(1)**

#### Purpose of Subsection 93118.5(g)(1)(A)

This subsection establishes that all harbor craft operating in RCW are required to have a CARB UVI painted on the vessel including vessels coming from outside of California, and it defines the format of the UVI.

#### Rationale of Subsection 93118.5(g)(1)(A)

Standardizing the UVI in a format starting with "CARB" would help identify the UVI that is issued by CARB. Having a standardized format will make it simple for members of the public, vessel owners and operators, and other stakeholders to quickly identify whether an identifier is a CARB UVI required for compliance with the Proposed Amendments.

### **2. Subsection (g)(2) Requirements**

#### Purpose of Subsection 93118.5(g)(2)(A)

This subsection establishes that all applicable harbor craft will need to have their CARB UVI permanently affixed to their vessel by January 1, 2024.

#### Rationale of Subsection 93118.5(g)(2)(A)

CARB staff considers one year adequate for CARB to issue the UVI to all applicable harbor craft and for vessel owners and operators to affix UVIs on their vessels.

#### Purpose of Subsection 93118.5(g)(2)(B)

This subsection establishes that beginning March 1, 2023, or within 30 calendar days of fulfilling the vessel registration and reporting requirements, whichever occurs later, the EO shall issue CARB UVI numbers via electronic mail or hard copy mailed to the business address provided on the application.

#### Rationale of Subsection 93118.5(g)(2)(B)

This provision is necessary to provide a timeframe for CARB to issue UVI numbers and explain how vessel owners and operators would receive UVI numbers. CARB staff considers 30 days a sufficient amount of time to generate and issue UVI numbers to vessel owners and operators after receiving reports.

#### Purpose of Subsection 93118.5(g)(2)(C)1. through 5.

This subsection defines the specifications that UVIs must follow and identify the locations that UVIs need to be affixed or painted. The specifications include requirements for the size, font, and color of the readily legible letters and numbers, and the background surface of UVIs.

#### Rationale of Subsection 93118.5(g)(2)(C)1. through 5.

This subsection is necessary to ensure that the identification number is readily legible by specifying the format, color, size, and location. It is necessary to require the UVI remain legible for the entire life of the vessel. Specifying the specifications of UVIs on all harbor craft ensures UVIs are uniform, easily found, and recognizable for the public and CARB enforcement staff. CARB staff considers 5 inches in height and 2.5 inches in width for letters and numbers, 10 inches in height and 40 inches in width for background surface to be readily legible. Requiring black letters and numbers and lime green background surface ensures letters and numbers are easily seen.

#### Purpose of Subsection 93118.5(g)(2)(D)

This subsection establishes that registered historic vessels would be allowed to install cast bronze, brass, or carved wooden plaques, or other formats to match their vessel's theme, but shall still be required to affix UVIs to their vessels.



### Rationale of Subsection 93118.5(g)(2)(D)

This subsection is necessary to allow registered historic vessels to maintain the aesthetic appearance of their vessels, while still requiring that they have the entire CARB UVI on both sides of the pilot house in a visible location.

### **3. Subsection (h) Main Engine Idling and Auxiliary Engine Operating and Idling Limits**

#### Purpose of Subsection 93118.5(h)

This subsection establishes the main engine idling and auxiliary engine idling or operating limits that all harbor craft must meet while at dock.

#### Rationale of Subsection 93118.5(h)

This subsection is necessary to reduce emissions and protect public health by limiting both main engine idling time and auxiliary engine idling and operating time when docked, berthed, or moored at any facility. CARB staff has observed, and has received complaints from the public, about extended main engine idling and auxiliary engine operating while harbor craft are at dock. CARB staff's preliminary analysis of electronic engine records provided by some vessel owners and operators indicate that up to 40 percent of all operational hours over the lifetime of the engines were at idle. Idling reduction through shutting off engines or plugging into shore power while at dock would reduce near-source exposure to diesel exhaust, NO<sub>x</sub>, operator fuel expenses, and GHG emissions.

### **4. Subsection (h)(1)**

#### Purpose of Subsection 93118.5(h)(1)

This subsection establishes that beginning on January 1, 2024, no vessel subject to this subsection shall idle propulsion engines or operate or idle auxiliary engines with a power rating of 99 kW or less for more than 15 consecutive minutes when docked, berthed, or moored at any facility.

#### Rationale of Subsection 93118.5(h)(1)

This subsection is necessary to communicate the effective date and time limit for operating auxiliary engines or idling main and auxiliary engines while at dock. This subsection takes effect on January 1, 2024, which would allow facilities sufficient time to install any infrastructure needed to use shore power instead of using on-board electric generators to provide on-board power to the vessel. According to the feedback from the marine industry, CARB staff is proposing a 15-minute idling limit, which is longer than the five-minute limits that are set by other regulations, due to vessels having multiple engines, and the actual operator or captain needing to traverse distances across the vessel to access the engine room and pilot house. 99 kW

was chosen as the upper limit for shore power because this is the maximum power for auxiliary generators that are typically used on a vessel for house load. In cases where generators are larger, they would be used for a functional purpose, such as generators to power pumps on petrochemical tank barges at a refinery terminal.

#### Purpose of Subsection 93118.5(h)(1)(A)

This subsection establishes that the idling and operational limits do not apply to idling or operation at designated facilities for testing, servicing, repairing or diagnosing engine issues.

#### Rationale of Subsection 93118.5(h)(1)(A)

It is necessary to allow sufficient idling time to perform any diagnostic or maintenance related work. The intent of this subsection is to limit excess and unnecessary idling, not idling that is required to be performed for servicing engines. CARB staff proposes this exception would only apply at designated facilities where maintenance activities would occur to minimize confusion or claims that unnecessary or inadvertent idling was for engine or vessel service purposes.

#### Purpose of Subsection 93118.5(h)(1)(B)

This subsection establishes that operational limits do not apply to operation of direct-drive or other non-generator specialty auxiliary engines while at a dockside location.

#### Rationale of Subsection 93118.5(h)(1)(B)

If auxiliary engines are not electric generators, they would not be able to be alternatively powered by shore power while at dock. CARB staff's intent is to use shore power instead of diesel engine power where possible, and not to require that all auxiliary engines are converted to electric generators.

#### Purpose of Subsection 93118.5(h)(1)(C)

This subsection establishes that the idling and operational limits do not apply to engines performing emergency operations.

#### Rationale of Subsection 93118.5(h)(1)(C)

It is necessary to not restrict a vessel owner's or operator's ability to use a diesel engine while at dock if performing emergency operations as defined in subsection (d) of the Proposed Amendments.

#### Purpose of Subsection 93118.5(h)(1)(D)

This subsection establishes that the idling and operational limits do not apply to idling or operation at facilities where shore power is not available or not required pursuant to vessel visit thresholds as defined in subsection (i).

#### Rationale of Subsection 93118.5(h)(1)(D)

It is necessary to allow necessary idling or operational time for engines at facilities where no shore power is available as this is out of the vessel owner's or operator's control.

#### Purpose of Subsection 93118.5(h)(1)(E)

This subsection establishes that the idling and operational limits are 30 minutes instead of 15 minutes for initial startup and crew changes for new working shifts.

#### Rationale of Subsection 93118.5(h)(1)(E)

It is necessary to allow for a longer idling or auxiliary engine operation period for the initial startup each day and between crew changes. CARB received input from vessel stakeholders indicating the range of initial daily inspections and procedures that need to be followed that would not be feasible within a 15-minute window.

### **5. Subsection (h)(2)**

#### Purpose of Subsection 93118.5(h)(2)

This subsection establishes vessel owner and operator shore power responsibilities for complying with this subsection .

#### Rationale of Subsection 93118.5(h)(2)

It is necessary for vessel owners and operators to be aware of their responsibilities when using shore power. It is reasonable that vessel owners and operators would be responsible for the installation, maintenance, and operation of equipment needed on their own vessels to establish shore power connection.

### **6. Subsection (h)(3)**

#### Purpose of Subsection 93118.5(h)(3)

This subsection establishes that if vessel owners and operators require use of shore power, the facility owner or operator must provide available access to power and accessible connection points as outlined in facility infrastructure requirements (subsection (i)).

### Rationale of Subsection 93118.5(h)(3)

This subsection is necessary because facility owners and operators are responsible for providing shore power to auxiliary engines while at dock to meet idling requirements; as such facility owners and operators must provide access to power if available and accessible connection points to enable a shore power connection.

## **J. Subsection (i) Facility Infrastructure Requirements**

### Purpose of Subsection 93118.5(i)

This subsection establishes facility infrastructure requirements for infrastructure to support shore power and ZEAT.

### Rationale of Subsection 93118.5(i)

The Proposed Amendments newly include facility owner and operator responsibilities in addition to the existing vessel owner and operator responsibilities. For vessel owners and operators to be able to comply with idling requirements and requirements for adopting ZEAT vessels in certain vessel categories, it is critical to require facilities and vessel owners and operators to install necessary infrastructure. The specific requirements and rationale is included in the following text.

### **1. Subsection (i)(1) Facility Operator and Facility Operator Shore Power Requirements**

#### Purpose of Subsection 93118.5(i)(1)

This subsection establishes the shore power infrastructure requirements for facility owners and facility operators and establishes joint responsibility between the facility owners and operators to meet this requirement.

#### Rationale of Subsection 93118.5(i)(1)

This subsection is necessary to clarify that facility owners and operators would need to provide up to 99 kW of land-side shore power infrastructure per vessel for vessel owners and operators to meet idling or engine operating requirements as set forth in subsection (h). CARB staff proposes joint responsibility between facility owners and facility operators because lease agreements and terms between the facility owner and operator vary from location. Therefore, it would be the responsibility of the facility owners and operators to develop a mutual agreement or arrangement on the responsibilities to meet this requirement.

**a. Subsection (i)(1)(A)1. through 3.**

Purpose of Subsection 93118.5(i)(1)(A)1. through 3.

These subsections establish the deadline of January 1, 2024 for facility owners and operators to provide and be responsible for maintaining shore power infrastructure if they allow more than 50 vessels to visit per year. This subsection defines a vessel visit as a period of time lasting between one and 24 hours with engine(s) using shore power at a facility.

Rationale of Subsection 93118.5(i)(1)(A)1. through 3.

The Proposed Amendments would take effect on January 1, 2023; CARB staff considers one year an appropriate amount of time for facilities to build shore power infrastructure if a facility is not yet equipped. A vessel visit threshold of 50 visits per year is proposed to ensure facilities that do not conduct business with CHC, such as facilities that primarily have docks for recreational vessels, but occasionally allow CHC to dock, are not required to install shore power for an incremental emissions benefit. This subsection is necessary to clarify that facilities are responsible for installing and maintaining shore power infrastructure in working condition.

Purpose of Subsection 93118.5(i)(1)(A)3.a.

This subsection establishes that a facility owner or operator who is not able to install shore power infrastructure by January 1, 2024 may request a compliance extension as set forth in subsection (e)(12)(E)(1).

Rationale of Subsection 93118.5(i)(1)(A)3.a.

This subsection is necessary to allow facilities that are not able to install infrastructure by the compliance date due to reasons that are out of their control to apply for a compliance extension.

**b. Subsection (i)(1)(B)**

Purpose of Subsection 93118.5(i)(1)(B)

This subsection establishes that facility owners and operators shall install shore power up to 99 kW per vessel, and specifies that shore power needs greater than 99 kW per vessel are not the responsibility of facility owners and operators.

Rationale of Subsection 93118.5(i)(1)(B)

This subsection is necessary to clarify CARB staff intent that facilities are not expected to provide infrastructure for the compliance strategy of a vessel owner or operator for the functional purpose of their vessel. From feedback received, the maximum engine power of an onboard generator is 99 kW. As such, it is necessary to clarify that other

use of electricity other than house load power is not the responsibility of facility owners and operators.

**c. Subsection (i)(1)(C)**

Purpose of Subsection 93118.5(i)(1)(C)

This subsection establishes that if distributed generation is used to supply shore power, the electricity generated must meet the emissions standards defined in subsection (d).

Rationale of Subsection 93118.5(i)(1)(C)

This subsection is necessary to prevent situations where internal combustion engine power from stationary or portable generators is used to provide shore power, which would undermine the emission benefits of using shore power from grid electricity. The standards defined in subsection (d) are intended to achieve emissions levels equal to or more stringent than grid electricity.

**d. Subsection (i)(1)(D)**

Purpose of Subsection 93118.5(i)(1)(D)

This subsection establishes the requirements for facilities that do not provide shore power infrastructure due to not meeting 50 vessel visits threshold. Requirements include submitting an exemption request, obtaining CARB's approval, reporting annual vessel visits, and installing shore power by January 1 of the year that is between 12 and 24 months after reaching 50 vessel visits per year.

Rationale of Subsection 93118.5(i)(1)(D)

This provision is necessary for CARB to effectively implement and enforce the facility infrastructure requirements of the Proposed Amendments. Without applying for an exception, a facility could not provide shore power and claim that they did not offer more than 50 vessel visits per year. It is important to clarify that once facilities offer more than 50 vessel visits per year, that requirements to report and provide shore power are triggered.

**2. Subsection (i)(2) Facility Owner and Facility Operator ZEAT Infrastructure Requirements**

Purpose of Subsection 93118.5(i)(2)

This subsection establishes facility infrastructure requirements for any facility where ZEAT vessels dock or moor at its location.

#### Rationale of Subsection 93118.5(i)(2)

It is necessary to establish clear responsibilities on ZEAT infrastructure for facility owners and operators to understand what they must do to support operation of ZEAT vessels.

#### Purpose of Subsection 93118.5(i)(2)(A)

This subsection establishes that facilities must allow the installation of charging or fueling infrastructure needed to power ZEAT vessels.

#### Rationale of Subsection 93118.5(i)(2)(A)

ZEAT infrastructure is one of the key factors to ensure deployment and operation of ZEAT vessels is feasible. It is necessary to establish that facility owners or operators cannot impede or prevent the installation of ZEAT infrastructure needed where ZEAT vessels dock or moor.

#### Purpose of Subsection 93118.5(i)(2)(B)

This subsection establishes that facility owners and operators must cooperate with vessel owners and operators to allow for surveying, permitting, construction, installation, and maintenance of the necessary charging or fueling infrastructure required to effectively operate ZEAT vessels.

#### Rationale of Subsection 93118.5(i)(2)(B)

This subsection is necessary to establish that facility owners and operators must work with vessel owners and operators to allow the installation of charging or fueling infrastructure to support operation of ZEAT vessels. Without facilities permission and assistance, infrastructure would not be able to be installed and ZEAT vessels would not be able to operate. As such, it would be impossible to deploy the ZEAT vessels in marine sector and owners and operators of ZEAT vessels would not be able to comply.

### **3. Subsection (i)(3) Vessel Owners and Operators ZEAT Infrastructure Requirements**

#### Purpose of Subsection 93118.5(i)(3)(A)

This subsection establishes that ZEAT vessel owners and operators are responsible for purchasing, installing and maintaining ZEAT infrastructure.

#### Rationale of Subsection 93118.5(i)(3)(A)

The installation and maintenance of ZEAT infrastructure can require investments that require cost recovery over a period of time that exceeds the length of lease terms. If the tenant with a particular vessel no longer visits the facility, it may result in stranded

assets for the facility. There is a higher likelihood of stranded assets for harbor craft because technology is becoming commercialized but is not yet standardized. Unlike passenger cars where standard SAE J1772 plug connections are used on most vehicles, the physical connections and charging protocols are not established within the marine sector. Therefore, CARB staff does not propose that facilities should be responsible for installing infrastructure to support ZEAT.

## **K. Subsection (j) Facility Recordkeeping and Reporting Requirements**

### Purpose of Subsection 93118.5(j)

This subsection defines the general information that a facility owner or operator needs to report, and specifies an initial reporting requirement by July 1, 2023 and on an annual basis thereafter.

### Rationale of Subsection 93118.5(j)

This provision is necessary because CARB staff estimates that over one-third of vessels operating in the State, which are subject to the CHC Regulation, has not satisfied the reporting requirements of CARB's Current Regulation. Unreported vessels may have non-compliant engines, and without proper reporting, CARB is limited in its ability to locate, identify, and ensure that the vessels are compliant with the regulation and are achieving the intended emission reductions. To improve the reporting rate and help CARB implementation and enforcement staff identify non-reported harbor craft, it is necessary to establish recordkeeping and reporting requirements for facilities. This will ensure that the applicable facilities are aware of their reporting obligations on harbor craft visiting their facilities.

### **1. Subsection (j)(1)**

#### Purpose of Subsection 93118.5(j)(1)

This subsection establishes that facility owners and operators or marine oil terminal operators must submit an initial list of all vessel tenants no later than July 1, 2023, and report vessel information for all vessel tenants annually thereafter.

#### Rationale of Subsection 93118.5(j)(1)

It is necessary to set July 1, 2023 as the starting date, which is after the effective date and within the first year that the Proposed Amendments would take effect. It is necessary to set visit thresholds of a minimum of seven days per month for a reporting facility, or any number of visits for a marine oil terminal. The basis for reporting vessels staying for seven days or longer is to capture non-reported harbor craft, not necessarily to capture daily vessel activity. During discussions with facility owners and operators in workgroup meetings as outlined in Appendix F, vessels remaining at one location longer than seven days typically require a contract or agreement with the facility. The exception is marine oil terminals, which often have vessels staying for



shorter than seven days, but typically only allow vessels with a contract or business purpose to dock.

#### Purpose of Subsection 93118.5(j)(1)(A)

This subsection establishes the detailed information of what facilities need to report.

#### Rationale of Subsection 93118.5(j)(1)(A)

This subsection is necessary for facilities to be aware of what information they are required to report on an annual basis.

#### Purpose of Subsections 93118.5(j)(1)(A)1 through 3

These subsections establish that facility operators must report facility name, address, and geographic coordinate information.

#### Rationale of Subsections 93118.5(j)(1)(A)1 through 3

These subsections are necessary to identify the facility where vessel owners and operators may be docking or mooring. These subsections are also necessary for CARB to recognize which facility is reporting.

#### Purpose of Subsections 93118.5(j)(1)(A)4 through 7

These subsections establish that facilities must report the property owner name, facility owner or operator, address, and responsible official and applicable facility owner or operator contact information.

#### Rationale of Subsections 93118.5(j)(1)(A)4 through 7

These subsections are necessary so that CARB is able to contact the responsible party for facility reporting related issues or questions.

#### Purpose of Subsection 93118.5(j)(1)(B)

This subsection establishes that each facility must report each vessel's CARB UVI, vessel name, vessel type, and other identifier, such as a USCG or IMO number if no CARB UVI is available.

#### Rationale of Subsection 93118.5(j)(1)(B)

One of the purposes of establishing facility reporting requirements is to improve vessels reporting rate. It is necessary for facilities to report vessel information so that CARB can locate vessels that are operating in California but have not reported to CARB. It is necessary to provide a unique identifier because many vessels have the same non-unique name or Nautilus.

#### Purpose of Subsections 93118.5(j)(1)(C)1. through 5.

These subsections establish that a facility owner or operator must report vessel owner or operator contact information, including company name, mailing address, primary contract, phone number and email address.

#### Rationale of Subsections 93118.5(j)(1)(C)1. through 5.

This information is necessary to report to provide CARB sufficient information to follow up with the vessel owners and operators regarding their compliance obligations under the Proposed Amendments.

#### Purpose of Subsections 93118.5(j)(1)(D) through (F)

These subsections establish that a facility owner or operator must report the start date and end date of each vessel and facility use agreement, and which dock, berth, or slip location or number where a vessel docks at the facility.

#### Rationale of Subsections 93118.5(j)(1)(D) through (F)

This information is necessary to enable CARB staff to corroborate the vessel information as to the period of time that the vessel docks at the facility and the location the vessel is docked, which assist with accurate tracking and locating of vessels for implementation and enforcement of the Proposed Amendments.

#### Purpose of Subsection 93118.5(j)(1)(G)

This subsection establishes that a facility owner or operator must retain and report the annual vessel visits if below 50 visits per calendar year.

#### Rationale of Subsection 93118.5(j)(1)(G)

Facilities with fewer than 50 vessel visits are exempt from the shore power infrastructure requirements and would be subject to shore power infrastructure if 50 vessel visits is reached. As such, it is necessary to request vessel visit information for CARB to determine whether or not a facility has been tracking visits and is required to meet the shore power requirements.

## **2. Subsection (j)(2)**

#### Purpose of Subsection 93118.5(j)(2)

This subsection establishes that facilities with land-side infrastructure must report infrastructure information and it specifies the due date of January 1, 2024 for submitting the required information.

#### Rationale of Subsection 93118.5(j)(2)

This subsection is necessary to ensure that CARB effectively implements and enforces the main engine idling and/or auxiliary engine operating time limits. If a facility is not required to install shore power, then the vessel would be permitted to operate auxiliary engines beyond the 15 or 30 minute limits set forth in subsection (h). Requiring a report submission date of January 1, 2024 aligns with the compliance date of facility shore power requirements in subsection (i). For infrastructure installed after January 1, 2024, a timeframe of 30 days for submission is consistent with other reporting requirements of the Proposed Amendments.

#### Purpose of Subsections 93118.5(j)(2)(A) through (C)

These subsections establish the infrastructure information that facilities must report, which include infrastructure type, manufacturer, serial number, installation date, equipment type supported, number of vessels supported, number of plugs, plug configuration, amperage, and voltage for each connection.

#### Rationale of Subsection 93118.5(j)(2)(A) through (C)

Knowing infrastructure information allows CARB staff to verify the connection compatibility and investigate discrepancies between vessels and facilities, which is critical for effective implementation and enforcement of the Proposed Amendments.

### **3. Subsection (j)(3)**

#### Purpose of Subsection 93118.5(j)(3)(A)

This subsection sets the timeline of three years for retaining records including the date, local time, and position for each vessel tenant, and if applicable, the date of vacancy for each vessel tenant, and it sets an expected delivery time of 30 days to supply CARB with records when requested.

#### Rationale of Subsection 93118.5(j)(3)(A)

This provision is necessary to ensure that facility operators maintain records for a sufficient amount of time for CARB to effectively implement and enforce the regulation. Without any records, it would not be possible for CARB to audit or determine whether a facility was reporting all vessels docking or mooring at a facility. The expected delivery of records in 30 days is consistent with other recordkeeping requirements.

## **L. Subsection (k) Opacity Testing and Emission Control Repair Requirements**

### Purpose of Subsection 93118.5(k)

This subsection establishes requirements and test procedures that all main propulsion engines must follow when conducting opacity tests and defines opacity limits that both main propulsion engines and auxiliary engines must not exceed in order to comply with opacity testing requirements. This subsection also establishes recordkeeping and reporting requirements related to opacity testing for main and auxiliary engines.

### Rationale of Subsection 93118.5(k)

CARB has received complaints about visible emissions coming from harbor craft in several areas of the State. However, the Current Regulation does not have any mechanism to address this issue. This subsection allows CARB to require harbor craft operators to perform opacity testing to ensure vessel owners and operators maintain engines and aftertreatment in proper working condition, identify the cause of excess emissions, and take corrective action accordingly.

### **1. Subsection (k)(1) Test Procedure and Repair Requirements**

#### Purpose of Subsection 93118.5(k)(1)

This subsection defines test procedures for performing opacity testing and establishes repair requirements if the tested engines exceed opacity limits. This subsection specifies that the SAE J1667 recommended practice would be applied to harbor craft under the Proposed Amendments. Specific purpose and rationale of subparts is contained in the following text.

#### Rationale of Subsection 93118.5(k)(1)

This subsection is necessary because it is critical to establish specific test procedures that apply to all harbor craft to ensure all tests are performed in a consistent manner.

#### Purpose of Subsection 93118.5(k)(1)(A)

This subsection establishes that opacity should be measured downstream of all aftertreatment, but upstream of any water muffler or water injection systems into the exhaust stream.

#### Rationale of Subsection 93118.5(k)(1)(A)

It is necessary to clarify the appropriate location for opacity testing to ensure emissions are measured without contamination. The Proposed Amendments would require opacity testing downstream of any aftertreatment, such as a DPF, to ensure it is in proper working order and is repaired if damaged; conversely, opacity testing

would be required upstream of any water exhaust system, because the presence of water vapor or liquid, and/or seawater injection would interfere with the light-absorption measurement of opacity that is intended to detect the presence of soot in the exhaust stream.

#### Purpose of Subsection 93118.5(k)(1)(B)

This subsection outlines test procedures for performing opacity tests.

#### Rationale of Subsection 93118.5(k)(1)(B)

This subsection is necessary because CARB staff is proposing to modify part of the existing SAE J1667 procedure to evaluate emissions while the vessel is accelerating in open water rather than accelerating the engine speed while the engine is disengaged from the propeller or jet drive. As discussed in Appendix E, it is not possible for all harbor craft vessels to disengage the engine from the propeller. Therefore, it is necessary to have clear tangible steps established for opacity testers to follow to ensure tests are conducted consistently between various types of vessels.

#### Purpose of Subsection 93118.5(k)(1)(C)

This subsection establishes that individuals conducting opacity tests must have completed appropriate training and obtained certification on the proper administration of the specified test procedure.

#### Rationale of Subsection 93118.5(k)(1)(C)

This subsection is necessary to ensure opacity testers understand the test procedures, and the opacity testing is performed correctly by following the test procedures established.

#### Purpose of Subsection 93118.5(k)(1)(D)

This subsection establishes that an alternative compliance method may be used if approved in situations where complying with opacity testing requirements is not feasible.

#### Rationale of Subsection 93118.5(k)(1)(D)

CARB staff understands every vessel is unique, and some vessel categories may have logistical limitations to accelerate at full power in open water. This provision is necessary to allow the use of an alternative test procedure if approved by CARB to demonstrate or evaluate whether engines and aftertreatment devices are in proper working condition.

#### Purpose of Subsection 93118.5(k)(1)(E)

This subsection establishes that if a Category 2 or Category 3 engine does not meet opacity limits required, a letter or attestation provided by a certified third-party engine professional may be considered as an alternative compliance method.

#### Rationale of Subsection 93118.5(k)(1)(E)

Category 2 and Category 3 engines are large displacement engines and respond more slowly to changes. In addition, operational characteristics and response vary widely for different engine manufacturers. In some situations, Category 2 or Category 3 engines are not able to meet opacity limits even if engines are functioning properly. As such, this provision is necessary to provide an alternative compliance method if engines are certified to be in proper working condition.

#### Purpose of Subsection 93118.5(k)(1)(F)

This subsection establishes that CARB has authority to perform opacity testing in the field, audit opacity test records at any time, and request necessary actions along with supporting documentation for audit purposes. This subsection also establishes a timeframe by which a vessel owner or operator would need to complete an inspection report of their engines or emission control systems (within 30 days) and perform any corrective action (within 30 additional days).

#### Rationale of Subsection 93118.5(k)(1)(F)

This provision is necessary to enable CARB to evaluate the need for, and request corrective action be taken to repair malfunctioning emission control systems on engines or aftertreatment devices.

#### Purpose of Subsection 93118.5(k)(1)(G)

This subsection establishes that opacity testing is not required for swing engines when maintained at a dockside location but that it is required once installed on a vessel.

#### Rationale of Subsection 93118.5(k)(1)(G)

It is necessary to require swing engines, when operating on a vessel, to perform opacity testing to ensure the engines are subject to the same requirements of any other diesel engine operating on a vessel.

## **2. Subsection (k)(2) Opacity Limits for Main Propulsion and Auxiliary Engines**

### Purpose of Subsection 93118.5(k)(2)(A)

This subsection sets forth a 5 percent opacity limit that both main propulsion engines and auxiliary engines meeting the Tier 3 or 4 + DPF performance standards must not exceed.

### Rationale of Subsection 93118.5(k)(2)(A)

This subsection is necessary so that vessel owners and operators are aware of the opacity limit engines equipped with DPFs must not exceed. The 5 percent opacity limit is consistent with the latest requirements for DPF equipped engines in CARB's PSIP and HDVIP for on-road heavy-duty vehicles.

### Purpose of Subsection 93118.5(k)(2)(B)

This subsection sets forth a 40 percent opacity limit that both main propulsion engines and auxiliary engines not equipped with DPFs must not exceed, regardless of certification level or fuel type, to comply with opacity testing requirements.

### Rationale of Subsection 93118.5(k)(2)(B)

This subsection is necessary so that vessel owners and operators are aware of the opacity limit that non-DPF engines must not exceed. As discussed in Appendix E, CARB staff performed opacity tests on seven vessels, which included tugboats, ferries, workboats, and excursion vessels, representing engines ranging from uncertified pre-Tier 1 engines to engines certified Tier 4 standards. Based on the tests data collected, CARB staff set 40 percent as the opacity limit for non-DPF engines.

## **3. Subsection (k)(3) Biennial Testing Requirements for Main Propulsion Engines**

### Purpose of Subsection 93118.5(k)(3)(A)

This subsection establishes that a vessel owner or operator subject to this subsection must perform opacity testing on main propulsion engines biennially, and the results must be submitted to CARB by March 31 of each even-numbered calendar year.

### Rationale of Subsection 93118.5(k)(3)(A)

This subsection is necessary for vessel owners and operators to be aware of the time frame for conducting opacity tests and the time frame for submitting the test results. The submission date of March 31 is consistent with the submission date of the annual reporting requirements of opacity data in subsection (o)(1). A date of March 31 was selected to provide vessel owners and operators sufficient time to prepare and submit required information at a time not coinciding with the State holidays on and preceding

January 1. CARB staff considers requiring opacity testing once every two years to be a reasonable frequency to detect malfunctioning emission controls considering engines are subject to audit and inspection at any time.

#### Purpose of Subsection 93118.5(k)(3)(B)

This subsection establishes that engines with MY 2020 or newer are exempt from this subsection until the calendar year that is four years after the MY of the engine.

#### Rationale of Subsection 93118.5(k)(3)(B)

This subsection is necessary to avoid self-testing newer engines that have a higher likelihood of being in good working condition compared to engines that are older than four years old. A time frame of four years is also consistent with the opacity testing requirements set forth in CHE Regulation as set forth in 13 CCR 2479.

#### Purpose of Subsection 93118.5(k)(3)(C)

This subsection establishes that if any vessel(s) based outside of California will be in RCW for more than 30 consecutive days, opacity testing must be performed on all applicable engines within 30 days of entering RCW. This subsection also establishes newly installed engines, such as swing engines, are subject to opacity testing under the same timeline.

#### Rationale of Subsection 93118.5(k)(3)(C)

CARB staff considers operating less than 30 consecutive days as temporary operational time; as such, to reduce opacity testing burden on vessel owners and operators, operating in RCW less than 30 days would not require opacity testing, but engines would still remain subject to meeting and complying with opacity limits at all times while within RCW. The provision for newly installed engines is necessary to clarify that those engines, such as swing engines, must be opacity tested within a short time period of their installation to ensure proper function.

#### Purpose of Subsection 93118.5(k)(3)(D)

This subsection establishes the procedures that regulated parties must follow in situations where the opacity exceeds the applicable opacity limits; within 30 days the emission control system must be repaired, and the engine must be retested prior to returning the engine to normal revenue service.

#### Rationale of Subsection 93118.5(k)(3)(D)

It is necessary to require the engine that failed the opacity test be repaired or be taken out of service. It is necessary to require that the engine, DPF, or other emission control systems be repaired such that it meets the opacity requirements before being returned to service. It is necessary to require a post-repair opacity test be performed



to determine if the repairs made were sufficient to meet opacity limits. A period of 30 days was selected, rather than a shorter time period, because if repairs require ordering replacement parts, such as a new substrate for the DPF, the process of diagnosing, ordering, receiving, and installing the new parts may require up to a few months. The 90-day time period is consistent with the requirements for VDECS as specified in (e)(12)(F).

#### Purpose of Subsection 93118.5(k)(3)(E)

This subsection establishes if the post-repair opacity measure is greater than the applicable opacity limits, the engine shall remain out of service until it can be repaired so that the post-repair opacity meets opacity limits.

#### Rationale of Subsection 93118.5(k)(3)(E)

This provision is critical to ensuring the engine is in good working condition and does not return to service until it has been repaired.

### **4. Subsection (k)(4) Opacity Compliance Requirements for Auxiliary Engines**

#### Purpose of Subsection 93118.5(k)(4)(A)

This subsection establishes that auxiliary engines must meet opacity limits but are not required to be tested biennially.

#### Rationale of Subsection 93118.5(k)(4)(A)

As discussed in Appendix E, due to the variety of applications, CARB is not proposing to require biennial opacity testing for auxiliary engines. However, the Proposed Amendments would require auxiliary engines to be subject to meeting proposed opacity limits. Upon receiving complaints or observing auxiliary engines with excess visible emissions, CARB enforcement staff may evaluate compliance with opacity limits using any sound engineering method as defined by SAE J1667 over a 5-inch path length. Appendix E provides more details on methods that may be used to measure the opacity limits for auxiliary engines.

#### Purpose of Subsection 93118.5(k)(4)(B)

This subsection establishes the procedures that must be followed if auxiliary engines do not meet opacity limits.

#### Rationale of Subsection 93118.5(k)(4)(B)

This provision is aligned with the requirements required for main engines when failing to meet opacity limits. It is necessary to require necessary repairs to ensure auxiliary engines in good working condition and meet opacity limits.

## **M. Subsection (I) Compliance Fee Requirements**

### Purpose of Subsection 93118.5(I)

This subsection establishes the compliance fee requirements that would apply to all CHC except for commercial fishing vessels.

### Rationale of Subsection 93118.5(I)

CARB is authorized by HSC 43019.1 to adopt a schedule of fees to cover reasonable costs associated with compliance. This is a new subsection, which was not included in the Current Regulation. This subsection is necessary so that CARB staff is available to effectively implement and enforce the Proposed Amendments. Commercial fishing vessels are not subject to fees for the same reason they are subject to less stringent requirements than the rest of CHC. Commercial fishing vessels are price-takers and are not able to effectively pass on compliance costs to an individual or customer.

### Purpose of Subsection 93118.5(I)(1)

This subsection establishes that fees are only assessed based on the number of main engines and number of vessels; no fees are assessed for auxiliary engines operating on harbor craft.

### Rationale of Subsection 93118.5(I)(1)

It is reasonable that fee payment is based on the number of main engines and number of vessels because the more vessels and main engines a fleet owns or operates, the more time and staff are needed to implement and enforce the Proposed Amendments. Some auxiliary engines are permitted by local air districts or enrolled in PERP and are already subject to other compliance fees. It is necessary to exclude auxiliary engines from CHC compliance fees to avoid vessel owners and operators from paying two sets of fees for the same engines.

### Purpose of Subsections 93118.5(I)(2) through (4)

These subsections instruct vessel owners and operators as to the process and the first deadline of September 1, 2023 for submitting their applicable fee payment amount and establishes that fees are non-refundable except in circumstances as determined by the EO.

### Rationale of Subsections 93118.5(I)(2) through (4)

These subsections are necessary to include so that regulated entities know how to submit their fee payment in order to comply with the compliance fee requirements. It is necessary for regulated entities to understand that fees are non-refundable unless the EO determines that fees can be refunded. A fee due date of September 1 was

chosen is to provide CARB staff sufficient time to process annual reports which ensure the most up-to-date vessel and engine information was used to calculate fees.

#### Purpose of Subsection 93118.5(l)(5)

This subsection sets the annual fees, late fees, and late fee deadlines that each vessel owner or operator of regulated in-use vessels would pay to the EO.

#### Rationale of Subsection 93118.5(l)(5)

In accordance with HSC 43019.1, the fee amount is based on estimates of CARB personnel, travel, and contract costs to conduct implementation and enforcement of the Proposed Amendments. This includes, but is not limited to, receiving and processing vessel and facility reports, outreach and follow-up with regulated parties, review and approval of compliance extension requests, and statewide enforcement of the regulation. Late fees were calculated assuming that the same number of vessel owners and operators not currently reporting to CARB would not pay fees, and the cost of the dedicated staff within CARB's enforcement division for collection of late fees.

### **N. Subsection (m) Recordkeeping Requirements**

#### Purpose of Subsection 93118.5(m)

This subsection defines which information vessel owners and operators need to maintain and be made available upon request to CARB.

#### Rationale of Subsection 93118.5(m)

This subsection is necessary to ensure vessel owners and operators are maintaining all of the necessary information and make it available, if requested, to CARB. This subsection was included in the Current Regulation. The Proposed Amendments makes some clarifications and requires more information to be maintained to reflect the additional requirements in the Proposed Amendments.

#### **1. Subsection (m)(1) Owner or Operator Contact Information**

##### Purpose of Subsection 93118.5(m)(1)(C)

This subsection clarifies that address for the vessel owner or operator refers to the address where the company is located.

##### Rationale of Subsection 93118.5(m)(1)(C)

It is necessary to clarify exactly which address is needed. Vessel registration location might not be the same as the location where the company is located.

## **2. Subsection (m)(2) Vessel Information**

### Purpose of Subsection 93118.5(m)(2)(B)

This subsection clarifies vessel categories for vessel information by specifying sub vessel categories based on the vessel use.

### Rationale of Subsection 93118.5(m)(2)(B)

This clarification and update is necessary to align with industry nomenclature and regulatory requirements. In addition, these categories align with those presented in this ISOR and in the emission inventory calculations. Collecting this information will refine CARB's ability to update emission inventories over time and develop new strategies to reduce emissions from harbor craft.

### Purpose of Subsection 93118.5(m)(2)(C)

This subsection clarifies that vessel homebase is required instead of vessel homeport.

### Rationale of Subsection 93118.5(m)(2)(C)

Some stakeholders expressed confusion between homeport defined in the Current Regulation and hailing port defined by USCG. To eliminate the confusion, the Proposed Amendments would remove references to homeport and instead use homebase.

## **3. Subsection (m)(3) Engine Information (for Each Diesel Engine on the Vessel, Including Swing Engines)**

### Purpose and Rationale of Subsection 93118.5(m)(3)(F)

This subsection clarifies that after January 1, 2023, engine model year instead of year of manufacture of engine is required.

### Purpose and Rationale of Subsection 93118.5(m)(3)(F)

To eliminate confusion over engines manufactured after their designated model year, this provision is necessary to clarify that the Proposed Amendments would require engine MY.

## **4. Subsection (m)(4) Operational Information**

### Purpose of Subsection 93118.5(m)(4)(B)

This subsection clarifies that the total annual hours for commercial operation needs to be maintained and separated from other uses.

#### Rationale of Subsection 93118.5(m)(4)(B)

This information is necessary to satisfy the needs for some requirements, for example, low-use exceptions in (e)(14), in which total annual hours of operation is based on the commercial operation only.

#### Purpose of Subsection 93118.5(m)(4)(C)

This subsection clarifies that the total annual hours of all activities needs to be maintained, including commercial operation, non-commercial operation within and outside of RCW, and daily operational logbooks as needed.

#### Rationale of Subsection 93118.5(m)(4)(C)

This information is necessary to satisfy the needs for some requirements, for example, low-use exceptions in (e)(14), in which total annual hours of operation is based on the commercial operation only.

#### Purpose of Subsection 93118.5(m)(7)

This subsection clarifies that this provision is only applicable until December 31, 2022.

#### Rationale of Subsection 93118.5(m)(7)

The Proposed Amendments removed provisions for near-retirement vessels. As such, it is necessary to clarify that this provision is no longer applicable after January 1, 2023.

#### Purpose of Subsection 93118.5(m)(8)

This subsection establishes that the provision for determining the effective engine model year using the "Engine's Model Year + 5" method pursuant to subsection (e)(6)(D)2 is only applicable until December 31, 2022.

#### Rationale of Subsection 93118.5(m)(8)

Subsection (e)(6) is replaced with subsection (e)(12) in the Proposed Amendments. As such, it is necessary to clarify that this provision is no longer applicable after January 1, 2023.

#### Purpose of Subsection 93118.5(m)(9)

This subsection clarifies that this provision also applies to subsection (e)(12)(E)5 of the Proposed Amendments to comply with subsection (e)(12)(C) and (e)(12)(D).

#### Rationale of Subsection 93118.5(m)(9)

Subsection (e)(6)(E)3 is updated in subsection (e)(12)(E)5 of the Proposed Amendments, and (e)(6) in the Current Regulation is replaced with (e)(12) in the Proposed Amendments. As such, it is necessary to update the reference accordingly to reflect the proper provisions in both the Current Regulation and Proposed Amendments.

#### Purpose of Subsection 93118.5(m)(10)

This subsection clarifies that this provision is also applicable to (e)(12).

#### Rationale of Subsection 93118.5(m)(10)

Subsection (e)(6) in the Current Regulation is replaced with subsection (e)(12) in the Proposed Amendments. As such, it is necessary to clarify this provision applies to (e)(12) in the Proposed Amendments as well.

#### Purpose of Subsection 93118.5(m)(11)

This subsection establishes that records for each VDECS must be retained for the entire VDECS life.

#### Rationale of Subsection 93118.5(m)(11)

This information is necessary to help CARB effectively implement and enforce the Proposed Amendments.

#### Purpose of Subsection 93118.5(m)(13)

This subsection clarifies that this provision is only applicable until December 31, 2022.

#### Rationale of Subsection 93118.5(m)(13)

The Proposed Amendments removed the BACT requirements for new ferries. As such, it is necessary to specify that this provision is not applicable after January 1, 2023.

### **5. Subsection (m)(14) Vessel Information**

#### Purpose of Subsection 93118.5(m)(14)(A)

This subsection establishes that a vessel owner or operator needs to keep a photo of the vessel.

#### Rationale of Subsection 93118.5(m)(14)(A)

This subsection is necessary to differentiate vessels that have the same name. In addition, requiring a photo of the vessel may help CARB determine whether the

reported vessel is classified correctly and assist CARB during other implementation and enforcement activities.

Purpose of Subsection 93118.5(m)(14)(B)

This subsection establishes that a vessel owner or operator must describe vessel activity information.

Rationale of Subsection 93118.5(m)(14)(B)

This provision is necessary to assist CARB to verify whether the vessel category is classified accurately.

Purpose of Subsection 93118.5(m)(14)(C)

This subsection establishes that a vessel owner or operator must maintain records of percent time operated in each vessel category.

Rationale of Subsection 93118.5(m)(14)(C)

This information is necessary to enable CARB to effectively implement the regulation by determining the compliance date of a vessel.

Purpose of Subsection 93118.5(m)(14)(D) and (E)

These subsections establish that a vessel owner or operator must maintain records of the vessel's overnight berthing or mooring location in RCW (if applicable), specify whether the vessel transits interstate continuously, stopping only for commerce or at anchorages, and whether and where the vessel operates exclusively or periodically in RCW.

Rationale of Subsection 93118.5(m)(14)(D) and (E)

This information is necessary to help CARB identify and locate vessels for effective implementation and enforcement of the Proposed Amendments.

Purpose of Subsection 93118.5(m)(14)(F)

This subsection establishes that a vessel owner or operator must keep record of the California DMV CF number if applicable.

Rationale of Subsection 93118.5(m)(14)(F)

This is necessary to allow CARB staff to identify a vessel when DMV CF number is the only number available. Requesting the DMV CF number is not required by the Current Regulation and is a new component. California DMV CF number is a unique number which can be used to identify a certain vessel.

#### Purpose of Subsection 93118.5(m)(14)(G)

This subsection establishes that a vessel seller must maintain documentation of purchase transaction indicating the date, selling party, and purchasing party name.

#### Rationale of Subsection 93118.5(m)(14)(G)

This provision is necessary for CARB to verify whether the vessel is a relocated vessel or newly acquired in-use vessel and ensure that vessel is subject to the appropriate requirements of the Proposed Amendments.

#### Purpose of Subsection 93118.5(m)(14)(H)

This subsection establishes that a vessel seller must maintain transaction records, including the date of sale, the purchasing entity name, and contact information.

#### Rationale of Subsection 93118.5(m)(14)(H)

This provision is necessary to indicate if a vessel has been sold and that the seller has no compliance obligations for that vessel. Knowing the purchasing entity name and contact information would help CARB identify the new operator of the vessel if the buyer did not submit required reporting after purchasing and operating the vessel.

#### Purpose of Subsection 93118.5(m)(14)(I)

This subsection establishes that a vessel owner or operator must maintain records of incentive funding information if any incentive funding is received.

#### Rationale of Subsection 93118.5(m)(14)(I)

This provision is necessary to help CARB staff verify the eligibility of ZEAT credits or ACE plans that are included in the Proposed Amendments.

