Control Measure for Ocean-Going Vessels At Berth

Cost Analysis Inputs and Assumptions for Standardized Regulatory Impact Assessment

Revised: 5/10/19

This document was prepared by California Air Resources Board (CARB) Staff to document inputs and assumptions used in the development of preliminary cost estimates for the Draft Control Measure for Ocean-Going Vessels At Berth.

Staff is developing the cost estimates for the Standardized Regulatory Impact Assessment (SRIA), which is required by Senate Bill (SB) 617 for proposed regulations that have an economic impact exceeding $50 million. This document, and the accompanying cost calculations, are preliminary discussion drafts and are still under development. To date, Staff has incorporated information received from various sources including many industry stakeholders, and continues to request additional data to further refine the cost analysis. Staff requests that industry stakeholders submit any additional information to Staff by May 29, 2019 to be considered for the SRIA.

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Table I. Scope and Timing of Analysis

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<tr><td>Draft Regulation Implementation Schedule</td><td>2021 – Container/Reefer and Cruise
2025 – Auto/RoRo
2027 – Tankers (Ports of Los Angeles and Long Beach)
2029 – Tankers (all other terminals in the State)</td></tr>
<tr><td>Terminal Thresholds (used to determine applicable terminals and vessel visits)</td><td><table>
<tr><th>Vessel Type</th><th>Annual Port Threshold (Annual Visits)</th><th>Annual Terminal Threshold (Annual Visits)</th></tr>
<tr><td>Container/Reefer</td><td>50</td><td>25</td></tr>
<tr><td>Cruise</td><td>25</td><td>5</td></tr>
<tr><td>Auto/RoRo</td><td>50</td><td>25</td></tr>
<tr><td>Tanker</td><td>25</td><td>5</td></tr>
</table></td></tr>
<tr><td>Standardized Regulatory Impact Assessment (SRIA) Alternatives</td><td><u>Alternative 1</u>: Shore power required for all vessel types (no capture and control).
<u>Alternative 2</u>: Same as Draft Regulation, except Auto/RoRo vessels not subject to emission control requirements.</td></tr>
<tr><td>Staff assumptions regarding control technology</td><td><table>
<tr><th>Vessel Type</th><th>Draft Regulation and Alternative 2</th><th>Alternative 1</th></tr>
<tr><td>Container/Reefer</td><td>Primarily shore power, with some barge-based capture and control</td><td>Shore power only</td></tr>
<tr><td>Cruise</td><td>Shore power only</td><td>Shore power only</td></tr>
<tr><td>Auto/RoRo</td><td>Combination of land-based and barge-based capture and control</td><td>Shore power only</td></tr>
<tr><td>Tanker</td><td>Land-based capture and control only</td><td>Shore power only</td></tr>
</table></td></tr>
<tr><td>Shore power vessels</td><td>“Frequent vessel” means a vessel that visits any terminal in California 4+ times per year.</td></tr>
<tr><td>Staff assumptions regarding timing of costs</td><td><u>Terminal Infrastructure Costs:</u>
Container/Reefer, Cruise, and Auto/RoRo: costs begin ONE YEAR prior to implementation date.
Tankers: costs begin THREE YEARS prior to implementation date.
<u>Vessel Modification Costs:</u>
Container/Reefer, Cruise, and Auto/RoRo: costs begin ONE YEAR prior to implementation date.
Tankers: no vessel modification costs assumed.
<u>Maintenance, Labor, and Energy Costs</u></td></tr>
</table>

	• All costs start in the implementation year for each vessel type. Administrative Costs: • Staff costs are incurred beginning in 2020 – 2021 for CARB personnel-years (PYs) and 2021 for other agency PYs. • Port plan costs for Container/Reefer and Cruise vessels are assumed to occur in the 12 MONTHS prior to the deadline in the Draft Regulation. • Port plan costs for Auto/RoRo and Tanker vessels are assumed to occur TWO YEARS prior to the deadline in the Draft Regulation. • Terminal plans for all vessel categories are assumed to occur in the 12 MONTHS prior to the due date in the Draft Regulation. • Vessel visit reports assumed to occur in the calendar year of the vessel visit, based on the due date of 7 days following each vessel visit in the Draft Regulation. Feasibility, Engineering and Permitting Costs: • Feasibility, engineering and permitting costs for Tanker terminal infrastructure projects are assumed to occur over the SEVEN YEARS prior to the implementation date at the terminal. Capture and Control Technology Approvals: • Capture and control technology approvals would occur over the TWO YEAR period prior to Tanker implementation dates and over the ONE YEAR period prior to other vessel category implementation dates.
Terminal and vessel equipment life	• The expected life of terminal equipment is 20 years as described in **Table XII**. Capital Recovery Factor (CRF) (5%, 20 years) = 0.0802. • The expected life of vessel shore power equipment is 10 years as described in **Table XII**. CRF (5%, 10 years) = 0.1295. • After 10 years, Staff assumes annual vessel shore power equipment costs would equal 50 percent of the annualized capital costs to account for major repairs and component replacements.
Currency	All costs assumed to be in 2019 U.S. Dollars (2019$). Staff used the U.S. Bureau of Labor Statistics Consumer Price Index (CPI) Inflation Calculator to convert costs to 2019$ where cost inputs were derived from information provided to CARB in previous year dollars.
Direct costs to regulated industry versus costs incurred by other parties	Direct costs incurred by the regulated industry and included in the total annualized costs of the regulation: • All infrastructure costs (terminal and vessel-side), labor, maintenance, and energy costs. • Hourly barge-based capture and control system utilization fees. • All administrative costs related to port plans, terminal plans, vessel visit reports, feasibility studies, engineering and permitting costs, and remediation fee costs.

	Direct costs incurred by parties outside the regulated industry and NOT included in the total annualized costs of the regulation (these costs ARE included in the SRIA macroeconomic modeling): • All administrative costs incurred by the State of California including CARB and other state and local government agencies. • Direct costs to barge capture and control technology providers. Staff assumes that these costs would be incurred by the technology providers, who would charge an hourly fee to the barge user. (The hourly fees are included in the total annualized costs to the regulated industry.)
Industry growth factors	Annual industry growth factors (see **Table XII**) are applied uniformly to cost calculations to account for multiple individual factors including the potential for increased vessel visits, vessel sizes, infrastructure requirements due to increased economic activity, labor and energy costs.

Table II. Barge-Based Capture and Control Systems – Cost Inputs

Data Input	Value	Basis
Note: the below inputs are used to calculate direct costs to the technology provider. These are not summed into the total annualized costs of the Draft Regulation, as described in **Table I.**		
Barge-based system capital cost	$4,900,000	Claimed confidential data obtained from industry sources that requested non-attribution.
Leasing/port fees	$2,633 monthly cost per barge	Ruben Garcia of Advanced Environmental Group (AEG) email to Angela Csondes of CARB dated 3/27/19 stated costs of $4,800 per month at Port of Los Angeles (POLA) and $1,100 per month at Port of Long Beach (POLB) per barge. Nick Tonsich of Clean Air Engineering-Maritime (CAEM) email to Angela Csondes (CARB) dated 10/17/18 stated approximate cost for docking/storage of $2,000 per month.
Fuel costs	$40/hr	Ruben Garcia (AEG) email to Angela Csondes dated 3/27/19.
Labor costs	$160/hr for two staff to stay on barge at all times	Ruben Garcia emails to Angela Csondes (CARB) dated 3/27/19 and 4/3/19. CAEM has also indicated that barges would need to be continuously manned during emission control operations.
Tug costs	$500/hr	Ruben Garcia (AEG) email to Angela Csondes (CARB) dated 3/27/19.

