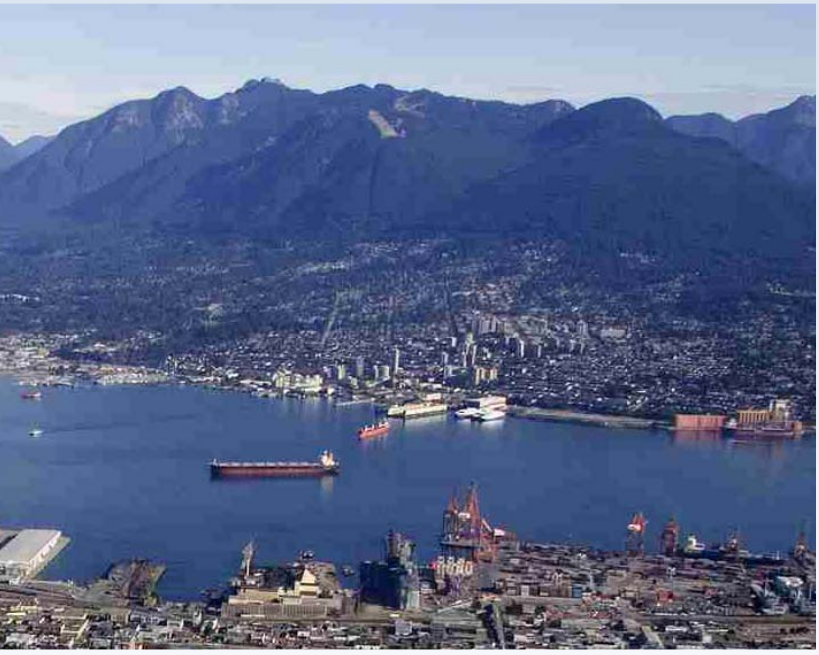

Northwest Ports Clean Air Strategy

Port of Seattle
Port of Tacoma
Vancouver Port Authority

December 2007

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INTRODUCTION

Purpose

This is a strategy (herein referred to as the "Strategy") to reduce maritime and port-related emissions that affect air quality and climate change in the Pacific Northwest via a collaborative approach led by the Ports of Seattle and Tacoma in Washington State and Vancouver in British Columbia. The purpose of this Strategy is to reduce diesel and greenhouse gas emissions in the region by achieving early reductions in advance of, and complementary to, applicable regulations. In addition, this Strategy sets targets that build on the success and momentum of current emissions reduction initiatives, and suggests a range of practical actions the Ports and their industry stakeholders may choose from to achieve those targets. This Strategy has been improved based on various consultation and outreach with and feedback from stakeholders, conducted formally and informally by each port since the Ports released the first draft of the Strategy in May 2007. This final Strategy will be sent to the Ports of Seattle and Tacoma Commissions for adoption in January of 2008.

Early in 2007, Vancouver Port Authority (VPA), Fraser River Port Authority, and North Fraser Port Authority entered into discussions that would lead them to amalgamate into one entity, the Vancouver Fraser Port Authority (VFPA). Amalgamation is expected early in 2008. The Vancouver Port Authority and Environment Canada have worked in collaboration with their United States (US) counterparts throughout the development of this Strategy, and recognize the importance of action on both sides of the border to its success. Vancouver Port Authority and Environment Canada staff have participated on the basis that formal commitment to the Northwest Ports Clean Air Strategy by the amalgamated Vancouver Fraser Port Authority will secure the Strategy's actions and benefits over a wider range of port and maritime activities in British Columbia's Lower Mainland.

In the same way that commitment from the new Vancouver Fraser Port Authority will maximize the Strategy's benefits, consulting stakeholders of all three former Port Authorities under the banner of the new amalgamated Authority will ensure the most effective consultation process, and lead to the most successful Strategy possible. Formal consultation with stakeholders in Canada will therefore take place in 2008. As a result of this strategic but unique timing for Canada, further improvements to the Strategy will be considered in late summer/ early fall of 2008 following consultation with Canadian stakeholders, with the goal of adoption by the VFPA Board in September 2008.

In creating this Strategy, the Ports worked together with the regulatory agencies of Environment Canada, the Puget Sound Clean Air Agency, the United States Environmental Protection Agency (EPA), and Washington Department of Ecology (Ecology). These agencies support this collaborative approach, believing that working cooperatively is the best way to achieve significant air emissions reductions as early as possible. The success of this effort hinges on the following qualities of the three Ports: 1) All three ports make significant economic contributions to the region, 2) All three ports have plans and expect significant investments for

continued development, and 3) All three ports are committed to improving the environment, public health, and the regional economy by reducing their impacts on air quality and climate change. This Strategy addresses emissions reductions with shared targets, while allowing each port to implement its own unique and appropriate emission reduction actions. The regulatory agencies will lead, in cooperation with the three Ports, an effort with other regional ports and non port-related emitters of diesel emissions within the same airshed to achieve similar goals as those outlined in this Strategy.

Geographic Scope

This Strategy is aimed at improving the air around ports and maritime industry hubs with benefits that extend throughout the Georgia Basin - Puget Sound airshed as illustrated in Figure 1. In general, the marine areas include the Strait of Juan de Fuca, the greater Puget Sound area, the Strait of Georgia, Haro Strait, Boundary Pass, Rosario Strait, and other relevant nearby waterways. In consideration of the proposed geographic scope of the Clean Air Strategy, the Ports and agencies welcome and encourage other regional ports and industry stakeholders to participate and sign on to the Strategy.

Figure 1: Map of Georgia Basin-Puget Sound

Map by Environment Canada

Importance of the Clean Air Strategy

Ports are a critical part of the Pacific Northwest and North American economy, allowing people across the continent to buy and sell their products, as well as travel, all over the world. Global trade also brings good jobs and business opportunities to local communities and supports a strong quality of life. As world trade continues to grow, the Pacific Northwest stands to benefit even further from its ports.

However, many port-related activities contribute to air emissions as described in the Puget Sound Maritime Air Emissions Inventory,[1] the 2005-2006 British Columbia Ocean-Going Vessel Emissions Inventory, and the soon-to-be completed British Columbia Lower Mainland Port Land-Based Emission Inventory and Lower Fraser Valley Emission Inventory. Diesel engines in ships, trains, trucks, and other equipment are the primary power driving the maritime goods and passenger movement industries. While these engines are more efficient and cleaner than they used to be, they still emit significant amounts particulate matter (PM), nitrogen oxides (NOx), and sulfur oxides (SOx) which negatively affect human health and the environment. All three of these criteria air pollutants are addressed to varying degrees in this Strategy.

