Kris Battleson
HSE Manager, Richmond Refinery

January 29, 2026

via E-mail

Chief, Transportation and Toxics Division
California Air Resources Board (CARB)
1001 I Street
Sacramento, CA 95814

Chevron Richmond Refinery
CARB At-Berth Regulation: Richmond Long Wharf Terminal and Port Plan

The Chevron Richmond Refinery is submitting to the California Air Resources Board (CARB) its combined Terminal and Port Plan pursuant to Section 93130.14 of the Control Measure for Ocean-Going Vessels At Berth (At-Berth Regulation), Title 17, Division 3, Chapter 1, Subchapter 7.5 of the California Code of Regulations (CCR).

Please contact Kris Battleson at (510) 242-1400 if you have any questions or need additional information regarding this submittal.

Sincerely,

Kris Battleson

Attachments
Chevron Richmond Long Wharf Terminal and Port Plan 2026

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Chevron Richmond Long Wharf
Terminal and Port Plan

January 29, 2026

Version	Date	Approver
1	12 / 01 / 2021	Alan Davis
2	01 / 29 / 2026	Tolly Graves

Certification

I certify that the information contained in the Terminal and Port Plan being submitted pursuant to Control Measure for Ocean-Going Vessels At Berth (At-Berth Regulation), Title 17, Division 3, Chapter 1, Subchapter 7.5 of the California Code of Regulations (CCR) is true, accurate, and complete to the best of my knowledge, signed under penalty of perjury.

~~Responsible Official~~ Signature	Tolly Graves Printed Name	Jan 29, 2026 Date

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Introduction

This 2026 Terminal and Port Plan for the Chevron Richmond Long Wharf (RLW), located in Richmond, California, is submitted by the Chevron Richmond Refinery ("Chevron") to the California Air Resources Board (CARB) pursuant to **Section 93130.14** of the Control Measure for Ocean-Going Vessels At Berth (At-Berth Regulation), Title 17, Division 3, Chapter 1, Subchapter 7.5 of the California Code of Regulations (CCR), **Sections 93130** to **93130.22**. This is a combined Terminal Plan and Port Plan for the single terminal at RLW.

In accordance with the provisions of **Section 93130.14(a)(3)** of the At-Berth Regulation governing the contents of Terminal Plans, and the provisions of **Section 93130.14(b)(3)** of the At-Berth Regulation governing the contents of Port Plans, this combined Terminal and Port Plan addresses the following below:

I. Identification and description of the applicable compliance strategy
II. Number of vessels expected to visit the terminal using the strategy
III. Identification and description of equipment purchases and/or construction projects necessary for compliance
IV. Schedule for installing equipment and/or necessary construction projects
V. Identification of berths at the terminal where the equipment will be used for compliance
VI. Geographic boundary coordinates for the terminal and the berths at RLW
VII. Specific berthing restrictions
VIII. Identification of physical and/or operational constraints at the terminal

The contents of this combined Terminal and Port Plan for the RLW build on the 2021 submission. Chevron is continuing to evaluate whether a CARB Approved Emissions Control Strategy (CAECS) can be implemented in a safe, reliable, and feasible manner at RLW to achieve compliance with the At-Berth Regulation within the required timeline. Chevron and other stakeholders presented extensive evidence during the rulemaking process showing that, as of the date of adoption of the Regulation in August 2020, there was no CAECS proven to be technologically safe, reliable, and feasible for implementation to control emissions from tanker vessels at the RLW. This continues to be true in January 2026, and the status of Chevron's ongoing evaluation of the potential use of one or more CAECS at RLW is described below.

In the intervening years since the 2021 Terminal and Port Plan[1] was submitted by Chevron, we have collaborated with capture and control vendors to assess their technology, advance engineering studies, and progress assurance of design with the goal of enabling the safe and reliable adoption of their technology at RLW.

Chevron has also been leading several engineering studies to understand requirements and feasibility of shore power at RLW, including design of shore power systems, ability of PG&E to support Chevron's requirements, and feasible designs for shore power cable handling systems. Additionally, Chevron has been leading industry initiatives at OCIMF and engaging with IEC to develop a standardized, safe, and reliable design for shore power for tankers.

Given the ongoing uncertainty over whether one or more CAECS can be used at RLW in a feasible, safe, and reliable manner compliant with approved executive order (EO) parameters for At-Berth Regulation compliance, Chevron's intended compliance strategy is to use a package of Innovative Concepts to achieve emissions reductions in accordance

[1] Microsoft Word - RLW_Terminal_Plan_1Dec2021.docx: ww2.arb.ca.gov/sites/default/files/2022-05/Richmond%20-%20Chevron%20Original%20Plan%20-%20%28non-ADA%29.pdf

with **Section 93130.17** of the Regulation. Chevron plans to utilize CARB-approved CAECS, once proven safe, reliable, and feasible for use at the RLW and vessels calling RLW.