### **6. Subsection (m)(15) Engine Information (for Each Diesel Engine on the Vessel, Including Swing Engines)**

#### Purpose of Subsections 93118.5(m)(15)(A) and (B)

These subsections establish that a vessel owner or operator must keep record of the general location and applicable tier level of engines.

#### Rationale of Subsections 93118.5(m)(15)(A) and (B)

These subsections are necessary because requiring an engine's general location helps CARB enforcement staff identify the specific engine in the field. Knowing an engine's tier level helps CARB verify the compliance status of the engine.



## **7. Subsection (m)(16) Operational Information**

### Purpose of Subsection 93118.5(m)(16)(A)

This subsection establishes that a vessel owner or operator must record the operating time if a vessel is used to perform emergency operations.

### Rationale of Subsection 93118.5(m)(16)(A)

Emergency operations are not counted toward the operation hours limits in some requirements of the Proposed Amendments, for example annual hours of operation for low-use exceptions. As such, it is necessary to record and report those hours used in emergency operations.

## **8. Subsection (m)(17) Control Equipment (If Applicable)**

### Purpose of Subsections 93118.5(m)(17)(A) and (B)

These subsections establish that a vessel owner or operator must maintain records of DEF consumption and installer information if engines are equipped with SCR systems.

### Rationale of Subsections 93118.5(m)(17)(A) and (B)

Recording DEF consumption helps vessel owners and operators examine whether an SCR system has been functioning properly. Requiring installer information for third-party DPFs and SCRs is necessary for CARB to reach out to the installer if an operator has a tampered configuration, or a problem with the install. This information is also necessary to align and reconcile records reported under CARB's VDECS regulations to effectively implement and enforce the Proposed Amendments.

## **9. Subsection (m)(18) Records of Opacity Testing and Emission Control Repair**

### Purpose of Subsections 93118.5(m)(18)(A) and (B)

These subsections establish that a vessel owner or operator must maintain records of the brand name and model of the opacity meter, and dates of last calibration of the opacity meter and chart recorder.

### Rationale of Subsection 93118.5(m)(18)(A) and (B)

These subsections are necessary to verify whether the opacity meter used meets and is calibrated to SAE J1667 specifications.

### Purpose of Subsections 93118.5(m)(18)(C) and (D)

These subsections establish that a vessel owner or operator must maintain records of information of the smoke meter operator who conducted the test, and name and

address of the contracted smoke test facility or vessel repair facility that conducted the test, if applicable.

#### Rationale of Subsections 93118.5(m)(18)(C) and (D)

These subsections are necessary to verify whether the smoke meter operator is certified and qualified to perform the opacity test. This information is necessary to enable CARB staff to contact the smoke meter operator or the opacity test facility for verification.

#### Purpose of Subsection 93118.5(m)(18)(E)

This subsection establishes that a vessel owner or operator must maintain the record of CARB UVI (if issued) or other UVI, engine model, engine make, engine MY, engine family number if applicable, engine serial number, and test date.

#### Rationale of Subsection 93118.5(m)(18)(E)

It is necessary to identify and report to CARB the engines and vessels on which the opacity tests are performed for effective implementation and enforcement of the Proposed Amendments.

#### Purpose of Subsections 93118.5(m)(18)(F) and (G)

These subsections establish that a vessel owner or operator must maintain the records of the test date, hour meter reading at start of the test, initial smoke test opacity levels (for three successive test readings), average of the three readings, test strips upon request, and test results.

#### Rationale of Subsections 93118.5(m)(18)(F) and (G)

It is necessary to require vessel owners and operators to retain and report the test results to CARB. Without this information, CARB staff would not be able to make a determination of compliance with opacity limits.

#### Purpose of Subsections 93118.5(m)(18)(H), (I), and (J)

These subsections establish that a vessel owner or operator must maintain the records of the date the engine was taken out of service, the hour meter reading on that date if the test failed, documentation associated with repair activity, and post-repair test date and hour meter readings of post-test.

#### Rationale of Subsections 93118.5(m)(18)(H), (I), and (J)

This information is necessary to demonstrate that the necessary repairs have been made for engines that failed the opacity tests. Requiring pre-repair and post-repair test dates is necessary to verify whether the repair has been done within 30 days of

the failed test. The repair information is necessary for CARB to effectively identify whether a compliant post-repair opacity measurement would be unequivocally the result of identifying and fixing the root cause of the failure.

#### Purpose of Subsections 93118.5(m)(18)(K) and (L)

These subsections establish that a vessel owner or operator must maintain records of the post-repair test opacity levels, final test results, and test strips upon CARB's request.

#### Rationale of Subsections 93118.5(m)(18)(K) and (L)

These provisions are necessary to verify whether the repaired engines meet the opacity testing requirements and if further actions are needed.

#### Purpose of Subsection 93118.5(m)(18)(M)

This subsection establishes that a vessel owner or operator must maintain the record of the date an engine is put back in active service and a current hour meter reading.

#### Rationale of Subsection 93118.5(m)(18)(M)

This provision is necessary to keep accurate information on vessel activity and help CARB effectively implement and enforce the Proposed Amendments.

### **10. Subsection (m)(19)**

#### Purpose of Subsections 93118.5(m)(19)(A) and (B)

These subsections establish that a vessel owner or operator must maintain the information of manufacturer, model number, and MY of each component of a ZEAT system, as well as maintenance procedures for the component(s), engine(s) and related equipment for the powertrain.

#### Rationale of Subsection 93118.5(m)(19)(A) and (B)

Maintaining this information is necessary for ZEAT vessel owners and operators to follow the appropriate maintenance procedures to ensure ZEAT systems are in good working condition and reach out to component manufacturers if needed.

#### Purpose of Subsections 93118.5(m)(19)(C), (D), and (E)

These subsections establish that a vessel owner or operator must maintain hours of operation and fuel usage for any onboard combustion engines and zero-emission systems.

#### Rationale of Subsections 93118.5(m)(19)(C), (D), and (E)

It is necessary to maintain the records of operation hours and fuel usage of the combustion engines to ensure combustion engines on ZEAT vessels are not operated in excess of allowable limits and only for emergency operations. A limit of 20 hours per year is established before documentation of emergency operations is needed to avoid administrative work for small incidental operations that may be needed but do not meet the definition of emergency operations.

#### Purpose of Subsection 93118.5(m)(19)(F)

This subsection establishes that the hour meter readings of any combustion engines must be recorded whenever a zero-emission short-run ferry operates in a secondary vocation

#### Rationale of Subsection 93118.5(m)(19)(F)

This subsection is necessary to ensure that short-run ferries that operate in secondary vocations are permitted to operate their combustion engines on those routes, while not counting toward combustion hour limitations of zero-emission vessel requirements. As discussed elsewhere, combustion engines can operate up to 20 hours per year for any reason before needing to demonstrate additional hours are due to emergency operations. If no records were required, and the combustion engines were used to operate the vessel in a secondary vocation, there would be no way to effectively implement and enforce against zero-emission vessel operating requirements.

#### Purpose of Subsection 93118.5(m)(19)(G)

This subsection establishes that any non-zero-emission temporary replacement vessel activity occurring on a dedicated zero-emission short-run ferry route shall be reported separately from annual reports within 30 days of the initial operation.

#### Rationale of Subsection 93118.5(m)(19)(G)

This separate reporting data is necessary to ensure the incremental emissions can be evaluated and the performance of zero-emission vessels can be tracked for CARB staff to continue tracking the progress of ZEAT adoption in the marine industry.

#### Purpose of Subsection 93118.5(m)(19)(H)

This subsection establishes that diesel-powered or hybrid vessels interlining on short-run ferry routes must record and report all engines activity occurring on the short-run ferry route separately from annual reporting for activities not occurring on the short-run ferry route.

#### Rationale of Subsection 93118.5(m)(19)(H)

This separate reporting data is necessary for CARB staff to evaluate the efficacy of the short-run ferry vessel requirements to inform additional stringency for ZEAT within the harbor craft sector.

#### Purpose of Subsection 93118.5(m)(19)(I)

This subsection establishes that a vessel owner or operator must maintain all records specific to a particular ZEAT approved by the EO pursuant to subsection (e)(10)(C).

#### Rationale of Subsection 93118.5(m)(19)(I)

This information is necessary to ensure records are retained that CARB has reviewed and approved a ZEAT system prior to its use.

### **11. Subsection (m)(20)**

#### Purpose of Subsections 93118.5(m)(20)(A) through (D)

These subsections establish that for each vessel adopting ZEAT, a vessel owner or operator must maintain zero-emission infrastructure information, including infrastructure type, manufacturer, serial number, installation date, equipment type, number of equipment supported, capacity (fuel/energy storage volume), amp/voltage, public or private use, and number of plugs.

#### Rationale of Subsection 93118.5(m)(20)(A) through (D)

It is necessary to keep records of infrastructure information because those are required to be reported to CARB to assist with implementing and enforcing requirements for facility owners and operators to support infrastructure.

### **O. Subsection (n) Initial and Compliance Plan Reporting Requirements (Applicable until December 31, 2022).**

#### Purpose of Subsection 93118.5(n)

This subsection establishes that the initial and compliance plan reporting requirements in the Current Regulation are no longer applicable after December 31, 2022. In addition, changes to this subsection to identify the correct new subsection references are made.

#### Rationale of Subsection 93118.5(n)

The Proposed Amendments set forth reporting requirements in subsection (o), which replace the initial and compliance plan reporting requirements in subsection (n) in the Current Regulation. As such, it is necessary to sunset subsection (n) to ensure vessel owners and operators comply with subsection (o) of the Proposed Amendments.

**P. Subsection (o) Reporting Requirements (Applicable on and after January 1, 2023)**

Purpose of Subsection 93118.5(o)

This subsection defines general information regulated entities need to report annually, or need to report under certain circumstances, as well as the due date for reported information.

Rationale of Subsection 93118.5(o)

This provision is necessary to ensure regulated entities are providing all of the necessary information to CARB, and also ensures the information is received in a timely manner.

Purpose of Subsection 93118.5(o)(1)

This subsection establishes that vessel owners and operators must report contact information, vessel information, engine information, operational information, control equipment information, and some maintenance records annually by March 31 of each year, and other records including opacity testing results, and ZEAT vessel information based on reporting periods specified in the respective requirements.

Rationale of Subsection 93118.5(o)(1)

The Current Regulation requires reporting periodically, and only after actions are taken or compliance dates are approaching. CARB staff estimated that over one-third of vessels are not reported, and a greater fraction of owners and operators have not submitted updated reports and maintained records as required by the Current Regulation. Requiring annual reporting helps CARB keep the accurate and the most up-to-date information for engines, vessels and ZEAT related information. This information is needed to effectively implement and enforce the Proposed Amendments.

Purpose of Subsection 93118.5(o)(2)

This subsection establishes that reporting is required under some circumstances in addition to annual reporting requirements.

Rationale of Subsection 93118.5(o)(2)

This subsection is necessary to enable CARB staff to be informed with the most up-to-date information in a timely manner.

#### Purpose of Subsection 93118.5(o)(2)(A) through (C)

These subsections establish that regulated entities must update some information within 30 days of a change, including a significant change of annual hours of operation, vessel category or commercial use, change of hour meter, or purchase, sell, lease, rental, or change of ownership of the vessel, engine, or VDECS. In the case of engine or vessel transaction, both the party in control or possession of the engine or vessel before and after the transaction is responsible for reporting.

These subsections also establish that regulated entities must report required information within 30 days of the initial operation of a vessel brought into RCW, the transfer of a vessel from a California facility to outside of California or the establishment of a new facility within California.

#### Rationale of Subsection 93118.5(o)(2)(A) through (C)

These provisions are necessary to ensure CARB staff has accurate information to effectively implement and enforce the Proposed Amendments. It also helps CARB hold responsible the appropriate party when a violation occurs. CARB staff considers 30 days an appropriate amount of time to report changes, and is consistent with other reporting requirements of the Proposed Amendments.

### **Q. Subsection (p) Violations**

#### Purpose of Subsection 93118.5(p)

This subsection makes minor updates on references to the Health and Safety code.

#### Rationale of Subsection 93118.5(p)

This subsection is carried over from the Current Regulation, but adds one more Health and Safety code section applicable to the Proposed Amendments. It is necessary to ensure applicable Health and Safety code sections specified in this subsection is accurate.

### **R. Subsection (q), (r) and (s)**

#### Purpose of Subsections (q), (r) and (s)

These provisions are included in the Current Regulation and retained and applied to the Proposed Amendments, but subsection numbers are changed.

#### Rationale of Subsections (q), (r) and (s)

The Proposed Amendments add more subsections, making it necessary to renumber the subsection numbers.

**S. Subsection (t) Submittal of Documents (Applicable until December 31, 2022)**

Purpose of Subsection 93118.5(t)

This subsection establishes that the provision of submittal of documents in the Current Regulation is no longer applicable under the Proposed Amendments after December 31, 2022.

Rationale of Subsection 93118.5(t)

This subsection in the Current Regulation is replaced with subsection (u) in the Proposed Amendments. As such, it is necessary to sunset subsection (t) to ensure regulated entities comply with subsection (u) of the Proposed Amendments when submitting reports, applications, or documents.

**T. Subsection (u) Submittal of Documents (Applicable on and after January 1, 2023)**

Purpose of Subsections 93118.5(u)(1) through (2)

These subsections specify how to properly submit reporting information and compliance fees to CARB.

Rationale of Subsections 93118.5(u)(1) through (2)

These subsections are necessary to ensure that any person subject to this section is aware of the proper way to submit data or documents to CARB.



## **V. Benefits Anticipated from Regulatory Action**

### **A. Air Quality**

To estimate the impacts of the Proposed Amendments, staff evaluated the economic and emission impacts of the proposal relative to the baseline (Baseline) scenario for each year of the analysis period from 2023 to 2038. The years of the analysis extend three years post full implementation of the Proposed Amendments. The Baseline for the Proposed Amendments reflects compliance with the Current Regulation and incorporates updates to the CHC vessel inventory.

The Proposed Amendments are expected to reduce emissions of PM<sub>2.5</sub>, DPM, NO<sub>x</sub>, ROG, and GHGs beyond levels achieved under the Baseline (Table V-1). Emission reductions begin in 2023 when the Proposed Amendments would require additional requirements to achieve emission reductions. Staff estimated that from 2023 through 2038, the Proposed Amendments would further reduce cumulative statewide emissions by approximately 1,610 tons of PM<sub>2.5</sub>, 1,680 tons of DPM, 34,340 tons of NO<sub>x</sub>, 2,460 tons of ROG, and 415,060 metric tons (MT) of GHG, relative to the Baseline. Some provisions of the Proposed Amendments will increase GHG emissions, such as requiring use of DPFs that are generally associated with a small fuel penalty. However overall, GHG emission reductions would be achieved because cleaner tiered engines and ZEAT penetrate the CHC fleet. Additionally, the requirement to use R99 diesel fuel will create increased demand for fuel that has significantly lower lifecycle carbon intensity than standard CARB low sulfur diesel fuel. The reductions associated with the use of R99 are not included in Table V-1 because the emission reductions are already accounted within CARB's Low Carbon Fuel Standard (LCFS) program.

**Table V-1. Projected Annual Total PM2.5, DPM, NOx, ROG, and GHG Emission Reductions Resulting from the Proposed Amendments (2023 – 2038)**

Year	PM2.5 (Tons)	DPM (Tons)	NOx (Tons)	ROG (Tons)	GHG (MT)
2023	42	44	584	21	339
2024	53	56	941	53	4,781
2025	62	64	1,239	75	9,139
2026	71	74	1,568	96	15,963
2027	77	80	1,767	110	18,876
2028	83	87	1,906	120	20,204
2029	90	94	2,046	131	21,313
2030	103	108	2,328	164	22,539
2031	117	122	2,585	201	25,342
2032	125	131	2,767	217	29,784
2033	133	139	2,845	222	39,598
2034	136	142	2,853	222	40,709
2035	134	140	2,805	216	41,063
2036	131	138	2,756	210	41,429
2037	129	135	2,703	203	41,804
2038	126	132	2,648	196	42,180
Total	1,610	1,680	34,340	2,460	415,060

Overall, these emission reductions will improve local and regional air quality and mitigate some impacts of global climate change. More on air quality will be discussed in Chapter VI of this Staff Report, and for more information on the methodology for the emission inventory, refer to Appendix H.

## **B. Health Benefits**

### **1. Reduced Ambient PM Levels**

A substantial number of epidemiological studies have found a strong association between exposure to ambient PM and adverse health effects. CARB staff evaluated the impacts the Proposed Amendments would have on both potential cancer risks from DPM, and noncancer health impacts associated with exposure to ambient levels of primary and secondary PM (including PM2.5). Communities located near California’s seaports and marine terminals bear a disproportionate health burden due to their close proximity to emissions from CHC (at dock, and in transit) and other emission sources including trucks, locomotives, and terminal equipment serving the ports. Most California seaports, harbors, marinas, and docks are in urban areas, where people live, work, and go to school. Many of the communities surrounding seaports and harbors are DACs and experience a disproportionately high pollution burden. Emissions from CHC are a significant and growing contributor to community air pollution and associated health impacts.

### **2. Reduction in Potential Cancer Risk**

CARB’s HRA (Appendix G) provides a cancer risk metric, which CARB staff uses to determine the localized health impacts for nearby communities. Cancer risk is

expressed as the chance an individual has of developing cancer if one million people were continuously exposed to a TAC for a specified duration of exposure. For this assessment, the pollutant of concern, is DPM emitted from diesel-fueled internal combustion engines. In 1998, CARB identified DPM as a TAC based on its potential to cause cancer and other health impacts under AB 1807 Toxic Air Contaminant Identification and Control Program.<sup>96</sup> The benefits of reduced cancer risk were quantified by reductions in exposure to DPM from CHC.

#### **a. Population Impacted by Potential Cancer Risk**

The risk to the broader population (based on a 70-year exposure duration) is expressed in terms of the population numbers exposed to each cancer risk level. Staff estimated that full implementation of the Proposed Amendments would benefit millions of Californians living next to major commercial seaports, harbors, marinas, and docks located throughout the California coastline and island regions. Although CARB's HRA only evaluated exposure to residents (also referred to as receptors), it is expected that significant potential cancer risk reduction would also benefit on-site and off-site workers, including, but not limited to, deckhands, vessel operators, longshoremen, crane operators, mechanics, truck drivers, guards, construction workers, and other individuals who work nearby seaports, harbors, and marinas.

As part of CARB's HRA, staff estimated the potential cancer health benefits of reducing DPM emitted from diesel-fueled main and auxiliary engines from CHC (see Appendix G for the detailed HRA methodology).

In the HRA, staff evaluated the health impacts in the South Coast and the San Francisco Bay Area Air Basins. Staff selected these two locations based on CHC activity and overall emissions. The South Coast Air Basin represents about 28 percent of CHC emissions in California while the San Francisco Bay Area Air Basin represents about 37 percent. Staff used air dispersion modeling to estimate the DPM concentrations for the South Coast and the San Francisco Bay Area Air Basins and estimated cancer risks from the modeled results. The estimated cancer risks were calculated for the broader population in the South Coast and the San Francisco Bay Area Air Basins.

When comparing the Proposed Amendments to the Current Regulation, the implementation of the Proposed Amendments in 2023 would reduce the total DPM emissions by approximately 25 percent. In 2038, when comparing the Proposed Amendments to the Current Regulation, it would reduce the DPM emissions by

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<sup>96</sup> CARB, Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant; Part A, Exposure Assessment, April 22, 1998, last accessed July 6, 2021, [https://www.arb.ca.gov/toxics/dieseltac/part\\_a.pdf%20](https://www.arb.ca.gov/toxics/dieseltac/part_a.pdf%20).

approximately 89 percent. Table V-2 below shows the Estimated CHC DPM emission reductions in the South Coast and the San Francisco Bay Area Air Basins.

**Table V-2. South Coast and San Francisco Bay Area Air Basins Estimated CHC DPM Emission Reductions by Implementation Year**

Implementation Year	South Coast DPM Emission Reductions	South Coast DPM Baseline Emissions	San Francisco Bay Area DPM Emission Reductions	San Francisco Bay Area DPM Baseline Emissions
2023	11.8	49.2	17.5	62.5
2038	38.8	43.3	52.0	57.2

Compared to the Current Regulation, implementation of the Proposed Amendments would reduce total DPM emissions by approximately 90 percent and 91 percent for the South Coast Air Basin and San Francisco Bay Area Air Basin, respectively in 2038. As a result, potential cancer risk is also projected to decrease based on CARB staff analysis.

In 2038 without the Proposed amendments, in the San Francisco Bay Area Air Basin, about 7 million people, including 0.5 million people who live in DACs, are estimated to be exposed to a potential cancer risk of >1 chance per million from exposure to DPM. Under the Proposed Amendments compared to a baseline of the Current Regulation in 2038:

- the population weighted-average cancer risk would be reduced from 12 chances per million to 1 chance per million;
- the population exposure to a potential cancer risk level of greater than 50 chances per million would be eliminated; and,
- the population that would be exposed to a potential cancer risk >1 chance per million would reduce to 2 million.

In 2038 without the Proposed Amendments, in the South Coast Air Basin, about 15 million people, including 6 million people who live in DACs, are estimated to be exposed to a potential cancer risk of >1 chance per million from exposure to DPM. Under the Proposed Amendments compared to a baseline of the Current Regulation in 2038:

- the population weighted-average cancer risk would be reduced from 10 chances per million to 1 chance per million;
- the population exposure to a potential cancer risk level of greater than 100 chances per million would be eliminated; and,
- the population that would be exposed to a potential cancer risk >1 chance per million would reduce to 5 million.

For a more detailed analysis and overview of cancer risk estimates, see Appendix G.

### 3. Noncancer Health Impacts and Valuations

#### a. Noncancer Health Outcomes

California experiences some of the highest concentrations of PM<sub>2.5</sub> in the nation.<sup>97</sup> Individuals who live in high-risk areas in the South Coast and the San Francisco Bay Area Air Basins are exposed to higher PM<sub>2.5</sub> concentrations from CHCs than other California residents. These individuals are at a higher risk of developing respiratory impairments as a result of the main and auxiliary CHC engine emissions, especially those individuals within sensitive groups.

The Proposed Amendments would reduce NO<sub>x</sub> and DPM emissions from CHCs, resulting in health benefits for individuals in California. NO<sub>x</sub> includes NO<sub>2</sub>, a potent lung irritant, which can aggravate lung diseases such as asthma when inhaled.<sup>98</sup> However, the most serious quantifiable impacts of NO<sub>x</sub> emissions occur through the conversion of NO<sub>x</sub> to fine particles of ammonium nitrate aerosol through chemical processes in the atmosphere. PM<sub>2.5</sub> formed in this manner is termed as secondary PM<sub>2.5</sub>. Both directly emitted PM<sub>2.5</sub> and secondary PM<sub>2.5</sub> from CHC are associated with adverse health outcomes, such as cardiopulmonary mortality, hospitalizations for cardiovascular illness and respiratory illness, as well as emergency room visits for asthma. As a result, reductions in PM<sub>2.5</sub> and NO<sub>x</sub> emissions are associated with reductions in these adverse health outcomes. Benefits from the reductions include fewer hospital and emergency room visits and avoided premature deaths.

CARB staff used two methods to estimate the noncancer health benefits of the Proposed Amendments. One method used the air dispersion results from the HRA and the other method used the incidence-per-ton (IPT) methodology (see detail on the IPT methodology in Appendix G).

- PM health benefits: For both the South Coast Air Basin and the San Francisco Bay Air Basin, PM health benefits were estimated using the air dispersion results from the HRA. For all the other air basins, staff used the IPT methodology.
- NO<sub>x</sub> health benefits: IPT methodology was used for all air basins.

CARB staff estimated the potential reductions in statewide PM mortality and illness impacts associated with exposure to PM<sub>2.5</sub> from the implementation of the Proposed

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<sup>97</sup> U.S. EPA, Fine Particle Concentrations Based on Monitored Air Quality from 2009 – 2011, July 15, 2012, last accessed July 6, 2021, [https://www.epa.gov/sites/production/files/2016-04/documents/current\\_pm\\_table.pdf](https://www.epa.gov/sites/production/files/2016-04/documents/current_pm_table.pdf).

<sup>98</sup> U.S. EPA, Integrated Science Assessment for Oxides of Nitrogen – Health Criteria, January 2016, last accessed July 6, 2021, [http://ofmpub.epa.gov/eims/eimscomm.getfile?p\\_download\\_id=526855](http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=526855).

Amendments (see Appendix G for the details of Noncancer Health Impacts methodology).

These health outcomes include cardiopulmonary mortality, hospital admissions, and emergency room visits. Based on the analysis, staff estimated that the total number of cases that would be reduced from the implementation of the Proposed Amendments are as follows:

- 531 avoided premature deaths (415 to 651, 95 percent confidence interval (CI)).
- 161 avoided hospital admissions (21 to 299, 95 percent CI).
- 236 avoided emergency room visits (149 to 323, 95 percent CI).

#### **b. Monetization of Health Outcomes**

CARB staff monetized the health outcomes by multiplying incidence by a standard value derived from economic studies.<sup>99</sup> This valuation per incident is provided in Table V-3. The valuation for avoided premature mortality is based on willingness to pay.<sup>100</sup> This value 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 risks of dying in a year. 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,<sup>101</sup> nor does it consider any specific costs associated with mortality such as hospital expenditures. 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 care, out-of-pocket expenses, and lost earnings for both individuals and family members, lost recreation value, and lost household protection

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<sup>99</sup> U.S. EPA, Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses, December 2010, last accessed July 6, 2021, <https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf>.

<sup>100</sup> U.S. EPA, An SAB Report on EPA's White Paper Valuing the Benefits of Fatal Cancer Risk Reduction, July 2000, last accessed July 6, 2021, [https://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/\\$File/eacf013.pdf](https://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/$File/eacf013.pdf).

<sup>101</sup> U.S. EPA, Mortality Risk Valuation – What does it mean to place a value on life?, last accessed July 6, 2021, <https://www.epa.gov/environmental-economics/mortality-risk-valuation#means>.

(e.g., valuation of time-losses from inability to maintain the household or provide childcare).<sup>102</sup>

**Table V-3. Valuation per Incident for Avoided Health Outcomes (2019 \$)**

Avoided Health Outcome	Valuation Per Incident
Deaths	\$9,864,695
Hospital Admissions for cardiovascular illness	\$58,288
Hospital Admissions for respiratory illness	\$50,841
Emergency Room Visits	\$834

Statewide valuations of health benefits were calculated by multiplying the avoided health outcomes by valuation per incident. The total statewide valuation due to avoided health outcomes between 2023 and 2038 totaled \$5.25 billion. These values are summarized in Table V-4. The spatial distribution of these benefits follow the distribution of emission reductions and avoided adverse health outcomes, therefore most cost savings associated with avoided health outcomes for individuals would occur in the South Coast and the San Francisco Air Basins.

**Table V-4. Statewide Valuation from Avoided Adverse Health Outcomes between 2023 and 2038 for the Proposed Amendments**

Avoided Health Outcome	Statewide Valuation
Deaths	\$5,242,800,000
Hospital Admissions	\$8,700,000
Emergency Room Visits	\$197,000

### C. Greenhouse Gases and Black Carbon

Greenhouse gasses (GHG) from diesel engines, which commonly include CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>, are the primary climate forcing agents which contribute to global warming, and other shifts in the climate system observed over the past century are caused by human activities. GHGs and SLCPs such as black carbon (BC) (a subset of PM<sub>2.5</sub>) from CHC contribute to climate change. Climate scientists agree that global warming and other shifts in the climate system observed over the past century are caused by human activities. These recorded changes are occurring at an unprecedented rate. According to new research,<sup>103</sup> unabated GHG emissions could cause sea levels to rise up to 10 feet by the end of this century—an outcome that could devastate coastal communities in California and around the world.

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<sup>102</sup> CARB, The Economic Value of Respiratory and Cardiovascular Hospitalizations, May 31, 2003, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/99-329.pdf>.

<sup>103</sup> California Ocean Protection Council Science Advisory Team Working Group, Rising Seas in California: An Update on Sea-Level Rise Science, April 2017, last accessed July 6, 2021, <https://opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf>.

California is already feeling the effects of climate change, and projections show that these effects will continue and worsen over the coming decades. The impacts of climate change on California have been documented by OEHHA in the Indicators of Climate Change Report.<sup>104</sup>

The Proposed Amendments would achieve GHG benefits. This is mainly achieved by reducing fuel consumption through the use of shore power and the requirement for ZEAT. Additionally, the Proposed Amendments require Tier 4 engines, which are generally associated with less fuel consumption per unit work relative to older engines, such as uncertified engines or those certified to marine Tier 1, Tier 2, and Tier 3 emission standards. For a period starting with the first implementation in 2023 through 2038, GHG emissions on average are reduced by 5 percent by implementing the Proposed Amendments. Therefore, the forecasted GHG emission reductions for the Proposed Amendments are a net benefit.

#### **D. Additional Benefits**

##### **1. Passengers**

In addition to regional and local air quality benefits, passengers onboard vessels would have the potential for substantially less exposure to air pollutants, such as DPM and NOx. The immediate on-source exposure implications of passengers are not quantified in regional or local HRA work presented in Appendix G. While vessels are in transit and moving, passengers may not be directly exposed to the exhaust of the vessel. However, while transiting at lower speeds, maneuvering, or while embarking or disembarking from the vessel, there is likely exposure to the exhaust of the main and auxiliary engines of the vessels. The Proposed Amendments would require use of cleaner diesel engines, ZEAT, and shore power, which collectively will reduce emissions and exposure to CHC engine exhaust. Additionally, ZEAT requirements would require the use of quieter zero-emission and other advanced technologies compared to diesel technology. Passengers would have reduced exposure to high noise levels due to the Proposed Amendments.

##### **2. Technology Providers**

The Proposed Amendments are expected to result in benefits to the OEM of engines, VDECS manufacturers, battery systems manufacturers, hydrogen fueling system manufacturers, diesel engine repair shops, opacity testing equipment manufacturers, and DPF installation, repair, and maintenance centers.

The Proposed Amendments would provide fleets the options to repower older engines or install exhaust retrofits as part of their overall strategy to meet

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<sup>104</sup> OEHHA, Indicators of Climate Change in California, May 2018, last accessed July 6, 2021, <https://oehha.ca.gov/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf>.



performance requirements. It will provide market opportunities for engine OEMs and VDECS manufacturers to advance and innovate technology to develop compliance strategies.

The Proposed Amendments would require ZEAT on all short-run ferries and new excursion vessels. The Proposed Amendments would also provide fleet incentives to adopt ZEAT in the form of additional compliance time on other selected conventional (e.g., diesel-fueled) vessels within their fleets. CARB staff's proposal, therefore, includes both requirements, and additional incentives for fleet operators to adopt ZEAT. In turn, the Proposed Amendments would provide multiple pathways and different market opportunities for ZEAT manufacturers, such as battery systems, electrical charging infrastructure, and hydrogen fueling system manufacturers, the opportunity to develop new technology.

The Proposed Amendments would require vessels to perform opacity testing every other year (biennially). This would benefit the opacity testing equipment manufacturers, and the testing companies who perform pay-for-service opacity testing for operators of diesel fleets. The engines and emission control systems (e.g., DPFs) on vessels that fail to meet opacity test limits would be required to repair the engines and emission control systems. These additional repair activities would provide immediate emission benefits and would also benefit the diesel engine repair shop industry.

The Proposed Amendments would require engines aboard vessels to be retrofitted with DPF aftertreatment devices for compliance. This would provide additional business opportunities for diesel repair shops, boatyards, or other companies that will perform repowers, vessel modifications, and installations of aftertreatment devices.

### **3. Construction**

The Proposed Amendments would provide opportunities for both larger and smaller engineering, construction, and design firms to redesign and expand existing seaport, harbor, marina, or other dockside infrastructure to accommodate CHC owner and operator compliance strategies. The Proposed Amendments would provide opportunities for naval architecture firms that will perform evaluations and design for Vessel repowering and retrofitting. The Proposed Amendments would also benefit alternative fuel suppliers to construct additional pipeline networks to feed directly to the seaports, providing additional benefits for other freight equipment. The utilities and electrical infrastructure component OEMs would benefit from the opportunities to expand dock power, hydrogen fuel delivery, and charging services to the seaports. CARB staff is not anticipating large-scale deployment of new electrical substations by local utilities. However, in the event that such installation is needed, large-scale upstream infrastructure may catalyze further development of local distributed electrical generation networks.

#### **4. Technology Research and Development**

The Proposed Amendments would provide an incentive for both university research centers and OEMs to expand innovative technology into the market.

The Proposed Amendments would require vessels to use R100 or R99 to achieve additional NO<sub>x</sub> and DPM reductions beyond those achieved by engines meeting the proposed emissions performance standards. The requirement to use R100 or R99 could increase the demand for additional alternative fuels. For example, by creating market demand at seaports, marinas, and harbors along the California coastline, additional distribution and point-of-sale locations may be established in response to the Proposed Amendments. This would increase demand for renewable diesel benefiting the renewable diesel production sector and would have an additional benefit of providing demand for low-carbon fuels credited through CARB's LCFS program.

#### **5. Out-of-State and International Impacts**

Successful adoption of the Proposed Amendments may provide an example to other regions outside of California and worldwide to adopt their own programs. For example, in the federal CAA § 209(e)(2)(B), other qualifying states have the option to adopt and enforce California non-road (marine) standards that have been granted an authorization, provided, in pertinent part, that such states adopt emission standards that are identical to the authorized California standards. In September 2020, the NJDEP gave a presentation outlining potential future plans to harmonize with CARB's Current Regulation and/or Proposed Amendments to the CHC Regulation.<sup>105</sup> Establishing identical requirements in other states would provide a greater incentive for manufacturers of cleaner diesel engines, DECS (retrofit DPFs), and ZEAT for marine applications.

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<sup>105</sup> NJDEP, Ocean Going Vessels & Harbor Craft, Stakeholder Meeting - September 16, 2020, last accessed July 6, 2021, <https://www.nj.gov/dep/workgroups/docs/njpact-air-co2-20200916-ogv-pm-pres.pdf>.

## VI. Air Quality

### A. Objective

CARB programs focus on three distinct emission reduction goals: (1) reduce localized potential cancer risk from TACs, (2) control NO<sub>x</sub>, PM<sub>2.5</sub>, and criteria pollutants to meet local, regional, State, and NAAQS, and (3) limit GHGs that contribute to the global burden of climate change.

The Proposed Amendments to the CHC Regulation are intended to further protect the health of California's residents by reducing diesel engine emissions from CHC. This chapter summarizes the potential air quality impacts in California in response to the Proposed Amendments to the CHC Regulation. This chapter includes the following elements: (1) an overview of the emission inventory methods; (2) description of the baseline used to estimate emission benefits of the Proposed Amendments to the Current Regulation; (3) summary of health analyses, and (4) changes in emissions due to the Proposed Amendments to the Current Regulation. For an explanation of the specific benefits resulting from the air quality impacts, see Chapter V.

### B. Emissions Inventory Methods

CARB staff has updated the emissions inventory for CHC to reflect new information and improved methodologies. The revised emission inventory used to support the Proposed Amendments (hereafter, called the 2021 Emissions Inventory) is an updated version from the previous emissions inventories released by staff. The inventory update is used to support the emission reduction quantifications in the Proposed Amendments, which are used for local and statewide planning efforts, the health benefit valuation, and an HRA showing additional benefits of lowered emissions after implementation of the Proposed Amendments. A description of the emission inventory methodology and estimates of reductions are provided in this chapter. For full details of the 2021 Emissions Inventory for CHC, see Appendix H.

The 2021 Emissions Inventory was updated with the following input data available at the time of the update:

- Vessel and engine population and profile data obtained from POLA, POLB, Port of Oakland, CARB reporting data 2019,<sup>106</sup> and USCG data;<sup>107</sup>

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<sup>106</sup> CHC engine data reported to CARB by owners/operators under the CHC Regulation, February 2019.

<sup>107</sup> USCG, Merchant Vessels of the United States, March 2019, [https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy\(CG-5P\)/InspectionsCompliance\(CG-5PC\)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx](https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy(CG-5P)/InspectionsCompliance(CG-5PC)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx).

- Population and activity growth factors were estimated based on historical trends in the past decade;<sup>108, 109, 110, 111</sup>
- Survival and purchasing curves were developed from the age distribution of CHCs in CARB reporting data from 2019;
- Load factors were updated using CARB reporting data and Engine Control Module (ECM) data voluntarily supplied by industry during 2019 and 2020; and
- Emission factors (EFs) were updated using U.S. EPA marine<sup>112</sup> and off-road<sup>113</sup> engine certification data.

CARB's 2021 Emissions Inventory estimates rely on the best available data for CHC. The updated inventory methodology used CARB and ports reporting data between 2010 and 2019 to project future baseline and control emissions scenarios for each vessel type, engine type (i.e., main engine or auxiliary engine), and pollutant.

The basic equation used to calculate per engine emissions is as follows:

$$E = \sum_{i,j,k,l,m} POP_{i,j,k,l,m} * A_{j,k,n} * HP * LF_{j,k} * EF_{j,l,m} * FCF_{j,m}$$

Where:

- E is the amount of emissions of a pollutant (NO<sub>x</sub>, DPM, ROG and GHGs) emitted (grams);
- i, j, k, l, m, n: location, vessel type, engine type, rated hp bin, MY, age;
- POP: population of engines;
- A: average activity in annual operating hours (hr);
- HP: rated brake-horsepower for each equipment type (bhp);

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<sup>108</sup> POLA, Annual Inventory of Air Emissions, last accessed July 6, 2021, <https://www.portoflosangeles.org/environment/air-quality/air-emissions-inventory>.

<sup>109</sup> POLB, Emissions Inventory, last accessed May 19, 2021, <https://polb.com/environment/air/#emissions-inventory>.

<sup>110</sup> CARB reporting database from 2010 to 2018

<sup>111</sup> WETA, 2016 Strategic Plan, last accessed July 6, 2021, <https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WETAstrategicPlanFinal.pdf>.

<sup>112</sup> U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Marine Compression-Ignition (CI) Engines, 2020, last accessed July 7, 2021, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.

<sup>113</sup> U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Nonroad Compression Ignition (NRCI) Engines, 2020, last accessed July 7, 2021, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.

- LF: Load factor (unit-less);
- EF: Emission factor, adjusted for deterioration (grams/bhp-hr); and
- FCF: Fuel correction factor (unit-less).

### **C. Air Quality Impacts**

CARB staff projected NO<sub>x</sub>, DPM, GHG, and ROG emissions from main and auxiliary engines for two scenarios from all regulated and unregulated CHC categories from 2023 to 2038. The two scenarios assume:

- 1) No further requirements were imposed beyond the Current Regulation after calendar year 2022 (baseline emissions).
- 2) The implementation timeline for the Proposed Amendments to the CHC Regulation consists of compliance deadlines between 2023 and 2031, with most compliance extensions expiring by 2034. The Proposed Amendments would accomplish emission reductions goals by requiring engines to meet a more stringent performance standard for new and in-use vessels. The addition of vessel categories not covered by the Current Regulation, including CPFVs, commercial fishing, all barges, pilot, research, and workboat vessels would also accomplish additional emission reductions that are needed in areas where CHC operate.

The projected emissions for each scenario are listed below. Most emission reductions are achieved after compliance dates ending for regulated in-use vessels on December 31, 2031, which are reflected in emissions projections for the 2032 calendar year. Full compliance with the Proposed Amendments will occur by December 31, 2034, which coincides with the expiration of the most remaining compliance extensions. Emissions projections in 2035 and ongoing reflect the full projected emissions benefits of the Proposed Amendments. Comparing the scenarios with each another provides a quantitative demonstration of the changes of emissions associated with the Current Regulation (Baseline) and the Proposed Amendments.

Figure VI-1. Projected Annual NOx Emissions from All CHC Vessels Statewide

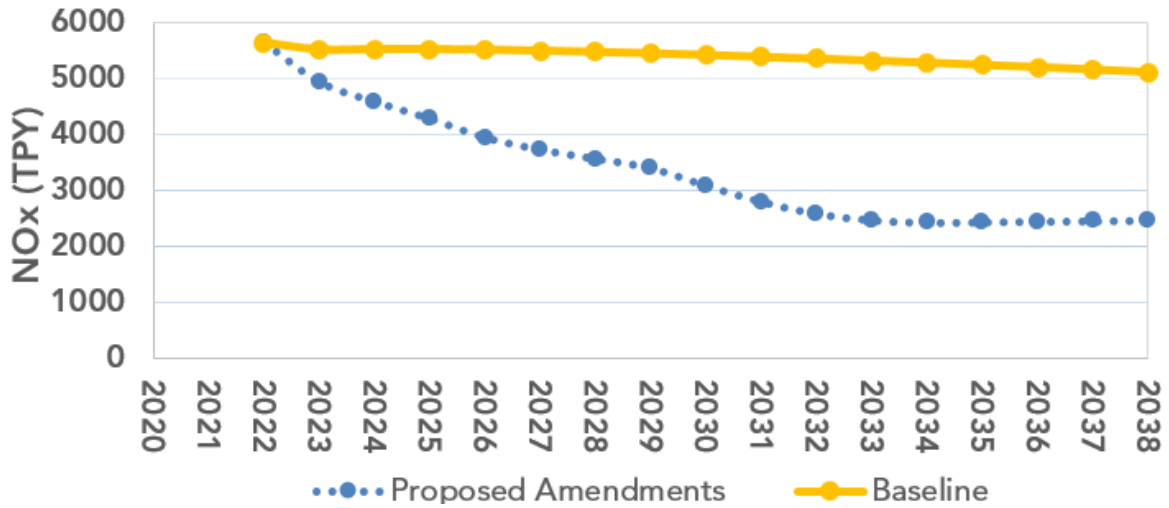


Figure VI-1 presents projected NOx emissions from 2022 to 2038 for the two scenarios. Relative to the Current Regulation, the Proposed Amendments are projected to reduce a cumulative total of 34,340 tons of NOx from 2023 to 2038. In 2038, when comparing the Proposed Amendments to the Current Regulation, NOx emissions would be reduced by about 52 percent, from 5,120 tons per year (TPY) to 2,470 TPY.

Figure VI-2. Projected Annual DPM Emissions from All CHC Vessels Statewide

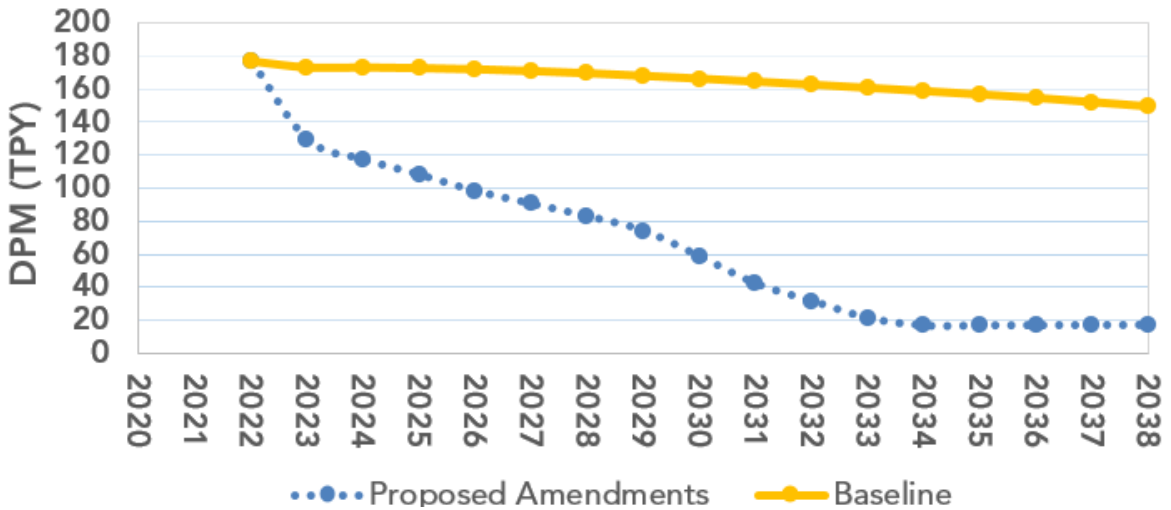


Figure VI-2 presents projected DPM emissions from 2023 to 2038 for the two scenarios. Relative to the Current Regulation, the Proposed Amendments are projected to make significant reductions in DPM emissions. From 2023 to 2038, the Proposed Amendments would reduce approximately 1,680 tons of DPM. In 2038, when comparing the Proposed Amendments to the Current Regulation, DPM emissions would be reduced about 89 percent, from 149 TPY to 17 TPY.