Tug hours per visit	2	Staff assumption based on conversations with technology developers.
Spacer barge	$300/day	Claimed confidential data obtained from industry sources that requested non-attribution.
Annual performance testing cost	$33,000/yr per system	Ruben Garcia (AEG) email to Angela Csondes (CARB) dated 3/27/19.
Annual maintenance cost	$200,000 per system	Ruben Garcia (AEG) email to Angela Csondes (CARB) dated 3/27/19. Includes inspections/maintenance of barge, tower boom, Continuous Emissions Monitoring System (CEMS) and control room. Nick Tonsich (CAEM) email to Angela Csondes (CARB) dated 10/17/18 stated a similar estimate of $200,000 per year for maintenance.
Cost to obtain initial CARB technology approval	$170,000 per approval	Ruben Garcia (AEG) email to Angela Csondes (CARB) dated 3/27/19 stated cost range of $180,000-$200,000. This includes completing 200 operating hours with 3rd party testing, labor, and tugs. Nick Tonsich (CAEM) email to Angela Csondes (CARB) dated 10/17/18 stated cost estimate of $150,000 or less per future approval.
Recycling costs	$800 annually per system	Ruben Garcia (AEG) email to Angela Csondes (CARB) dated 3/27/19. This cost is for transport and disposal of non-hazardous water at an approved transportation, storage and disposal facility.
Overhead Costs	$180,000 per year	Nick Tonsich (CAEM) email to Angela Csondes (CARB) dated 10/17/18, this includes general and administrative expenses.
Number of Barge-Based Technology Approvals	3	Staff assumption is 1 per vessel type.
Note: the below inputs are used to calculate direct costs to the regulated industry and are summed into the total annualized costs of the Draft Regulation, as described in **Table I.**		
Hourly usage fee for Container/Reefer and Auto/RoRo vessels	$900/hr average for Container/Reefer and Auto/RoRo vessel types	Ruben Garcia (AEG) emails to Angela Csondes (CARB) dated 3/27/19 and 4/3/19. Applies to Container/Reefer and Auto/RoRo vessel types.

Hourly usage fee for tanker vessels	N/A	Staff conversations with tanker terminals indicated none are planning to use barge systems at this time.

Table III. Land-Based Capture and Control Systems – Cost Inputs

Data Input	**Value**	**Basis**
Land-based system capital cost – Auto/RoRo terminals	$3,600,000	Claimed confidential data obtained from industry sources that requested non-attribution.
Tanker terminal infrastructure and land-based system costs	• Piping Infrastructure from Berth to Land-side Emission Control System: $4,500,000 • Emissions Control System (4.5 MW): $4,999,500	Staff analysis of data from AEG Benicia RoRo AMECS project, ShoreKat project, and EU 2001 VOC control system cost estimates. Staff's Berth Analysis estimates the number of land-side systems that would be required at each terminal. The cost analysis calculates costs on a per-berth basis, and therefore assumes one 4.5 megawatt (MW) system for each berth to account for larger systems at terminals serving multiple vessels simultaneously.
Loading arm (crane) cost for Tanker terminals	$7,000,000 per loading arm	Claimed confidential data obtained from an industry source that requested non-attribution.
Labor costs	$0	Tri-Mer stated during 4/16/19 CARB meeting that no additional labor beyond existing crane mechanics is required during control of container vessel emissions. Staff has no information at this time to indicate additional labor would be needed for other vessel types.
Annual performance testing cost	$12,000 per system	Claimed confidential data obtained from an industry source that requested non-attribution. The source verbally stated to Staff that $1,000 per month was a reasonable estimate for a staff person to process and report CEMS data.
Annual maintenance costs for emission control system	$17,500 per system	Claimed confidential data obtained from an industry source that requested non-attribution.

		The source verbally provided Staff an estimated range of $15,000 - $20,000 annually per system, which includes potential repair costs for components including the generator, blower, and filter replacement.
Operating and Other Costs	$100 per hour	Claimed confidential data obtained from an industry source that requested non-attribution. The source verbally stated to Staff that this estimate includes fuel and other consumables required to operate the system.
Tanker Vessel Boiler Modifications	$0	Claimed confidential data obtained from an industry source that requested non-attribution. The source verbally stated to Staff that the system is designed not to require vessel modifications because it uses negative pressure to extract exhaust, which does not create back pressure. Therefore, for a land-side system, Staff assumes no vessel modifications would be required.
Cost for initial technology approval	$150,000 per system	Claimed confidential data obtained from an industry source that requested non-attribution. Note: Staff assumes technology approval costs would be incurred by the technology developer and are not summed into the annualized cost to the regulated industry, as described in **Table I**.
Number of Land-Based Technology Approvals	3	Staff assumes 1 approval per vessel type.

Table IV. Tanker Terminal Infrastructure Feasibility, Engineering and Permitting Costs

Data Input	**Value**	**Basis**
Feasibility Study Cost	$500,000 per berth	Tri-Mer stated an estimate of $500,000 - $1,000,000 per feasibility study during 4/16/19 CARB meeting. Staff divided the average of this range, $750,000, by approximately 1.5 berths per tanker terminal covered under the Draft Regulation statewide = $500,000 per berth.

Engineering and Permitting Costs (combined)	$1,000,000 per berth	Staff assumes that engineering and permitting costs would be roughly double the feasibility study costs.

Table V. Auxiliary Engine Effective Power Values

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr><td>Auxiliary engine effective power values for each vessel type.

Note: These values are used to calculate shore power energy costs and cost savings only</td><td><table><tr><th>Vessel Type</th><th>kilowatts (kW)</th></tr><tr><td>Container/Reefer</td><td>1,053</td></tr><tr><td>Cruise</td><td>5,620</td></tr><tr><td>Auto/RoRo</td><td>1,159</td></tr><tr><td>Tankers (all)</td><td>938</td></tr></table></td><td>Staff calculated average effective power per vessel type using the same power values cited in Table 7 of the emission inventory methodology https://ww3.arb.ca.gov/msei/ordiesel/draft2019ogvinv.pdf. Values used in cost analysis for container/reefer and tanker vessels are calculated as one kW-average per vessel type, weighted by average vessel kW at each port/terminal and vessel visits to each port/terminal.</td></tr>
</table>

Table VI. Duration of Emission Control at Berth

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr><td>Average duration of emission control at berth per vessel visit (hours) for each vessel type</td><td><table><tr><th>Vessel Type</th><th>hours</th></tr><tr><td>Container/Reefer</td><td>38.8</td></tr><tr><td>Cruise</td><td>11.2</td></tr><tr><td>Auto/RoRo</td><td>19.8</td></tr><tr><td>Tankers (all)</td><td>40.7</td></tr></table></td><td>Staff calculated average duration of emission control at berth using the same time at berth and stay time values used for the emission inventory and calculated weighted average by location and vessel visits for each vessel type.</td></tr>
</table>

Table VII. Administrative Cost Inputs

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr><td>Number of Port Plans</td><td><table><tr><th>Vessel Type</th><th>Number of Plans</th><th>Year(s) Costs Incurred</th></tr><tr><td>Container/Reefer</td><td>5</td><td>2020</td></tr><tr><td>Cruise</td><td>4</td><td>2020</td></tr></table></td><td>1 per port, based on number of ports over the port threshold in Table I. Timing of costs described in Table I.</td></tr>
</table>

