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ACRONYMS AND ABBREVIATIONS

2020 and Beyond Plan Final Seaport Air Quality 2020 and Beyond Plan (June 13,

2019)

AB assembly bill

ASC automated stacking crane

BAAQMD Bay Area Air Quality Management District

BACT best available control technology

BNSF Burlington Northern and Santa Fe Railroad

Board of Port Commissioners

CAAP Clean Air Action Plan (prepared by the Ports of Los Angeles

and Long Beach)

CARB California Air Resources Board

CE Clean Energy Fuels, Inc.

CEPP U.C. Berkeley Goldman School of Public Policy/Center for

Environmental Public Policy

CHC commercial harbor craft (same as harbor craft)

CHE cargo-handling equipment

City of Oakland

CNG compressed natural gas

CTMP Port of Oakland Comprehensive Truck Management Plan

DGE diesel gallon equivalent

DOC diesel oxidation catalyst

DPF diesel particulate filter

DPM diesel particulate matter

EBMUD East Bay Municipal Utilities District

EDF Environmental Defense Fund
EIR environmental impact report

EJ/WOEIP Earth Justice/West Oakland Environmental Indicators Project

FITS Freight Intelligent Transportation System

GHG greenhouse gas

GSPP U.C. Berkeley Goldman School of Public Policy/Center for

Environmental Public Policy

HC harbor craft

HEPA high-efficiency particulate filter

HVIP Hybrid and Zero-Emission Truck and Bus Voucher Incentive

Program

IMO International Maritime Organization

ITS intelligent transportation system

JPA joint powers authority

LCFS Low Carbon Fuel Standard

LEED Leadership in Energy and Environmental Design

LNG liquefied natural gas

LPG liquefied petroleum gas

MARPOL The International Convention for the Prevention of Pollution

from Ships

MOU memorandum of understanding

MTC Metropolitan Transportation Commissions

MY model year

NOx oxides of nitrogen

NTAP Seaport Air Quality 2020 and Beyond Plan/Near-Term Action

Plan

NZE near-zero-emissions

OAB Oakland Army Base

OEM original equipment manufacturer

OGRE Oakland Global Rail Enterprise

OGV ocean-going vessel

OIG Oakland International Gateway (BNSF Railyard)

PM particulate matter

Port of Oakland

PETF Port Efficiency Taskforce

PV photovoltaic

RTG rubber-tired gantry crane

SB senate bill

SCA/MM standard condition of approval/mitigation measure

SCR selective catalytic reduction

SEP supplemental environmental project

STEP Port of Oakland Secure Truck Enrollment Program

SPBP San Pedro Bay Ports

TAP San Pedro Bay Ports' Technology Advancement Program

TCM transportation control measure

TMP West Oakland Truck Management Plan

TRU transport refrigeration unit

UP or UPRR Union Pacific Railroad Company

U.S. EPA or EPA United States Environmental Protection Agency

VSR vessel speed reduction

WOCAP West Oakland Community Action Plan (AB 617)

ZANZEFF Zero and Near-Zero Emissions Freight Facilities

ZE zero emissions

SEAPORT AIR QUALITY 2020 AND BEYOND PLAN: THE PATHWAY TO ZERO EMISSIONS

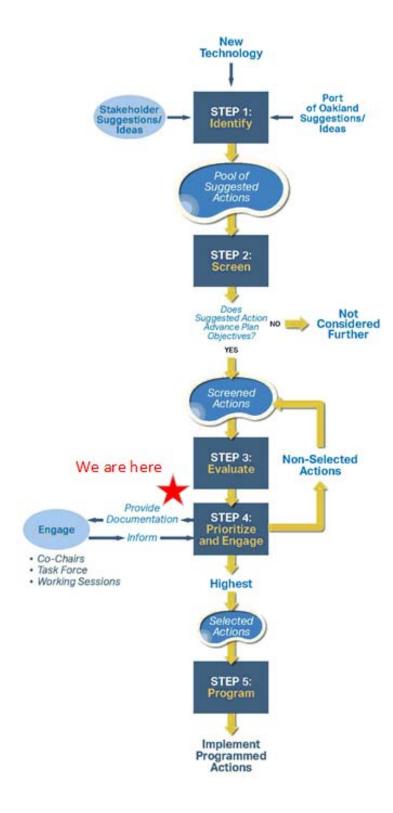
Memorandum - Evaluation and Prioritization of Screened Actions

INTRODUCTION

On June 13, 2019, the Board of Port Commissioners approved the Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions ("2020 and Beyond Plan" or "Plan") (Port 2019a). The 2020 and Beyond Plan was developed with input from stakeholders through the 2020 and Beyond Plan Task Force and includes an on-going process to engage stakeholders in the implementation of the Plan. During development of the 2020 and Beyond Plan, both the Port and stakeholders identified actions that could contribute to implementation of the Plan. These actions are designated "Suggested Actions."

The 2020 and Beyond Plan includes a comprehensive five-step process to screen and evaluate Suggested Actions. The purpose of the five-step screening and evaluation process is to identify actions that are most effective at furthering the goals of the 2020 and Beyond Plan. This process is detailed in Appendix D: Screening and Evaluation of Implementing Actions (see Figure 1: Screening and Evaluation Process Diagram). Under the five-step process, Step 1: Identify, is the identification of Suggested Actions. All actions, whether identified by the Port or suggested by stakeholders, are initially classified as Suggested Actions and compiled into Pool #1. In Step 2: Screen, each Suggested Action is screened to determine whether it meets the criteria in Table D-1: Screening Criteria. Actions that pass the screening step are classified as "Screened Actions" and are placed into Pool #2. As described in the Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions Memorandum - Screening of Suggested Actions ("Screening Memo") (Port 2020), 196 actions passed Step 2: Screen. Of these, 57 are already in progress or completed and do not require evaluation in subsequent steps. The Screening Memo provides a summary of Step 2 and the screening results for each Suggested Action. In addition, as provided for in the 2020 and Beyond Plan, if a new Suggested Action is sufficiently compelling, it may be screened on an individual basis. Suggested Action 282: Retrofit Tugs with Diesel Particulate Filters, was screened individually and passed the screening step.

Figure 1: Screening and Evaluation Process Diagram



Source: Port of Oakland 2019 (Port 2019a)

Following Step 2, the Port began Step 3: *Evaluate* and Step 4: *Prioritize and Engage* for the 139 Screened Actions in Pool #2. Given the number of Screened Actions (i.e., 139 actions), the Port is performing evaluation and prioritization by group (i.e., Group 1, Group 2, etc.) of approximately 20 actions at a time. This Evaluation and Prioritization Memorandum (Memorandum) documents the Step 3 evaluation and Step 4 prioritization methodology for Screened Actions and the results for the first group (Group 1) of Screened Actions. The actions that rank highest in Step 4 are classified as "Selected Actions." In Step 5: *Program*, Selected Actions will be considered for implementation as Port resources capacity allows and as Port-related businesses and other stakeholders are willing to take on new actions. As part of Step 5, Port staff will analyze and recommend the Selected Actions for project and budget approval by the Board. The staff recommendation is informed by the Co-Chairs and Task Force engagement undertaken in Step 4. The Board retains sole and absolute discretion to decide whether to approve or disapprove the recommendation.

To complete Step 4, Port staff provide documentation for Steps 1 and 2 for all Suggested Actions, and documentation for Steps 3 and 4 for Group 1 to the 2020 and Beyond Task Force Co-Chairs for their review, presentation to the Task Force, and feedback from the Task Force. The documentation is in the form of memoranda supported by detailed tables. As provided in the Plan in Step 4, where needed or desired, the Co-Chairs may convene Working Sessions, which will include Task Force members, for collaborative problem-solving on Selected Actions specified by the Co-Chairs and the Task Force. The Co-Chairs will document the Working Sessions to inform the qualitative assessment of specified Selected Actions.

Group 1 consists of 1) those strategies from the *West Oakland Community Action Plan* (WOCAP 2019), which designate the Port as the agency to implement these strategies as well as 2) four (4) additional actions identified by Port staff as having high potential for exposure reduction or a high level of stakeholder interest. The evaluation results for Group 1 are presented in matrix format in Table 1: *Step 3 Evaluation - Group 1* provided at the end of this Memorandum.

Following completion of the Step 3 evaluation and Step 4 prioritization for Group 1, the Port will continue with the evaluation and prioritization process for subsequent groups, until all 139 Screened Actions currently in Pool #2 have been evaluated and prioritized. The results of the Step 3 evaluation and Step 4 prioritization for subsequent groups of Screened Actions will be documented in the form of Addenda to this Memorandum. Like the process for Group 1, the Port will provide the Addenda for Steps 3 and 4 to the Co-Chairs. The Task Force Co-Chairs will also present the Step 3 and 4 results for subsequent groups of actions to the Task Force for feedback, and continue to convene Working Sessions, as needed.

In the future, after all Screened Actions currently in Pool #2 have been evaluated and prioritized, the Port will conduct new rounds of evaluation and prioritization. Future rounds of evaluation and prioritization may be triggered as (1) new Suggested Actions are identified and pass Step 2: *Screening*, (2) actions that are currently in progress are completed and the Port and stakeholders have the capacity to undertake additional actions, and (3) technology continues to mature and the ratings of actions change as a result. The frequency of Step 3 and 4 evaluation and prioritization cycles will depend on the rate at which actions that are currently in progress are completed, technology continues to mature and improve, and new Screened Actions are identified. (Note: The Port has committed to tracking technology development as part of the 2020 and Beyond Plan, including specific tracking actions in the Near-Term Action Plan.) All Screened Action will remain in Pool #2 until they are either selected for implementation or it becomes clear over time that an action would never be ranked high enough to be selected for implementation. Any actions removed from Pool #2 because they will never be ranked high enough to be selected for implementation will documented by the Port as actions that did not pass Step 2: *Screen*.