Figure VI-3. Projected Annual GHG Emissions from All CHC Vessels Statewide

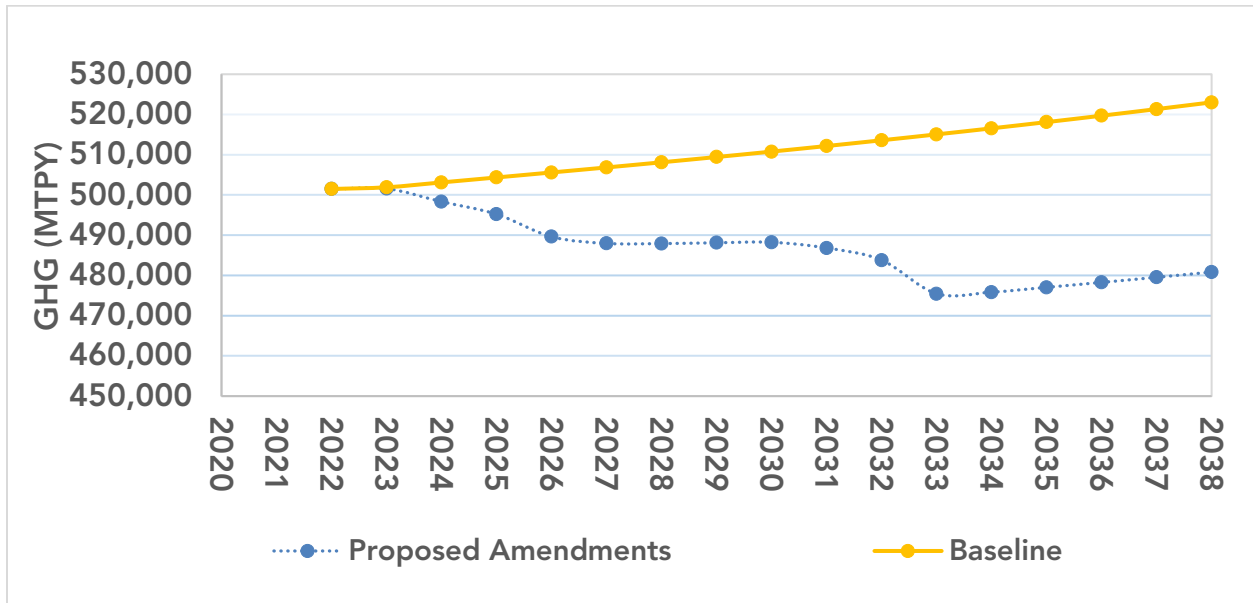


Figure VI-3 presents projected GHG (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) emissions from 2023 to 2038 for the two scenarios. The y-axis scale for GHG emissions starts from 450,000 metric tons per year (MTPY) rather than from zero to better show the difference in emissions between 2026 and 2038. The overall trend of annual GHG emissions for the baseline is expected to increase slightly between 2023 and 2038, which is due to increased CHC activity. The annual GHG emissions for the Proposed Amendments are expected to decrease slightly between 2023 and 2038, which is due to the ZEAT requirements and regulatory incentives which would result in the introduction vessels with zero-emission operation.

Relative to the Current Regulation, the Proposed Amendments are projected to reduce approximately 415,060 MT of GHG from 2023 to 2038. In 2038, when comparing the Proposed Amendments to the Current Regulation, GHG emissions would be reduced about 8 percent, from 523,000 MTPY to 480,800 MTPY. Overall, the GHG emission reductions achieved by the Proposed Amendments over the Current Regulation would amount to about 5 percent of the total GHG emissions, from 2023 to 2038.

CARB staff expects deployment of ZEAT, which includes full zero-emission vessels and zero-emission capable hybrid vessels that derive at least 30 percent of a vessel's annual work from a zero-emission tailpipe source. The Proposed Amendments require new excursion vessels deployed by December 31, 2024 to be zero-emission capable hybrid vessels, and all short-run ferries (new and in-use) by December 31, 2025. The Proposed Amendments additionally include a provision called ACE, which allows operators to propose any other combination of technologies or vessels to achieve equivalent emission reductions from their fleet of CHC only. Staff expects that in total, ZEAT will be deployed in 106 vessels at full implementation, which will result in the

Proposed Amendments achieving overall reduced GHG emissions relative to the baseline under the Proposed Amendments.

Figure VI-4. Projected Annual ROG Emissions from All CHC Vessels Statewide

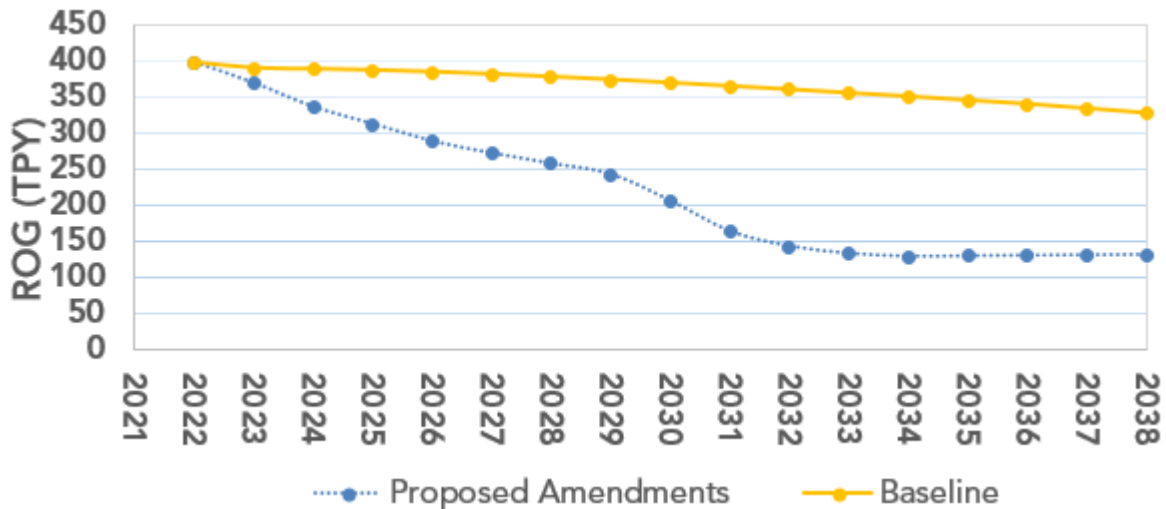


Figure VI-4 presents projected ROG emissions from 2023 to 2038 for the two scenarios. ROG emissions tend to decline in proportion with DPM emissions associated with the Proposed Amendments. Relative to the Current Regulation, the Proposed Amendments are projected to reduce approximately 2,460 tons of ROG from 2023 to 2038. In 2038, when comparing the Proposed Amendments to the CHC Regulation to the Current Regulation, ROG emissions would be reduced about 60 percent, from 328 TPY to 131 TPY.

In terms of reduction trends for the Proposed Amendments, the reduction in ROG emissions is similar to what would be achieved for NOx and DPM emissions.

The contribution to statewide CHC NOx emissions for each vessel category under baseline (Current Regulation) and Proposed Amendments in 2023 and 2038, is shown below in Figure VI-5. The Proposed Amendments to the CHC Regulation will reduce significant high emissions from main and auxiliary engines. As can be seen, in 2038, the greatest emission reductions will come from three vessel categories: workboat, tugboat-Escort/Ship Assist, ferry-catamaran, and commercial fishing. In addition, due to the large number of CHC categories, the data in Figure VI-5 illustrates that reductions from all categories of vessels are important to achieve overall emission reductions from the CHC source category.



Figure VI-5. Statewide CHC NOx Emissions by Vessel Category

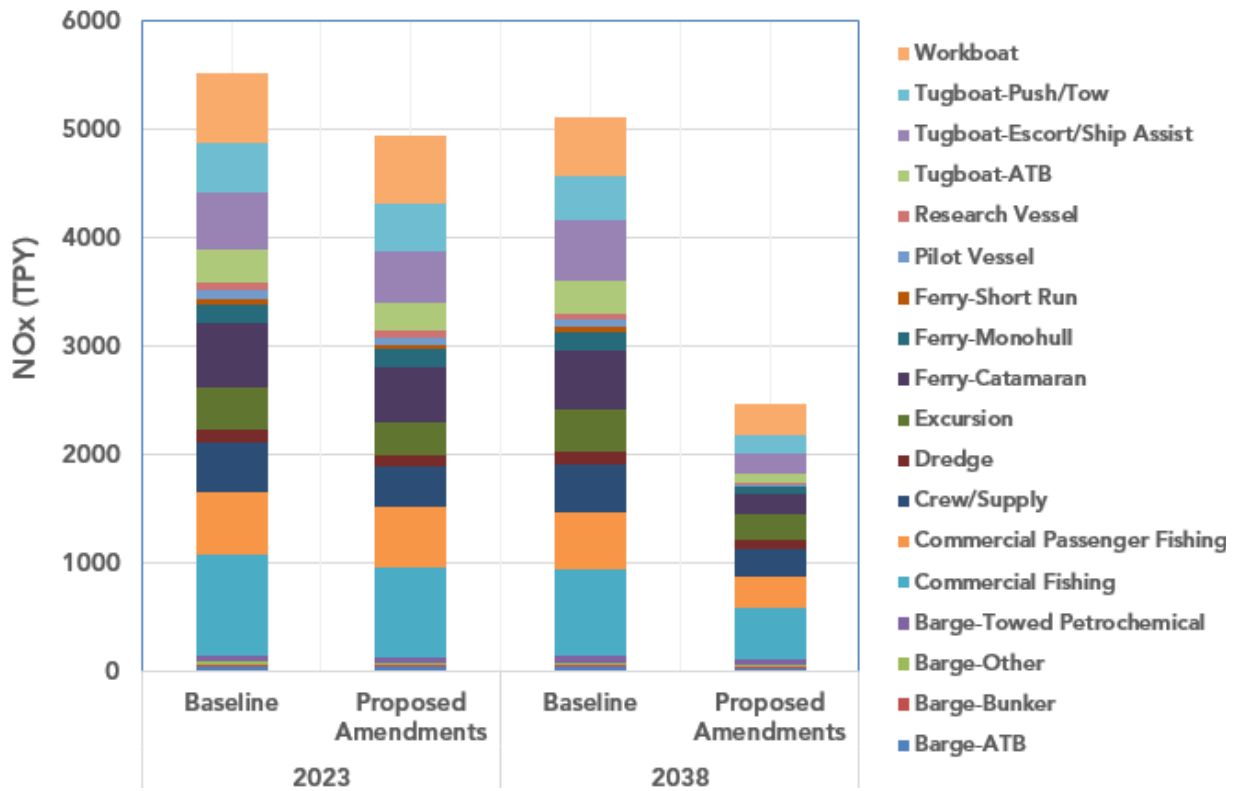
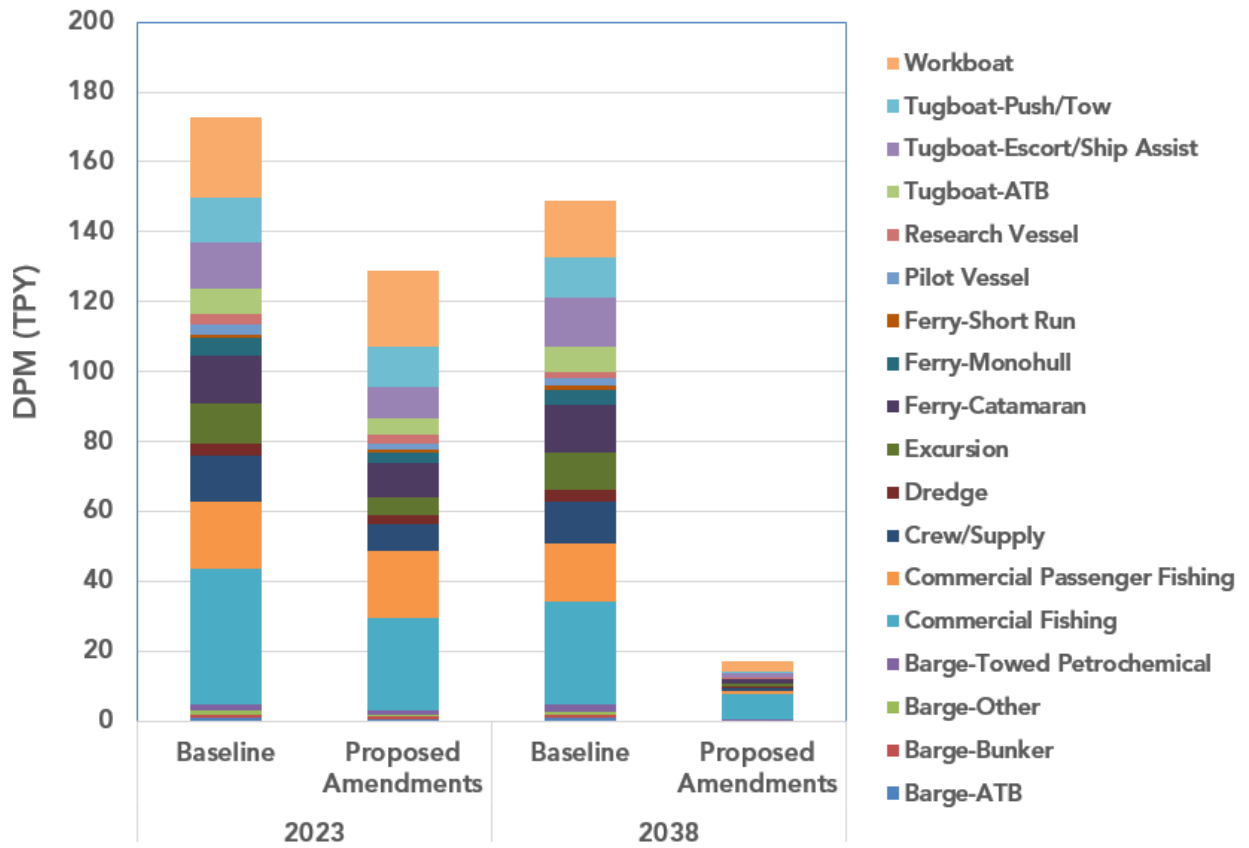


Figure VI-6 below shows the contribution to statewide CHC DPM emissions by each vessel type. In most cases, the relative contribution of NOx and DPM to the statewide inventory for each vessel category are comparable in magnitude. In 2038, the greatest emission reductions will come from three vessel categories: workboat, tugboat-Escort/Ship Assist, ferry-catamaran, and commercial fishing. In addition, due to the large number of CHC categories, the data in Figure VI-6 illustrates that reductions from all categories of vessels are important to achieve overall emission reductions from the CHC source category.

Figure VI-6. Statewide CHC DPM Emission by Vessel Type



## VII. Environmental Analysis

CARB, as the lead agency for the Proposed Amendments, has prepared an Environmental Analysis (EA) under its certified regulatory program (Title 17, CCR § 60000 through 60005) to comply with the requirements of the California Environmental Quality Act (CEQA). CARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality has been certified by California Secretary for Natural Resources under Public Resources Code § 21080.5 of CEQA (Title 14, CCR § 15251(d)). As a lead agency, CARB prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report to comply with the CEQA (Title 17, CCR § 60004.2).

The Original CHC Regulation was adopted by CARB in October 2008 and it became effective in November 2008. The CHC Regulation was originally developed in accordance with several action plans and standards aimed at reducing risk for people and the environment from emissions created from goods movement. Consistent with the RRP to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, the CHC Regulation addressed the air quality impacts of moving freight throughout California. The CHC Regulation also assists the State in meeting attainment goals under the CAA. Marine emissions standards are divided into increasingly stringent levels or tiers; the allowable emission level and effective dates vary with hp of the CHC. The Original CHC Regulation requires engines on all new CHC to meet applicable U.S. EPA marine engine emission standards at the time the vessel was acquired. The original CARB Staff Report included a chapter that was the substitute equivalent of a negative declaration, which analyzed the reasonably foreseeable environmental impacts of the methods of compliance. The analysis concluded that the adoption of the Original CHC Regulation, as written, and the reasonably foreseeable compliance with the Proposed Amendments would not result in significant adverse environmental impacts. The analysis has determined that the Proposed Amendments would lead to significant health benefits from the reduction in NO<sub>x</sub>, DPM, and GHG. When the Board approved the Original CHC Regulation in October 2008, it found that no significant impacts would result.

The first amendments to the CHC Regulation (Current Regulation) were adopted in June 2011, which stated that existing or in-use engines must meet U.S. EPA Tier 2 or Tier 3 standards based on a phased in compliance schedule. The amendments also required crew and supply vessels to meet in-use engine emission limits. The Staff Report for the Current Regulation was adopted by the Board and there were no significant adverse environmental impacts identified.

CARB has prepared this EA to assess the potential for significant adverse and beneficial environmental impacts associated with the Proposed Amendments, as required by CARB's certified regulatory program (Title 17, CCR § 60004.2). The resource areas from the CEQA Guidelines Environmental Checklist were used as a framework for assessing the potential for significant impacts.

While many impacts associated with the compliance with the Proposed Amendments could be reduced to less-than-significant levels through conditions of approval applied and mitigation measures to project-specific development, the authority to apply that mitigation lies with land use agencies or other agencies approving the development projects, not with CARB. Consequently, the EA takes a conservative approach in its significance conclusions and discloses for CEQA compliance purposes, that impacts from the development of new facilities and/or CHC associated with reasonably foreseeable compliance responses to the Proposed Amendments, could be potentially significant and unavoidable.

**Table VII-1. Summary of Potential Environmental Impacts**

<b>Section</b>	<b>Resource Area Impact</b>	<b>Significance</b>
1-1	Short-Term Construction-Related Impacts on Aesthetics	Potentially Significant and Unavoidable
1-2	Long-Term Operational-Related Impacts on Aesthetics	Potentially Significant and Unavoidable
2-1	Short-Term Construction and Long-Term Operational Impacts on Agricultural and Forest Resources	Potentially Significant and Unavoidable
3-1	Short-Term Construction-Related Impacts on Air Quality	Potentially Significant and Unavoidable
3-2	Long-Term Operational-Related Impacts on Air Quality	Less than Significant
4-1	Short-Term Construction-Related Impacts on Biological Resources	Potentially Significant and Unavoidable
4-2	Long-Term Operational-Related Impacts on Biological Resources	Potentially Significant and Unavoidable
5-1	Short-Term Construction-Related and Long-Term Operational-Related Impacts on Cultural Resources	Potentially Significant and Unavoidable
6-1	Short-Term Construction-Related Impacts on Energy Demand	Less than Significant
6-2	Long-Term Operational-Related Impacts on Energy Demand	Less than Significant
7-1	Short-Term Construction-Related and Long-Term Operational-Related Impacts on Geology and Soils	Potentially Significant and Unavoidable
8-1	Short-Term Construction-Related Impacts on Greenhouse Gases	Less than Significant
8-2	Long-Term Operational Related Impacts on Greenhouse Gases	Less than Significant
9-1	Short-Term Construction-Related Impacts to Hazards and Hazardous Materials	Potentially Significant and Unavoidable
9-2	Long-Term Operation-Related Impacts to Hazards and Hazardous Materials	Potentially Significant and Unavoidable
10-1	Short-Term Construction-Related Impacts to Hydrology and Water Quality	Potentially Significant and Unavoidable
10-2	Long-Term Operational-Related Impacts on Hydrology and Water Quality	Potentially Significant and Unavoidable

<b>Section</b>	<b>Resource Area Impact</b>	<b>Significance</b>
11-1	Short-Term Construction-Related and Long-Term Operational-Related Impacts to Land Use and Planning	Less than Significant
12-1	Short-Term Construction-Related and Long-Term Operational-Related Impacts to Mineral Resources	Less than Significant
13-1	Short-Term Construction-Related Impacts to Noise and Vibration	Potentially Significant and Unavoidable
13-2	Long-Term Construction-Related Impacts to Noise and Vibration	Potentially Significant and Unavoidable
14-1	Short-Term Construction Related and Long-Term Operational-Related Impacts to Population, Employment and Housing	Less than Significant
15-1	Short-Term Construction-Related and Long-Term Operational-Related Impacts to Public Services	Less than Significant
16-1	Short-Term Construction-Related and Long-Term Operational-Related Impacts to Recreation	Less than Significant
17-1	Short-Term Construction-Related Impacts to Transportation and Traffic	Potentially Significant and Unavoidable
17-2	Long-Term Operational-Related Impacts to Transportation and Traffic	Potentially Significant and Unavoidable
18-1	Short-Term Construction-Related and Long-Term Operational Impacts on Tribal Cultural Resources	Potentially Significant and Unavoidable
19-1	Short-Term Construction-Related and Long-Term Operational Impacts on Utilities and Service Systems	Potentially Significant and Unavoidable
20-1	Short-Term Construction Related and Long-Term Operational-Related Effects on Wildfire	Less than Significant

Written comments on the Draft EA will be accepted starting September 24, 2021 through November 8, 2021. The Board will consider the final EA and responses to comments received on the Draft EA before taking action to adopt the Proposed Amendments. The full Draft EA can be found in Appendix D. If comments received during the public review period raise significant environmental issues, staff will summarize and respond to the comments. The written responses to environmental comments will be approved prior to final action on the Proposed Amendments (Title 17, CCR § 60004.2(b)). If the Proposed Amendments are adopted, a Notice of Decision will be posted on CARB's website and filed with the Secretary of the Natural Resources Agency for public inspection (Title 17, CCR § 60004.2(d)).

## VIII. Environmental Justice

### A. Background

State law defines environmental justice as the fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Gov. Code, § 65040.12, subd. (e)(1)). Environmental justice includes, but is not limited to, all of the following: (A) The availability of a healthy environment for all people; (B) The deterrence, reduction, and elimination of pollution burdens for populations and communities experiencing the adverse effects of that pollution, so that the effects of the pollution are not disproportionately borne by those populations and communities; (C) Governmental entities engaging and providing technical assistance to populations and communities most impacted by pollution to promote their meaningful participation in all phases of the environmental and land use decision-making process; (D) At a minimum, the meaningful consideration of recommendations from populations and communities most impacted by pollution into environmental and land use decisions (Gov. Code, § 65040.12, subd. (e)(2)).

The Board approved its Environmental Justice Policies and Actions (Policies) on December 13, 2001, to establish a framework for incorporating environmental justice into CARB's programs consistent with the directives of State law.<sup>114</sup> These policies apply to all communities in California but are intended to address the disproportionate environmental exposure burden borne by low-income communities and communities of color. Environmental justice is one of CARB's core values and fundamental to achieving its mission.

In July 2017, AB 617 (Garcia, Chapter 136, Statutes of 2017) was signed into law to further environmental justice efforts in California. AB 617 requires CARB to address community-scale air pollution through new community focused and community-driven actions to reduce exposure and improve public health in communities that experience disproportionate cumulative burdens from exposure to air pollutants, such as DPM and NOx introduced by CHC activity near seaport communities.

California's CHC operations are largely situated in the vicinity of at-risk communities that directly benefit from localized reductions of NOx and DPM emissions. Although California has made dramatic progress in improving air quality, disparities in air pollution exposure, susceptibility, and health, still exist, particularly for people of color and low-income communities.

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<sup>114</sup> CARB, Policies and Actions for Environmental Justice, December 13, 2001, last accessed July 6, 2021, <https://ww3.arb.ca.gov/ch/programs/ej/ejpolicies.pdf>.

## B. Impacted Communities

Certain communities continue to experience environmental and health inequities from air pollution, particularly communities located near ports, rail yards, warehouses, and freeways. Communities near seaports, marinas, and harbors generally experience a higher concentration of air pollution associated with emissions from cars, diesel trucks, CHE, CHC, OGVs and locomotives due to activity around the ports. Many of the same communities also experience pollution impacts from large industrial facilities such as oil refineries that are often located near seaports. The impacts of this elevated, cumulative air pollution burden in these communities can be measured. For example, while exposure to cancer-causing diesel particles has decreased substantially across all communities statewide in California, exposure to diesel particles in DACs is on average twice that experienced in non-DACs.<sup>115</sup>

New Statewide actions are one of the core aspects along with several other elements included as part of CARB's CAPP to implement AB 617 (Garcia, Chapter 136, Statutes of 2017) to help achieve emission reductions in disproportionately burdened communities. These statewide actions reflect a coordinated suite of strategies including new regulations, new incentive grant funding, and new exposure reduction resources and tools. The Proposed Amendments described in this Staff Report are one of the Statewide regulatory measures that are included in the Community Air Protection Blueprint, a document describing the Statewide strategy for meeting AB 617's air protection goals, to help reduce air pollution caused by harbor craft in impacted communities.

Many of the communities identified as a priority for the deployment of community air monitoring systems and/or community emission reduction programs are located near concentrated CHC activity and would directly benefit from the Proposed Amendments. As of Spring 2021, the seaport communities that have been identified as priority communities include Richmond, West Oakland, San Diego Portside Environmental Justice Neighborhoods (Barrio Logan, West National City, Logan Heights, Sherman Heights), Wilmington, and West Long Beach.<sup>116</sup>

CARB has reached out to communities for input on the Proposed Amendments through community meetings. CARB presented to Bayview Hunters Point in November 2018, the Stockton community in September 2020, and San Diego in November 2020, and held monthly meetings with the California Cleaner Freight Coalition since 2018. Staff has also received input from Pacific Environment,

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<sup>115</sup> CARB, Community Air Protection Blueprint, October 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-03/final\\_community\\_air\\_protection\\_blueprint\\_october\\_2018\\_acc.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/final_community_air_protection_blueprint_october_2018_acc.pdf).

<sup>116</sup> CARB, Community Air Protection Program Communities, last accessed July 6, 2021, <https://ww2.arb.ca.gov/capp-communities>.

Earthjustice, Coalition for Clean Air, Environmental Health Coalition, Environmental Defense Fund, San Pedro & Peninsula Homeowners' Coalition, East Yard Communities for Environmental Justice, WOEIP, Friends of the Earth, Little Manila Rising, Ocean Conservancy, Sierra Club California, and Union of Concerned Scientists on the Proposed Amendments, and has met with a large fraction of these organizations to discuss their comments and concerns. These meetings helped CARB recognize that community members and environmental justice groups generally do not want to have to choose between near-term emission reductions and the future deployment of ZEAT in the marine sector. These groups place absolute zero-emission operation as a high priority in emission reductions, and do not want to sacrifice near-term reductions in order to meet that goal.

### **C. Benefits of the Proposed Amendments on Communities**

The purpose and intent of the Proposed Amendments are to further reduce DPM and NO<sub>x</sub> from diesel propulsion and auxiliary engines on harbor craft that operate in RCW. The Proposed Amendments are consistent with CARB's environmental justice goal of reducing exposure to air pollutants and reducing adverse health impacts from TACs in all communities, especially those historically overburdened by air pollution sources. As discussed in Chapter III of this Staff Report, the Proposed Amendments would expand in-use requirements to additional vessel categories, implement more stringent requirements for new and in-use vessels, and require the adoption of ZEAT where feasible. This ensures that air pollutants and associated health risks are reduced above and beyond the goals of the Current Regulation. This contributes to meeting community health goals set forth in AB 617.

Additionally, NO<sub>x</sub> and PM emission reductions contribute to meeting California's SIP obligations for attainment and help achieve environmental justice goals in all communities located within affected air basins, and further exercise authority given to CARB in HSC § 39660<sup>117</sup> et seq. and 43013<sup>118</sup> et seq. The additional reductions and associated improvements to air quality are designed to help protect all communities and would be of particular benefit in environmental justice communities frequently located in areas with increased exposure to air pollution and toxics from CHC.

To further reduce emissions in DACs, the Proposed Amendments would require more stringency for low-use compliance in areas that qualify as a DAC. The low-use compliance thresholds in DACs would be half that in other areas of the State. The

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<sup>117</sup> HSC § 39660 et seq., Division 26, Identification of Toxic Air Contaminants, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?sectionNum=39660.&lawCode=HSC](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=39660.&lawCode=HSC).

<sup>118</sup> HSC § 43013 et seq., Division 26, General Provisions, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?sectionNum=43013.&lawCode=HSC](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=43013.&lawCode=HSC).



low-use thresholds for each engine tier in DACs and other areas are outlined in Chapter III, Table III-7, and would apply to all vessels, regardless of category.

The Proposed Amendments would also provide more stringency for the feasibility extension available to operators that operate Tier 4 engines less than 2,600 hours per year. If operating in a DAC, this threshold would be halved to 1,300 hours per year. For more details, see Chapter III, Section 3.b. To ensure that DACs would not experience a higher burden than other communities, the ZEAT credit offered through the Proposed Amendments (see Chapter III, Section 2.b.) may not be applied to a vessel with a homebase (a facility where a vessel is anchored or docked the majority of the time within a calendar year) in a DAC, unless the ZEAT vessel is also deployed in a DAC.

CARB staff is also proposing an ACE option that would allow owners and operators to comply with the Proposed Amendments by implementing alternative emission control strategies that achieve equivalent or additional emission reductions relative to requirements of subsection (e)(6.1) of the Proposed Amendments. An ACE application would be required to demonstrate that DACs would not experience a higher burden than other communities as a result of implementing an ACE.

## IX. Economic Impacts Assessment

This chapter summarizes results from analyses that estimate the cost and benefit impacts of the Proposed Amendments. While the direct compliance costs of the regulation are large, by the time the impacts of the regulation work their way through the economy, the macroeconomic modeling shows a small impact on economic indicators such as Gross State Product (GSP), employment, output, and the personal income of individuals in California, as described in detail in this chapter. Thus, this regulatory action will not have a significant adverse economic impact on businesses.

Details on the calculations and assumptions used to perform this analysis are included in the SRIA, which is attached as Appendix C-1. CARB’s responses to comments from the DOF are attached as Appendix C-2.

In this chapter, staff provides a summary of the economic impacts of the Proposed Amendments to the CHC regulation. Greater details on the calculations and assumptions used to perform this analysis are included in Appendix C – SRIA to the CHC 2021 Amendments.

### A. Changes Since the Release of the SRIA

The Proposed Amendments and cost assumptions have been updated since the release of the SRIA on July 7, 2021. These changes and their potential impacts on the economic analysis are summarized as follows:

- **Low-Use Thresholds for DACs:** Since the SRIA, the Proposed Amendments were modified to specify a more stringent (lower) low-use threshold for regulated engines on in-use vessels that are homebased or regularly stop within two miles of a DAC. Vessels that operate below the low-use threshold are exempted from several provisions in the regulation and the Proposed Amendments. Table IX-1 summarizes the annual low-use hour limits in DACs and other areas by engine tier.

**Table IX-1. Annual Low-Use Hours Limits for Engines on Regulated In-Use Vessels with a Homebase or Regularly Scheduled Stops Within 2 Miles of a Disadvantage Community (DAC) and All Other Areas**

Engine Tier	Pre-Tier 1	Tier 1	Tier 2	Tier 3 or 4
Limits – DACs (hours/year)	40	150	200	350
Limits – All Other Areas (hours/year)	80	300	400	700

Table IX-2 below shows the updated percentage of vessels in each category qualifying for the low-use exception for the Proposed Amendments. Values have been weighted to account for the low-use percentages within DAC area and low-use percentages with all other areas by the vessel activity percentages within these two areas. This table

replaces “Table I-F: Low-Use Percentages of Vessel Horsepower by CHC Category” in Appendix A of SRIA for the updated cost analysis.

**Table IX-2. Vessel Low-Use Exception Percentage**

Vessel Category	Percentage of Low-Use
Ferry, Catamaran	3%
Ferry, Monohull	1%
Ferry, Short-Run	0%
Pilot Boat	2%
Push/Tow Tug	7%
Escort/Ship Assist Tug	14%
ATB Tug	36%
Research Vessel	21%
CPFV	9%
Excursion	13%
Dredge	19%
ATB Barge	23%
Bunker Barge	28%
Other Barge	39%
Towed Petrochemical Barge	1%
Crew Supply	12%
Workboat	35%
Commercial Fishing	9%

- Lower Annual Operation Threshold for Feasibility Extensions in DACs:**  
 The Proposed Amendments contain a provision that allow vessel owners of regulated in-use vessel to apply for a feasibility extension to retrofit Tier 4 engines with a DPF when 1) installation of a DPF is deemed infeasible, 2) when the number of operating hours is below a threshold for 2,600 hours. Since the SRIA, the Proposed Amendments were modified to include a lower threshold for approval of feasibility extensions in DACs. Essentially, the threshold was halved for vessels operating in DACs to prioritize emission reductions in these areas. Table IX-3 summarizes the annual operating threshold to be eligible for this feasibility extension.

**Table IX-3. Annual Operating Thresholds for Feasibility Extension for Vessels with Tier 4 Engines**

Homebase or Regularly Scheduled Stop Location	Extension Available if Operating Below
Within 2 Miles of a DAC	1,300 hours/year
All Other Areas	2,600 hours/year

Table IX-4 below shows the updated low-use percentages for Feasibility Extension (E)(4) (Tier4 +DPF) Applicability the Proposed Amendments. This table replaces “Table I-G: Percentage of Vessel Horsepower Qualifying for Limited Operating Hours Extension” in Appendix A of SRIA for the updated cost analysis.

Table IX-4. Tier 4 + DPF Low-Use Percentage (Engine >600 hp)

Vessel Category	Tier 4
Ferry, Catamaran	14%
Ferry, Monohull	8%
Ferry, Short-Run	0%
Pilot Boat	5%
Push/Tow Tug	9%
Escort/Ship Assist Tug	4%
ATB Tug	5%
Research Vessel	28%
Commercial Passenger Fishing	77%
Excursion	8%
Dredge	6%
ATB Barge	7%
Bunker Barge	0%
Other Barge	20%
Towed Petrochemical Barge	5%
Crew Supply	20%
Workboat	40%

- Majority of compliance extensions end in 2034:** To ensure that emission reductions are achieved sooner, staff modified the Proposed Amendments so the majority of compliance extensions can only be granted through December 31, 2034. Staff estimates that this change will result in fewer compliance extensions for certain vessel categories to be extended beyond 2034. Moreover, it will overall have minimal economic impact to the Proposed Amendments.
- Updates to compliance fee schedule:** Staff developed a draft schedule based on costs of personnel, equipment, and administration for implementation and enforcement equaling \$2.1 million per year, which is an updated total from the SRIA total of \$1.69 million per year. These changes were due to updated PY costs and changes to other administrative costs, such as travel and contract costs. The fee structure was also altered to ensure that CHC owners paying fees on-time are not paying for enforcement activities related to non-paying CHC owners. Enforcement resources dedicated to handling non-paying operators will be funded through late fees, that will be collected on top of the per-vessel and per-engine fees applicable to the operator.

Similar to the proposal described in Chapter C.2.n. of the SRIA, compliance fees are assessed based on the number of main engines and number of vessels and are not assessed for auxiliary engines operating on harbor craft. The previous fee amounts provided in the SRIA and the updated fee amounts are provided in Table IX-5.

**Table IX-5. Annual Fees for Owners or Operators of Regulated In-Use Vessels**

Category	Previous Fee Amount	Updated Fee Amount
	(SRIA proposal)	(ISOR proposal)
Per vessel, for single vessel fleets	\$349	\$364
Per vessel, for all other fleets	\$466	\$486
Per engine, for single vessel fleets	\$145	\$297
Per engine, for all other fleets	\$193	\$396
Per engine, if complying by low-use pathway	\$290	\$594
Late fee, per vessel	N/A	\$130
Late fee, per engine	N/A	\$86

Staff updated compliance fee amounts from the SRIA amounts to incorporate updates to vessel population, low-use percentages, and small business assumptions (informing single-vessel fleet counts) which all were updated with recently received insight into CHC businesses in California. The amended fees also incorporated updates and corrections to PY costs including overhead costs, travel costs, and indirect costs.

## **B. Direct Costs**

The direct cost inputs of the Proposed Amendments include:

- Costs for repowering and retrofitting in-use vessels including capital and labor and installation costs, fuel savings, increased electricity use and sales taxes.
- Costs for replacing vessels with new vessels or acquiring new build vessels, including capital and labor and installation costs, fuel savings, increased electricity use and sales taxes.
- Costs for installing dock power infrastructure and infrastructure to support ZEAT requirements.
- Various administrative costs described in detail below.

### **1. Cost Inputs**

#### **a. Key Assumptions in Cost Analysis**

##### **i. Amortization of Costs Based on Vessel, Engine, and Infrastructure Lifespan**

Staff assumes that capital and labor, and installation costs for engine repowers, retrofits, and vessel replacements/new-builds would be amortized over the expected equipment (i.e., engine and DPF) and vessel useful life periods. The useful life period is the point where approximately 50 percent of the engines or vessels retire in the fleet. More information about vessel survival curves can be found in Appendix H of the ISOR. Staff assumes the capital costs for land-side and vessel-side shore power and

ZEAT infrastructure would be amortized over a 20-year useful life at an interest rate of 5 percent. Staff assumes that shore power infrastructure costs would occur starting in 2023 and are amortized over a 20-year useful life at an interest rate of 5 percent.

## ii. Application of Vessel Population Growth Factors

The costs of the Proposed Amendments are directly proportional to the statewide vessel population. Staff assumed that the growth in the Statewide vessel population would be the same as the growth factor used to develop the baseline emissions estimates, which are described in further detail in Appendix H of the ISOR. The industrywide growth factors used for shore power infrastructure are provided in Table IX-6.

Table IX-6. Industrywide Compound Vessel Growth Factors

Year	Compound Growth Factor
2023	0.0%
2024	0.06%
2025	0.06%
2026	0.06%
2027	0.06%
2028	0.07%
2029	0.07%
2030	0.07%
2031	0.07%
2032	0.07%
2033	0.08%
2034	0.08%
2035	0.08%
2036	0.08%
2037	0.08%
2038	0.08%

## b. Repower and Retrofit Costs for In-Use Vessels

Vessel owners and operators would incur the following repower and retrofit costs:

- **Capital costs:** The costs resulting from equipment purchased to comply with the Proposed Amendments—i.e., Tier 3 or Tier 4 engines, DPFs, or zero-emission propulsion systems (short-run ferries). The capital costs for repower and retrofits range between \$141 and \$692 per hp, depending on the vessel category and engine tier. Tables II-A through II-Q in the SRIA Appendix A provides further details on the engine capital costs.
- **Labor and installation costs:** The costs resulting from labor and vessel modifications required to install the equipment, including structural and mechanical alternations, accessing the engine room, testing and commissioning, and shipyard costs. Labor and installation costs range between \$41 and \$512 per hp, depending on the vessel category and

engine tier. Tables II-A through II-Q in the SRIA Appendix A provides further details on the labor and installation costs.

- Operational and other costs: increased maintenance costs, changes due to differences in fuel consumption, and loss of use during repowering or retrofitting.
- Loss of use costs: Costs incurred due to vessel downtime during the repower and retrofit process. Loss of use costs range between \$17 and \$188 per hp, depending on the vessel category and engine tier.

For commercial fishing vessels, the Proposed Amendments would require all engines to meet a U.S. EPA certified Tier 2 or higher emissions standards, which would result in engine repower costs to vessel owners and operators.

Staff estimates the total cost of repowering and retrofitting engines for in-use vessels to equal \$1.2 billion through 2038.

### **c. Vessel Replacement/New-Build Vessel Costs**

Due to a variety of factors, including technical feasibility issues with repowering and/or retrofitting in-use engines, staff expects that some vessels would need to be replaced to meet emissions performance standards in the Proposed Amendments.

Staff expects that vessel owners and operators would incur the following costs, which apply to all vessel categories except for short-run ferries and excursion vessels, which are described in more detail further in this section.

- Capital costs: The costs resulting from purchasing a new-build vessel and DPFs, ranging from \$2,019 to \$18,883 per hp (see Table II-A to Table II-Q in the SRIA Appendix A, for details).
- Labor and installation costs: The costs resulting from designing and constructing a new vessel, and installing the DPFs, ranging from \$1,559 to \$18,088 per hp (see Table II-A to Table II-Q in the SRIA Appendix A, for details).
- Operational costs: Operational and other costs: increased maintenance costs, changes due to differences in fuel consumption, and loss of use during repowering or retrofitting.
- Vessel resale revenue: Costs savings due to revenue from reselling the old vessel.

Staff estimates the total cost of replacing and acquiring new-build vessels to equal \$472 million through 2038.

### **d. Sales Tax**

Sales tax is an additional cost levied on top of the purchase price of an engine, a DPF, and a new vessel. The sales tax varies across the state from a minimum of 7.25 percent

up to 10.5 percent in some municipalities. A value of 8.6 percent was used for staff's analysis based on a weighted average based on county level output.<sup>119</sup>

Staff applied this sales tax percentage to the capital cost values of engines and retrofit devices, and new-build vessels.

#### **e. Facility Shore Power Infrastructure Costs**

The Proposed Amendments contain an idling provision that would prohibit all propulsion engines from idling, and auxiliary engines from operating for more than 15 or 30 consecutive minutes when the vessel is docked, berthed, or moored. The 15-minute limit applies to all situations except the initial start-up of each day or for the new working crew change of a vessel. Shore power is the expected compliance strategy for vessel owners and operators if on-board power from auxiliary engines would be needed in excess of the 15 or 30-minute threshold. Facility owners and operators allowing more than 50 vessel visits per year would be required to install and maintain shore power infrastructure. Staff assumes that facility owners and operators would comply with the requirements in the Proposed Amendments by installing infrastructure to obtain electricity from the electric utility.

Both vessel owners and operators and facility owners and operators would incur costs as a result of the infrastructure required to enable a shore power connection and permit vessel owners and operators to shut down all on-board auxiliary generators. This includes infrastructure equipment cost, cost of installing chargers and increased electricity use, and cost savings from reduced use of diesel.

Staff estimates the total cost of facility shore power infrastructure to equal \$19 million through 2038.

#### **f. Zero-Emission Infrastructure**

The Proposed Amendments would require owners and operators of short-run ferries and excursion vessels to adopt zero-emission and zero-emission capable hybrid technologies. In order to meet these ZEAT requirements, staff expects that installation of charging infrastructure would be required.

Vessel owners and operators would incur costs for the installation and maintenance of all zero-emission infrastructure on both the vessel and the facility, including infrastructure for electric charging, hydrogen or other alternative refueling, or other advanced technologies.

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<sup>119</sup> California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, last accessed July 7, 2021, <https://www.cdtfa.ca.gov/taxes-and-fees/rates.aspx>.



For the cost analysis, staff assumed that the charging infrastructure would be powered by grid electricity. Although hydrogen-powered vessels and associated infrastructure is expected to some degree under the Proposed Amendments, based on the cost data that staff received from stakeholders and the current state of the technology, staff assumed that all ZEAT would be powered by battery electric technology.

As of August, 2021, staff is aware of nine vessels operating in revenue service in the United States that operate with fuel derived from zero-emission tailpipe fuels. All of these vessels use batteries for on-board energy storage, and there is no hydrogen fuel cell vessel currently operated in normal revenue service. There are hydrogen fuel cell vessels that are constructed and still undergoing final USCG approvals and would need to undergo sea trials before being able to enter revenue service. An updated and more detailed overview of these technologies is provided as part of the staff report in Appendix E of the ISOR in support of the Proposed Amendments.

Staff assumes the Zero-Emission Infrastructure costs to include upstream utility costs, charging equipment acquisition and installation, and the cost additional use of electricity. It also includes cost savings from reduced use of diesel.

Staff estimated that 17 charging facilities would need to be installed throughout the State to meet the charging demands resulting from ZEAT requirements. Staff estimates the total cost of zero-emission shore power infrastructure to equal \$146 million through 2038.

#### **g. Administrative Costs**

Vessel owners and operators, vessel facility owners and operators, and State agencies would all incur administrative costs as a result of the Proposed Amendments. Administrative costs to State and local governments are described in section E of this Chapter. Administrative costs include:

- Opacity Testing;
- Compliance Fees;
- Vessel Labeling;
- Naval Architect and Financial Feasibility Reports (Compliance Extensions);
- Recordkeeping and Reporting;
- Facility Reporting; and
- Regulation Interpretation Costs.

Staff estimates the total cost of administrative costs for vessel owners and operators to equal \$135 million through 2038.

### **i. Opacity Testing**

Beginning January 1, 2023, all main propulsion diesel engines, including low-use engines, operating on in-use vessels subject to the Proposed Amendments would need to perform opacity testing biennially and submit results to CARB.

