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Puget Sound Maritime Air Emissions Inventory

April 2007

Prepared by:
STARCREST CONSULTING GROUP, LLC

Port of Seattle
PORT of TACOMA U.S.A.
Port of EVERETT
WASHINGTON STATE DEPARTMENT OF ECOLOGY
northwest Clean Air agency
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Puget Sound Clean Air Agency
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OLYMPIC REGION CLEAN AIR AGENCY ORCAA
NORTH WEST CRUISESHIP ASSOCIATION
PMSA
BNSF RAILWAY
Washington State Ferries
WSPA
Western States Petroleum Association
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Puget Sound Maritime Air Forum
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Starcrest dedicates its work on this project to the loving memory of Kelly O'Reilly Ray

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ACRONYMS AND ABBREVIATIONS

AAPA	American Association of Port Authorities
ABS	American Bureau of Shipping
AIS	Arrival Information Services
APL	American Presidents Line
APM	A.P. Moller
ATB	articulated tug and barge
AWC	Auto Warehousing Company
BCCS	British Columbia Chamber of Shipping
BCMVEI	British Columbia Marine Vessel Emissions Inventory
BHP	brake horse-power hour
BNSF	Burlington Northern Santa Fe (Railway)
BSFC	brake-specific fuel consumption
CAA	Clean Air Act
CARB	California Air Resource Board
CCNI	Compañía Chilena de Navegación Interoceánica
CFEC	Alaska Commercial Fisheries Entry Commission
CH_4	methane
CHE	cargo handling equipment
CO	carbon monoxide
CO_2	carbon dioxide
COSCO	China Ocean Shipping
CSAV	Compañía Sudamericana de Vapores
CSCL	China Shipping Container Line
CTAS	Container Transportation Access Study
DOC	Diesel Oxidation Catalyst
DPM	Diesel Particulate Matter
DWT	deadweight tonnage
EF	emission factor
EMD	Electro-Motive-Diesel
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
FCF	fuel correction factor
FESCO	Far Eastern Shipping
Forum	Puget Sound Maritime Air Forum
FR	Federal Register
g/kW-hr	grams per kilowatt-hour
GEM	Global Electric Motor (cars)
GVWR	gross vehicle weight rating
GWP	global warming potential
HAL	Holland America Line
HC	hydrocarbon
HDDBS	heavy-duty diesel bus
HDDBT	heavy-duty diesel transit and urban buses

ACRONYMS AND ABBREVIATIONS (CONT'D)

HDDGS	heavy-duty gasoline bus
HDDV	heavy-duty diesel fueled vehicle
HDGV	heavy-duty gasoline vehicle
HDV	heavy-duty vehicles
HTI	Heffron Transportation, Inc
HIY	Hyundai Intermodal Yard
hp	horsepower
IFO	Intermediate Fuel Oil
IMO	International Maritime Organization
ITB	integrated tug and barge
K-Line	Kawasaki Kisen Kaisha
kW	kilowatts
LDDT	light-duty diesel truck
LDGT	light-duty gasoline truck
LDGV	light-duty gasoline vehicle
LDV	light-duty vehicles
LEV	low emission vehicle
LF	load factor
LLA	low load adjustment
LPG	liquefied petroleum gas
MARAD	U.S. Maritime Administration
MarEx	Marine Exchange
MARPOL	International Convention for the Prevention of Pollution from Ships
MCR	maximum continuous rated (power)
MISNA	Maritime Information Service of North America
MOBILE6	EPA Vehicle Emission Modeling Software
mph	miles per hour
MTC	Marine Terminals Corporation
NIM	North Intermodal Yard
NIPER	National Institute for Petroleum and Energy Research
NOAA	National Oceanic and Atmospheric Administration
N_2O	nitrous oxide
NO_x	oxides of nitrogen
NONROAD	EPA Offroad Equipment Emission Modeling Software
NWCA	NorthWest CruiseShip Association
NWCAA	Northwest Clean Air Agency
NYK	Nippon Yusen Kaisha Line
OCT	Olympic Container Terminal
OGVs	ocean-going vessels
OOCL	Orient Overseas Container Line
ORCAA	Olympic Region Clean Air Agency
P.A.	Port Angeles

ACRONYMS AND ABBREVIATIONS (CONT'D)

PAH	polyaromatic hydrocarbons
PCT	Pierce County Terminal
PM	particulate matter
PM_{10}	particulate matter, diameter of ten microns or less
$PM_{2.5}$	particulate matter, diameter of 2.5 microns or less; fine particulate
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
PSRC	Puget Sound Regional Council
RFID	radio-frequency identification
RIA	Regulatory Impact Analysis
RITA	Research and innovative Technology
RO	Residual Oil
RoRo	roll-on/roll-off
rpm	revolutions per minute
RSD	Regulatory Support Document
RTG	rubber tired gantry (crane)
SECA	Annex VI Sulfur Oxides Emission Control Area
SFC	specific fuel consumption
SFTA	Strategic Freight Transportation Analysis
SIG	Seattle International Gateway
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
SSA	Stevedoring Services of America
TEU	twenty-foot equivalent unit
TOTE	Totem Ocean Trailer Express
tpd	tons per day
tpy	tons per year
TransNow	Transportation Northwest at the University of Washington
TTI	Total Terminals, Inc
U.S.	United States
ULCC	ultra large crude carriers
ULEV	ultra low emission vehicle
ULSD	ultra low sulfur diesel (fuel)
UP	Union Pacific (Railroad)
UTC	University Transportation Center
VBP	Vessel Boarding Program
VLCC	very large crude carriers
VMT	vehicle miles traveled
VOCs	volatile organic compounds
VTS	Vessel Travel Service
WDFW	Washington Department of Fish and Wildlife
WRAP	Western Regional Air Partnership

ACRONYMS AND ABBREVIATIONS (CONT'D)

WSF	Washington State Ferries
WSPA	Western States Petroleum Association
WUT	Washington United Terminals
ZPMC	Zhenhua Port Machinery Company

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OVERVIEW

What is the emissions inventory?

The Puget Sound Maritime Air Emissions Inventory identifies and quantifies pollutants emitted from maritime-related diesel equipment operating within the greater Puget Sound region. It was conducted voluntarily and proactively, in advance of any regulatory directive, to provide a strong technical foundation to support future policy decisions. The inventory is not a policy document and does not include policy recommendations.

Who developed the emissions inventory?

The inventory was developed by Starcrest Consulting Group, LLC, in cooperation with members of the Puget Sound Maritime Air Forum (Forum), a voluntary association of private and public maritime organizations, ports, air agencies, environmental, public health advocacy groups, and other parties with operational or regulatory responsibilities related to the maritime industry. The Forum is committed to accurately quantifying and voluntarily reducing air emissions associated with the maritime transportation of freight and passengers. The emissions inventory is the first product of this collaboration.

Why was the inventory developed?

The greater Puget Sound region currently meets federal, state and local air quality standards, and project partners want to keep it that way.

The purpose of this emissions inventory is to provide scientifically valid data to improve understanding of the nature, location, and magnitude of emissions from maritime-related operations, which will aid in the planning and prioritization of pollution prevention investments in the region.

What does it measure?

This emissions inventory is unprecedented in scope. It estimates tons per year of emissions from maritime-related activities within the U.S. portion of the Georgia Basin/Puget Sound Airshed for the base year 2005 (see Figure O.1). This area spans approximately 140 miles south to north and 160 miles west to east, at its extremities. The project was closely coordinated with Environment Canada, the B.C. Chamber of Shipping and others who were concurrently preparing a similar emissions inventory for Georgia Basin.