STEP 3: EVALUATION - METHODOLOGY

Step 3 assesses each Screened Action against the seven feasibility criteria provided in the 2020 and Beyond Plan, Table 2: *Feasibility Criteria*, as applicable. Certain feasibility criteria, such as cost effectiveness, only apply to some actions.

Table 2. Feasibility Criteria								
Feasibility Criterion	Description							
Exposure Reduction Affordability	Does the Screened Action contribute to efforts to reduce community exposure to pollutants that are harmful to public health? Has the Board of Port Commissioners approved Port of Oakland (Port) funds							
Allordability	for the Screened Action or do the Port's budget projections indicate that sufficient funding is likely to be available given all other budget considerations? How does the cost of any zero-emissions equipment compare to its diesel-powered counterpart? Do projected Port net revenues support any longer-term associated costs? If the Screened Action will be implemented by an organization other than the Port, has that organization decided that the Screened Action is affordable according to its criteria? Is grant or other incentive funding available, and what is the level of effort required to apply for the funding? Would the Screened Action potentially result in stranded equipment or infrastructure, or jeopardize usage requirements for any grantfunded equipment already in place? Would the Screened Action impose an additional expense on the Port or Port-related business which would result in job losses, slowed job growth or other unacceptable, significant economic impacts?							

Table 2. Feasi	bility Criteria
Feasibility Criterion	Description
Cost- Effectiveness	Does the Screened Action provide cost-effective emissions reductions?
Commercial Availability	Has the proposed technology or system associated with the Screened Action reached commercial availability (Technological Readiness Level [TRL] 9) or, at a minimum, the pre-production stage (TRL 7)? (See Table D-3 for Technological Readiness Levels.) Is the equipment readily available from multiple vendors, and is there adequate competition in the marketplace?
Operational Feasibility	Is there sufficient experience with the technology or equipment to determine that its operational performance is acceptable? Are parts readily available and are repair and maintenance services available nearby? Does the existing workforce have sufficient training and experience to operate the new technology or equipment? Can routine maintenance be performed in-house?
Acceptability	Is there a party or entity willing to undertake the Screened Action, given the range of other considerations, such as availability of land, constraints on current or future operations, or financial capability? Does the Screened Action allow for continued reliable and satisfactory service delivery to customer(s)?
Need	 Is the Screened Action needed to keep the Port operational, or has a Port tenant or Port-related business determined that the Screened Action is required to keep it operational? Does the Screened Action complement other initiatives or programs that aim to reduce emissions-related health risk in the local community? How urgent is the Screened Action (e.g., is lack of electrical infrastructure preventing further deployment of battery-electric equipment)? Is the Screened Action part of a planned program, such as ongoing investment in capital equipment? Will the Screened Action result in a delay or cancellation of other (non-air-quality-focused) priority projects? Will the Screened Action substantially advance experience with a certain type or class of equipment? If the Screened Action provides emissions reductions benefits, do the associated emissions reductions benefits accrue near the local community? Will the Screened Action build capacity (such as expanding maintenance and repair services for battery-electric equipment or providing training for electric vehicle mechanics)?

Step 3: *Evaluate* consists of three tasks:

- 3.a: Identify Screened Action that are similar and compile similar actions into Screened Action *Categories* if there are seven or more similar Screened Actions. (Note: Categories are those used in the Plan for Suggested Actions. See Appendix C and tables for detailed presentation of categories.)
- 3.b: Assign Screened Actions to *Groups* based upon factors such as the level of stakeholder interest and potential exposure reduction.
- 3c: Evaluate all Screened Actions against the seven feasibility criteria provided in Table 2, either by category or individually within a group, as applicable.

TASK 3.A: COMPILE SIMILAR SCREENED ACTIONS INTO CATEGORIES

As discussed in the Screening Memo, the 39 Suggested Actions that were duplicates of other Suggested Actions were removed from further consideration so that each action was only screened once. Actions that were similar but not identical were screened individually. In Step 3.a, Port staff compiled similar actions into a Category for a generalized evaluation. While there may be small differences in ratings among these actions, the overall assessment is similar. The evaluations for these Categories will be provided the Addenda for Groups 4 and 5 and the evaluation of a specific Screened Action will be presented in the evaluation matrix. The Port currently anticipates generalized evaluations for Screened Actions in the following categories:

- Grant funding (Category: Funding Actions)
- Infrastructure planning (Category: Infrastructure), and
- Lease and other tenant requirements (Category: Operations)

TASK 3.B: ASSIGN SCREENED ACTIONS TO GROUPS

As discussed above, Group 1 consists of Port-related strategies in the WOCAP, as well as four additional actions identified by Port staff as having either a high potential of generating emissions reductions or being of high interest to local stakeholders. Because some of the WOCAP strategies comprise several specific actions, the Port differentiated these specific and for screening in Step 2. Additionally, one WOCAP strategy, Strategy 5 (Suggested Action 185, Accelerated Relocation of Non-Conforming Truck Businesses) did not pass Step 2 because it is under the purview of the City of Oakland pursuant to the West Oakland Specific Plan and does not include a role for the Port. Table 3, below, shows the list of the 20 Screened Actions in Group 1.

Table 3. Screened Actions Included in Group 1								
Screened Action No.	Source	Screened Action Name						
183	Port Staff	Provide Common Drayage Truck Charging Infrastructure						
186	WOCAP # 19	Adopt Electrical Infrastructure Plan Incorporating Trucks						
187	WOCAP # 21	Create Sustainable Freight Advisory Committee						
188	WOCAP # 26	Establish Permanent Truck Parking & Container Staging in Logistics Area						
189	WOCAP # 37	Set Interim Targets for Zero Emissions Trucks						
190	WOCAP # 37	Commercialization Effort for ZE Trucks						
191	WOCAP # 37	Increase Weight Limit for Single Axle Zero-Emissions Trucks						
192	WOCAP # 37	Develop Investment Plan for Port Infrastructure						
193	WOCAP # 37	Study Favorable Time-of-Day Electricity Rate Structure for Truckers						
194	WOCAP # 42	Award Long-Term Lease for Trucker Services Center						
195	WOCAP # 43	Study Effects of Larger Vessels on Truck Traffic						
196	WOCAP # 43	Study Feasibility of Off-Dock Yard Using ZE Trucks						
197	WOCAP # 43	Study Efficiency Gains from Increased Truck Double-Cycling						
198	WOCAP # 50	Use Air District Incentives to Upgrade Tugs and Barges						
199	WOCAP # 63	Implement a Clean Ship (Tier 3 Vessel) Program						
200	WOCAP # 64	Implement a Clean Locomotive (Tier 4 Locomotive) Program						
201	WOCAP # 65	Study Feasibility of Electric Switchers at BNSF, OGRE						
217	Port Staff	Low Sulfur Diesel Fuel in Ocean-Going Vessels						
280	Port Staff	Pursue a Hydrogen Fuel Cell Demonstration Project						
282	Port Staff	Retrofit Tugs with Diesel Particulate Filters						

The Port assigned the remaining Screened Actions to Groups 2 through 6, as follows, based on their potential to provide emissions reductions and community and other stakeholder interest in the actions:

- Group 2: Actions related to those in Group 1. Evaluation of Group 2 will complete the Port's evaluation of tug actions, and includes actions for ocean-going vessels (OGVs) and trucks. The information developed by the Port for Group 1 actions is sufficient to complete the evaluation of Group 2 actions.
- Group 3: Group 3 actions consist of OGV actions for which quantitative emissions reduction and cost estimate information still need to be developed. These include shore power, "bonnet," and vessel speed reduction actions, other truck actions not included in Groups 1 and 2, and actions involving differential truck or ship fees to incentivize cleaner equipment (also known as a truck or ship "rate.")
- Group 4: Group 4 includes actions pertaining to technology development not included in Groups 1 − 3 (i.e., demonstration projects, technology tracking, and target-setting actions, etc.), Operations category actions involving lease and other tenant requirements, and the Funding category actions involving grant funding. The Port will provide a generalized

evaluation for actions in the leasing and funding categories, in addition to evaluating and prioritizing specific actions in Group 4.

- <u>Group 5</u>: Actions in Group 5 consist of alternative fuels/NOx emissions reductions actions (including hydrogen infrastructure, LNG tugs, etc.), alternative/green energy actions, and Infrastructure category actions pertaining to infrastructure planning. The Port will provide a generalized evaluation for actions in the infrastructure category, in addition to evaluating and prioritizing specific actions in Group 5.
- <u>Group 6</u>: Group 6 comprises the remaining actions. This group includes other studies not captured in Groups 1 5, outreach/partnership actions not captured in Groups 1 5, low priority actions, and funding/financial plan actions.

These groups may be adjusted depending on Task Force feedback.

TASK 3.C: EVALUATE AND PRIORITIZE SCREENED ACTIONS IN GROUPS BY FEASIBILITY CRITERIA

The Port evaluates each individual Screened Action or category of actions against the seven feasibility criteria. For some actions, certain feasibility criteria do not apply; for example, conducting a study would not directly reduce emissions or exposure. The evaluation matrix shows the ratings for these actions as N/A, and describes why the criterion is not applicable for that action. Table 1 provides the evaluation matrix for Group 1 actions.