Based on stakeholder data,<sup>120</sup> staff assumes a per-vessel opacity testing cost of \$2,205 for catamaran and monohull ferries. For other vessel categories, staff assumes a per-engine opacity testing cost of \$200. Staff assumed higher costs would apply for CHC vessels compared to diesel engines in trucks to conduct opacity testing due to extra travel costs, time to test a smaller volume of engines at various in-field locations, and costs to transit the vessel out into open water. Opacity testing costs would occur biennially starting in 2023.

### **ii. Compliance Fees**

The Proposed Amendments include annual compliance fees that would impose a direct, on-going cost to vessel owners and operators. The compliance fees would help to offset staff costs of implementing and enforcing the Proposed Amendments.

Staff developed a preliminary proposed fee schedule based on estimated costs of personnel, equipment, and administration for implementation and enforcement equaling \$2.1 million per year. This fee structure (summarized in Table IX-7) is explained in further detail in Chapter III of this ISOR and the Draft Regulation Order.

**Table IX-7. Annual Fees for Owners or Operators of Regulated In-Use Vessels**

<b>Category</b>	<b>Fee Amount</b>
Per vessel, for single-vessel fleets	\$364
Per vessel, for all other fleets	\$486
Per engine, for single-vessel fleets	\$297
Per engine, for all other fleets	\$396
Per engine, if complying by low-use pathway	\$594
Late fee, per vessel	\$130
Late fee, per engine	\$86

### **iii. Vessel Labeling**

To increase reporting compliance, the Proposed Amendments would require the use of UVIs. All CHC would need to have their identifier affixed to the vessel by January 1, 2024.

Staff assume that the cost of a UVI would be \$150 per vessel, and that these costs would recur every five years beginning in 2023 due to labeling degradation. For more

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<sup>120</sup> Email between Lauren Duran Gularte (WETA) and Tracy Haynes (CARB) dated November 17, 2020.

information on UVI costs see Appendix A of the SRIA. Staff assume that vessel owners and operators would incur this cost during the year prior to the compliance deadline.

#### **iv. Naval Architect and Financial Feasibility Reports (Compliance Extensions)**

Vessel owners and operators seeking the compliance extension “Meeting Performance Standards Is Not Feasible for In-Use Harbor Craft” would need to demonstrate that Tier 4 + DPF is not feasible on their vessel, and that purchasing a replacement vessel with compliant engines would not be financially feasible. In order to do so, staff assume that vessel owners and operators would incur costs of obtaining a technical feasibility analysis from a third-party Naval Architect and providing financial data that staff would use to evaluate the ability to pay.

The total percentage of vessels in each category that incur the Financial Feasibility Report expense is based on the percentage of vessels that receive a compliance extension by their initial compliance date. Staff assumes it will take eight personnel hours to prepare each Financial Feasibility Report. At \$50 per personnel hour, this results in a total of \$400 per report.

#### **v. Recordkeeping and Reporting**

The Current Regulation requires vessels to report to CARB only periodically, such as after repowering engines or as compliance deadlines approach. To ensure that CARB’s records are current and the regulation can be effectively implemented, the Proposed Amendments would make changes to the information vessel owners and operators are required to report, and would require annual reporting.

Vessel owners and operators would be required to report to CARB the percentage of time a vessel is used in each vessel use category, new owner contact information when a vessel is sold, engine tier and MY, and the quantity of DEF consumed if the engine is equipped with an SCR.

Staff assumes that requirements to maintain vessel and engine records and submit annual reporting to CARB would cost \$200 per vessel, representing four personnel hours. These costs would occur annually beginning in 2023.

#### **vi. Facility Reporting**

To further increase reporting compliance, the Proposed Amendments require facilities to report to CARB quarterly, starting January 1, 2023. Facilities would be required to provide facility and vessel owner and operator contact information, information about the facility use agreement, and dock, berth or slip location number of vessel tenants. Facilities with shore power infrastructure would be required to provide information about the equipment, such as installation date, type of equipment supported, and number of plugs. Staff assumes that the facility reporting to CARB would cost

\$100 per vessel, representing two personnel hours. These costs would occur annually beginning in 2023.

### **vii. Regulation Interpretation Costs**

Staff received stakeholder input regarding the amount of time required to interpret CARB Regulations.<sup>121</sup>

Staff assumes this would be a one-time cost per fleet occurring in 2023, and represents administrative time needed to understand the regulation during the first year the Proposed Amendments would be in effect. Staff assume a per-fleet cost of \$7,500 which represents 100 personnel hours with a personnel hour cost of \$75. This cost is multiplied by 1,305 fleets, which is based on data in the emission inventory.

## **2. Statewide Costs**

The total net costs of the Proposed Amendments calculated from all direct cost inputs described above are summarized in Table IX-8. The total net costs include all capital costs, as well as infrastructure costs, administrative costs for registration and reporting, and cost savings.

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<sup>121</sup> Email between Alex Brodie (Island Packers) and David Quiros (CARB) dated October 1, 2020.

Table IX-8. Annual Direct Costs of the Proposed Amendments (2019 \$)

Year	Repower and Retrofit Costs	Vessel Replacement Costs	Infrastructure Costs	Administrative Costs	Fuel Cost Savings	Total Costs
2023	\$8,715,488	\$831,139	\$10,544,369	\$21,284,688	-\$1,154,078	\$40,221,606
2024	\$29,948,428	\$3,252,010	\$10,545,134	\$11,020,606	-\$3,654,879	\$51,111,299
2025	\$45,443,479	\$5,158,105	\$10,574,061	\$11,021,273	-\$5,583,033	\$66,613,885
2026	\$57,183,571	\$7,619,589	\$11,543,289	\$11,021,957	-\$7,862,264	\$79,506,142
2027	\$66,597,219	\$12,512,740	\$11,999,355	\$11,022,660	-\$9,640,605	\$92,491,370
2028	\$73,017,786	\$15,846,841	\$12,093,761	\$11,497,406	-\$10,555,874	\$101,899,920
2029	\$77,393,497	\$20,860,983	\$12,363,039	\$7,246,120	-\$11,757,897	\$106,105,742
2030	\$85,289,519	\$28,513,289	\$12,384,103	\$7,246,861	-\$13,529,007	\$119,904,765
2031	\$88,523,359	\$32,900,296	\$12,395,466	\$7,247,622	-\$14,433,936	\$126,632,806
2032	\$91,181,642	\$37,298,134	\$12,401,094	\$7,248,404	-\$15,265,792	\$132,863,482
2033	\$93,001,369	\$44,320,296	\$12,409,412	\$7,723,243	-\$16,694,227	\$140,760,093
2034	\$95,124,398	\$52,602,526	\$12,418,743	\$7,250,035	-\$18,255,381	\$149,140,322
2035	\$95,124,398	\$52,602,526	\$12,422,441	\$3,472,765	-\$18,264,379	\$145,357,751
2036	\$95,124,398	\$52,602,526	\$12,418,589	\$3,473,620	-\$18,268,177	\$145,350,956
2037	\$95,124,398	\$52,602,526	\$12,416,764	\$3,474,500	-\$18,270,745	\$145,347,443
2038	\$95,124,398	\$52,602,526	\$12,414,551	\$3,949,451	-\$18,273,961	\$145,816,965
<b>Total</b>	<b>\$1,191,917,346</b>	<b>\$472,126,054</b>	<b>\$191,344,172</b>	<b>\$135,201,212</b>	<b>-\$201,464,237</b>	<b>\$1,789,124,546</b>

## C. Direct Costs on Businesses and Individuals

### 1. Direct Costs on Typical Businesses

The typical business that would be impacted by the Proposed Amendments is a vessel owner or operator. The total vessel owner or operator costs are made up of repower costs, retrofit costs, vessel replacement/new-build vessel costs, ZEAT infrastructure costs, shore power related costs for vessel-side infrastructure, and administrative costs as detailed above in section B.1. of this Chapter.

There is a lot of variation in businesses that own or operate vessels in the State. Thus, staff analyzed the typical direct costs per vessel and per business for each category and summarized them in Table IX-9. Costs to vessel owners and operators will vary widely depending on the number of vessels owned and the specific compliance pathways that are taken. As described earlier in the chapter, some businesses may take immediate compliance actions, while others may take advantage of multiple compliance extensions or low-use exceptions.

**Table IX-9. Direct Amortized Costs for Typical Business Vessel Owners and Operators of CHC (2019 \$)**

Vessel Category	Average Vessel# per Business	Average Direct cost per vessel	Average cost per business
Ferry (Catamaran)	5.8	\$6,333,308	\$36,944,295
Ferry (Monohull)	2.5	\$2,806,487	\$7,016,217
Ferry (Short-Run)	2.7	\$2,532,820	\$6,754,187
Pilot Boat	3.3	\$1,653,379	\$5,511,264
Push/Tow Tug	2.9	\$1,319,801	\$3,804,133
Escort/Ship Assist Tug	3.7	\$3,046,463	\$11,289,832
ATB Tug	4.8	\$4,248,532	\$20,180,525
Research Vessel	1.8	\$673,804	\$1,203,222
CPFV	1.2	\$512,980	\$618,387
Excursion	2.0	\$587,694	\$1,146,383
Dredge	2.1	\$246,863	\$527,390
ATB Barge	4.8	\$1,878,943	\$8,924,978
Bunker Barge	2.8	\$103,554	\$291,834
Other Barge	3.7	\$192,161	\$704,591
Towed Petrochemical Barge	2.2	\$279,549	\$615,008
Crew Supply	2.6	\$515,950	\$1,329,142
Workboat	2.5	\$341,201	\$863,983
Commercial Fishing	1.2	\$44,438	\$51,479

### 2. Direct Costs on Small Businesses

To illustrate the costs and cost-savings to a small business owning or operating vessels or vessel facilities, staff completed a similar analysis as presented in the typical businesses section.

For these Proposed Amendments, staff defines small businesses as businesses with 100 or less employees. Based on this, 70 percent of vessel fleets are considered small businesses. Similar to the case of typical businesses, the compliance costs for a small business will vary depending on the compliance option and the number of vessels owned/operated.

To illustrate the anticipated cost for a typical small business, CARB staff constructed two small business examples and analyzed the costs to comply with the Proposed Amendments. All cost input assumptions are the same as discussed in Section B of this Chapter. For more details, refer to the SRIA, Chapter C.

The first small business example is a CPFV business with 1 vessel with total engine power of 730 hp. Staff analyzed a scenario in which this vessel would have a compliance deadline in 2026 which would require replacement of the existing vessel with a new-build vessel. Staff estimates the total amortized costs for such a small business to comply with the Proposed Amendments be approximately \$1.2 million, or an additional cost of \$74,000 per year for the period between 2023 and 2038.

The second small business example is a commercial fishing business that owns a single vessel with total engine power of 362 hp. Staff considered an example where this vessel would repower the engine to Tier 3 in 2030, the first compliance date for the commercial fishing vessel category. Staff estimates the total amortized costs for this typical business to comply with the Proposed Amendments to be approximately \$90,000, or an additional cost of \$5,600 per year for the period between 2023 and 2038.

### 3. Direct Costs on Individuals

The Proposed Amendments would not result in any direct costs to individuals. However, staff anticipates the Proposed Amendments would result in indirect costs to individuals to the extent that compliance costs are passed through ultimately to consumers of services and cargo. These costs are discussed in Appendix C of the SRIA and are summarized in Table IX-10 below.

**Table IX-10. Calculated Cost Metrics and Cost Impacts to Individuals**

<b>Cost Metric</b>	<b>Average Annualized Cost Increase</b>
Cost Per Passenger – High-Speed Ferry, One-Way Trip	\$1.84
Cost Per Passenger – Short-Run Ferry, One-Way Trip	\$0.98
Cost Per Passenger – Excursion Vessels	\$1.23
Cost Increase Per Twenty-Foot-Equivalent Unit – Tug Vessels	\$0.44
Cost Per Pound of Fish – Commercial Fishing Vessels	\$0.04
Cost Per Passenger/day – CPFVs, One-Day Trip	\$26.37
Cost Per Passenger/day – CPFVs, Multi-Day Trip	\$24.56
Cost Per Passenger/day – CPFVs, “6-pack” Vessel*	\$83.50

\*6-pack vessels are uninspected passenger vessels that can carry up to 6 passengers (in addition to 2 crew). Due to the smaller passenger capacity and market segment, the costs to individual passengers aboard these vessels were calculated separately.

## **D. Benefits**

### **1. Benefits to Vessel Owners and Operators and Facility Owners and Operators**

There are several benefits to terminal and vessel owners and operators and facility owners and operators: fuel savings from reduced use of diesel, LCFS credits from increased use of low carbon fuels, and health benefits. Fuel cost savings depend on fuel and electricity costs.

Facility owners and operators might benefit from generating LCFS credits if they opt-in the program and provide shore power or hydrogen refueling to ZEAT vessels.

### **2. Benefits to Other California Businesses**

The Proposed Amendments may result in financial benefits to many different industries whose products will be needed to comply with the Proposed Amendments. These businesses include CHC engine OEMs, battery systems manufacturers, hydrogen fueling system manufacturers, diesel engine repair shops and boatyards, opacity testing equipment manufacturers, companies offering opacity testing services, manufacturers of emission control technologies, including but not limited to DPFs, DPF installation, repair, and maintenance centers, electrical suppliers and design, engineering, and construction firms.

### **3. Benefits to Small Businesses**

Businesses, including construction companies, engineers, electricians, parts and components manufacturers, consulting firms, and others involved in designing, installing, and maintaining equipment for engine and aftertreatment technologies may fall into the category of small businesses. The benefits discussed above would also apply to small businesses.

### **4. Benefits to Individuals**

California experiences some of the highest concentrations of PM<sub>2.5</sub> in the nation. Individuals who live in, or work in, high-risk areas near seaports, marinas, harbors, and other waters are exposed to higher PM<sub>2.5</sub> concentrations from harbor craft than other California residents. These individuals are at a higher risk of developing respiratory impairments as a result of main and auxiliary engine emissions, especially those individuals within sensitive groups such as the young and the elderly.

The Proposed Amendments would reduce NO<sub>x</sub> and PM<sub>2.5</sub> emissions from CHC vessels and result in health benefits for individuals in California. This would benefit individuals by reducing incidents of premature death, hospital admissions, and emergency room visits, as well as reduce criteria pollutants and GHGs. The Proposed Amendments would accomplish this by reducing emissions from fuel combustion on



board a vessel, including PM2.5, DPM, NO<sub>x</sub>, and ROG. GHGs would be reduced when short-run ferries and excursion vessels use ZEAT technologies.

Staff estimates that the total number of cases statewide that would be reduced (from 2023 to 2038) from the implementation of the Proposed Amendments are as follows:

- 531 premature deaths reduced (415 to 651, 95 percent confidence interval (CI)).
- 73 hospital admissions for cardiovascular illness reduced (0 to 144, 95 percent CI).
- 88 hospital admissions for respiratory illness reduced (21 to 155, 95 percent CI).
- 236 emergency room visits reduced (149 to 323, 95 percent CI).

Table IX-11 shows the estimated total reductions in health outcomes resulting from reductions in PM2.5 and NO<sub>x</sub> emissions from the Proposed Amendments from 2023 to 2038.

**Table IX-11. Proposed Amendments: Estimated Total Reductions in Health Outcomes from 2023 to 2038\***

Air Basin	Cardiopulmonary Mortality	Hospitalizations for Cardiovascular Illness	Hospitalizations for Respiratory Illness	Emergency Room Visits for Asthma
Lake Tahoe	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
North Central Coast	2 (1 - 2)	0 (0 - 1)	0 (0 - 1)	1 (1 - 2)
North Coast	3 (2 - 3)	0 (0 - 1)	0 (0 - 1)	1 (1 - 1)
Sacramento Valley	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
San Diego County	35 (28 - 43)	5 (0 - 9)	6 (1 - 10)	15 (9 - 20)
San Francisco Bay	167 (130 - 205)	22 (0 - 43)	26 (6 - 47)	78 (50 - 107)
San Joaquin Valley	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
South Central Coast	28 (22 - 34)	4 (0 - 8)	5 (1 - 8)	12 (8 - 17)
South Coast	295 (230 - 360)	42 (0 - 82)	50 (12 - 88)	128 (81 - 176)
Statewide	531 (415 - 651)	73 (0 - 144)	88 (21 - 155)	236 (149 - 323)

\*The values in parentheses represent the 95 percent confidence intervals of the central estimate. Totals may not add due to rounding. Air basins with zero impacts are not shown, and these are: Great Basin Valleys, Lake County, Mojave Desert, Mountain Counties, Northeast Plateau, and Salton Sea.

Statewide valuation of health benefits was calculated by multiplying the avoided health outcomes by valuation per incident. The total statewide valuation due to avoided health outcomes between 2023 and 2038 totaled \$5.25 billion.

## 5. Social Cost of Carbon

The Proposed Amendments would result in an estimated cumulative net reduction in GHG emissions between 2023 and 2038 totaling 415,060 MT compared with the Baseline. The Proposed Amendments would achieve GHG benefits mainly by reducing fuel consumption using shore power and the requirement for ZEAT.

The monetary value of these GHG reductions can be estimated using the social cost of carbon (SC-CO<sub>2</sub>), which provides a dollar valuation of the damages caused by one ton of carbon pollution and represents the monetary benefit today of reducing carbon emissions in the future. If all GHG emission reductions under the Proposed Amendments are assumed to be CO<sub>2</sub> reductions, the avoided SC-CO<sub>2</sub> each year is the total emission reductions (in MT CO<sub>2</sub>e multiplied by the SC-CO<sub>2</sub> (in \$/MT CO<sub>2</sub>e) for that year. Staff estimates the annual avoided SC-CO<sub>2</sub> to range between a total of \$9 to \$41 million from 2023 to 2038, depending on the discount rate.

## **E. Fiscal Impacts**

This section summarizes the fiscal impacts of the Proposed Amendments on local, State, and federal governments. For more details on this analysis, please refer to Chapter D in the SRIA.

### **1. Local Government**

#### **a. Direct Costs to Vessel Fleet and Facility Owners and Operators**

The Proposed Amendments would have a small fiscal impact on local government agencies that own/operate fleets or vessel facilities, relative to the total estimated cost of the Proposed Amendments. Local governments are estimated to incur direct costs (identified in section B of this Chapter) to comply with this regulation. The estimated direct costs to local governments equipment and facility owners are \$40.6 million in the period between 2023 - 2038.

#### **b. Utility User Tax**

Several cities and counties in California levy a Utility User Tax on electricity usage. By increasing the amount of electricity used, there would be an increase in the amount of the utility user tax revenue collected by cities and counties. Staff estimates that this will increase local governments' revenues by \$1.0 million in the period between 2023-2038.

#### **c. Diesel Fuel Tax**

When used off-road, Dyed Diesel is taxed at the combined statewide sales tax rate, plus applicable district taxes. Displacing diesel with electricity would decrease the total amount of diesel fuel dispensed in the State, resulting in a reduction in tax revenue collected by local governments. Staff estimates that this will decrease local governments' revenues by \$3.1 million in the period between 2023-2038.

#### **d. Local Sales Tax**

The Proposed Amendments would result in additional sales of vessels and vessel equipment relative to baseline conditions, which would result in a direct increase in

sales tax revenue collected by local governments. Staff estimates that this will increase local governments' revenues by \$27.0 million in the period between 2023-2038.

### e. Fiscal Impact on Local Governments

In summary, the fiscal impact to local governments is estimated to be approximately \$15.6 million over the regulatory implementation period, from 2023 to 2038.

Table IX-12 summarizes these impacts by category.

**Table IX-12. Estimated Fiscal Impacts to Local Governments from 2023 through 2038 (2019\$)**

Year	Utility User Tax Revenue	Local Diesel Fuel Tax	Local sales Tax	Total Change in Revenue	Total Direct Costs	Total Fiscal Impact
2023	-\$14,048	\$8,299	-\$2,536,298	-\$2,542,048	\$4,240,445	\$1,698,397
2024	-\$14,055	\$104,311	-\$5,486,375	-\$5,396,119	\$6,435,195	\$1,039,077
2025	-\$15,075	\$177,114	-\$4,345,243	-\$4,183,204	\$4,440,893	\$257,689
2026	-\$49,288	\$181,003	-\$2,944,445	-\$2,812,730	\$3,012,446	\$199,717
2027	-\$65,387	\$187,624	-\$2,337,652	-\$2,215,415	\$3,157,957	\$942,542
2028	-\$68,719	\$195,174	-\$1,586,246	-\$1,459,791	\$2,393,571	\$933,779
2029	-\$78,223	\$192,254	-\$1,061,706	-\$947,676	\$2,387,769	\$1,440,093
2030	-\$78,966	\$211,154	-\$2,237,426	-\$2,105,238	\$3,844,377	\$1,739,138
2031	-\$79,367	\$215,813	-\$1,405,469	-\$1,269,023	\$2,349,023	\$1,080,001
2032	-\$79,565	\$219,334	-\$1,289,847	-\$1,150,077	\$2,215,680	\$1,065,603
2033	-\$79,858	\$226,416	-\$815,618	-\$669,059	\$2,233,673	\$1,564,614
2034	-\$80,186	\$230,206	-\$970,041	-\$820,021	\$2,712,135	\$1,892,114
2035	-\$80,316	\$229,786	\$0	\$149,470	\$282,135	\$431,605
2036	-\$80,179	\$229,608	\$0	\$149,429	\$281,355	\$430,784
2037	-\$80,114	\$229,488	\$0	\$149,374	\$280,978	\$430,352
2038	-\$80,035	\$229,338	\$0	\$149,303	\$288,884	\$438,187
Total	-\$1,023,381	\$3,066,923	-\$27,016,366	-\$24,972,825	\$40,556,516	\$15,583,691

## 2. State Government

### a. Direct Costs to Vessel Fleet and Facility Owners and Operators

The Proposed Amendments would have a small fiscal impact on State government agencies that own/operate fleet or vessel facilities, relative to the total estimated cost of the Proposed Amendments. State government is estimated to incur direct costs (identified in section B of this Chapter) to comply with this regulation. The estimated direct costs to State government equipment and facility owners are \$14.3 million in the period between 2023-2038.

### **b. Diesel Fuel Tax**

When used off-road, Dyed Diesel is taxed at the combined statewide sales tax rate, plus applicable district taxes. Displacing diesel with electricity would decrease the total amount of diesel fuel dispensed in the State, resulting in a reduction in tax revenue collected by local governments. Staff estimates that this will decrease State government's revenues by \$2.6 million in the period between 2023-2038.

### **c. Energy Resource Fee**

The Energy Resource Fee is a \$0.0003/kW-hr surcharge levied on consumers of electricity purchased from electrical utilities.<sup>122</sup> Increased use of electricity is expected to increase revenues to State government by \$33 thousand in the period between 2023-2038.

### **d. State Sales Tax**

The Proposed Amendments would result in additional sales of vessels and vessel equipment relative to baseline conditions, which would result in a direct increase in sales tax revenue collected by State government. Staff estimates that this will increase State government's revenues by \$22.8 million in the period between 2023-2038.

### **e. Costs to CARB**

Existing CARB staff have been working on the Current Regulation and additional staff will be necessary to augment and implement and enforce the Proposed Amendments. For more information, please refer to Chapter D in the SRIA. Staff estimates CARB's spending will increase by \$23.9 million in the period between 2023-2038.

### **f. Collected Compliance Fees**

The Proposed Amendments will impose new compliance fees which are expected to increase State revenue by about \$2.1 million annually, or \$33 million in the period between 2023 – 2038.

### **g. Fiscal Impacts on State Government**

Table IX-13 summarized the estimated fiscal cost to State government agencies due to the Proposed Amendments relative to baseline conditions. The fiscal impact to State government agencies is estimated to increase revenues by \$14.8 million over the regulatory implementation period.

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<sup>122</sup> California Department of Tax and Fee Administration, 2020 Electrical Energy Surcharge Rate, last accessed July 6, 2020, <https://www.cdtfa.ca.gov/formspubs/l725.pdf>.

Table IX-13. Estimated Fiscal Impacts to State Governments from 2023 through 2038 (2019 \$)

Year	Costs to CARB	State Diesel Fuel Tax	Energy Resources Fee	State Sales Tax	Total Direct Costs	Collected Compliance Fees	Total Fiscal Impact
2023	\$1,503,623	\$7,001	-\$512	-\$2,139,832	\$1,249,808	-\$2,054,290	-\$1,434,202
2024	\$1,495,623	\$88,006	-\$512	-\$4,628,762	\$2,108,411	-\$2,054,290	-\$2,991,524
2025	\$1,495,623	\$149,428	-\$535	-\$3,666,008	\$1,689,461	-\$2,054,290	-\$2,386,321
2026	\$1,495,623	\$152,709	-\$1,712	-\$2,484,178	\$1,129,929	-\$2,054,290	-\$1,761,919
2027	\$1,495,623	\$158,296	-\$2,236	-\$1,972,238	\$1,186,424	-\$2,054,290	-\$1,188,421
2028	\$1,495,623	\$164,665	-\$2,305	-\$1,338,289	\$886,769	-\$2,054,290	-\$847,827
2029	\$1,495,623	\$162,202	-\$2,579	-\$895,744	\$883,996	-\$2,054,290	-\$410,792
2030	\$1,495,623	\$178,147	-\$2,555	-\$1,887,678	\$1,453,425	-\$2,054,290	-\$817,329
2031	\$1,495,623	\$182,078	-\$2,521	-\$1,185,771	\$867,729	-\$2,054,290	-\$697,152
2032	\$1,495,623	\$185,049	-\$2,533	-\$1,088,222	\$815,612	-\$2,054,290	-\$648,761
2033	\$1,495,623	\$191,023	-\$2,546	-\$688,123	\$822,705	-\$2,054,290	-\$235,608
2034	\$1,495,623	\$194,221	-\$2,555	-\$818,407	\$1,009,910	-\$2,054,290	-\$175,498
2035	\$1,495,623	\$193,866	-\$2,577	\$0	\$59,253	-\$2,054,290	-\$308,125
2036	\$1,495,623	\$193,717	-\$2,595	\$0	\$59,205	-\$2,054,290	-\$308,340
2037	\$1,495,623	\$193,615	-\$2,604	\$0	\$59,181	-\$2,054,290	-\$308,475
2038	\$1,495,623	\$193,489	-\$2,614	\$0	\$62,423	-\$2,054,290	-\$305,369
Total	\$23,937,968	\$2,587,511	-\$33,493	-\$22,793,251	\$14,344,240	-\$32,868,640	-\$14,825,665

### **3. Federal Government**

The Proposed Amendments would have a small fiscal impact on federal government agencies that own/operate fleets or vessel facilities, relative to the total estimated cost of the Proposed Amendments. The federal government is estimated to incur direct costs (identified in Section B of this Chapter) to comply with this regulation. The estimated direct costs to federal government equipment and facility owners are estimated to be \$12.7 million.

#### **F. Macroeconomic Impacts**

Regional Economic Models, Inc. (REMI) Policy Insight Plus Version 2.5.0 is used to estimate the macroeconomic impacts of the proposed amendments on the California economy. REMI is a structural economic forecasting and policy analysis model that integrates input-output, computable general equilibrium, econometric and economic geography methodologies.

##### **1. California Employment Impacts**

The statewide employment impacts of the Proposed Amendments are anticipated to be slightly positive in 2023 through 2030, corresponding with demand for cleaner technology and ZEAT engines and demand for labor and installation of new engines that would likely occur at California-based shipyards. From 2031 through 2038, the Proposed Amendments are estimated to result in slightly lower employment growth as the overall costs of the Proposed Amendments offset the positive impacts of additional in-State demand. The changes in statewide employment never represent more than a 0.01 percent change relative to baseline California employment.

##### **2. California Business Impacts**

Gross output is used as a measure for business impacts because it represents an industry's sales or receipts and tracks the quantity of freight or services produced in a given time period. Output is the sum of output for each private industry, state, and local government as it contributes to the State's Gross Domestic Product (GDP), and is affected by production cost and demand changes. As production cost increases or demand decreases, output is expected to contract, but as production costs decline or demand increases, industries would likely experience growth.

The trends in output impacts by industry are also similar to the trends in the changes in employment by industry. The industries that face direct costs to comply with the Proposed Amendments are estimated to see a decrease in output of up to 1 percent in the years with the greatest impact. Conversely, industries such as ship and boat building and engine, turbine, and power transmission equipment manufacturing are estimated to see increases in output of 13 percent and 0.5 percent in the years of greatest impact.

### **3. Impacts on Investments in California**

Gross domestic private investment consists of purchases of residential and non-residential structures and of equipment and software by private businesses and nonprofit institutions. It 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 changes in private investment for the Proposed Amendments, relative to the baseline, show increases in private investment as great as \$41 million in 2024 and a decrease as large as \$47 million in 2037. In any given year these impacts represent changes of less than 0.01 percent of baseline investment.

### **4. Gross State Product**

GSP is the market value of all freight and services produced in California and is one of the primary indicators used to gauge the health of the economy. Under the Proposed Amendments, GSP is anticipated to increase slightly from 2023 through 2027. This primarily reflects the initial increase in demand for more expensive engines and demand for installations and construction services within California. After this initial demand has been met, the ongoing increased costs to the CHC sector results in a slight decrease in GSP growth. In 2037, GSP is estimated to be \$208 million lower than baseline levels, a 0.01 percent decrease.

### **5. Creation or Elimination of Businesses**

The Proposed Amendments do not directly result in business creation or elimination. However as discussed in Chapter E of the SRIA, changes in outputs of different sectors might indicate the creation or elimination of businesses in the State.

Based on the modeling of output changes, many sectors, such as shipyards and ship and boat building industry may experience an increase in output which may result in the creation of new businesses.

Industries that operate CHC would face costs and see net decreases in output growth and employment. Some of these businesses are large and would not be anticipated to face business elimination. However, many are small businesses and may face substantial compliance costs. If these businesses are unable to pass on the costs of the Proposed Amendments to customers or if there is a significant change in demand for services, it is possible that some businesses would be eliminated.

### **6. Incentives for Innovation**

The Proposed Amendments would provide a strong signal for the development of zero-emission technologies in the off-road and maritime sectors and help in building a robust market for advanced technologies. Growth in the industries that manufacture ZEAT will also strengthen the supply chain and promote technology improvements that may not have happened otherwise. The Proposed Amendments would result in

deploying ZEAT into the marine sector in California, which responds to Governor Newsom's Executive Order N-79-20 by establishing a strategy to achieve zero-emission off-road equipment operations, where feasible and cost effective, by 2035.

## **7. Significant Statewide Adverse Economic Impact Affecting Businesses, Including Ability to Compete**

Since the Proposed Amendments would impose requirements on nearly vessels operating in RCW, regardless of whether they are based in the State or not, the Proposed Amendments are not expected to create a competitive advantage or disadvantage for in-state versus out-of-state vessels or fleets in most vessel categories that operate in RCW.

Some CHC vessels that will be impacted do however compete with vessels located in other jurisdictions. Notably, commercial fishing vessels and ATBs do compete with operations located outside California. Staff discussed the potential impacts of the Proposed Amendments on these vessel categories in Chapter E of the SRIA. Overall staff anticipates the Proposed Amendments to have a limited adverse impact on these vessel categories.

### **G. Alternatives**

Staff analyzed two alternatives to the Proposed Amendments. Under Alternative 1, there would be no low-use exceptions and no compliance extension for vessels with Tier 4 engines and limited operating hours. Under Alternative 2, the Proposed Amendments would not include any new emission control requirements on commercial fishing vessels.

Alternative 1 is more stringent than the Proposed Amendments because it requires low-use excepted vessels to control emissions or be replaced, and it requires some vessels to control emissions or be replaced at an earlier date. Alternative 1 could provide more PM<sub>2.5</sub>, DPM, and NO<sub>x</sub> reductions and health benefits but results in higher costs (about 16 percent higher or \$282 million additional cost). Alternative 1 was rejected because it has higher costs and is less cost effective to implement than the Proposed Amendments.

Alternative 2 is less stringent because it does not require commercial fishing vessels to repower engines to achieve lower emissions. This is estimated to lower costs by \$41 million and overall lower emission reductions. Alternative 2 was rejected because, while it has a lower cost, it would also result in lower emission reductions, decrease health benefits, and is less cost effective in reducing emissions.

More detail on the alternatives is discussed in the following chapter.



## **X. Evaluation of Regulatory Alternatives**

Government Code § 11346.2, subdivision (b)(4) requires CARB to consider and evaluate reasonable alternatives to the proposed regulatory action and provide reasons for rejecting those alternatives. This section discusses alternatives evaluated and provides reasons why these alternatives were not included in the proposal. As explained below, no proposed alternative was found to be less burdensome and equally effective in achieving the purposes of the Proposed Amendments in a manner that ensures full compliance with the authorizing law. The Board has not identified any reasonable alternatives that would lessen adverse impacts on small businesses while still achieving necessary emission reductions.

During the development process of the Proposed Amendments, CARB staff solicited public input regarding alternatives to achieving the Regulation's goals. CARB staff requested input on alternatives in multiple public workshops since December 2018. Staff evaluated several alternatives to the proposal, including suggestions from both public and industry stakeholders.

Staff has selected two alternatives to the Proposed Amendments for formal evaluation, which includes an analysis of cost impacts and health benefits of each alternative and a discussion on why the alternative was rejected. These alternatives are different than the alternatives discussed in Chapter VII or in the EA (Appendix D) because these EA alternatives address reducing the environmental impacts of the Proposed Amendments. The alternatives evaluated in this chapter are proposed as less burdensome and equally effective in achieving the purposes of the Proposed Amendments. It is important to note that two of the alternatives listed here are the same as those that staff considered for the SRIA (Appendix C-1).

### **A. Alternative 1: No Low-Use Exception and No Extension for Vessels with Tier 4 Engines and Limited Operating Hours**

Alternative 1 would amend the Current Regulation. For this alternative, there would be no low-use exception and no extension for vessels with Tier 4 engines and limited operating hours. All vessels would need to comply with the Proposed Amendments, even if they only operate for a limited number of hours. Although this alternative would reduce the time staff would spend on processing paperwork for low-use exemptions and compliance extensions, it would provide less flexibility for vessel owners and operators to comply with the Proposed Amendments.

Alternative 1 would require all vessels to install cleaner engines and retrofit controls, and in some cases replace entire vessels to achieve additional DPM reductions through DPF retrofits. This alternative provides less flexibility for a regulated party to select the best control option to best fit their unique operations. Vessel owners and operators would not have the option to choose how to comply. Vessels with limited operating hours and vessels operating a greater number of hours per year would both be required to install the same controls. Vessels with even a few operational hours

per year would be required to install cleaner engines and new control technology, and in some cases replace their vessels to accommodate the emission control systems. Compliance costs would be the same for vessels regardless of operating hours, but operational revenue would differ substantially. Under Alternative 1, there could be competitiveness issues introduced into the vessel market.

Alternative 1 is estimated to cost \$282 million more than the Proposed Amendments from 2023 to 2038. Under Alternative 1, more vessels would need to be repowered and retrofitted to comply with the amended regulation, even though these vessels would only operate occasionally. Under this scenario, approximately 429 more vessels operating in RCW, with a homebase at several California seaports, harbors, and marinas, would be subject to emission control requirements compared with the Proposed Amendments. Therefore, there would be higher costs for repowering and retrofitting additional vessels. A more detailed breakdown of Alternative 1 costs and savings can be found in the SRIA (Appendix C-1).

Figures X-1 through X-3 below show the emissions benefits from Alternative 1 compared to the Proposed Amendments and the Current Regulation. Alternative 1 projected greater PM2.5, DPM, and NOx emission reductions compared to the Proposed Amendments and the Current Regulation. Alternative 1 supports NOx, PM2.5, and DPM emission reduction objectives.

### **1. Reason for Rejection**

Alternative 1 would cost more, be less cost-effective to implement than the Proposed Amendments, and provides less flexibility. It would increase the overall cost of the Proposed Amendments by 16 percent while achieving 2 percent more reductions for NOx, and 2 percent more reductions for DPM and PM2.5 between 2023 to 2038, a relatively small amount of emission reductions.

CARB staff believes Alternative 1 is not appropriate for all vessels and would result in a more burdensome regulation to the vessel owners and operators, as compared to the Proposed Amendments. For CHC that visit California seaports infrequently, making expensive vessel modifications, even for a single vessel visit, would not be economical.

Overall, CARB staff believes Alternative 1 would be less cost-effective to implement than the Proposed Amendments and would result in a more burdensome regulation to the vessel owners and operators, as compared to the Proposed Amendments. Therefore, Alternative 1 was rejected.

Figure X-1. Alternative 1 - NOx Emissions Estimates

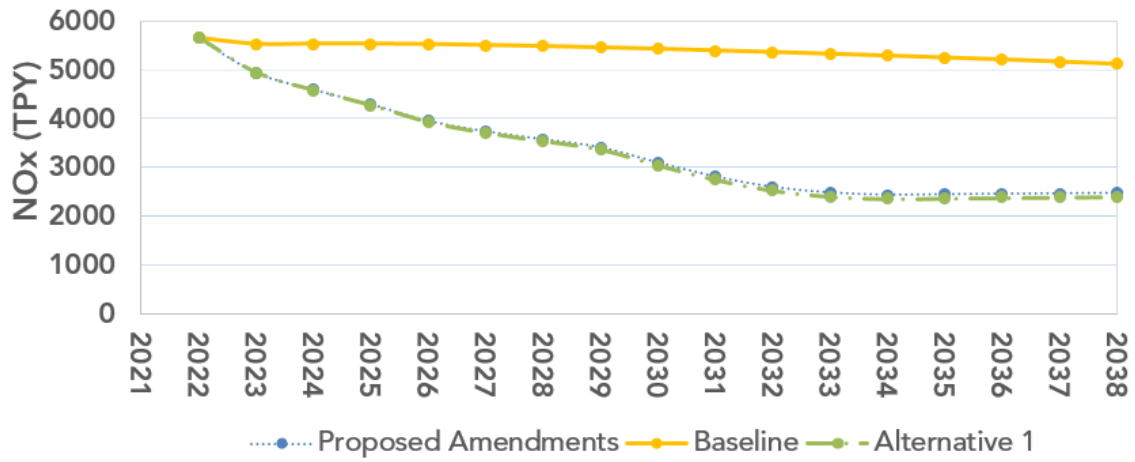


Figure X-2. Alternative 1 - DPM Emissions Estimates

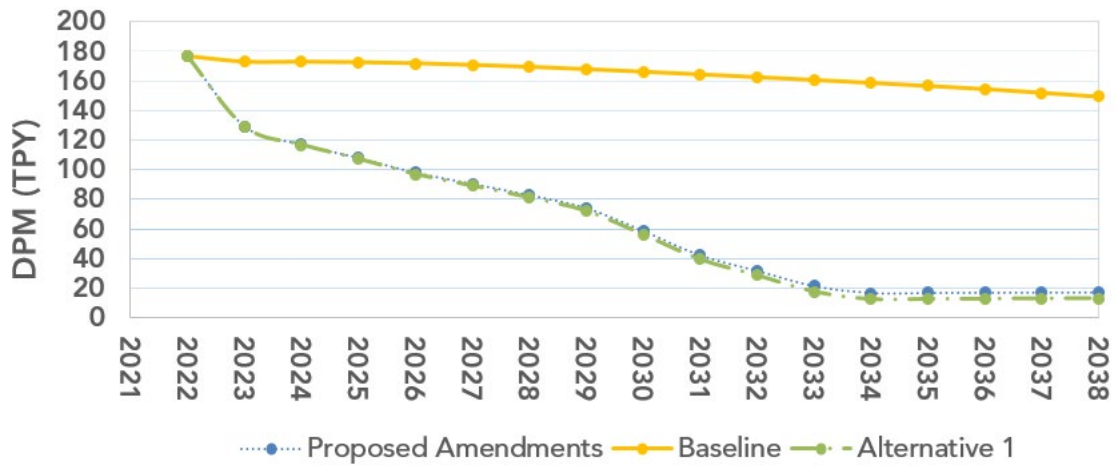
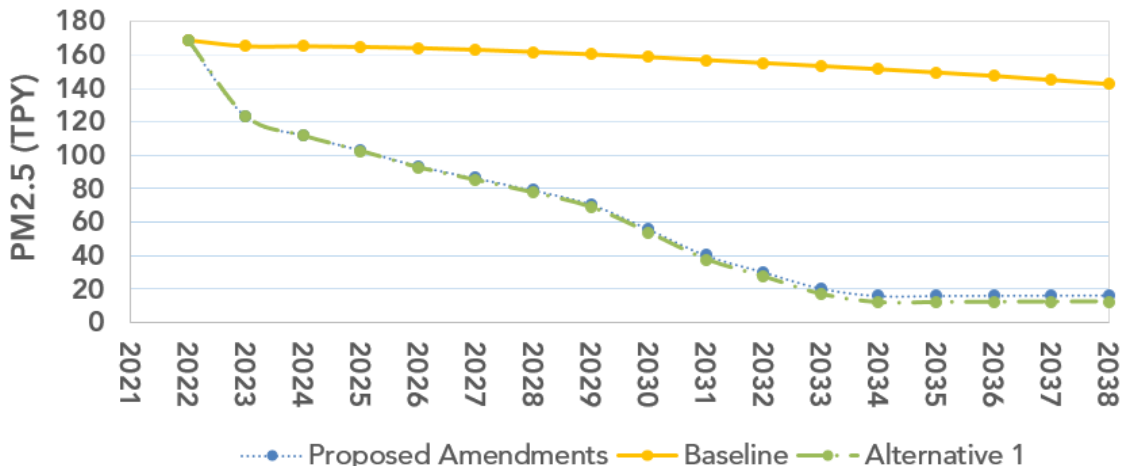


Figure X-3. Alternative 1 - PM2.5 Emissions Estimates



## **B. Alternative 2: No Requirements for Commercial Fishing Vessels**

Alternative 2 differs from the Proposed Amendments because it does not include emission control requirements for commercial fishing vessels. The Proposed Amendments currently require commercial fishing vessels to begin using engines certified to Tier 2 or newer levels between 2030 and 2032.

Under Alternative 2, vessel owners and operators for other regulated in-use vessels (non-commercial fishing vessels) would have the requirements of meeting emissions performance standards equivalent to using Tier 3 or Tier 4 engines plus a DPF, which would be achieved through repowering engines, retrofitting engines, replacing vessels, or using other methods to reduce the emissions, subject to CARB approval. However, under Alternative 2, approximately 640 fewer commercial fishing vessels operating in RCW, with a homebase at several California seaports, harbors, and marinas, would be subject to emission control requirements of using Tier 2 or cleaner engines, compared with the Proposed Amendments.

Figures X-4 through X-6 below show the emissions benefits from Alternative 2 compared to the Proposed Amendments and the Current Regulation. Alternative 2 would provide less NO<sub>x</sub>, PM<sub>2.5</sub>, and DPM emission reductions compared to the Proposed Amendments. Alternative 2 would decrease the overall cost of the Proposed Amendments by 2 percent, while achieving 7 percent less reductions for NO<sub>x</sub> and 7 percent less emission reductions for DPM and PM<sub>2.5</sub>.

### **1. Reason for Rejection**

As discussed in more detail in the SRIA (Appendix C-1), excluding commercial fishing vessels would forgo feasible emission reductions and result in fewer health benefits to the local communities, compared to the Proposed Amendments. Alternative 2 would fail to provide significant additional public health and air quality benefits for California's residents, especially communities adjacent to seaports and terminals.

Overall, CARB staff believes Alternative 2 would not meet CARB's goals and objectives for the Proposed Amendments, as described in Chapter II of this Staff Report. Therefore, Alternative 2 was rejected.