Figure O.1: Georgia Basin/Puget Sound Airshed

Pollutants in the inventory include relevant U.S. Environmental Protection Agency (EPA) criteria pollutants and precursors (carbon monoxide, nitrogen oxides, sulfur dioxides, volatile organic compounds and particulate matter); greenhouse gases (carbon dioxide, methane and nitrous oxide); and diesel particulate matter. This is the first emissions inventory in the United States to include a detailed, activity-based inventory of greenhouse gases for maritime related sources.

Data was gathered for the following six major source categories associated with marine activities: ocean-going vessels (such as cargo and cruise ships, tankers); harbor vessels (tugs, ferries, recreational vessels, etc); cargo handling equipment (cranes, straddle carriers, forklifts, etc.); on-road heavy-duty vehicles (trucks, buses, etc.); on-terminal fleet vehicles (passenger cars and trucks); and rail operations. Military operations and equipment were not included due to security considerations.

Why does the inventory focus on diesel engines?

Marine diesel engines, like all diesel engines, are significant generators of fine particles and toxic emissions. Exposure to these pollutants can contribute to increased rates of lung cancer, chronic respiratory and cardiovascular disease, and other health effects. Diesel emissions also contribute to acid deposition, climate change and impaired visibility. Given these implications for public health and the environment, the reduction and minimization of these emissions are a top priority of the Forum. This inventory will help identify where pollution prevention efforts could provide the best public benefit.

While the EPA has not yet listed diesel exhaust emissions as a hazardous air pollutant, it is important to note that federal regulations are in place to require dramatically cleaner fuels and new diesel engines in the future. In the meantime, however, Forum members are proactively working together to achieve early emissions reductions from maritime-related operations to protect public health and the environment.

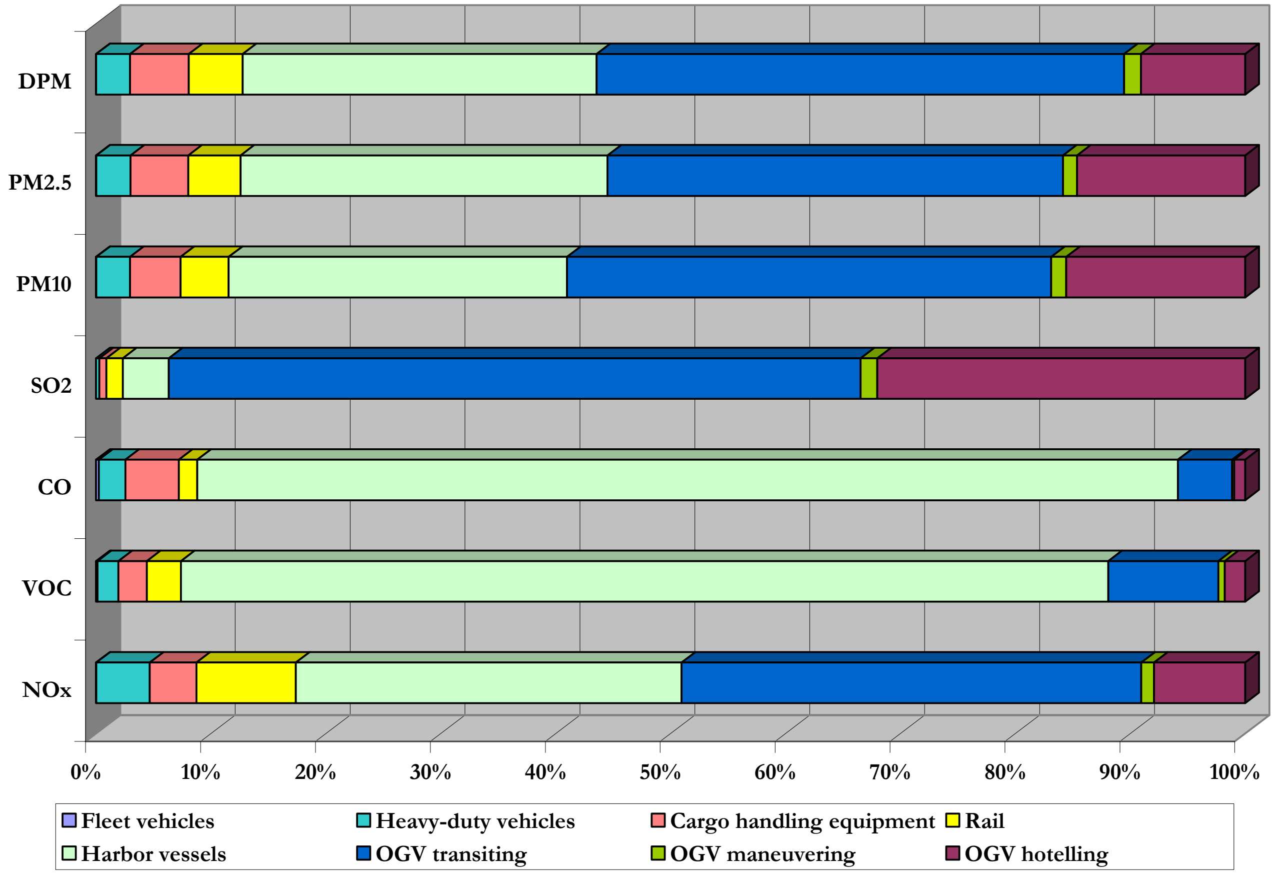
What are the findings?

Total emissions from maritime-related sources in the greater Puget Sound region are summarized in Table O.1.

Table O.1: Puget Sound 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Ocean-going vessels:								
Hotelling	2,259	74	191	4,229	262	209	131	274,421
Maneuvering	313	24	33	191	22	17	21	12,481
Transiting	11,390	399	932	7,953	709	566	663	496,844
Harbor vessels	9,555	3,363	16,854	529	495	456	445	689,649
Rail, off-terminal	1,285	57	166	96	35	32	32	59,854
Rail, on-terminal	1,180	67	154	93	35	32	35	48,135
Cargo handling equipment	1,155	103	918	80	74	72	74	111,592
Heavy-duty vehicles, off-terminal	1,120	58	307	35	45	39	39	156,242
Heavy-duty vehicles, on-terminal	203	18	148	4	4	4	4	17,845
Fleet vehicles	10	5	50	0	0	0	0	3,365
Total	**28,469**	**4,167**	**19,752**	**13,211**	**1,682**	**1,427**	**1,444**	**1,870,429**

Figure O.2: Puget Sound 2005 Maritime Air Emissions Inventory Summary, %



The Puget Sound Maritime Air Emissions Inventory shows that in 2005 maritime-related sources were responsible for the following percentages of emissions, which are broken down by regional Clean Air Agency jurisdiction:

Northwest Clean Air Agency (Island, Skagit and Whatcom Counties)

- 16% of oxides of nitrogen
- 6% of volatile organic compounds
- 5% of carbon monoxide
- 19% of sulfur dioxide
- 6% of fine particulate matter, and
- 40% of diesel particulate matter.

Olympic Region Clean Air Agency (Clallam, Grays Harbor, Jefferson, Mason, Pacific, and Thurston Counties)

- 40% of oxides of nitrogen
- 4% of volatile organic compounds
- 2% of carbon monoxide
- 83% of sulfur dioxide
- 13% of fine particulate matter, and
- 66% of diesel particulate matter.

Puget Sound Clean Air Agency (King, Kitsap, Pierce and Snohomish Counties)

- 11% of oxides of nitrogen
- 2% of volatile organic compounds
- 1% of carbon monoxide
- 33% of sulfur dioxide
- 4% of fine particulate matter, and
- 28% of diesel particulate matter.

Please see the full report for details regarding emissions from each source category.