Compliance Strategy

As outlined in this Terminal Plan and as previously detailed to CARB as part of the rulemaking process, it has not been demonstrated that there is a CAECS that can be implemented in a safe, reliable, and feasible manner to control emissions from tanker vessels at berth at the RLW. Chevron is continuing to evaluate a suite of potential CAECS technologies that could be 1) implemented in a safe, reliable, and feasible manner in the future at RLW and 2) that could be effectively applied to accommodate the approximately 140 unique vessels that call at RLW on an annual basis. Beginning on page 6, Chevron provides a detailed description of its ongoing assessment of the potential use of one or more CAECS.

Given the continued and significant uncertainties associated with safe, reliable, and feasible implementation of the approved CAECS technologies at RLW, Chevron intends to use a package of Innovative Concepts to comply with the At-Berth regulation. Chevron's package of Innovative Concepts is projected to result in emissions reductions that are sufficient to achieve initial compliance with the At-Berth Regulation (See **Section 93130.17**). Chevron plans to utilize CAECS, when proven safe, reliable, and feasible for use at the RLW and vessels calling at RLW.

Since January 2021, Chevron embarked on a program to obtain CARB approval for its portfolio of 14 Innovative Concepts (ICs) presented in its Innovative Concept Application[2]. The proposed Innovative Concepts include both terminal-adjacent and ship-related projects designed to achieve the necessary emission reductions in the absence of a CAECS that can be implemented and used safely, reliably, and feasibly at RLW. After working with CARB from 2023 through present on the approvals, the ICs currently being pursued are the following:

- Refinery ICs: IC.1, IC.3 and IC.6, and
- Shipping ICs: IC.10, IC.11, IC.12, and IC.13.

IC.1 received an Executive Order (EO) in May 2024[3], and IC.6 received an EO in January 2026. CARB has communicated its approval in-concept for the remainder of the ICs listed above but has not yet provided formal EOs for these ICs. Innovative Concepts 2, 4, 5, 7, 8, 9, and 14 were either eliminated from further consideration or deferred. With respect to timing and schedule, Chevron continues to actively pursue opportunities to implement Innovative Concepts ahead of the 2027 compliance deadline for tanker vessels and terminals.

[2] Innovative Concept Application: Chevron – Richmond | California Air Resources Board: https://ww2.arb.ca.gov/innovative-concept-application-chevron-richmond

[3] Chevron IC1 Approval Letter and Executive Order G-23-295: https://ww2.arb.ca.gov/sites/default/files/2024-06/FAB23-123%20-%20Chevron%20IC1%20Approval%20Letter%20ADA.pdf

Figure 1 CARB Approval Status of Innovative Concepts

Innovative Concept	CARB Approval Status
IC1 Locomotive	**Approved** EO issued in May 2024
IC6 TKN Heater	**Approved** EO issued in Jan 2026
IC3 Diesel Air Compressor	**TBD Approval** CARB verbal approval Jan 2025, written approval-in-concept July 2025
ICs 10-13 Shipping ICs	**TBD Approval** CARB written approval-in-concept April-July 2025

CARB issuance of the EOs for the approved Innovative Concepts can significantly expedite implementation of the ICs and help accelerate emissions reductions to the benefit of nearby communities.

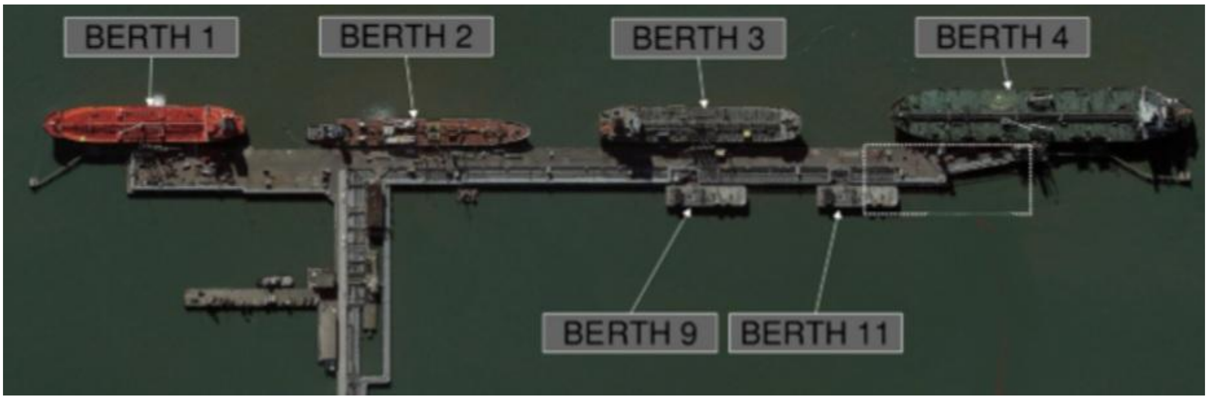
I: Identification and description of the applicable compliance strategy

This section of the plan covers the items in sections 93130.14(a)(3)(A), 93130.14(a)(3)(D) (Terminal Plan) and sections 93130.14(b)(3)(A), 93130.14(b)(3)(D) (Port Plan) of the At-Berth Regulation.

