

## **Attachment A**

### **Study of Performance Incentive Programs for Ocean-Going Vessels and Locomotives**

#### **Background**

On June 13, 2020, the Port of Oakland Board of Port Commissioners (“Board”) approved its *Seaport Air Quality 2020 and Beyond Plan: The Pathway to Zero Emissions* (“2020 and Beyond Plan” or “Plan”; Board Resolution 19-41.) The 2020 and Beyond Plan provides the planning and policy framework for the Port of Oakland (Port) to continue its efforts to reduce emissions from Seaport operations and improve air quality. Port Staff developed the Plan with substantial stakeholder review, input, and engagement through the 2020 and Beyond Task Force and extensive comments on the Draft Plan (June 29, 2018) and the Revised Draft Plan (December 14, 2018). When the Final Plan was presented to the Board for consideration on June 13, 2019, public commenters requested that the Board include a set of follow-up studies in its Plan approval action. Among the requests was a study of performance incentive programs for ocean-going vessels and locomotives. This study fulfills the Board’s direction to study the performance incentive programs. The portion of the analysis pertaining to Vessel Speed Reduction (VSR) programs also satisfies Item #21 in the Plan’s Near-Term Action Plan, which is to evaluate a VSR program.

Port Staff contracted with AECOM to investigate existing incentive programs for ships and locomotives throughout North America. AECOM examined how different ports developed their own programs and evaluated the costs and participation levels. AECOM described their findings in a report. Port Staff added to the report by conducting a feasibility evaluation consistent with the criteria and steps described in Appendix D of the 2020 and Beyond Plan. Port Staff drew heavily on information from its Evaluation process conducted in Spring 2020. That analysis was done by Ramboll and Gaia Consulting in support of Group 1 Evaluations, which included all Port-related strategies in the West Oakland Community Action Plan (WOCAP)<sup>1</sup>. Four of the actions evaluated in Group 1 pertain directly to this study of performance incentive programs, as summarized in Table 1.

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<sup>1</sup> Results of the Screening and Evaluation process along with Technical Memos were presented to the 2020 and Beyond Plan Co-Chairpersons in April 2020 and to the Task Force in June 2020. The documents are available on the Port’s website here: <https://www.portoakland.com/community/environmental-stewardship/maritime-air-quality-improvement-plan/>

**Table 1**  
**Summary of Suggested Actions Pertaining to this Study**

| Suggested Action # | WOCAP Strategy # | Name  |
|--------------------|------------------|---|
| 199                | 63               | Implement a Clean Ship Program                            |
| 200                | 64               | Implement a Clean Locomotive Program                      |
| 201                | 65               | Study Feasibility of Electric Switchers at Port Railyards |
| 217                | N/A              | Study Low Sulfur Diesel Fuel in Vessels                   |

The final Performance Incentive Programs for Ocean-Going Vessels and Locomotives Study is provided on the Port’s website for public review:

<https://www.portoakland.com/community/environmental-stewardship/maritime-air-quality-improvement-plan/>.

The report was provided to the 2020 and Beyond Plan Co-Chairpersons on November 10, 2020 for feedback and was presented to the Task Force on November 18, 2020. The feedback received includes: wanting the Port to exert more influence over Union Pacific Rail, urging the Port to pursue a pilot project for ships to burn even cleaner on-road diesel fuel while maneuvering near the Port, expressing concern about NOx emissions as a precursor to forming secondary particulate matter, and supporting the idea of having the Port contribute to the existing vessel speed reduction program called “Protecting Blue Whales and Blue Skies.”

### **Program Descriptions and Conclusions of Study**

This summary starts with a brief introduction into the different types of performance incentive programs for ocean-going vessels and locomotives. Next, it provides a sense of the costs to run different programs, followed by a discussion of the possible benefits and challenges for each. This is followed by a summary of evaluation results, according to the seven feasibility criteria laid out in the 2020 and Beyond Plan. The final section gives conclusions of the analysis.

#### *Ocean-Going Vessel Incentive Programs*

There are four types of incentive programs for ships: clean engine programs, green ship indexes, clean fuel programs, and vessel speed reduction. Variations and combinations of all four are used at different ports in North America including the Ports of Los Angeles, Long Beach, New York/New Jersey, and Vancouver, British Columbia.