Five of the criteria are *qualitative* criteria. Two criteria, cost effectiveness and commercial availability, can be evaluated on a *quantitative* basis for some actions. Evaluations that include a quantitative evaluation for cost effectiveness and/or technological readiness criteria are considered *quantitative* evaluations. The evaluation matrix shows whether a given action was evaluated on a qualitative or quantitative basis. Evaluation ratings are None, Low, Moderate, or High for each applicable criterion, either quantitative or qualitative. If there is insufficient information to make an evaluation of a specific action against a criterion, that action receives an "Unknown" rating for that action. The basis for each rating is provided in the evaluation matrix. The methodology for assessing each action's performance against the seven feasibility criteria is provided below.

Criterion 1: Exposure Reduction

Exposure reduction can be provided by emissions reductions relative to existing operations and by moving emissions sources farther from the community. Exposure reduction was evaluated on a qualitative basis because conducting a health risk assessment is not within the scope of the Plan.

The evaluation of whether an action by itself would provide exposure reduction through emissions reductions requires consideration of related actions. Often it is related actions, which contribute the most to emissions reductions and, by extension, reduces exposure. As an example, to promote increased use of zero-emissions cargo handling equipment (CHE) at the Seaport, the Port or tenant would first conduct comprehensive infrastructure planning, then conduct specific engineering for the tenant's location followed by infrastructure construction and deployment of zero-emissions CHE. There may also be required demonstration testing for each class of CHE as well as grant applications to minimize financial barriers to equipment deployment. Given the complexity of evaluating related actions, the Port evaluated exposure reduction only for actions that directly resulted in a change to cleaner equipment (i.e., either deploying cleaner equipment or incentives that resulted in cleaner equipment, etc.), thereby providing emissions reductions and by extension, exposure reduction.

The sources for emissions reductions estimates were 1) technical memoranda prepared for this evaluation (see Ramboll 2020a, b, c, d) and 2) available information on emissions by equipment category from the 2017 Emissions Inventory (Ramboll 2018), and the associated information on the number of pieces of equipment contained in that equipment category. This information provides an estimate of the emissions reductions achievable by converting each piece of equipment to zero emissions and can then be combined with the likely number of pieces of equipment to be upgraded to cleaner equipment because of the action. For example, for actions leading to the replacement of diesel trucks with zero-emissions trucks, the exposure reduction criterion considers the average per-truck DPM emissions reduction and the number of trucks likely to be affected. The estimated annual DPM emissions reduction benefit associated with converting all trucks in the Port's STEP registry (approximately 6,000 trucks) to zero-emissions trucks is 0.3 tons, ^{1,2} leading to estimated DPM emissions reductions of 0.00005 tons per truck converted to zero emissions. Therefore, the exposure reductions achievable by converting many trucks to zero emissions would be very small. As another example, actions reducing diesel truck emissions (e.g., by reducing the number of truck trips) would result in smaller emissions reductions than converting a truck to zero emissions. For context, the total estimated annual Seaport-related DPM emissions in 2017 was 35.8 tons (Ramboll 2018). The qualitative assessment approach provides sufficient information to evaluate the exposure reduction potential of an action based upon the likely emissions reductions and rate the specific action accordingly.

¹ This is the Port's "best estimate" of Calendar Year 2017 truck-related DPM emissions developed using current methodology. Emissions estimates based on current methodology are found in Tables 8.1a and 8.1b of the 2017 Port emissions inventory (Ramboll 2018).

² 2020 emissions would be even lower because turn-over of older trucks to trucks with cleaner engines is an ongoing process.

Criterion 2: Affordability

Affordability was evaluated for each action individually. Where applicable, the rating was adjusted to reflect the affordability of a group of similar actions. For example, an individual study may be affordable for the Port; however, concurrent multiple studies may be less affordable. Consequently, studies that would be performed by the Port were generally rated as moderate in affordability. Affordability will also be a consideration in the selection of actions recommended for implementation. As the current (Spring 2020) COVID-19 crisis indicates, the Port's and its partner agencies' ability to support implementation is subject to many factors, some of which are outside the Port's control.

Criterion 3: Cost Effectiveness

Quantitative emissions reductions estimates were developed for equipment actions only and are provided in four technical memoranda referenced above. Emissions reductions estimates were developed for DPM, criteria air pollutants, and GHGs, as appropriate for the equipment type. Quantitative estimates of emissions reductions form the basis for the cost effectiveness evaluation.

Costs for most actions were very difficult to define. Unlike cost effectiveness calculations for grant applications, where the specific types of equipment and associated installation or construction cost have been determined, estimated costs here can only be defined in ranges. In many cases there is insufficient information to develop a reasonable cost range. This is particularly true for actions that focus on technology that is not yet available. Developing cost estimates for actions that involve providing incentives to deploy cleaner equipment is also challenging as the amount of incentives that will achieve specific levels of response at the Port of Oakland is unknown. In most cases therefore, a unit cost effectiveness (\$/tons of emissions reduced) could not be established. However, it was sometimes possible to estimate *relative* costs as discussed in the presentation of results for Group 1.

Where reasonably accurate cost estimates could be developed, cost effectiveness was calculated as the *estimated annual cost per ton of annual emissions reduced*. The cost effectiveness criterion considered criteria pollutants and GHGs. These constituents were evaluated independently, considering both the total quantity of emissions reductions and, where available, the cost per ton of emissions reductions. When the cost/ton of emissions reductions is low, cost effectiveness is high. Low cost effectiveness means that the cost/ton of emissions reduced is high.

For certain actions, the Port developed a qualitative cost effectiveness assessment. The 2017 Emissions Inventory (Ramboll 2018) provides total emissions by equipment category. When an equipment class contains many pieces of equipment and generates only small quantities of emissions, as is the case for drayage trucks, the small quantities of emissions reductions that could be achieved would generally have a high cost because a lot of equipment would have to be replaced or upgraded. Therefore, actions pertaining to drayage trucks would have low cost effectiveness.

Criterion 4: Commercial Availability

This criterion only applies to actions involving equipment or infrastructure. As discussed in Appendix D of the Plan, commercial availability is evaluated using Technological Readiness Levels (TRLs). The TRLs presented in Appendix D were modified slightly from those used by the US Department of Energy to be more specifically applicable to actions that could occur as part of Plan implementation. Equipment and infrastructure actions meeting or exceeding TRL 9 were rated as High for commercial availability. Equipment and infrastructure actions meeting TRL 8 were rated as Moderate; all other TRL levels were rated as Low. The commercial availability rating of various equipment and infrastructure actions will change over time and will be updated as needed in future rounds of evaluation.

Criterion 5: Operational Feasibility

The operational feasibility criterion is focused on equipment and infrastructure actions. However, certain other actions could have operational constraints such as staffing or other administrative factors. For example, it is operationally feasible for the Port to conduct studies. However, the number of studies that the Port can conduct is subject to availability of staffing and budget resources. Thus, while studies are operationally feasible for the Port, they received a rating of Moderate to reflect the fact that only a limited number of studies can effectively be contracted and managed at any one time. A similar situation exists for Port actions involving planning and incentive programs. Planning and incentive programs actions received a Moderate rating for operational feasibility.

Criterion 6: Acceptability

The acceptability criterion reflects the willingness of an organization to implement the action. Step 2: *Screen* included consideration of potential adverse side effects, and thus addressed the potential for an action to be unacceptable to stakeholders affected by that action. Screened Actions would be undertaken by the Port or a Port-related business. The evaluation provides information on the acceptability of various actions to the Port, and the Port's understanding of Port-related businesses' willingness to undertake actions under their purview.

Criterion 7: Need

The Need criterion addresses qualitative aspects not reflected in the other feasibility criteria that may influence decision to select an action for implementation, such as increasing operational experience with zero-emissions equipment. While the description of this criterion included eight factors, other factors might affect the assessment of Need. The evaluation describes how the Screened Action satisfies any of the identified Need factors or other Need factors that are not specifically enumerated in the description of the criterion. Screened Actions that do not address a specific Need factor rate Low on this criterion. Screened Actions that address multiple Need factors (i.e., three or more) rate High on this criterion.

STEP 3 EVALUATION RESULTS SUMMARY - GROUP 1 SCREENED ACTIONS

Group 1 consists of 20 Screened Actions. Table 1 provides the detailed evaluation results for each of these Screened Actions. Based on availability of data, the Port conducted a qualitative evaluation for 14 of the Group 1 actions, and a quantitative evaluation for six of the Group 1 actions.

The evaluations showed that several actions received multiple high ratings (e.g., Action 198: *Use Air District Incentives to Upgrade Tugs and Barges* was rated High for four criteria), and some actions only received low ratings (e.g., Action 187: *Create Sustainable Freight Advisory Committee*). A summary of findings for each evaluation criterion is provided below.

Criterion 1: Exposure Reduction

Nine of the 20 actions evaluated provide exposure reduction through emissions reductions. The remaining actions are studies, plans, or similar actions that would not on their own provide direct emissions reductions, and therefore would not provide any exposure reduction. The potential direct emissions reductions ranged from very small reductions (e.g., Action 280: *Pursue a Hydrogen Fuel Cell Demonstration Project*) to substantial reductions for Action 198: *Use Air District Incentives to Upgrade Tugs and Barges*.