The proposed compliance strategy is to use a package of Innovative Concepts for compliance until a CAECS is proven to be safe, reliable, and feasible for adoption at the RLW. Please refer to the Innovative Concepts Application on CARB's website[2] for all necessary and planned equipment and their respective locations.

In the event a CAECS becomes safe, reliable, and feasible for use at RLW, the anticipated equipment could be at Berths 1, 2, 3 and/or 4, as shown in Figure 2. These four berths accept ocean-going vessels covered by the At-Berth Regulation. Chevron's efforts to identify a feasible CAECS are described in further detail below.

Figure 2: Overhead image of Richmond Long Wharf with berths identified



II: Number of vessels expected to visit the terminal using this strategy

This section of the plan covers the items in Section 93130.14(a)(3)(B) (Terminal Plan) of the At-Berth Regulation.

Per past performance and expected future demands, the vessel count at Richmond is expected to be similar to the numbers listed in the 2021 Terminal and Port Plan.[4] These values are listed in Table 1 below. The exact number of vessel calls for each vessel type is expected to vary slightly on an annual basis.

Table 1 Vessel types and number of visits to RLW in representative year

Vessel Type	Number of Vessel Visits
Aframax	25
Chemical	16
Panamax	27
Product	196
Suezmax	114
Total	**378**

III: Identification and description of equipment purchases and/or construction projects necessary for compliance

This section of the plan covers the items in Section 93130.14(b)(3)(B) (Port Plan) of the At-Berth Regulation.

Suitable CAECS equipment does not exist for RLW today. Chevron has entered agreements with barge-based exhaust capture and control vendors to progress technology development and use the technology once it is proven to be safe and reliable for conditions at RLW.

No equipment purchases or construction for CAECS are presently in progress. Further work with vendors of the barge-based capture and control, shore power, and on-vessel control technology will be necessary to determine what new equipment is needed, if any, and develop that new equipment before purchases could be specified or detailed design completed.

See the Innovative Concepts Application for equipment purchases relating to Innovative Concepts.

IV: Schedule for installing equipment and/or necessary construction projects

This section of the plan covers the items in Section 93130.14(b)(3)(F) (Terminal Plan) and Section 93130.14(b)(3)(C) (Port Plan) of the At-Berth Regulation.

[4] Microsoft Word - RLW_Terminal_Plan_1Dec2021.docx: ww2.arb.ca.gov/sites/default/files/2022-05/Richmond%20-%20Chevron%20Original%20Plan%20-%20%28non-ADA%29.pdf

Chevron continues to evaluate barge-based exhaust capture and control and shore power to develop new technology capable of operating at the RLW. These efforts are detailed in the "Chevron's Ongoing Evaluation of Potential CAECS" section below.

A schedule for installing equipment and/or obtaining any necessary construction permits will be developed once equipment suitable for use at RLW is developed and detailed design is completed based on the specifications for the to-be developed equipment.

Innovative Concepts 1 and 6 have already been implemented. Innovative Concepts 10, 11, and 13 are currently being implemented. Schedule of remaining Innovative Concepts projects is pending CARB approval.

V: Identification of berths at the terminal where the equipment will be used for compliance and their geographic boundaries

This section covers the items in Section 93130.14(a)(3)(C) (Terminal Plan) and Section 93130.14(b)(3)(E) (Port Plan) of the At-Berth Regulation. As explained above, in the absence of a feasible CAECS, no new equipment to be used for compliance has been identified at this time. Table 2 and Figure 3 indicate the geographic location of these berths at which equipment may be used in the future.

Table 2: List of Each Berth with Geographic Boundary Coordinates

Berth	Mooring Hook	Latitude	Mooring Hook	Longitude
1	MK-101 MK-107	37°55'13.07"N 37°55'19.32"N	MK-101 MK-107	122°24'29.58"W 122°24'35.52"W
2	MK-200 MK-204	37°55'19.55"N 37°55'24.64"N	MK-200 MK-204	122°24'35.89"W 122°24'41.44"W
3	MK-204 MK-401	37°55'24.64"N 37°55'31.93"N	MK-204 MK-401	122°24'41.44"W 122°24'48.18"W
4	MK-401 MK-408	37°55'31.93"N 37°55'40.39"N	MK-401 MK-408	122°24'48.18"W 122°24'55.30"W

NOTE: Mooring hooks denote the furthest extent of the berth for vessel mooring purposes.

Some hooks are shared between adjacent berths. Berths 5, 7, 9 and 11 do not receive tankers.