Technical Approach

Data and technical guidance for this study was collected from ports, and individuals and companies (or their representatives) that own, operate, maintain and/or charter the equipment and vessels. Contributors included ports, terminal owners, vessel captains and engineers, equipment operators and others having first-hand knowledge of either equipment details or operational parameters. Data also was provided by regional Clean Air Agencies, other government agencies and industry associations. Forum members and the consultant worked with regulatory agencies to project activity or emissions levels for those facilities not actually surveyed in accordance with the Technical Approach, which is described in detail in the report.

Cautionary notes

This emissions inventory has been prepared in sufficient detail to provide the maritime community, regional air agencies and others with a scientific baseline to develop and measure regional air policy in the future. Total emissions, however, do not tell the whole story. The characteristics, duration and distribution of emissions are also important to consider. A ton of pollutants emitted near a dense urban environment, for example, is of greater significance to public health than the same emissions distributed over a sparsely-populated 100 mile area. This inventory will help identify where emission reductions could provide the best public health benefit.

It is also important to view this inventory in context with other sources of air emissions in the region. Marine-related sources are one component of total air emissions sources present in the Puget Sound air basin. Other categories that affect air quality include point sources (refineries, manufacturing facilities, etc.), on-road mobile sources (cars, trucks, buses and motorcycles), non-road equipment (construction equipment, farming equipment, etc.), and stationary area sources (home wood heating, open burning, auto body shops, etc.).

Who funded the emissions inventory and how much did it cost?

The cost of the inventory is estimated at roughly $520,000, not including substantial in-kind contributions from project participants. Financial support was provided by the U.S. Environmental Protection Agency and members of the Forum's Steering Committee, which includes: American Lung Association of Washington and Idaho, BNSF Railway, Northwest Clean Air Agency, Northwest CruiseShip Association, Olympic Region Clean Air Agency, Pacific Merchant Shipping Association, Port of Everett, Port of Seattle, Port of Tacoma, Puget Sound Clean Air Agency, Washington State Department of Ecology Washington State Ferries and Western States Petroleum Association.

What's being done now to reduce maritime air pollution?

In addition to participating in the emissions inventory project, Forum partners are also working within their own organizations, in local initiatives, nationally and internationally on efforts to reduce emissions. The Port of Seattle, Port of Tacoma and Vancouver Fraser Port Authority in British Columbia, for example, are collaborating on a joint action plan for reducing air emissions from their operations. Other actions being implemented by Forum partners include switching to cleaner fuels, using shore power instead of ship engines when cruise ships are in port, replacing old engines with cleaner engines, retrofitting older engines with advanced pollution control devices, rebuilding engines, and implementing systems to use equipment more efficiently. Additionally, a number of important pilot projects are underway to test new technologies and fuels, such as a seawater scrubber demonstration project, and alternative fuels testing on different types of equipment. The voluntary reductions achieved to date by the maritime industry in the Puget Sound region and other West Coast ports are unprecedented among industrial sectors.

What's next?

With maritime operations expected to grow significantly in the future, the ongoing commitments by Forum participants to minimize pollution are critical. This inventory provides the most complete picture to date of maritime-related emissions in the greater Puget Sound region. Review and assessment of this data will enable the maritime community to better design and implement cost-effective, fact-based air pollution control strategies to help maintain air quality standards, minimize health risks and protect the environment. Continued industry leadership by the Forum will play a key role in stimulating early action. To that end, the Forum will continue to facilitate the sharing of technical expertise and funding support for diesel emission reduction projects, and invites further collaborative work by interested parties on these efforts.

EXECUTIVE SUMMARY

The Puget Sound Maritime Air Emissions Inventory was developed by members of the Puget Sound Maritime Air Forum to provide a voluntary, detailed baseline of maritime-related air emissions in the greater Puget Sound region. This was done in advance of any regulatory directive. The region is currently in attainment with all federal, state and local ambient air quality standards. Effective focus of air pollution prevention resources requires a good understanding of the nature, location, and magnitude of emissions from maritime-related operations which include ocean-going vessels, harbor vessels, trucks, buses, locomotives, light-duty vehicles and cargo handling equipment. This report is not a policy document and does not include policy recommendations. The purpose of this emissions inventory is to provide scientifically valid data to aid in the planning and prioritization of pollution prevention investments in the region.

Project partners are motivated by a commitment to protect the environment and public health in the Puget Sound region and elsewhere. Public and private organizations with maritime operations could have prepared separate inventories of their own operations and effectively reduced their emissions. But success in protecting ambient air quality standards and reducing the public health risks from exposure to diesel emissions relies on the larger maritime community working together to address the issue from an industry-wide perspective. Forum partners also are working within their own organizations, in local initiatives, with other West Coast entities, in national efforts and in the Pacific Ports Clean Air Collaborative to reduce emissions.

The Puget Sound Maritime Air Emissions Inventory is unprecedented in scope. It includes estimated emissions from most maritime-related sources in the Puget Sound airshed (see Figure ES.1) for the base year 2005. It includes sources such as cargo and cruise ships, fishing boats, tugboats, tankers, recreational vessels, ferries, cargo handling equipment, locomotives, buses and trucks. Military operations and equipment were not included due to security considerations. Pollutants in the inventory include relevant Environmental Protection Agency (EPA) "criteria pollutants” and precursors (carbon monoxide [CO], nitrogen oxides [NO_x], sulfur oxides [SO_2], volatile organic compounds [VOC], and particulate matter [PM]); greenhouse gases (carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]); and diesel particulate matter. The Puget Sound Maritime Air Emissions Inventory is the first emissions inventory in the United States (U.S.) to include a detailed activity-based inventory of greenhouse gases for maritime-related sources.

Table ES.1: Ambient Air Quality Standards

Pollutant	National (EPA)		Washington	Local
	Primary	Secondary	Ecology	PSCAA
Total Suspended Particulate Matter				
Annual Geometric Mean ($\mu g/m^3$)			60	
24-Hour Average ($\mu g/m^3$)			150 (a)	
Inhalable Coarse Particulate Matter (PM10)				
Annual Average ($\mu g/m^3$)	(b)		50	54 (c)
24-Hour Average ($\mu g/m^3$)	150 (a)		150 (a)	154 (d)
Fine Particulate Matter (PM2.5)				
Annual Average ($\mu g/m^3$)	15 (e)	15 (e)		15 (c)
24-Hour Average ($\mu g/m^3$)	35 (f)			35 (g)
Sulfur Dioxide (SO2)				
Annual Average (ppm)	0.03	--	0.02	0.02
24-Hour Average (ppm)	0.14 (a)	--	0.10 (a)	0.10
3-Hour Average (ppm)	--	0.50 (a)	--	--
1-Hour Average (ppm)	--	--	0.25 (h)	0.25 (h)
1-Hour Average (ppm)	--	--	0.40 (a)	0.40
Carbon Monoxide (CO)				
8-Hour Average (ppm) (a)	9		9	9.4
1-Hour Average (ppm) (a)	35		35	35
Ozone (O_3)				
8-Hour Average (ppm)(I)	0.08	0.08		0.08
1-Hour Average (ppm)	(j)	(j)	0.12	(j)
Nitrogen Dioxide (NO_2)				
Annual Average (ppm)	0.053	0.053	0.05	0.053
Lead (Pb)				
Quarterly Average ($\mu g/m^3$)	1.5	1.5		1.5

NOTES: **$\mu g/m^3$** = micrograms per cubic meter; **ppm** = parts per million; **blank cells** indicate no standard

All values not to be exceeded except as noted; all averages arithmetic except TSP annual geometric mean.