Criterion 2: Affordability

The Port had sufficient information to evaluate affordability for 16 of the 20 Group 1 actions. Affordability was not applicable to two actions (Actions 187: *Create Sustainable Freight Advisory Committee* and 189: *Set Interim Targets for Zero Emissions Trucks*. The Port had insufficient information to evaluate the affordability of Action 200: *Implement a Clean Locomotive (Tier 4 Locomotive) Program* and Action 280: *Pursue a Hydrogen Fuel Cell*

Demonstration Project. These two actions were rated Unknown ("Unk.") for affordability. The affordability of other actions ranged from Low to High. Studies, plans, and similar actions that are individually affordable to the Port but could result in a high cumulative cost if several of these actions are implemented were rated as Moderate for affordability.

Criterion 3: Cost Effectiveness

As previously stated, nine actions would provide emissions reductions. Of these, six were evaluated on a quantitative basis and three on a qualitative basis. The Port developed a cost estimate four of the twenty actions in Group 1. This is not surprising because much of the technology included in the Screened Actions is too new to have established pricing. In some cases, information on equipment pricing was available, but operational costs could not be determined. Table 1 provides available cost information as part of the discussion for the cost effectiveness criterion. Because all criteria are rated on a None/Low/Moderate/High scale, qualitative information is sufficient to develop a rating for the cost effectiveness criterion.

Criterion 4: Commercial Availability

The commercial availability criterion was applicable to seven actions. In all cases, it was apparent whether a given technology was commercially available. Three of the seven actions received a High rating; the other three, associated with technology that is still in the developmental stage, received a Low rating.

Criterion 5: Operational Feasibility

The operational feasibility criterion was applicable to all 20 Group 1 actions. Actions based on proven, in-use technology were rated High for this criterion. Conversely, if the technology or process is still in the developmental stage, the action was rated Low. Studies, plans, and similar actions are individually operationally feasible for the Port, but could result in a high cumulative staff needs if several of these actions are implemented. Therefore, these types of actions were rated as Moderate for operational feasibility.

Criterion 6: Acceptability

The Acceptability criterion was applicable to all 20 Group 1 actions. In general actions that are low in cost and high in operational feasibility are rated High for acceptability. Increasing cost and complexity typically reduce the rating for this criterion. Actions that pose a potential safety hazard or produce negligible emissions reductions at a high cost are rated "None" for acceptability. The acceptability criterion was the only criterion for which any actions received a "None" rating.

Criterion 7: Need

The Need criterion was applicable to all 20 Group 1 actions. Only three actions were rated High for the Need criterion; nine did not satisfy any of the factors comprising the Need criterion and received a Low rating.

STEP 4: PRIORITIZATION - METHODOLOGY

In Step 4: *Prioritize and Engage*, the Port first converts the ratings for each Screened Action into a numerical score to provide an initial assessment of the relative performance of each Screened Action. Next, the Port reviews all the actions relative to each other. For example, Action 282: *Retrofit Tugs with Diesel Particulate Filters* (DPFs) would result in emissions reductions approximately equal to either 1) converting all drayage trucks serving the Port to zero emissions or 2) converting all locomotives in the Seaport area to zero emissions. In addition, Action 282 would be easier and less costly to implement, thus making it preferable to actions that would convert all drayage trucks or all locomotives serving the Seaport area to zero emissions. However, Action 282 is also the only action that would result in an increase in fuel consumption (and therefore GHG emissions) and is one of the few actions that might result in increased operational costs for tug operators. In addition, its cost effectiveness is much lower than the cost effectiveness of Action 198: Use Air District Incentives to Upgrade Tugs and Barges. Relative considerations of this type influenced prioritization of actions in Step 4.

If two actions ranked similarly in the initial assessment, the action providing more cost-effective emissions reductions would be deemed preferable. If cost effectiveness could not be calculated, the action providing higher overall emissions reductions would be generally preferable, provided the action were also affordable.

STEP 4: PRIORITIZATION - GROUP 1 SCREENED ACTIONS

Table 4 summarizes the evaluation ratings for each of the 20 Screened Actions in Group 1. The highest-ranking actions are:

- Action 198: Use Air District Incentives to Upgrade Tugs and Barges
- Action 188: Establish Permanent Truck Parking & Container Staging in Logistics Area

These actions are described further below.

Action 198 is ranked first. Action 198 assumes that all tugs would be upgraded to Tier 4 engines prior to the regulatory deadline for doing so (anticipated for 2026). Retrofitting the nine tugs that

Table 4. Summary of Evaluation and Prioritization Results for Group 1 Actions											
Action No.	Name of Suggested Action	Qualitative or Quantitative Evaluation?	1 - Exposure Reduction	2 - Affordability	3 - Cost Effectiveness	4 - Commercial Availability	5 - Operational Feasibility	6 - Acceptability	7 - Need		
198	Use Air District Incentives to Upgrade Tugs and Barges	Quantitative	Н	M	M	Н	M	Н	Н		
188	Establish Permanent Truck Parking & Container Staging in Logistics Area	Qualitative	L	M	N/A	N/A	Н	Н	M		
217	Low Sulfur Diesel Fuel in Ocean-Going Vessels	Quantitative	Н	L	L	Н	M	L	Н		
186	Adopt Electrical Infrastructure Plan Incorporating Trucks	Qualitative	N/A	M	N/A	N/A	M	M	M		
192	Develop Investment Plan to Support Port Infrastructure for Truck Charging	Qualitative	N/A	M	N/A	N/A	M	M	M		
193	Study Favorable Time-of-Day Electricity Rate Structure for Truckers	Qualitative	N/A	M	N/A	N/A	M	M	M		
195	Study Effects of Larger Vessels on Truck Traffic	Qualitative	N/A	M	N/A	N/A	M	M	L		
280	Pursue a Hydrogen Fuel Cell Demonstration Project	Qualitative	L	Unk.	L	L	L	Н	Н		
194	Award Long-Term Lease for Trucker Services Center	Qualitative	N/A	L	N/A	N/A	M	L	M		
197	Study of Efficiency Gains from Increased Truck Double-Cycling	Qualitative	N/A	M	N/A	N/A	M	L	L		
201	Study Feasibility of Electric Switchers at BNSF, OGRE	Qualitative	N/A	M	N/A	N/A	M	L	L		
183	Provide Common Drayage Truck Charging Infrastructure	Qualitative	N/A	L	N/A	L	L	M	M		
282	Retrofit Tugs with Diesel Particulate Filters (DPFs)	Quantitative	L	L	L	L	L	L	M		
200	Implement a Clean Locomotive (Tier 4 Locomotive) Program	Quantitative	L	Unk.	L	Н	L	L	L		
187	Create Sustainable Freight Advisory Committee	Qualitative	N/A	N/A	N/A	N/A	L	L	L		
189	Set Interim Targets for Zero Emissions Trucks	Qualitative	N/A	N/A	N/A	N/A	L	L	L		
199	Implement a Clean Ship (Tier 3 Vessel) Program	Quantitative	L	L	L	L	L	L	L		
190	Commercialization Effort for ZE Trucks	Qualitative	L	L	L	N/A	L	None	M		
196	Study Feasibility of Off-Dock Yard Using ZE Trucks	Quantitative	L	L	L	N/A	M	None	L		
191	Increase Weight Limit for Single Axle Zero-Emissions Trucks	Qualitative	N/A	L	L	N/A	L	None	L		

provide approximately 80% of tug services related to the Seaport with Tier 4 engines would provide substantial DPM emissions reductions (an estimated 2.09 tons/year). Tug emissions comprise the second largest category of DPM emissions at Seaport after ocean-going vessels. Based on the 2017 Emissions Inventory (Ramboll 2018), DPM emissions from tugs exceed the *combined* DPM emissions from dredges, cargo-handling equipment, trucks, locomotives, and construction and maintenance equipment. Due to the location of the emissions (close to the ground), tug emissions also have a high per-ton exposure factor compared to ocean-going vessels (which have tall exhaust stacks providing greater dispersion of emissions). Tier 4 engines for tugs are available. While retrofitting a tug is a complex undertaking, substantial emissions reductions could be generated from retrofitting a relatively small amount of equipment (i.e., nine tugs). The primary challenges with this Selected Action are likely to be the availability of sufficient incentives to modify all nine tugs and the ability of tug boat operators to take their vessels out of service for the duration of the retrofit period.

Action 188 is ranked second. This action was evaluated on a qualitative basis and received high ratings for operational feasibility and acceptability. Providing a permanent truck parking area within the Seaport would maintain existing emissions reductions achieved by the temporary parking currently being provided by the Port. This action could also provide an opportunity to install common truck charging stations in the future.

These highest-ranking actions are considered Selected Actions, and may be recommended for implementation in Step 5: *Program*. The Port will conduct other rounds of evaluation and prioritization in the future. The frequency of future rounds will be determined by: (1) the rate at which new Suggested Actions are identified and pass Step 2: *Screen*, (2) actions currently in progress are completed (the Port and stakeholders have the capacity to undertake additional actions), and (3) technology continues to mature and the ratings of actions may change as a result.

NEXT STEPS

The information developed as part of the evaluation and prioritization of Group 1 actions will be presented to the 2020 and Beyond Plan Task Force Co-Chairs in April 2020 for their review and presentation to the Task Force. The Port has scheduled Task Force meetings in May 2020 in the form of one-hour webinars in conformance with public health guidelines during the COVID-19 period. At the webinars, the Co-Chairs will receive input from the Task Force members on the Co-Chairs review of the analysis documentation of Steps 2-4 developed and provided by the Port. As appropriate, the Co-Chairs will convene a Working Session, which will include Task

Force members, for collaborative problem-solving on Selected Actions specified by the Co-Chairs and the Task Force. The Co-Chairs will document the Working Sessions to inform the qualitative assessment of specified Selected Actions.