Air quality in the vicinity of Northwest ports currently meets US ambient air quality standards as well as Canadian air quality objectives and standards. However, fine particulate standards have recently been tightened in the US which will bring several areas in Puget Sound out of attainment. In addition, the Canada Wide Standards include provisions for continuous improvement and keeping clean areas clean. The Ports are committed to improving maritime, port-related emissions and see substantial environmental, economic, and social benefits associated with further air quality improvements.

A key goal of the joint Strategy is to stay in attainment of ambient air quality standards and objectives, including continuous improvement recognizing that standards and objectives are not a limit to "pollute up to." In addition to concerns about ambient air quality, reducing risk from exposure to diesel particulate is also a primary goal of the Strategy. For example, air quality agencies for the Puget Sound and Lower Fraser Valley areas estimate that PM from all diesel engines (i.e. not just port-related) accounts for more than 70% of the potential cancer risk from all air pollutants.[2] Exposure to diesel emissions can worsen asthma and contributes to increased rates of lung cancer, chronic respiratory and cardiovascular disease, and other health impacts. Diesel emissions also contribute to issues such as acid deposition, crop and forest damage, climate change, impaired visibility, and aerial deposition to aquatic ecosystems. Given these and other implications for public health and the environment, the reduction and minimization of these emissions are a top priority for the Ports, air agencies, and other

[1] Puget Sound Maritime Air Emissions Inventory, April 2007, available online at: http://www.maritimeairforum.org/EI/Puget%20Sound%20Maritime%20Air%20Emissions%20Inventory.pdf, last visited 12/12/2007.

[2] Puget Sound Clean Air Agency, *Final Report: Puget Sound Air Toxics Evaluation*, October 2003, available online at: http://www.pscleanair.org/airq/basics/psate_final.pdf, last visited 12/12/2007.
Draft *Air Toxics Emission Inventory and Health Risk Assessment – Summary Report*, October 2006, prepared for Greater Vancouver Regional District Policy and Planning Department and Environment Canada. This report has not yet been released for public consumption.

stakeholders. By voluntarily reducing maritime, port-related emissions, this Strategy helps to achieve the reduction of related health, environmental, and economic impacts.

Additionally, the global climate, including in the Pacific Northwest, is changing with potentially profound consequences that will be felt all over the world. Greenhouse gas emissions from combustion of fossil fuels are a principal contributor to climate change,[3] and both the Puget Sound and British Columbia's maritime Emissions Inventories quantify maritime sources of these emissions. While the solution to climate change will need to be global in scope, this Strategy will contribute by reducing greenhouse gas emissions from Pacific Northwest maritime, port-related activities as a co-benefit of various PM emission reduction initiatives.

GOALS AND OBJECTIVES

The goal of this Strategy is to reduce air emissions from current and future maritime, port operations in the Pacific Northwest through specific strategies and actions within each category of port operation. In addition, all future port growth should be defined in terms of "green" growth, emphasizing reduced emissions and long-term sustainability. The Ports are committed to working with their tenants and stakeholders to implement these, and other actions, during construction of new terminals and facilities. The initial emphasis of the Strategy is on the three major ports in the region, and takes into account each port's unique development plans and emissions reduction opportunities with a focus on continuous improvement. The actions identified in this Strategy are meant to address three primary emissions reduction objectives:

1) Reduce maritime and port-related air quality impacts on human health, the environment, and the economy;

2) Reduce contribution to climate change through co-benefits associated with reducing air quality impacts; and

3) Help the Georgia Basin – Puget Sound airshed continue to meet air quality standards and objectives.

EMISSIONS REDUCTION ACTIONS

Activities for Future Implementation

The Port's emission reduction strategies are organized by the sources (herein referred to as "sectors") of maritime emissions: ocean-going vessels; cargo handling equipment; rail; trucks and vehicles; and harbor vessels. For all sectors except Harbor Vessels, the Ports have identified a performance measure as a goal and means of measuring success. For each sector,

[3] Intergovernmental Panel on Climate Change (IPCC), Working Group I Report, *The Physical Science Basis*, February 2007, available online at: http://ipcc-wg1.ucar.edu/wg1/wg1-report.html, last visited on 12/12/2007.

a core "menu" of potential emissions reduction activities is suggested for implementation over both a short (by 2010) and long (by 2015) term timeframe. The short-term actions are intended to achieve real reductions quickly, while the long-term actions will take more time to develop. Although the focus of this Strategy is on actions between now and 2015, the Ports recognize the need to review and adjust the Strategy up to 2015 and beyond in light of new standards, technology, and air emissions data. A major review and update process is planned for five-year intervals through 2015. The suggested activities outlined are potential options for achieving these standards, and would augment those currently underway. A sixth category, Administration, is also included to highlight some of the various administrative actions the Ports are taking to reduce their own diesel and other emissions.

Short-term actions for all sectors focus primarily on:

- Switching to use of electricity and cleaner fuels and increasing fuel efficiency,
- Retrofitting[4] existing engines,
- Ensuring best available engine technologies for new equipment purchased in this time frame,
- Initiating demonstration projects to evaluate promising emissions reduction technologies, and;
- Continued operational efficiency improvements during port development.

Exploration of emissions reduction options through feasibility studies and pilot projects is also a key component of short-term actions, with the idea that many of these options could be implemented in the long-term as they are proven feasible and viable. The Ports recognize that there is not enough funding available to implement all of the ideas for pilot projects and studies in the Georgia Basin - Puget Sound region, and are working closely with other ports, air agencies, and the maritime industry to share lessons learned from projects implemented outside of the region and to encourage coordination of a range of demonstration projects to accelerate the availability of promising innovations. In many instances, the short-term actions act as interim solutions leading up to broader changes (such as major equipment upgrades; switching to non-diesel, alternative power sources; and business model shifts) in each category.

The Ports acknowledge the importance of and are implementing strategies to reduce greenhouse gas emissions, but have not developed separate performance measures in this strategy to do so. Many of the actions identified in this Strategy do, however, target both criteria air contaminants and greenhouse gases. Examples of actions that contribute to reduction of greenhouse gases include anti-idling measures, electrification and hybridization of engines, use of biodiesel fuel, and operational efficiency improvements. Many of these actions are targeted for multiple sectors. In addition, the Ports are working to determine how best to establish additional greenhouse gas reduction strategies in light of the goals established or currently being established by state, provincial, and federal government agencies.[5] The Ports recognize

[4] Inclusive of replace, repower, retrofit, refuel, and repair/rebuild.