(a) Not to be exceeded more than once per year
(b) Particles <10 micrometers in size; Federal annual PM10 standard revoked as of Sept. 21, 2006
(c) The 3-year annual average of the daily concentrations must not exceed level
(d) The 3-year average of the 99th percentile (based on the number of samples taken) of the daily concentrations must not exceed level
(e) Attainment based on the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors not exceeding level
(f) Attainment based on the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area not exceeding level
(g) The federal 24-hour standard for PM2.5 was revised as of Sept. 21, 2006. PSCAA has not yet adopted this standard, but soon will.
(h) Not to be exceeded more than twice in seven consecutive days
(I) Attainment based on 3-year average of the 4th highest daily maximum 8-hour ozone concentration at each monitoring location
(j) Federal 1-hour ozone standard was revoked in all areas except 14 remaining nonattainment areas. The federal and the PSCAA 1-hour standard lapsed on June 15, 2005.

Source: Geomatrix Consultants, Inc. based on most recent local, state, and federal rules.

Table ES.2: Pollutant Description

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Ozone (O_3)* is a pungent-smelling, colorless gas produced in the atmosphere when nitrogen oxides (NO_x) and volatile organic compounds (VOC) chemically react under sunlight. The highest O_3 levels occur on hot summer afternoons. This inventory does not include O_3 because it is not directly emitted; this inventory does include the O_3 ingredients nitrogen oxides and volatile organic compounds.	The region has not violated national ambient standards for O_3 since 1992, and in 1996 the region was re-designated to "attainment" status by EPA. O_3 levels have not decreased significantly. Concentrations often exceed, but don't violate, standards a few times each summer.	Most O_3-causing NO_x and VOC come from the transportation sector - cars and light trucks, marine vessels, and heavy-duty diesel vehicles. Other sources include gasoline-powered yard equipment; gasoline refueling; industrial solvents; and auto-body paint shops, among others. Natural emissions from biogenic (vegetation) sources also contribute to O_3 formation.	Exposure to ground-level O_3 can reduce lung function, cause respiratory irritation, aggravate asthma symptoms, and weaken the immune system. O_3 has environmental impacts as well; studies show that O_3 can damage agricultural crops and forests.
Oxides of Nitrogen (NO_x) is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Most NO_x are colorless and odorless. **Nitrogen dioxide (NO_2)*** is one form of NO_x. NO_2, along with particles in the air can often be seen as a reddish-brown layer over many urban areas.	NO_2 levels are well-below federal air quality standards in the Puget Sound Region. See information above for information about the role of NO_x in O_3 formation.	NO_x form when fuel is burned at high temperatures, as in a combustion process. The primary manmade sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Other sources include industrial boilers and processes, home heaters, and gas stoves. NO_x can also be formed naturally.	Exposure to NO_2 has been connected to a range of respiratory diseases and infections. NO_2 plays an essential role in the photochemical reactions that produce O_3, the major component in smog. NO_x can react with other compounds in the air to form tiny particles adding to PM concentrations.
*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**			

Table ES.2: Pollutant Description, cont'd

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Volatile organic compounds (VOC) VOC are included in the emissions inventory because they are an ozone ingredient, see ozone information above	No ambient standards. VOC's are not classified as criteria pollutants but can contribute to the formation of ozone.	See ozone information above.	In addition to contributing to the formation of ozone, some VOC are air toxics which can contribute to a wide range of adverse health effects.
Carbon monoxide (CO) Carbon monoxide is a colorless, odorless, toxic gas commonly formed when carbon-containing fuel is not burned completely. Motor vehicles are the predominant source of carbon monoxide in the Puget Sound region.	CO levels are well below federal standards and no longer considered a pollutant of concern in the Puget Sound area. This region was designated as "attainment" status in 1996 and has not violated the carbon monoxide standard since 1990.	CO forms during incomplete combustion of fuels. The majority of CO comes from on and off road vehicle engine exhaust. Other contributing CO source categories in the Puget Sound region include woodstoves and fireplaces, outdoor burning and industrial sources.	CO combines with hemoglobin in red blood cells and decreases the oxygen-carrying capacity of the blood. CO weakens heart contractions, reducing the amount of blood pumped through the body. It can affect brain and lung function. People with heart disease and pregnant women are especially at risk.
Sulfur dioxide (SO_2)* is a colorless, corrosive gas produced burning of fuel containing sulfur like coal and oil, and by industrial processes such as smelters, paper mills, power plants and steel manufacturing plants. Sulfur dioxide (SO_2) is one form of SO_x.	SO_x levels in the Puget Sound region are well below federal standards.	Over the past decade our area has experienced a significant decrease in SO_2 from sources such as pulp mills, cement plants, and smelters. Additionally, levels of sulfur in diesel and gasoline fuels are decreasing due to federal regulations set by the Environmental Protection Agency.	SO_2 is associated with a variety of respiratory diseases. Inhalation of SO_2 can cause increased airway resistance by constricting lung passages. Some of the SO_x become sulfate particles in the atmosphere adding to measured PM levels.

*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**

Table ES.2: Pollutant Description, cont'd

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Particulate Matter (PM_{10} * & $PM_{2.5}$*) refers to tiny, discrete solid or aerosol particles in the air. Dust, dirt, soot, and smoke are considered particulate matter (PM). Two types of PM are included in this emissions inventory: PM_{10}, which consists of particles measuring up to 10 micrometers in diameter; and $PM_{2.5}$, which consists of fine particles measuring 2.5 micrometers in diameter or smaller.	The region is in attainment with federal air quality standards for PM. Some areas do not meet the Puget Sound Clean Air Agency local health goal for $PM_{2.5}$, which is stricter than the federal standard and more protective of human health. Some areas in the region will not comply with new stricter federal $PM_{2.5}$ standards.	In the winter, most PM comes from wood burning in fireplaces and wood stoves particularly in residential neighborhoods. During the summer, vehicle exhaust (cars, trucks, buses, among others) are the predominant sources of fine particles in urban areas. In rural areas, land-clearing burning and backyard burning of yard waste contribute to summer time levels.	Fine particles are a concern because their very tiny size allows them travel more deeply into lungs, increasing the potential for health risks. Exposure to $PM_{2.5}$ is linked with respiratory disease, decreased lung function, asthma attacks, heart attacks and premature death. Some PM, such as diesel particulate matter and smoke from wood and waste burning, are classified as toxic due to the concentrations of harmful chemicals bound to the particles.
Diesel Particulate Matter (DPM) is a significant component of PM. Diesel exhaust also includes more than 40 substances that are listed as hazardous pollutants. DPM is considered a surrogate for the effects of both the PM and gaseous component of diesel exhaust. Because of their microscopic size, DPM can become trapped in the small airways of the lungs.	No ambient standards - Air agencies have made it a priority to lower DPM emissions as soon and as much as is practical due to its relative toxicity even though the total tons of DPM in this and other inventories are usually much lower than for other pollutants.	Sources of diesel emissions include diesel-powered trucks, buses and cars (on-road sources); diesel-powered marine vessels, construction equipment, trains and aircraft support equipment (non-road sources).	DPM has been shown to contribute up to 80% of the carcinogenic health risk related to the portion of outdoor air pollutants classified as "toxics". DPM is linked with health effects typical of all PM, including heart problems, aggravated asthma, chronic bronchitis and premature death.
*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**			

Table ES.2: Pollutant Description, cont'd

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Greenhouse Gases (GHG) included in this emissions inventory are carbon dioxide, methane, and nitrous oxide. Additional gases that are not significantly emitted in by maritime-related sources or included in this inventory also contribute to climate change.	No ambient standards	GHG come from natural processes as well as human activities, though increases of human-made GHG are most responsible for disrupting the balance of the atmosphere. Most GHG come from transportation and electricity generation.	Climate change, also referred to as global warming, occurs when excessive amounts of GHG accumulate in our atmosphere. These gases trap heat, causing the temperature of the earth to rise.
*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**			

Comprehensive air quality planning requires quality emissions inventories as a foundation. An emissions inventory identifies and quantifies by means of engineering calculations pollutants emitted by sources in a geographic area (or airshed) and their relative contributions to total emissions within the same airshed. The emissions inventory is the foundation or baseline for other activities such as air quality analysis and strategy development.