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<tr>
<td></td>
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<table>
<tr><td>Auto/RoRo</td><td>5</td><td>2023</td></tr>
<tr><td>Tankers (applies to So. CA Only)</td><td>2</td><td>2025</td></tr>
<tr><td>Total:</td><td>16</td><td></td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Number of Terminal Plans</td>
<td>
<table>
<tr><th>Vessel Type</th><th>Number of Plans</th><th>Year(s) Costs Incurred</th></tr>
<tr><td>Container/Reefer</td><td>19</td><td>2020</td></tr>
<tr><td>Cruise</td><td>5</td><td>2020</td></tr>
<tr><td>Auto/RoRo</td><td>11</td><td>2023 - 2034</td></tr>
<tr><td>Tankers – So. CA</td><td>9</td><td>2025 - 2026</td></tr>
<tr><td>Tankers – all other terminals</td><td>13</td><td>2027 - 2028</td></tr>
<tr><td>Total:</td><td>57</td><td></td></tr>
</table>
</td>
<td>1 per terminal, based on the number of terminals over the terminal threshold in Table I. Timing of costs described in Table I. Where deadlines occur mid-year, costs are split over two calendar years.</td>
</tr>
<tr>
<td>Annual Number of Terminal Reports</td>
<td>
<table>
<tr><th>Vessel Type</th><th>Number of Reports</th><th>Year(s) Costs Incurred</th></tr>
<tr><td>Container/Reefer</td><td>3,742</td><td>Annually 2021 - 2032</td></tr>
<tr><td>Cruise</td><td>527</td><td>Annually 2021 - 2032</td></tr>
<tr><td>Auto/RoRo</td><td>1,017</td><td>Annually 2025 - 2032</td></tr>
<tr><td>Tankers – So. CA</td><td>577</td><td>Annually 2027 - 2032</td></tr>
<tr><td>Tankers – all other terminals</td><td>772</td><td>Annually 2029 - 2032</td></tr>
<tr><td>Total:</td><td>6,629</td><td></td></tr>
</table>
</td>
<td>1 terminal report per vessel visit, based on the number of vessel visits to California terminals that would be regulated under the Draft Regulation. These values are equivalent to “All annual vessel visits” in Tables XIII, XIV, XV and XVI.</td>
</tr>
<tr>
<td>Annual Number of Vessel Reports</td>
<td>
<table>
<tr><th>Vessel Type</th><th>Number of Reports</th><th>Year(s) Costs Incurred</th></tr>
<tr><td>Container/Reefer</td><td>3,742</td><td>Annually 2021 - 2032</td></tr>
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</tr>
<tr>
<td>Cost per Port Plan</td>
<td>$10,000 per regulated terminal</td>
<td>Staff estimate. Assumes 100 employee-hours at $100/hour</td>
</tr>
</table>

Cost per Terminal Plan	$2,500 per regulated berth	Staff estimate. Assumes 25 employee-hours at $100/hour
Cost per Terminal Report	$100 per vessel visit	Visit information would be submitted through CARB's electronic Freight Regulations Reporting System (FRRS), which is currently under development. Staff assumes 1 employee-hour at $100/hour.
Cost per Vessel Report	$100 per vessel visit	Visit information would be submitted through FRRS. Staff assumes 1 employee-hour at $100/hour.
CARB PYs	2 Air Pollution Specialist (APS) Range C – Enforcement $173,000 Year 1, $172,000 subsequent years 2 Air Resources Engineer (ARE) Range D – Transportation and Toxics Division (TTD) $182,000 Year 1, $181,000 subsequent years	PY cost sheet provided by CARB's Office of Economic Policy & Analysis (OEPA).
Other Agency PYs	1 for California State Lands Commission (CSLC) beginning in 2020 1 (combined) for all other State and Local Agencies beginning in 2020	Staff estimate based on phone conversation with CSLC on 3/27/19.

Table VIII. Electricity and Fuel Cost Inputs

Data Input	Value	Basis
Future electricity rates for all analysis years	$0.18 per kilowatt-hour (kWh) through 2030 $0.19 per kWh in 2031 and 2032	California Energy Commission Mid Case Revised Demand Forecast (CEC, updated February 21, 2018). Projected rates for PG&E, LADWP, SDG&E, and SCE averaged to produce an average statewide rate.

Marine fuel prices for all analysis years	$1,193 per metric ton (MT) in 2021, increasing annually to $1,753/MT in 2032	Based on marine gas oil (MGO) price of $763.50/MT for ports of Los Angeles and Long Beach accessed from http://www.shipandbunker.com/prices on 4/26/19, adjusted using U.S. Energy Information Administration (EIA) price projections for transportation diesel fuel. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=12-AEO2018&cases=ref2018&sourcekey=0
Brake-specific fuel consumption for calculating fuel savings	217 grams/kWh	CARB emission inventory methodology document Appendix A, fuel consumption factor for auxiliary engines at berth, distillate fuel. https://ww3.arb.ca.gov/msei/ordiesel/draft2019ogvinv.pdf
Low Carbon Fuel Standard (LCFS) credit value	$0.10 – 0.11/kWh	Based on LCFS Staff analysis dated 4/12/19.
Percent of potential LCFS credits anticipated to be claimed	100%	Staff assumes that entities eligible to claim LCFS credits would maximize their opportunity for revenue from these credits.
Who benefits from LCFS credits claimed	Terminals or Ports	Based on the LCFS Regulation Sections 95483 (c)(5)(A) and (B) designating the owner of the fueling supply equipment as the credit generator unless they agree by a written contract to designate another entity to generate the credits.

Table IX. Growth Factors

Data Input	Value					Basis
Annual industry growth factors	Year	Container/Reefer	Cruise	Auto/RoRo	Tanker	Annual values compounded through analysis period, year 2016 base, specific to vessel type. Weighted average of values used for emissions inventory. https://ww3.arb.ca.gov/msei/ordiesel/draft2019ogvinv.pdf These values are applied to all cost calculations as describe in **Table I**.
	2019	8.0%	7.5%	7.5%	1.0%	
	2020	15.3%	16.0%	11.5%	1.5%	
	2021	19.4%	20.2%	15.1%	2.7%	
	2022	23.8%	24.7%	18.4%	3.5%	
	2023	28.5%	29.2%	21.9%	4.3%	
	2024	33.4%	34.0%	25.4%	5.1%	
	2025	41.0%	38.9%	29.1%	5.9%	
	2026	44.4%	44.0%	32.9%	7.1%	
	2027	48.2%	49.3%	35.9%	8.2%	
	2028	52.3%	54.8%	39.0%	9.4%	
	2029	56.7%	60.5%	42.2%	10.5%	

	2030	61.4%	66.5%	45.4%	11.7%	
	2031	69.1%	72.6%	48.9%	13.0%	
	2032	77.2%	78.9%	52.3%	14.3%	

Table X. Cost Apportionment to Ports and Terminals

Data Input	**Value**			**Basis**
Note: Cost apportionment factors are used to assign costs to either ports or terminals for the purpose of the SRIA macroeconomic modeling analysis. These factors do not impact the total calculated costs to regulated industry.				
Apportionment of shore power infrastructure capital costs to ports vs. terminals	Scenario	% borne by port	% borne by terminal	Staff assumes all ports and IMTs would incur capital costs, as applicable. POLB terminal operators indicated in discussions with Staff that infrastructure capital costs would be incurred by the Port initially prior to potentially being passed onto the terminal operators through lease agreements. On this basis, Staff assumes that the Port would bear the initial cost and disclose that it may be passed along through leases.
	Draft Regulation and Alternative 2	100% for all ports	0% for all terminals at ports	
	Alternative 1	100% for all ports	0% for terminals at ports; 100% for all Independent Marine Terminals (IMTs)	
Apportionment of shore power terminal equipment maintenance costs to ports vs. terminals	Scenario	% borne by port	% borne by terminal	Staff assumptions based on discussions with POLB and POLA terminal operators.
	Draft Regulation and Alternative 2	100% for all ports except POLB; 0% for POLB	0% for all terminals at ports except POLB; 100 % for terminals at POLB	
	Alternative 1	100% for all ports except POLB; 0% for POLB	0% for all terminals at ports except POLB; 100 % for terminals at POLB; 100% for all IMTs	

<table>
<tr><td>Apportionment of shore power terminal labor costs to ports vs. terminals</td><td><table><tr><th>Scenario</th><th>% borne by port</th><th>% borne by terminal</th></tr><tr><td>Draft Regulation and Alternative 2</td><td>100% for POLA;
0% for all other ports</td><td>100% for terminals at all ports except POLA; 0% for terminals at POLA</td></tr><tr><td>Alternative 1</td><td>100% for POLA;
0% for all other ports</td><td>100% for terminals at all ports except POLA; 0% for terminals at POLA;
100% for all IMTs</td></tr></table></td><td>Staff assumptions based on discussions with POLB and POLA terminal operators.</td></tr>
<tr><td>Who bears the cost for terminal cable reels</td><td>Terminals</td><td>Staff assumption based on discussions with POLB terminal operators.