[5] Governor Gregoire aims to reduce Washington State greenhouse gas emissions to 1990 levels by 2020 and to 25% below 1990 levels by 2035. This would be a reduction of 10 million and 30 million metric tons, respectively, below 2004 levels. The Government of British Columbia (B.C.) aims to reduce B.C.'s greenhouse gas emissions by at least 33% below current levels by

that it will be critical to align their actions with these broader goals, and intend to work closely with their stakeholders in 2008 to identify additional actions and how to achieve this alignment, as well as how to identify and measure individual projects leading to greenhouse gas reductions. The Ports are committed at this time to achieving the greatest feasible diesel emissions reductions, as well as to targeting greenhouse gases, based on a combination of the following actions performed by both the Ports and their stakeholders.

Ocean-Going Vessels (OGV)

In the short-term, the Ports will focus the performance measure for OGV on the use of cleaner fuels at dockside and at anchor for frequent callers.[6] Concurrently, other emission reducing options will be evaluated for future implementation. In addition, the Ports will work with the industry over the next few years to ensure that all ships, where feasible, are operating with the highest emissions reduction potential and are moving toward the performance measure. In the long-term, the Ports will move feasible projects from the pilot stage to implementation and continue to explore new technologies as they become available. Again, the actions in this Strategy are some example options from which ports and their industry stakeholders can choose to achieve the performance measure.

Performance Measure

By 2010: Reach the equivalent PM reduction of using distillate fuels with a maximum sulfur content of 0.5% for all hotelling auxiliary engine operations.[7][8] Use of fuels with a maximum sulfur content of 1.5%, or use of equivalent PM reduction measures for all hotelling main or diesel electric engine operations.[9]

By 2015: For all ships, compliance with performance measures that the International Maritime Organization (IMO) adopts and in accordance with the IMO schedule. The United States has submitted a proposal to the IMO that calls for the equivalent emissions reduction that would result from use of 0.1% sulfur fuel and calls for a circa 80% reduction in NOx emissions in defined coastal areas.[10][11] The Ports support a flexible approach similar to the US EPA

2020. This would be 10 per cent under 1990 levels. The Government of Canada also set a target of a 6% improvement each year from 2007 to 2010 (18% reduction in emissions from 2006 levels) and 2% annual improvements thereafter for existing facilities. Sources: State of Washington, Office of the Governor, Executive Order 02-07, Washington Climate Change Challenge, February 2007, available online at: http://www.governor.wa.gov/execorders/eo_07-02.pdf, last visited 12/12/2007. Speech from the Throne given at the Opening of the Third Session, Thirty-Eighth Parliament of the Province of British Columbia, February 2007, available online at: http://www.leg.bc.ca/38th3rd/4-8-38-3.htm, last visited on 12/12/2007. Government of Canada Action on Climate Change and Air Pollution website: http://www.ecoaction.gc.ca/news-nouvelles/20070426-3-eng.cfm, last visited on 12/12/2007.

[6] Frequent callers are defined as vessels in regularly scheduled service or strings making five or more calls to any one of the three ports in twelve consecutive months.

[7] It has been demonstrated that up to a 70% per vessel reduction in fine particulate can be achieved by switching from bunker to distillate fuels.

[8] Note there may be some ships with specific technical circumstances that would not be able to comply until 2012.

[9] Except during active docking and departure, during which non-hotelling engine operations are running.

[10] Review of MARPOL Annex VI and the NOx Technical Code: Development of Standards for NOx, PM, and SOx, submitted by the United States to IMO sub-committee on Bulk Liquids and Gases, February 2007, available online at: http://www.arb.ca.gov/research/seca/imo07b.pdf, last visited on 12/12/2007. Sections 14 and 23 summarize the key elements of the US Submittal to IMO:

proposal to the IMO that would allow use of technology or a combination of technology and cleaner fuels to reach the proposed standards. If new IMO performance measures that are substantially similar to the US IMO proposal are not in force by 2015, the Ports agree to continue to work towards meeting these goals, recognizing that technology and fuel availability could impact shipping lines ability to achieve this goal.

The menu of potential actions to meet the performance measures includes, but is not limited to:

Short Term: By 2010

Alternative or Cleaner Fuels

- Widespread use of cleaner fuels[12] at berth and at anchor, with a focus on frequent callers.
- Use of shore power where currently available for equipped vessels.
- Conduct a feasibility study for expanded shore power infrastructure at existing and new berths or other marine power alternatives, such as portable power units.

Cleaner Engines and After-Treatment

- Identify opportunities for vessel and engine redesign or retrofit on

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14 Ships operating within the defined coastal areas (such areas would include the United States and other coastal areas defined in the negotiation) could meet specified emission standards through the use of low-sulphur distillate fuels or the use of exhaust gas cleaning technology, or both. Vessels operating within these defined coastal areas would need to meet a SO_x standard of [0.4 g/kW-hr] or use a distillate fuel with a sulphur level not exceeding [0.1]%. PM limits could be defined as follows:

- [0.50] g/kW-hr for engines with a per-cylinder displacement of 15 liters or more;
- [0.27] g/kW-hr for engines with a per-cylinder displacement of 5 liters but less than 15 liters; and
- [0.20] g/kW-hr for engines with a per-cylinder displacement of less than 5 liters.

Summary of the United States proposal

23 The following table provides a summary of the proposal described in paragraphs 10 to 21 above.

Summary of Key Elements of the Proposal
NO_x standards for new build engines with a cylinder displacement greater than 30 liters: a) Tier II: 15-25% reduction effective in 2011; and b) Tier III: 80% reduction for engines on vessels applicable only in defined areas (x miles from shore) effective in 2016.
PM & SOx: Limits applicable to all vessels operating in defined areas [x miles from shore] effective in [2011]. Shipowners may choose to comply through the use of low-sulphur distillate fuel and/or the use of scrubbing technology.
NO_x standard for existing engines: 20% reduction applicable to pre-2000 large-displacement engines with exceptions to be defined for certain engines where the reduction is impractical. Reduction to be met through in-cylinder changes and simplified certification procedures by [2012].