After the Co-Chairs and the Task Force complete their review, as part of Step 5, Port staff will recommend certain Selected Actions for project and budget approval by the Board. The staff recommendation will be informed by the Co-Chairs and Task Force engagement undertaken in Step 4. The Board retains sole and absolute discretion to decide whether to approve or disapprove the recommendation. Following Board approval, the Selected Action is classified as a "Programmed Action" and implementation planning can begin. Programmed Actions will be added to the Near-Term Action Plan. If the Board does not approve the Port staff recommendation, Port staff will respond to the Board's direction. Other organizations may choose to fund and schedule an Implementing Action. In this case, Port staff will classify a non-Port-sponsored actions as a "Programmed Action."

REFERENCES

Bay Area Air Quality Management District and West Oakland Environmental Indicators Project. 2019. Final Owning Our Air: West Oakland Community Action Plan - Volume 1 - the Plan. (WOCAP 2019). October.

California Fuel Cell Partnership (CFCP). 2020. Available at: https://cafcp.org/sites/default/files/h2 station list.pdf. Accessed March 18, 2020.

https://cafcp.org/sites/default/files/h2_station_list.pdf . Accessed March 18, 2020.
Port of Oakland (Port). 2019a. Final Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions. June.
2019b. Zero-Emissions Drayage Truck Feasibility Study. November.
2020. Seaport Air Quality 2020 and Beyond Plan - Memorandum: Screening of Suggested Actions. Draft. March.
Ramboll. 2018. Port of Oakland 2017 Seaport Air Emissions Inventory Final Report. August.
2020a. Memorandum - Tug Repower and Retrofit Emissions Reductions. April 2020.
2020b. Memorandum - Ocean-Going Vessel (OGV) Clean Ships. April 2020.
2020c. Memorandum - Line-Haul Locomotive Emissions Reductions. April 2020.
2020d. Memorandum - Truck Emissions Measures. April 2020.
San Pedro Bay Ports (SPBP). 2017. San Pedro Bay Ports Clean Air Action Plan 2017 - Bay Wide Ocean-Going Vessel International Maritime Organization Tier Forecast 2015 - 2050. July.
2019. San Pedro Bay Ports Clean Air Action Plan - 2018 Feasibility Assessment for Drayage Trucks. April.
United States Merchant Marine Academy. Undated (ca. 2016). "Economies of Scale in Container Ship Costs" prepared by Midshipman William Murray.