Figure X-4. Alternative 2 - NOx Emissions Estimates

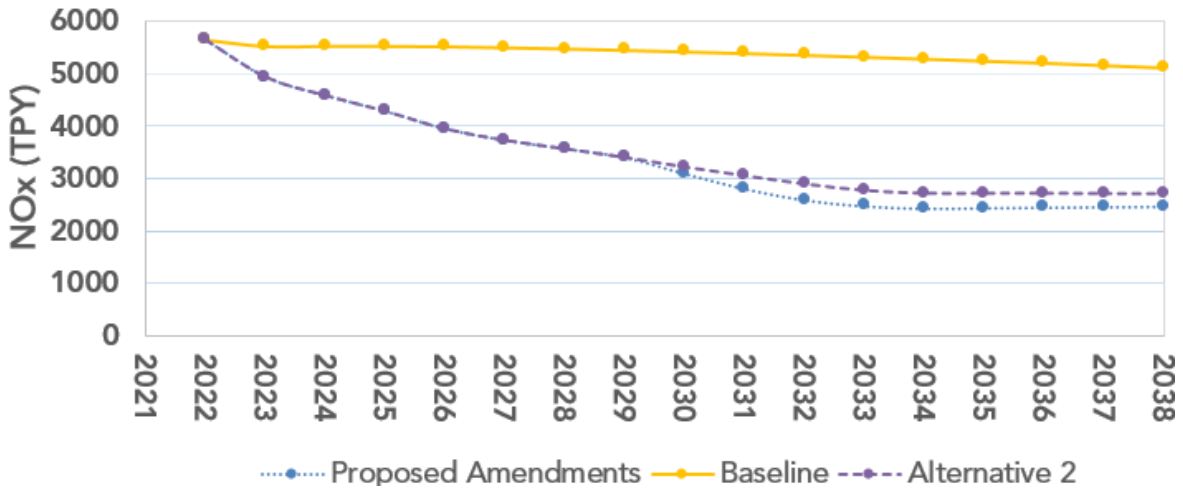


Figure X-5. Alternative 2 - DPM Emissions Estimates

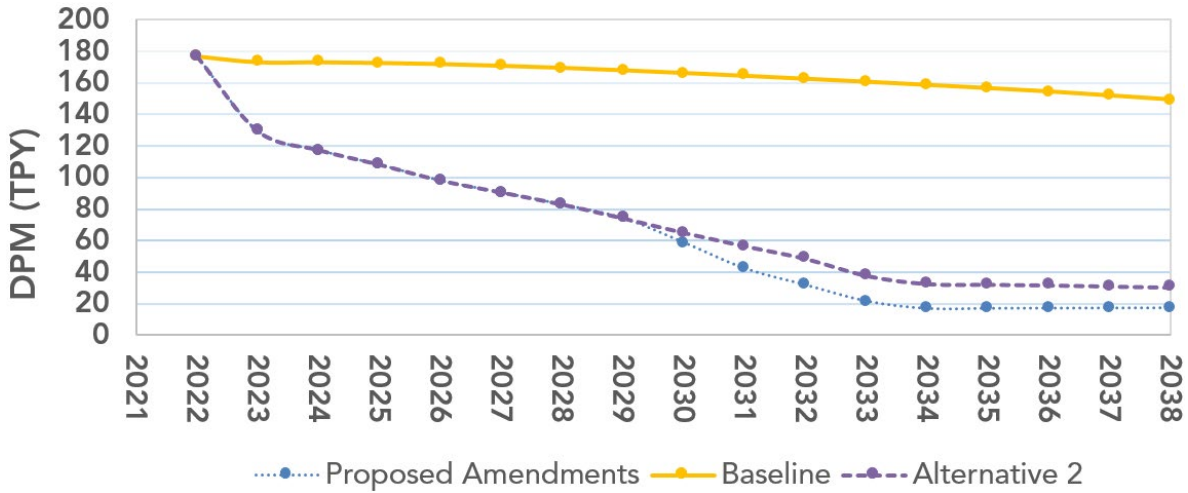
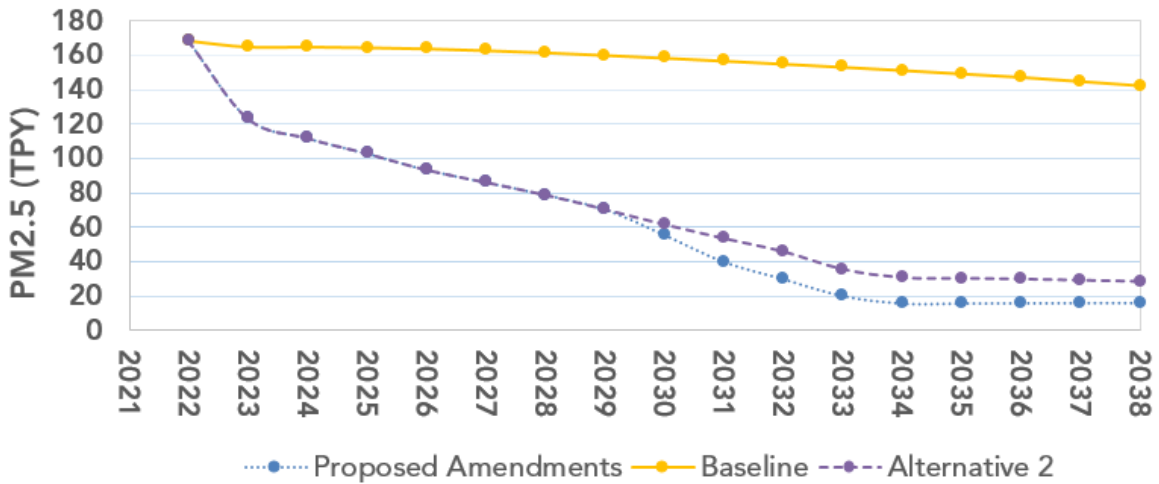


Figure X-6. Alternative 2 - PM2.5 Emissions Estimates



### **C. Small Business Alternative**

The Board has not identified any reasonable alternatives that would lessen adverse impact on small businesses while still achieving necessary emission reductions.

### **D. Emissions Performance Standards in Place of Prescriptive Standards**

With respect to Government Code § 11346.2(b)(4)(A) and 11346.2(b)(1), the Proposed Amendments do not mandate the use of specific technologies or equipment or prescribe specific actions for regulated entities.

### **E. Health and Safety Code § 57005 Major Regulation Alternatives**

CARB staff estimates the Proposed Amendments would have an economic impact on the State's business enterprises of more than \$10 million in one or more years of implementation. Staff will evaluate alternatives submitted and consider whether there is a less costly alternative or combination of alternatives that would be equally as effective in achieving increments of environmental protection in full compliance with statutory mandates within the same amount of time as the proposed regulatory requirements, as required by HSC § 57005.

## **XI. Justification for Adoption of Regulations Different from Federal Regulations Contained in the Code of Federal Regulations**

Government Code section 11346.2(b)(6) requires CARB to describe its efforts to avoid unnecessary duplication or conflicts with federal regulations that address the same issues. Currently, there are no federal regulations that directly address the same issues as CARB's Proposed Amendments to the Current Regulation, so the Proposed Amendments do not conflict with nor duplicate any federal regulations.

The U.S. EPA has promulgated Tier 3 and Tier 4 standards for new marine and off-road (nonroad) engines, but has not promulgated federal standards for addressing emission reductions from in-use commercial harbor craft engines. Under federal Clean Air Act (CAA) section 213, U.S. EPA is without authority to adopt in-use standards for off-road (nonroad) engines, including off-road engines used in CHC. Consequently, the Proposed Amendments do not conflict with or duplicate any federal regulations.

California is the only governmental entity in the United States authorized by the CAA, in the first instance, to adopt emission requirements for in-use off-road engines. (See *Engine Manufacturers Association v. U.S. EPA* 88 F3d. 1075 (D.C. Cir. 1996). Section 209(e)(1) of the CAA conclusively preempts states, including California, from adopting requirements for new off-road engines less than 175 horsepower that are used in farm or construction equipment, and new engines used in new locomotives and locomotive engines. However, the proposed amendments address off-road engines used in marine vessels, rather than those used in farm or construction equipment, or locomotives.

## **XII. Public Process Description**

Consistent with Government Code sections 11346, subdivision (b), and 11346.45, subdivision (a), and with the Board's long-standing practice, CARB staff held public workshops and had other meetings with interested persons during the development of the Proposed Amendments. These informal pre-rulemaking discussions provided staff with useful information that was considered during the development of the Proposed Amendments that are now being shared for formal public comment.

### **A. Public Engagement for Rulemaking Process**

The Proposed Amendments were developed through an extensive public process to address the public health impacts of harbor craft operations.

The rulemaking process for the Proposed Amendments began in 2018. During this process, CARB staff conducted more than 400 meetings, conference calls, and site visits with members of impacted communities, environmental justice advocates, public agencies at federal, state, and local levels, and industry stakeholders (including vessel operators, seaports, marine terminals, industry associations, as well as manufacturers of emission control and ZEAT systems). The format of these conversations included agency working groups, public workshops, community meetings, and meetings with individual stakeholders. In Spring 2020, all meetings transitioned to remote formats such as webinars and web conferences.

Staff hosted meetings and participated in the meetings hosted by stakeholders to gather further input and information and discuss the Proposed Amendments. Among the industry associations represented in these conversations were American Waterways Operators, Passenger Vessel Association, Sportfishing Association of California, and the Marine Recreation Association. Discussions were held with groups such as the Engine Manufacturers Association, in addition to several individual manufacturers who produce engine and emission reduction technologies for vessels. Additionally, staff actively engaged with suppliers of ZEAT and diesel aftertreatment systems such as DPFs, including the Manufacturers of Emission Controls Association, and several of its individual members. Staff also consulted with multiple government agencies throughout the development of the Proposed Amendments, including U.S. EPA, USCG, OSPR, and local air districts in California.

Staff visited several vessel operators to learn more about their individual business operations and understand the scope of challenges facing their industries and surrounding communities. Staff also made visits to tour multiple vessels including ferry, tugboat, articulated tug-barge, pilot, and workboat vessels to learn about their unique layout and operational challenges.

A comprehensive list of these meetings, presentations, workshops, visits, and conference calls can be found in Appendix F. Throughout the rulemaking process,



access to information including notices, presentations, and contact information was made available on CARB’s website for CHC.<sup>123</sup>

## **B. Public Workshops and Webinars**

CARB staff conducted five public workshop webinars to discuss the development of the Proposed Amendments, as well as one question-and-answer session for additional inquiries. All of these meetings were announced with a public workshop notice, which was issued at least two weeks prior to their occurrence. These notices were posted to the CHC program’s website and were sent out to over 4,000 subscribers on CARB’s “Harbor Craft (CHC Regulatory Activities)” email list. These workshops were open to all members of the public. CARB staff regularly provided documents and presentations in advance of the workshops to help stakeholders prepare for the discussions.

In these workshops, staff described the progress and elements of the current draft of the Proposed Amendments, including planned or completed analyses. Staff would then solicit questions, comments, and suggestions from participants. Because the workshops covered the extent of the Proposed Amendments, these discussions in some cases were broad, and staff regularly arranged for individual follow-up calls and meetings with stakeholders who expressed interest in receiving further detail on specific elements. Due to the number of stakeholder inquiries in the September 2020 workshop, CARB staff held an additional public question-and-answer session the following month.

## **C. Community Meetings**

CARB staff attended and presented at multiple community meetings of residents and businesses, to communicate intentions and solicit input. These meetings included community-based organizations, environmental justice advocacy organizations, as well as steering committees for communities that are implementing targeted emission reduction programs under AB 617. The CHC regulation is included in the CAPP Blueprint as an action CARB must consider to help communities heavily impacted by freight sources achieve their air quality goals. As these meetings were generally for the residents of specific areas and communities, the content of inquiries and comments staff received was typically focused on the specific types of harbor craft operating in that area.

## **D. Work Groups and Informational Meetings**

CARB staff joined many workgroups, teleconferences, and webinars of trade associations, technology providers, vessel operators, and seaport authorities, to gather information that would inform the development of the Proposed Amendments.

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<sup>123</sup> CARB, CHC Meetings and Workshops, last accessed July 6, 2021, <https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft/chc-meetings-workshops>.

These meetings provided perspectives on the status of available and upcoming technologies with lower and zero emissions, as well as on current developments among related industry sectors and public agencies. Following these workgroup sessions, staff frequently requested meetings with individual companies. These informational meetings provided staff with many specific details of harbor craft operations and technologies, and informed the development of concepts, including the ACE compliance option. These informational meetings also included discussion of trends in various industry sectors, which assisted staff in examining the interest among technology providers potentially considering entry into the marine market.

#### **E. Site and Vessel Visits**

CARB staff made several in-person visits to the facilities, offices, and vessels of harbor craft operators to observe and discuss operations. These visits were invaluable in providing staff with further perspective on the challenges and opportunities for harbor craft operators to reduce emissions. The nature of the discussion during these visits generally centered on the costs, feasibility, and application of various emission control strategies. Vessel visits also allowed staff to evaluate proposed concepts in the field; for example, CARB staff collected opacity data (for more information, see Appendix E) on vessels as one input in developing the proposed opacity testing procedures. Site visits allowed CARB staff to meet with the employees and managers implementing the requirements of the Current Regulation and to discuss the concepts under development for the Proposed Amendments. In-person visits were conducted from April 2018 to March 2020.

## XIII. References

### A. ISOR Chapters I-XII References

- [1] CARB, Community Air Protection Blueprint, October 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-03/final\\_community\\_air\\_protection\\_blueprint\\_october\\_2018\\_acc.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/final_community_air_protection_blueprint_october_2018_acc.pdf).
- [2] U.S. EPA, Federal Register, Vol. 76, No. 239, California State Nonroad Engine Pollution Control Standards; Commercial Harbor Craft Regulations; Notice of Decision, December 13, 2011, last accessed June 28, 2021, <https://www.govinfo.gov/content/pkg/FR-2011-12-13/pdf/2011-31916.pdf>.
- [3] CARB, Regulatory Advisory, Advisory Number: 310, Implementation of the Commercial Harbor Craft Regulation, last accessed June 28, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/enf/advs/advs310.pdf>.
- [4] U.S. EPA, Federal Register, Vol. 82, No. 12, California State Nonroad Engine Pollution Control Standards; Commercial Harbor Craft Regulation; Notice of Decision, January 19, 2017, last accessed June 28, 2021, <https://www.govinfo.gov/content/pkg/FR-2017-01-19/pdf/2017-01261.pdf>.
- [5] CARB, Staff Report: Public Hearing to Consider Adoption of Emission Standards and Test Procedures for New 2001 and Later Model Year Spark-Ignition Marine Engines, October 23, 1998, last accessed June 28, 2021, <https://ww3.arb.ca.gov/regact/marine/isor.pdf>.
- [6] CARB, Staff Report: Public Hearing to Consider Adoption of Emission Standards and Test Procedures for New 2003 and Later Spark-Ignition Inboard and Sterndrive Marine Engines, June 8, 2001, last accessed June 28, 2021, <https://www.arb.ca.gov/regact/marine01/isor.pdf>.
- [7] CARB, Final Regulation Order: Control Measure for Ocean-Going Vessels At Berth, 2020, last accessed June 28, 2021, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/fro.pdf>.
- [8] CARB, Final Regulation Order: Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port, 2007, last accessed June 28, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-04/finalregulation\\_ADA.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-04/finalregulation_ADA.pdf).
- [9] CARB, Staff Report: Initial Statement of Reasons, Public Hearing to Consider the Proposed Control Measure for Ocean-Going Vessels At Berth, October 15, 2019, last accessed June 28, 2021, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/isor.pdf>.

- [10] 17 CCR, §93118.2, Airborne Toxic Control Measure for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline, Amended October 27, 2011, last accessed June 28, 2021, <https://ww3.arb.ca.gov/ports/marinevess/documents/fuelogv17.pdf>.
- [11] 46 CFR Subchapter D – Tank Vessels, last accessed June 28, 2021, <https://www.gpo.gov/fdsys/pkg/CFR-2008-title46-vol1/pdf/CFR-2008-title46-vol1-chapl-subchapD.pdf>.
- [12] 46 CFR Subchapter O – Certain Bulk Dangerous Cargoes, last accessed June 28, 2021, <https://www.gpo.gov/fdsys/pkg/CFR-2011-title46-vol5/pdf/CFR-2011-title46-vol5-chapl-subchapO.pdf>.
- [13] 46 CFR Subchapter U – Oceanographic Research Vessels, last accessed June 28, 2021, <https://www.govinfo.gov/content/pkg/CFR-2012-title46-vol7/pdf/CFR-2012-title46-vol7-chapl-subchapU.pdf>.
- [14] CARB, Overview: Diesel Exhaust & Health, last accessed June 28, 2021, <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>.
- [15] U.S. EPA, Health Assessment Document for Diesel Engine Exhaust, May 2002, last accessed June 28, 2021, [https://ofmpub.epa.gov/eims/eimscomm.getfile?p\\_download\\_id=36319](https://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=36319).
- [16] IARC, WHO, Diesel and Gasoline Engine Exhausts and Some Nitroarenes, Volume 105, 2012, last accessed June 28, 2021, [https://www.who.int/ipcs/assessment/public\\_health/IARC\\_mono105.pdf](https://www.who.int/ipcs/assessment/public_health/IARC_mono105.pdf).
- [17] CARB, Inhalable Particulate Matter and Health (PM2.5 and PM10), last accessed June 28, 2021, <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>.
- [18] U.S. EPA, Nitrogen Dioxide (NO<sub>2</sub>) Pollution, 2016, last accessed June 28, 2021, <https://www.epa.gov/no2-pollution/basic-information-about-no2#>.
- [19] Quiros, et al., Real-World Emissions from Modern Heavy-Duty Diesel, Natural Gas, and Hybrid Diesel Trucks Operating Along Major California Freight Corridors, July 19, 2016, last accessed June 28, 2021, <https://link.springer.com/content/pdf/10.1007/s40825-016-0044-0.pdf>.
- [20] IMO, Greenhouse Gas Emissions, last accessed June 28, 2021, <https://www.imo.org/en/OurWork/Environment/Pages/GHG-Emissions.aspx>.

- [21] Stefanini, Sara, Countries Inch Towards 'Bare Minimum' Climate Target For Shipping, April 10, 2018, last accessed June 28, 2021, <https://www.climatechangenews.com/2018/04/10/countries-inch-towards-bare-minimum-climate-target-shipping/>.
- [22] HSC § 38566, Division 25.5, Senate Bill No. 32, September 8, 2016, last accessed June 28, 2021, [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=2015201605B32](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=2015201605B32).
- [23] Quiros, et al., Greenhouse Gas Emissions from Heavy-Duty Natural Gas, Hybrid, and Conventional Diesel On-Road Trucks During Freight Transport, Atmospheric Environment, Volume 168, November 2017, <https://www.sciencedirect.com/science/article/pii/S1352231017305794>.
- [24] Myhre, G. et al., Anthropogenic and Natural Radiative Forcing, 2013, last accessed June 28, 2021, [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_Chapter08\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf).
- [25] CPUC, Passenger Stage Corporation & Vessel Common Carrier, last accessed June 28, 2021, <https://www.cpuc.ca.gov/pscvccl/>.
- [26] CPUC, Rules of Practice and Procedure, California Code of Regulations Title 20, Division 1, Chapter 1, April 1, 2018, last accessed June 28, 2021, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K618/209618807.pdf>.
- [27] CPUC, Resolution M-4838, February 5, 2019, last accessed June 28, 2021, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M264/K682/264682931.pdf>.
- [28] CPUC, Instructions for Filing the PUC Transportation Reimbursement Account (PUCTRA) Fee Statement, June 2019, last accessed June 28, 2021, [https://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Public\\_Website/Content/Licensing/Regulatory\\_Information/Instructions%20for%20Filing%20PUCTRA%20\(VCC\).pdf](https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Licensing/Regulatory_Information/Instructions%20for%20Filing%20PUCTRA%20(VCC).pdf).
- [29] CPUC, Resolution TL-18989, March 6, 2002, last accessed June 28, 2021, [https://docs.cpuc.ca.gov/published/Final\\_resolution/13913.htm](https://docs.cpuc.ca.gov/published/Final_resolution/13913.htm).
- [30] CPUC, Resolution TL-19042, June 9, 2004, last accessed June 28, 2021, [https://docs.cpuc.ca.gov/published/Agenda\\_resolution/36583.htm](https://docs.cpuc.ca.gov/published/Agenda_resolution/36583.htm).
- [31] CPUC, Passenger Carriers Enforcement, last accessed June 28, 2021, <https://www.cpuc.ca.gov/General.aspx?id=3009>.

- [32] Texas Commission on Environmental Quality, Emissions Reduction Incentive Grants (ERIG) Program, Webinar Presentation, Air Grants Division, November 2020, last accessed June 28, 2021, [https://www.tceq.texas.gov/assets/public/implementation/air/terp/erig/FY21/FY20\\_ERIG\\_Workshop\\_Presentation\\_Final.pdf](https://www.tceq.texas.gov/assets/public/implementation/air/terp/erig/FY21/FY20_ERIG_Workshop_Presentation_Final.pdf).
- [33] New Jersey Clean Air Council, Public Hearing July 30, 2020, Past, Present, and Future: Air Quality Around Our Ports and Airports, last accessed on June 28, 2021, <https://www.state.nj.us/dep/cleanair/pdfs/cac2020report.pdf>.
- [34] CARB, Final Regulation Order: Regulation for In-Use Off-Road Diesel-Fueled Fleets, 2011, last accessed June 28, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/ordiesel/documents/finalregorder-dec2011.pdf>.
- [35] CARB, Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments for Commercial Harbor Craft, September 2007, <https://ww3.arb.ca.gov/regact/2007/chc07/isor.pdf>.
- [36] U.S. EPA, MARPOL Annex VI and the Act to Prevent Pollution from Ships (APPS), last accessed June 28, 2021, <https://www.epa.gov/enforcement/marpol-annex-vi-and-act-prevent-pollution-ships-apps#marpol>.
- [37] U.S. EPA, Federal Register, Vol. 73, No. 126, June 30, 2008, Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder, last accessed June 28, 2021, <https://www.gpo.gov/fdsys/pkg/FR-2008-06-30/pdf/R8-7999.pdf>.
- [38] UCR, Final Report: Ultra-Low NOx Near-Zero Natural Gas Vehicle Evaluation ISX12N 400, April 2018, last accessed June 29, 2021, <https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/5b9ff77eb8a045bc3da9ab05/1537210247037/Ultra-Low+NOx+Near-Zero+Natural+Gas+Vehicle+Evaluation.pdf>.
- [39] U.S. EPA, Federal Register, Vol. 85, No. 192, Amendments Related to Marine Diesel Engine Emission Standards, 40 CFR Part 1042, October 2, 2020, last accessed June 29, 2021, <https://www.govinfo.gov/content/pkg/FR-2020-10-02/pdf/2020-18621.pdf>.
- [40] CARB, Frequently Asked Questions: Regulation for In-Use Off-Road Diesel-Fueled Fleets (Off-Road Regulation), December 2015, last accessed June 29, 2021, <https://ww3.arb.ca.gov/msprog/ordiesel/faq/vdecsfaq.pdf>.

- [41] CARB, Executive Order DE-09-006, April 17, 2009, last accessed June 29, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic//diesel/verdev/pdf/executive\\_orders/de-09-006.pdf](https://ww2.arb.ca.gov/sites/default/files/classic//diesel/verdev/pdf/executive_orders/de-09-006.pdf).
- [42] CARB, Verification Procedure: Currently Verified, last accessed June 29, 2021, <https://ww2.arb.ca.gov/verification-procedure-currently-verified>.
- [43] International Council on Clean Transportation, European Stage V Non-Road Emission Standards Policy Update, November 2016, last accessed June 29, 2021, [https://theicct.org/sites/default/files/publications/EU-Stage-V\\_policy%20update\\_ICCT\\_nov2016.pdf](https://theicct.org/sites/default/files/publications/EU-Stage-V_policy%20update_ICCT_nov2016.pdf).
- [44] Official Journal of the European Union, Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016, September 14, 2016, last accessed June 29, 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1628&from=EN>.
- [45] CARB, Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, October 2000, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic//diesel/documents/rrpfinal.pdf>.
- [46] CARB, Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed July 6, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).
- [47] OEHHA, CalEnviroScreen 3.0, last accessed July 6, 2021, <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30>.
- [48] CARB, Draft Community Air Protection Blueprint For Selecting Communities, Preparing Community Emissions Reduction Programs, Identifying Statewide Strategies, and Conducting Community Air Monitoring, June 7, 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-06/draft\\_community\\_air\\_protection\\_blueprint.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-06/draft_community_air_protection_blueprint.pdf).
- [49] CARB, AB 1807 Toxic Air Contaminant Identification and Control, last accessed July 6, 2021, <https://ww3.arb.ca.gov/toxics/background.htm>.
- [50] CARB, Staff Report: Public Hearing to Consider the Proposed Advanced Clean Trucks Regulation, October 22, 2019, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2019/act2019/isor.pdf>.
- [51] CARB, Mobile Source Strategy, May 2016, last accessed July 6, 2021, <https://www.arb.ca.gov/planning/sip/2016sip/2016mobsr.pdf>.

- [52] CARB, Revised Proposed 2016 State Strategy for the State Implementation Plan, March 7, 2017, last accessed July 6, 2021, <https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf>.
- [53] CARB, Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed July 6, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).
- [54] HSC, Assembly Bill No. 32, September 27, 2006, last accessed July 6, 2021, [http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_0001-0050/ab\\_32\\_bill\\_20060927\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf).
- [55] HSC, Senate Bill 32, September 8, 2016, last accessed July 6, 2021, [http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb\\_0001-0050/sb\\_32\\_bill\\_20160908\\_chaptered.html](http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb_0001-0050/sb_32_bill_20160908_chaptered.html).
- [56] CARB, Short-Lived Climate Pollutant Reduction Strategy, March 2017, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-12/final\\_slcp\\_report%20Final%202017.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-12/final_slcp_report%20Final%202017.pdf).
- [57] Stefanini, Sara, Countries Inch Towards 'Bare Minimum' Climate Target for Shipping, 2018, last accessed July 6, 2021, <https://www.climatechangenews.com/2018/04/10/countries-inch-towards-bare-minimum-climate-target-shipping/>.
- [58] UNFCCC, The Paris Agreement, United Nations Climate Change, 2017, last accessed July 6, 2021, <https://unfccc.int/process/the-paris-agreement/what-is-the-paris-agreement>.
- [59] Cook, J., et al., Consensus on Consensus: a Synthesis of Consensus Estimates on Human-Caused Global Warming, *Environ. Res. Lett.* 11 (2016) 048002, April 13, 2016, last accessed July 6, 2021, <http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002/pdf>.
- [60] California Ocean Protection Council Science Advisory Team Working Group, Rising Seas in California: An Update On Sea-Level Rise Science, April 2017, last accessed July 6, 2021, <https://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf>.
- [61] OEHHA, Indicators of Climate Change in California, May 9 2018, last accessed July 6, 2021, <https://oehha.ca.gov/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf>.



- [62] Office of Governor Edmund G. Brown, Executive Order B-32-15, April 29, 2015, last accessed July 6, 2021, <https://www.ca.gov/archive/gov39/2015/07/17/news19046/>.
- [63] HSC, Senate Bill No. 32, September 8, 2016, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=2015201605B32](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=2015201605B32).
- [64] CARB, Community Air Protection Program- 2018 Community Recommendations Staff Report, Revised September 11, 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-09/2018\\_community\\_recommendations\\_staff\\_report\\_revised\\_september\\_11.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-09/2018_community_recommendations_staff_report_revised_september_11.pdf).
- [65] SCAQMD, Community Emissions Reduction Plan- Wilmington, Carson, West Long Beach, September 2019, last accessed July 6, 2021, <http://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/wilmington/cecp/final-cecp-wcwlb.pdf?sfvrsn=8>.
- [66] Bay Area Air Quality Management District, WOEIP, Owning Our Air: The West Oakland Community Action Plan-A Summary, October 2019, last accessed July 6, 2021, <https://www.baaqmd.gov/~media/files/ab617-community-health/west-oakland/100219-files/owning-our-air-plan-summary-pdf.pdf?la=en>.
- [67] Unified Port of San Diego, Port of San Diego Climate Action Plan, 2013, last accessed July 6, 2021, <https://pantheonstorage.blob.core.windows.net/environment/Port-of-San-Diego-Climate-Action-Plan.pdf>.
- [68] Port of San Diego, Maritime Clean Air Strategy Subcommittee Presentation, September 29, 2020, last accessed July 6, 2021, [https://www.sandiegocounty.gov/content/dam/sdc/apcd/PDF/AB\\_617/Port%20of%20San%20Diego%20MCAS%20Subcommittee%20Presentation\\_09.29.20.pdf](https://www.sandiegocounty.gov/content/dam/sdc/apcd/PDF/AB_617/Port%20of%20San%20Diego%20MCAS%20Subcommittee%20Presentation_09.29.20.pdf)
- [69] POLA and POLB, San Pedro Bay Ports Clean Air Action Plan, November 2017, last accessed July 6, 2021, <http://cleanairactionplan.org/documents/final-2017-clean-air-action-plan-update.pdf/>.
- [70] Port of Oakland, Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions, June 13, 2019, last accessed July 6, 2021, <https://www.portofoakland.com/files/PDF/2020%20and%20Beyond%20Plan%20Vol%20I.pdf>.

- [71] Littlejohn, Donna, Port of LA Continues Breaking Cargo Records in Historic 7-Month Surge, March 16, 2021, last accessed July 6, 2021, <https://www.dailybreeze.com/2021/03/16/port-of-la-continues-breaking-cargo-records-in-historic-7-month-surge/>.
- [72] Littlejohn, Donna, Long Beach Port Sees Largest February Cargo Flow in Its 110-Year History, March 10, 2021, last accessed July 6, 2021, <https://www.presstelegram.com/2021/03/10/long-beach-port-sees-largest-february-cargo-flow-in-its-110-year-history/>.
- [73] POLA, Container Statistics, 2019-2021, last accessed July 7, 2021, <https://www.portoflosangeles.org/business/statistics/container-statistics>.
- [74] POLB, Port Statistics, 2019-2021, last accessed July 7, 2021, <https://polb.com/business/port-statistics/#teus-archive-1995-to-present>.
- [75] Email between Tim Hanners (WETA) and David Quiros (CARB) dated June 21, 2021, June 28, 2021, and July 7, 2021.
- [76] Email between Tim Hanners (WETA) and David Quiros (CARB) dated April 20, 2021. Some data in 2021 was imputed to approximate monthly totals where not directly provided by WETA.
- [77] Comment letter from Hornblower to CARB sent via email on November 1, 2020 in response to CARB's public workshop on September 30, 2020.
- [78] DOF, Economic Forecasts, U.S. and California, last accessed July 7, 2021, [https://www.dof.ca.gov/Forecasting/Economics/Eco\\_Forecasts\\_Us\\_Ca/](https://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/).
- [79] CARB, Final Statement of Reasons for Rulemaking for the Adoption of a Proposed Regulation to Reduce Emissions from In-Use On-Road Diesel Vehicles, 2008, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2008/truckbus08/pt2revfsor.pdf>.
- [80] CARB, Final Statement of Reasons for Rulemaking: Public Hearing to Consider Proposed Amendments to the Regulation for Mobile Cargo Handling Equipment, 2011, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2011/cargo11/cargofsor.pdf>.
- [81] CARB, Final Statement of Reasons for Rulemaking: Public Hearing to Consider the Adoption of Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements, 2010, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2010/offroadlsi10/lisifsor.pdf>.

- [82] CARB, Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, 2020, last accessed July 6, 2021, <https://ww3.arb.ca.gov/regact/2020/hdomnibuslownox/isor.pdf>.
- [83] OEHHA, SB 535 Disadvantaged Communities, June 2017, last accessed July 6, 2021, <https://oehha.ca.gov/calenviroscreen/sb535>.
- [84] HSC § 39711, Division 26, 2019, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=HSC&division=26.&title=&part=2.&chapter=4.1.&article](https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=26.&title=&part=2.&chapter=4.1.&article).
- [85] CARB, The Carl Moyer Program Guidelines, 2017, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017\\_cmpgl.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf).
- [86] Bryan, Tom, Renewable Diesel's Rising Tide, January 12, 2021, last accessed July 6, 2021, <http://www.biodieselmagazine.com/articles/2517318/renewable-diesels-rising-tide>.
- [87] CalEPA, Staff Report: Multimedia Evaluation of Renewable Diesel, last accessed July 6, 2021, [https://ww3.arb.ca.gov/fuels/multimedia/meetings/renewabledieselstaffreport\\_nov2013.pdf](https://ww3.arb.ca.gov/fuels/multimedia/meetings/renewabledieselstaffreport_nov2013.pdf).
- [88] California Council on Diesel Education and Technology, Applying the SAE J1667 Snap Acceleration Test Procedure to RTG Cranes, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic//ports/cargo/documents/091118saej1667rtg.pdf>.
- [89] U.S. EPA, Visual Emissions Field Manual EPA Methods 9 and 22, December 1993, last accessed July 6, 2021, <https://www.epa.gov/sites/production/files/2020-08/documents/velfieldmanual.pdf>.
- [90] CARB, Public Workshop for the Draft Proposed Amendments to the Commercial Harbor Craft Regulation, September 30, 2020, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/2020-09/CHC%20Workshop%20September%202020.pdf>.
- [91] USCG, National Vessel Documentation Center FAQ, last accessed February 5, 2021, <https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/National-Vessel-Documentation-Center/National-Vessel-Documentation-Center-FAQ/>.

- [92] DMV, Boat/ Vessel Registration, last accessed July 6, 2021, <https://www.dmv.ca.gov/portal/vehicle-registration/new-registration/register-your-boat-vessel/>.
- [93] FGC § 7880-7892, Division 6, 1997, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=FGC&division=6.&title=&part=3.&chapter=1.&article=4](https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=FGC&division=6.&title=&part=3.&chapter=1.&article=4).
- [94] IMO, IMO Identification Number Schemes, last accessed July 6, 2021, <https://www.imo.org/en/OurWork/MSAS/Pages/IMO-identification-number-scheme.aspx>.
- [95] U.S. Department of Homeland Security, Maritime Mobile Source Identity, last accessed July 6, 2021, <https://www.navcen.uscg.gov/?pageName=mtmmsi>.
- [96] CARB, Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant; Part A, Exposure Assessment, April 22, 1998, last accessed July 6, 2021, [https://www.arb.ca.gov/toxics/dieseltac/part\\_a.pdf%20](https://www.arb.ca.gov/toxics/dieseltac/part_a.pdf%20).
- [97] U.S. EPA, Fine Particle Concentrations Based on Monitored Air Quality from 2009 – 2011, July 15, 2012, last accessed July 6, 2021, [https://www.epa.gov/sites/production/files/2016-04/documents/current\\_pm\\_table.pdf](https://www.epa.gov/sites/production/files/2016-04/documents/current_pm_table.pdf).
- [98] U.S. EPA, Integrated Science Assessment for Oxides of Nitrogen – Health Criteria, January 2016, last accessed July 6, 2021, [http://ofmpub.epa.gov/eims/eimscomm.getfile?p\\_download\\_id=526855](http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=526855).
- [99] U.S. EPA, Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses, December 2010, last accessed July 6, 2021, <https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf>.
- [100] U.S. EPA, An SAB Report on EPA’s White Paper Valuing the Benefits of Fatal Cancer Risk Reduction, July 2000, last accessed July 6, 2021, [https://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/\\$File/eeacf013.pdf](https://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/$File/eeacf013.pdf).
- [101] U.S. EPA, Mortality Risk Valuation – What does it mean to place a value on life?, last accessed July 6, 2021, <https://www.epa.gov/environmental-economics/mortality-risk-valuation#means>.
- [102] CARB, The Economic Value of Respiratory and Cardiovascular Hospitalizations, May 31, 2003, last accessed July 6, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/99-329.pdf>.

- [103] California Ocean Protection Council Science Advisory Team Working Group, Rising Seas in California: An Update on Sea-Level Rise Science, April 2017, last accessed July 6, 2021, <https://opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf>.
- [104] OEHHA, Indicators of Climate Change in California, May 2018, last accessed July 6, 2021, <https://oehha.ca.gov/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf>.
- [105] NJDEP, Ocean Going Vessels & Harbor Craft, Stakeholder Meeting – September 16, 2020, last accessed July 6, 2021, <https://www.nj.gov/dep/workgroups/docs/njpact-air-co2-20200916-ogv-pm-pres.pdf>.
- [106] CHC engine data reported to CARB by owners and operators under the CHC Regulation, February 2019.
- [107] USCG, Merchant Vessels of the United States, March 2019, [https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy\(CG-5P\)/InspectionsCompliance\(CG-5PC\)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx](https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy(CG-5P)/InspectionsCompliance(CG-5PC)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx).
- [108] POLA, Annual Inventory of Air Emissions, last accessed July 6, 2021, <https://www.portoflosangeles.org/environment/air-quality/air-emissions-inventory>.
- [109] POLB, Emissions Inventory, last accessed May 19, 2021, <https://polb.com/environment/air/#emissions-inventory>.
- [110] CARB reporting database from 2010 to 2018
- [111] WETA, 2016 Strategic Plan, last accessed July 6, 2021, <https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WETAstrategicPlanFinal.pdf>.
- [112] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Marine Compression-Ignition (CI) Engines, 2020, last accessed July 7, 2021, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.
- [113] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Nonroad Compression Ignition (NRCI) Engines, 2020, last accessed July 7, 2021, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.

- [114] CARB, Policies and Actions for Environmental Justice, December 13, 2001, last accessed July 6, 2021, <https://ww3.arb.ca.gov/ch/programs/ej/ejpolicies.pdf>.
- [115] CARB, Community Air Protection Blueprint, October 2018, last accessed July 6, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-03/final\\_community\\_air\\_protection\\_blueprint\\_october\\_2018\\_acc.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/final_community_air_protection_blueprint_october_2018_acc.pdf).
- [116] CARB, Community Air Protection Program Communities, last accessed July 6, 2021, <https://ww2.arb.ca.gov/capp-communities>.
- [117] HSC § 39660 et seq., Division 26, Identification of Toxic Air Contaminants, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?sectionNum=39660.&lawCode=HSC](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=39660.&lawCode=HSC).
- [118] HSC § 43013 et seq., Division 26, General Provisions, last accessed July 6, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?sectionNum=43013.&lawCode=HSC](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=43013.&lawCode=HSC).
- [119] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, last accessed July 7, 2021, <https://www.cdtfa.ca.gov/taxes-and-fees/rates.aspx>.
- [120] Email between Lauren Duran Gularte (WETA) and Tracy Haynes (CARB) dated November 17, 2020.
- [121] Email between Alex Brodie (Island Packers) and David Quiros (CARB) dated October 1, 2020.
- [122] California Department of Tax and Fee Administration, 2020 Electrical Energy Surcharge Rate, last accessed July 6, 2020, <https://www.cdtfa.ca.gov/formspubs/l725.pdf>.
- [123] CARB, CHC Meetings and Workshops, last accessed July 6, 2021, <https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft/chc-meetings-workshops>.

## **B. Appendix C-1 References**

### **1. Chapters A-F References**

- [1] 17 CCR § 93118.5. Amendments to The Regulations to Reduce Emissions From Diesel Engines on Commercial Harbor Craft Operated Within California Waters And 24 Nautical Miles of The California Baseline, "Airborne Toxic Control Measure for Commercial Harbor Craft," [https://ww3.arb.ca.gov/regact/2010/chc10/frochc931185.pdf?\\_ga=2.78049812.1270712077.1612894570-1636078118.1596670776](https://ww3.arb.ca.gov/regact/2010/chc10/frochc931185.pdf?_ga=2.78049812.1270712077.1612894570-1636078118.1596670776).

- [2] 13 CCR § 2299.5. Amendments to The Regulations to Reduce Emissions From Diesel Engines on Commercial Harbor Craft Operated Within California Waters And 24 Nautical Miles of The California Baseline, "Low Sulfur Fuel Requirement, Emission Limits and Other Requirements for Commercial harbor Craft," [https://ww3.arb.ca.gov/regact/2010/chc10/frochc22995.pdf?\\_ga=2.14562743.1270712077.1612894570-1636078118.1596670776](https://ww3.arb.ca.gov/regact/2010/chc10/frochc22995.pdf?_ga=2.14562743.1270712077.1612894570-1636078118.1596670776).
- [3] California Legislature, Senate Bill 617, signed on October 5, 2011, last accessed June 2020, [http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201120120SB617](http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB617).
- [4] Department of Finance, Chapter 1: Standardized regulatory Impact Analysis For Major Regulations - Order of Adoption, last accessed June 2020, [http://www.dof.ca.gov/Forecasting/Economics/Major\\_Regulations/SB\\_617\\_Rule\\_making\\_Documents/documents/Order\\_of\\_Adoption-2.pdf](http://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/SB_617_Rule_making_Documents/documents/Order_of_Adoption-2.pdf).
- [5] California Air Resources Board Final Regulation Order Airborne Toxic Control Measure for Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline, Section 93118.5, Title 17, California Code of Regulations, November 19, 2008, [https://www.arb.ca.gov/regact/2007/chc07/rev93118.pdf?\\_ga=2.250235973.234599760.1605638934-1017863673.1605638934](https://www.arb.ca.gov/regact/2007/chc07/rev93118.pdf?_ga=2.250235973.234599760.1605638934-1017863673.1605638934).
- [6] California Air Resources Board Final Regulation Order Emission Limits and Requirements for Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline, Section 2299.5, Title 13, California Code of Regulations, November 19, 2008, <https://www.arb.ca.gov/regact/2007/chc07/chcfro13.pdf>.
- [7] Specifically, Research Vessels are any vessel subject to requirements of 46 CFR Subchapter U, Oceanographic Research Vessels, last accessed January 28, 2021, <https://www.govinfo.gov/content/pkg/CFR-2012-title46-vol7/pdf/CFR-2012-title46-vol7-chap1-subchapU.pdf>.
- [8] CARB, Overview: Diesel Exhaust & Health, last accessed January 29, 2020, <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>.
- [9] CARB Board Hearing, Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed February 21, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).

- [10] Public Workshop for the Draft Proposed Amendments to the Commercial Harbor Craft Regulation, March 16, 2021, <https://ww2.arb.ca.gov/sites/default/files/2021-03/March%202021%20Workshop%20Slides%20-%20English.pdf>.
- [11] Adapted from CARB Board Hearing, Implementation of State SIP Strategy and South Coast AQMD - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed February 21, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).
- [12] CARB, Inhalable Particulate Matter and Health (PM2.5 and PM10), August 10, 2017, last accessed November 16, 2020, <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>.
- [13] U.S. EPA, What is NO2, <https://www.epa.gov/no2-pollution/basic-information-about-no2#>.
- [14] Real-World Emissions from Modern Heavy-Duty Diesel, Natural Gas, and Hybrid Diesel Trucks Operating Along Major California Freight Corridors, July 19, 2016, <https://link.springer.com/article/10.1007/s40825-016-0044-0>.
- [15] IMO, Greenhouse Gas Emissions, accessed November 16, 2020, <https://www.imo.org/en/OurWork/Environment/Pages/GHG-Emissions.aspx>.
- [16] Stefanini, S., Climate Change News, "Countries Inch Towards 'Bare Minimum' Climate Target For Shipping," April 10, 2018, last accessed November 16, 2020 <https://www.climatechangenews.com/2018/04/10/countries-inch-towards-bare-minimum-climate-target-shipping/>.
- [17] California Health and Safety Code §38566, Division 25.5, Senate Bill No. 32, September 8, 2016, Accessed November 16, 2020, [https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?lawCode=HSC&sectionNum=38566](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=HSC&sectionNum=38566)
- [18] California Air Resources Board Final Regulation Order Airborne Toxic Control Measure for Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline, Section 93118.5, Title 17, California Code of Regulations, November 19, 2008, [https://www.arb.ca.gov/regact/2007/chc07/rev93118.pdf?\\_ga=2.250235973.234599760.1605638934-1017863673.1605638934](https://www.arb.ca.gov/regact/2007/chc07/rev93118.pdf?_ga=2.250235973.234599760.1605638934-1017863673.1605638934).



- [19] California Air Resources Board Final Regulation Order Amendments to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline, Section 93118.5, Title 17, July 20, 2011, [https://www.arb.ca.gov/regact/2010/chc10/frochc931185.pdf?\\_ga=2.207842769.234599760.1605638934-1017863673.1605638934](https://www.arb.ca.gov/regact/2010/chc10/frochc931185.pdf?_ga=2.207842769.234599760.1605638934-1017863673.1605638934).
- [20] Executive Order N-79-2020. State of California Executive Order signed by Governor Gavin Newsom. September 23, 2020, <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>.
- [21] CARB Board Hearing, Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed February 21, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).
- [22] Ibid.
- [23] Assembly Bill No. 32, September 27, 2006, [http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_0001-0050/ab\\_32\\_bill\\_20060927\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf).
- [24] Senate Bill 32, September 8, 2016, [http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb\\_0001-0050/sb\\_32\\_bill\\_20160908\\_chaptered.html](http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb_0001-0050/sb_32_bill_20160908_chaptered.html).
- [25] California Health and Safety Code § 39730, Division 26, Senate Bill No. 605, Short-lived climate pollutants, September 21, 2014, last accessed January 29, 2021, [http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=201320140SB605](http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140SB605).
- [26] California Air Resources Board, Revised Proposed 2016 State Strategy for the State Implementation Plan, March 7, 2017, <https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf>.
- [27] Implementation of State SIP Strategy and South Coast AQMP - Concepts to Minimize the Community Health Impacts from Large Freight Facilities, March 22, 2018, last accessed February 21, 2021, [https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?\\_ga=2.243242562.1596168673.1607359382-1902767897.1606875431](https://www.arb.ca.gov/board/books/2018/032218/18-2-5pres.pdf?_ga=2.243242562.1596168673.1607359382-1902767897.1606875431).

