

San Pedro Bay Ports Technology Advancement Program

Program Guidelines



Port of
LONG BEACH
The Green Port

Updated: December 2019

CONTENTS

1	Introduction	3
2	Project Identification	4
3	Eligibility	5
3.1	Eligible Applicants.....	5
3.2	Eligible Projects	5
3.3	Eligible Costs and Match Funding	6
4	Request for information Process	7
4.1	Concept Paper Submission	7
4.2	Initial Screening	8
4.3	Full Proposal.....	8
4.4	Full Proposal Review Process	10
5	Evaluation Criteria.....	10
6	Project Selection	13
7	Contract Requirements	14
7.1	Project Milestones and Deliverables	14
7.2	Reports	15
8	Basis of Payments	15
9	Project Closeout.....	15
10	Non-Performance.....	15
11	Contacts.....	16
12	Appendix A: Resources.....	17

List of Tables

Table 1:	Budget Template.....	9
Table 2:	Cost-Share Template.....	10
Table 3:	Evaluation Criteria and Scoring.....	13

1 INTRODUCTION

The Technology Advancement Program (TAP) was developed in 2007 under the San Pedro Bay Ports Clean Air Action Plan (CAAP)¹, which aimed to significantly reduce the health risks posed by air pollution from the ships, trucks, harbor craft, cargo handling equipment, and rail locomotives that serve the Port of Long Beach and Port of Los Angeles (Ports). In 2017, the Ports updated the CAAP with even more aggressive air-emission control strategies and a goal to achieve a zero-emissions port complex by 2030.

To achieve our CAAP goals, the Ports need technologies that reduce criteria pollutants and greenhouse gases (GHG), and, in many cases, eliminate emissions entirely. Thus, the TAP seeks to accelerate the commercial availability of new, clean technologies for port equipment, in order to move towards zero emissions. The TAP is focused on testing and evaluating the performance of emerging technologies through in-service demonstrations. The TAP's goal is to nurture nascent emission-reduction technologies so they can be commercialized and deployed portwide.

Unlike other regional and state technology advancement programs, the Ports' TAP is focused on clean technologies and infrastructure specifically for maritime related mobile sources that operate in and around ports. The Ports have identified the following categories for TAP funding priority:

- Ships
- Cargo-handling equipment
- Harbor craft
- Locomotive
- Heavy-duty on-road trucks
- Fueling infrastructure technology advancements

The TAP is supported by its TAP Advisory Committee (TAP AC), which is comprised of representatives from both Ports, the United States Environmental Protection Agency (USEPA), the California Air Resources Board (CARB), the California Energy Commission, and the South Coast Air Quality Management District (South Coast AQMD). The TAP AC serves in an advisory role to the Ports for screening, reviewing, and recommending projects that merit further evaluation and development.

¹ <http://www.cleanairactionplan.org/>

2 PROJECT IDENTIFICATION

The TAP relies on several approaches to identify and support potential projects:

- **Open Request for Information:** Beginning in 2020, an open Request of Information (RFI) will be available on the TAP website². The RFI will provide instructions to submit a short concept paper. An RFI is intended to help the Ports learn about promising new emission-reduction technologies of which they were not previously aware and is not limited to a specific source category, technology platform, or application.

Concept papers may be submitted at any time. The Ports TAP and the TAP AC will review concept papers as they are submitted for alignment with the TAP Program Guidelines and TAP priorities. Concepts that pass this step will be invited to submit a full project proposal for TAP funding consideration. Concept that do not pass this step will be notified via email of the Ports' decision.

Details on the RFI and the concept paper process may be found in Section 4 of the TAP Program Guidelines.

- **Request for Proposals (RFPs):** Periodically, in order to stimulate technology development in high-need applications, or to target a specific technology or source category, the Ports may issue RFPs. RFPs are intended to help the Ports generate interest and spur technology development around a singular focus.

Details on eligibility requirements, project types, allowable costs, project deliverables, and application instructions will be contained in each RFP.

- **Port-Initiated Projects:** On occasion, where there is specific interest in an emissions reduction technology or project, the Ports will develop a project, seek partnerships to demonstrate the use of the technology in port applications, and manage the implementation of the project. Such projects may include paper studies, development of test protocols, grant-funded demonstrations, and co-funding for port-related technology projects led by other agencies.

