Marine Ecosystem and Air Quality Programs at the Port of Prince Rupert

March 20, 2018
Pacific Ports Clean Air Collaborative
Canada Marine Act

Port was established and is governed by three distinct articles:

- Canada Marine Act - 1998
- Port Authority Operations Regulations
- PRPA Letters Patent
- Build marine infrastructure for Canada
- Manage services and infrastructure in a commercial manner
- Provide and ensure a high level of safety and environmental protection
LAND
• 2,400 acres of land
• Total land holdings – 966 hectares

WATER
• 35,000 acres of water
• Owned harbour – 14,000 hectares
• Navigable waters – approx. 350 km of shoreline
• Natural deep water port – no draught restrictions
• Easily accessible from Great Circle Route
GATEWAY 2020 – ROAD RAIL UTILITY CORRIDOR
GATEWAY 2020 – FAIRVIEW TERMINAL EXPANSION
Environmental Sustainability Program

- Establishment of an Environmental Sustainability Plan
- Port Environmental Stewardship Committee
  - Port tenants and users
  - First Nations
  - Proponents
  - Government agencies
  - Academics
  - NGOs
  - Community
- Development of programs and action plans:
  - Air Quality
  - Water Quality
  - Aquatic Invasive Species
  - Habitat Stewardship
  - Marine Mammals
Green Marine Program

- Program established 2007
- Collaboration of ship owners, ship yards, port authorities and terminals in Canada and US
- Prince Rupert Port Authority joined program in 2010
- First west coast participant
- Core of program is continued improvement
- Program has facilitated communication and collaboration with other program participants and supporters including NGOs, academics and government agencies.
Green Marine Program

- Performance indicators for port authorities include:
  - Air and GHG Emissions
  - Spill Prevention
  - Community Impacts
  - Environmental Leadership
  - Waste Management
  - Underwater Noise
Participants
Prince Rupert Port Authority
Ridley Terminals Inc
DP World
Saam Smit
Tidal Transport
Pinnacle Renewable Energy
BC Ferries

Supporters
City of Prince Rupert
District of Port Edward
Port Edward Harbour Authority
Environment Canada
Transport Canada
Fisheries and Oceans Canada
Ocean Networks Canada
BC Chamber of Shipping
WWF
Vancouver Aquarium
Northwest Community College
Quickload Logistics
Western Canada Marine Response Corporation
Pacific Pilotage Authority
BC Coast Pilots
Ducks Unlimited
Pacific Salmon Foundation
Water Quality
Water Quality Program

Understand baseline, establish long-term monitoring and implement measures to manage and mitigate impacts

- Ocean Networks Canada Partnership
- Marine Environmental Water Quality Program
- Pollution Tracker Program
- Water Quality Practices
Ocean Network Canada Partnership

Established a partnership with ONC to enhance operational excellence and increase collection of scientific data

- March 2016: ONC extended Smart Oceans BC network to north coast
- Codar and X-Band radar (surface currents and wave height)
- Early detection of earthquakes and tsunamis
- Water CTD
- Hydrophone
Ocean Network Canada Partnership
Ocean Network Canada Partnership

In January 2017, a new station was added to the Ocean Networks Canada network in Prince Rupert.

Atlin Terminal Station collects data on:

- Temperature
- Depth (Pressure)
- Salinity
- Turbidity
- Dissolved Oxygen
- Chlorophyll
Ocean Network Canada Partnership

Plotting utility on Ocean Networks Canada site for data across the network.

Examples of:

A) Pressure and Temperature
B) Oxygen and Chlorophyll
Marine Environmental Water Quality Program

A long-term monitoring program for the port region to establish baseline conditions, monitor for trends over time and work to minimize impacts and improve water quality

- MEWQ program established in 2013
- 30 sites around the harbour
- Collaboration between PRPA, City of Prince Rupert, DP World, RTI, AltaGas, LNG proponents
- Provide training and education regarding water quality
Marine Environmental Water Quality Program

- 29 Sites around the port region
- Parameters include:
  - General parameters
  - Nutrients
  - Metals
  - Bacteria
  - PAHs
  - Chlorophyll

MEWQ Program sampling sites
Marine Environmental Water Quality Program

Water Quality Index

Mathematically combines water quality values, compares against Provincial or Federal water quality guidelines and produces a score for an indication of water quality.

- >95 (excellent)
- 80-94 (good)
- 65-79 (fair)
- 45-64 (marginal)
- <44 (poor)

Incorporates three elements

- Scope (number variables)
- Frequency (number times)
- Amplitude (amount exceeded)
Variability in Temperature – Salinity data identifies seasonal variability and freshwater input in the region.

Data assists with assessing biogeochemical processes.
Pollution Tracker Program

Established by the Ocean Pollution Research Program at the Vancouver Aquarium.

BC coastwide assessment of pollutants in the ecosystem.

Samples of sediment and muscles collected and analyzed.