- [28] San Joaquin Valley Air Pollution Control District, Draft Community Emissions Reduction Program, Stockton, February 3, 2021, last accessed February 21, 2021, [http://community.valleyair.org/media/2301/draft-stockton-cerp\\_02032021.pdf](http://community.valleyair.org/media/2301/draft-stockton-cerp_02032021.pdf).
- [29] Bay Area Air Quality Management District, West Oakland Environmental Indicators Projects, The West Oakland Community Action Plan, October 2019, last accessed February 21, 2021, <https://www.baaqmd.gov/~media/files/ab617-community-health/west-oakland/100219-files/final-plan-vol-1-100219.pdf.pdf?la=en>.
- [30] South Coast Air Quality Management District, Draft Community Emissions Reduction Plan Wilmington, Carson, West Long Beach, September 2019, last accessed February 21, 2021, <http://www.aqmd.gov/docs/default-source/ab-617-ab-134/steering-committees/wilmington/cerp/final-cerp-wcwlb.pdf?sfvrsn=8>.
- [31] San Diego Air Pollution Control District, Draft Community Emissions Reduction Plan, San Diego Portside Environmental Justice Neighborhoods Community, October 2020, last accessed February 21, 2021, [https://www.sandiegocounty.gov/content/dam/sdc/apcd/PDF/AB\\_617/Portside%20Environmental%20Justice%20DRAFT%20CERP%20Oct%202020.pdf](https://www.sandiegocounty.gov/content/dam/sdc/apcd/PDF/AB_617/Portside%20Environmental%20Justice%20DRAFT%20CERP%20Oct%202020.pdf).
- [32] Executive Order N-79-2020. State of California Executive Order signed by Governor Gavin Newsom. September 23, 2020, <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>
- [33] CARB Board Resolution 14-2, Sustainable Freight Strategy Update, January 23, 2014, <https://arb.ca.gov/board/res/2014/res14-2.pdf>.
- [34] California Air Resources Board, Sustainable Freight Pathways to Zero and Near-Zero Emissions Discussion Document, April 23, 2015, last accessed January 29, 2021, <https://ww2.arb.ca.gov/resources/documents/sustainable-freight-pathways-zero-and-near-zero-emissions-discussion-document>.
- [35] In the Current Regulation, CPFVs that carry six passengers or less, even if operated commercially, meet the definition of a recreational vessel. In the CPFV industry, these vessels are commonly called "six pack" or "uninspected" vessels.
- [36] CARB, The Carl Moyer Program Guidelines 2017 Revisions, April 27, 2017, last accessed February 25, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017\\_cmpgl.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf).

- [37] CARB, Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, 2007, accessed February 9, 2021, <https://ww3.arb.ca.gov/regact/2007/chc07/appb.pdf>.
- [38] CHC engine data reported to CARB by owners/operators under the CHC Regulation, Feb 2019.
- [39] U.S. Coast Guard, Merchant Vessels of the United States. Accessed May 2018, [https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy\(CG-5P\)/InspectionsCompliance\(CG-5PC\)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx](https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy(CG-5P)/InspectionsCompliance(CG-5PC)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx).
- [40] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Marine Compression-Ignition (CI) Engines, January 1, 2021, accessed February 9, 2021, <https://www.epa.gov/sites/production/files/2021-01/marine-compression-ignition-2000-present.xlsx>.
- [41] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Nonroad Compression Ignition (NRCI) Engines, January 1, 2021, accessed February 9, 2021, <https://www.epa.gov/sites/production/files/2021-01/nonroad-compression-ignition-2011-present.xlsx>.
- [42] Logistics Management, "Port of Los Angeles and Port of Long Beach end 2020 with strong volume gains," January 21, 2021, last accessed February 25, 2021, [https://www.logisticsmgmt.com/article/port\\_of\\_los\\_angeles\\_and\\_port\\_of\\_long\\_beach\\_end\\_2020\\_with\\_strong\\_volume\\_gain](https://www.logisticsmgmt.com/article/port_of_los_angeles_and_port_of_long_beach_end_2020_with_strong_volume_gain).
- [43] State of California, Department of Finance, Economic Forecasts, California Economic Forecast – Annual and Quarterly (.xlsx), April 2021, last accessed June 8, 2021, [https://www.dof.ca.gov/Forecasting/Economics/Eco\\_Forecasts\\_Us\\_Ca/documents/California%20Economic%20Forecast%20MR%202021-22.xlsx](https://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/documents/California%20Economic%20Forecast%20MR%202021-22.xlsx).
- [44] N/A – Explanatory Footnote
- [45] CARB Community Air Protection Blueprint, October 2018, last accessed February 10, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-03/final\\_community\\_air\\_protection\\_blueprint\\_october\\_2018\\_acc.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/final_community_air_protection_blueprint_october_2018_acc.pdf).
- [46] N/A – Explanatory Footnote
- [47] United States Environmental Protection Agency, Integrated Science Assessment for Oxides of Nitrogen – Health Criteria, EPA/600/R-15/068, January 2016, last accessed May 7, 2021, [http://ofmpub.epa.gov/eims/eimscomm.getfile?p\\_download\\_id=526855](http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=526855).

- [48] CARB staff use CALPUFF modeling to evaluate the Primary PM<sub>2.5</sub> impacts at South Coast Air Basin and San Francisco Bay Area Air Basin. CALPUFF modeling was performed according to the Calpuff User Guide, last accessed May 7, 2021, [http://www.src.com/calpuff/download/calpuff\\_usersguide.pdf](http://www.src.com/calpuff/download/calpuff_usersguide.pdf).
- [49] National Institute of Health, The Environmental Benefits Mapping and Analysis Program – Community Edition (BenMAP–CE): A tool to estimate the health and economic benefits of reducing air pollution, February 2018, last accessed May 11, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6022291/>.
- [50] Centers for Disease Control and Prevention, CDC WONDER databases, last accessed May 11, 2021, <https://wonder.cdc.gov>.
- [51] National Institute of Health, The Environmental Benefits Mapping and Analysis Program – Community Edition (BenMAP–CE): A tool to estimate the health and economic benefits of reducing air pollution, February 2018, last accessed May 11, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6022291/>.
- [52] Estimating Health Benefits Associated with Reductions in PM and NO<sub>x</sub> Emissions: Detailed Description, last accessed February 9, 2021, <https://ww2.arb.ca.gov/sites/default/files/2019-08/Estimating%20the%20Health%20Benefits%20Associated%20with%20Reductions%20in%20PM%20and%20NOX%20Emissions%20-%20Detailed%20Description.pdf>.
- [53] Fann N, Fulcher CM, Hubbell BJ., The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution, *Air Quality, Atmosphere & Health*, 2:169-176, 2009, last accessed May 7, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2770129/>.
- [54] Fann N, Baker KR, Fulcher CM., Characterizing the PM<sub>2.5</sub>-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S. *Environ Int.*; 49:141-51, November 15, 2012, last accessed May 7, 2021, <https://www.sciencedirect.com/science/article/pii/S0160412012001985>.
- [55] Fann N, Baker K, Chan E, Eyth A, Macpherson A, Miller E, Snyder J., Assessing Human Health PM<sub>2.5</sub> and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025, *Environ. Sci. Technol.* 52 (15), pp 8095–8103, 2018, last accessed May 7, 2021, <https://pubs.acs.org/doi/abs/10.1021/acs.est.8b02050>.
- [56] CARB’s Methodology for Estimating the Health Effects of Air Pollution, last accessed February 9, 2021, <https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution>.

- [57] Daniel Krewski et al., Extended Follow-Up and Spatial Analysis of the American Cancer Society Study Linking Particulate Air Pollution and Mortality, May 2009, Health Effects Institute Research Report 140, last accessed May 7, 2021, <https://ephtracking.cdc.gov/docs/RR140-Krewski.pdf>.
- [58] R. Charon Gwynn et al., The burden of air pollution: impacts among racial minorities, August 2001, Environmental Health Perspectives; 109(4):501–6, last accessed May 7, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1240572/>.
- [59] National Center for Environmental Economics et al., Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses (EPA 240-R-10-001, Dec. 2010), last accessed May 7, 2021, <https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf>.
- [60] United States Environmental Protection Agency Science Advisory Board (U.S. EPA-SAB), An SAB Report on EPA’s White Paper Valuing the Benefits of Fatal Cancer Risk Reduction (EPA-SAB-EEAC-00-013), July 2000, last accessed May 7, 2021, [http://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/\\$File/eeacf013.pdf](http://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/$File/eeacf013.pdf).
- [61] United States Environmental Protection Agency, Mortality Risk Valuation – What does it mean the place a value on a life?, last accessed May 7, 2021, <https://www.epa.gov/environmental-economics/mortality-risk-valuation#means>.
- [62] Lauraine G. Chestnut et. al., The Economic Value Of Preventing Respiratory And Cardiovascular Hospitalizations (Contemporary Economic Policy, 24: 127–143. doi: 10.1093/CEP/BYJ007), January 2006, last accessed May 7, 2021, <http://onlinelibrary.wiley.com/doi/10.1093/cep/byj007/full>.
- [63] Additional technical detail on the IWG process is available in the Technical Updates of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866 (by the Interagency Working Group on Social Cost of Greenhouse Gases, United States Government), last accessed May 7, 2021, <https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf>, and [https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc\\_tsd\\_final\\_clean\\_8\\_26\\_16.pdf](https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf).
- [64] California Air Resources Board, California’s 2017 Climate Change Scoping Plan, November 2017, last accessed May 7, 2021, [https://www.arb.ca.gov/cc/scopingplan/scoping\\_plan\\_2017.pdf](https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf).

- [65] Office of Management and Budgets, Circular A-4, last accessed May 7, 2021, <https://www.transportation.gov/sites/dot.gov/files/docs/OMB%20Circular%20No.%20A-4.pdf>.
- [66] National Academies of Sciences, Engineering, Medicine, Valuing Climate Damages: Updating Estimation of Carbon Dioxide, last accessed May 7, 2021, <http://www.nap.edu/24651>.
- [67] The SC-CO<sub>2</sub> values are of July 2015 and are available at: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866, revised July 2015, last accessed May 7, 2021, <https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc-tds-final-july-2015.pdf>.
- [68] The IWG SC-CO<sub>2</sub> values are provided in 2007 dollars. CARB staff adjusted from 2007 to 2019 dollars by using the Consumer Price Index (CPI-U), adjusting from 2007 dollars to 2019 dollars, last accessed May 7, 2021, [https://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/documents/CPI\\_All\\_Item\\_CY.xlsx](https://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/documents/CPI_All_Item_CY.xlsx).
- [69] National Academies of Sciences, Engineering, and Medicine. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, 2017, last accessed May 7, 2021, <https://www.nap.edu/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of>.
- [70] Intergovernmental Panel on Climate Change, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Climate Change 2007: Mitigation of Climate Change. 2007, last accessed May 18, 2021, <https://www.ipcc.ch/report/ar4/wg3/>.
- [71] N/A – Explanatory Footnote
- [72] Staff communications with SWITCH Maritime on November 4, 2020.
- [73] R.E. Staite Engineering, INC. comment letter to CARB, Proposed Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft (CHC) operated within California Waters and 24 Nautical Miles of the California Baseline, October 30, 2020.
- [74] CSU Maritime Academy, Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, 2019, last accessed February 2021, <https://ww2.arb.ca.gov/resources/documents/commercial-harbor-craft-tier-4-feasibility-report>.
- [75] Stakeholder discussion was on Tuesday October 13, 2020, in a meeting with the Sportfishing Association of California Board.

- [76] Catamaran ferry vessel replacement percentages were derived using the average of data provided by WETA in a November 13, 2020 email to Melissa Houchin (CARB), and data provided by an industry source who asked to remain unnamed.
- [77] Monohull ferry vessel replacement percentages were derived using the average of the compliance percentages derived from feasibility factors in the CSU Maritime Academy Study (September, 2019) and data provided by an industry source who asked to remain unnamed.
- [78] N/A – Explanatory Footnote
- [79] N/A – Explanatory Footnote
- [80] Public Workshop for the Draft Proposed Amendments to the Commercial Harbor Craft Regulation, March 16, 2021, <https://ww2.arb.ca.gov/resources/documents/public-workshop-presentation-english-march-16-2021>.
- [81] California Division of Boating and Waterways, Find a Boating Facility, last accessed January 2021, <http://www.dbw.ca.gov/BoatingFacilities>.
- [82] Copy of Facility Contact Sheet, 2019.
- [83] N/A – Explanatory Footnote
- [84] N/A – Explanatory Footnote
- [85] Staff communications with SWITCH Maritime on November 4, 2020.
- [86] R.E. Staite Engineering, INC. comment letter to CARB, Proposed Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft (CHC) operated within California Waters and 24 Nautical Miles of the California Baseline, October 30, 2019.
- [87] Scrapped Disposal Costs per Vessel Category.xlsx
- [88] Staff communications with SWITCH Maritime on November 4, 2020.
- [89] R.E. Staite Engineering, INC. comment letter to CARB, Proposed Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft (CHC) operated within California Waters and 24 Nautical Miles of the California Baseline, October 30, 2020.
- [90] California Department of Tax and Fee Administration, "California City & County Sales & Use Tax Rates, October 1, 2020, last accessed February 10, 2021, <https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm>.

- [91] CSU Maritime Academy, "Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, 2019, last accessed February 2021, <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>.
- [92] 2019 Master Survey for Cost Analysis.
- [93] CARB staff assumption, which aligns with expected lifetime data and assumptions presented in the California Air Resources Board, Standardized Regulatory Impact Assessment for the Proposed Control Measure for Ocean-Going Vessels At Berth, August 2019, last accessed June 2021, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/appc-1.pdf>.
- [94] California Energy Commission, Final 2019 Integrated Energy Policy Report, February 2020, last accessed January 2021, <https://efiling.energy.ca.gov/getdocument.aspx?tn=232922>.
- [95] California Energy Commission, Transportation Energy Demand Forecast 2020 IEPR Update, December 3, 2020, last accessed January 2021), <https://efiling.energy.ca.gov/GetDocument.aspx?tn=235841&DocumentContentId=68785>.
- [96] Energy Information Administration, Annual Energy Outlook 2020, last accessed January 2021, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2020&region=1-9&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.3-3-AEO2020.1-9&map=ref2020-d112119a.4-3-AEO2020.1-9&sourcekey=0>.
- [97] N/A – Explanatory Footnote
- [98] CARB staff assumption, which aligns with expected lifetime data and assumptions presented in the California Air Resources Board, Standardized Regulatory Impact Assessment for the Proposed Control Measure for Ocean-Going Vessels At Berth, August 2019, last accessed June 2021, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/appc-1.pdf>.
- [99] Ibid.
- [100] Email between Lauren Duran Gularte (WETA) and Tracy Haynes (CARB) dated November 17, 2020.
- [101] [101] Revised Draft Regulatory Language, Table 19–Annual Fees for Owners or Operators of Regulated In-Use Vessels, April 1, 2021, <https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised%20Draft%20CHC%20Regulatory%20Language.pdf>.



- [102] N/A – Explanatory Footnote
- [103] N/A – Explanatory Footnote
- [104] Email between Alex Brodie (Island Packers) and David Quiros (CARB) dated October 1, 2020.
- [105] N/A – Explanatory Footnote
- [106] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015, last accessed May 4, 2021, <https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html>.
- [107] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015, last accessed May 4, 2021, <https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html>.
- [108] California Government Code, Title 2, Division 3, Part 5.5, Chapter 6.5, §14837, last accessed May 27, 2021, [https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?sectionNum=14837.&lawCode=GOV](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=14837.&lawCode=GOV).
- [109] Dun and Bradstreet Database, 2020. Annual gross income data for vessel companies.
- [110] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015, last accessed May 4, 2021, <https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html>.
- [111] Small Business CPFV Cost Assumption notes from 13OCT2020 meeting with SAC Board.pdf.
- [112] Email from Ken Franke, President of Sportfishing Association of California, October 14, 2020, SAC CPFV Profit Loss Formula.pdf.
- [113] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015, last accessed May 4, 2021, <https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html>.
- [114] N/A – Explanatory Footnote
- [115] N/A – Explanatory Footnote
- [116] N/A – Explanatory Footnote
- [117] N/A – Explanatory Footnote

- [118] California State Controller's Office, User Utility Tax Revenue and Rates, last accessed January 2021, [https://www.sco.ca.gov/Files-ARD-Local/LocRep/2017-18\\_Cities\\_UUT.pdf](https://www.sco.ca.gov/Files-ARD-Local/LocRep/2017-18_Cities_UUT.pdf).
- [119] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 1, 2020, last accessed February 10, 2021. <https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm>.
- [120] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate, last accessed May 18, 2021, <https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm>.
- [121] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 1, 2020, last accessed February 10, 2021. <https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm>.
- [122] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate, last accessed May 18, 2021. <https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm>.
- [123] California Department of Tax and Fee Administration, 2020 Electrical Energy Surcharge Rate, last accessed July 2020, <https://www.cdtfa.ca.gov/formspubs/l725.pdf>.
- [124] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, last accessed February 2021, <https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm>.
- [125] Mobile Source Certification and Compliance Fee Workshop, Aftermarket Parts, Evaporative Components, and Retrofits, July 30, 2020, last accessed May 19, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-07/July%2030%2C%202020%201PM%20AMP-EvapComp-Retrofit%20workshop%20ver.2\\_R.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-07/July%2030%2C%202020%201PM%20AMP-EvapComp-Retrofit%20workshop%20ver.2_R.pdf).
- [126] For further information and model documentation see: <https://www.remi.com/model/pi/>
- [127] California Legislature, Senate Bill 617. October 2011, last accessed June 4, 2021, [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=201120120SB617](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201120120SB617)

- [128] California Department of Finance, Chapter 1: Standardized Regulatory Impact Analysis for Major Regulations - Order of Adoption. December 2013, last accessed June 4, 2021,  
[https://www.dof.ca.gov/Forecasting/Economics/Major\\_Regulations/documents/Order\\_of\\_Adoption-12012013.pdf](https://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/documents/Order_of_Adoption-12012013.pdf)
- [129] California Department of Finance. Economic Research Unit. National Economic Forecast – Annual & Quarterly. Sacramento: California. April 2021, last accessed May 14, 2021,  
[https://www.dof.ca.gov/Forecasting/Economics/Eco\\_Forecasts\\_Us\\_Ca/documents/United%20States%20Economic%20Forecast%20MR%202021-22.xlsx](https://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/documents/United%20States%20Economic%20Forecast%20MR%202021-22.xlsx).
- [130] California Department of Finance. Economic Research Unit. California Economic Forecast – Annual & Quarterly. Sacramento: California. April 2021, last accessed May 26, 2021,  
[https://www.dof.ca.gov/Forecasting/Economics/Eco\\_Forecasts\\_Us\\_Ca/documents/California%20Economic%20Forecast%20MR%202021-22.xlsx](https://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/documents/California%20Economic%20Forecast%20MR%202021-22.xlsx).
- [131] California Department of Finance. Economic Research Unit. National Deflators: Calendar Year averages: from 1929, April 2021. Sacramento: California. April 2021, last accessed May 25, 2021,  
<https://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/documents/Implicit%20Price%20Deflators%20CY.xlsx>.
- [132] California Department of Finance. Demographic Research Unit. Report P-3: Population Projections, California, 2010-2060 (Baseline 2019 Population Projections; Vintage 2020 Release). Sacramento: California. April 2021, last accessed May 28, 2021,  
[https://www.dof.ca.gov/Forecasting/Demographics/Projections/documents/P3\\_Complete.zip](https://www.dof.ca.gov/Forecasting/Demographics/Projections/documents/P3_Complete.zip).
- [133] N/A – Explanatory Footnote
- [134] N/A – Explanatory Footnote
- [135] Office for Coastal Management Commercial Fish Landings, 2021, last accessed June 16, 2021,  
<https://www.fisheries.noaa.gov/foss/f?p=215:200:9224158526384::NO>.
- [136] The Carl Moyer Program Guidelines, Appendix C: Cost-Effectiveness Calculation Methodology and Appendix D: Tables for Emission Reduction and Cost-Effectiveness Calculations, last accessed June 2021,  
[https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017\\_cmpgl.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf).

## 2. Appendix A References

- [1] CSU Maritime Academy, "Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, 2019, last accessed February 2021, <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>.
- [2] Caterpillar, "Your U.S. EPA Tier 4 Final Marine Engine Questions Answered," last accessed July 2020, [https://www.cat.com/en\\_US/by-industry/marine/tier-four/your-questions-answered/def-faqs.html](https://www.cat.com/en_US/by-industry/marine/tier-four/your-questions-answered/def-faqs.html).
- [3] Cummins, "Diesel Exhaust Fluid (DEF) Q&A," last accessed April 2020, <https://www.cumminsfiltration.com/sites/default/files/MB10033.pdf>.
- [4] California Energy Commission, Transportation Energy Demand Forecast 2020 IEPR Update, December 3, 2020, last accessed January 2021, <https://efiling.energy.ca.gov/GetDocument.aspx?tn=235841&DocumentContentId=68785>.
- [5] Energy Information Administration, Annual Energy Outlook 2020, last accessed January 2021, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2020&region=1-9&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.3-3-AEO2020.1-9&map=ref2020-d112119a.4-3-AEO2020.1-9&sourcekey=0>.
- [6] San Francisco Bay Area Water Emergency Transportation Authority, "2016 Strategic Plan," last accessed March 2021, <https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WETAstrategicPlanFinal.pdf>.
- [7] Staff communications with SWITCH Maritime on November 4, 2020.
- [8] R.E. Staite Engineering, INC. comment letter to CARB, Proposed Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft (CHC) operated within California Waters and 24 Nautical Miles of the California Baseline, October 30, 2019.
- [9] CARB Staff's assumption based on phone call discussions with: 1. American Waterway Operation (AWO) on May 8, 2019 and Sport fishing Association on October 19, 2020.

## 3. Appendix C References

- [1] San Francisco Giants 2019 Season Schedule, last accessed May 13<sup>th</sup>, 2021, <https://www.mlb.com/giants/schedule/printable-schedule-2019>.

- [2] Chase Center Event Schedule, last accessed August 25<sup>th</sup>, 2020, <https://www.chasecenter.com/events>.
- [3] Golden Gate Bridge Highway & Transportation District Website: "Golden Gate Ferry Schedules," last accessed August 14<sup>th</sup>, 2020, <https://www.goldengate.org/ferry/schedules-maps/>.
- [4] Email from WETA to Tracy Haynes on November 17<sup>th</sup>, 2020.
- [5] CARB Staff's Ferry Classification Analysis.
- [6] For Ferries, Staff used a Statewide compound growth factor that assumed zero population growth for the State with the exception of the Bay Area, where Ferry growth assumptions were based on the San Francisco Bay Area Water Emergency Transportation Authority (WETA) 2016 Strategic Plan, The Ferry growth percentages apply to Catamaran, Monohull, and Short Run Ferry categories, last accessed March 2021, <https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WETAStrategicPlanFinal.pdf>.
- [7] CARB Draft Cost Analysis for Standardized Regulatory Impact Assessment for the Draft Proposed Amendments to the Airborne Toxic Control Measure for Commercial Harbor Craft, June 25, 2021 version, "Cost Metrics" tab.
- [8] Hornblower Cruises Alcatraz Departure Schedule, last accessed April 22, 2021, <https://www.cityexperiences.com/san-francisco/city-cruises/alcatraz/departure-schedule/>.
- [9] Email from Flagship Cruises to Melissa Houchin on December 1, 2020.
- [10] Angel Island Ridership Data emailed to Melissa Houchin on December 14, 2020.
- [11] CARB Draft Cost Analysis for Standardized Regulatory Impact Assessment for the Draft Proposed Amendments to the Airborne Toxic Control Measure for Commercial Harbor Craft, April 2021 version, "Major Cost Inputs" tab, Table 23.
- [12] For Ferries, Staff used a Statewide compound growth factor that assumed zero population growth for the State with the exception of the Bay Area, where Ferry growth assumptions were based on the San Francisco Bay Area Water Emergency Transportation Authority (WETA) 2016 Strategic Plan, last accessed March 2021, The Ferry growth percentages apply to Catamaran, Monohull and Short Run Ferry categories: <https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WETAStrategicPlanFinal.pdf>.

- [13] CARB Draft Cost Analysis for Standardized Regulatory Impact Assessment for the Draft Proposed Amendments to the Airborne Toxic Control Measure for Commercial Harbor Craft, June 25, 2021 version, "Cost Metrics" tab.
- [14] CARB, Excursion Websites Data, September 2020.
- [15] CARB, Emission Inventory, March 2020,  
[https://ww2.arb.ca.gov/sites/default/files/2020-03/CHC%20Webinar%20Presentation%20March%202020\\_1.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/CHC%20Webinar%20Presentation%20March%202020_1.pdf)
- [16] Staff Report: Initial Statement of Reasons (ISOR) Appendix H: 2019 Update to Inventory for Ocean-Going Vessels At Berth: Methodology and Results, Page H-15, <https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/apph.pdf>.
- [17] 2016 Port of Richmond Data obtained from the San Francisco Marine Exchange <https://www.sfmex.org/>.
- [18] SFMX-Vessel-Type-Codes, last accessed September 9, 2020,  
<https://www.sfmex.org/wp-content/uploads/2017/10/Vessel-Type-Codes.pdf>
- [19] Title 14, California Code of Regulations, Subdivision 4. Office of Spill Prevention and Response, Chapter 4. Vessel Requirements, Subchapter 1. Tank Vessel Escort Regulations for the San Francisco Bay Region Sections 851.1 through 851.10.1, last accessed September 9, 2020,  
<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=22000&inline>.
- [20] San Francisco Bar Pilots Operations Guidelines for the Movement of Vessels on San Francisco Bay and Tributaries, Page 10. Last accessed September 9, 2020,  
<http://sfbarpilots.com/wp-content/uploads/2016/04/GuidelinesHighlighted.pdf>
- [21] Crowley Tug Rate Sheet 2018\_SF [https://www.crowley.com/wp-content/uploads/2018/10/2018\\_SF\\_SAE\\_Rate\\_Sheet.pdf](https://www.crowley.com/wp-content/uploads/2018/10/2018_SF_SAE_Rate_Sheet.pdf), Last accessed September 9, 2020.
- [22] Foss Tug SF Rate Sheet 2020 <https://www.foss.com/wp-content/uploads/Foss-SF-Rate-Sheet-2020.pdf>, last accessed September 9, 2020.
- [23] CHC\_Implementation\_Cost\_V0.22 2023 to 2038.xlsx. CARB Draft Cost Analysis for Standardized Regulatory Impact Assessment for the Draft Proposed Amendments to the Airborne Toxic Control Measure for Commercial Harbor Craft, April 2021 version, "Cost Metrics" tab.
- [24] Proposed Control Measure for Ocean-Going Vessels At Berth, ISOR Appendix C-1: Standardized Regulatory Impact Assessment, Page 283,  
<https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/appc-1.pdf>.

- [25] California Department Fish and Wildlife, Table 7 - Origin and Poundage of Commercial Fish Landings into California During 2017, Last accessed April 14, 2021. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=159547&inline>.
- [26] California Department Fish and Wildlife, Table 7 - Origin and Poundage of Commercial Fish Landings into California During 2018, Last accessed April 13, 2021. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=171059&inline>.
- [27] California Department Fish and Wildlife, Table 7 - Origin and Poundage of Commercial Fish Landings into California During 2019, Last accessed April 13, 2021. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=178009&inline>.
- [28] CARB, CPFV Trips & Pricing Data, February 2021.
- [29] CARB, CPFV Angler Data References, Last accessed February 19, 2021, <https://www.sportfishingreport.com/>.
- [30] Sportfishing Association of California, Engine Survey, June 2020.
- [31] CARB, CPFV Trips & Pricing Data, February 2021.
- [32] CARB, CPFV Angler Data References, Last accessed February 19, 2021, <https://www.sportfishingreport.com/>

### **C. Appendix C-2 References**

- [1] CSU Maritime Academy, Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, 2019, <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>.

### **D. Appendix D-1 References**

- [1] N/A – Explanatory Footnote
- [2] N/A – Explanatory Footnote
- [3] CARB, Final Regulation Order: Airborne Toxic Control Measure for Diesel Engines on Commercial Harbor Craft Operated within California Waters and 24 Nautical Miles of the California Baseline, Title 17 section 93118.5, 2008, last accessed August 15, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/regact/2007/chc07/rev93118.pdf>.

- [4] CARB, Final Regulation Order: Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated within California Waters and 24 Nautical Miles of the California Baseline, Title 17 section 93118.5, 2010, last accessed August 15, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/regact/2010/chc10/frochc931185.pdf>.
- [5] N/A – Explanatory Footnote
- [6] CARB, Community Air Protection Blueprint, October 2018, last accessed August 9, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-10/Blueprint\\_Complete\\_Oct2018.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-10/Blueprint_Complete_Oct2018.pdf).
- [7] Ibid.
- [8] N/A – Explanatory Footnote
- [9] N/A – Explanatory Footnote
- [10] N/A – Explanatory Footnote
- [11] Martin, Paul, How Much Lithium is in a Li-Ion Vehicle Battery? November 29, 2017, last accessed August 9, 2021, <https://www.linkedin.com/pulse/how-much-lithium-li-ion-vehicle-battery-paul-martin/>.
- [12] Jaskula, Brian, Lithium, Mineral Commodity Summaries, USGS, January 2020, last accessed August 11, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-lithium.pdf>.
- [13] Executive Order N-79-20, September 23, 2020, last accessed August 15, 2021, <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>.
- [14] Schulte, Ruth, Mineral Commodity Summaries, Platinum Group Metals, January 2021, last accessed August 11, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-platinum.pdf>.
- [15] N/A – Explanatory Footnote
- [16] Martin, Paul, How Much Lithium is in a Li-Ion Vehicle Battery? November 29, 2017, last accessed August 9, 2021, <https://www.linkedin.com/pulse/how-much-lithium-li-ion-vehicle-battery-paul-martin/>.
- [17] Jaskula, Brian, Lithium, Mineral Commodity Summaries, USGS, January 2020, last accessed August 11, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-lithium.pdf>.



- [18] CARB, Notice of Preparation of a Draft Substitute Environmental Document, September 17, 2020, last accessed August 15, 2021, [https://files.ceqanet.opr.ca.gov/264733-2/attachment/a7vNh7BpkzrLHQscEmu2ZKxDbqf8grk0IYO4j\\_F516CSkrE0hmrIFNShkNwpXufW4PqupOHDGegBmfEt0](https://files.ceqanet.opr.ca.gov/264733-2/attachment/a7vNh7BpkzrLHQscEmu2ZKxDbqf8grk0IYO4j_F516CSkrE0hmrIFNShkNwpXufW4PqupOHDGegBmfEt0).
- [19] Jaskula, Brian, Lithium, Mineral Commodity Summaries, USGS, January 2020, last accessed August 11, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-lithium.pdf>.
- [20] Mineral Education Coalition, Platinum, Periodic Table of the Elements, last accessed August 11, 2021, <https://mineralseducationcoalition.org/elements/platinum/>.
- [21] Glaister, Mudd, The Environment Costs of Platinum-PGM Mining and Sustainability: Is the Glass Half-Full or Half-Empty?, 2009, last accessed August 11, 2021, <https://www.sciencedirect.com/science/article/abs/pii/S0892687509003045>.
- [22] CalEEMod, Download Model: CalEEMod Version 2020.4.0, <http://www.caleemod.com/>.
- [23] CalEEMod, User's Guide for CalEEMod Version 2020.4.0, May 2021, last accessed August 9, 2021, <http://www.caleemod.com/>.
- [24] California Energy Commission, Renewables Portfolio Standard- Verification and Compliance, last accessed August 9, 2021, <https://www.energy.ca.gov/programs-and-topics/programs/renewables-portfolio-standard/renewables-portfolio-standard>.
- [25] Senate Bill No. 100, California Renewables Portfolio Standard Program: emissions of greenhouse gases, 2018, last accessed August 9, 2021, [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=201720180SB100](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100).
- [26] California Energy Commission, Tracking Progress, February 2020, last accessed August 9, 2021, [https://www.energy.ca.gov/sites/default/files/2019-12/renewable\\_ada.pdf](https://www.energy.ca.gov/sites/default/files/2019-12/renewable_ada.pdf).
- [27] U.S, Department of Agriculture, Natural Resources Conservation Service, Shorebirds, Fish and Wildlife Habitat Management Leaflet, July 2000, last accessed August 11, 2021, <https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=18480.wba>.

- [28] Fox, Kayla, Environmental Impacts of Lithium Extraction, November 6, 2020, last accessed August 11, 2021, <https://storymaps.arcgis.com/stories/0898df4b1f7e475ab49a4ae23aaed426/print>.
- [29] Society of Vertebrate Paleontology, Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources, 2010, last accessed August 11, 2021, [https://vertpaleo.org/wp-content/uploads/2021/01/SVP\\_Impact\\_Mitigation\\_Guidelines.pdf](https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines.pdf).
- [30] Nyberg, Michael, Electric Generation Capacity and Energy, California Energy Commission, 2021, last accessed August 15, 2021, <https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy>.
- [31] Kinhal, How Does Mining Impact the Environment?, last accessed August 11, 2021, [https://greenliving.lovetoknow.com/How\\_Does\\_Mining\\_Affect\\_the\\_Environment](https://greenliving.lovetoknow.com/How_Does_Mining_Affect_the_Environment).
- [32] CalEEMod, Download Model: CalEEMod Version 2020.4.0, <http://www.caleemod.com/>.
- [33] CalEEMod, User's Guide for CalEEMod Version 2020.4.0, May 2021, last accessed August 9, 2021, <http://www.caleemod.com/>.
- [34] Jacoby, It's Time to Get Serious About Recycling Lithium-Ion Batteries, July 14, 2019, last accessed August 11, 2021, <https://cen.acs.org/materials/energy-storage/time-serious-recycling-lithium/97/i28>.
- [35] Sepadi et al., Platinum Mine Workers' Exposure to Dust Particles Emitted at Mine Waste Rock Crusher Plants in Limpopo, South Africa, 2020, last accessed August 11, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7014327/>.
- [36] Zeng et al., Solving Spent Lithium-Ion Battery Problems in China: Opportunities and Challenges, 2015, last accessed August 11, 2021, <https://www.sciencedirect.com/science/article/abs/pii/S136403211500859X>.
- [37] Battery University, BU-304a: Safety Concerns with Li-Ion, April 23, 2019, last accessed August 11, 2021, <https://batteryuniversity.com/article/bu-304a-safety-concerns-with-li-ion>.
- [38] Health and Safety Executive, Fuel Cells: Understand the Hazards, Control the Risks, 2004.

- [39] European Parliament, Impact of Shale Gas and Shale Oil Extraction on the Environment and on Human Health, 2012, <https://www.europarl.europa.eu/document/activities/cont/201312/20131205ATT75545/20131205ATT75545EN.pdf>.
- [40] Environmental Health Perspectives, Salting the Earth: The Environmental Impact of Oil and Gas Wastewater Spills, December 2016, last accessed August 11, 2021, [https://www.researchgate.net/publication/311243994\\_Salting\\_the\\_Earth\\_The\\_Environmental\\_Impact\\_of\\_Oil\\_and\\_Gas\\_Wastewater\\_Spills](https://www.researchgate.net/publication/311243994_Salting_the_Earth_The_Environmental_Impact_of_Oil_and_Gas_Wastewater_Spills).
- [41] Friends of the Earth, Lithium, 2013, last accessed August 11, 2021, [https://www.foeeurope.org/sites/default/files/publications/13\\_factsheet-lithium-gb.pdf](https://www.foeeurope.org/sites/default/files/publications/13_factsheet-lithium-gb.pdf).
- [42] Jaskula, Brian, Lithium, Mineral Commodity Summaries, USGS, January 2020, last accessed August 11, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-lithium.pdf>.
- [43] Ibid.
- [44] Ibid.
- [45] 86 FR 11849, EO 14017, America's Supply Chains, February 24, 2021, last accessed August 15, 2021, <https://www.govinfo.gov/content/pkg/FR-2021-03-01/pdf/2021-04280.pdf>.
- [46] Schulte, Ruth, Mineral Commodity Summaries, Platinum Group Metals, January 2021, last accessed August 11, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-platinum.pdf>.
- [47] Ibid.
- [48] Ibid.
- [49] Ibid.
- [50] Caltrans, Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013, last accessed August 11, 2021, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf>.
- [51] FTA, Transit Noise and Vibration Impact Assessment Manual, September 2018, last accessed August 11, 2021, [https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123\\_0.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf).

- [52] Centers for Disease Control and Prevention, What Noises Cause Hearing Loss?, October 7, 2019, last accessed August 11, 2021, [https://www.cdc.gov/nceh/hearing\\_loss/what\\_noises\\_cause\\_hearing\\_loss.html](https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html).
- [53] CARB, Community Air Protection Blueprint, October 2018, last accessed August 9, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-10/Blueprint\\_Complete\\_Oct2018.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-10/Blueprint_Complete_Oct2018.pdf).
- [54] CARB, Appendix D – Final Environmental Analysis Prepared for the Proposed Control Measure for Ocean-Going Vessels At Berth in California, August 25, 2020, last accessed August 15, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/regact/2019/ogvatberth2019/finalea.pdf>.
- [55] City of Sausalito, Clipper Yacht Harbor Marina Dock Replacement Project, May 2021, last accessed August 11, 2021, <https://files.ceqanet.opr.ca.gov/270142-1/attachment/VViQk3kLy0wFxsPT8iXFgvXWBagLcYpvBCjVdNoOn7gCHTqqmLJdwZLVL56GQQzs36EPvhZLuPNIY5R0>.
- [56] POLA, Draft Initial Study/ Mitigated Negative Declaration, Berth 163-164 [NuStar-Valero] Marine Oil Terminal Wharf Improvements Project, May 2021, last accessed August 11, 2021, <https://kentico.portoflosangeles.org/getmedia/d2ea2caf-a0bc-4acc-b8f4-620c60c63d14/Valero-NuStar-Draft-IS-MND>.
- [57] City of Newport Beach, Draft Environmental Impact Report, December 4, 2020, last accessed August 11, 2021, <https://www.newportbeachca.gov/home/showpublisheddocument?id=69371>.
- [58] San Diego Unified Port District, Draft Environmental Impact Report, July 2020, last accessed August 11, 2021, [https://pantheonstorage.blob.core.windows.net/ceqa/Lockheed\\_Martin\\_Harbor\\_Island\\_Facilities\\_Demolition\\_and\\_Sediment\\_Remediation\\_Project-DEIR\\_and\\_Appendices.pdf](https://pantheonstorage.blob.core.windows.net/ceqa/Lockheed_Martin_Harbor_Island_Facilities_Demolition_and_Sediment_Remediation_Project-DEIR_and_Appendices.pdf).
- [59] Martin, Paul, How Much Lithium is in a Li-Ion Vehicle Battery? November 29, 2017, last accessed August 9, 2021, <https://www.linkedin.com/pulse/how-much-lithium-li-ion-vehicle-battery-paul-martin/>.

#### **E. Appendix D-2 References**

- [1] U.S. Department of Agriculture, U.S. Forest Resource Facts and Historical Trends, August 2014, last accessed August 13, 2021, <https://www.srs.fs.usda.gov/products/marketing/cards/fs-1035.pdf>.

- [2] U.S. Department of Agriculture, Ag and Food Statistics: Charting the Essentials, March 13, 2018, last accessed April 17, 2018, <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/>.
- [3] California Department of Conservation, Farmland Mapping and Monitoring Program, California Farmland Conversion Report 2015, September 2015, last accessed August 13, 2021, [http://www.conservation.ca.gov/dlrp/fmmp/Documents/fmmp/pubs/2010-2012/FCR/FCR%202015\\_complete.pdf](http://www.conservation.ca.gov/dlrp/fmmp/Documents/fmmp/pubs/2010-2012/FCR/FCR%202015_complete.pdf).
- [4] California Department of Food and Agriculture, California Agricultural Statistics Review, 2019-2020, last accessed August 13, 2021, [https://www.cdfa.ca.gov/Statistics/PDFs/2020\\_Ag\\_Stats\\_Review.pdf](https://www.cdfa.ca.gov/Statistics/PDFs/2020_Ag_Stats_Review.pdf).
- [5] California Department of Conservation, The Williamson Act Status Report, 2016–17, last accessed August 13, 2021, [https://www.conservation.ca.gov/dlrp/wa/Documents/stats\\_reports/2018%20WA%20Status%20Report.pdf](https://www.conservation.ca.gov/dlrp/wa/Documents/stats_reports/2018%20WA%20Status%20Report.pdf).
- [6] California Department of Fish and Wildlife, Timberland Conservation Program, last accessed June 9, 2021, <https://wildlife.ca.gov/Conservation/Timber>.
- [7] California Department of Fish and Wildlife, Summary of Natural Community Conservation Plans, October 2017.
- [8] U.S. Environmental Protection Agency, Basic Information about Carbon Monoxide (CO) Outdoor Air Pollution, September 8, 2016, last accessed June 1, 2021, <https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution>.
- [9] U.S. Environmental Protection Agency, Basic Information about NO<sub>2</sub>, September 8, 2016, last accessed June 1, 2021, <https://www.epa.gov/no2-pollution/basic-information-about-no2>.
- [10] U.S. Environmental Protection Agency, Sulfur Dioxide Basics, April 2, 2019, last accessed June 1, 2021, <https://www.epa.gov/so2-pollution/sulfur-dioxide-basics>.
- [11] U.S. Environmental Protection Agency, Health Effects of Ozone Pollution, May 5, 2021, last accessed June 1, 2021, <https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution>.
- [12] U.S. Environmental Protection Agency, Ground-Level Ozone Basics, May 5, 2021, last accessed June 1, 2021, <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>.

- [13] U.S. Environmental Protection Agency, Particulate Matter (PM) Basics, May 6, 2021, last accessed June 1, 2021, <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>.
- [14] U.S. Environmental Protection Agency, Health and Environmental Effects of Particulate Matter (PM), May 26, 2021, last accessed June 1, 2021, <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>.
- [15] U.S. Environmental Protection Agency, Basic Information about Lead Air Pollution, January 14, 2021, last accessed June 1, 2021, <https://www.epa.gov/lead-air-pollution/basic-information-about-lead-air-pollution>.
- [16] U.S. Environmental Protection Agency, Ground-Level Ozone Basics, May 5, 2021, last accessed June 1, 2021, <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>.
- [17] U.S. Environmental Protection Agency, Basic Information about NO<sub>2</sub>, September 8, 2016, last accessed June 1, 2021, <https://www.epa.gov/no2-pollution/basic-information-about-no2>.
- [18] CARB, 2016 SIP Emission Projection Data, 2012 Estimated Annual Average Emissions Statewide, last accessed April 17, 2018.
- [19] California Air Resources Board and California Air Pollution Control Officers Association, Risk Management Guidance for Stationary Sources of Air Toxics, July 23, 2015, last accessed August 13, 2021, <https://www.arb.ca.gov/toxics/rma/rmgssat.pdf>.
- [20] The Nature Conservancy, States of the Union: Ranking America's Biodiversity, April 2002, last accessed August 13, 2021, <https://www.researchgate.net/publication/269111849/download>.
- [21] California Department of Fish and Wildlife, California State Wildlife Action Plan, September 2015, last accessed August 13, 2021, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=110399&inline>.
- [22] Ibid.
- [23] Ibid.
- [24] Ibid.
- [25] Ibid.
- [26] Ibid.