[11] The Port of Seattle, Pacific Merchant Shipping Association, World Shipping Council, and American Association of Port Authorities have formally endorsed the US IMO Proposal, and Canada has supported the elements of the US Proposal.

[12] Cleaner fuels are defined in terms of performance standards based on use of distillate at berth and use of 1.5% sulfur or cleaner fuels during transit and maneuvering.

selected/suitable engines and secure commitments where possible.

- Complete feasibility projects such as the Holland America Line Seawater Scrubber Feasibility and Demonstration Project.
- Evaluate feasibility study of dockside after-treatment technology.

Efficiency and Conservation

- Evaluate vessel opacity program, similar to that in place at Port of Seattle and Vancouver Port Authority.
- Review operational adjustments with vessel operators and pilots to reduce emissions such as optimized speed within Puget Sound and the Strait of Georgia.

Incentives, Influence, and Collaboration

- Evaluate incentive programs, such as recognition and differentiated harbor dues or other appropriate port fees, and implement where feasible.
- Continue to work with the West Coast Collaborative (WCC), the US EPA, Environment Canada, the IMO, British Columbia Marine Vessel Air Quality Work Group, Puget Sound Maritime Air Forum, Pacific Ports Air Quality Collaborative, the Pacific Merchant Shipping Association, the North West Cruiseship Association, the British Columbia Chamber of Shipping, and others, and actively participate in these larger venues on issues such as ratification/implementation of amendments to MARPOL Annex VI regulations, the potential adoption of SOx Emissions Control Area (SECA) legislation, and/or vessel and engine redesign.
- Increase operational efficiency as port development occurs, resulting in reduced time at anchor and at dock.

Long-Term: By 2015

- Standardize fuels and technology as identified in the US proposal to the IMO to be implemented by 2011.
- Installation of alternative ship-side or shore-side power at berth for equipped vessels.
- Implement additional at-dock (e.g. stack after-treatment and electrification including portable power units) and during voyage (e.g. electrification or scrubbing) emissions reduction options deemed viable from short-term feasibility studies and pilots.
- Evaluate and update environmentally preferable vessel design considerations for future new builds, and prepare a list of such vessel design features to promote with owners, carriers, yards, and the general industry.
- Support pilot projects that promote an early implementation of technologies and fuels that are identified in the US proposal to the IMO.

Measurement, Verification, and Reporting

For the first year of reporting, frequent callers will be asked to report the type of fuels used and the sulfur level of fuels used during transit, maneuvering, at anchor, and at dock for all engines. They can also report any alternative measures used such as shore power. Annual reporting will note the percentage of frequent calls using distillate fuel (or alternative) out of total frequent

calls per port, as well as the percentage of frequent calls relative to total calls per port by all callers. The Ports will work with the stakeholder group outlined in the Performance Management, Verification, and Reporting section of this Strategy to determine the feasibility of and best methods for collecting data for all callers in subsequent reporting years. The goal will be to establish a measurement and verification process developed with input from stakeholders that includes a sound tracking, reporting, monitoring, and auditing system.

Cargo Handling Equipment (CHE)

The short-term goal for cargo handling equipment is that port operators use the cleanest available technology that meets port operational needs at the earliest possible date. The long-term goal is the use of advanced technology/near-zero emission CHE. With regard to specific performance measures for locomotives, those outlines in the Rail section of this Strategy are appropriate for terminal rail operations.

The Ports want to encourage fleet turnover while providing flexibility for the discovery and implementation of more efficient and cost-effective technologies in the near future. Thus, the Ports are not proposing an immediate, full-scale replacement of older engines; rather they assume that in the future, hybridization, full electrification, or other new types of technology will come into wide-scale use. Therefore, the short-term list of appropriate actions illustrates interim steps leading up to complete fleet modernization.

The performance measure will be achieved through actions aimed at three categories of equipment – old equipment to be replaced, new equipment being purchased, and newer pieces of equipment that have a useable life span beyond 2015. Any new equipment used at the Ports will be purchased with the cleanest technology available from the manufacturer, and 2007 US EPA on-road engines will be installed where practicable for the anticipated use at the time of scheduled capital upgrades. For the "in-between" equipment, the Ports will work with tenants and the technology industry to periodically review the status of CHE and fleet characterization, and develop a plan for the fleet to meet the 2015 measure as a whole.

Performance Measure

By 2010: Reach the port-wide equivalent PM reduction of Tier 2 or Tier 3 engines[13] operating with ULSD or a biodiesel blend of an equivalent sulfur level, and promote early implementation of the requirements between now and 2010. All new terminals will be equipped with new CHE equipment meeting the highest standards that is practicable for the anticipated use at the time of purchase.

By 2015: Reach a port-wide equivalent of Tier 4 engines,[14] for 80% of equipment. Retrofit the remainder of equipment with best available verified retrofit technologies. Purchase the cleanest

[13] Tier 2 and 3 standards are 0.15 g/hp*hr for most CHE. See Table 1.1 in US EPA's *Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines*, August 1998, available online at: http://www.epa.gov/nonroad-diesel/frm1998/nr-ria.pdf, last visited on 12/12/2007.

[14] For Tier 4 standards, see http://www.epa.gov/nonroad-diesel/2004fr.htm, last visited 12/12/2007.

available CHE equipment that is practicable for the anticipated use at the time of scheduled capital upgrades.

The menu of potential actions to meet the performance measures includes, but is not limited to:

Short Term: By 2010

Cleaner Engines and Fuels

- Begin CHE fleet modernization program: for candidate equipment, replacement with lighter, more efficient straddle carriers, rubber tired gantries (RTG), or fully-electric rail mounted gantry (RMG) cranes, and use of Tier 4 engines for yard tractor fleet.
- Complete retrofits of suitable CHE with exhaust treatment equipment which achieves the highest practical PM reductions, with a preference for verified technologies.
- Standardize the use of ULSD and/or biofuel and promote the use of cleaner fuels and lubricants, where appropriate.
- Implement idle reduction education, technology, and policy program with provisions to encourage terminal adherence to anti-idling policies and procedures.
- Identify opportunities for, and maximize the use of, regenerative energy technologies for CHE.
- Complete retrofit of suitable CHE with crankcase emission reduction equipment.