1. Clean Engine programs reward shipping lines for deploying ships with higher-tiered (meaning newer and cleaner) engines. Higher-tiered engines reduce NOx emissions, however they do not reduce diesel particulate matter (DPM) nor greenhouse gas emissions (GHG) which are the pollutants of concern in the 2020 and Beyond Plan.

2. Green Ship Index programs reward shipping lines for deploying ships with environmental performance superior to regulatory requirements. Some green ship criteria are based on emissions (higher-tiered engines), and others are based on chemical pollution from antifouling coatings, hydraulic fluids, gear oils, cooling water treatment, and handling of sewage, garbage, and bilge water. These types of programs require shipping lines to register with a specific verification program such as Environmental Ship Index, Clean Shipping Index, Green Marine, and Green Award.
3. Clean Fuel programs reward vessel operators for switching to cleaner fuels, typically while at berth or transiting near shore. However, several existing programs including 1) the International Maritime Organization's North American Emission Control Area extending 200 nautical miles from the coast, 2) California's in-use fuel rule for ships within 24 nautical miles of the California coast, and 3) California's At-Berth regulation requiring containerships to plug in while at berth have all made this type of reward program essentially obsolete in California. The Port took this one step further during the Group 1 Evaluation process, to investigate the use of ultra-low sulfur diesel (ULSD), which is beyond the requirement in California.
4. Vessel Speed Reduction (VSR) programs reward shipping lines for slowing down in certain zones. Containerships typically operate at cruising speeds around 20-23 knots in the open ocean. Slowing to 10-12 knots reduces the load on the propulsion engines resulting in less emissions. There is a seasonal VSR program near San Francisco Bay and Santa Barbara Channel called Protecting Blue Whales and Blue Skies. It runs from mid-May to mid-November with the primary goal of reducing whale strikes. Entire fleets must comply to be eligible; it is not on a per-call basis.

### Locomotive Incentive Programs

There are no known clean locomotive incentive programs that reward rail lines based on activity levels, like the clean ship programs described above. The San Pedro Bay ports offer grants via their San Pedro Bay Technology Advancement Program (TAP) that provides up to 50% funding for locomotive projects that demonstrate potential for zero emissions, or hybrid and near-zero emissions engine technologies.

For the Port of Oakland, the primary opportunity is to encourage rail lines to take advantage of grant opportunities to replace local switcher engines. Grants include Carl Moyer administered by the Bay Area Air Quality Management District, Diesel Emissions Reduction Act (DERA) grants administered by the U.S. Environmental Protection Agency, or the Goods Movement Program grant (Year 5 solicitation for Proposition 1B funding) which was announced on November 9, 2020.

### Cost and Benefit of Programs

The study found a few data points on cost which are summarized in Table 2 along with information about the participation levels and emissions benefits of the programs. Most of the

programs are focused on NOx emissions, and do not publish information about other emission reductions achieved. However, emissions estimates and participation rates are provided below as available.