This activity-based emissions inventory provides detailed information on the five major source categories associated with the marine activities, which are ocean-going vessels, harbor craft, cargo handling equipment, on-road heavy-duty vehicles, and rail operations.

The marine-related inventory must be viewed in context with the other sources of air emissions in the region. Marine-related sources are one component of total air emissions sources present in the Puget Sound airshed. Other categories that contribute to total airshed emissions include point sources (refineries, manufacturing facilities, etc.), on-road mobile sources (cars, trucks, buses and motorcycles), non-road equipment (construction equipment, farming equipment, etc.), and stationary area sources (home wood heating, open burning, auto body shops, etc.).

An emissions inventory by itself is a very useful tool to quantify the mass emissions and track emission changes through time from the variety of sources of pollution in a geographic area and to help prioritize those sources for potential emission reductions. Furthermore, the regional emissions inventory, including the marine-related portion, is a critical component of an overall air quality assessment and mitigation strategy development process employed by air regulatory agencies to ensure the area complies with local, state and national air quality standards.

In addition to assuring continued compliance with air quality standards, air agencies work to protect public health and the environment. Adverse health impacts can occur from toxic air emissions (e.g., diesel particulate matter) even if a region is in compliance with air quality standards. Environmental impacts such as visibility impairment can occur at levels significantly less than those standards. Since health impacts are directly related to the concentration and duration of public exposure to specific air pollutants, agencies use additional tools to help them understand the impacts of air pollution. They operate air quality monitoring networks to measure ambient concentrations at representative locations. They also perform computer modeling based on local meteorological data to convert emissions inventory data to estimated ambient concentrations across specific areas. Air quality managers use the data from monitors and modeling to plan and select strategies that reduce emissions sufficiently to meet air quality standards and protect health and environmental goals everywhere in the airshed.

Diesel engines, like many other mobile, stationary, and area sources, are significant generators of criteria pollutants, their precursors and toxic emissions. Excessive exposure to these pollutants can contribute to increased rates of lung cancer, chronic respiratory disease, impaired lung development in children, cardiovascular disease, and other health effects. Given these implications for public health, the reduction and minimization of these emissions are a top priority of the Puget Sound Maritime Air Forum as well as the Puget Sound Clean Air Agency, the Olympic Region Clean Air Agency, the Northwest Clean Air Agency, the Washington Department of Ecology, the EPA, and others. This emission inventory will support that effort by increasing the understanding of the emission contributions from the maritime-related sources, one component of the state's air quality concerns. Because the health impacts of toxic emissions can be proximity dependant, this inventory will contribute to a better understanding of where emission reductions could provide the best public health benefit. While the EPA has not yet officially designated diesel emissions as a hazardous air contaminant, and there are no established regulatory standards for diesel particulate emissions beyond inclusion in the PM_{10} and $PM_{2.5}$ ambient air standards, it is important to note that federal regulations are in place to require dramatically cleaner fuels and new diesel engines in the future. In addition, in its Health Assessment Document for Diesel Engine Exhaust [EPA/600/8-90/057F May 2002, page ii, pdf p.3] EPA concludes that "long-term (i.e., chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure." Puget Sound Maritime Air Forum participants are committed to proactively working with regulatory agencies and others to achieve early emissions reductions from maritime-related operations to protect public health and the environment.

ES.1.1 Maritime-Related Source Categories

Maritime-related air emission source categories included in this inventory are:

- Ocean-going vessels
- Harbor vessels
- Cargo handling equipment
- Rail
- Heavy-duty vehicles
- Fleet vehicles

Ocean-going vessels include containerships, ocean-going tug boats, refrigerated vessels (reefers), roll-on roll-off (RoRo) ships, passenger cruise vessels, auto carriers, general cargo ships, bulk liquid tankers and miscellaneous vessels. There were a total of 2,937 inbound ocean-going vessel calls to the Puget Sound region in 2005. Military vessels were not included due to security considerations.

Harbor vessels are commercial, recreational, and government vessels that spend the majority of their operational time within or near ports and harbors. Activity data was collected for 678 harbor craft including commercial fishing vessels, ocean tugs, harbor tugs, excursion vessels, government boats, ferries, work boats, and assist and escort tugs. Tank barges are also included in this section.

Offroad cargo handling equipment includes equipment used to move cargo (containers, general cargo, and bulk cargo) to and from marine vessels, railcars and onroad trucks. This category includes cranes, straddle carriers, yard tractors, top and side handlers, forklifts and other related equipment. Cargo handling equipment is operated on terminals rather than roads. A total of 1,145 pieces of cargo handling equipment was inventoried at Puget Sound terminals.

The rail category includes yard locomotives and the cargo handling equipment and heavy-duty vehicles used within rail yards serving marine cargo terminals, and line haul locomotives carrying cargo to or from marine terminals to out of area destinations. Marine cargo transported by rail may be loaded at on-dock or near-dock rail yards. Emissions from more than 7,000 line haul trains and related switch yard locomotives serving maritime-related facilities were included in the inventory.

Onroad heavy-duty vehicles include the heavy duty trucks that are used to move cargo to and from terminals, local and national destinations and between terminals and off-port railcar loading facilities. This category also includes the buses that are used to transport passengers to and from cruise ship terminals and the airport or other locations in the region.

Fleet vehicles include passenger cars and trucks licensed for onroad use, but used primarily on marine terminals, including some heavy-duty vehicles. Also included are passenger vehicles parking at cruise terminals, and light-duty vehicle import emissions as the vehicles are transferred from ship-to-shore. There were 614 light duty vehicles used on cargo terminals and an estimated 91,600 passenger vehicles parked at Port of Seattle cruise ship terminals in 2005.

A glossary of terms related to the development of emissions inventories and maritime emissions is presented in Appendix B, for the convenience of the reader.

ES.1.2 Puget Sound Maritime Air Emissions Inventory Findings

ES.1.2.1 Overview of Findings

The area encompassed by this emissions inventory is illustrated in Figure ES. 1[2]. In this figure, the Georgia Basin airshed comprises the Canadian portion of the Georgia Basin/Puget Sound Airshed, including Whatcom and San Juan Counties and the southern coastline of the Strait of Juan de Fuca, while the Puget Sound airshed encompasses the counties to the south of Whatcom County in Washington State. The solid red line is the boundary of the Georgia Basin/Puget Sound Airshed and also by Steering Committee decision the study area boundary. The red dashed line is the boundary between the Georgia Basin and Puget Sound airsheds. The black dashed line is the international border between Canada and the U.S.

Total emissions from maritime-related sources in the entire study area, the greater Puget Sound region, are summarized in Table ES.3 and Figures ES.2 and ES.3. Ocean-going vessel emissions are broken out into hotelling (i.e., dockside), maneuvering, and transiting emissions. The 'harbor vessels' designation is used to collectively identify harbor craft, recreational vessels and tank barges which are detailed separately in Section 4. For purposes of the figures, the off-terminal and on-terminal rail emissions have been combined, and the off-terminal and on-terminal heavy-duty vehicle emissions have been combined. Greenhouse gases are presented as carbon dioxide equivalents, which includes the contributions of carbon dioxide, nitrous oxide, and methane. Greenhouse gases were not included in the figures because the scale would be distorted relative to the other pollutants. Details regarding emissions from each source category are provided in relevant sections of this report.