Pilot Projects

- Complete pilot test of battery electric yard hostler and implement where feasible.
- Evaluate feasibility of diesel electric hybrid yard equipment and/or rubber tired gantry cranes.
- Evaluate feasibility of liquefied natural gas (LNG), compressed natural gas (CNG), and propane use.
- Identify verified exhaust treatment technologies which will achieve the highest practical PM reductions for existing equipment and integrate those technologies into retrofit projects.

Long-Term: By 2015

- Retrofit pre-Tier 4 equipment with technology sufficient to meet the fleet average.
- Use CHE with hybridization or full-electrification technologies, where feasible.
- Maximize operational efficiency and terminal design as port development occurs, and negotiate cleaner alternatives at the time of major modifications and lease negotiations.
- Use lease measures and project reviews to drive continuous improvements and emissions reductions.

Measurement, Verification, and Reporting

The Ports will ask each terminal operator to report the number of pieces by type of cargo handling equipment in their fleet identifying how many have Tier 0, Tier 2, Tier 3 or Tier 4

engines in use each year; the number and kinds of emissions related retrofits that have been installed on the equipment; what fuel(s) their fleet is operating on; and other information that would be relevant to air emissions estimates such as use of technology similar to radio frequency identification (RFID) or Optical Character Recognition (OCR). The data collected for the 2005 regional emissions inventory will serve as the baseline. Annual reporting will note the ratio or percent change from year to year. For emissions inventory update years, horsepower hours of operation and additional information will be used to quantify emissions reductions.

Rail

The short- and long-term goals for the rail sector require a commitment by the Ports to actively work with their partner railways in a joint effort to implement currently available, cost-effective technologies; to explore new technologies as they become available; and to work to increase operational efficiencies, especially as port volume increases. Many of the actions outlined below are currently underway via demonstration projects in this region or elsewhere in North America. Railways, similar to the other sectors, have demonstrated that they are making efforts for emissions reduction and are encouraged, via this Strategy, to continue and accelerate this trajectory.

Because of the unique federal regulatory structures the US and Canadian railways operate under, separate approaches will be undertaken to achieve emissions reductions from this sector. The purpose of the efforts on both sides of the border is to establish performance measures and operational best practices for reducing emissions from switching locomotives and cargo handling operations at designated port rail yards that reach beyond current national agreements. With regard to specific performance measures for CHE, those outlined in the CHE section of this Strategy are appropriate for operations by the rail sector in support of port cargo handling. The Ports recognize that there are rail-related operations and equipment, such as switch engines, that are conducted and operated by companies other than the major railways which the Ports will be working with to achieve these performance measures.

Performance Measure

By 2010: At the Ports of Tacoma and Seattle, expedite the implementation of the SmartWay Partner commitments[15] at intermodal facilities where BNSF, Union Pacific, and Tacoma Rail have operations in the Puget Sound region. At Vancouver Port Authority, work with the industry and regulatory agencies to develop a British Columbia Locomotive and Rail Air Quality Work Group in 2008, through which collaborative efforts to reduce emissions from the rail sector will be developed.

[15] SmartWay is a voluntary program of U.S. EPA that establishes incentives for freight industry sectors to achieve fuel efficiency improvements and greenhouse gas emissions reductions. The three primary components of the program are to create partnerships, reduce all unnecessary engine idling, and increase the efficiency and use of rail and intermodal operations. See: U.S. EPA SmartWay, http://www.epa.gov/smartway/index.htm, last visited on 12/12/2007.

By 2015: Compliance with the US EPA Proposed 2007 Locomotive and Marine Diesel Engine Rule which, if adopted, will reduce PM emissions from all new locomotives engines by 90%.[16]

The menu of potential actions to meet the performance measures includes, but is not limited to:

Short Term: By 2010

Cleaner Engines and Fuels

- Identify all suitable switching locomotives for re-power with cleaner and more efficient engines or retrofit with after treatment devices.
- Use ULSD and/or biofuel in switch yard locomotive engines.
- Complete the evaluation of switch yard electrification for long-term objectives.
- Implement multi-genset technologies for switch engines, where feasible.
- Standardize routine stack opacity tests on locomotives as currently practiced by BNSF Railway Company.
- Launch and complete a pilot project for re-power/ new locomotive engine redesign.
- Pilot locomotive retrofits with advanced pollution control devices.

Anti-Idling and Efficiency Improvement

- Implement an education program and operational procedures regarding strategies to turn off the locomotives when not in use for specified periods of time.
- Implement efficiency improvements to switchyards including electrification of lift equipment and RFID system implementation.
- Increase port-wide rail and switching yard efficiencies and identify the feasibility of on-dock rail as alternative to near dock rail.
- Implement freight car productivity improvements, incorporating technologies that can reduce train resistance (drag).
- Complete BNSF Railway Company North Seattle International Gateway (SIG) railyard electrification.
- Advocate for expanded capacity at Stampede Pass to prevent mode switching (which would result in increased truck activity) and to increase operational efficiency.
- Actively pursue pilots and demonstration projects of existing technologies such as switch-engine anti-idling and recapturing electricity during line haul.

Long-Term: By 2015

Cleaner Engines and Fuels

- Begin electrification of CHE at identified rail yards.
- Implement Stampede Pass improvements if needed for rail capacity.

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16 EPA Proposal for More Stringent Emissions Standards for Locomotives and Marine Compression-Ignition Engines**,** April 2007, available online at: http://www.epa.gov/otaq/regs/nonroad/420f07015.pdf, last visited on 12/12/2007.

Anti-Idling and Efficiency Improvements

- For future new terminal developments, implement on-dock rail in preference to near dock rail, where feasible.
- Include provisions for anti-idling technology in all locomotive engines and maximize regenerative capabilities.

Measurement, Verification, and Reporting
The Ports and agencies will work with railroads to annually report the number of switcher locomotives in their local fleet, identification of how many have Tier 0, Tier 1, Tier 2 and Tier 3 engines in use each year; the number and kinds of emissions related retrofits that have been installed on the equipment; what fuel(s) their local fleet is using; and other information that would be relevant to air emissions estimates.

Trucks and Vehicles

The Ports have agreed that in order to make a significant impact on emissions from this sector, a business model is needed that provides the financial ability for truck owners and operators to purchase and implement available emissions reducing technologies and vehicles. The exact shape this business model would take and the details of a process for its implementation have yet to be defined. The Ports are committed to working with trucking industry to find a model that will produce desired emissions reductions. In addition, the Ports are continuing to monitor developments in other West Coast ports which may lead to a West Coast model for addressing port-related truck emissions. The short-term actions listed below are interim steps leading to a sustainable long-term business model.