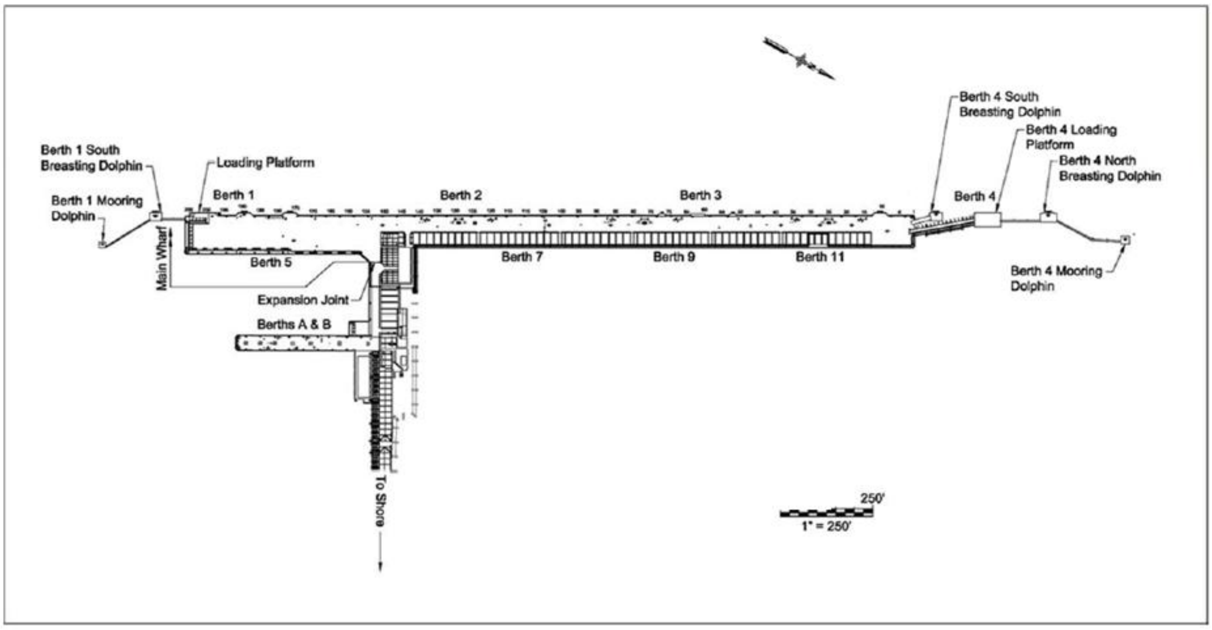


Figure 3: Main Wharf and Independent Dolphin Structures Arrangement

VI: Specific berthing restrictions

This section of the plan covers the items in Section 93130.14(a)(3)(E) (Terminal Plan) and Section 93130.14(b)(3)(F) (Port Plan) of the At-Berth Regulation.

Each vessel at each berth has specific restrictions on approach velocity, approach angle, draft, approach direction, and tidal restrictions. These are in accordance with Chapter 31F of California Building Code, Division 5, Section 3105F, as regulated by the Marine Environmental Protection Division of the California State Lands Commission.

VII: Division of responsibilities between terminal and port

This section of the plan covers the items in Section 93130.14(a)(3)(G) (Terminal Plan) and Section 93130.14(b)(3)(G) (Port Plan) of the At-Berth Regulation.

The RLW is both the port and terminal. There is no division of responsibilities.

VIII: Identification of physical and/or operational constraints at the terminal

This section of the plan covers the items in Section 93130.14(a)(3)(H) (Terminal Plan) of the At-Berth Regulation.

Physical and operational constraints to implementing the CAECS are discussed in detail below in the “Chevron’s Ongoing Evaluation of Potential CAECS” section and in the technology assessment and risk assessment workshops performed in May through June 2021 by DNV[5], which included CARB staff participants. Throughout the rulemaking process, in the DNV technology assessment workshops, and continued CARB engagements, CARB has been made aware of the numerous constraints with the technologies and their

[5] CALIFORNIA AIR RESOURCES BOARD’S (CARB) OCEAN-GOING VESSELS AT BERTH REGULATION EMISSIONS CONTROL TECHNOLOGY ASSESSMENT FOR TANKERS: https://brandcentral.dnv.com/original/gallery/10651/files/original/db90cd1d-136c-4552-a6be-f154f6567abb.pdf

implementation at Northern California marine terminals. Chevron adopts the statements in the aforementioned DNV study regarding the relevant physical and operational constraints.

Because of the constraints identified below, Chevron's initial compliance strategy is to execute our Innovative Concepts Projects as identified in the Innovative Concepts Application until a CAECS that is safe, reliable, and feasible for use at the RLW is identified.

Chevron's Ongoing Evaluation of Potential CAECS

This section of the plan covers the items in Section 93130.14(a)(1) (Terminal Plan) and Section 93130.14(b)(1) (Port Plan) of the At-Berth Regulation.