Table 1: Evaluation of Gr	oup 1 Screened Actions	Qualitative or	Evaluation by Criterion							
Name of Suggested Action	Description of Suggested Implementing Action	Quantitative Evaluation?	1 - Exposure Reduction	2 - Affordability	3 - Cost Effectiveness		4 - Commercial Availability	5 - Operational Feasibility	6 - Acceptability	7 - Need
Provide Common Drayage 183 Truck Charging Infrastructure	The Port, working with the City of Oakland, could promote off- terminal charging and serving locations within the Port's land, as part of the ongoing Truck Management Plan effort or within the Oakland Army Base development process. The Plan notes that the Port will be responsible for providing power to trucks dominiced at the Port-provided parking areas (Plan at p. F-24), but does not seglian wity similar charging initializative could not be used by other drapage trucks serving the Port.	Qualitative	Installing supporting infrastructura does not directly provide exposura reduction. The Port is considering installing common charging stations at the former UP Roundhouse parking area; however, even if a substantial number of truckers purchase zero-emissions strucks, the effect or overall emissions and exposure reduction would be eminimal. Truck emissions contributes a very small portion to emissions in West Oakland. According to the Port's 2017 Emissions inventory (Rembold 2018) Poter-feated muck DPM emissions were 0.3 stors in 2017. According to the WOCAP, which also takes into consideration some on- heavey emissions, Port-related truck emissions were 0.3 tons in 2017 for all approximatingly 6.000 trucks in the Port's Secure Truck emissions are projected to decrease to 0.12 tons in 2024 even without any electrification.	While the cost of individual charging stations is affordable, providing stifficient charging stations to accommodate a large number of trucks would not be affordable due to the large number of charging stations that would be required.	Installing infrastructure does not directly provide emissions reductions, and therefore oos effectiveness cannot be adiculated. However, went if the Port worked to provide additional common charging locations outside of the former UP Roundhouse location, the number of additional trust hat could be accommodated would be armal, and all 6,000 trucks in the Ports STEP contribute less than 1% of local Port-related emissions. Therefore, any emissions reductions supported by this action would be small.	Rating	Notes R Zero-emissions trucks are still in the pilot/demonstration stage and there is no universal standard for chargers. Until there is a universal standard for chargers or the number of required charging configurations is limited to a small number, chargers are considered TRL 7.	While installing chargers is operationally feasible, installing chargers for every type of zero-emissions truck would require a large number and variety of chargers, and the Seaport lacks the space to accommodate charging for all future zero-emissions trucks.	The Port is considering installing common chargers at the former UP Roundhouse parking area. Additional public chargers may be installed at a trucker services facility in the more OAB area (if a substalled acconcessionaire is interested in pursuing such a facility)	Rating Notes While this action would support deployment of zero-emissions dispage trucks, deployment of zero-emissions trucks offers only very small reductions in DPM emissions and exposure reduction. This action would help promote limited reductions in GHG emissions.
Adopt Electrical 186 Infrastructure Plan Incorporating Trucks	The Port of Cakland adopts an Electrical Infrastructure Plan for the maritime waterfront areas of Cakland. This Plan seeks to remove barriers to adoption of zero-emission trucks, such as cost, land, and ownership of changing equipment.	Qualitative	NVA Infrastructure planning itself does not provide direct, quantifiable emissions reductions.	M The Port can afford to develop this plan; the Port's ability to prepare this plan is subject to staff and budget resources.	N/A There are no emissions reductions associated with plans and studies; therefore the cost effectiveness criterion does not apply.	N/A	This criterion only applies to equipment actions.	M It is feasible for the Port to adopt a plan; the capacity of the Port to implement this action is subject to budget and staff resources.	M It is acceptable for the Port to adopt a plan; the capacity of the Port to implement this action is subject to budget and staff resources.	M Planning for infrastructure needs is a critical element of the pathway to zero emissions.
Create Sustainable 187 Freight Advisory Committee	The Air District works with the City and Pot of Collaboral and other agency and tool partners to create a Statishable Freight Advisory Committee to provide recommendations to each agency's governing board or council. The Committee's soop enidudes air quality issues, enhanced increased enforcement of truck parking and silling, improved referral and followy to insusance and offer complaints related to goods movement, improvements to the Port apportment system, charging infrastructure and rates, developing land-use restrictions in industrial sease, funding, and consideration of 400 our surfaces to enforce truck parking, route, and filling of 400 our surfaces to enforce truck parking, route, and filling	Qualitative	N/A Forming a Sustainable Freight Advisory Council would not provide direct emissions reductions.	Most of the tasks proposed for this Committee are already being conducted by the Port or Port-related groups, such as the Port Efficiency Task Force, Trucker Working Group, or 2020 and Beyond Plan Task Force.	There are no emissions reductions associated with plans, studies, and committees; therefore the cost effectiveness criterion does not apply.	N/A	This criterion only applies to equipment actions.	The Port is already involved in many of the initiatives that are proposed as part of a proposed Committee. It would be difficult to manage overlapping areas of responsibility with existing initiatives	L This effort would be duplicative of existing efforts	The Sustainable Freight Action Plan exists at the State level, and the Port already conducts most of the actions for which the proposed Committee would be responsible.
Establish Permanent Truck Parking and Container Staging in Logistics Area	The City and Port of Oakland will work to establish permanent locations for parking and staging of Port related trucks and cargo equipment, it. eritors, chassis, and containers. Such facilities will provide long-term lesses to parking operations and truck owner-operations at competitive rates. Such facilities will be at the City or Port logistics center or otherwise not adjacent to West Oakland residents.	Qualitative	The Port is committed to creating a permanent 15-acre area, most likely at the former UP Roundhouse property for truck parking and associated container staging. Because truck parking and associated container staging is currently cocurring within the Port area, this action would not provide any surplus emissions reductions.	The Port is committed to creating a permanent 15- area, most likely on the site of the former UP Roundhouse property for permanent truck parking and associated container staging; doing so would potentially prevent the Port tion earling higher lease fees if the property were leased for another purpose.	There are no emissions reductions associated with continuing to provide truck parking and associated temporary container staging within the Port area.	N/A	This criterion only applies to equipment actions.	H The Port is currently providing truck parking and associated container staging at the former UP Roundhouse location; this is highly feasible.	Setting aside 15 acres for truck parking and associated container staging on a permanent basis is highly acceptable to the Port. Setting aside further acreage would not be acceptable to the Port.	There is an on-going need for truck parking and related storage for chassis, containers, etc.; the 15-acre area, in combination with the City of Oakland's dedication of 15 acres in the former OAB area, is projected to address the commitment for overnight truck and container staging.
189 Set Interim Targets for Zero Emissions Trucks	The Port of Oakland, as part of the 2020 and Beyond Sasport. Air Quality Plan, supports the transition to zero-emission drayage truck operations, including setting interim year largets out to 2035	Qualitative	N/A Setting targets does not provide direct emissions reductions.	The Port completed the Zero-Emissions Drayage Truck Feasibility Study (Port 2019b), which concluded that, due to technological readness and commercial availability limitations, it is not feasible to set targets at this stage of Para implementation. No further expenditures are anticipated.	N/A There are no emissions reductions associated with setting targets.	N/A	This criterion only applies to equipment actions.	The Port's Zero-Emissions Drayage Truck Feasibility Study (Port 2019b) determined that it was not feasible to set targets at this stage of Plan implementation.	As shown in the Port's Zero Emissions Drayage Truck Feasibility Study (Pert 2019b), it is premature to set targets at this stage of technology development.	Setting targets in advance of technology development would not accelerate the technological trajectory. Targets already exist in the SPBP's CAAP 3.0, yet technology development has lagged expectations (per staff eport at the March 9, 2020 special board meeting of the Ports of u. SA Angeles and Long Beach to determine whether to approve an ordinance for a truck ratio).
190 Commercialization Effort for ZE Trucks	The Port of Oakland, as part of the 2020 and Beyond Seaport Air Quality Plans, supports the transition to zero-emission drayage truck operations, including, coordinating an extensive zero-emission truck commercialization effort,	Qualitative	A commercialization effort would result in some very small immediate DPM emissions reductions, as well as some limited GHG emissions reductions, as a small number of diesel trucks are replaced by zero-emissions trucks being evaluated in various types of service as part trucks are replaced by zero-emissions trucks would only provide small DPM emissions reductions. Even absent electrification, the approximately 4000 trucks serving the Port are forecast in the WPCAP to produce only 0.12 tons of DPM in 2024 while working at the Port and driving near West Caldand	Coordinating an extensive zero-emissions truck commercialization effort would be very costly, requiring not only plot testing of zero-emissions ruxus in marious applications, but also developing the necessary charging and electrical supply infrastructure, and service and supply systems. Such an effort is not affordable to the Port.	Even if all diesel-powered trucks were eventually replaced with zero- emissions trucks, DPM emissions reductions would be very small, and not cost-effective compared to other more feasible emissions selections actions. This action is also not cost-effective for GHos, as replacing all the other commissions vehicles would only provide 50% of the GHOS emissions reductions achievable by replacing all CHE with zero-emissions equipment.	N/A	This action would be designed to create commercial availability.	This action is not operationally feasible for the Port. The Port does not control the means of production, supply, or service for zero-emissions trucks, and does not control inflatoructure outside of the Seaport area. In addition, the Port does not have the staff resources to manage the logistical requirements of such a program.	one This action is not acceptable to the Port.	Technology, market, and regulatory drivers are slowly creating a market for zero-emissions heavy-duly trucks. Replacing all diesel-powered trucks serving the Port with zero-emissions trucks would only provide minor reductions in DPM emissions; complete conversion of the Port drayage truck feet could residue current Seaport-related GHG emissions by approximately 9.8% once the source of electricity is 100% carbon free (required by 2045 for California's Renewable Portfolio Standard).
Increase Weight Limit for 191 Single Aute Zero- Emissions Trucks	The Port of Cakland, as part of the 2020 and Beyond Seaport Air Quality Plan, supports the transition to zero-emission drayage truck operations, including, working with the City of Cakland to amend local ordinances to Increase the allowable weight limits for single- acte, zero-emission trucks on local streets located within the Port and the Oakland Army Base/Gateway areas	Qualitative	Only a small fraction of drayage trucks could work exclusively in the Port area (most truckers require the flexibility to be able to take on truck trips of any length) and even if year botalers are included in this action, it is unkelly that more than 10% of all drayage within the Post area would occur using single-sele zero-emissions trucks. Given that all crayage trucks combined occur using single-sele zero-emissions trucks. Given that all crayage trucks combined occur using single-sele zero-emissions trucks. One that the crayage trucks continued over yeary minor DPM emissions reductions (e.e. less than 0.1% of all Port-related DPM emissions). This action would also provide some GPM emissions reductions, estimated to be a maximum of no more than 1% of all Seaport-related GHG emissions.	The Port could theoretically afford to support development of an ordinance by the City, through passing a Board resolution and L providing information on truck use. However, this ordinance would raise safety (truck overturning) and maintenance (increased roadway damage due to higher a	Although DPM emissions reductions would be very minor, this action would not require the purchase of any new equipment or other expenditure. In addition, this action would restult in limited GHG emissions reductions. However, the heavier per-acte weight would be also in creased were and tear on Seaport roads, requiring either at stronger powement section (i.e., replacement of the current pawing section) or more frequent respring. The increased maintenance would lead to slightly highler emissions from construction equipment, and the manufacture and placement of saphatt.	N/A	This criterion only applies to equipment actions.	Allowing single-axie zero-emissions trucks on surface street could create a potential safety hazard, as these vehicles could file when tunning while hausing a loaded container. In addition, the heavier also weight would increase the cost of road maintenance in the Sesport area.	This action is not acceptable to the Port as an ordinance allowing use of these types of trucks could create safety hazards. However, the Port is working on an owneepid cronifer study to evaluate the possibility of raising the overweight simit from \$5,000 lbs. or 110,000 lbs. and to determine any necessary associated requirements for trucks.	This ordinance would be applicable to only a small fraction of all trucks, and could result in safety and maintenance concerns.