This category is somewhat unique in that one of the Ports, Vancouver, has an established truck licensing program which the other two ports do not have in place. This program requires that container (known as “drayage” in the US and herein referred to as such) and long haul truckers accessing port terminals must have a valid Truck Licensing System (TLS) license in place. Truckers without a TLS license are not granted access to VPA property. The TLS license sets out minimum safety and environmental requirements for trucks accessing port property. In partnership, the Ports of Seattle and Tacoma will consider programs such as VPA’s truck licensing program and gate reservation system, and will work with terminal operators and railroads to establish agreements that restrict trucks that do not meet the performance measures from accessing marine terminals and intermodal yards.

The Ports are looking to engage in dialogue with stakeholders leading to real results with adequate standards for safety and air emissions. They are committed to find ways to share the responsibility of reducing community exposure by improving operations and raising awareness of options. In 2008, the Ports will work with the air agencies, engine and retrofit technology manufacturers, and other stakeholders to determine an acceptable package of emissions equivalency options to meet the performance measures. In addition, the Ports will work to gather more data on the type, age, and destination of the port drayage trucks in order to design a comprehensive program to meet the performance measures. The Ports will also conduct necessary outreach to terminal and railyard operators to achieve successful implementation of a comprehensive program.

Along with those actions listed that speak directly to the performance measures, there are a number of planning-related and project implementation actions which the Ports agree to work with regional transportation departments and air agencies to implement to gain even further emissions reductions within this sector. These actions include faster freight corridors, and priority treatments and freight-only capacity expansions to move freight on our roads and rail facilities more quickly and efficiently. Recognizing that drayage truck operations are just a portion of regional trucking activity, the air agencies commit to working with the broader trucking sector to implement similar measures to those set for drayage trucks to comprehensively reduce emissions from trucking operations.. Washington State Department of Ecology has already developed a long term strategy to address diesel particulate emissions from a variety of sources, with a priority to address sources in areas with the highest exposure risk to humans. Ecology is working toward developing programs and actions in line with the goals and priorities identified in that strategy.[17] In addition, Puget Sound Clean Air Agency has been implementing its Diesel Solutions program since 2001; however, this program has focused primarily on public fleets, including school buses. Recently, the Agency developed a draft Diesel Risk Reduction Plan and is working with partners to expand and extend State funding for diesel emissions reduction. A priority for these funds will be to reduce emissions from private trucking operations.

Performance Measure

By 2010: Reach the equivalent PM emissions level of 1994 or newer heavy-duty truck engine model year through vehicle purchase or by using approved retrofit packages to be identified in 2008 (per above).

By 2015: Eighty percent of heavy-duty drayage trucks will reach the equivalent PM emissions level of 2007 or newer engine model year through vehicle purchase or by using approved retrofit packages to be identified in 2008 (per above). This is an interim objective on the way to the goal of 100% of heavy-duty drayage trucks by 2017. All gates will have an automated system using best available technology to reduce truck waiting times.

The menu of potential actions to meet the performance measures includes, but is not limited to:

Short Term: By 2010

Cleaner Engines and Fuels

- Evaluate and/or expand testing of retrofits for drayage trucks.
- Implement truck modernization modeled after Cascade Sierra Solutions and programs such as SmartWay.
- Develop a reference list for emissions equivalency options by 2008 that would include items such as: retrofit eligible equipment such as diesel particulate filters (DPF) or diesel

[17] Diesel Particulate Emission Reduction Strategy for Washington State, Washington Department of Ecology publication # 06-02-022, December 2006, available online at: http://www.ecy.wa.gov/pubs/0602022.pdf, last visited on 12/12/07.

oxidation catalysts (DOC) and fuel saving devices that would also reduce greenhouse gas emissions.
- Encourage the use of biodiesel and other alternative fuels.

Anti-idling, Decreased Congestion, and Efficiency Improvement

- Maximize implementation of "paperless gate," such as use of RFID in combination with web-based booking systems (see next item) to prevent gate congestion and idling, and use of OCR for gate efficiency.
- Evaluate viability of mandatory web-based reservation systems; and if implemented, giving preference to trucks participating in diesel reduction strategies.
- Implement increased gate hours (thus, decreasing congestion).
- Work with state/provincial and local agencies to pass anti-idling rules and enforce anti-idling at terminal gates.

Planning Measures

- Educate regarding cruise passenger bus anti-idling at ports and encourage retrofits and replacements with cleaner engines.
- Implement terminal efficiency and off-dock logistics upgrades/improvements.
- Conduct terminal efficiency and off-dock logistics studies.
- Perform feasibility study of short sea shipping as an alternative to truck transport.
- Work with local and state agencies, community groups, and the trucking industry to ensure the most viable truck routes and parking options, as appropriate.

Long-Term: By 2015

Cleaner Engines and Fuels

- Evaluate a business model that may include programs similar to VPA's truck licensing program and gate reservation system.
- Support redesign of drayage trucks (for the Northwest region) and incorporation of full-electrification and hybridization technologies.

Anti-idling, Decreased Congestion, and Efficiency Improvement

- Install RFID systems for all drayage trucks and OCR for all terminals, or equivalent technologies.

Planning Measures

- Analyze the feasibility of developing a Northwest Region Virtual container yard and a Regional chassis pool, and implement as practical.
- Continue terminal gate and roadway efficiencies for congestion relief.
- Evaluate dedicated terminal to railyard routes.

Measurement, Verification, and Reporting

The Ports will work with terminal operators and other stakeholders to report the number of trucks meeting the 1994 and 2007 standards on an annual basis. Vancouver Port Authority will

rely on their already established truck licensing program for reporting progress towards the performance measures. The Ports of Tacoma and Seattle will utilize existing reporting systems to the greatest extent possible rather than creating a new system for data collection, and will work with eModal or equivalent software system to create a field that indicates conformance with the performance measure. They will also work with stakeholders on creating an approach of restricting access for non-conforming trucks similar to VPA's.