Note: Staff Berth Analysis indicated no terminal cable reels would be purchased.</td></tr>
</table>

Table XI. Berth and Terminal Counts, Anticipated Infrastructure Needs, and Unique Vessels

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr><td>Number of terminals subject to terminal threshold, for each vessel type, by port/terminal</td><td><table><tr><th>Port/IMT</th><th>Contain-er/Reefer</th><th>Cruise</th><th>Auto/ RoRo</th><th>Tankers</th></tr><tr><td>Los Angeles</td><td>7</td><td>1</td><td>1</td><td>5</td></tr><tr><td>Long Beach</td><td>6</td><td>1</td><td>3</td><td>4</td></tr><tr><td>Oakland</td><td>4</td><td>--</td><td>--</td><td>--</td></tr><tr><td>San Francisco</td><td>--</td><td>1</td><td>1</td><td>--</td></tr><tr><td>San Diego</td><td>1</td><td>2</td><td>1</td><td>--</td></tr><tr><td>Hueneme</td><td>1</td><td>--</td><td>3</td><td>--</td></tr><tr><td>Stockton Area</td><td>--</td><td>--</td><td>--</td><td>1</td></tr><tr><td>Richmond Area</td><td>--</td><td>--</td><td>1</td><td>5</td></tr></table></td><td>Based on Staff Berth Analysis, based on terminal threshold in Table I.

The number of terminals is used to calculate the administrative costs of preparing and submitting Terminal Plans.

The number of terminals does not directly impact infrastructure cost calculations because infrastructure costs are calculated on a per-berth basis.</td></tr>
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<tr><td>Carquinez Area</td><td>--</td><td>--</td><td>1</td><td>5</td></tr>
<tr><td>Rodeo Area</td><td>--</td><td>--</td><td>--</td><td>2</td></tr>
<tr><td>Total:</td><td>19</td><td>5</td><td>11</td><td>22</td></tr>
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<td></td>
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<td>Number of berths subject to terminal threshold, for each vessel type, by port/terminal</td>
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<table>
<tr><th>Port/IMT</th><th>Container/Reefer</th><th>Cruise</th><th>Auto/ RoRo</th><th>Tankers</th></tr>
<tr><td>Los Angeles</td><td>22</td><td>2</td><td>4</td><td>6</td></tr>
<tr><td>Long Beach</td><td>20</td><td>1</td><td>4</td><td>8</td></tr>
<tr><td>Oakland</td><td>12</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td>San Francisco</td><td>--</td><td>2</td><td>1</td><td>--</td></tr>
<tr><td>San Diego</td><td>3</td><td>6</td><td>5</td><td>--</td></tr>
<tr><td>Hueneme</td><td>3</td><td>--</td><td>4</td><td>--</td></tr>
<tr><td>Stockton Area</td><td>--</td><td>--</td><td>--</td><td>3</td></tr>
<tr><td>Richmond Area</td><td>--</td><td>--</td><td>1</td><td>8</td></tr>
<tr><td>Carquinez Area</td><td>--</td><td>--</td><td>2</td><td>6</td></tr>
<tr><td>Rodeo Area</td><td>--</td><td>--</td><td>--</td><td>3</td></tr>
<tr><td>Total:</td><td>60</td><td>11</td><td>21</td><td>34</td></tr>
</table>
</td>
<td>Based on Staff Berth Analysis. The berth numbers are the basis of infrastructure calculations, which are estimated on a per-berth basis.</td>
</tr>
<tr>
<td>Number of berth shore power retrofits or land-side capture and control infrastructure projects that Staff anticipates would be constructed in response to the Draft Regulation or alternatives, for each vessel type, by port/terminal.</td>
<td>
<table>
<tr><th>Port/IMT</th><th>Container/Reefer</th><th>Cruise</th><th>Auto /RoRo</th><th>Tankers</th></tr>
<tr><td>Los Angeles</td><td>0</td><td>0</td><td>4</td><td>6</td></tr>
<tr><td>Long Beach</td><td>0</td><td>0</td><td>4</td><td>8</td></tr>
<tr><td>Oakland</td><td>0</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td>San Francisco</td><td>--</td><td>1</td><td>1</td><td>--</td></tr>
<tr><td>San Diego</td><td>0</td><td>0</td><td>5</td><td>--</td></tr>
<tr><td>Hueneme</td><td>0</td><td>--</td><td>4</td><td>--</td></tr>
<tr><td>Stockton Area</td><td>--</td><td>--</td><td>--</td><td>3</td></tr>
<tr><td>Richmond Area</td><td>--</td><td>--</td><td>1</td><td>8</td></tr>
</table>
</td>
<td>Based on Staff Berth Analysis

For Auto/RoRo terminals, the number of retrofit projects is only applicable to Alternative 1 (all shore power). Based on the Berth Analysis, Staff does not anticipate that terminal infrastructure projects would be needed to support land-side capture and control systems at Auto/RoRo terminals.

For Tanker terminals, the number of land-side capture and control infrastructure projects (Draft Regulation)</td>
</tr>
</table>

<table>
<tr>
<td>For shore power projects, “retrofit” refers to installing shore power at a berth where no shore power currently exists.</td>
<td>
<table>
<tr><td>Carquinez Area</td><td>--</td><td>--</td><td>2</td><td>6</td></tr>
<tr><td>Rodeo Area</td><td>--</td><td>--</td><td>--</td><td>3</td></tr>
<tr><td>Total:</td><td>0</td><td>1</td><td>21</td><td>34</td></tr>
</table>
</td>
<td>or shore power retrofits (Alternative 1) is equivalent to the number of berths subject to the terminal threshold.</td>
</tr>
<tr>
<td>Number of new shore power vaults Staff estimates would be installed in response to the Draft Regulation or alternatives. This refers to adding additional vaults to berths where shore power already exists.</td>
<td>
<table>
<tr><th>Port/IMT</th><th>Contain-er/Reefer</th><th>Cruise</th><th>Auto/ RoRo</th><th>Tankers</th></tr>
<tr><td>POLA</td><td>2</td><td>0</td><td>--</td><td>--</td></tr>
<tr><td>POLB</td><td>0</td><td>0</td><td>--</td><td>--</td></tr>
<tr><td>Oakland</td><td>3</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td>POSF</td><td>--</td><td>0</td><td>--</td><td>--</td></tr>
<tr><td>POSD</td><td>0</td><td>0</td><td>--</td><td>--</td></tr>
<tr><td>Hueneme</td><td>0</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td>Total:</td><td>5</td><td>0</td><td>--</td><td>--</td></tr>
</table>
</td>
<td>Staff Berth Analysis, based on conversations with terminal operators.