All technology developers, project proposers and other interested stakeholders wishing to receive advanced notices of RFI, RFPs, Port-Initiated Projects or other TAP notices may sign up for the TAP email list at www.cleanairactionplan.org/tap.

² <https://cleanairactionplan.org/technology-advancement-program/>

3 ELIGIBILITY

3.1 Eligible Applicants

Any public or private entity is eligible to apply.

3.2 Eligible Projects

All TAP projects must meet the following requirements:

- Project team includes a demonstration project partner that operates or calls at one or both of the Ports (i.e., a terminal operator, shipping line, trucking company, etc.);
- Technology has the potential to result in reductions of diesel particulate matter (DPM), nitrogen oxides (NOx), sulfur oxides (SOx), and/or GHG;
- For on-road heavy-duty trucks or cargo handling equipment, the technology must be beyond the conceptual and/or research and development (R&D) phase and already exist as a prototype³;
- For ships, harbor craft, and locomotives R&D and prototype-development projects that meet aforementioned emission reduction targets will be considered;
- Infrastructure focused projects must in some form innovate beyond simply supporting vehicle deployments; and
- Equipment must operate in one or both of the Ports during the demonstration.

Projects may target either new equipment or the retrofit of existing equipment.

The Ports will only consider the following project types:

- **Trucks:** Zero emissions (no tailpipe emissions and 100% diesel fuel displacement), hybrid drivetrains, or certified near-zero emissions; for hybrid trucks, preference will be given to hybrid trucks with capacity to operate in all zero-emissions mode, such as a plug-in electric hybrid.
- **Cargo-handling equipment:** Zero-emissions (no tailpipe emissions and 100% diesel fuel displacement), hybrid drivetrains, or certified near-zero emissions operations; for hybrid equipment, preference will be given to hybrid equipment with capacity to operate at least some of the time in zero-emissions mode, such as a plug-in electric hybrid.
- **Ships:** Alternative fuel and/or engine technologies resulting in NOx emission levels *better than* Tier 3, or, technologies that can be applied to existing ships (i.e., retrofit) to achieve Tier 3 emission levels or better.

³ A prototype is a fully designed and constructed piece of equipment that is not yet commercially available. A technology may be considered a prototype if it exists at a smaller scale than what is required by port operations or in a similar application.

Additionally, projects that demonstrate optimized fuel efficiency or demonstrate at-berth control technologies.

- **Harbor craft:** Hybrid, alternative fuel, and/or engine technologies resulting in NOx emission levels better than Tier 4 standards, or, technologies that can be applied to existing harbor craft (i.e., retrofit or repower) to achieve Tier 3 or Tier 4 emission levels.
- **Locomotives:** Zero emissions (no tailpipe emissions and 100% fuel displacement) or hybrid and near-zero emissions engine technologies or alternative fuel that provide significant reductions beyond existing technology.

The following project types are not eligible for TAP funding:

- Commercialized technologies;
- Technologies that are not applicable to port-related mobile equipment or infrastructure;
- Fuel additives;
- Technologies in the conceptual or R&D phase (with the exception of ships, harbor craft, and locomotives);
- Stationary energy management, demand reduction, or energy generation technologies⁴; and
- Transport Refrigeration Unit (TRU) technologies.

3.3 Eligible Costs and Match Funding

The following costs are eligible for TAP funding:

- Design and engineering
- Materials and equipment
- Construction
- Systems integration
- Data tracking equipment and software
- Emissions testing
- Fueling infrastructure to support the demonstration
- In-use demonstration costs, including staff time to track and report data
- Project management not to exceed 10% of the total project cost

The following costs are not eligible for TAP funds:

- Fuel and other consumables
- Labor to operate the equipment or vehicle during the course of normal business operations

⁴ Applicants with stationary energy-related projects can apply to the Port of Long Beach's Energy Technology Advancement Program (ETAP). More information can be found at www.polb.com/energyisland.

- Administrative overhead, including office space, utilities, insurance, personnel not directly related to project implementation
- Travel
- Marketing or promotional costs

Match funding is a TAP requirement. Up to 50% of a project's costs will be funded by the TAP. Of the technology provider's minimum 50% cost share, a minimum of 10% must be in the form of a cash contribution to the project. All costs, including match funding, will be tracked and documented in accordance with contract requirements.

Although TAP funds cannot be used to pay for labor to operate the equipment or vehicle in the course of normal business operations or fuels and other consumables, these costs can be used to meet a portion of the cost share requirements.