Up to three tiers of analysis conducted including:

- Metals
- Hydrocarbons
- Pesticides
- Dioxins and furons
- Microplastics

Two samples collected in the Prince Rupert area in 2016. Additional samples collected in the region in 2017.
Water Quality Practices

Commercial ship inspections
• Ensure practices and procedures followed

Storm water sampling
• Sampling program for port-related discharge points

Filters and processes
• Installation of filters and processes like rain gardens across port properties
• Sewage treatment at Fairview terminal

Removal of old infrastructure
• Old bunker pipes near waterfront
Marine Ecosystems
Marine Ecosystem Program

Collecting data to understand baseline conditions and establish long-term monitoring programs.

• Aquatic Invasive Species Program
• Plankton Sampling
• Shoreline Cleanup
• Shoreline surveys
• Habitat monitoring
• ShoreZone
Aquatic Invasive Species

Establish an early detection program for the harbour

- Program established in 2012
- Collaboration between PRPA, DFO, Northwest Community College and Smithsonian Platewatch
- Platewatch Program (tunicates)
- Green Crab monitoring

Local college used DFO and Smithsonian to process samples from north coast.
Plankton Sampling

Began data collection in 2017

Training and sampling protocol provided by DFO

Working with local college environmental program to continue sampling
Shoreline Cleanups

• Annual cleanups
  • Spring
  • Fall

Fall cleanup work with school district
Shoreline Surveys

- Shoreline surveys collecting baseline data at various locations
Porpoise Harbour Reefs

Forty reefs constructed in Porpoise Harbour as compensation for the Road Rail Utility Corridor.

The reefs have shown growth of algae, kelp, invertebrates and fish.

Completed year three of a five year monitoring program.

Comparing productivity of the reefs against two reference sites in the area.
ShoreZone

Establish an understanding and inventory of shorelines and coast of the region

- Port led initiative with currently six partners
- Over 4000 km surveyed
- Photos and video available online
- Mapping of biological and physical features completed for 600 km
- Uses have included:
  - Project and environmental planning
  - Emergency preparedness and response
  - Traditional resources for First Nations
Physical and Biological Layers
Air Quality Program

Understand baseline, establish long-term monitoring and implement measures to manage and mitigate impacts

- Energy and Emission Inventory
- Air quality and dust monitoring
- Meteorological stations
- Dispersion modeling
- Wet deposition station
- Shore Power
- Clean Trucking Program
- Energy conservation
- Green Wave Program
Energy and Emission Inventory

- Annual inventory includes all port tenants and users
- Includes land and water side components
- Use of the Port Emission Inventory Tool (PEIT) developed by Transport Canada
- Five source groups are:
  - Marine
  - Cargo Handling Equipment
  - Rail
  - On-Road Vehicles
  - Administration
- Marine vessels account for largest component of port emissions
- Reductions of SOx and PM2.5 due to implementation of NA ECA
Energy and Emission Inventory

- Landside Boundary includes all landside activities plus vessels at berth.
- Port Boundary includes all port anchorages and extends to pilot station at Triple Island. Also includes rail and road off of immediate terminal boundaries.
Emission Inventory Data

**NO\textsubscript{x} (Inventory Boundary)**

**SO\textsubscript{x} (Inventory Boundary)**

**PM\textsubscript{2.5} (Inventory Boundary)**

**Port-wide VOCs (Port Boundary)**
Green Wave Program

- Established 2013
- Targets marine component of port emissions

- Reduced harbour dues for vessels that have implemented emission reduction measures and/or other environmental practices to improve environmental performance

- Vessels qualify based on performance within one of the following organizations/initiatives:
  - Green Marine
  - RightShip
  - Environmental Ship Index
  - Green Award
  - Clean Shipping Index
  - Energy Efficiency Design Index
  - Clean Cargo Working Group

- 2017 – 126 vessels qualified, $321K in discounts
## 2018 Green Wave Criteria

<table>
<thead>
<tr>
<th>GENERAL</th>
<th>SPECIFIC</th>
<th>TIER 1 (10%)</th>
<th>TIER 2 (20%)</th>
<th>TIER 3 (50%)</th>
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<td>ENVIRONMENTAL PROGRAM</td>
<td>Rightship</td>
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<td>Verified GHG B+</td>
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<td>Level 3 GHG and min Level 2 overall</td>
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<td>Clean Shipping Index</td>
<td>Score of Yellow</td>
<td>Score of Green</td>
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<td></td>
<td>Clean Cargo Working Group</td>
<td>CO2 dry score &lt;46 – 36</td>
<td>CO2 dry score &lt;36</td>
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Green Wave Program

2017 Breakdown by Tier

- Tier 1: 20.5%
- Tier 2: 11.5%
- Tier 3: 6.0%
- Not Qualified: 61.9%
Marine Mammal Program
Marine Mammals and Underwater Noise

A partnership to understand regional marine mammal populations, collect scientific and sighting data and work to mitigate potential risks.
Education and Outreach
Whale Trail
Report Your Cetacean Sightings

Many populations of cetaceans are at risk in B.C. Report your sightings to help provide valuable information. By reporting your sightings, you are helping researchers better understand the distribution and abundance of these species.