Note: Does not apply to IMTs because none are currently shore power-equipped.</td>
</tr>
<tr>
<td>Number of land-based capture and control systems, for each vessel type</td>
<td>Auto/RoRo: 3

For Tankers, equivalent to the number of berths subject to the terminal threshold (34)</td>
<td>Staff Berth Analysis evaluated the number of land-side systems anticipated to be installed. The estimated cost per land-side capture and control system is directly applied to this value for Auto/RoRo vessels. For Tanker vessels, for cost analysis purposes, Staff applied an equivalent cost per berth to all berths.</td>
</tr>
<tr>
<td>Number of terminal infrastructure projects for land-based capture and control</td>
<td>No infrastructure projects assumed for Auto/RoRo

For Tankers, equivalent to the number of berths subject to the terminal threshold (34)</td>
<td>Staff assumes that all Tanker terminals would require an infrastructure project to support land-side capture and control. Again, for cost analysis purposes, Staff applied an equivalent cost per berth to all berths.</td>
</tr>
</table>

<table>
<tr>
<td>Number of additional terminal loading arms needed for land-based capture and control</td>
<td>1 per berth</td>
<td>Staff assumes that 1 loading arm at each tanker berth would be sufficient to operate the capture and control system.</td>
</tr>
<tr>
<td>Number of barge-based capture and control systems for each vessel type</td>
<td>Container/Reefer: 1 at POLA/POLB

Auto/RoRo: 6 (one each at all ports and IMTs except Hueneme)</td>
<td>Staff Berth Analysis, based on conversations with terminal operators.</td>
</tr>
<tr>
<td>Unique vessel counts for vessel shore power equipment retrofits</td>
<td>
<table>
<tr><th>Vessel Type</th><th>Draft Regulation & Alternative 2</th><th>Alternative 1</th></tr>
<tr><td>Container/Reefer</td><td>57</td><td>62</td></tr>
<tr><td>Cruise</td><td>26</td><td>26</td></tr>
<tr><td>Auto/Ro-Ro</td><td>0</td><td>261</td></tr>
<tr><td>Tankers - Retrofit</td><td>0</td><td>446</td></tr>
<tr><td>Total:</td><td>83</td><td>795</td></tr>
</table>
</td>
<td>DRAFT REGULATION & ALTERNATIVE 2:
Container/Reefer vessel assumptions:
• "Frequent" (defined in Table I) non-shore power vessels would install shore power due to the <u>existing regulation</u> (costs not included in this analysis).
• "Infrequent" non-shore power vessels would install shore power due to the <u>new regulation</u> if they visited Oakland 1+ time or POLA/POLB 3+ times in 2017 (costs are included in analysis).
• "Infrequent" non-shore power vessels that do not meet the above criteria would use capture and control or Terminal Incident Events (TIEs) or Vessel Incident Events (VIEs).
Cruise vessel assumptions:
• All vessels that visited CA 1+ times in 2017 that do not currently have shore power would install it for the <u>new regulation</u> (costs are included in analysis).</td>
</tr>
</table>

		Staff assumes Auto/RoRo and Tanker vessels would use capture and control systems instead of shore power. ALTERNATIVE 1: Container/Reefer vessel assumptions: • Same as Draft Regulation and Alternative 2 except vessels that visited POLA/POLB 2 times in 2017 would also install shore power. Cruise vessel assumptions: • Same as Draft Regulation and Alternative 2. Auto/Ro-Ro and Tanker vessel assumptions: • All vessels that visited CA in 2017 would install shore power. Basis: the number of vessels that make only 1 annual visit is higher than the number of visits that could be covered by TIEs/VIEs.
Number of terminal cable reels	0	Staff Berth Analysis, based on conversations with terminal operators.

Table XII. Shore Power Infrastructure, Maintenance and Labor – Cost Inputs

Data Input	Value	Basis
Shore power berth retrofit cost per Container/Reefer berth	$7,010,813 per berth	$6,316,048 per berth converted from 2012$ to 2019$. This is the cost to install shore power at a berth that does not already have shore power. Average of June 2018 survey values ranging from $3,200,000 to $11,750,000 total cost per berth (assumed to be in 2012$). Includes costs to bring additional power to the terminal where survey respondents indicated it would be needed and provided cost estimates.

Shore power berth retrofit cost per Cruise berth	$83,200,000 per berth (site-specific estimate for Port of San Francisco only)	Estimate provided to staff by the Port of San Francisco in an email to Nicole Light of CARB dated 5/1/19 and discussed on a 5/6/19 phone call. Staff Berth Analysis indicates only the Port of San Francisco would retrofit a Cruise berth for shore power.
Shore power vault Installation	$1,993,255 per vault	$1,795,725 per vault converted from 2012$ to 2019$. This is the cost to install an additional shore power vault at a berth that already has shore power. Average of June 2018 survey values ranging from $800,000 to $3,133,333 total cost per vault (assumed to be in 2012$).
Shore power berth retrofit cost per Tanker berth Applies only to Alternative 1	$21,983,333 per berth	Average of June 2018 survey values ranging from $2,250,000 to $40,000,000 per berth.
Shore power retrofit cost per Container/Reefer vessel	$878,541 per vessel	$791,478 per vessel converted from 2012$ to 2019$. Average of June 2018 survey values ranging from $268,500 to $2,146,500 per vessel (assumed to be in 2012$). Includes shore power on second side of the vessel where indicated by survey respondents and included in total costs.
Shore power retrofit cost per Cruise Vessel	$1,629,682 per vessel	$1,468,182 per vessel converted from 2012$ to 2019$. Average of June 2018 survey values ranging from $1,000,000 to $2,200,000 per vessel (assumed to be in 2012$). Includes shore power on second side of the vessel where indicated by survey respondents and included in total costs.
Shore power retrofit cost per Auto/RoRo Vessel Applies only to Alternative 1	$3,163,500 per vessel	$2,850,000 per vessel converted from 2012$ to 2019$. Average of June 2018 survey values ranging from $900,000 to $4,800,000 per vessel. Includes shore power on second side of the vessel where indicated by survey respondents and included in total costs.
Shore power retrofit cost per Tanker Vessel Applies only to Alternative 1	$2,504,469 per vessel	$2,256,278 per vessel converted from 2012$ to 2019$. Average of June 2018 survey values ranging from $1,612,556 to $2,900,000 per vessel. Includes shore power on second side of the vessel where indicated by survey respondents and included in total costs.
Berth equipment life	20 years	Claimed confidential data obtained from industry sources that requested non-attribution.

		The sources indicated equipment life ranging from 15 to 20 years, assuming proper maintenance.
Vessel equipment life	10 years	Claimed confidential data obtained from industry sources that requested non-attribution. The sources indicated equipment life ranging from 8 years to the life of the ship, assuming proper maintenance.
Terminal cable reel capital cost	$250,000 per reel	Based on Staff conversations with terminal staff where this equipment has been purchased or cost estimates obtained.
Shore Power connection labor cost – non-Tanker vessel visits	$2,355 per visit	Average of June 2018 survey values ranging from $815 to $5,250 per visit.
Shore Power terminal equipment maintenance cost	$24,285 annually per berth retrofit	Average of 2018 survey values ranging from $4,000 to $44,571 annually. Conversations with terminal operators at POLB indicated an average cost around $20,000/year.
Shore Power vessel equipment maintenance cost	$10,000 annually per vessel retrofit	Averaged from June 2018 survey values ranging from $5,000 to $20,000 annually per vessel.

Table XIII. Annual Vessel Visits – Container/Reefer

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr><td>Annual vessel visits <u>unadjusted for flexibility provisions.</u></td><td><table><tr><td>Port</td><td>All annual vessel visits</td></tr><tr><td>Los Angeles</td><td>1029</td></tr><tr><td>Long Beach</td><td>909</td></tr><tr><td>Oakland</td><td>1597</td></tr><tr><td>San Diego</td><td>52</td></tr><tr><td>Hueneme</td><td>155</td></tr><tr><td>Total:</td><td>3,742</td></tr></table></td><td>Includes all vessel visits that would be controlled under the Draft Regulation or alternatives, based on 2017 CSLC data.

This is the base number of vessel visits used for each year of the cost analysis. To account for the potential of increased vessel visits over the analysis period, Staff applied annual industry growth factors as described in Table I.</td></tr>
</table>

<table>
<tr>
<td rowspan="3"></td>
<td></td>
<td>These vessel visit counts are used to calculate administrative costs of preparing and submitting vessel visit reports.</td>
</tr>
<tr>
<td>
<table>
<tr><th>Port</th><th>Newly regulated vessel visits</th></tr>
<tr><td>Los Angeles</td><td>123</td></tr>
<tr><td>Long Beach</td><td>89</td></tr>
<tr><td>Oakland</td><td>191</td></tr>
<tr><td>San Diego</td><td>0</td></tr>
<tr><td>Hueneme</td><td>0</td></tr>
<tr><td>Total:</td><td>403</td></tr>
</table>
</td>
<td>Includes visits from vessels in fleets not subject to the existing At-Berth Regulation, or from non-shore power-capable vessels in currently regulated fleets.