**Table 2  
Summary of Performance Incentive Programs at Other Ports**

| Port or Entity<br><i>Name of Program</i>                                       | Incentive Information  | Benefit Information   |
|--|--|---|
| Port of Los Angeles<br><i>Environmental Ship Index Incentive Program</i>       | <ul style="list-style-type: none"> <li>• Either \$750 per call or \$2,500 per call, depending on the clean ship score</li> <li>• \$5,000 per call for Tier 3 ships</li> </ul>  | No data available   |
| Port of Long Beach<br><i>Green Ship Incentive Program</i>                      | <ul style="list-style-type: none"> <li>• \$2,500 per call for Tier 2 ships</li> <li>• \$6,000 per call for Tier 3 ships</li> </ul>   | No data available   |
| Port of Long Beach<br><i>Green Flag VSR Program</i>                            | <ul style="list-style-type: none"> <li>• Either 15% or 30% refund on first day of dockage depending on whether the vessel slows at 20 nm or 40nm distance</li> </ul>   | Participation is very high, above 90%   |
| Port of Los Angeles<br><i>Vessel Speed Reduction Program</i>                   | <ul style="list-style-type: none"> <li>• Either 15% or 25% refund on total dockage depending on whether the vessel slows at 20 nm or 40nm distance</li> </ul>  | Participation is very high, above 90%   |
| Port of Vancouver, BC<br><i>EcoAction Program</i>                              | <ul style="list-style-type: none"> <li>• 23% to 47% discount on dockage depending on clean ship score</li> </ul>   | About 30% participation in vessel calls, no emissions data available  |
| Port Authority of New York/New Jersey<br><i>VSR</i>                            | They pay a consultant about \$60,000 per year to administer their VSR program  | See below.  |
| Port Authority of New York/New Jersey<br><i>Clean Vessel Incentive Program</i> | <ul style="list-style-type: none"> <li>• Total score based on combination of VSR and clean ship score</li> <li>• Range of \$1,000 up to \$3,000 per call for depending on their score</li> <li>• Additional \$5,000 per call for Tier 3 ships</li> <li>• They stop paying incentives once the annual cap of \$1.5M is reached</li> </ul> | 2018 reported: <ul style="list-style-type: none"> <li>• 7.1 tons of PM reduction</li> <li>• 15,626 tons of CO2 reduction</li> <li>• 9 carriers participating</li> </ul> |
| NOAA Marine Sanctuaries<br><i>Protecting Blue Whales and Blue Skies</i>        | Funding cap of about \$200,000 each year, used for incentives, publicity, and recognition ceremony   | 2019 reported: <ul style="list-style-type: none"> <li>• 15 companies</li> <li>• 349 vessels</li> <li>• 17,026 tons of GHG reduction</li> </ul>                          |

### Performance Incentive Programs at the Port of Oakland

This section describes some of the challenges that each type of program faces at the Port of Oakland.

Clean Engine: Higher tiered engines on ocean-going vessels reduce NO<sub>x</sub> emissions<sup>2</sup>, but do not reduce DPM or GHG emissions. Therefore, a Clean Engine Program would not meet the goals of the 2020 and Beyond Plan which are focused on exposure to DPM as a cancer risk and reducing GHG to protect against climate change.

Green Ship Index: Clean ship programs combine various environmental performance metrics including engine tier, chemical pollutions from antifouling coatings, gear oils, hydraulic fluids, cooling water treatment, cleaning agents, refrigerants, and handling of sewage, garbage, and bilge water. These are important, however, none of them reduces DPM emissions or meets the goals of the 2020 and Beyond Plan. Further, carriers make ship deployment decisions based on their needs at the San Pedro Bay Ports. Therefore, Oakland could be rewarding shipping lines for decisions based on other factors.

Clean Fuels: Ships in California are required to use fuel with maximum 0.1% sulfur content. The Port examined 2019 data and found that the actual in-use fuel for ships coming to Oakland is much cleaner, about 0.05% sulfur on average. The Port evaluated the potential of using even cleaner, ultra-low sulfur diesel (ULSD with 15 ppm sulfur) which is the same as on-road diesel. The analysis found there would be a DPM benefit. Because of shore power, ships do not burn fuel at berth so the main benefit to the community is while the ships are maneuvering near the Port. Port Staff held discussions with carriers and found that in many instances they are already using ULSD because that is what is available. Anecdotally, refineries may sell as ship fuel ULSD that does not meet all the specifications for on-road use. The Port does not play a role in where ships take on fuel, however it is encouraging that ULSD is becoming more common.

Vessel Speed Reduction: The opportunity for slowing down vessels at the Port of Oakland is outside the Golden Gate. Within the San Francisco Bay, vessels are already limited to 15 knots maximum. Slowing down any further jeopardizes safety, as vessels are less maneuverable at slow speeds. Additionally, the emissions benefit of slowing from 15 knots to 12 knots is minimal. Therefore, any DPM reductions would occur at sea, far from the community and would not result in exposure reduction. However, the 2020 and Beyond Plan also has a goal

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<sup>2</sup> NO<sub>x</sub> is a precursor to particulate matter, as two stakeholders mentioned. However, the chemical process of nitrogen oxidizing in the atmosphere from NO<sub>2</sub> to NO<sub>3</sub> then mixing with ammonia to form ammonium nitrate is slow and occurs region-wide, not in the immediate vicinity of the emission. NO<sub>x</sub> is not an emission of concern in the WOCAP, and the Port has not received any previous comments asking to incorporate NO<sub>x</sub> reductions as a goal of the 2020 and Beyond Plan. The San Francisco Bay Area Basin is in attainment for both California and National Ambient Air Quality Standards for NO<sub>2</sub>.

to reduce greenhouse gas emissions. GHG reduction benefits are not tied to location, so any GHG reductions would meet the goals of the 2020 and Beyond Plan.