What to Report
- YOUR NAME AND CONTACT INFORMATION
- SPECIES
- DATE AND TIME
- LOCATION
  Latitude/Longitude coordinates if available
- NUMBER OF ANIMALS
- BEHAVIOUR OF ANIMALS
- SEA STATE, WIND SPEED, AND VISIBILITY

Report your Sightings
- WILDWHALES.ORG
- 1.866.1.SAW.ONE (1.866.472.9663)
- SIGHTINGS@VANAQUA.ORG
- WHALEREPORT SMARTPHONE APP
  iOS and Android devices

Vancouver Aquarium
Cetacean Sighting Network
WhaleReport app
Marine Mammal Research
Hydrophone Data Collection
Partnership between:
• Port of Prince Rupert
• Port of Vancouver
• DFO
• Vancouver Aquarium

Supporters included:
• BC Chamber of Shipping
• Pacific Pilotage Authority
• BC Coast Pilots
• Shipping Federation of Canada
• BC Ferries
HUMPBACK WHALE
*Megaptera novaeangliae*

**Average Adult Length:** 12 m / 40 ft

**SARA Status 2013**

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<th>Special Concern</th>
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<th>Endangered</th>
<th>Extirpated</th>
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</table>

**Dorsal Fin**
Short with a broad base and variable in shape, located 2/3 of the way along the back of the body.

**Appearance**
Grey to black on top, with varying amounts of white on underside, throat and pectoral fins. Thick body shape. Distinct pectoral fins, nearly 1/3 as long as body, colour can range from all black to all white, leading edges are scalloped. Distinctive knobs present on top of head. Underside of tail can range from all black to mostly white. Bushy-shaped blow.

**Behaviour**
Usually lifts tail flukes when making a deep dive. Can be active and acrobatic at surface.

**Distribution**
Found in all the world's oceans. North Pacific population is highly migratory and can be found in coastal shelf waters of northern Japan, Russia, Alaska, B.C. and the west coast of the United States during summer months. Breeding grounds are near islands or reefs in Hawaii, Mexico, Central America and Asia during winter months.

**Vulnerability of the Species**
Humpback whales experience the second highest strike rate of any whale species worldwide because they are relatively abundant and they often feed at or near the surface. Additionally, vessel noise may disturb humpback whales and cause them to move away from the best feeding areas. Further threats to humpback whales include entanglement, toxic spills and prey reduction.
Relative Abundance of Humpback Whales in B.C. Waters

May to September

October to April
Mariner’s Guide
TO WHALES, DOLPHINS,
AND PORPOISES OF
WESTERN CANADA

CETACEAN HOTSPOTS ON B.C.’S NORTH COAST

Relative Abundance of Cetaceans Along B.C.’s North Coast

Relative Abundance of Cetaceans Along the Approach to Prince Rupert

This project was undertaken with the financial support from:
MINIMIZE LARGE VESSEL STRIKES AND DISTURBANCES

Acknowledging engineering and navigational limitations, and that safety is paramount, the following strategies are suggested to help reduce the impact of large vessels on cetacean populations. They should be employed when appropriate, feasible and safe to do so.

1. When cetaceans are observed or reported in your path, or in known high-density areas, consider reducing speed to 10 knots or less, if possible and safe. The risk of striking cetaceans greatly increases with vessel speed.

2. When possible, make gradual course changes away from the cetacean location or direction of travel. If you sight a large aggregation of cetaceans that makes it impossible to avoid the group entirely, try to pass through the least dense part of the aggregation.

3. Maintain a sharp lookout for cetaceans in all coastal waters, paying particular attention when visibility is low. If possible, post extra crew on the bow of the vessel to watch for cetaceans.

4. Should groups of dolphins or porpoises choose to ride the bow wave of your vessel, avoid sudden speed or course changes.

5. Review the International Maritime Organization's guidelines for vessel noise reduction to find out how activities such as vessel maintenance, propeller design and selection, as well as selection and mounting of engines and machinery can lead to a quieter vessel.
Modelling Cumulative Vessel Noise near the Port of Prince Rupert
2016 Baseline
High Growth Potential
Green Wave Program

- Added underwater noise criteria Jan 1, 2017
- One of two ports in the world to offer incentive discounts based on noise
- Ship classification societies
  - Det Norske Veritas - Germanischer Lloyd (DNV-GL)
    - SILENT notation OR Certificate of Compliance
  - Bureau Veritas (BV)
    - URN notation
  - Registro Italiano Navale (RINA)
    - DOLPHIN notation
- Technology
  - Becker Mewis Duct
  - Propeller Boss Cap Fins
  - Schneekluth Wake Equalizing Duct
# Green Wave Program

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<td>BMD installed</td>
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UNDERWATER NOISE

OVERVIEW

2 separate indicators - SOs and Ports

• 5 levels
• Objective: Reduce underwater noise made by activities to reduce impacts on marine mammals
UNDERWATER NOISE

L1
- Monitoring of regulations

L2
- Raising awareness and implementation of best practices

L3
- Develop and implement a Management Plan related to UN
- Data acquisition: noise or whales

L4
- UN measurement for ships (SO)
- Introduction of new technologies (SO)
- Development of UN reduction targets (ports)
- Incentive program for SO (ports)

L5
- In depth UN measurement
- Meet reduction targets on UN
Collaboration is Key