While there currently is no approved CAECS capable of being implemented in a safe, reliable, and feasible manner to control emissions from tanker vessels at RLW within the timeline required by the CARB At-Berth Regulation, Chevron has been diligently pursuing technical feasibility assessments and additional research to identify a realistic and practical implementation methodology and timelines for the following three potential CAECS for use at RLW:

1. Barge-Based Exhaust Capture and Control (ECC)
2. Shore Power
3. On-Vessel Control Technology

In the intervening four years since the 2021 Terminal and Port Plan was submitted by Chevron, we have collaborated with capture and control vendors to 1) understand the design capabilities and limitations, and 2) improve the safety and reliability of their barge-based systems. We have also completed independent feasibility studies of shore power and have been progressing new engineering studies to propose ship modifications as potential CARB Approved Emission Control Strategies (CAECS). Chevron has entered contracts with barge-based capture and control vendors for the future provision of services, after we have deemed their technology to be safe and reliable for use at RLW. Chevron has actively involved subject matter experts and arranged feasibility studies with top engineering consultants like Moffat & Nichol, Marin, Glosten, PND Engineers, Avantis, Hyundai Marine Solutions, and DSEC to advance engineering concepts and propose new CAECS solutions. These initiatives help Chevron gain an in-depth understanding of the scope and complexity associated with each of the possible engineering solutions. Chevron has also worked with original equipment manufacturers—including Appleton, Alfa Laval, Cavotec, Cemtek, Cummins, EagerOne, Fassmer, Fives Pillard, Framo, Hug Engineering, John Zink, Hamworthy, Kangrim, MAN (now Everlence), PurEmissions, Redecam, Rypos, Trellborg, Wabtec, and Wartsila—to review and evaluate the technology.

Technological, technical, and operational challenges associated with implementation of the proposed CAECS for terminals with tanker vessels within the required regulatory timeline are also highlighted in DNV's Technology Assessment (titled "California Air Resources Board's (CARB) Ocean-going Vessels At Berth Regulation Emissions Control Technology Assessment for Tankers, Report # 2021-9470", dated November 2021).

Capture and Control

Barge-based Exhaust Capture and Control

In 2024, Chevron co-led and contributed to a petroleum tanker industry-wide working group to develop a shared hazards identification and risk assessment. From that work, minimal functional requirements for the safe use of barge-based ECC alongside oil and product tankers at berth were jointly developed and mutually agreed. The resulting “Emission Capture and Control at Berth: Preliminary Safety Recommendations”[6] was published in January 2025. Chevron is continuing to partner with STAX and CAEM to improve the safety and reliability of their barges. Several assurance engagements have occurred with each of the companies. For these assurance reviews, Chevron is using the industry safety recommendations published by OCIMF. While all due diligence reviews have presently focused on the adoption of the technology in Southern California, Chevron is using these learnings to advance applicability of the technology in Northern California. The metocean and terminal conditions and bay mud characteristics in Richmond, California are significantly different than Southern California. Hence, Chevron will continue to collaborate with STAX and CAEM to progress the barge design and operations to ensure safe and reliable operation at Richmond.

As of January 2026, there is no existing ECC barge suitable for tankers with liquid cargo pumping rates up to 55,000 barrels per hour (bph), nor designed and engineered specifically for tanker use at RLW’s more extreme metocean and soft muds conditions. Further, there is still no approved barge-based exhaust capture and control CAECS that is suitable for use on tanker auxiliary boilers. The approved tanker barge-based exhaust capture and control EOs[3] are limited to auxiliary engine emissions only. One EO is limited to up to two auxiliary engines, and the other is limited to no more than three auxiliary engines. Additionally, the EOs preclude use of the barge-based exhaust capture and control technology on vessels with boilers or vessels with exhaust flow rates higher than those in the approved EOs. While CARB has approved test plans for barge vendors to conduct testing of approved barge-based exhaust capture and control CAECS on tanker vessels equipped with auxiliary engines and boilers,[7] CARB’s website currently indicates the status of such test plans as “Testing In Progress.”[8] To date, no suitable barge-based exhaust capture and control has been approved for use on tanker vessels that use boilers and steam turbines as primary means of cargo operations, which account for approximately half of the vessels calling RLW.

Further research and development is necessary to demonstrate initial feasibility of this CAECS in RLW, with specific focus on the below items:

1. Developing a barge that is seaworthy for the meteorological and metocean conditions prevalent in the San Francisco Bay Area and capable of mooring at water depths of greater than 50 ft into loose Young Bay Mud sediment and meets California Code of Regulations Title 2, Division 3, Chapter 1 Article 5 Marine Terminals, section 2340 subsection (C) 28 (A and B) (“Article 5”) .
2. Technology development and capability of METS to process auxiliary engine and auxiliary boiler exhaust volumes associated with large tanker vessels pumping at rates greater than 55,000 bbls/hr.