4 REQUEST FOR INFORMATION PROCESS

The Ports will post the RFI on the TAP website beginning in January 2020. The RFI announcement will also be emailed to all contacts signed up for the TAP contact list. The RFI process consists of two steps:

- (1) A concept paper, and,
- (2) A full proposal, if requested.

Proposers should be aware that documents submitted to the Ports are considered public record.

4.1 Concept Paper Submission

In accordance with the RFI, proposers shall fill out the website form at this link:

<https://cleanairactionplan.org/technology-advancement-program/tap-guidelines-and-funding-opportunities/>

An outline of the information requested in response to the RFI is provided below:

- Company Name, address, phone and email for two contacts, including (1) the lead technical contact, and (2) the lead business/marketing contact, if applicable
- Technology overview (scientific explanation of the technology and its current use in other applications, if applicable)
- Description of the proposed demonstration, including duration, objectives, project partners, and cost estimates

- Projected emission reductions and the basis for those projections (for the project itself, not an extrapolation to larger scale implementation)
- Plan for agency approval (i.e., verification or certification)
- Business case for technology commercialization

In advance of submittal, proposers are encouraged to review the documents listed in Appendix A, which include testing protocols and duty cycle reports, as applicable.

Proposers may not submit more than one concept paper in a calendar year for the same technology platform.

4.2 Initial Screening

Port staff will perform an initial screening of each project concept paper upon submission, based upon the following questions:

- Does the proposed project meet all eligibility criteria and include a port demonstration partner?
- Is the technology feasible in a marine environment?
- Does the technology have significant potential benefits relative to the Ports' clean-air goals, specifically, does the technology address a sizeable portion of the fleet or show promise for significant emission reductions?
- Has the proposer adequately justified the funding request (i.e., is the request reasonable in terms of the ratio of Port to project funds, and/or does the project cost match the scale of potential benefits/applicability)?

Upon completion of this initial screening, the Ports will notify proposers of results and next steps, as applicable. Notification will be made via email. The Ports strive to notify proposers within 10 weeks of submission.

4.3 Full Proposal

Project concepts that warrant further consideration will be invited to submit a full proposal. A full proposal consists of the following information:

1. Cover page:
 - a. Descriptive project title
 - b. Contact information
 - i. Name of primary contacts (technical and business/marketing)
 - ii. Business and mailing addresses
 - iii. Telephone and email addresses
2. Project description:
 - a. Brief technology description and principle of operation
 - b. Description of the proposed project and expected deliverables

- c. Projected air quality benefits (i.e., PM, NO_x, SO_x, GHG reductions) of the technology, including documentation of emission testing results. This is for the project equipment, not the port fleet.
 - d. Projected commercial cost of technology
 - e. Project schedule (include milestones, deliverables and associated deadlines)
3. Project team description:
- a. Qualifications and capabilities of project team
 - b. Commitment letter(s) secured from port operators participating in the project
 - c. Commitment letter(s) secured from project team members that document role and cost share.
4. Project Scope of Work:
- a. Task Description, including list of key milestones. These milestones will be linked to invoice payments.
 - b. List of project deliverables by task
5. Proposed budget, by task in table format (see templates below in Table 1 and Table 2):
- a. Cost of each task, including cost type (in-kind, cash) and source (TAP, contractor, other grant sources, etc.)
 - b. Provide a clear summary in table format of all in-kind and direct cost-sharing, secured and anticipated

The proposal must not exceed 15 pages and must be submitted via email to Port staff delineated in Section 11.

Table 1: Budget Template

Task Description	Requested TAP Funding \$ (A)	Project Team Cash \$ (B)	Project Team In-Kind \$ (C)	Total Project Team \$ (B+C=D)	Total Cost \$ (A+D)
Design and Engineering					
Materials and Equipment ¹					
Construction and/or Systems Integration					
In-Use Demonstration ²					
Emissions Testing					
Charging or Fueling Infrastructure, if applicable					
Project Management ³					
TOTAL:					

¹ Includes data tracking equipment and software.
² Includes labor during the demonstration to test the equipment and staff time to track and report data.
³ Not to exceed 10% of the total project cost.

Table 2: Cost-Share Template

Project Partner/Agency	Cost Share \$
TOTAL:	

4.4 Full Proposal Review Process

Upon receipt of a full proposal, Port staff will forward the proposal to the TAP Advisory Committee for evaluation. The evaluation criteria identified in Section 5 will be used. The Advisory Committee will provide recommendations to the Ports to either approve, request additional information or clarification or decline TAP funding for the project. A minimum score of 70 points must be achieved to be considered for TAP funding.