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[2] Puget Sound Clean Air Agency

Figure ES.1: Georgia Basin/Puget Sound Airshed

Table ES.3: Puget Sound 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO$_2$	PM$_{10}$	PM$_{2.5}$	DPM	Greenhouse Gases, CO$_2$ eq
Ocean-going vessels:								
Hotelling	2,259	74	191	4,229	262	209	131	274,421
Maneuvering	313	24	33	191	22	17	21	12,481
Transiting	11,390	399	932	7,953	709	566	663	496,844
Harbor vessels	9,555	3,363	16,854	529	495	456	445	689,649
Rail, off-terminal	1,285	57	166	96	35	32	32	59,854
Rail, on-terminal	1,180	67	154	93	35	32	35	48,135
Cargo handling equipment	1,155	103	918	80	74	72	74	111,592
Heavy-duty vehicles, off-terminal	1,120	58	307	35	45	39	39	156,242
Heavy-duty vehicles, on-terminal	203	18	148	4	4	4	4	17,845
Fleet vehicles	10	5	50	0	0	0	0	3,365
Total	**28,469**	**4,167**	**19,752**	**13,211**	**1,682**	**1,427**	**1,444**	**1,870,429**

Figure ES.2: Puget Sound 2005 Maritime Air Emissions Inventory Summary, tpy

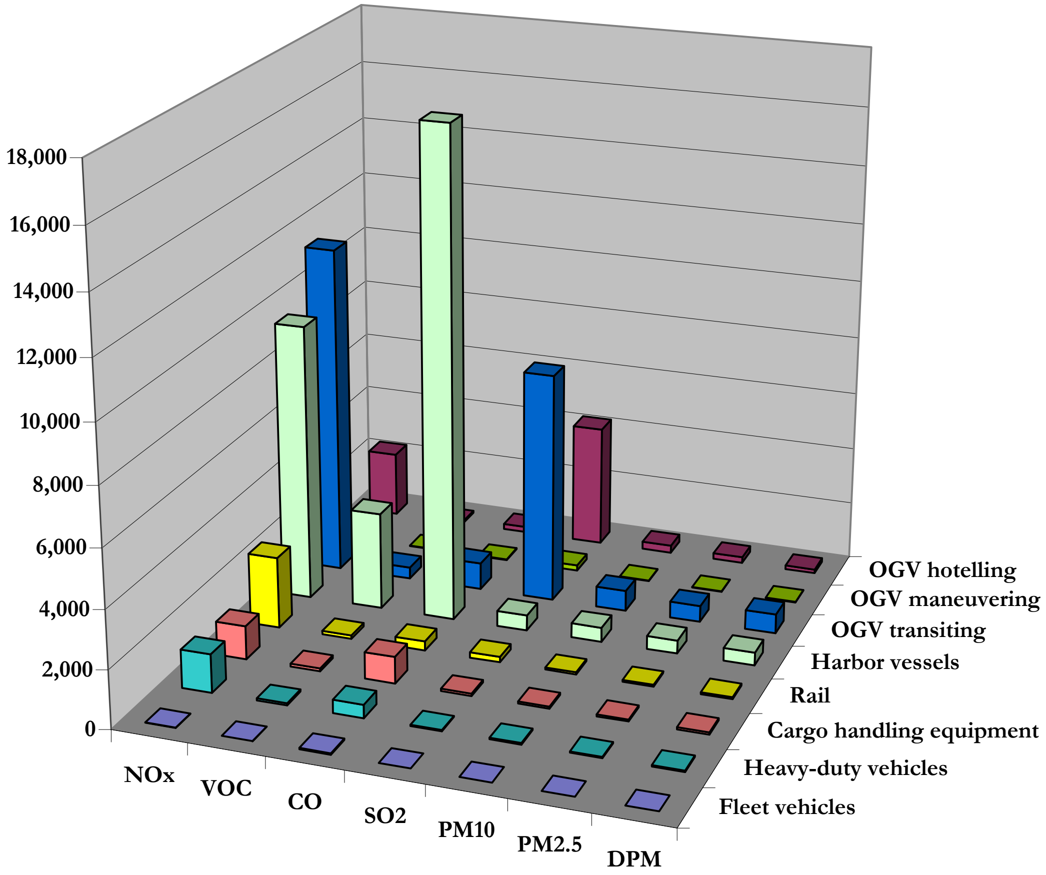
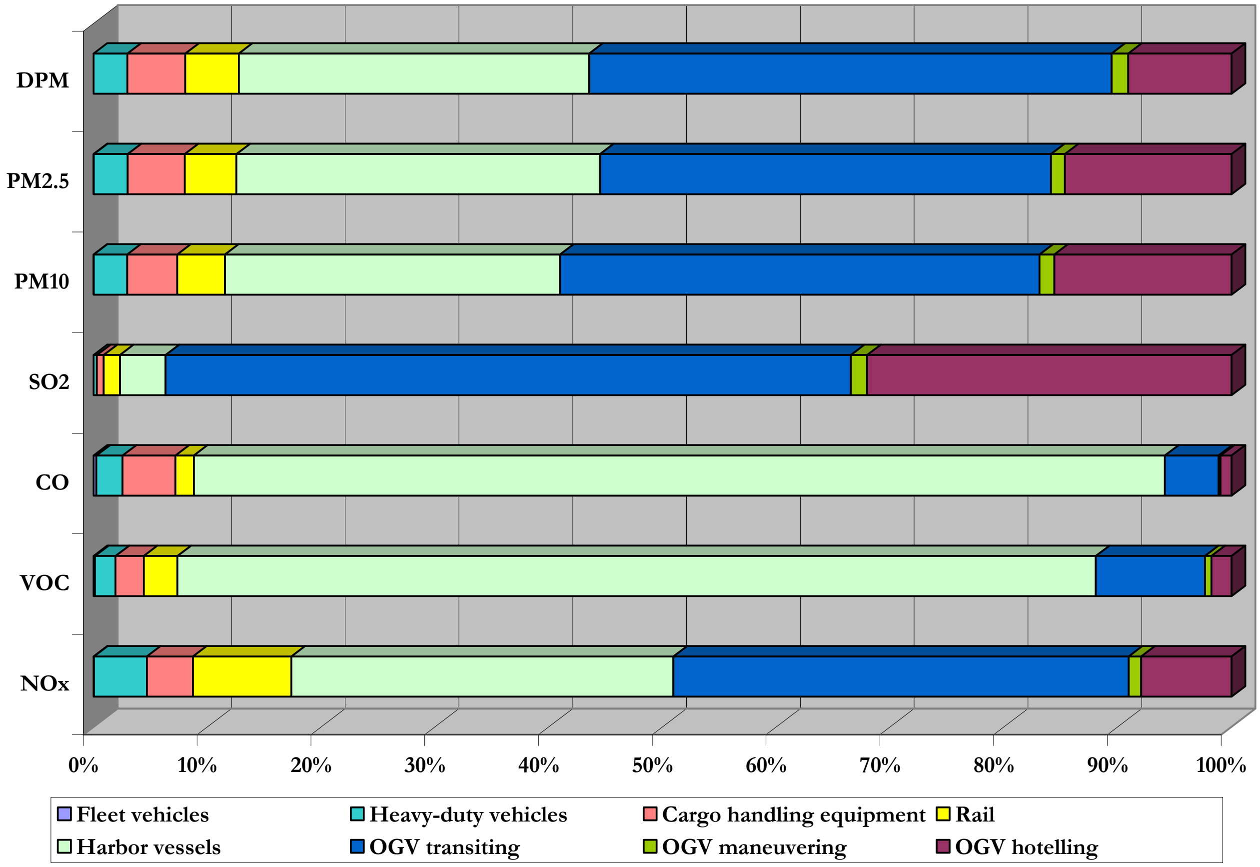