Specifically, the vendor Clean Air Engineering Maritime (“CAEM”) has mentioned that their existing barge spud design must be modified to address low sediment shear strength, the depth of Young Bay Mud, and insufficient propulsion capacity to handle current velocities in the San Francisco Bay Area and Carquinez Straits. Per CAEM, this could include lengthening the spuds to 110 ft or longer, adding supplemental anchoring capabilities to the barge, enlarging the barge footprint, or possibly integrating a vacuum mooring systems to eliminate spud mooring entirely. Further, it

[6] Emission Capture and Control at Berth: Preliminary Safety Recommendations: https://www.ocimf.org/publications/information-papers/emission-capture-and-control-at-berth-preliminary-safety-recommendations

[7] CARB, METS-3 Test Plan Approval Letter for Additional Tanker Auxiliary Engines and Boilers, Oct. 13, 2025; CARB, Amendment to the March 7, 2022 Test Plan for Tanker Auxiliary Engine and Boiler, Aug. 27, 2025.

[8] CARB Approved Test Plans: https://ww2.arb.ca.gov/approved-test-plans.

is imperative that the barge-based ECC CAECS vendors' barges consistently demonstrate their ability to disconnect and move away from a moored ship in less than 30 minutes, in accordance with California Code of Regulations Title 2, Division 3, Chapter 1 Article 5 Marine Terminals, section 2340 subsection (C) 28 (A and B) ("Article 5"), under a range of sea state conditions. If a capture and control barge prevents a tanker from moving away from a terminal in an emergency situation, the consequences could be catastrophic.

Chevron has consulted with local barge operators in the Bay Area who have worked at Richmond Long Wharf, and confirmed that the time required to retract four spuds deployed in water depths to 40-50 ft and prepare the barge to move, including lowering the crane from the vessel stack, would likely exceed the 30-minute emergency departure time limit required in Article 5. This presents a significant safety risk that has been noted in prior workshops and DNV's Technology Assessment associated with the Regulation.

Another concern is that repeated insertion and retraction of spuds near RLW could produce mud plumes, and over time weaken the substrate. Unfortunately, spud mooring experts consulted could only speculate on the above potential impacts based on information provided and basic engineering calculations. We have suggested further detailed engineering and demonstrations to be completed to confirm predictions and ensure safe and reliable operations at RLW.

Summary of Outstanding Issues that Chevron is Addressing with Barge Technology/Vendor

- Barge needs to be able to safely operate for the entire range of ships that visit RLW and the various possible ship berthing orientations (port-side or starboard-side to).
- Northern California-suitable barge design to operate safely in proximity to and at the RLW in a range of metocean conditions. Barge must have demonstrated ability to operate within currently accepted wind speed limits for vessels at berth per approved Statements of Terminal Operating Limits (STOLS) pursuant to Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) / California Building Code (CBC) Chapter 31F Section 3105. Barge must be able to demonstrate consistently that it can disconnect and safely move away from tanker in 30-minutes or less as required by Article 5.
- Barge must be able to operate 24/7 for multi-day vessel calls (up to 3-5 days at berth).
- Barge mooring risks must be understood, evaluated, and mitigated, including proposed vacuum mooring, spud mooring, and geotechnical constraints.
- Effect of barge, if attached to vessel via mooring lines or vacuum mooring, on vessel Statements of Terminal Operating Limits (STOLs) and subsequent changes (if any) to STOLs approved by California State Lands Commission pursuant to MOTEMS (CBC Chapter 31F) requirements.

- Resolve safety and operational concerns identified in DNV's Technology Assessment and OCIMF's "Emission Capture and Control at Berth: Preliminary Safety Recommendations"[9].
- The barge must not create a static electricity charge and ignition threat to tankers. DNV's Technology Assessment identified short circuit/static charge risks regarding contact between vessel stack and capture hood, where charge could build up on the barge and be discharged to the tanker, or vice versa if contact is made.
- Ability of barge to safely process increased exhaust emissions from tankers fitted with auxiliary boilers. Technology is presently not capable of processing combined stack emissions from auxiliary engines and tanker auxiliary boilers from a Suezmax tanker pumping at typical pumping rates of 55,000-65,000 barrels per hour. It is imperative for the technology providers to ensure and demonstrate that using the technology on boilers does not increase back pressure on the boilers as this could lead to a catastrophic and significant incident on the tanker.

Until these issues are resolved with respect to the suitability of the barge design for safe adoption in Northern California marine environmental conditions and mooring interface with vessels at berth, the barge-based exhaust capture and control system is not feasible for use at RLW.

Shore Power

Chevron retained infrastructure engineering consultants Moffat & Nichol (M&N) to complete preliminary engineering of the civil infrastructure, electrical design, and mechanical design of a shore power system at RLW. This effort has produced a 30% engineering package. Chevron and M&N have identified numerous safety and feasibility challenges. The following are specific significant concerns related to the terminal infrastructure:

Power Available to the Terminal

It is very challenging to deliver a sufficient amount of high voltage electrical power to the vessel berths at RLW. Chevron has evaluated the necessary power to service four vessels simultaneously at the RLW for shore power with complete electric discharge system and determined that an additional 12-20 MW of service is required. Chevron's existing distribution system does not have the capacity for the additional demand from terminals at the RLW and would need to be heavily modified to provide the required power, including the construction of additional substations within the refinery. To supply the power, these significant upgrades to the refinery require long permitting and approval from various state agencies (e.g. CEQA), which would cause estimated delay well past the January 1, 2027 compliance deadline.