Project proposals not selected for TAP funding will not be considered at a later/future time unless the proposal is substantively different from the original proposed project.

5 EVALUATION CRITERIA

The Ports, in consultation with the TAP Advisory Committee, will use the evaluation criteria and scoring matrix in Table 3 when reviewing full project proposals. Below is a general discussion of each criterion:

Potential Emission Reductions

Emission reductions will be calculated following the accepted CARB and SCAQMD methodologies. The primary calculation methodology is based on the Carl Moyer Program⁵. Applicants may propose alternative emissions reduction calculation approaches believed to be appropriate to their project proposal, which may be necessary for unique project types.

Project Cost

The requested funding level, or the cost to the Ports, will be considered when prioritizing the use of limited Port funds. In order to leverage TAP funding, a minimum of 50% of matching funds will be required for all projects, either as a direct financial commitment or in-kind services. A minimum of 10% of match funding must be a direct financial commitment (i.e., cash). Proposers must document commitments from project partners and showing the level of financial support secured.

⁵ Carl Moyer Program Guidelines are available at <http://www.arb.ca.gov/msprog/moyer/moyer.htm>

Degree of Technology Maturity

A key evaluation criterion is the degree of technology maturity. This criterion refers to the certainty of an emissions control approach to achieve the expected emission reductions.

For most projects, technologies must at minimum exist as a prototype to be considered. A prototype is a fully designed and constructed vehicle or piece of equipment that is not yet commercially available. A technology may be considered a prototype if it exists at a smaller scale than what is required by port operations or in a similar application.

For projects related to ships, harbor craft, and locomotives only: The TAP will consider technologies in the R&D/pre-prototype phase, though preference will be given for more mature technologies. For such projects, proposers must demonstrate they have the technical, logistical, and financial ability to manufacture a working prototype for demonstration purposes.

Technologies that are certified or verified⁶ by CARB at the time of project implementation for a different type of equipment, indicating full technology maturation, will be considered most favorably. Proposals that involve non-certified or non-verified technologies will also be considered, but proposers must detail steps they have taken to secure CARB certification or verification or document plans to do so.

Proposers must submit supporting documentation to verify the emission reduction capability of the proposed project, including either CARB Executive Orders indicating verification/certification or emission test results (including the laboratory name, address and telephone number; test protocols; and methods).

Projects may include funding requests for emissions testing at testing facilities agreed upon by CARB, the Ports and the proposer.

Proposal Team's Qualifications/Expertise

Proposals will be evaluated based on the experience and qualifications of the project applicant and/or project team, as documented in the proposal. The Ports will give preference to teams/team members with previous experience participating in technology advancement programs and/or grant-funded demonstrations and to companies with experience designing, manufacturing, and integrating the proposed technology.

⁶ Refer to <http://www.arb.ca.gov/diesel/verdev/background.htm> for background regarding CARB's certification and verification programs relating to the sale, use, or modification of emission control systems in California. The programs are specific to the type of device as well as the market for which it is designed.

Potential Industry Benefits

Technologies with a high likelihood of industry acceptance as judged by fleet applicability and technological readiness to meet the demands of port operations are preferred. Proposers can see the types and quantities of equipment used at the Port of Long Beach or Port of Los Angeles by consulting their respective emissions inventories.⁷ The Ports will consider the following criteria in evaluating industry benefits:

- Opportunities for widespread commercial deployment (and thus significant port-wide emission reductions), i.e., technologies with the potential to address large segments of the fleet.
- Technology is likely to be durable, have adequate power to meet port duty cycles, and has been proven in a marine environment (or has substantial potential to be proven in a marine environment).
- Capital, operating, and lifecycle costs will be considered in order to gauge how well a new technology may be accepted by the industry.

Technical Approach/Statement of Work/Project Schedule

Proposals will be evaluated based on the technical approach, statement of work and project schedule. Proposed demonstration projects should be consistent with Port-approved test protocols, if applicable, and maximize TAP resources.