Figure ES.3: Puget Sound 2005 Maritime Air Emissions Inventory Summary, %

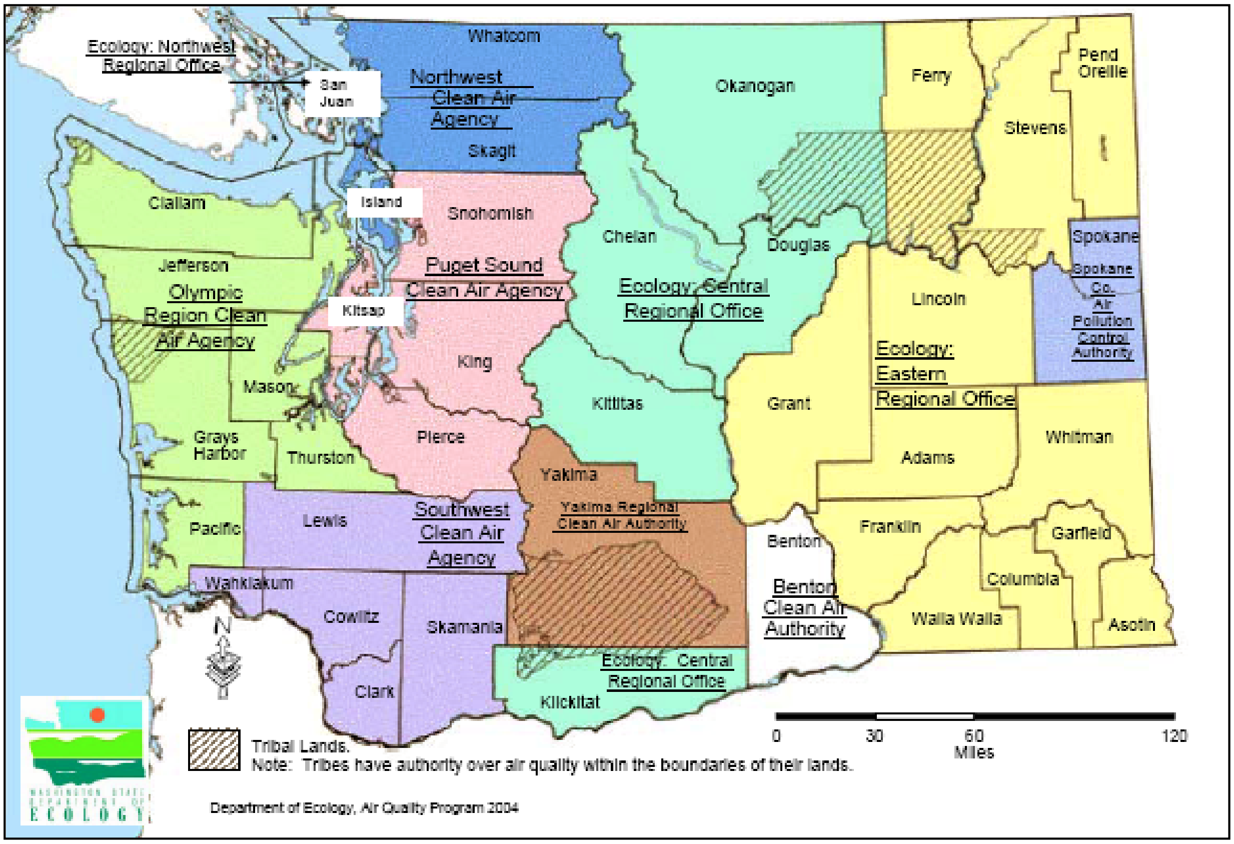


ES.1.2.2 Data Summaries by Regional Clean Air Agencies

To the extent data was available, the following tables and charts summarize total air emissions including maritime-related emission sources that were emitted in 2005 within the jurisdictions of each of the three regional clean air agencies that are located in the study area: the Northwest Air Pollution Authority, the Olympic Region Clean Air Agency, and the Puget Sound Clean Air Agency, as shown in Figure ES.4 from the Washington Department of Ecology.

The agencies have compiled emissions inventory updates for sources within their jurisdictions for 2005. The non-maritime sources include point sources (large industrial sources), onroad mobile sources (vehicles that are licensed for highway use), offroad mobile sources (vehicles that are not licensed for use on highways), locomotive mobile sources, and area sources (a broad category that includes everything else such as wood burning and small business operations). The pollutants and specific source categories that were reported by the regional clean air agencies varied from agency to agency so the emissions inventories from the three agencies can not be accurately summed across the entire study area for the Puget Sound Maritime Air Emissions Inventory. Therefore, comparisons of regional emissions with maritime-related emissions are made on the basis of regional clean air agency jurisdiction only.

Figure ES.4: Regional Clean Air Agencies of Washington



The Northwest Clean Air Agency administers air quality programs in Island, Skagit and Whatcom Counties. San Juan County is included in the Washington Department of Ecology's jurisdiction, but emissions are counted with the Northwest Clean Air Agency Counties for simplicity. Table ES.4 presents the maritime and non-maritime emissions comparison, and Figures ES.5 through ES.8 illustrate that data for fine particulate or $PM_{2.5}$, diesel particulate matter, sulfur dioxide, and nitrogen oxides, respectively. Sources not listed did not equal at least one percent even when aggregated.

The Olympic Region Clean Air Agency administers air quality programs in Clallam, Jefferson, Mason and Thurston Counties. Grays Harbor and Pacific Counties are also under the agency's jurisdiction; however, they were not included in the study area since they are outside the Puget Sound airshed and do not border Puget Sound. Table ES.5 presents the maritime and non-maritime emissions comparison, and Figures ES.9 through ES.12 illustrate that data for $PM_{2.5}$, diesel particulate matter, sulfur dioxide, and nitrogen oxides, respectively.

The Puget Sound Clean Air Agency administers air quality programs in King, Kitsap, Pierce and Snohomish Counties. Table ES.6 presents the maritime and non-maritime emissions comparison, and Figures ES.13 through ES.16 illustrate that data for $PM_{2.5}$, diesel particulate matter, sulfur dioxide, and nitrogen oxides, respectively.

In addition, maritime and non-maritime heavy-duty vehicle and rail locomotive emissions for the region are compared in Figures ES.20 and ES.21, respectively.