Chevron completed a preliminary engineering study with PG&E to determine PG&E's ability to serve the additional load at Chevron Richmond Refinery. The study concluded that no changes to the PG&E system are required.

[9] Emission Capture and Control at Berth: Preliminary Safety Recommendations: https://www.ocimf.org/publications/information-papers/emission-capture-and-control-at-berth-preliminary-safety-recommendations

Range of Vessels Calling at Each Berth

Designing a high voltage shore power system for RLW is challenging because vessels of many sizes use the berths, and they could dock on either direction - port or starboard. Each vessel's size and docking position requires different mooring setups, which affects where and how shore power equipment can be installed.

The placement of cable management systems and other equipment must be carefully planned so they do not interfere with mooring lines or other terminal gear. Even if there's space for the equipment, its exact location needs to be evaluated for possible conflicts with vessel mooring arrangements.

Figure 3 shows how this issue appears at Berth 4, where different vessel types and docking directions mean cable connection points can vary by over 200 feet. At the south end, the cable system could be placed above the wharf deck with extra supports, while at the north end, a separate structure and crane would be needed to handle the cables at each end. To add to this situation and complexity is the fact that there is no international standard for shore power connection on tankers and there is no cable management system that has been designed and proven to operate in hazardous work environment.

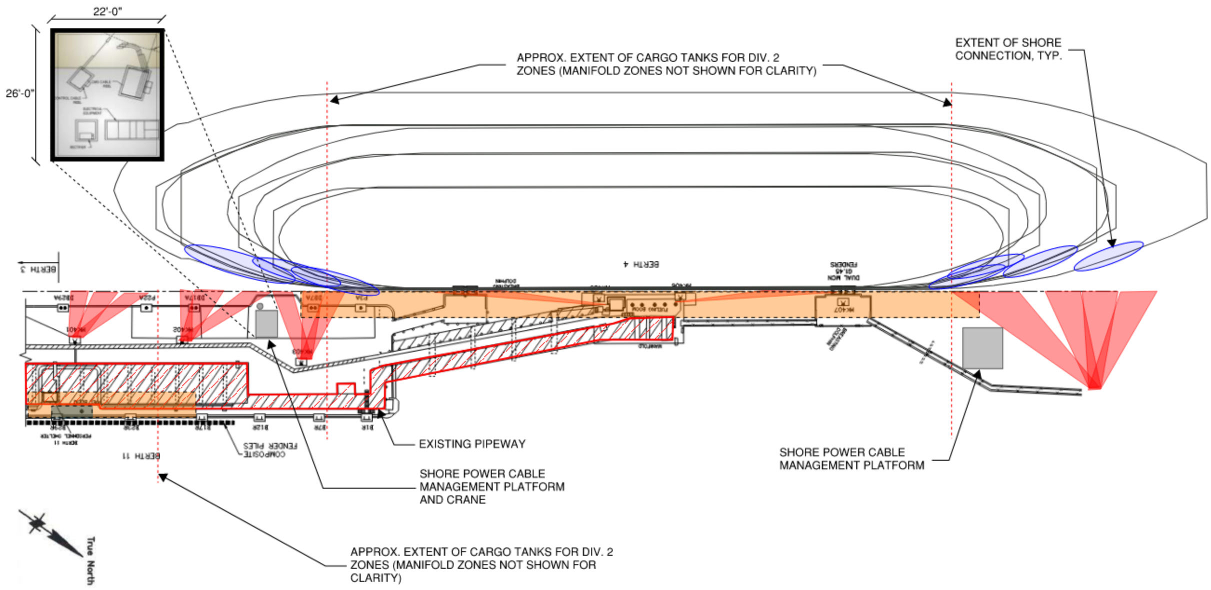


Figure 4: Possible shore power locations at Berth 4 relative to mooring line arrangements for approved vessel classes at berth.

Installation of Equipment in Classified Zones

Chevron has concerns about installing unproven high voltage cables and cable handling equipment within an electrically classified area. Richmond Long Wharf has an electrically classified area (hazard zone) that stretches the length of the long wharf and to a height of 100 feet above the wharf deck. There is no commercially available shore power cable management system that has been demonstrated to be safe and reliable while passing high voltage cables through an electrically classified area. Furthermore, there are no commercially available high voltage cables that simultaneously meet the flexibility requirements of a shore power cable and the material test requirements for hazard zone installation. Chevron retained cable management system maker Cavotec to study the feasibility of designing a shore power cable management system that would pass high voltage cables through the electrically classified areas of RLW. The presence of a hazardous zone at tanker terminals is not unique to Chevron. A shore power system that fits at one oil terminal (such as LB 121) may not work at another oil terminal due to the differences in the shape and coverage of the terminal's hazard zone.