These vessel visit counts are further adjusted below to account for flexibility provisions prior to being used to calculate costs.</td>
</tr>
<tr>
<td>
<table>
<tr><th rowspan="2">Port</th><th colspan="2">Annual visits from vessels not anticipated to install shore power</th></tr>
<tr><th>Draft Regulation & Alternative 2</th><th>Alternative 1</th></tr>
<tr><td>Los Angeles</td><td>21</td><td>21</td></tr>
<tr><td>Long Beach</td><td>34</td><td>24</td></tr>
<tr><td>Oakland</td><td>0</td><td>0</td></tr>
<tr><td>San Diego</td><td>0</td><td>0</td></tr>
<tr><td>Hueneme</td><td>0</td><td>0</td></tr>
<tr><td>Total:</td><td>55</td><td>45</td></tr>
</table>
</td>
<td>Includes visits from vessels that do not currently have shore power and are not anticipated to install it due to the Draft Regulation because they do not meet the filters described in Table XI.

These vessel visit counts are equal to the number of visits Staff anticipates would use capture and control systems under the Draft Regulation and Alternative 2. Under Alternative 1, Staff anticipates these visits would be covered by TIEs/VIEs.</td>
</tr>
<tr>
<td>Annual vessel visits <u>adjusted for flexibility provisions.</u>

These vessel visit counts are used to calculate shore power energy costs, fuel</td>
<td>
<table>
<tr><th rowspan="2">Port</th><th colspan="2">Newly regulated vessel visits adjusted for non-shore power vessels, exceptions, remediation (All Years)</th></tr>
<tr><th>Draft Regulation & Alternative 2</th><th>Alternative 1</th></tr>
<tr><td>Los Angeles</td><td>60</td><td>60</td></tr>
<tr><td>Long Beach</td><td>18</td><td>28</td></tr>
<tr><td>Oakland</td><td>125</td><td>125</td></tr>
<tr><td>San Diego</td><td>0</td><td>0</td></tr>
<tr><td>Hueneme</td><td>0</td><td>0</td></tr>
<tr><td>Total:</td><td>202</td><td>212</td></tr>
</table>
</td>
<td>Visits from non-shore power vessels, safety and commissioning exceptions and remediation fee visits are subtracted from the unadjusted “newly regulated vessel visits.”

This is the number of vessel visits used to calculate shore power labor costs.</td>
</tr>
</table>

<table>
<tr>
<td rowspan="2">savings, LCFS credits and labor costs, and hourly capture and control barge costs, as described in the “Basis” column.</td>
<td>
<table>
<tr><td rowspan="2">Port</td><td colspan="2">Newly regulated vessel visits adjusted for non-shore power vessels, exceptions, TIE/VIEs, remediation: All Scenarios</td></tr>
<tr><td>2021 - 2022</td><td>2023 - 2032</td></tr>
<tr><td>Los Angeles</td><td>0</td><td>0</td></tr>
<tr><td>Long Beach</td><td>0</td><td>0</td></tr>
<tr><td>Oakland</td><td>0</td><td>29</td></tr>
<tr><td>San Diego</td><td>0</td><td>0</td></tr>
<tr><td>Hueneme</td><td>0</td><td>0</td></tr>
<tr><td>Total:</td><td>0</td><td>29</td></tr>
</table>
</td>
<td>Visits from non-shore power vessels, safety and commissioning exceptions, TIE/VIEs, and remediation fee visits are subtracted from the unadjusted “newly regulated vessel visits.”

This is the number of vessel visits used to calculate shore power energy costs, fuel savings and LCFS credits.</td>
</tr>
<tr>
<td>
<table>
<tr><td>Port</td><td>Barge-based capture and control visits: Draft Regulation & Alternative 2 (All Years)</td></tr>
<tr><td>Los Angeles</td><td>21</td></tr>
<tr><td>Long Beach</td><td>34</td></tr>
<tr><td>Oakland</td><td>0</td></tr>
<tr><td>San Diego</td><td>0</td></tr>
<tr><td>Hueneme</td><td>0</td></tr>
<tr><td>Total:</td><td>55</td></tr>
</table>
</td>
<td>Based on Staff’s Berth Analysis, these numbers are equal to the number of vessel visits from vessels not expected to install shore power in response to the Draft Regulation or alternatives.

This is the number of vessel visits used to calculate hourly capture and control barge costs.</td>
</tr>
</table>

Table XIV. Annual Vessel Visits – Cruise

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr>
<td>Annual vessel visits <u>unadjusted for flexibility provisions.</u></td>
<td>
<table>
<tr><td>Port</td><td>All annual vessel visits</td></tr>
<tr><td>Los Angeles</td><td>101</td></tr>
<tr><td>Long Beach</td><td>256</td></tr>
<tr><td>San Francisco</td><td>81</td></tr>
<tr><td>San Diego</td><td>89</td></tr>
<tr><td>Total:</td><td>527</td></tr>
</table>
</td>
<td>Includes all vessel visits that would be controlled under the Draft Regulation or alternatives, based on 2017 CSLC data.

This is the base number of vessel visits used for each year of the cost analysis. To account for the potential of increased vessel visits over the analysis period, Staff applied annual industry growth factors as described in Table I.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>These vessel visit counts are used to calculate the administrative costs of preparing and submitting vessel visit reports.</td></tr>
<tr><td></td><td>
<table>
<tr><th>Port</th><th>Newly regulated vessel visits</th></tr>
<tr><td>Los Angeles</td><td>22</td></tr>
<tr><td>Long Beach</td><td>0</td></tr>
<tr><td>San Francisco</td><td>18</td></tr>
<tr><td>San Diego</td><td>16</td></tr>
<tr><td>Total:</td><td>56</td></tr>
</table>
</td><td>Includes visits from vessels in fleets not subject to the existing At-Berth Regulation, or from non-shore power capable vessels in currently regulated fleets.

These vessel visit counts are further adjusted below to account for flexibility provisions prior to being used to calculate costs.</td></tr>
<tr><td></td><td>
<table>
<tr><th>Port</th><th>Annual visits from vessels not anticipated to install shore power: All Scenarios</th></tr>
<tr><td>Los Angeles</td><td>0</td></tr>
<tr><td>Long Beach</td><td>0</td></tr>
<tr><td>San Francisco</td><td>0</td></tr>
<tr><td>San Diego</td><td>0</td></tr>
<tr><td>Total:</td><td>0</td></tr>
</table>
</td><td>Includes visits from vessels that do not currently have shore power and would not be anticipated to install it in response to the Draft Regulation or alternatives.

Note: Staff assumes all cruise vessels that do not currently have shore power would install it in response to the Draft Regulation or alternatives.</td></tr>
<tr><td>Annual vessel visits <u>adjusted for flexibility provisions.</u>

These vessel visit counts are used to</td><td>
<table>
<tr><th>Port</th><th>Newly regulated vessel visits adjusted for exceptions and remediation: All Scenarios (All Years)</th></tr>
<tr><td>Los Angeles</td><td>18</td></tr>
<tr><td>Long Beach</td><td>0</td></tr>
<tr><td>San Francisco</td><td>15</td></tr>
<tr><td>San Diego</td><td>12</td></tr>
<tr><td>Total:</td><td>45</td></tr>
</table>
</td><td>Visits from safety and commissioning exceptions and remediation fee visits are subtracted from the unadjusted “newly regulated vessel visits.”

This is the number of vessel visits used to calculate shore power labor costs.</td></tr>
</table>

<table>
<tr>
<td>calculate shore power energy costs, fuel savings, LCFS credits and labor costs, as described in the "Basis" column.</td>
<td>
<table>
<tr><td rowspan="2">Port</td><td colspan="2">Newly regulated vessel visits adjusted for exceptions, TIE/VIEs, remediation: All Scenarios</td></tr>
<tr><td>2021 - 2022</td><td>2023 - 2032</td></tr>
<tr><td>Los Angeles</td><td>8</td><td>12</td></tr>
<tr><td>Long Beach</td><td>0</td><td>0</td></tr>
<tr><td>San Francisco</td><td>7</td><td>10</td></tr>
<tr><td>San Diego</td><td>3</td><td>7</td></tr>
<tr><td>Total:</td><td>18</td><td>29</td></tr>
</table>
</td>
<td>Visits from safety and commissioning exceptions, TIE/VIEs, and remediation fee visits are subtracted from the unadjusted "newly regulated vessel visits."