- [27] U.S. Fish and Wildlife Service, Habitat Conservation Plans: Section 10 of the Endangered Species Act, December 2005, last accessed August 13, 2021, [https://www.fws.gov/endangered/esa-library/pdf/HCP\\_Incidental\\_Take.pdf](https://www.fws.gov/endangered/esa-library/pdf/HCP_Incidental_Take.pdf).
- [28] California Department of Fish and Wildlife, Summary of Natural Community Conservation Plans, October 2017.
- [29] Jones, Klar, California Prehistory: Colonization, Culture, and Complexity, 2007.
- [30] Ibid.
- [31] Ibid.
- [32] Ibid.
- [33] Ibid.
- [34] Moratto, Michael J, California Archaeology, 1984, Print Edition.
- [35] Chartkoff, Joseph L., Kerry K. Chartkoff, The Archaeology of California, 1984, Print Edition.
- [36] Jones, Klar, California Prehistory: Colonization, Culture, and Complexity, 2007.
- [37] Ibid.
- [38] Moratto, Michael J, California Archaeology, 1984, Print Edition.
- [39] Jones, Klar, California Prehistory: Colonization, Culture, and Complexity, 2007.
- [40] Moratto, Michael J, California Archaeology, 1984, Print Edition.
- [41] Chartkoff, Joseph L., Kerry K. Chartkoff, The Archaeology of California, 1984, Print Edition.
- [42] Jones, Klar, California Prehistory: Colonization, Culture, and Complexity, 2007.
- [43] Ibid.
- [44] Ibid.
- [45] Ibid.
- [46] Kroeber, Alfred L, Handbook of the Indians of California, 1925, Print Edition.
- [47] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.

- [48] Ibid.
- [49] Sturtevant, William C, Handbook of North American Indians, Volume 10, Southwest, Ortiz, Alfonso, 1983, Print Edition.
- [50] Sturtevant, William C, Handbook of North American Indians, Volume 11, Great Basin, D'Azevedo, Warren L, 1986, Print Edition.
- [51] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [52] Kroeber, Alfred L, Handbook of the Indians of California, 1925, Print Edition.
- [53] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [54] Sturtevant, William C, Handbook of North American Indians, Volume 10, Southwest, Ortiz, Alfonso, 1983, Print Edition.
- [55] Sturtevant, William C, Handbook of North American Indians, Volume 11, Great Basin, D'Azevedo, Warren L, 1986, Print Edition.
- [56] Cook, Sherburne A., The Population of the California Indians: 1769–1970, 1976, Print Edition.
- [57] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [58] Ibid.
- [59] Ibid.
- [60] Arnold, Jeanne E., Foundations of Chumash Complexity, Perspectives in California Archaeology, Volume 7, 2004, Print Edition.
- [61] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [62] Ibid.
- [63] Kroeber, Alfred L, Elements of Culture in Native California, 1922, Print Edition.
- [64] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [65] Ibid.



- [66] U.S. Census Bureau, Quickfacts: California; United States, 2018, last accessed April 17, 2018, <https://www.census.gov/quickfacts/fact/table/CA,US/RHI825216>.
- [67] Native American Heritage Commission, California Native American Heritage Commission Five-Year Strategic Plan 2018-2022, January 19, 2018, last accessed August 13, 2021, <http://nahc.ca.gov/wp-content/uploads/2018/04/2018-NAHC-Strategic-Plan.pdf>.
- [68] Rolle, W.F., California: A History, 1969, Print Edition.
- [69] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [70] Ibid.
- [71] Beck, Warren A., Haase. Ynez D., Historical Atlas of California, 1974, Print Edition.
- [72] Staniford, Edward F, The Pattern of California History, 1975, Print Edition.
- [73] Hoover, et al., Historic Spots in California, 2002, Print Edition.
- [74] Sturtevant, William C, Handbook of North American Indians, Volume 8, California, Heizer, Robert F, 1978, Print Edition.
- [75] Hoover, et al., Historic Spots in California, 2002, Print Edition.
- [76] California Department of Transportation, A Historical Context and Archaeological Research Design for Mining Properties in California, 2008, last accessed August 13, 2021, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/ser/mining-study-a11y.pdf>.
- [77] Jefferson, George T, Paleontologic Resources and Collections Management Policy, 2004.
- [78] USGS, Divisions of Geologic Time- Major Chronostratigraphic and Geochronologic Units, July 2010, last accessed August 16, 2021, <https://pubs.usgs.gov/fs/2010/3059/pdf/FS10-3059.pdf>.
- [79] Paleontology Portal, 2003, California, last accessed November 12, 2011, [http://paleoportal.org/index.php?globalnav=time\\_space&sectionnav=state&name=California](http://paleoportal.org/index.php?globalnav=time_space&sectionnav=state&name=California).
- [80] San Diego Natural History Museum, Ankylosaur, last accessed August 13, 2021, <http://www.sdnhm.org/exhibitions/fossil-mysteries/fossil-field-guide-a-z/ankylosaur>.

- [81] U.S. Energy Information Administration, U.S. Energy Facts Explained, May 14, 2021, last accessed May 24, 2021, <https://www.eia.gov/energyexplained/us-energy-facts/>.
- [82] Ibid.
- [83] Ibid.
- [84] Ibid.
- [85] U.S. Energy Information Administration, California: State Profile and Energy Estimates, February 18, 2021, last accessed May 14, 2021, <https://www.eia.gov/state/?sid=CA>.
- [86] California Energy Commission, 2019 Total System Electric Generation, last accessed August 13, 2021, <https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2019-total-system-electric-generation>.
- [87] Ibid.
- [88] U.S. Environmental Protection Agency, EPA and NHTSA Adopt Standards to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium- and Heavy-Duty Vehicles for Model Year 2018 and Beyond, August 2016, last accessed August 13, 2021, <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NL.PDF?Dockkey=P100P7NL.PDF>.
- [89] California Energy Commission, ICF International, Combined Heat and Power: Policy Analysis and 2011-2030 Market Assessment, June 2012, last accessed August 13, 2021, <https://efiling.energy.ca.gov/GetDocument.aspx?tn=65855>.
- [90] Ibid.
- [91] U.S. Geological Survey, Ground Water Atlas of the United States: California, Nevada, 1995, last accessed August 13, 2021, [http://pubs.usgs.gov/ha/ha730/ch\\_b/index.html](http://pubs.usgs.gov/ha/ha730/ch_b/index.html).
- [92] California Department of Water Resources, California Precipitation, 2014, last accessed August 13, 2021, [https://cw3e.ucsd.edu/wp-content/uploads/2015/02/CA\\_Precip\\_final.pdf](https://cw3e.ucsd.edu/wp-content/uploads/2015/02/CA_Precip_final.pdf).
- [93] Harden, Deborah R, California Geology, 1997, Print Edition.
- [94] Ibid.
- [95] Ritchie, David, Alexander E. Gates, Encyclopedia of Earthquakes and Volcanoes, 2001, Print Edition.

- [96] California Geological Survey, Earthquake Fault Zones: A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California, 2018, last accessed August 13, 2021, [https://www.conservation.ca.gov/cgs/Documents/Publications/Special-Publications/SP\\_042.pdf](https://www.conservation.ca.gov/cgs/Documents/Publications/Special-Publications/SP_042.pdf).
- [97] Ahrens, C. Donald, Meteorology Today: An Introduction to Weather, Climate and the Environment, 2003.
- [98] Intergovernmental Panel on Climate Change, Climate Change 2007: The Physical Science Basis, 2007, last accessed August 13, 2021, [https://www.ipcc.ch/site/assets/uploads/2018/05/ar4\\_wg1\\_full\\_report-1.pdf](https://www.ipcc.ch/site/assets/uploads/2018/05/ar4_wg1_full_report-1.pdf).
- [99] Intergovernmental Panel on Climate Change, Climate Change 2013: The Physical Science Basis, 2013, last accessed August 13, 2021, [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_all\\_final.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf).
- [100] California Climate Action Registry, California Climate Action Registry General Reporting Protocol, April 2008, last accessed August 13, 2021, [https://www.climateactionreserve.org/wp-content/uploads/videos/GRP\\_V3\\_April%202008\\_FINAL.pdf](https://www.climateactionreserve.org/wp-content/uploads/videos/GRP_V3_April%202008_FINAL.pdf).
- [101] California Air Resources Board, California Greenhouse Gas Emissions for 2000 to 2018: Trends of Emissions and Other Indicators, 2020, last accessed August 13, 2021, [https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000\\_2018/ghg\\_inventory\\_trends\\_00-18.pdf](https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2018/ghg_inventory_trends_00-18.pdf).
- [102] Ibid.
- [103] California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy, March 2017, last accessed August 13, 2021, [https://www.arb.ca.gov/cc/shortlived/meetings/03142017/final\\_slcp\\_report.pdf](https://www.arb.ca.gov/cc/shortlived/meetings/03142017/final_slcp_report.pdf).
- [104] Intergovernmental Panel on Climate Change, Climate Change 2013: The Physical Science Basis, 2013, last accessed August 13, 2021, [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_all\\_final.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf).
- [105] California Energy Commission, ICF International, Combined Heat and Power: Policy Analysis and 2011-2030 Market Assessment, June 2012, last accessed August 13, 2021, <https://efiling.energy.ca.gov/GetDocument.aspx?tn=65855>.
- [106] Ibid.
- [107] Ibid.

- [108] California Natural Resources Agency, 2009 California Climate Adaptation Strategy, 2009, last accessed August 13, 2021, [http://resources.ca.gov/docs/climate/Statewide\\_Adaptation\\_Strategy.pdf](http://resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf).
- [109] Ibid.
- [110] California Department of Water Resources, California's Groundwater (Bulletin 118), 2003, last accessed August 13, 2021, <https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118>.
- [111] Ibid.
- [112] U.S. Environmental Protection Agency, Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, January 1993, last accessed August 13, 2021, <https://www.epa.gov/nps/guidance-specifying-management-measures-sources-nonpoint-pollution-coastal-waters>.
- [113] USGS, Lithium Data Sheet, last accessed August 16, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-lithium.pdf>.
- [114] USGS, Cobalt Data Sheet, 2020, last accessed August 13, 2021, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-cobalt.pdf>.
- [115] Clinkenbeard, John, Smith, Joshua, California Non-Fuel Minerals 2011, 2011, last accessed August 13, 2021, <https://www.conservation.ca.gov/cgs/Documents/Minerals/california-non-fuel-mineral-production-2011.pdf>.
- [116] Caltrans, Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013, last accessed August 13, 2021, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf>.
- [117] Caltrans, California Airport Land Use Planning Handbook, October 2011, last accessed August 13, 2021, <https://dot.ca.gov/-/media/dot-media/programs/aeronautics/documents/californiaairportlanduseplanninghandbook-a11y.pdf>.
- [118] Caltrans, Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013, last accessed August 13, 2021, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf>.
- [119] Egan, M. David, Architectural Acoustics, 2007.

- [120] Caltrans, Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013, last accessed August 13, 2021, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf>.
- [121] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, September 2018, last accessed August 13, 2021, [https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123\\_0.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf).
- [122] Caltrans, Transportation and Construction Vibration Guidance Manual, April 2020, last accessed August 13, 2021, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tcvgm-apr2020-a11y.pdf>.
- [123] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, September 2018, last accessed August 13, 2021, [https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123\\_0.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf).
- [124] Ibid.
- [125] Ibid.
- [126] Ibid.
- [127] Office of Planning and Research, State of California General Plan Guidelines, 2017, last accessed August 13, 2021, [http://www.opr.ca.gov/docs/OPR\\_COMPLETE\\_7.31.17.pdf](http://www.opr.ca.gov/docs/OPR_COMPLETE_7.31.17.pdf).
- [128] U.S. Census Bureau, Quickfacts: California; United States, 2019, <https://www.census.gov/quickfacts/fact/table/CA,US/RHI825216>.
- [129] Ibid.
- [130] Bureau of Labor Statistics, Economy at a Glance: California, last accessed August 13, 2021, <https://www.bls.gov/eag/eag.ca.htm>.
- [131] U.S. Census Bureau, Quickfacts: California; United States, 2019, <https://www.census.gov/quickfacts/fact/table/CA,US/RHI825216>.
- [132] U.S. Census Bureau, Census: Population and Foreign-Born. February 2001, Volume 8, Number 2, last accessed April 17, 2018, <https://migration.ucdavis.edu/mn/more.php?id=2302>.

- [133] University of Southern California, New California Population Projection Shows Massive Slowdown, April 24, 2012, last accessed August 13, 2021, <https://www.sciencedaily.com/releases/2012/04/120424142117.htm>.
- [134] U.S. Census Bureau, Quickfacts: California; United States, 2018, last accessed April 17, 2018, <https://www.census.gov/quickfacts/fact/table/CA,US/RHI825216>.
- [135] Ibid.
- [136] Bureau of Labor Statistics, Databases, Tables & Calculations by Subject, last accessed June 9, 2021, <https://data.bls.gov/timeseries/LASST0600000000000003>.
- [137] California State Parks, Meeting the Park Needs of All Californians, 2015 Statewide Comprehensive Outdoor Recreation Plan, last accessed August 13, 2021, <https://www.parksforcalifornia.org/scorp/2015>.
- [138] U.S. Bureau of Reclamation, About the Central Valley Project, April 18, 2017, last accessed April 17, 2018, <https://www.usbr.gov/mp/cvp/about-cvp.html>.
- [139] Ibid.
- [140] California Department of Water Resources, State Water Project, last accessed August 13, 2021, <https://water.ca.gov/Programs/State-Water-Project>.
- [141] Office of Planning and Research, State of California General Plan Guidelines, 2017, last accessed August 13, 2021, [http://www.opr.ca.gov/docs/OPR\\_COMPLETE\\_7.31.17.pdf](http://www.opr.ca.gov/docs/OPR_COMPLETE_7.31.17.pdf).

## **F. Appendix E References**

- [1] U.S. EPA, Federal Register, Vol. 73, No. 126, Monday, June 30, 2008, Preamble to The Final Rule on Locomotive and Marine, pg. 32, last accessed July 12, 2021, <https://www.govinfo.gov/content/pkg/FR-2008-06-30/pdf/R8-7999.pdf#page=32>.
- [2] U.S. EPA, Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, pg. 344, May 2008, last accessed July 12, 2021, <https://nepis.epa.gov/Exe/ZyPDF.cgi/P10024CN.PDF?Dockey=P10024CN.PDF>.
- [3] Official Journal of the European Union, Directive 2004/ 26/EC of the European Parliament and of the Council of 21 April, 2004, last accessed July 12, 2021, <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:146:0001:0107:EN:PDF>.
- [4] IMO, Nitrogen Oxides (NOx)- Regulation 13, last accessed July 12, 2021, [https://www.imo.org/en/OurWork/Environment/Pages/Nitrogen-oxides-\(NOx\)-%E2%80%93-Regulation-13.aspx](https://www.imo.org/en/OurWork/Environment/Pages/Nitrogen-oxides-(NOx)-%E2%80%93-Regulation-13.aspx).

- [5] Official Journal of the European Union, Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016, last accessed July 12, 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R1628>.
- [6] ICCT, Technology Pathways for Diesel Engines Used in Non-Road Vehicles and Equipment, September 2016, page 37, last accessed July 12, 2021, [https://theicct.org/sites/default/files/publications/Non-Road-Tech-Pathways\\_white-%20paper\\_vF\\_ICCT\\_20160915.pdf](https://theicct.org/sites/default/files/publications/Non-Road-Tech-Pathways_white-%20paper_vF_ICCT_20160915.pdf).
- [7] Official Journal of the European Union, Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016, last accessed July 12, 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R1628>.
- [8] USCG, MARPOL Annex VI, (revised, 2008), last accessed July 12, 2021, [https://homeport.uscg.mil/Lists/Content/Attachments/891/Brief%20on%20MARPOL%20Annex%20VI%20\(revised\).pdf](https://homeport.uscg.mil/Lists/Content/Attachments/891/Brief%20on%20MARPOL%20Annex%20VI%20(revised).pdf).
- [9] USCG Office of Commercial Vessel Compliance (CG-CVC) Mission Management System (MMS) Work Instruction, CVC-WI-014(1), Exercise of Enforcement Discretion With Regard to MARPOL Annex VI Regulation 13.5.1.2, October 7, 2018, last accessed July 12, 2021, [https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/CG-5PC/CG-CVC/CVC\\_MMS/CVC-WI-014\(1\).pdf](https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/CG-5PC/CG-CVC/CVC_MMS/CVC-WI-014(1).pdf).
- [10] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, pgs. 111-112.
- [11] Engine Fix UK, Piston Function, Requirements and Types, last accessed July 12, 2021, <https://enginefixuk.com/engine-products/pistons/>.
- [12] C.E. Roberts et al., International Journal of Automotive Engineering 2 (2011) 55-60, Advancement in Diesel Combustion System Design to Improve the Smoke-BSFC Tradeoff, last accessed July 12, 2021, [https://www.jstage.jst.go.jp/article/jsaeijae/2/3/2\\_20114602/\\_pdf](https://www.jstage.jst.go.jp/article/jsaeijae/2/3/2_20114602/_pdf).
- [13] Sealand Turbo-Diesel Asia, What Are Electronic Unit Injectors and How Do They Work?, January 18, 2018, last accessed July 12, 2021, <https://www.slrturbodiesel.com/what-are-electronic-unit-injectors-and-how-do-they-work/>.
- [14] Hannu Jaaskelainen, Magdi K. Khair, Common Rail Fuel Injection, last accessed July 12, 2021, [https://dieselnet.com/tech/diesel\\_fi\\_common-rail.php](https://dieselnet.com/tech/diesel_fi_common-rail.php).
- [15] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, (pgs. 70-71).
- [16] Hannu Jaaskelainen, Alessandro Ferrari, Common Rail Injection System Pressure Control, last accessed July 12, 2021, [https://dieselnet.com/tech/diesel\\_fi\\_common-rail\\_control.php](https://dieselnet.com/tech/diesel_fi_common-rail_control.php).

- [17] Mirza Mackovic, Characterization of Soot Particles From Diesel Engines and Tin Dioxide Particles Milled in Stirred Media Mills, 2012 (pgs. 17-18), <https://dnb.info/1024406768/34>.
- [18] Wollenhaupt, Gary, Marine Engine Makers Gear Up For Stiffer Emissions Standards, Professional Mariner, October 1, 2013, last accessed July 12, 2021, <https://www.professionalmariner.com/marine-engine-makers-gear-up-for-stiffer-emissions-standards/?cparticle=1&siarticle=0#artanc>.
- [19] Gladstein, Neandross & Associates, Ultrafine Particulate Matter and the Benefits of Reducing Particle Numbers in the United States, July 2013, last accessed July 12, 2021, [http://www.meca.org/resources/meca\\_ufp\\_white\\_paper\\_0713\\_final.pdf](http://www.meca.org/resources/meca_ufp_white_paper_0713_final.pdf).
- [20] Kittelson, et al., Prospects of Meeting EU Number Emission Standards With a Diesel Engine Without a DPF, University of Minnesota Center for Diesel Research, 27 June 2014, (Slide 16), last accessed July 12, 2021, [https://a.storyblok.com/f/77802/x/3af092197f/cpm\\_kittelson\\_2014\\_prospects-of-meeting-eu-number-emission-standards-with-a-diesel-engine-without-a-dpf.pdf](https://a.storyblok.com/f/77802/x/3af092197f/cpm_kittelson_2014_prospects-of-meeting-eu-number-emission-standards-with-a-diesel-engine-without-a-dpf.pdf).
- [21] Hyperphysics, Specific Heat, last accessed July 12, 2021, <http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/spht.html>.
- [22] Hyster, Big Trucks Eco-Technology: Advanced Solutions for Meeting EPA Tier 4 Engine Emission Regulations on H400-1150HD and Reachstackers, last accessed July 12, 2021, <https://autodocbox.com/Diesel/82264103-Advanced-solutions-for-meeting-epa-tier-4-engine-emission-regulations-on-h-hd-and-reachstackers.html>.
- [23] C.E. Roberts et al., International Journal of Automotive Engineering 2 (2011) 55-60, Advancement in Diesel Combustion System Design to Improve the Smoke-BSFC Tradeoff, last accessed July 12, 2021, [https://www.jstage.jst.go.jp/article/jsaeijae/2/3/2\\_20114602/\\_pdf](https://www.jstage.jst.go.jp/article/jsaeijae/2/3/2_20114602/_pdf).
- [24] GE Transportation, Simply Clean: GE Marine L250 and V250 Series Diesel Engines, EPA Tier 4/ IMO Tier III, last accessed July 12, 2021, [http://www.oissco.com/Downloads/L250\\_V250.pdf](http://www.oissco.com/Downloads/L250_V250.pdf).
- [25] CPTDB Wiki, Detroit Diesel Series 60, last accessed July 12, 2021, [https://cptdb.ca/wiki/index.php/Detroit\\_Diesel\\_Series\\_60](https://cptdb.ca/wiki/index.php/Detroit_Diesel_Series_60).
- [26] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, (pg. 330).
- [27] M. Reissig, et al., Condensation-Fouling Interaction in Low-Temperature EGR-Coolers, 2014, last accessed July 12, 2021, [https://www.matec-conferences.org/articles/mateconf/pdf/2014/09/mateconf\\_heat2014\\_03004.pdf](https://www.matec-conferences.org/articles/mateconf/pdf/2014/09/mateconf_heat2014_03004.pdf).



- [28] Malcolm Latache, The Basics and Origins of a Ship Turbocharger, September 19, 2017, last accessed March 4, 2021, <http://178.62.53.118/articles/basics-origins-ship-turbocharger>.
- [29] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, (pg. 32).
- [30] Mechanical Engineering, Turbocharger Cutaway.jpg, December 20, 2016, last accessed July 12, 2021, <https://mechanical-engg.com/gallery/image/2406-turbocharger-cutawayjpg/>.
- [31] BorgWarner, Design and Function of a Turbocharger: Bearing Systems, last accessed July 13, 2021, <https://turbo.borgwarner.com/en/products/turbochargerBearingSystem.aspx>.
- [32] Cummins, Cummins Tier 4 Technology Overview, last accessed July 13, 2021, <https://www.cdc.gov/niosh/mining/userfiles/workshops/dieselaerosols2012/nioshmvs2012tier4technologyreview.pdf>.
- [33] Highway & Heavy Parts, How Does a Wastegate Work On a Diesel Engine Turbo?, last accessed July 13, 2021, <https://highwayandheavyparts.com/n-12953-how-does-a-wastegate-work-on-a-diesel-engine-turbo.html>.
- [34] Cummins, Cummins Tier 4 Technology Overview, last accessed July 13, 2021, <https://www.cdc.gov/niosh/mining/userfiles/workshops/dieselaerosols2012/nioshmvs2012tier4technologyreview.pdf>.
- [35] Engine Basics, What is Turbine A/R and How Does it Affect Turbo Performance, last accessed July 13, 2021, <https://www.enginebasics.com/Advanced%20Engine%20Tuning/AR%20turbo%20ratio%20explained.html>.
- [36] Behrens, Rolf, Goodbye Turbo Lag!, July 2, 2018, last accessed July 13, 2021, <https://www.mtu-solutions.com/au/en/stories/technology/research-development/goodbye-turbo-lag.html>.
- [37] Applied Cooling Technology, Charge Air Coolers, last accessed July 13, 2021, <http://appliedcool.com/products/charge-air-coolers/>.
- [38] GE Transportation, Simply Clean: GE Marine L250 and V250 Series Diesel Engines, EPA Tier 4/ IMO Tier III, last accessed July 12, 2021, [http://www.oissco.com/Downloads/L250\\_V250.pdf](http://www.oissco.com/Downloads/L250_V250.pdf).
- [39] Crowley Maritime, Ocean Class Tugboats DP1 & DP2, last accessed July 13, 2021, [https://www.crowley.com/wp-content/uploads/sites/7/2020/04/CM\\_OceanClassTug\\_SpecSheet.pdf](https://www.crowley.com/wp-content/uploads/sites/7/2020/04/CM_OceanClassTug_SpecSheet.pdf).

- [40] CARB, Final Regulation Order: Amendments to The Regulations to Reduce Emissions From Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of The California Baseline, 2010, last accessed July 13, 2021, [https://ww3.arb.ca.gov/regact/2010/chc10/frochc22995.pdf?\\_ga=2.194839917.1924282725.1614293712-855995493.1604617821](https://ww3.arb.ca.gov/regact/2010/chc10/frochc22995.pdf?_ga=2.194839917.1924282725.1614293712-855995493.1604617821).
- [41] Watson, et al., Reducing Lubricant Ash Impact on Exhaust Aftertreatment With a Oil Conditioning Filter, August 6, 2009, last accessed July 13, 2021, [https://www.energy.gov/sites/prod/files/2014/03/f8/deer09\\_watson.pdf](https://www.energy.gov/sites/prod/files/2014/03/f8/deer09_watson.pdf).
- [42] Schrenk, et al., Composition of Diesel Engine Exhaust Gas, American Journal Of Public Health and The Nation's Health, Volume 31, Number 7, July 1941, (pgs. 669-681), last accessed July 13, 2021, <https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.31.7.669>.
- [43] U.S. EPA, Diesel Oxidation Catalysts: Informational Update, November 2007, last accessed July 13, 2021, <https://permanent.fdlp.gov/gpo33296/420f07068.pdf>.
- [44] CARB, Executive Order A-013-0152-2, February 27, 2003, last accessed July 16, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic/msprog/onroad/cert/mdehdehdv/2003/caterpillar\\_mhdd\\_a0130152r2\\_7d2\\_2d5-0d10.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/msprog/onroad/cert/mdehdehdv/2003/caterpillar_mhdd_a0130152r2_7d2_2d5-0d10.pdf).
- [45] Hasan, Mohammed, The Filtration and Oxidation Characteristics of a Diesel Oxidation Catalyst and a Catalyzed Particulate Filter: Development of a 1-D 2-Layer Model, May 2005, last accessed July 16, 2021, <https://digitalcommons.mtu.edu/cgi/viewcontent.cgi?article=1370&context=etds>.
- [46] CTS, Basics of Diesel Particulate Filter (DPF) Operation, last accessed July 16, 2021, <https://www.ctscorp.com/products/sensors-2/rf-dpf-sensor/diesel-particulate-filter-dpf-knowledge-base/basics-dpf-operation/>.
- [47] CARB, Executive Order DE-09-006, April 17, 2009, last accessed July 16, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic//diesel/verdev/vt/marine/rypos/eode09006.pdf>.
- [48] CARB, Executive Order A-013-0152-2, February 27, 2003, last accessed July 16, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic/msprog/onroad/cert/mdehdehdv/2003/caterpillar\\_mhdd\\_a0130152r2\\_7d2\\_2d5-0d10.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/msprog/onroad/cert/mdehdehdv/2003/caterpillar_mhdd_a0130152r2_7d2_2d5-0d10.pdf).
- [49] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment, Marine CI Engine Certification Data (Model Years: 2000-Present), last accessed July 16, 2021, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.

- [50] Majewski, Wall-Flow Monoliths, Figure 1, last accessed July 13, 2021, [https://dieselnet.com/tech/dpf\\_wall-flow.php](https://dieselnet.com/tech/dpf_wall-flow.php).
- [51] U.S. EPA, Technical Bulletin: Diesel Particulate Filter Operation and Maintenance, February 2009, last accessed July 16, 2021, <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100LFHJ.PDF?Dockey=P100LFHJ.PDF>.
- [52] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, (pgs. 418-421).
- [53] Gang, L., Catalytic Oxidation of Ammonia to Nitrogen, page 8, table 3, January 1, 2002, last accessed July 16, 2021, <https://pure.tue.nl/ws/files/1911936/200210267.pdf>.
- [54] Ravishankara, et al., Nitrous Oxide (N<sub>2</sub>O): The Dominant Ozone-Depleting Substance Emitted in the 21st Century, 2009, last accessed July 16, 2021, <https://www.jstor.org/stable/pdf/40328592.pdf?refreqid=excelsior%3Acfff47a1ab5c46d1621fac8ee16f7298>.
- [55] CAT, Diesel Exhaust Fluid (DEF) FAQs, last accessed July 16, 2021, [https://www.cat.com/en\\_US/by-industry/marine/tier-four/your-questions-answered/def-faqs.html](https://www.cat.com/en_US/by-industry/marine/tier-four/your-questions-answered/def-faqs.html).
- [56] BlueBasic, Reliable Quality Diesel Exhaust Fluid DEF Arla32 to Lower Emission, last accessed July 16, 2021, [https://www.everbluesolution.com/reliable-quality-diesel-exhaust-fluid-def-arla32-to-lower-emission\\_p211.html](https://www.everbluesolution.com/reliable-quality-diesel-exhaust-fluid-def-arla32-to-lower-emission_p211.html).
- [57] EJNet, Metals as Catalysts for Dioxin Formation, December 29, 2003, last accessed July 16, 2021, <https://www.ejnet.org/dioxin/catalysts.html>.
- [58] Elena Sala Gil, Evaluation of Ammonia Slip Catalysts, Chalmers University of Technology, 2013, last accessed July 16, 2021, <https://publications.lib.chalmers.se/records/fulltext/179045/179045.pdf>.
- [59] U.S. EPA, The EPA Enforcement Policy on Vehicle and Engine Tampering and Aftermarket Defeat Devices under the Clean Air Act, November 23, 2020, PDF, last accessed July 16, 2021, <https://www.epa.gov/sites/production/files/2020-12/documents/epatamperingpolicy-enforcementpolicyonvehiclandenginetaampering.pdf>.
- [60] CARB, On-Board Diagnostic II (OBD II) Systems Fact Sheet, September 19, 2019, last accessed July 16, 2021, <https://ww2.arb.ca.gov/resources/fact-sheets/board-diagnostic-ii-obd-ii-systems-fact-sheet>.
- [61] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment, Marine CI Engine Certification Data (Model Years: 2000-Present), last accessed July 16, 2021, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.

- [62] Scott, Fast, Freightliner of Arizona, EPA 2010/ GHG14 Emissions, slide 6, last accessed July 16, 2021, <https://studylib.net/doc/5501882/presentation-on-federal-standards>.
- [63] CARB, Verification Procedure For In-Use Strategies to Control Emissions From Diesel Engines, last accessed July 16, 2021, <https://ww2.arb.ca.gov/our-work/programs/verification-procedure-use-strategies-control-emissions-diesel-engines>.
- [64] CARB, Heavy Duty DECS Installation and Maintenance: Frequently Asked Questions, last accessed July 16, 2021, <https://ww2.arb.ca.gov/resources/fact-sheets/heavy-duty-decs-installation-and-maintenance-frequently-asked-questions>.
- [65] Cal Maritime, Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, September 30, 2019, last accessed July 16, 2021, <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>.
- [66] 46 CFR Chapter I – Coast Guard, Department of Homeland Security, last accessed July 16, 2021, <https://www.govinfo.gov/content/pkg/CFR-2016-title46-vol1/pdf/CFR-2016-title46-vol1.pdf>.
- [67] Cal Maritime, Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, September 30, 2019, last accessed July 16, 2021, <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>.
- [68] American Bureau of Shipping, Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways, 2007, last accessed July 16, 2021, <https://towmasters.files.wordpress.com/2009/05/abs-steel-vessel-river-rules.pdf>.
- [69] American Bureau of Shipping, ABS Rules for Steel Vessels Under 90m in Length for Vessels Certificated for International Voyages, July 1, 2010, last accessed July 16, 2021, <https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/Alternate%20Compliance%20Program/abslt90m7122010.pdf>.
- [70] USCG, Tonnage Regulations Amendments, March 31, 2016, last accessed July 16, 2021, <https://www.federalregister.gov/documents/2016/03/31/2016-05623/tonnage-regulations-amendments>.
- [71] USCG, U.S. Department of Homeland Security, Navigation and Vessel Inspection Circular No. 11-93, Change 3, Applicability of Tonnage Measurement Systems to U.S. Flagged Vessels, November 21, 2003, last accessed July 16, 2021, [https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/NVIC/1993/CH-3\\_11-93.pdf](https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/NVIC/1993/CH-3_11-93.pdf).

- [72] USCG, U.S. Department of Homeland Security, Marine Safety Center Technical Note (MTN) No. 04-95, CH-2, January 11, 2016, last accessed July 16, 2021, [https://www.dco.uscg.mil/Portals/9/MSC/MTN/MTN.04-95.CH-2.2016.01.11.Lightship\\_Change\\_Determination.pdf](https://www.dco.uscg.mil/Portals/9/MSC/MTN/MTN.04-95.CH-2.2016.01.11.Lightship_Change_Determination.pdf).
- [73] 46 CFR § 144.140 – Qualifications, last accessed July 16, 2021, <https://www.law.cornell.edu/cfr/text/46/144.140>.
- [74] CARB, Shipyard Analysis Email Survey.
- [75] Shipyard Capacity Project Workbook.
- [76] Davison Publishing Co., Marine Yellow Pages, last accessed July 16, 2021, <https://www.marineyellowpages.com/>.
- [77] CARB, Initial Statement of Reasons for Proposed Rulemaking: Proposed Regulation on the Commercialization of Alternative Diesel Fuels, January 2, 2015, last accessed July 16, 2021, <https://www.arb.ca.gov/regact/2015/adf2015/adf15isor.pdf>.
- [78] ETIP Bioenergy, Transesterification to Biodiesel, last accessed July 16, 2021, <https://www.etipbioenergy.eu/value-chains/conversion-technologies/conventional-technologies/transesterification-to-biodiesel>.
- [79] Mohamed Al-Dawody, Optimization Strategies to Reduce the Biodiesel NO<sub>x</sub> Effect in Diesel Engine with Experimental Verification, December 31, 2012, last accessed July 16, 2021, [https://www.researchgate.net/publication/257051405\\_Optimization\\_strategies\\_to\\_reduce\\_the\\_biodiesel\\_NOx\\_effect\\_in\\_diesel\\_engine\\_with\\_experimental\\_verification](https://www.researchgate.net/publication/257051405_Optimization_strategies_to_reduce_the_biodiesel_NOx_effect_in_diesel_engine_with_experimental_verification).
- [80] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, (pg. 253).
- [81] National Renewable Energy Laboratory, Biodiesel Storage and Use Guide (pg. 19), December 2009, last accessed July 16, 2021, <https://www.nrel.gov/docs/fy09osti/43672.pdf>.
- [82] Majewski and Khair, Diesel Emissions and Their Control, Print Edition, Published 2006, (pg. 253).
- [83] U.S. EPA, Federal Register Vol. 81, No. 238, Renewable Fuel Standard Program: Standards for 2017 and Biomass-Based Diesel Volume for 2018, December 12, 2016, last accessed July 16, 2021, <https://www.govinfo.gov/content/pkg/FR-2016-12-12/pdf/2016-28879.pdf>.

- [84] CARB, Final Report: CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California “Biodiesel Characterization and NOx Mitigation Study” (page 97-99), October 2011, last accessed July 16, 2021, [https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013\\_carb%20final%20biodiesel%20report.pdf](https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_carb%20final%20biodiesel%20report.pdf).
- [85] IEA Bioenergy, Biofuels for the Marine Shipping Sector, October 2017, last accessed July 16, 2021, <https://www.ieabioenergy.com/wp-content/uploads/2018/02/Marine-biofuel-report-final-Oct-2017.pdf>.
- [86] CalEPA, Staff Report: Multimedia Evaluation of Renewable Diesel (pg. 4), May 21, 2015, last accessed July 16, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable\\_Diesel\\_Multimedia\\_Evaluation\\_5-21-15.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Multimedia_Evaluation_5-21-15.pdf).
- [87] Valero, The Technical Side of Renewable Diesel, last accessed July 16, 2021, <https://www.valero.com/renewables/renewable-diesel/renewable-diesel-science-process>.
- [88] Gladstein, Neandross and Associates, Renewable Diesel as a Major Transportation Fuel in California: Opportunities, Benefits, and Challenges, August 2017, <https://learn.gladstein.org/whitepaper-renewablediesel>.
- [89] Ibid.
- [90] Ibid.
- [91] Ibid.
- [92] Ibid.
- [93] California Energy Commission, Biofuels: Diesel Substitutes, last accessed July 17, 2021, <https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/clean-transportation-funding-areas-2-0>.
- [94] CARB, Proposed Regulation on the Commercialization of Alternative Diesel Fuels – Staff Report: Initial Statement of Reasons (pp. 44-45), January 2, 2015, last accessed July 17, 2021, <https://www.arb.ca.gov/regact/2015/adf2015/adf15isor.pdf>.
- [95] Durbin, et al., CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California “Biodiesel Characterization and NOx Mitigation Study”, October 2011, last accessed July 17, 2021, [https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013\\_carb%20final%20biodiesel%20report.pdf](https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_carb%20final%20biodiesel%20report.pdf).
- [96] U.S. Department of Energy, Renewable Hydrocarbon Biofuels, last accessed July 17, 2021, [https://afdc.energy.gov/fuels/emerging\\_hydrocarbon.html](https://afdc.energy.gov/fuels/emerging_hydrocarbon.html).

- [97] U.S. EPA, Renewable Fuel Standard Program: Overview for Renewable Fuel Standard, last accessed July 17, 2021, <https://www.epa.gov/renewable-fuel-standard-program/overview-renewable-fuel-standard>.
- [98] U.S. Department of Energy, Biodiesel Income Tax Credit, last accessed July 17, 2021, <https://afdc.energy.gov/laws/396>.
- [99] U.S. Department of Energy, Renewable Hydrocarbon Biofuels, last accessed July 17, 2021, [https://afdc.energy.gov/fuels/emerging\\_hydrocarbon.html](https://afdc.energy.gov/fuels/emerging_hydrocarbon.html).
- [100] Argus Media, Phillips 66 to convert refinery to renewables: Update, August 12, 2020, last accessed July 17, 2021, <https://www.argusmedia.com/en/news/2131865-phillips-66-to-convert-refinery-to-renewables-update>.
- [101] Phillips 66, Phillips 66 Plans World's Largest Renewable Fuels Plant, August 12, 2020, last accessed July 17, 2021, <https://www.phillips66.com/newsroom/rodeo-renewed>.
- [102] Phillips 66, About Rodeo Renewed, last accessed July 17, 2021, <https://www.rodeorenewed.com/about>.
- [103] Green Car Congress, Phillips 66 to convert San Francisco Refinery into world's largest renewable fuels plant; 800M+ gallons per year, August 13, 2020, last accessed July 17, 2021, <https://www.greencarcongress.com/2020/08/20200813-rodeo.html>.
- [104] Marathon Petroleum, Marathon Seeks Permits for Martinez Renewable Diesel Project, October 1, 2020, last accessed July 17, 2021, <https://www.marathonpetroleum.com/Newsroom/Company-News/Marathon-seeks-permits-for-Martinez-renewable-diesel-project/>.
- [105] Valero, Renewable Diesel, Innovation and Unmatched Execution, last accessed July 17, 2021, <https://www.valero.com/renewables/renewable-diesel>.
- [106] Biomass Magazine, World Energy Invests \$350M to Expand Paramount Biofuel Production, October 24, 2018, last accessed July 17, 2021, <http://biomassmagazine.com/articles/15699/world-energy-invests-350m-to-expand-paramount-biofuel-production>.
- [107] Bioenergy International, World Energy to Complete Paramount Refinery Conversion to Renewable Fuels, October 30, 2018, last accessed July 17, 2021, <https://bioenergyinternational.com/biofuels-oils/world-energy-to-complete-paramount-refinery-conversion-to-renewable-fuels>.
- [108] Oil and Gas Journal, Global Clean Energy Lets Contract for Bakersfield Refinery Conversion Project, June 9, 2020, last accessed July 17, 2021, <https://www.ogj.com/refining-processing/refining/article/14177460/global-clean-energy-lets-contract-for-bakersfield-refinery-conversion-project>.

- [109] Biodiesel Magazine, Renewable Diesel's Rising Tide, January 12, 2021, last accessed July 17, 2021, <http://www.biodieselmagazine.com/articles/2517318/renewable-diesels-rising-tide>.
- [110] City of Walnut Creek, City of Walnut Creek Sustainability Best Practices Activities, last accessed July 17, 2021, [http://ca-ilg.org/sites/main/files/file-attachments/walnut\\_creek\\_2018.pdf](http://ca-ilg.org/sites/main/files/file-attachments/walnut_creek_2018.pdf).
- [111] DGS, Management Memo, Diesel, Biodiesel, and Renewable Hydrocarbon Diesel Bulk Fuel Purchases, MM 15-07, December 9, 2015, last accessed July 17, 2021, [https://www.dgs.ca.gov/-/media/Divisions/OSP/PR/Memos/MM15\\_07.pdf?la=en&hash=B72C4ED5D9C01190EE7DFDDAC4D36D4A4CB85241](https://www.dgs.ca.gov/-/media/Divisions/OSP/PR/Memos/MM15_07.pdf?la=en&hash=B72C4ED5D9C01190EE7DFDDAC4D36D4A4CB85241).
- [112] City and County of San Francisco, Mayor Lee Announces San Francisco to Use Renewable Diesel in City Fleet, July 21, 2015, last accessed July 17, 2021, <https://sfmayor.org/article/mayor-lee-announces-san-francisco-use-renewable-diesel-city-fleet>.
- [113] City of Oakland, City of Oakland Drives Environmental Progress with New Renewable Diesel Model, April 18, 2019, last accessed July 17, 2021, <https://www.oaklandca.gov/news/2019/city-of-oakland-drives-environmental-progress-with-new-renewable-diesel-model>.
- [114] Bioenergy International, San Diego Latest Californian City to Run Municipal Fleet on Renewable Diesel, November 1, 2016, last accessed July 17, 2021, <https://bioenergyinternational.com/biofuels-oils/san-diego-latest-californian-city-to-run-municipal-fleet-on-renewable-diesel>.
- [115] Biomass Magazine, Carlsbad, California, City Fleet Fueling with Renewable Diesel, July 6, 2016, last accessed July 17, 2021, <http://biomassmagazine.com/articles/13431/carlsbad-california-city-fleet-fueling-with-renewable-diesel>.
- [116] Sacramento County, Media Release: Renewable Diesel, August 26, 2016, last accessed July 17, 2021, <https://www.saccounty.net/news/latest-news/Pages/Press-Release-Renewable-Diesel.aspx>.
- [117] Environment + Energy Leader, UPS, Google Fleets Cutting Emissions with Neste Renewable Diesel, March 10, 2017, last accessed July 17, 2021, <https://www.environmentalleader.com/2017/03/ups-google-fleets-cutting-emissions-neste-renewable-diesel/>.
- [118] Biodiesel Magazine, US Navy Completes Sea Trial with 100 Percent Renewable Diesel, August 8, 2016, last accessed July 17, 2021, <http://www.biodieselmagazine.com/articles/1495553/us-navy-completes-sea-trial-with-100-percent-renewable-diesel>.



- [119] NBC Bay Area, Bay Area to Become First U.S. Region to Use Renewable Diesel Ferries, April 12, 2018, last accessed July 17, 2021, <https://www.nbcbayarea.com/news/local/bay-area-to-become-first-us-region-to-use-renewable-diesel-ferries/56739/>.
- [120] Neste, Californian Cruise Company Red and White Fleet Switches to Neste MY Renewable Diesel, April 13, 2018, last accessed July 17, 2021, <https://www.neste.com/releases-and-news/renewable-solutions/californian-cruise-company-red-and-white-fleet-switches-neste-my-renewable-diesel>.
- [121] Meeting with Nathan Crum, VP/CEO of Valley Pacific Petroleum Services Inc., March 19, 2021.
- [122] Meeting with Tim Johnson, Senior Vice President/General Manager of Diesel Direct, February 16, 2021.
- [123] U.S. Department of Energy, Clean Cities Alternative Fuel Price Report, October 2020, last accessed July 17, 2021, [https://afdc.energy.gov/files/u/publication/alternative\\_fuel\\_price\\_report\\_october\\_2020.pdf](https://afdc.energy.gov/files/u/publication/alternative_fuel_price_report_october_2020.pdf).
- [124] U.S. Department of Energy, Clean Cities Alternative Fuel Price Report, January 2020, last accessed July 17, 2021, [https://afdc.energy.gov/files/u/publication/alternative\\_fuel\\_price\\_report\\_jan\\_2020.pdf](https://afdc.energy.gov/files/u/publication/alternative_fuel_price_report_jan_2020.pdf).
- [125] Meeting with Tim Johnson, Senior Vice President/General Manager of Diesel Direct, February 16, 2021.
- [126] Ibid.
- [127] Meeting with Dirk Vaughn, Fabio Bezerra, Tim Wang, and Matt Leuck from Neste on February 2, 2021.
- [128] Volvo Trucks, Volvo Trucks Approves Use of Renewable Diesel Fuel for Proprietary Engines, December 9, 2015, last accessed July 17, 2021, <https://www.volvotrucks.us/news-and-stories/press-releases/2015/december/volvo-trucks-approves-use-of-renewable-diesel-fuel-for-proprietary-engines/>.
- [129] Mack Trucks, Mack Trucks Green-Lights Renewable Diesel Fuel for Use in Mack Engines, January 7, 2016, last accessed July 17, 2021, <https://www.macktrucks.com/mack-news/2016/mack-trucks-green-lights-renewable-diesel-fuel/>.
- [130] Ibid.
- [131] City of Knoxville Fleet Services, Renewable Diesel Test, June 15, 2017, last accessed July 17, 2021, [https://tncleanfuels.org/docs/Renewable-Diesel-Report\\_City-of-Knoxville\\_6-15-17.pdf](https://tncleanfuels.org/docs/Renewable-Diesel-Report_City-of-Knoxville_6-15-17.pdf).