Develop Investment Plan 192 Infrastructure for Truck Charging	The Port of Clakland, as part of the 2020 and Beyond Seport Air Ouality Plan, supports the transition to zero-emission drayage truck operations, including. developing an investment plan for needed upgrades to the Port's electrical infrastructure	Qualitative	NVA Developing a plan does not generate direct emissions reductions.	This action is affordable to the Port; the Port's capacity to conduct studies, prepare plans, and implement other planning actions is subject to budget and staff resources. language	N/A Prepairing a plain does not generate any direct emissions reductions; therefore this criterion does not apply.	N/A	This criterion only applies to equipment actions.	M The has the ability Port to develop this plan provided that sufficient staff and budget resources are available.	The Port supports analysis of costs and financing options associated with the 2020 and Beyond Plan. The Boast of Port Commissioners directed staff to provide an agenda report to the Board by December 2020 on costs M and financing aspects associated with the 2022 and Beyond Plan including discussions of grant and incentive funding opportunities from costide sources (i.e., CARE, BARGAM), and the California Energy Commission, oct.) and private exercise and Port resources of the California Energy Commission, oct.) and private exercise and Port resources.	There will be an on-going need for investment in infrastructure, both for the Port as a whole (i.e., ensuring a sufficient and reliable supply of electrical power), and for specific projects. M The Ports approach, as described in the 2020 and Beyond Plan, is to build out needed infrastructure as the technology develops and tenants make commitments for purchasing zero-emissions equipment.
Study Favorable Time-of- 193 Day Electricity Rate Structure for Truckers	The Port of Oakland also works with the California Public Utilities Commission and the California Energy Commission to study the development of time-cf-day electric rate structures favorable to truck operators.	Qualitative	NVA Modifying electrical rates would not provide any direct emissions reductions.	This action is affordable to the Port; the Port's capacity to conduct studies, prepare plans, and implement other planning actions is subject to budget and staff resources. language	N/A This action would not provide any direct emissions reductions. Therefore, this criterion does not apply.	N/A	This criterion only applies to equipment actions.	M The Port has the ability to work with the CEC to conduct this study, provided that sufficient staff and budget resources are available.	M It is acceptable to the Port to conduct this study provided that sufficient staff and budget resources are available.	Determining the types of rates that would incentivize truckers to purchase zero-emissions vehicles would enable the CEC and the Port to determine whether such rates are feasible at the Port.
Award Long-Term Lease 194 for Trucker Services Center	The City and Port of Oakland award long-term leases to vendors that will deliver trucker services (including mini-market and convenience stores, fast food, and fast casual restaurants), and parking to keep trucks off West Oakland streets.	Qualitative	NVA Awarding a long-term lease would not result in direct emissions reductions.	Negotiating and awarding such a lease would be affordable to the Port, depending on the lease terms. The Ports capacity to implement this is limited by the interest level of potential concessionaires. It is uncertain whether such a site could be commercially viable.	N/A This action would not provide any direct emissions reductions. Therefore, this criterion does not apply.	N/A	This criterion only applies to equipment actions.	It is feasible to eward a lease for a trucker services area, provided there is a viable, interested tenant. The Port had clentified a suitable location for a trucker services location and had initiated planning for such a site; due to factors outside of the Port's control, the project is currently on hold.	There is no currently no viable, interested tenant for such a facility and the availability of a suitable site is uncertain.	Providing a range of services for truckers at the Seaport may potentially reduce truck travel into West Oakland, and would provide the opportunity to offer other emissions-reductions features, such as renewable desired and changing stations for zero-emissions whichces as well as services for truckers such as food, showers, and minor truck maintenance and repair.
195 Study Effects of Larger Vessels on Truck Traffic	The Port of Oakland studies the effects on truck flow and congestion due to increasing visits from larger container ships	Qualitative	N/A Conducting a study does not provide direct emissions reductions.	The Port has the ability to conduct this study; the Port's capacity to conduct studies, prepare plans, and implement other planning actions is subject to budget and staff resources.	N/A This action would not provide any direct emissions reductions. Therefore this criterion does not apply.	N/A	This criterion only applies to equipment actions.	It is fessible for the Port to conduct a study; the capacity of the Port to implement these types of administrative actions is subject to budget and staff resources.	It is acceptable to the Port to conduct this study, provided that sufficient staff and budget resources are available.	While it is feasible for the Port to conduct a study, implementation of this action would not provide surplus emissions.
Study Feasibility of Off- 196 Dock Yard Using ZE Trucks	The Port of Caldand studiesthe feasibility of an off-terminal container yard that utilizes zero-emission trucks to move containers to and from the matrine terminals	Quantitative	The Port assessed the potential benefit of converting all truck trips to and from Port area rallyands to zero-emissions truck trips (trips to and from the rallyands comprise the largest group of short-haul truck trips). The maximum DPM emissions reduction benefit from this action would be 0.045 tons of DPM firms ent and 00,000 truck fine are converted to zero-emissions truck (Ramboll 2020d). These emissions reductions would decrease as regulations require the use of cleaner cleant trucks.	The Port has conducted an initial assessment (Ramboll 2020d). The Port has the ability to conduct a more detailed study, the Ports capacity to conduct studies, prepare plans, and implement other planning actions is subject to budget and staff resources. Converting all trucks serving the raliyard to zero emissions and would have low affordability and provides only low emissions reductions.	Replacing all truck trips associated with the Port-area railyards with zero-emissions truck trips (the most likely scenario with a substantial number of short-haut truck trips) would only reduce DPM emissions by 0.045 toos (17%). This action would also generate a 19% education in GHG emissions (3,710 tons) from trucks (Ramboll 2020d) once grid electricity is 100% reservable in 2046 prior to 2045, the GHG emissions reductions would be lover). Given that a tot (numdered or thousands) of trucks would have be converted to zero emissions, implementation of this action would have low cost effectiveness for DPM and GPM emissions reduction.	N/A	This criterion only applies to equipment actions.	It is feasible for the Port to conduct a study; the capacity of the Port to implement these types of administrative actions is subject to budget and staff resources.	This study would not be necessary and is therefore not acceptable to the Port.	The Port is already evaluating the feasibility of using zero-emissions trucks in short-haul service through the testing of SYD trucks by Port teniant Shippers Transport Express. Shippers Transport Express contemply provided of Hormital container storage and management, a separate study to evaluate an exclusively zero-emissions off-ferminal yard is not required.
Study of Efficiency Gains 197 from Increased Truck Double-Cycling	The Port of Oakland studiesthe potential efficiency gains from increasing the number of trucks hauling loaded containers on each leg of a roundtrip to the Port.	Qualitative	Hauling leaded containers on each leg of a rounding to the Port is called double-goling. Materializing double-goling would result in emissions reductions of 0.061 times of DPM (Ramboll 2020s) under current conditions, and would decrease as regulations require cleaner clesel trucks.	The Port has conducted an initial assessment (Rambol 2020d). A definitive study world be complex due to the level of systems information required (i.e., increasing the current level of drouble organized with the contraction of the contractio	Maximizing double cycling would reduce emissions by 0.061 tons of DPM and 4.648 tons CO2e (GHGs) (Rambol 2020d). Estimating the cost effectiveness of maximizing double-cycling would require detailled NI/A information on the costs associated with developing software connectivity among many organizations, which is not available at this time. However, the maximum amount of emissions reductions achievable would be small.	N/A	This criterion only applies to equipment actions.	It is feasible for the Port to conduct a study; the capacity of the Port to implement these types of administrative actions is subject to budget and staff resources.	A detailed study would be difficult to implement due to the sensitive nature of much of the information and the action would only result in a small amount of emissions reductions. This action has low acceptability to the Port.	Increasing double cycling would reduce the total number of truck trips to and from the Port, L but is a complex undertaking due to the level of systems integration required to make it feasible. The maximum emissions reductions achievable are low.
Use Air District Incentives 1980 b Upgrade Tuge and Barges	The Air District plans to offer financial incentives to apprade typs and baryos operating at the Port of Oskland with cleaner engress every year.	Quantitative	In 2017, approximately 80% of the toxing work related to the Seaport was conducted by two companies with a combined nine tags. Six of these tags are equipped with Ter 3 regimes, also with Ter 4 regimes, and one with Ter 4 regimes (Emande 2020s), If the three tags not currently at Ter 3 are upgraded to Ter 3. DPM emissions would decrease by an estimated 0.66 tons per year. Upgrading all of the tags therefore 4 regimes (Including the three not in Ter 3) would be present to tall estimated emissions reductions of 2.00 tons of DPM, or 46% of all tag-related of the companies of the c	Based on a study performed by Call Meetine, the estimated capital scal to resoft is the 5 to Time 4 is 62.812 million, plass an additional service of the control of the co	It is anticipated that regulation will require flugs to be upgraded to Tler 4 with DFF by 2026; surplus emissions reductions would herefore accurs for a maximum of 5 years if flugs are reflored in easy 2021. Dissoit on the estimated resuld cost of an estimated \$2.29 million/ton estimated \$2.20 million/ton estimate the cost effectiveness of interits pollutaria sovided (tons of MROG and NDx, and ons of PMc00), ton prerofits would provide emissions reductions at a cost of \$44.400/Claf Myor ton. The floresture also suggests that the vetorit would a result in a 4% MROG and MROG	н	Tier 4 engines are available. Several tugs in the Bay Area are equipped with Tier 4 engines.	A vessel equipped with Tier 4 engines has a higher level of operational composity due to the orbinate shertheatment devices that are part of the require more space than lower tier engines, and bycally require some redesign of the vessel. Tugboat operators bycally choose to put Tier 4 engines on new vessels specifiedly designed to accommodate those engines. The feasibility of using incentives to encourage tag operators to service for the most period and the availability of Air District staff to administer the incentive program:	H Providing incentives is expected to have a high level of acceptability for stakeholders, assuming the incentive levels are sufficiently high.	H Reducing emissions from tugs is an important component of reducing overall DPM emissions. Providing incentives would help accelerate the transition to cleaner tugs.
199 (Ter 3 Vessel) Program	The Port of Oakland implements a Clean Ship Program to increase the frequency of visits by ships with International Maritime Organization Tier 2 and Tier 3 engines.	Quantitative	Cleaner ships are those with more modern engines (a higher engine ter). However, the CARB emissions model reports that only NOx emission factors are affected by the Ter level of the ship (Rambotl 2020b). Based on the CARB model, higher engine tiers do not provide any DPM emissions reductions. DPM emissions reductions could be achieved by reducing falle stuffer content (see Screened Action 211) and/or reducing vessel speeds. The Port included the feasibility of implementing a sessel speed reduction program in the 2020 and Beyond Plan's Near-Term Action Plan (Item 21, scheduled to be implemented in 2020).	The Port of Los Angeles grants a \$5,000 per call incentive for Tier 3 vessels. It is unknown what level of incentives would be required to further increase the number of Tier 3 vessels in the West Coast fleet.	Each call by a Tier 3 vessel would reduce NOx emissions by sproximately 1 to 1.16 tons relative to a lower tier vessel. It a \$5,000 per call Port of Oxidaria Incentive would result in additional Tier 3 vessels being assigned to the West Coast feet, the incentive would result in a coast of \$4,300. Sec, 500 per NOx to reduced (not including administrative costs of implementing an incentive program). No DPM emissions reductions benefits would accure (Ramboll 2020b). There are no associated GHG emissions reductions that could be quantified. Based on a paper prepared by the U.S. Morchant Marine Academy, undated), fivel efficiency is primarly a function of vessels are rather than age (e.e., newer vessels are not necessarily more fuel efficient than older vessels).	L t	Ther 3 vessels requirements were effective starting with a keel laid date of 2016, meaning that Tier 3 vessels have only been built for the past few years. In 2017 there were no calls by Tier 3 vessels at the Port. In 2018, the Tier 3 vessel calls at the Ports of Los Anglesia and Long Beach were of 15s and 2.2%, respectively, the Port of 16 Tier 3 vessel calls were by cruse sites. A 2017 study by the San Pedro Boy Ports Sreccest 3 vessels calls were by cruse sites. A 2017 study by the San Pedro Boy Ports Sreccest 5 vessels are commercially available, but the supply is still limited.	The likelihood of reaching a substantial number of Tier 3 vessel calls at the Port of Caktand in the near future is low, as shown by the San Pedro Bay Ports study and 2018 Tier 3 vessel call data. The SPBP's vessel call data lared yielder the SPBP's incontive program. It would take some time to identify the optimal existing system to track incentive significant continuations of the continuation of the program of the progra	Provided that incentives are affordable to the Port, this action is L acceptable to the Port, however, the potential benefits would be low in the near-term and would be limited to NOx emissions reductions.	Increasing the percentage of Tier 3 vessels calling the Port would only affect NOx emissions teductions; other actions (e.g., retrofitting tugs with Tier 4 engines) could provide NOx emissions reductions while also reducing DPM.