This is the number of vessel visits used to calculate shore power energy costs, fuel savings and LCFS credits.</td>
</tr>
</table>

Table XV. Annual Vessel Visits – Auto/RoRo

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr>
<td>Annual vessel visits <u>unadjusted for flexibility provisions.</u></td>
<td>
<table>
<tr><td>Port/IMT</td><td>All annual vessel visits</td></tr>
<tr><td>Los Angeles</td><td>94</td></tr>
<tr><td>Long Beach</td><td>211</td></tr>
<tr><td>San Francisco</td><td>26</td></tr>
<tr><td>San Diego</td><td>253</td></tr>
<tr><td>Hueneme</td><td>240</td></tr>
<tr><td>Richmond Area</td><td>71</td></tr>
<tr><td>Carquinez Area</td><td>122</td></tr>
<tr><td>Total:</td><td>1,017</td></tr>
</table>
</td>
<td>Includes all vessel visits that would be controlled under the Draft Regulation or alternatives, based on 2017 CSLC data.

This is the base number of vessel visits used for each year of the cost analysis. To account for the potential of increased vessel visits over the analysis period, Staff applied annual industry growth factors as described in Table I.

These vessel visit counts are used to calculate the administrative costs of preparing and submitting vessel visit reports.</td>
</tr>
<tr>
<td>Annual vessel visits <u>adjusted for flexibility provisions.</u></td>
<td>
<table>
<tr><td>Port/IMT</td><td><u>Barge-based</u> capture and control visits: Draft Regulation (All Years)*</td></tr>
<tr><td>Los Angeles</td><td>90</td></tr>
<tr><td>Long Beach</td><td>103</td></tr>
<tr><td>San Francisco</td><td>25</td></tr>
</table>
</td>
<td>Land-based capture and control visits are assumed only where Staff's Berth Analysis indicated barge-based capture and control technology would likely be used. At ports/IMTs where Staff assumes only barge-based systems would be used, this</td>
</tr>
</table>

<table>
<tr>
<td rowspan="3">These vessel visit counts are used to calculate capture and control costs and shore power energy costs, fuel savings, LCFS credits and labor costs (for Alternative 1), as described in the "Basis" column.</td>
<td>
<table>
<tr><td>San Diego</td><td>196</td></tr>
<tr><td>Hueneme</td><td>0</td></tr>
<tr><td>Richmond Area</td><td>68</td></tr>
<tr><td>Carquinez Area</td><td>117</td></tr>
<tr><td>Total:</td><td>599</td></tr>
</table>
*Barge-based capture and control visits + land-based capture and control visits = total annual vessel visits adjusted for exceptions and remediation.
</td>
<td>number equals all annual vessel visits with safety and commissioning exceptions and remediation fee visits removed. At ports/IMTs where Staff assumes both barge and land based systems would be used, <u>half</u> of the annual visits are assumed to use barges.

Hourly barge costs are calculated from this number of visits and the hourly barge utilization fee listed in Table II.</td>
</tr>
<tr>
<td>
<table>
<tr><th>Port/IMT</th><th><u>Land-based</u> capture and control visits: Draft Regulation (All Years)*</th></tr>
<tr><td>Los Angeles</td><td>0</td></tr>
<tr><td>Long Beach</td><td>100</td></tr>
<tr><td>San Francisco</td><td>0</td></tr>
<tr><td>San Diego</td><td>47</td></tr>
<tr><td>Hueneme</td><td>230</td></tr>
<tr><td>Richmond Area</td><td>0</td></tr>
<tr><td>Carquinez Area</td><td>0</td></tr>
<tr><td>Total:</td><td>377</td></tr>
</table>
*Barge-based capture and control visits + land-based capture and control visits = total annual vessel visits adjusted for exceptions and remediation.
</td>
<td>Land-based capture and control visits are assumed only where Staff's Berth Analysis indicated land-based capture and control technology may be used. At ports/IMTs where Staff assumes only land-based systems would be used, this number equals all annual vessel visits with safety and commissioning exceptions and remediation fee visits removed. At ports/IMTs where Staff assumes both barge and land based systems would be used, <u>half</u> of the visits are assumed to use land-based systems.

Since Staff assumes land-based systems would be purchased by terminals, only labor costs are calculated from this number of vessel visits.</td>
</tr>
<tr>
<td>
<table>
<tr><th>Port/IMT</th><th>All vessel visits adjusted for exceptions, remediation (All Years)</th></tr>
<tr><td>Los Angeles</td><td>90</td></tr>
<tr><td>Long Beach</td><td>202</td></tr>
<tr><td>San Francisco</td><td>25</td></tr>
</table>
</td>
<td>Visits from safety and commissioning exceptions and remediation fee visits are subtracted from the unadjusted "all annual vessel visits."</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td>
<table>
<tr><td>San Diego</td><td>243</td></tr>
<tr><td>Hueneme</td><td>230</td></tr>
<tr><td>Richmond Area</td><td>68</td></tr>
<tr><td>Carquinez Area</td><td>117</td></tr>
<tr><td>Total:</td><td>975</td></tr>
</table>
</td>
<td>This is the number of vessel visits used to calculate shore power labor costs for Alternative 1.</td>
</tr>
<tr>
<td></td>
<td>
<table>
<tr><td rowspan="2">Port/IMT</td><td colspan="2">All vessel visits adjusted for exceptions, TIE/VIEs, remediation</td></tr>
<tr><td>2025</td><td>2026 - 2032</td></tr>
<tr><td>Los Angeles</td><td>81</td><td>84</td></tr>
<tr><td>Long Beach</td><td>181</td><td>190</td></tr>
<tr><td>San Francisco</td><td>22</td><td>23</td></tr>
<tr><td>San Diego</td><td>217</td><td>227</td></tr>
<tr><td>Hueneme</td><td>206</td><td>216</td></tr>
<tr><td>Richmond Area</td><td>61</td><td>64</td></tr>
<tr><td>Carquinez Area</td><td>105</td><td>110</td></tr>
<tr><td>Total:</td><td>873</td><td>914</td></tr>
</table>
</td>
<td>Visits from safety and commissioning exceptions, TIE/VIEs, and remediation fee visits are subtracted from the unadjusted "all annual vessel visits."

This is the number of vessel visits used to calculate land-based capture and control operational costs for the Draft Regulation and shore power energy costs, fuel savings and LCFS credits for Alternative 1.</td>
</tr>
</table>

Table XVI. Annual Vessel Visits – Tankers

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr>
<td>Annual vessel visits <u>unadjusted for flexibility provisions.</u></td>
<td>
<table>
<tr><td>Port/IMT</td><td>All annual vessel visits</td></tr>
<tr><td>Los Angeles</td><td>209</td></tr>
<tr><td>Long Beach</td><td>368</td></tr>
<tr><td>Stockton Area</td><td>55</td></tr>
<tr><td>Richmond Area</td><td>403</td></tr>
<tr><td>Carquinez Area</td><td>241</td></tr>
<tr><td>Rodeo Area</td><td>67</td></tr>
<tr><td>Total:</td><td>1343 (POLA/POLB: 577, all other terminals: 766)</td></tr>
</table>
</td>
<td>Includes all vessel visits that would be controlled under the Draft Regulation or alternatives, based on 2017 CSLC data.