One option for the Port is to contribute financially to the existing VSR program, “Protecting Blue Whales and Blue Skies.” According to Pacific Maritime Shipping Association, current ship compliance with the program is about 64% for ships approaching San Francisco Bay<sup>3</sup>. NOAA has an annual incentive budget of about \$200,000 for the program. The Bay Area Air Quality Management District (“BAAQMD”) supports the program. Most recently they contributed \$80,000 to be spent over a 2-year period. The Port could also offer non-monetary incentives such as giving recognition on the Port’s website or giving press releases to thank and congratulate participating carriers.

Clean Locomotive: There is no existing program to use as a model. Two challenges for the Port would be 1) there is no equivalent of ship dockage fees for locomotives, so there is no obvious hook to reward specific arrivals or departures and 2) there is no equivalent of the San Francisco Marine Exchange keeping track of train movements so there would be no way to verify which locomotives came and went. Further, line-haul engines are not captive; they may cross the country and never come back. Lastly, the local emission reductions would be small. OGRE does not do any line haul moves, and the end of BNSF yard is only two miles from where the tracks cross under the 580. Therefore, the local exposure reduction would be minimal.

Getting cleaner switchers would be a better goal. OGRE already has a Tier 4 switcher engine, which arrived in 2019. They partnered with BAAQMD on a DERA grant. The grant paid about \$640,000 and OGRE paid about \$1.9M. The Port will talk to its other rail tenant, BNSF, about getting a Tier 4 engine, perhaps using the newly announced Goods Movement Program grant which is open until January 15, 2021.

Feasibility Evaluation Summary

The 2020 and Beyond Plan includes a detailed approach to evaluating the feasibility of any suggested action. Appendix D of the 2020 and Beyond Plan lists seven different criteria and a description of each. The criteria were applied to both types of performance incentive programs included in this study, and the results are summarized in Table 3. For each criterion, a score of Low, Moderate, or High is given along with a brief explanation.

**Table 3  
Feasibility Evaluation Summary**

| Criteria           | Ocean-Going Vessels  | Locomotives   |
|--------------------|--|---|
| Exposure Reduction | <b>Low</b> – The main benefit of a VSR would be seaward of the Sea Buoy, which does not reduce harmful DPM emissions in the vicinity of West | <b>Low</b> – The Port’s two rail tenants, BNSF and OGRE, combined emit about 0.3 tons of DPM per year from all their activity including switchers |

<sup>3</sup> Information received from John Berge in chat function of Air Quality Task Force Meeting held 11/18/20.