⁷ Emissions inventories for each port are available online and provide detailed information on port equipment. https://www.portoflosangeles.org/environment/studies_reports.asp
<http://www.polb.com/environment/air/emissions.asp>

Table 3: Evaluation Criteria and Scoring

Evaluation Criteria	Maximum Score
<p>Potential Emission Reductions</p> <ul style="list-style-type: none"> • Has the proposer adequately articulated the technology’s potential to significantly reduce emissions? (0-5 points) • Was initial emissions testing documentation submitted to support these claims? (Yes = 0-5 points) <p><i>For cargo-handling equipment and trucks:</i></p> <ul style="list-style-type: none"> • Is the technology fully zero-emissions? (Yes = 10 points) • Is this technology capable of limited zero-emission miles? (Yes = 5 points) • Is this technology a fully hybridized drivetrain? (Yes = 3 points) <p><i>Or</i></p> <p><i>For ships, harbor craft, and locomotives:</i></p> <ul style="list-style-type: none"> • Does the technology significantly reduce NOx, PM, SOx, or GHG? (reductions <10% = 3 points, reductions 11-24% = 5 points, reductions > 25% = 10 points) 	20
<p>Project Cost</p> <ul style="list-style-type: none"> • Percentage of funding requested from the TAP? (TAP funding request is: 50% of total project cost = 3 points; Less than 50% of total project cost = 4-10 points, with more points awarded for larger cost share contributions) 	10
<p>Degree of Technology Maturity</p> <ul style="list-style-type: none"> • Is the technology certified or verified, even in another application? (Yes = 0-5 points) • Is the technology ready for in-use demonstration? (Yes = 0-5 points) <p><i>For ships, harbor craft, and locomotives:</i></p> <ul style="list-style-type: none"> • Is there a working prototype for the technology? (Yes = +5 bonus points) 	10
<p>Proposal Team’s Qualifications</p> <ul style="list-style-type: none"> • Has team previously participated in in-use demonstrations? (Yes = 0-5 points) • Has team previously developed this technology, even in another application? (Yes = 0-5 points) • Has the team previously worked together? Did the team complete the project per the scope of work, budget, and schedule? (Yes = 0-5 points) 	15
<p>Potential Benefits</p> <ul style="list-style-type: none"> • Is this technology applicable to a large segment of the fleet? (Yes = 0-5 points) • Does the technology have potential to meet demands of port operations? (Yes = 0-10 points) • Has the proposer articulated the potential capital, operating, and lifecycle costs associated with commercialization of this technology? (Yes = 0-5 points) • Has the Port partner signaled intent to use the technology in regular operations upon completion of a successful in-use demonstration? (Yes = 0-5 points) 	25
<p>Technical Approach</p> <ul style="list-style-type: none"> • Has the proposer clearly articulated the demonstration plan? (Yes = 0-10 points) • Is the plan able to meet the project objectives? (Yes = 0-5 points) • Is the schedule reasonable? (Yes = 0-5 points) 	20
TOTAL	100
TOTAL WITH BONUS POINTS	105

6 PROJECT SELECTION

Projects are recommended for TAP funding by the Ports’ staffs in consultation with the TAP AC to each Port’s respective Board of Harbor Commissioners. The Boards of Harbor Commissioners have final approval over all TAP projects; the Ports are not responsible for any project costs until a contract is fully executed by both parties.

7 CONTRACT REQUIREMENTS

If selected for TAP funding, the proposer will be required to execute a contract with the Ports that includes standard terms and conditions for the project award, including port-specific, project-specific insurance requirements. The contract will be issued to a single entity; in the case of a project partnership, it will be the entity that maintains fiscal liability for the project.

Proposers must be prepared to execute the contract within three months of approval, unless a written extension is granted by the Ports. If an awardee is unable or unwilling to execute a contract within that timeframe, the project award may be rescinded.

7.1 Project Milestones and Deliverables

The Ports will establish performance milestones and associated deliverables to ensure adequate progress as part of the contracting process. These deliverables are incorporated into the TAP contract and are linked to the payment schedule.