Harbor Vessels

The Ports and the air agencies recognize harbor vessels (including ferries, commercial vessels, tugs,[18] and pleasure craft) are also a source of emissions and therefore, actions should be taken to reduce emissions in this sector. However, the Ports have little or no authoritative control over harbor vessels, making port generated commitments to act difficult to implement. With agencies taking the lead for this sector, they and the Ports agree to create and implement an outreach strategy to work directly with the owners and operators of harbor vessels to help raise awareness and support implementation of emissions reductions. Understanding that consultation with critical players has yet to occur in Canada, as discussed in the Introduction section of this Strategy, differing approaches to working with harbor vessels may need to be taken on both sides of the border. With a focus on engine retrofits and the use of cleaner fuels, the air agencies and Ports agree to encourage and help implement pilot projects. In addition, the Ports recognize the independent efforts by the Washington State and British Columbia Ferries to reduce emissions, and encourage the continuation of these actions. As voluntary emissions reduction efforts in this sector have just recently begun, the setting of a performance measure and identifying specific actions to achieve the measure will continue with the multi-stakeholder group outlined in the Performance Management, Verification, and Reporting section of this Strategy.

The menu of potential actions to meet the goals includes, but is not limited to:

Short Term: By 2010

<u>Ferries and Commercial Vessels</u>

- Use of ULSD or alternative fuels.
- Support efforts to increase fuel efficiency.

<u>Tugs</u>

- Investigate use of ULSD or alternative fuels.
- Support efforts to increase fuel efficiency.
- Pilot hybridization.
- Raise awareness about reducing emissions and influence new purchases up to the highest emissions standards.
- Evaluate alternative docking locations to reduce unnecessary transiting.

[18] The Ports recognize harbor tugs and ocean-going tugs may need to be approached differently.

- Perform a demonstration project on converting from mechanical to electronically injected engines.

Pleasure Craft

- Use of ULSD and/or biofuel blends.
- Support efforts to increase fuel efficiency.
- Continue encouragement of use of the Shilshole Bay marina biodiesel fueling station, and explore possibility of biodiesel fueling stations in Tacoma and Vancouver.
- Continue education and outreach to encourage cleaner operations and consumer decisions.

Long-Term: By 2015

Ferries and Commercial Vessels

- Implement dockside electrification or hybridization, where feasible.
- Implement engine retrofits, where feasible.
- Pilot post combustion control/ after treatment technologies.
- Develop an agreement between the Puget Sound Clean Air Agency and Washington State Ferries to significantly reduce fuel consumption through the use of composite restraint systems, fuel sensors, and other efficiency technologies.

Tugs

- Implement dockside electrification or hybridization, where feasible.
- Implement engine retrofits, where feasible.
- Pilot post combustion control/ after treatment technologies.

Measurement, Verification, and Reporting

The agencies and Ports will work with major harbor vessel operators to annually report the number of engines and identification of how many have Tier 0, Tier 1, Tier 2 and Tier 3 engines in use each year; the number and kinds of emissions related retrofits that have been installed on the equipment; what fuel(s) their fleet is using; and other information that would be relevant to air emissions estimates.

Administration

The Ports and the air agencies recognize that while most emissions come from equipment that the Ports do not operate themselves, they have administration related emissions, diesel or otherwise, that can be reduced. Some examples of what some or all of the Ports are doing to reduce these emissions include:

- Use of cleaner technology or alternative fueled vehicles
- Employee programs to facilitate sustainable commuting options
- Leadership in Energy and Environmental Design (LEED) certification for buildings
- Energy audits and implementation of feasible improvements

The Ports are committed to continue to look for ways to reduce their administrative emissions.

Measurement, Verification, and Reporting

Each port will report the number of on and off road vehicles and vessels in their fleet and identify how many have Tier 0, Tier 1, Tier 2, Tier 3, or Tier 4 engines in use each year; the number and kinds of emissions related retrofits that have been installed on the equipment; how much and what fuel(s) their fleet is using; and other information that would be relevant to air emissions estimates. They will also report on other strategies such as employee commute reduction programs, green buildings, and energy efficiency initiatives which have been implemented and reduce air emissions and help protect the climate.

Currently Ongoing and/or Recently Accomplished Activities

The references below contain a partial list of activities recently completed or currently underway at one or more of the three Ports that help to accomplish the emissions reduction goals of this Strategy. These activities are far-reaching and robust in themselves, and in part lay the groundwork upon which future activities can be built. These activities, along with the existing, on-going, collaborative efforts and communication between ports, tenants, customers, and other stakeholders frame the future commitments laid out in this Strategy. In addition to these activities, updated maritime and port-related emissions inventories[19] and analytical tools will support air program development for Puget Sound and Greater Vancouver. These inventories and tools will help to target, along with monitoring, where to invest pollution prevention dollars to gain the biggest public health and environmental benefits for the dollars invested.

- Puget Sound Maritime Air Forum, *Emission Reduction Projects in the Puget Sound Region*, April 2007, available online at: http://www.maritimeairforum.org/EI/PSEI_Projects.pdf, last visited 12/12/2007
- Port of Vancouver, *Integrated Air Emissions Reduction Program for the Port of Vancouver: Actions to Address Air Quality and Climate Change*, January 2007, available online at: http://www.portvancouver.com/the_port/docs/2007_POV_Integrated_Air_Emissions_Reduction_Program_Final.pdf, last visited 12/12/2007.

PERFORMANCE MANAGEMENT, VERIFICATION, AND REPORTING

This strategy will be executed as an ongoing cycle of planning, implementing, reviewing and improving the actions that the Ports and their customers undertake to meet emission reduction goals. The approach is voluntary and strategic, driven by the Ports' unique and collaborative relationship with industry partners. Implementation is based on the plan, do, check, act model leading to continual improvement as follows:

[19] Puget Sound Maritime Air Emissions Inventory, April 2007, available online at: http://www.maritimeairforum.org/EI/Puget%20Sound%20Maritime%20Air%20Emissions%20Inventory.pdf, last visited on 12/12/2007.
The Chamber of Shipping, *2005-2006 BC Ocean-Going Vessel Emissions Inventory*, January 2007, available online at: http://www.chamber-of-shipping.com/index/air_main, last visited on 12/12/2007.

- Each Port will develop specific implementation initiatives to meet the objectives and performance measures outlined in the overall Strategy;
- As initiatives are carried out, Ports will measure performance and exchange ongoing feedback among participants working to achieve results;
- Collectively, the three Ports will assess results and analyze trends on a regular basis; and
- Based on results, the changes will be made to achieve continual improvement and reinforce activities that achieve results.

Following is a description of the performance management, verification, and reporting process for activities outlined in this Strategy. Each sector has a measurement, verification, and reporting section that provides more detail on the type of data to be tracked, assessed and reported.