| Criteria                | Ocean-Going Vessels   | Locomotives   |
|-------------------------|---|---|
|                         | Oakland. The main benefit of a Clean Ship program would be to reduce NOx since higher Tier level ships do not reduce PM. NOx is not a pollutant of concern in either the 2020 and Beyond Plan or in the WOCAP.  | and line haul. The participation rate for a prototype Clean Locomotive Program is highly speculative, especially given the transient nature of line haul locomotive operation.  |
| Affordability           | <b>Unknown</b> – For reference, the Ports of LA/LB offer 15%-30% reductions in dockage fees for vessels participating in VSR, rebates of \$750 to \$2,500 per call for vessels participating in Clean Ships, and the program might cost on the order of \$60,000 per year to administer.  | <b>Unknown</b> – There are no known Clean Locomotive Programs in the U.S. to use as a reference to estimate the amount of incentive required to change behavior.  |
| Cost-Effectiveness      | <b>Low</b> – Although the participation rate and cost of a VSR or clean ship program is unknown, the cost effectiveness would be low since neither type of program would reduce DPM near the Port.  | <b>Low</b> – Although the participation rate and cost of a clean locomotive program is unknown, the cost-effectiveness would be low since the maximum amount of DPM reductions is only about 0.25 tons/year (assuming 85% reductions could be achieved from the 2017 level of 0.3 tons of DPM). |
| Commercial Availability | <b>High</b> – A variety of VSR and Clean Ship programs exist and are used at different Ports in North America and in California. The Port could support the existing VSR program “Protecting Blue Whales and Blue Skies.”   | <b>Low</b> – There are no known Clean Locomotive Programs in the U.S. to use as a model.  |
| Operational Feasibility | <b>Moderate</b> – A VSR program is operationally feasible outside the Golden Gate, however the emission reductions would occur far from shore and would not benefit West Oakland. A VSR program within the San Francisco Bay would be challenging because ships are already limited to 15 knots at most, and slowing further would be unsafe. | <b>Low</b> – A Clean Locomotive program would be challenging to administer because of the lack of independent data on locomotive movements and switcher usage. The Port would need to rely on information provided by the railroads themselves with no method of verification.                  |
| Acceptability           | <b>High</b> – VSR and Clean Ship programs have proven successful at other Ports and have high participation rates.  | <b>Unknown</b> – No programs of this type exist, so potential participation rates are highly speculative.   |

| Criteria | Ocean-Going Vessels   | Locomotives  |
|----------|---|--|
| Need     | <b>Low</b> – Because of Oakland’s position as a second port of call, and its smaller size compared to the Ports of LA and LB, it is unclear whether performance incentive programs would influence carrier behavior or merely reward vessel operators for decisions based on other factors. | <b>Low</b> – Locomotive emissions from the Port’s two rail tenants contribute only about 0.6% of the Port’s diesel PM emissions. Even if the tenants reached 100% participation and reduced diesel PM by 85% by going from all Tier 0 to all Tier 4, it would only reduce diesel PM by 0.25 tons/year. |

**CONCLUSIONS**

Port Staff concluded that Ship and Locomotive Performance Incentive Programs would not be effective for reducing DPM emissions or exposure near the Port and in West Oakland.

1. Using Port resources to start a new Vessel Speed Reduction program locally is not recommended for the following reasons:
  - Ships already have a speed limit of 15 knots inside the San Francisco Bay. Therefore, this program would only require ships to slow down by 3-5 knots, which does not reduce emissions significantly. Additionally, San Francisco Bar Pilots have expressed safety concerns about slowing vessels below 15 knots while they are transiting in restrictive, highly trafficked channels.
  - Outside the Golden Gate, the DPM emission reductions are too far away to reduce exposure for the community in West Oakland.
2. Starting a Clean Engine or Green Ship Incentive program is not recommended because:
  - The Port of Oakland is almost always a second port of call. Carriers select which vessels they put into the Pacific service based on their needs at the large Southern California ports. The Port of Oakland benefits from these programs at the Ports of Los Angeles and Long Beach. A new program in Oakland would reward carriers for behavior they are already doing.
  - Further, rewarding carriers for bringing vessels with higher tier engines serves to reduce NOx, but does not provide any benefit for DPM, which is the pollutant of primary concern in Oakland.
3. Starting a new Clean Locomotive Incentive Program in Oakland is not recommended because:
  - There are no proven programs anywhere else that can demonstrate a benefit.
  - The two rail tenants at the Port, BNSF and OGRE, only emit about 0.269 tons of DPM/year combined for both switching and line haul combined. The maximum benefit the Port could achieve is about 0.2 to 0.25 tons DPM/year, even with the most aggressive assumptions for participation.
  - A better option would be to encourage BNSF to use Tier 4 switchers in their Oakland yard.

One positive option for the Port is to donate money or other support to the existing Vessel Speed Reduction program, Protecting Blue Whales and Blue Skies. This would align with the 2020 and Beyond Plan goal of reducing GHG emissions. The program is administered by NOAA Channel Islands National Marine Sanctuary and currently has about \$200,000 available annually for incentive awards and recognition ceremony. Additional contributions from the Port could be used to increase the award amounts. The Port could also increase recognition and publicity for participants. Either of these might motivate more shipping lines to participate in the program.