Performance milestones and deliverables are negotiated with the contractor and thus vary from project to project, but some commonly used performance milestones include but are not limited to:

- Acceptance of the test plan
- Completion of technology/equipment integration, manufacturing and/or installation
- Initial acceptance testing
- Documentation for CARB certification or verification, as appropriate
- Delivery of equipment or vehicle at prescribed port terminal(s) or truck facility
- Progress of the in-use demonstration at prescribed intervals
- Final report

Deliverables include but are not limited to:

- Test plan
- Interim progress reports
- Initial operation of demonstration technology
- Emissions or laboratory testing, if applicable
- Final report

7.2 Reports

Contractors are required to provide regular updates on the progress of the technology development and demonstration. Types of reports include:

- ***Project Meetings:*** Periodic project meetings will be required during the project term. These project meetings may take place by phone on a weekly, bi-monthly or monthly basis, depending on project needs. The contractor must also facilitate field visits during the demonstration as specified in the contract terms.
- ***Interim Reports:*** Interim reports will be filed at intervals prescribed by the contract and used to document project progress for payment purposes. They require supporting documentation including, but not limited to invoices, test data, and photographs.
- ***Final Report:*** The final report will be submitted at the conclusion of the project. This report should include the following, at a minimum:
 - Documented emissions reductions achieved
 - Total project budget and final cost
 - Lessons learned (any challenges/limitations with application, opportunities to improve performance, etc.)
 - Information on future roll-out and availability of the technology
 - Business case for commercialization

8 BASIS OF PAYMENTS

TAP payments are issued on a reimbursement basis following completion of each milestone task described in the contract. Contractors must provide sufficient documentation of task completion, including but not limited to interim reports, itemized deliverables as prescribed in the contract, data logs, invoices, purchase reports, and photographs.

9 PROJECT CLOSEOUT

The TAP project is considered complete when the Ports accept the final report and issue the final payment. Final reports are posted to the TAP website for public review.

10 NON-PERFORMANCE

Contractors that fail to meet the terms and conditions specified in their contract may be deemed “non-performing.” Non-performance may include:

- Failure to abide by general funding contract terms and conditions
- Failure to respond to repeated inquiries on project status or progress

- Failure to meet major milestones
- Failure to file required reports

Should the Ports believe non-performance has occurred, or if it appears non-performance may occur during the grant term as evidenced by interim reports or project progress, the contractor will be required to submit a corrective action plan. The Ports have sole discretion to accept or reject the corrective action plan. Repeated non-performance may result in the Ports canceling the TAP contract.

Additionally, at any time, if a contractor cannot or no longer wants to move forward on a project, the contractor may request contract cancellation. The request must be sent in writing to the Ports and may be submitted via email.

11 CONTACTS

Questions about these guidelines or the TAP in general may be submitted to:

Jacob Goldberg
Port of Los Angeles
jgoldberg@portla.org

Rose Szoke
Port of Long Beach
rose.szoke@polb.com

12 APPENDIX A: RESOURCES

San Pedro Bay Ports Clean Air Action Plan

<https://cleanairactionplan.org/>

San Pedro Bay Ports Technology Advancement Program

<http://www.cleanairactionplan.org/technology-advancement-program/>

San Pedro Bay Ports Technology Feasibility Assessments

Cargo-Handling Equipment: *<https://cleanairactionplan.org/documents/final-cargo-handling-equipment-che-feasibility-assessment.pdf/>*

Drayage Trucks: *<https://cleanairactionplan.org/documents/final-drayage-truck-feasibility-assessment.pdf/>*

San Pedro Bay Ports Fleet

Port of Long Beach: *<http://www.polb.com/environment/air/emissions.asp>*

Port of Los Angeles: *https://www.portoflosangeles.org/environment/studies_reports.asp*

Technolgy Advancement Program Final Reports

<https://cleanairactionplan.org/technology-advancement-program/final-reports/>

Duty Cycle Reports

Drayage Trucks: *<http://www.cleanairactionplan.org/documents/drayage-truck-chassis-dynamometer-test-cycle-final-report-9-30-11.pdf>*

<http://www.cleanairactionplan.org/documents/hdv-drayage-truck-duty-cycle-final-report-revised-3-10-11-with-modal-data.pdf>

Yard Trucks: *<http://www.cleanairactionplan.org/documents/development-of-a-yard-hostler-activity-cycle-final-report.pdf>*

<http://www.cleanairactionplan.org/documents/development-of-a-yard-hostler-activity-cycle-2-summary-report.pdf>

Test Protocols

Drayage Trucks

<http://www.cleanairactionplan.org/documents/san-pedro-bay-ports-zero-near-zero-emissions-drayage-truck-testing-demonstration-guidelines.pdf>

Yard Trucks

<http://www.cleanairactionplan.org/documents/yard-tractor-test-protocol-final-draft.pdf>

Emission Reduction Calculations

Use the methodology for the Carl Moyer Program:

https://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmp_appc_20151218.pdf