Shore Power Civil Engineering

Chevron has concerns with the size and impact of new foundations that would be required to support the shore power equipment at the RLW. The design requirements of the cable management system, such as the reach requirements and hazard zone crossing, will result in a very large crane. The resulting crane foundation exceeds the structural capacity of the RLW as currently constructed. Significant modification to the wharf would be required to support shore power equipment, including new pilings, platforms, and cable ways. The required heavy modifications to the wharf would change the wharf design and generate impacts to the environment, both of which would need approval from the California State Lands Commission and could require an extensive permitting process.

MOTEMS Conformance

Based on engineering studies that Chevron has completed, our position is that there is a low probability of designing and operating a reliable high voltage shore power system that can meet existing MOTEMS requirements. In addition to identifying a location for the cable management system and crane installation that does not interfere with mooring lines, the system must be certified to pass through electrically classified areas. Further, the system must be able to reach the ship connection points for Chemical carriers to Panamax vessels at Berths 2 and 3, and Product Carriers to VLCCs at Berths 1 and 4. The resulting cable and crane requirements to reach those long distances (145 ft. range) will add reaction forces and high centered masses to the existing RLW structure and will affect the seismic loads on the wharf. The capacity of the existing structure must remain in conformance with the seismic requirements of MOTEMS (California Building Code, Section 3104F). The wharf does not have sufficient seismic capacity for these increased loads. Independent structures will be required for the shore power cable management system.

Concerns regarding shipping fleet and ship/shore interface, and timing for ship retrofits:

Chevron has concerns that a high voltage shore power system designed for RLW may not be utilized by the vessels that call at RLW. A very small percentage, estimated at less than 1%, of the global tanker fleet is equipped with a high voltage shore power system onboard.

Likewise, only a small percentage of large tankers (VLCCs, Suezmax, and Aframax) are fitted with all-electric cargo pumping systems. The typical design for large ocean-going oil tankers is steam-driven cargo pumping systems. Heavy consumers onboard are powered by steam from auxiliary boilers, not electrical power.

Neither the IMO nor any other maritime regulatory body:

- Mandates that tanker electrical power distribution be designed to receive shore power.
- Mandates use of electric cargo pumps in tankers

Independent tanker operators are not incentivized to invest in shore power systems. There are very few oil terminals worldwide where vessels may discharge cargo while connected to shore power.

Adoption of complete shore power systems (auxiliary loads and electric cargo electric pumping systems on shore power) or partial shore power (auxiliary loads on shore power and steam power cargo pumping system by the global tanker industry will require strong guidance from the IMO, classification societies, and international standards.

Chevron continues to drive the development of IEC/IEEE industry standards on high voltage shore power. The goal is to develop shore power technology that is safe, reliable, and feasible to implement at Richmond Long Wharf.

On-Vessel Control Technology

Chevron has also explored potential pathways to compliance that do not involve using capture and control barges or shore power for two sizes of tanker classes in Chevron's operated fleet. However, there are several complications that need to be carefully considered prior to making such modifications.

For smaller, medium range product carriers that use diesel engines to generate hydraulic pressure for pumping cargo via deep well pumps, it may be possible to add aftertreatment systems such as Selective Catalytic Reactors (SCR's) and Diesel Particulate Filters (DPF's) or other technologies to reduce NOx and PM to below CARB emission limits.

For larger tankers that use steam-driven cargo pumps, a concept is being considered that would utilize a combination of flue gas recirculation, steam injection, and specially designed low NOx burner heads and control systems to come under the CARB emission limits.

Chevron is assessing the feasibility of concepts that may allow some vessels to become compliant with CARB At-Berth regulation. Once these engineering studies have matured to a level that gives high confidence to Chevron on successful compliance with the CARB At-Berth regulation, Chevron will engage with CARB and submit applications for new CAECS for each vessel type.

The above-mentioned modifications are only contemplated for a subset of the vessels that Chevron operates. (1) Ship owner's permission, (2) classification society approval, (3) EPA approval, and (4) USCG OCMI inspections and approval would be required for such modifications.

Conclusion

Chevron remains committed to achieving compliance with the CARB At-Berth Regulation at Richmond Long Wharf through ongoing evaluation and implementation of feasible, safe, and reliable emissions reduction strategies. While current technological and operational constraints have limited the immediate adoption of CARB Approved Emissions Control Strategies (CAECS), Chevron continues to advance innovative concepts, collaborate with industry partners to develop guidance for safe adoption of existing approved CAECS, and pursue further research and development on new technologies. These efforts reflect Chevron's dedication to safety, reducing emissions, and supporting environmental stewardship in the surrounding communities as new solutions become viable and approved.

Mapping of submission to requirements

Figure 5: Mapping of submission to CARB-at-berth requirements in Section 93130.14(a) and (b)