- [132] CARB, Local Air Benefits by Switching from Diesel Fuel to LNG on a Marine Vessel, March 2020, last accessed July 17, 2021, [https://ww2.arb.ca.gov/sites/default/files/2021-01/LNG%20Ferry%20ARB%20Draft%20Report%20Final%20-%20CARB\\_ADA.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-01/LNG%20Ferry%20ARB%20Draft%20Report%20Final%20-%20CARB_ADA.pdf).
- [133] American Cancer Society, Formaldehyde, last accessed July 17, 2021, <https://www.cancer.org/cancer/cancer-causes/formaldehyde.html>.
- [134] CARB, Local Air Benefits by Switching from Diesel Fuel to LNG on a Marine Vessel (pg.27), March 2020, last accessed July 17, 2021, [https://ww2.arb.ca.gov/sites/default/files/2021-01/LNG%20Ferry%20ARB%20Draft%20Report%20Final%20-%20CARB\\_ADA.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-01/LNG%20Ferry%20ARB%20Draft%20Report%20Final%20-%20CARB_ADA.pdf).
- [135] U.S. EPA, Understanding Global Warming Potentials, last accessed July 17, 2021, <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.
- [136] CAT, About Caterpillar, last accessed July 17, 2021, [https://www.cat.com/en\\_US/news/engine-press-releases/-caterpillar-shipsfirstcat3500seriesmarinegasenginesfromlafayette.html](https://www.cat.com/en_US/news/engine-press-releases/-caterpillar-shipsfirstcat3500seriesmarinegasenginesfromlafayette.html).
- [137] OptiFuel Systems, About Us, last accessed July 17, 2021, <https://optifuel.com/optifuel>.
- [138] Cummins, ISX12N Overview, last accessed July 17, 2021, <https://www.cummins.com/engines/isx12n-2018>.
- [139] Cummins Westport, Move to Zero: Setting New Standards for Performance and Reliability with Near Zero Emissions – ISX12N, last accessed July 17, 2021, [https://www.cumminswestport.com/content/841/ISX12N\\_5544037\\_0418.pdf](https://www.cumminswestport.com/content/841/ISX12N_5544037_0418.pdf).
- [140] Marine Insight, 10 Noteworthy LNG-Powered Vessels, November 5, 2020, last accessed July 17, 2021, <https://www.marineinsight.com/tech/10-noteworthy-lng-fueled-vessels/>.
- [141] DNV-GL, Comparison of Alternative Marine Fuels, July 5, 2019, last accessed July 17, 2021, [https://sea-lng.org/wp-content/uploads/2020/04/Alternative-Marine-Fuels-Study\\_final\\_report\\_25.09.19.pdf](https://sea-lng.org/wp-content/uploads/2020/04/Alternative-Marine-Fuels-Study_final_report_25.09.19.pdf).
- [142] American Clean Skies Foundation, Natural Gas Marine Vessels- U.S. Market Opportunities, April 2012, last accessed July 17, 2021, [http://www.cleanskies.org/wp-content/uploads/2012/04/Marine\\_Vessels\\_Final\\_forweb.pdf](http://www.cleanskies.org/wp-content/uploads/2012/04/Marine_Vessels_Final_forweb.pdf).
- [143] MDPI, The Potential Role of Ammonia as Marine Fuel- Based on Energy Systems Modeling and Multi-Criteria Decision Analysis, April 17, 2020, last accessed July 17, 2021, <https://www.mdpi.com/2071-1050/12/8/3265/pdf>.
- [144] Ibid.

- [145] Ibid.
- [146] Ibid.
- [147] Wartsila, World's First Full Scale Ammonia Engine Test- An Important Step Towards Carbon Free Shipping, June 30, 2020, last accessed July 17, 2021, <https://www.wartsila.com/media/news/30-06-2020-world-s-first-full-scale-ammonia-engine-test--an-important-step-towards-carbon-free-shipping-2737809>.
- [148] Riviera, New Four-Stroke Engine: Turning Hydrogen Sceptics into Believers, September 23, 2020, last accessed July 17, 2021, <https://www.rivieramm.com/news-content-hub/new-four-stroke-engine-turning-hydrogen-sceptics-into-believers-61023>.
- [149] U.S. EPA, Air Pollution Control Technology Fact Sheet, last accessed July 17, 2021, <https://www3.epa.gov/ttnca1/dir1/fsncr.pdf>.
- [150] Switch Maritime, Zero-Carbon Vessels, last accessed July 17, 2021, <https://www.switchmaritime.com/>.
- [151] Society of Automotive Engineers (SAE), J1667 Recommended Practice- Snap Acceleration Smoke Test Procedure for Heavy-Duty Powered Vehicles, 1996, last accessed July 17, 2021, <https://ww2.arb.ca.gov/sites/default/files/2020-03/saej1667R.pdf>.
- [152] CARB, Proposed Amendments to the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program, April 3, 2018, last accessed July 17, 2021, <https://www.arb.ca.gov/regact/2018/hdvipsip18/isor.pdf>.
- [153] Ibid.
- [154] <sup>1</sup> California Council on Diesel Education and Technology, Applying the SAE J1667 Snap Acceleration Test Procedure to RTG Cranes, last accessed July 17, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/ports/cargo/documents/saej1667rtg091118.pdf>.
- [155] CARB, Off-Road Certification Database, last accessed July 17, 2021, [https://ww3.arb.ca.gov/msprog/offroad/cert/cert.php?eng\\_id=OFCI&year=2000](https://ww3.arb.ca.gov/msprog/offroad/cert/cert.php?eng_id=OFCI&year=2000).
- [156] Bosch RTT-100 Diesel Smoke Opacimeter Operating Instructions
- [157] U.S. EPA, Method 9 - Visual Determination of the Opacity of Emissions from Stationary Sources, August 3, 2017, last accessed July 17, 2021, [https://www.epa.gov/sites/production/files/2017-08/documents/method\\_9.pdf](https://www.epa.gov/sites/production/files/2017-08/documents/method_9.pdf).
- [158] Bureau of Mines, Ringlemann Smoke Chart, May 1967, last accessed July 17, 2021, <https://www.cdc.gov/niosh/mining/userfiles/works/pdfs/ic8333.pdf>.

- [159] CARB, Evaluation of Opacity Filters by Pamela Niiya, December 4, 2019.
- [160] Calculated using Equations 7.28 and 7.29 in Aerosol Technology (1999) by William C. Hinds.
- [161] MTU Solutions, Turbocharging: Key technology for high-performance engines, January 2014, last accessed July 17, 2021, [https://www.mtu-solutions.com/content/dam/mtu/download/technical-articles/3100641\\_MTU\\_General\\_WhitePaper\\_TurboCharging\\_2014.pdf/\\_jcr\\_content/renditions/original./3100641\\_MTU\\_General\\_WhitePaper\\_TurboCharging\\_2014.pdf](https://www.mtu-solutions.com/content/dam/mtu/download/technical-articles/3100641_MTU_General_WhitePaper_TurboCharging_2014.pdf/_jcr_content/renditions/original./3100641_MTU_General_WhitePaper_TurboCharging_2014.pdf).
- [162] Red Mountain, Inc., Diesel Emissions Testing Solution, last accessed July 17, 2021, <http://www.redmtnengr.com/>.
- [163] Beryl Technologies LLC, Portable Wireless Diesel Smoke Opacity Meters, last accessed July 17, 2021, <http://www.beryltechnologies.com/>.
- [164] Wagner, 7500 In-Line Smoke Opacity Meter, last accessed July 17, 2021, <https://www.wagerusa.com/copy-of-7500-partial-flow>.
- [165] Wagner, 6500 Smoke Opacity Meters, last accessed July 17, 2021, <https://www.wagerusa.com/6500-smoke-meters>.
- [166] Khan, et al., Effects of Diesel Addition on Viscosity of Linseed Oil and Consequent Effects on Performance Characteristics of CI Engine, last accessed July 17, 2021, [https://www.researchgate.net/figure/Mechanical-Efficiency-V-s-Engine-Load\\_fig3\\_302991246](https://www.researchgate.net/figure/Mechanical-Efficiency-V-s-Engine-Load_fig3_302991246).
- [167] CAT, Real-World Comparison Reveals Big Savings, last accessed July 17, 2021, [https://www.cat.com/en\\_US/by-industry/marine/hybrid-propulsion/real-world-comparison-reveals-big-savings.html](https://www.cat.com/en_US/by-industry/marine/hybrid-propulsion/real-world-comparison-reveals-big-savings.html).
- [168] UCR, Evaluating Emission Benefits of a Hybrid Tug Boat, October 2010, last accessed July 17, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-12/hybridreport1010\\_remediated.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-12/hybridreport1010_remediated.pdf).
- [169] Powers, Judith, Cat Introduces AVD Scalable Power System, February 22, 2019, last accessed July 17, 2021, <https://www.waterwaysjournal.net/2019/02/22/cat-introduces-avd-scalable-power-system/>.
- [170] Strashny, Igor, The CAT Advanced Variable Drive Marine Propulsion System, last accessed July 17, 2021, <https://s7d2.scene7.com/is/content/Caterpillar/CM20180906-23030-46993>
- [171] UCR, Evaluating Emission Benefits of a Hybrid Tug Boat, October 2010, last accessed July 17, 2021, [https://ww2.arb.ca.gov/sites/default/files/2020-12/hybridreport1010\\_remediated.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-12/hybridreport1010_remediated.pdf).

- [172] Geertsma, et al., Design and Control of Hybrid Power and Propulsion Systems for Smart Ships: A Review of Developments, 2017, last accessed July 17, 2021, <https://www.sciencedirect.com/science/article/pii/S0306261917301940>.
- [173] Switch Maritime, Zero-Carbon Vessels, last accessed July 17, 2021, <https://www.switchmaritime.com/>.
- [174] RINA, Type Approval and MED, last accessed July 17, 2021, <https://www.rina.org/en/type-approval-med>.
- [175] USCG, U.S. Department of Homeland Security, Design Guidance for Lithium-Ion Battery Installations Onboard Commercial Vessels, October 2, 2019, last accessed July 17, 2021, [https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/Design%20and%20Engineering%20Standards/Systems%20Engineering%20Division/ENG%20Policy%20Ltr\\_02-19%20Li-Ion%20Battery%20Policy\\_Signed.pdf?ver=2019-10-10-073508-267](https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/Design%20and%20Engineering%20Standards/Systems%20Engineering%20Division/ENG%20Policy%20Ltr_02-19%20Li-Ion%20Battery%20Policy_Signed.pdf?ver=2019-10-10-073508-267).
- [176] Sandia National Laboratories, Feasibility Study of Replacing the R/V Robert Gordon Sproul with a Hybrid Vessel Employing Zero-Emission Propulsion Technology, September 2020, last accessed July 17, 2021, <https://www.osti.gov/servlets/purl/1670517>.
- [177] Ibid.
- [178] Delserro Engineering Solutions, IEC 60068-2 Electronic Equipment & Product Standards, last accessed July 17, 2021, <https://www.desolutions.com/testing-services/test-standards/iec-60068-2/>.
- [179] Corvus Energy, Corvus Orca Energy, last accessed July 17, 2021, <https://corvusenergy.com/products/corvus-orca-energy/>.
- [180] Corvus Energy, Energy or Power – Corvus Energy Orca ESS Product Line Meets Both Differing Demands, July 31, 2017, last accessed July 17, 2021, <https://corvusenergy.com/energy-or-power-corvus-energy-orca-ess-product-line-meets-both-differing-demands/>.
- [181] Arumugam Manthiram, A Reflection on Lithium-Ion Battery Cathode Chemistry, 2020, last accessed July 17, 2021, <https://www.nature.com/articles/s41467-020-15355-0.pdf>.
- [182] Moorthi, MuMu, Lithium Titanate Batteries for High Rate and High Cycle Life Applications, last accessed July 17, 2021, [https://neicorporation.com/white-papers/NEI\\_White\\_Paper\\_LTO.pdf](https://neicorporation.com/white-papers/NEI_White_Paper_LTO.pdf).
- [183] Lightning Global, Lithium-Ion Battery Overview, May 2012, last accessed July 17, 2021, [https://sun-connect-news.org/fileadmin/DAT/EIEN/Dateien/New/Issue10\\_Lithium-ionBattery\\_TechNote\\_final.pdf](https://sun-connect-news.org/fileadmin/DAT/EIEN/Dateien/New/Issue10_Lithium-ionBattery_TechNote_final.pdf).
- [184] Ibid.

- [185] Florida Solar Energy Center, Hydrogen Basics – Fuel Cells, last accessed July 17, 2021, <http://www.fsec.ucf.edu/en/consumer/hydrogen/basics/fuelcells.htm>.
- [186] Hydrogen Europe, Fuel Cells, last accessed March 3, 2021, <https://hydrogeneurope.eu/fuel-cells>.
- [187] National Institute of Standards and Technology, PEM Fuel Cells, last accessed July 17, 2021, <https://physics.nist.gov/MajResFac/NIF/pemFuelCells.html>.
- [188] Science Direct, Nafion, last accessed March 3, 2021, <https://www.sciencedirect.com/topics/engineering/nafion>.
- [189] Shapley, Fuel Cells, last accessed July 17, 2021, <http://butane.chem.uiuc.edu/pshapley/Environmental/L11/2.html>.
- [190] Ibid.
- [191] Ballard, Marine Modules, last accessed July 17, 2021, <https://www.ballard.com/fuel-cell-solutions/fuel-cell-power-products/marine-modules>.
- [192] Ballard, Fuel Cell Applications for Marine Vessels- Why Fuel Cells Make Sense, March 2019, last accessed July 17, 2021, [https://www.ballard.com/docs/default-source/default-document-library/marine-informational-paper-final.pdf?sfvrsn=c1cec080\\_2#:~:text=Fuel%20cells%20operating%20on%20hydrogen,water%20vapor%20and%20some%20heat](https://www.ballard.com/docs/default-source/default-document-library/marine-informational-paper-final.pdf?sfvrsn=c1cec080_2#:~:text=Fuel%20cells%20operating%20on%20hydrogen,water%20vapor%20and%20some%20heat).
- [193] Switch Maritime, Zero-Carbon Vessels, last accessed July 17, 2021, <https://www.switchmaritime.com/>.
- [194] Golden Gate Zero Emission Marine, Water-Go-Round Project, last accessed July 17, 2021, <https://watergoround.com/>.
- [195] Professional Mariner, 2019 Ship of the Year: Enhydra, November 5, 2018, last accessed July 17, 2021, <https://www.professionalmariner.com/2019-ship-of-the-year-enhydra/>.
- [196] Switch Maritime, Zero-Carbon Vessels, last accessed July 17, 2021, <https://www.switchmaritime.com/>.
- [197] Maritime Journal, Foss Unveils Carolyn Dorothy, last accessed July 17, 2021, [https://www.maritimejournal.com/news101/tugs,-towing-and-salvage/foss\\_unveils\\_carolyn\\_dorothy](https://www.maritimejournal.com/news101/tugs,-towing-and-salvage/foss_unveils_carolyn_dorothy).
- [198] Professional Mariner, Baydelta Brings Next-Gen Hybrid to the Bay Area, July 1, 2019, last accessed July 17, 2021, <https://www.professionalmariner.com/baydelta-brings-next-gen-hybrid-to-the-bay-area/>.

- [199] Hornblower Cruises & Events, The Hornblower Hybrid is a Model of Alternative Energy Innovation, last accessed July 17, 2021, <https://www.alcatrazcruises.com/wp-content/uploads/2020/03/hybrid-vessel-release.pdf>.
- [200] Ibid.
- [201] Ibid.
- [202] Nicholson, Gilbert, Gee's Bend Has the Nation's First Electric Ferry, February 15, 2019, last accessed July 17, 2021, <https://alabamane.wscenter.com/2019/02/15/gees-bend-has-the-nations-first-electric-ferry/>.
- [203] Haun, Eric, Marine News' Top Boats of 2020: James V. Glynn and Nikola Tesla, December 30, 2020, last accessed July 17, 2021, <https://www.marinelink.com/news/marine-news-top-boats-james-v-glynn-484229>.
- [204] bid.
- [205] The Explorer, The World's First Electric Car and Passenger Ferry, last accessed July 17, 2021, <https://www.theexplorer.no/solutions/ampere--the-worlds-first-electric-car-and-passenger-ferry/>.
- [206] Coastal & Inland Waterways, Cat and Sanmar to Present Latest Hybrid Concept at Tugology '19, March 18, 2019, last accessed July 17, 2021, <https://www.workboat.com/coastal-inland-waterways/cat-and-sanmar-to-present-latest-hybrid-concept>.
- [207] Sandia National Laboratories, Feasibility of the SF-Breeze: a Zero Emission, Hydrogen Fuel Cell, High-Speed Passenger Ferry, September 2016, last accessed July 17, 2021, <https://www.ebdg.com/wp-ebdg-content/uploads/2016/10/SF-BREEZE-SAND2016-9719.pdf>.
- [208] 46 CFR Subchapter T – Small Passenger Vessels (Under 100 Gross Tons), last accessed July 17, 2021, <https://www.govinfo.gov/content/pkg/CFR-2012-title46-vol7/pdf/CFR-2012-title46-vol7-chap1-subchapT.pdf>.
- [209] Corvus Energy, Corvus Orca Energy, last accessed July 17, 2021, <https://corvusenergy.com/products/corvus-orca-energy/>.
- [210] Engineering Toolbox, Fuels – Higher and Lower Calorific Values, last accessed July 22, 2021, [https://www.engineeringtoolbox.com/fuels-higher-calorific-values-d\\_169.html](https://www.engineeringtoolbox.com/fuels-higher-calorific-values-d_169.html).
- [211] Ibid.
- [212] Leigh, Gabriel, Travel Norway's Fjords on a Quiet Electric Ferry, July 2, 2021, last accessed July 17, 2021, <https://www.bloomberg.com/news/articles/2021-07-03/travel-norway-s-fjords-on-a-quiet-electric-ferry>.

- [213] California Air Resources Board, 2019 Commercial Harbor Craft Survey, February 28, 2019
- [214] Marina Del Rey Landing, last accessed July 17, 2021, <https://www.delreylanding.com/marina>.
- [215] San Diego Air Pollution Control District, Tugboat Service Project, 2012.
- [216] Grand Marina, General Info – Grand Marina, last accessed July 17, 2021, <https://www.grandmarina.com/general-info/>.
- [217] Driftwood Marina, About – Driftwood Marina, last accessed July 17, 2021, <http://www.driftwoodmarina.com/about/>.
- [218] Emeryville Marina, Safe Harbor Emeryville – Emeryville Marina, last accessed July 17, 2021, <https://shmarinas.com/locations/safe-harbor-emeryville/>.
- [219] Huntington Harbor Marina, Technical Details – Huntington Harbor, last accessed July 17, 2021, <http://www.huntingtonharbourmarina.com/technical-details>.
- [220] Brisbane Marina, Berth Information – Brisbane Marina, last accessed July 17, 2021, <https://www.brisbaneca.org/marina/page/berth-information>.
- [221] Benicia Marina, Benicia Marina, Welcome to Benicia Marina, last accessed July 17, 2021, <https://beniciamarina.net/>.
- [222] San Diego Air Pollution Control District, Tugboat Service Project, 2012.
- [223] Stäubli, Single Pole Round Connectors, December 2019, last accessed July 17, 2021, [https://ec.staubli.com/AcroFiles/Catalogues/IS\\_PL-Main-Insulated-10-21mm-11013982\\_\(en\)\\_hi.pdf](https://ec.staubli.com/AcroFiles/Catalogues/IS_PL-Main-Insulated-10-21mm-11013982_(en)_hi.pdf).
- [224] Ibid.
- [225] Ibid.
- [226] Ibid.
- [227] Ibid.
- [228] DSM&T, IP Rating Chart, last accessed July 17, 2021, <https://www.dsmt.com/resources/ip-rating-chart/>.
- [229] Damen, Damen Delivers Five Zero Emissions Propulsion Ferries To Arriva In Copenhagen, July 6, 2020, last accessed July 17, 2021, [https://www.damen.com/en/news/2020/07/damen\\_delivers\\_five\\_zero\\_emissions\\_propulsion\\_ferries\\_to\\_arriva\\_in\\_copenhagen](https://www.damen.com/en/news/2020/07/damen_delivers_five_zero_emissions_propulsion_ferries_to_arriva_in_copenhagen).



- [230] Stäubli, Multipole Connector for Harsh Environments, November 2019, last accessed July 17, 2021, <https://www.staubli.com/en-us/file/26720.show>.
- [231] Ibid.
- [232] The Enclosure Company, What is an IP Rating?, last accessed July 17, 2021, <https://www.enclosurecompany.com/ip-ratings-explained.php>.
- [233] Electric Power Research Institute, SAE J-3105TM Heavy-Duty Conductive Automatic Charging Recommended Practice, March 10, 2021, last accessed July 17, 2021, [https://assets.ctfassets.net/ucu418cgcnau/1Ktt4o78uHGFrzVB7p7BjK/416abbf7851dd964c1663ab69c082bcc/05\\_SAE\\_J3105\\_Review\\_Kosowski.pdf](https://assets.ctfassets.net/ucu418cgcnau/1Ktt4o78uHGFrzVB7p7BjK/416abbf7851dd964c1663ab69c082bcc/05_SAE_J3105_Review_Kosowski.pdf).
- [234] CharIN, Megawatt Charging System (MCS), last accessed July 17, 2021, <https://www.charin.global/technology/mcs/>.
- [235] Underwriters Laboratory Inc, Plug, Receptacles, and Couplers for Electric Vehicles, August 21, 2009, last accessed August 5, 2021, <https://www.lib.must.edu.tw/TCT/UL%202251-2009.pdf>.
- [236] Cavotec, APS, last accessed July 17, 2021, <https://www.cavotec.com/en/your-applications/ports-maritime/crane-electrification/e-rtg/product-aps>.
- [237] Cavotec, Electric Vessels, last accessed July 17, 2021, <https://www.cavotec.com/en/your-applications/ports-maritime/automated-mooring/electric-vessels>.
- [238] Cavotec, E-Charging, last accessed July 17, 2021, <https://www.cavotec.com/en/your-applications/ports-maritime/e-charging>.
- [239] Cavotec, Electric Vessels, last accessed July 17, 2021, <https://www.cavotec.com/en/your-applications/ports-maritime/automated-mooring/electric-vessels>.
- [240] Cavotec, Automated Mooring, last accessed July 17, 2021, <https://www.cavotec.com/en/your-applications/ports-maritime/automated-mooring>.
- [241] Ibid.
- [242] HMS Global Maritime, Gee's Bend Ferry Battery Conversion, June 7, 2019, last accessed July 17, 2021, <http://allianceverte.org/wp-content/uploads/2019/06/4-TimAguirre.pdf>.
- [243] Ibid.
- [244] Torqeedo, Torqeedo for Commercial Applications, last accessed July 17, 2021, <https://www.torqeedo.com/us/en-us/dealers/commercial-use.html>.

- [245] ABB, Electric, Digital and Connected Solutions for the Marine Industry, last accessed July 17, 2021, <https://new.abb.com/marine/>.

### **G. Appendix G References**

- [1] California Office of Environmental Health Hazard Assessment, SB 535 Disadvantaged Communities, last accessed July 21, 2021, <https://oehha.ca.gov/calenviroscreen/sb535>.
- [2] Apte et al., A Method to Prioritize Sources for Reducing High PM2.5 Exposures in Environmental Justice Communities in California, November 21, 2019, last accessed July 22, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/17rd006.pdf>
- [3] South Coast Air Quality Management District, Final Report: Multiple Air Toxics Exposure Study in the South Coast Air Basin, May 2015, last accessed July 21, 2021, <https://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7>.
- [4] N/A – Explanatory Footnote
- [5] Office of Environmental Health Hazard Assessment, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February 2015, last accessed June 3, 2021, <https://oehha.ca.gov/media/downloads/crn/2015guidancemanual.pdf>.
- [6] California Air Resources Board, Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Part A, Exposure Assessment, April 22, 1998, last accessed July 17, 2021, [https://ww2.arb.ca.gov/sites/default/files/classic/toxics/id/summary/diesel\\_a.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/toxics/id/summary/diesel_a.pdf).
- [7] N/A – Explanatory Footnote
- [8] South Coast Air Quality Management District, Commercial Marine Ports Working Group, last accessed June 3, 2021, <https://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/facility-based-mobile-source-measures/comm-ports-wkng-grp>.
- [9] South Coast Air Quality Management District, Southern California Air Basins, 1999, last accessed June 3, 2021, <http://www.aqmd.gov/docs/default-source/default-document-library/map-of-jurisdiction.pdf>.

- [10] Contra Costa County, Draft Environmental Impact Report Del Hombre Apartments Project: Air Quality, pg. 3.2-1, September 10, 2019, last accessed June 3, 2021, <https://www.contracosta.ca.gov/DocumentCenter/View/61025/32-Air-Quality-PDF>.
- [11] U.S. EPA, Air Dispersion Modeling Alternatives, last accessed July 16, 2021, <https://www.epa.gov/scram/air-quality-dispersion-modeling-alternative-models#calpuff>.
- [12] MarineCadastre.gov, Vessel Traffic Data, last accessed June 3, 2021, <https://marinecadastre.gov/ais/>.
- [13] Lakes Environmental, ISCST3 Tech Guide Plume Rise Formulas, last accessed July 20, 2021, [https://www.weblakes.com/guides/iscst3/section6/6\\_1\\_4.html](https://www.weblakes.com/guides/iscst3/section6/6_1_4.html).
- [14] N/A – Explanatory Footnote
- [15] N/A – Explanatory Footnote
- [16] N/A – Explanatory Footnote
- [17] N/A – Explanatory Footnote
- [18] N/A – Explanatory Footnote
- [19] N/A – Explanatory Footnote
- [20] N/A – Explanatory Footnote
- [21] N/A – Explanatory Footnote
- [22] Code of Federal Regulations, Title 33 § 164.46 Automatic Identification System, pg. 666, July 1, 2015, last accessed May 10, 2021, <https://www.govinfo.gov/content/pkg/CFR-2015-title33-vol2/pdf/CFR-2015-title33-vol2-sec164-46.pdf>.
- [23] California Air Resources Board, Speciation Profiles Used in CARB Modeling PMSIZE, April 30, 2021, last accessed July 20, 2021, <https://ww2.arb.ca.gov/speciation-profiles-used-carb-modeling>.
- [24] California Air Resources Board and California Air Pollution Control Officers Association, Risk Management Guidance for Stationary Sources of Air Toxics, July 23, 2015, last accessed June 4, 2021, <https://www.arb.ca.gov/toxics/rma/rmgssat.pdf>.
- [25] N/A – Explanatory Footnote

- [26] N/A – Explanatory Footnote
- [27] N/A – Explanatory Footnote
- [28] N/A – Explanatory Footnote
- [29] N/A – Explanatory Footnote
- [30] N/A – Explanatory Footnote
- [31] United States Census Bureau, Centers of Population 2010, last accessed July 17, 2021,  
[https://www2.census.gov/geo/docs/reference/cenpop2010/tract/CenPop2010\\_Mean\\_TR06.txt](https://www2.census.gov/geo/docs/reference/cenpop2010/tract/CenPop2010_Mean_TR06.txt).
- [32] N/A – Explanatory Footnote
- [33] N/A – Explanatory Footnote
- [34] N/A – Explanatory Footnote
- [35] N/A – Explanatory Footnote
- [36] N/A – Explanatory Footnote
- [37] N/A – Explanatory Footnote
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- [49] N/A – Explanatory Footnote
- [50] N/A – Explanatory Footnote
- [51] N/A – Explanatory Footnote
- [52] N/A – Explanatory Footnote
- [53] N/A – Explanatory Footnote
- [54] U.S. EPA, Integrated Science Assessment for Oxides of Nitrogen – Health Criteria, January 2016, last accessed July 16, 2021, [http://ofmpub.epa.gov/eims/eimscomm.getfile?p\\_download\\_id=526855](http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=526855).
- [55] California Air Resources Board, CARB’s Methodology for Estimating the Health Effects of Air Pollution, last accessed July 20, 2021, <https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution>.
- [56] U.S. Census Bureau, American Community Survey 2016 5-Year Estimates, July 6, 2021, last accessed July 20, 2021, <https://data.census.gov/cedsci/table?q=american%20community%20survey%202016&g=0400000US06.140000&tid=ACSSST5Y2016.S0101>.
- [57] California Department of Finance, Projections P-2B County Population by Age, last accessed April 4, 2018, <https://www.dof.ca.gov/Forecasting/Demographics/Projections/>.
- [58] U.S. Centers for Disease Control and Prevention, CDC WONDER, last accessed August 29, 2018, <https://wonder.cdc.gov/>.
- [59] U.S. EPA, Benefits Mapping and Analysis Program (BenMAP) Downloads: BenMAP-Community Edition v1.5, last accessed July 20, 2021, <https://www.epa.gov/benmap/benmap-downloads>.
- [60] U.S. EPA, Quantitative Health Risk Assessment for Particulate Matter, June 2010, last accessed July 16, 2021, [https://www3.epa.gov/ttn/naaqs/standards/pm/data/PM\\_RA\\_FINAL\\_June\\_2010.pdf](https://www3.epa.gov/ttn/naaqs/standards/pm/data/PM_RA_FINAL_June_2010.pdf).
- [61] Krewski et al., Extended Follow-Up and Spatial Analysis of the American Cancer Society Study Linking Particulate Air Pollution and Mortality, May 2009, last accessed July 20, 2021, <https://ephtracking.cdc.gov/docs/RR140-Krewski.pdf>.

- [62] Bell et al., Seasonal and Regional Short-term Effects of Fine Particles on Hospital Admissions in 202 US Counties 1999-2005, October 14, 2008, last accessed July 20, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2732959/pdf/kwn252.pdf>.
- [63] Ito et al., Characterization of PM2.5, gaseous pollutants, and meteorological interactions in the context of time-series health effects models, December 14, 2007, last accessed July 20, 2021, <https://www.nature.com/articles/7500627.pdf>.
- [64] Fann, et al., The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution, June 9, 2009, last accessed July 20, 2021, <https://link.springer.com/content/pdf/10.1007/s11869-009-0044-0.pdf>.
- [65] Fann, et al., Characterizing the PM2.5-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S., *Environment International* 49 (2012):141-151, <https://doi.org/10.1016/j.envint.2012.08.017>.
- [66] Fann, et al., Assessing Human Health PM2.5 and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025, August 7, 2018, last accessed July 20, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6718951/pdf/nihms-1047155.pdf>.
- [67] N/A – Explanatory Footnote
- [68] N/A – Explanatory Footnote
- [69] N/A – Explanatory Footnote
- [70] U.S. EPA, Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses, December 2010, last accessed July 6, 2021, <https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf>.
- [71] U.S. EPA Science Advisory Board, An SAB Report on EPA's White Paper Valuing the Benefits of Fatal Cancer Risk Reduction, July 27, 2000, last accessed July 21, 2021, [https://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/\\$File/eeacf013.pdf](https://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/$File/eeacf013.pdf).
- [72] U.S. EPA, Mortality Risk Valuation – What does it mean to place a value on life?, last accessed June 4, 2021, <https://www.epa.gov/environmental-economics/mortality-risk-valuation#means>.

- [73] Thayer et al., The Economic Value of Respiratory and Cardiovascular Hospitalizations, May 31, 2003, last accessed July 21, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/99-329.pdf>.
- [74] U.S. EPA, Technical Support Document (TSD) for the Final Revised Cross-State Air Pollution Rule Update for the 2008 Ozone Season NAAQS: Estimating PM<sub>2.5</sub>- and Ozone-Attributable Health Benefits, March 2021, last accessed July 21, 2021, [https://www.epa.gov/sites/default/files/2021-03/documents/estimating\\_pm2.5-\\_and\\_ozone-attributable\\_health\\_benefits\\_tsd\\_march\\_2021.pdf](https://www.epa.gov/sites/default/files/2021-03/documents/estimating_pm2.5-_and_ozone-attributable_health_benefits_tsd_march_2021.pdf).
- [75] California Air Resources Board, Overview: Diesel Exhaust & Health, last accessed July 21, 2021, <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>.
- [76] International Agency for Research on Cancer, Press Release N° 213, IARC: Diesel Engine Exhaust Carcinogenic, June 12, 2012, last accessed July 21, 2021, [https://www.iarc.who.int/wp-content/uploads/2018/07/pr213\\_E.pdf](https://www.iarc.who.int/wp-content/uploads/2018/07/pr213_E.pdf).
- [77] Propper, et al., Ambient and Emission Trends of Toxic Air Contaminants in California, September 4, 2015, last accessed July 21, 2021, <https://pubs.acs.org/doi/pdf/10.1021/acs.est.5b02766>.
- [78] California Air Resources Board, Inhalable Particulate Matter and Health (PM<sub>2.5</sub> and PM<sub>10</sub>), last accessed July 21, 2021, <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>.
- [79] U.S. EPA, Particulate Matter (PM) Basics, last accessed July 21, 2021, <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>.
- [80] U.S. EPA, Health and Environmental Effects of Particulate Matter (PM), last accessed July 21, 2021, <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>.
- [81] World Health Organization, Review of evidence on health aspects of air pollution - REVIHAAP Project: Technical Report, 2013, last accessed July 21, 2021, [https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf](https://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf).
- [82] U.S. EPA, Integrated Science Assessment (ISA) for Particulate Matter, December 2019, last accessed July 21, 2021, <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=347534>.
- [83] U.S. EPA. Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants, April 2020, last accessed July 21, 2021, <http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=348522>.

- [84] Gharibi, et al., Ozone pollution and asthma emergency department visits in the Central Valley, California, USA, during June to September of 2015: a time-stratified case-crossover analysis, *Journal of Asthma* 56, 10 (2019):1037-1048, doi: 10.1080/02770903.2018.1523930.
- [85] Wolfe, et al., Monetized health benefits attributable to mobile source emission reductions across the United States in 2025, September 21, 2018, last accessed July 21, 2021, <https://www.sciencedirect.com/science/article/pii/S0048969718337239?via%3DiHub>.
- [86] Davidson et al., The recent and future health burden of the U.S. mobile sector apportioned by source, July 6, 2020, last accessed July 22, 2021, <https://iopscience.iop.org/article/10.1088/1748-9326/ab83a8/pdf>.
- [87] California Air Resources Board, Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach, 2006, last accessed July 22, 2021, <https://ww2.arb.ca.gov/sites/default/files/classic/regact/marine2005/portstudy0406.pdf>.
- [88] Marshall et al., Prioritizing Environmental Justice and Equality: Diesel Emissions in Southern California, *Environmental Science & Technology* 48, 7 (2014): 4063-4068, doi: 10.1021/es405167f.
- [89] Perez et al., Global Goods Movement and the Local Burden of Childhood Asthma in Southern California, November 2009, last accessed July 22, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2774197/pdf/S622.pdf>.
- [90] Rosenbaum et al., Analysis of diesel particulate matter health risk disparities in selected US harbor areas, December 2011, last accessed July 22, 2021, <https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2011.300190>.
- [91] U.S. EPA, Final Rule – Economic Analysis of Regulation of Methylene Chloride, Paint and Coating Remover under TSCA Section 6(a), March 11, 2019, last accessed July 22, 2021, <https://www.regulations.gov/document/EPA-HQ-OPPT-2016-0231-0990>.

## H. Appendix H References

- [1] Marshall JD., Environmental Inequality: Air Pollution Exposures in California's South Coast Air Basin, *Atmospheric Environment*, February 4, 2008, last accessed July 19, 2021, [https://depts.washington.edu/airqual/Marshall\\_15.pdf](https://depts.washington.edu/airqual/Marshall_15.pdf).
- [2] Marshall JD., et al., Prioritizing Environmental Justice and Equality: Diesel Emissions in Southern California, February 21, 2014, last accessed July 19, 2021, <https://pubs.acs.org/doi/pdf/10.1021/es405167f>.



- [3] CHC engine data reported to CARB by owners/operators under the CHC Regulation, Feb 2019
- [4] Carl Moyer Incentive Repowers data, 2019.
- [5] U.S. Coast Guard, Merchant Vessels of the United States, last accessed May 30, 2019,  
[https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy\(CG-5P\)/InspectionsCompliance\(CG-5PC\)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx](https://www.dco.uscg.mil/OurOrganization/AssistantCommandantforPreventionPolicy(CG-5P)/InspectionsCompliance(CG-5PC)/OfficeofInvestigationsCasualtyAnalysis/MerchantVesselsoftheUnitedStates.aspx).
- [6] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Marine Compression-Ignition (CI) Engines, 2020,  
<https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.
- [7] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Nonroad Compression Ignition (NRCI) Engines, 2020,  
<https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.
- [8] Marine Cadastre, Vessel Traffic Data, last accessed July 19, 2021,  
<https://marinecadastre.gov/ais/>.
- [9] CARB, Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, 2007, last accessed July 19, 2021,  
<https://ww3.arb.ca.gov/msei/chc-appendix-b-emission-estimates-ver02-27-2012.pdf>.
- [10] CARB, Appendix C: Emission Inventory Methodology, 2011, last accessed July 19, 2021,  
<https://ww2.arb.ca.gov/sites/default/files/classic/regact/2010/chc10/appc.pdf>.
- [11] Marine Cadastre, National Viewer, last accessed July 19, 2021,  
<https://marinecadastre.gov/nationalviewer/>.
- [12] ATB Barges activity was split 50/50 between Bay Area and South Coast Air Basin based on data from petrochemical barges. ATB Tugs activity was quantified by the Air Basins using Marine Cadastre, Vessel Traffic Data, last accessed July 19, 2021, <https://marinecadastre.gov/ais/>.
- [13] N/A – Explanatory Footnote
- [14] Sportfish San Diego, Best of 3,4-Pack, 6-Pack Sport Fishing, Spearfishing Charters, last accessed July 20, 2021, [www.sportfishsandiego.com/6-pack.html](http://www.sportfishsandiego.com/6-pack.html).

- [15] Sportfishing Report, Charter Boats, last accessed July 20, 2021, [https://www.sportfishingreport.com/charter\\_boats/?page=8](https://www.sportfishingreport.com/charter_boats/?page=8).
- [16] San Diego Fishing Company, Private Six Pack Sportfishing Charter, last accessed July 20, 2021, <http://www.sandiegofishing.co/>.
- [17] Six Pack Fishing, Private Sportfishing Charters, last accessed July 20, 2021, <http://www.sixpackfishing.com/boats.html>.
- [18] Marine Cadastre, Vessel Traffic Data, last accessed July 19, 2021, <https://marinecadastre.gov/ais/>.
- [19] Starcrest Consulting Group, Port of Los Angeles Inventory of Air Emissions, 2018, last accessed July 19, 2021, [https://kentico.portoflosangeles.org/getmedia/0e10199c-173e-4c70-9d1d-c87b9f3738b1/2018\\_Air\\_Emissions\\_Inventory](https://kentico.portoflosangeles.org/getmedia/0e10199c-173e-4c70-9d1d-c87b9f3738b1/2018_Air_Emissions_Inventory).
- [20] Starcrest Consulting Group, Port of Long Beach Air Emissions Inventory, 2017, last accessed July 19, 2021, [https://safety4sea.com/wp-content/uploads/2018/08/POLB-2017-Air-Emissions-Inventory-2018\\_08.pdf?\\_\\_cf\\_chl\\_jschl\\_tk\\_\\_=pmd\\_b82d2e13ea42959b205f5bb3fc1675897a86df68-1626736313-0-gqNtZGzNAiKjcnBszQji](https://safety4sea.com/wp-content/uploads/2018/08/POLB-2017-Air-Emissions-Inventory-2018_08.pdf?__cf_chl_jschl_tk__=pmd_b82d2e13ea42959b205f5bb3fc1675897a86df68-1626736313-0-gqNtZGzNAiKjcnBszQji).
- [21] San Francisco Bay Area Water Emergency Transportation Authority, 2016 Strategic Plan, 2016, last accessed July 19, 2021, [https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WE\\_TAStrategicPlanFinal.pdf](https://weta.sanfranciscobayferry.com/sites/default/files/weta/strategicplan/WE_TAStrategicPlanFinal.pdf).
- [22] Bureau of Transportation Statistics, National Transportation Statistics, last accessed July 19, 2021, <https://www.bts.gov/topics/national-transportation-statistics>.
- [23] Port of Long Beach, Port Statistics, last accessed July 19, 2021, <https://polb.com/business/port-statistics/#yearly-teus>.
- [24] Port of Los Angeles, Annual Container Statistics, last accessed July 19, 2021, <https://www.portoflosangeles.org/business/statistics/container-statistics>.
- [25] CARB, Emissions Impact of Recent Congestion at California Ports, June 28, 2021, last accessed August 11, 2021, [https://ww2.arb.ca.gov/sites/default/files/2021-06/ogvcongestion\\_ada.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-06/ogvcongestion_ada.pdf).
- [26] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Marine Compression-Ignition (CI) Engines, 2020, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.

- [27] U.S. EPA, Annual Certification Data for Vehicles, Engines, and Equipment: Nonroad Compression Ignition (NRCI) Engines, 2020, <https://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment>.
- [28] CARB, Speciation Profiles Used in CARB Modeling, April 2021, last accessed July 20, 2021, <https://ww2.arb.ca.gov/speciation-profiles-used-carb-modeling>.
- [29] CARB, 2017 Off-Road Diesel Emission Factor Update for NOx and PM, 2017, last accessed July 19, 2021, [https://ww3.arb.ca.gov/msei/ordiesel/ordas\\_ef\\_fcf\\_2017.pdf](https://ww3.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017.pdf).
- [30] CARB, 2017 Off-Road Diesel Emission Factor Update for NOx and PM, 2017, last accessed July 19, 2021, [https://ww3.arb.ca.gov/msei/ordiesel/ordas\\_ef\\_fcf\\_2017.pdf](https://ww3.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017.pdf).
- [31] U.S. EPA, Emission Factors for Greenhouse Gas Inventories, March 9, 2018, last accessed July 19, 2021, [https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors\\_mar\\_2018\\_0.pdf](https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf).
- [32] U.S. EPA, Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b, July 2018, last accessed July 19, 2021, [https://cfpub.epa.gov/si/si\\_public\\_file\\_download.cfm?p\\_download\\_id=541846&Lab=OTAQ](https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=541846&Lab=OTAQ).
- [33] CARB, 1999 Mobile Source Mailouts, MSC 99-32, January 27, 2000, last accessed July 19, 2021, [https://ww3.arb.ca.gov/msprog/mailouts/mouts\\_99.htm](https://ww3.arb.ca.gov/msprog/mailouts/mouts_99.htm).
- [34] CARB collected engine ECM data directly from industries
- [35] CARB, Final Regulation Order: Airborne Toxic Control Measure for Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline, 2007, last accessed July 19, 2021, <https://ww3.arb.ca.gov/regact/2007/chc07/chcfro17.pdf>.
- [36] CalEPA, Staff Report: Multimedia Evaluation of Renewable Diesel, May 2015, last accessed July 19, 2021, [https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable\\_Diesel\\_Multimedia\\_Evaluation\\_5-21-15.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Multimedia_Evaluation_5-21-15.pdf).
- [37] N/A – Explanatory Footnote

## **XIV. Appendices**

Appendix A: Proposed Regulation Order

Appendix B: Documents Incorporated by Reference

Appendix C-1: Standardized Regulatory Impact Assessment (SRIA)

Appendix C-2: DOF Comments to the CHC SRIA and CARB Responses

Appendix D-1: Draft Environmental Analysis for Commercial Harbor Craft

Appendix D-2: Attachment A, Environmental and Regulatory Setting

Appendix D-3: Attachment B, Summary of Environmental Impacts and Mitigation Measures

Appendix D-4: Attachment C, Air Quality Calculations

Appendix E: Technical Support Document and Assessment of Marine Emission Control Strategies, Zero-Emission, and Advanced Technologies

Appendix F: List of Public Workshops, Meetings, and Phone Calls

Appendix G: Health Analyses

Appendix H: 2021 Update to the Emission Inventory for Commercial Harbor Craft: Methodology and Results