Table 1: Evaluation of Group 1 Screened Actions										
Qualitative or	Evaluation by Criterion									
Name of Suggested Action Description of Suggested Implementing Action Quantitative Evaluation?	1 - Exposure Reduction	2 - Affordability	3 - Cost Effectiveness	4 - Commercial Availability 5 - Operational Feasi	ibility 6 - Acceptability	7 - Need				
	Rating Notes F	Rating Notes Ratin	g Notes	Rating Notes Rating Notes	Rating Notes	Rating Notes				
The Port of Oakland Implements a Clean Locomotive Program to increase the number of U.S. EPA Tier 4 compliant bocomotives used by the UP. BNSF, and OGRE railways to provide service in and out of the Port of Oakland.	The UPRR is not on Port property; therefore this action would only apply to the BNSF and OGRE. OGRE does not use line-haul locomotives, but rather entirely engines, so this action does not apply to the OGRE. While emissions reductions from cleaner becombives would occur I in the vicinity of the community, line haul locomotives only spend a small amount of time at any one rallyard. Estimated emissions reductions from conceilertail pine-haul engine turn-over to Ter 4 are only 0.001 tons of DPM in 2023, relative to the estimated 2020 baseline. A greater benefit could be achieved by upgrading switcher engines to Tier 4 (see evaluation of Screened Action 239).	The level of incentives that would be required to accelerate use of Tier 4 locomothees in and out of the OICI is unknown. This would require a study to undestand how much money would be involved to influence railroad behavior.	The cost effectiveness of this action would be low because the emissions reductions that are achievable at the Port are extremely low	Ther 4 engines are commercially available, and the changes in locomotive fleet composition from 2017 to 2020 indicate that Tier 4 engines are starting to be integrated into time-haut service without incentives. While use of Tier 4 locomotives is operationally leasable, commonly a starting to be integrated into time-haut service without incentives. While use of Tier 4 locomotives is operationally leasable, commonly a starting to be integrated into time-haut service without incentives.	allocating specific line-haul land is likely to have low feasibility. Lail over the country as needed to briotist for the Port of Oakland.	While this action would provide emissions reductions in the vicinity of the community, substantially greater local benefits can be achieved from upgrading switcher engines to Tier 4 (see Screened Action 239), and the funds that would be deveded to a clean loomonive program would provide more emissions reductions benefits if used for other actions.				
Study Feasibility of 201 Electric Switchers at BNSF, OGRE The Port of Oakland studies the feasibility of using electric switcher locomotives at the two Port railyards. Qualitative	N/A Conducting a study does not provide direct emissions reductions.	The Port has the sality to conduct this study; the Port's capacity to conduct studies, prepare plans, and implement other planning actions is subject to budget and staff resources. However, electric switchers do not currently exist.	This action would not provide any direct emissions reductions. Therefore, this criterion does not apply.	N/A This criterion only applies to equipment actions. It is fleasible for the Port to conduct a stu- implement these types of administrative stuff resources.		Electric switcher engines are currently unavailable. BAACMD recently included this idea in a list of options for reducing emissions from port related activity (Ramboll 2020c). But the option referenced (a CARB and SCACMD funded demonstration project) has not moved beyond the planning stage (Ramboll 2020c). The Port has conducted an intill assessment of the benefit of replacing existing switcher engines with Ter 4 switchers. Changing to Tier 4 switchers under provide provide approximately 69% of the board DAPM emissions reductions possible relative to current emissions from switcher (a reduction of 0.243 found-year compared to total emissions of 20-252 tensively (Findered 2020c). OPER has already replaced the did switcher section of the compared to the switchers of the compared to t				
Suffur is a significant contributor to PM emissions. Ships maneuvering within the North American Emission Control Area (ECA), Including California, are required to use full that contains no more than 0.1% soft. With Reducing the suffur content of the used in OCVs could reduce PM emissions by approximately 10.5% for full containing 0.01% suffur, and by 45% for the containing 0.01% suffur and by 45% for	Based on the Ports review, the sulfur content of fuel used by ocean-going vessels on the West Coast is much lower than the requirement. Analysis shows in-use fuel is approximately 0.05% manual review of the property of the	Fuel containing 0.05% sulfur is already in use; therefore the evaluation of this criterion focuses on use of ULS diesel. California compliant ultra-low sulfur fuel costs approximately 35% - 47% (5238 - 5331) more per metric to that her earine gae of ucurrently in use. If U.S diesel is bought outside of California (i.e., not compliant with California videntity standards), the cost differential approximately standards (i.e., cost offerential approximately standards). The cost differential approximately standards (i.e., cost offerential approximately standards). Owner that fuel is substantial portion of the operating cost for a container vessel, the affordability of U.S. diesel is low.	Use of California-compliant ultra-low sulfur diesel has an estimated cost effectiveness of \$2.80,000 - \$3,900,000 per PM ton reduced (equivalent \$1.40,000 - \$1915,000 per Carly Moyer Into, Lising the lower non-California compliant US diesel price, the cost effectiveness would be on the order of \$1,500,000 per PM ton (\$75,000 per Carly Moyer ton) reduced. There would be no GHG emissions reductions from using ULS diesel.	U.S diesel could seally be delivered by currently deliver a good higher sulfur face may not be feasible in larger mainting. H ULS diesel fuel is readily available. M OGVs. In addition, sulfur provides bit reduced below a critical threshold, man sulfur-content engine oils, counteracting fuel.	content fuel however, use of this regines given current IMO limits the large marine engines used bricky, and if fuel sulfur content is t unacceptable to ocean carriers.	Reducing DPM emissions from ocean-going vessels is critical, as they represent by far the largest single source of DPM associated with the Seaport. This measure would provide benefits for vessels at borth as well as manavering and in transit, and would not adversely self-cl implementation of any other measures to reduce emissions associated with ocean-going vessels.				
280 Pursue a Hydrogen Fuel Identify opportunities for demonstration testing of a hydrogen fuel Qualitative	Testing one, or even a few, hydrogen fuel cell vehicles would have a negligible exposure reduction benefit.	The affordability of demonstration testing would depend on whether the Port and its partners could obtain grant funding or other lock. Unix. Insultantial support (e.g., from OEMs), If the Port and its partners have to pay the entire could of phytogen fusic old whiche and associated inflastructure for a pilot test, affordability would be low.	One or a few demonstration fuel cell vehicles would generate negligible emission reductions, and due to the state of the technology, the vehicles would be costly.	Hydrogen fuel cell whice require available. Hydrogen fuel cell whice a force of the considered to be TRL 6 or 7 (SPBP 2019). They are not commercially available. Hydrogen fuel cell trucks are considered to be TRL 6 or 7 (SPBP 2019). They are not commercially available. Hydrogen fuel cell frucks are considered to be TRL 6 or 7 (SPBP 2019). They are not commercially available. Hydrogen fuel cell frucks are considered to be TRL 6 or 7 (SPBP 2019). They are not commercially available. Hydrogen fuel cell which desire a fuel commercial to the commercial fuel cell frucks are considered to be TRL 6 or 7 (SPBP 2019). They are not commercially available. Hydrogen fuel cell which desire require available and the commercial fuel cell which are considered to be TRL 6 or 7 (SPBP 2019). They are not commercially available. Hydrogen fuel cell which desire require available at the commercial function and the commercial function for the cell force in the call force in Call function in Callifornia Fuel commercial function in Callifornia Fuel	It hydrogen fueling stations. If the d carephanding equipment (e.g. of carephanding equipment (e.g. of carephanding equipment (e.g. of separations) in the Bay is laid frybycogne littleng stations in the Bay is laid frybycogne littleng stations in a Cell Partnership showed only in an Avenue (CPC P200). The ng stations currently being distilloss currently being distilloss currently being distilloss activations possibly opening total of 41 stations in California pro 18 additional stations possibly opening total of 41 stations in California	This action would increase knowledge about the performance of hydrogen fuel call vehicles in Port service. It is also important to continue to develop multiple zero-emissions options for vehicles. This action would complement other initiatives, such as hydrogen fuel power generation for resiliency.				
Tuga represent a substantial faction of Seaport-related DPM emissions. Because buy operations other occur relatively does to express the properties of the control of the properties of the control of the properties of the particulate Filters (DPFs). Because the properties of the particulate Filters (DPFs) (DPF	Among the Seaport-related emissions sources, tugs pose the greatest exposure risk (WOCAP 2019). CARB provides three levels of cortor for DPFs (Level 1.25%, Level 2.25%), and Level 3.55%), care consists of the control	There are no certified Level 3 systems for tugs currently on the market, it is likely that manufacturers would develop certified Level 3 systems if new regulations require tugs to be retrofitted with DPFs (this may be implemented in the mid-2020s as port of new harbor craft regulations currently in the preliminary development stages by CARS). Based on a Call Martines duty (Call Martine 2019 ofted in Ramboll 2020s) the ceptal cost of retrofitting a Tiler 4 tug with DPF would be exportantled by Stage 100 in addition to the approximately \$2.28 million to upgrade the tug to Tier 4. This is a substantial added cost. The study also estimates that full consumption would increase approximately 10% by adding the DPF, resulting in incremental operating costs of around \$5.00 (Oxyleve for fact end); (Remboll consistency is likely to be low.	Considering capital and operational costs associated with DPFs, the estimated cost per ton of DPM reduced by adolding DPF to a Tier 4 engine is \$3.95 million, and \$163,300 for a Carl Moyer fon. The addition of DPFs to Tier 4 tags would have an adverse effect on GHG emissions. Use of DPFs would increase GHG emissions by an estimated net 6% out to increase that consumption over Tier 3 tugs not equipped with DPF (Remtool 2020a).	Only one certified Level 2 system is currently available. Certified Level 3 systems are not available yet, and are unlikely to be available until after the Tier 4 engine standard is implemented (tentatively mid 2020s). Due to the complexity of implementing operators would simultaneously upgrads to the need to take a tage out of service two systems that could have achieved to the rugged service environment of tug operationsly featible. There is no inform certified Level 3 systems.	to Tier 4. This would also avoid be for upgrades. Earlier DPF a missions reductions failed due by the control of the control o	Retrofitting Tier 4 tugs with Level 3 DPF would results in emissions reductions approximately equal to either converting all dranges trucks to zero emissions or converting all locomotives in the Seaport area to zero emissions.				

Source: Port of Oakhand 2020
For a description of the evaluation criteria, please see the text of this evaluation memorandum.
Accrumps and abbreviations are defined in the list of accrumps and abbreviations found following the table of contents of this evaluation memorandum.