Tracking Progress

Annual progress will be established by tracking and reporting the implementation of planned activities, such as the numbers of engines meeting certain standards or using specific fuels. More detailed estimates of actual emissions reduced as a result of these activities will be calculated and reported after 2010 and 2015, in conjunction with emissions inventory updates. Data will be collected and housed by each port[20] individually within their own tracking system/database, with common reporting in the spring following the calendar year of data collection. The Ports and agencies will work together in the first half of 2008 to determine measurement, verification, and reporting requirements, and in the second half to begin implementation. The Ports will submit a report for the second half of 2008.

Level of Reporting

Data will be reported both port by port annually, as well as regionally in 2010 and 2015. Port by port reporting will occur in a common, joint format at the same time each year. The exact data elements to be reported on will be identified by the three Ports after consultation with the partner regulatory agencies and stakeholders prior to the start of each year. Port by port reporting is necessary as each port has different key stakeholders and programs. In addition, regional total emissions reduced are important to report in the goal years, due to the shared nature of the airshed.

Analyzing Data and the Measurement and Verification System

The partner regulatory agencies (Environment Canada, Puget Sound Clean Air Agency, US Environmental Protection Agency and Washington State Department of Ecology) will review with the ports (at the ports) the annual data collected, and will provide recommendations for enhancements in type of data collected, methodology, and other data aspects for the following year. The Ports acknowledge that the success of this effort relies on the significant contributions of their tenants, customers, and other stakeholders who may be directly responsible for the equipment and operations addressed by the diesel emissions reduction

[20] In a few cases such as certain harbor craft categories and non-drayage heavy-duty trucks, the agencies will be responsible for data collection.

actions outlined in this Strategy. Movement of goods and passengers at ports is so interlinked that each organization can only contribute part of the solution. After the first year of reporting, the ports will convene sector-specific multi-stakeholder meetings to review the data collected and the measurement and verification process. The goal of these meetings will be to determine the adequacy of the initial process and the necessity and feasibility of collecting additional data in the future to show progress toward the goals, and to make recommendations to the Ports about any need for additional (third-party or external) verification. The Ports will also continue more general outreach regarding the Strategy and its associated actions via established regional air forums such as the British Columbia Marine Vessel Air Quality Work Group and the Puget Sound Maritime Air Forum.

INCENTIVES

The Northwest Ports Clean Air Strategy will succeed in large part due to the voluntary actions of the Ports and their respective clients and stakeholders in order to meet the performance measures and emission reduction targets committed to in the Strategy. Many of the individual actions in the Strategy refer to incentive-based approaches to leverage commitment. These incentives are intended to stimulate and reward those who make the decisions to actively work towards the Strategy's measures. The Ports and air agencies agree that modest, focused incentives can significantly leverage the good will of those who are making significant investments to meet the goals of this Strategy. Properly designed, such incentives can also help differentiate between those who are moving forward and those who are not. The Ports and the air agencies realize that an appropriate set of incentives that other partners can confidently rely upon over time will maximize the Strategy's benefits. As such, there is an opportunity and a responsibility to develop, fund, and implement this set of incentives. Doing so will create a unique and dynamic relationship between the Ports, air agencies, and all other partners necessary for success. The Ports and air agencies will continue to work together to develop meaningful financial and other incentives such as grants, low interest loans, fee-based responses and/or recognition programs that reward and stimulate investment in cleaner fuels, improved technologies, and enhanced operating practices. The Ports and air agencies are also committed to working together to define legal mechanisms and institutionalize programs to provide and manage these incentives.

In order to accomplish this, the Ports and air agencies will concentrate initially on supporting those activities that contribute directly to the performance measures and targets outlined in the Strategy. They will also be cognizant of emerging opportunities to pilot promising technologies or other strategies that might significantly contribute to success in ways not yet conceivable at this time. There are opportunities to continue the incentive-based efforts of the past few years in a more systemic and reliable way, including developing award and recognition programs, such as Green Flag, and raising and distributing seed money for pilots and other capital investment activities. The Ports and air agencies commit to working together within their own mandates and jurisdictions, at the local, state and provincial, and federal level, to secure

sufficient funding so that the incentives described in this Strategy become a reality. They also commit to working with technology suppliers regarding verification of technologies, and on the relationships between verification programs and funding programs. This effort will begin in earnest in 2008 and will involve all partners needed for success.

CONCLUSION

This Strategy emphasizes four main categories of actions for reducing emissions from port-related activities: utilization of cleaner fuels, development of better engines and technology to work in concert with the cleaner fuels, more efficient operations, and innovative thinking around the ways in which a specific port or other maritime activity might be carried out. This document is a framework of what the Ports of Seattle, Tacoma, and Vancouver believe needs to be achieved in order to operate sustainably and outlines the pathways, activities, and commitments needed to get there. The Ports are dedicated to responsible environmental stewardship to help protect public health and the environment. Where the Ports can not take direct action, the Ports will work collaboratively with tenants, customers, and other stakeholders to decide how best to achieve the goals and meet the performance measures outlined in this Strategy.

The Ports of Seattle, Tacoma, and Vancouver invite industry stakeholders and other regional ports to join in this collaboration and achieve the objectives and performance measures outlined in this Strategy. The three Ports and air agencies are developing a mechanism for stakeholders to sign on to the Strategy and a recognition program for those who do so.

APPENDIX A

Acronym List

BC – British Columbia

BNSF – formally, Burlington Northern Santa Fe railway, officially now known as BNSF Railway Company

CHE – cargo handling equipment

CNG – compressed natural gas

DOC – diesel oxidation catalyst

DPF – diesel particulate filter

EPA – (United States) Environmental Protection Agency

IMO – International Maritime Organization

LEED – Leadership in Energy and Environmental Design

LNG – liquefied natural gas

MARPOL – International Convention for the Prevention of Pollution from Ships

NOx – nitrogen oxides

OCR – Optical Character Recognition

OGV – ocean going vessels

PM – particulate matter

RFID - radio frequency identification

RMG – rail mounted gantry

RTG – rubber tired gantry

SECA – SOx Emissions Control Area

SIG – Seattle International Gateway

SOx – sulfur oxides

TLS – Truck Licensing System

ULSD – ultra-low sulfur diesel (< 15 ppm)

US – United States

VFPA – Vancouver Fraser Port Authority

VPA – Vancouver Port Authority

WCC – West Coast Collaborative