This is the base number of vessel visits used for each year of the cost analysis. To account for the potential of increased vessel visits over the analysis period, Staff applied annual industry growth factors as described in Table I.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>These vessel visit counts are used to calculate the administrative costs of preparing and submitting vessel visit reports.</td></tr>
<tr><td rowspan="3">Annual vessel visits <u>adjusted for flexibility provisions.</u>

These vessel visit counts are used to calculate capture and control costs and shore power energy costs, fuel savings, LCFS credits and labor costs (for Alternative 1), as described in the “Basis” column.</td>
<td><table>
<tr><th>Port/ IMT</th><th>Land-based capture and control visits, Draft Regulation & Alternative 2 (Year 2027: POLA/POLB and Year 2029: all other terminals)</th></tr>
<tr><td>Los Angeles</td><td>200</td></tr>
<tr><td>Long Beach</td><td>352</td></tr>
<tr><td>Stockton Area</td><td>53</td></tr>
<tr><td>Richmond Area</td><td>386</td></tr>
<tr><td>Carquinez Area</td><td>231</td></tr>
<tr><td>Rodeo Area</td><td>64</td></tr>
<tr><td>Total:</td><td>1,287</td></tr>
</table></td>
<td>Visits from safety and commissioning exceptions and remediation fee visits are subtracted from the unadjusted “all annual vessel visits.”

Since Staff assumes land-based systems would be purchased by terminals, only labor costs are calculated from this number of vessel visits.</td></tr>
<tr><td><table>
<tr><th>Port/IMT</th><th>All vessel visits adjusted for exceptions, remediation (Year 2027: POLA/POLB and Year 2029: all other terminals)</th></tr>
<tr><td>Los Angeles</td><td>200</td></tr>
<tr><td>Long Beach</td><td>352</td></tr>
<tr><td>Stockton Area</td><td>53</td></tr>
<tr><td>Richmond Area</td><td>386</td></tr>
<tr><td>Carquinez Area</td><td>231</td></tr>
<tr><td>Rodeo Area</td><td>64</td></tr>
<tr><td>Total:</td><td>1,287</td></tr>
</table></td>
<td>This number equals “all annual vessel visits” with safety and commissioning exceptions and remediation fee visits removed.

This is the number of vessel visits used to calculate shore power labor costs for Alternative 1.</td></tr>
<tr><td><table>
<tr><th rowspan="2">Port/IMT</th><th colspan="2">All annual vessel visits adjusted for exceptions, TIE/VIEs, remediation</th></tr>
<tr><th>2027: POLA/POLB and 2029: all other terminals</th><th>2028 – 2032: POLA/POLB and 2030 – 2032: all other terminals</th></tr>
<tr><td>Los Angeles</td><td>179</td><td>187</td></tr>
<tr><td>Long Beach</td><td>315</td><td>330</td></tr>
</table></td>
<td>This number equals “all annual vessel visits” with safety and commissioning exceptions, TIEs/VIEs, and remediation fee visits removed.

This is the number of vessel visits used to calculate capture and control operational costs for the Draft</td></tr>
</table>

	Stockton Area	47	49	Regulation and shore power energy costs, fuel savings and LCFS credits for Alternative 1.
	Richmond Area	346	362	
	Carquinez Area	207	217	
	Rodeo Area	58	60	
	Total:	1,152	1,206	

Table XVII. Flexibility Adjustments

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr>
<td>Percent of visits to a terminal allowed as a Terminal Incident Event (TIE) or Vessel Incident Event (VIE) (combined)</td>
<td>
<table>
<tr><th>Vessel Category</th><th>2021 - 2022</th><th>2023 - 2024</th><th>2025</th><th>2026</th></tr>
<tr><td>Container/ Reefer</td><td>10%</td><td>6%</td><td>6%</td><td>6%</td></tr>
<tr><td>Cruise</td><td>10%</td><td>6%</td><td>6%</td><td>6%</td></tr>
<tr><td>Auto/RoRo</td><td>--</td><td>--</td><td>10%</td><td>6%</td></tr>
<tr><td>Tankers (POLA/POLB)</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td>Tankers (all other terminals)</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
</table>
<table>
<tr><th>Vessel Category</th><th>2027</th><th>2028</th><th>2029</th><th>2030 - 2032</th></tr>
<tr><td>Container/ Reefer</td><td>6%</td><td>6%</td><td>6%</td><td>6%</td></tr>
<tr><td>Cruise</td><td>6%</td><td>6%</td><td>6%</td><td>6%</td></tr>
<tr><td>Auto/RoRo</td><td>6%</td><td>6%</td><td>6%</td><td>6%</td></tr>
<tr><td>Tankers (POLA/POLB)</td><td>10%</td><td>6%</td><td>6%</td><td>6%</td></tr>
<tr><td>Tankers (all other terminals)</td><td>--</td><td>--</td><td>10%</td><td>6%</td></tr>
</table>
</td>
<td>Draft Regulation

These percentages are applied to adjust the annual vessel visits that are used to calculate specific costs as described in Tables XIII, XIV, XV and XVI.</td>
</tr>
<tr>
<td>Percent of visits to a terminal categorized as</td>
<td>0.62% of all vessel visits</td>
<td>Based on Staff analysis of 2017 CARB Enforcement data documenting reasons vessels failed to connect to shore power.</td>
</tr>
</table>

<table>
<tr><td>safety/emergency exception</td><td></td><td>Container, Reefer, and Cruise vessels reported safety events for 21 out of 3,424 visits from shore power-capable vessels</td></tr>
<tr><td>Percentage of visits to a terminal categorized as a commissioning exception</td><td>3% of all vessel visits</td><td>Based on Staff analysis of 2017 CARB Enforcement data documenting reasons vessels failed to connect to shore power.</td></tr>
<tr><td>Percentage of vessel visits assumed to use remediation fee</td><td><table>
<tr><th>Vessel Type</th><th>% Visits Terminal Upgrades</th><th>% Visits Vessel Equipment Repair</th></tr>
<tr><td>Container/ Reefer</td><td>0.50%</td><td>0%</td></tr>
<tr><td>Cruise</td><td>0.50%</td><td>0%</td></tr>
<tr><td>Auto/Ro-Ro</td><td>0.50%</td><td>0%</td></tr>
<tr><td>Tankers (POLA/POLB)</td><td>0.50%</td><td>0.17%</td></tr>
<tr><td>Tankers (all other terminals)</td><td>0.50%</td><td>0%</td></tr>
</table></td><td>Remediation fee visits calculated as a percentage of total vessel visits, based on 2017 CARB Enforcement data documenting reasons vessels failed to connect to shore power. In 2017 there were 17 out of 3,424 instances of terminal or port construction preventing shore power connection, and one vessel visit that would have been expected to use the remediation fee under the Draft Regulation.</td></tr>
</table>

Table XVIII. Remediation Fee Costs

<table>
<tr><th>Data Input</th><th>Value</th><th>Basis</th></tr>
<tr><td>Hourly remediation fee for terminal and for vessel, for each vessel type</td><td><table>
<tr><th>Vessel Type</th><th>Vessel Hourly Fee</th><th>Terminal Hourly Fee</th></tr>
<tr><td>Container/ Reefer</td><td>$2,395</td><td>$2,395</td></tr>
<tr><td>Cruise</td><td>$12,879</td><td>$12,879</td></tr>
<tr><td>Auto/Ro-Ro</td><td>$1,515</td><td>$1,515</td></tr>
<tr><td>Product Tankers</td><td>$1,783</td><td>$1,783</td></tr>
<tr><td>Crude Tankers</td><td>$9,873</td><td>$9,873</td></tr>
</table></td><td>Staff analysis using Carl Moyer formula to calculate average emissions in tons per hour by vessel category. Product and crude tanker values were averaged for cost estimation purposes, however the fee would be dependent on the vessel type. Note that these values are estimates based on current Staff analyses at the time this document was prepared, and do not necessarily represent the exact fees that would apply.</td></tr>
<tr><td>Which terminals would offer the remediation fee as an option?</td><td>All (100%)</td><td>Staff assumes that all terminals would offer the remediation fee as an option.</td></tr>
</table>