Table ES.4: Comparison of 2005 Maritime and Non-Maritime Emissions for the Northwest Clean Air Agency Region, tpy

Source Category	NOx	VOC	CO	SO_2	$PM_{2.5}$	DPM
Maritime sources:						
Ocean-going vessel:						
Hotelling	484	18	43	1,696	73	21
Maneuvering	27	3	3	20	2	2
Transiting	1,934	68	159	1,380	97	113
Harbor vessel	1,009	1,175	6,006	93	47	32
Rail locomotive	0	0	0	0	0	0
Cargo handling equipment	0	0	0	0	0	0
Heavy-duty vehicle	107	7	28	3	3	3
Fleet vehicle	0	0	0	0	0	0
Maritime subtotal	3,562	1,271	6,240	3,192	222	171
Non-maritime sources	19,347	19,217	130,887	13,935	3,600	257
Regional emissions	**22,909**	**20,488**	**137,127**	**17,126**	**3,822**	**428**

Figure ES.5: Comparison of 2005 Maritime and Non-Maritime Emissions for the Northwest Clean Air Agency Region, %

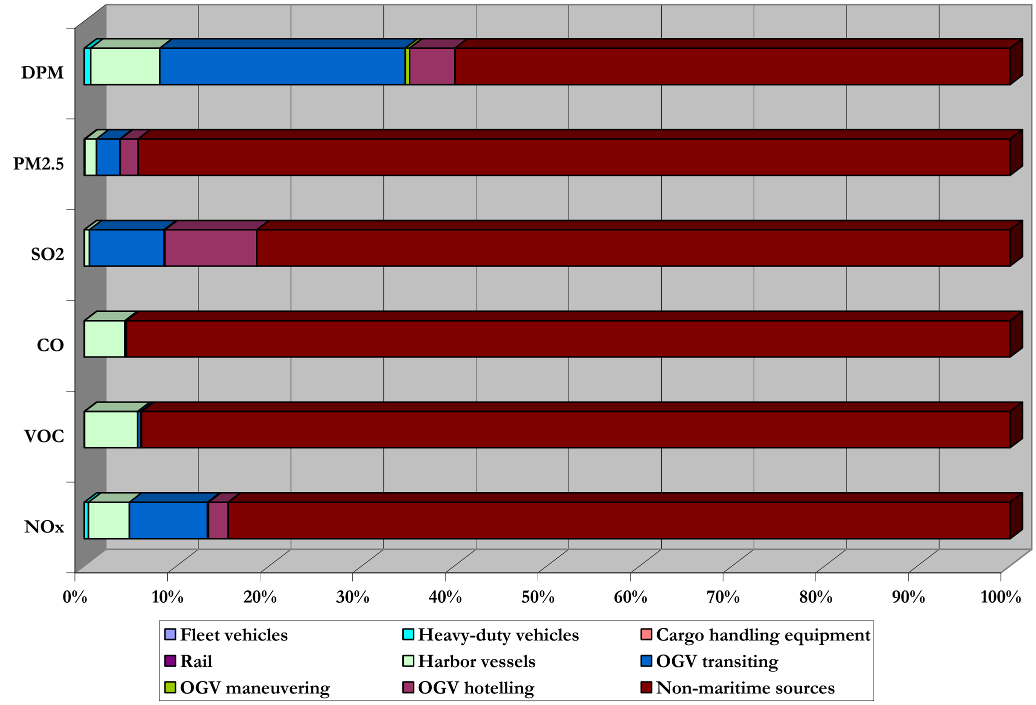


Figure ES.6: Comparison of 2005 Maritime and Non-Maritime $PM_{2.5}$ Emissions for the Northwest Clean Air Agency Region, tpy

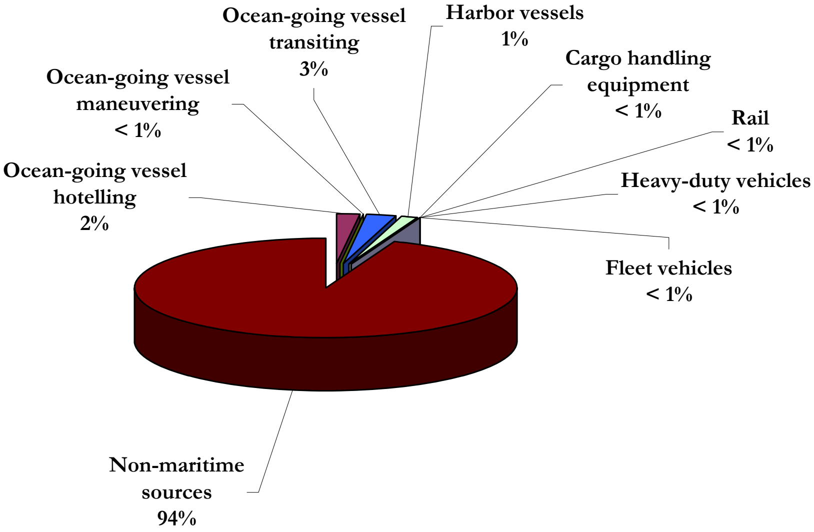


Figure ES.7: Comparison of 2005 Maritime and Non-Maritime DPM Emissions for the Northwest Clean Air Agency Region, tpy

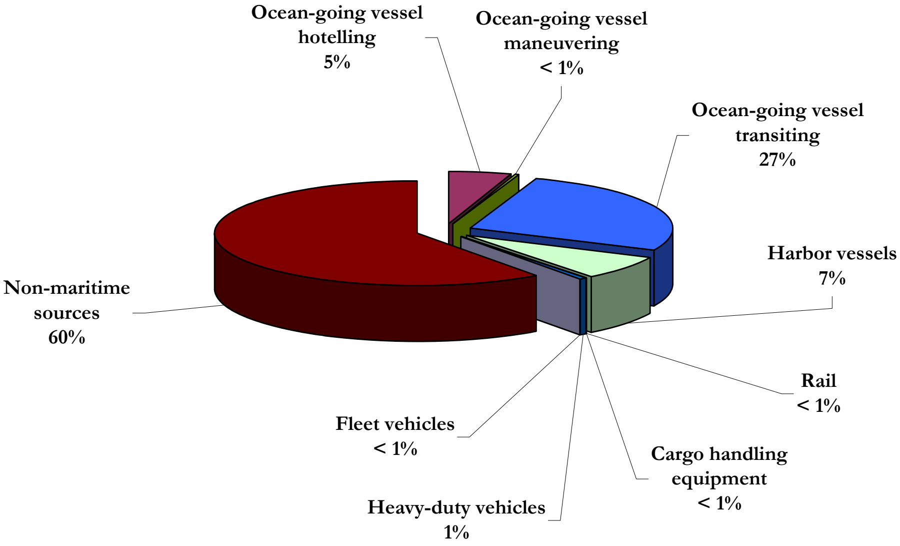


Figure ES.8: Comparison of 2005 Maritime and Non-Maritime SO_2 Emissions for the Northwest Clean Air Agency Region, tpy

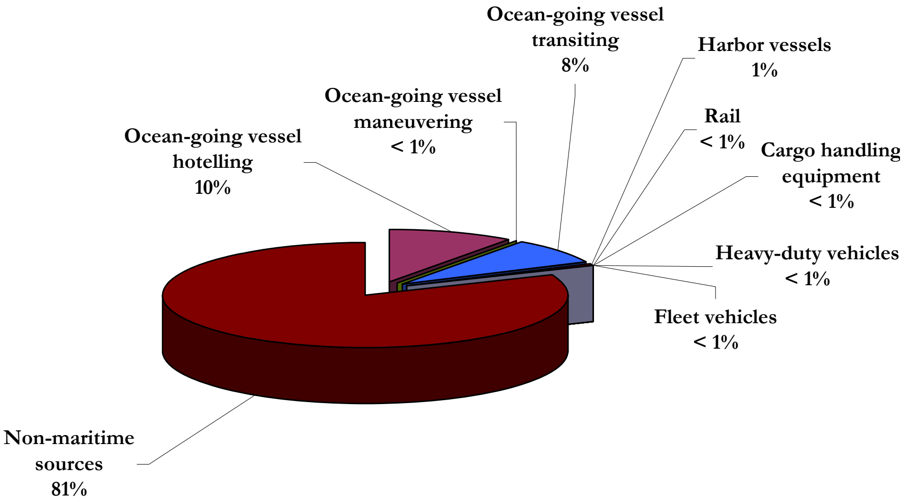


Figure ES.9: Comparison of 2005 Maritime and Non-Maritime NO_x Emissions for the Northwest Clean Air Agency Region, tpy

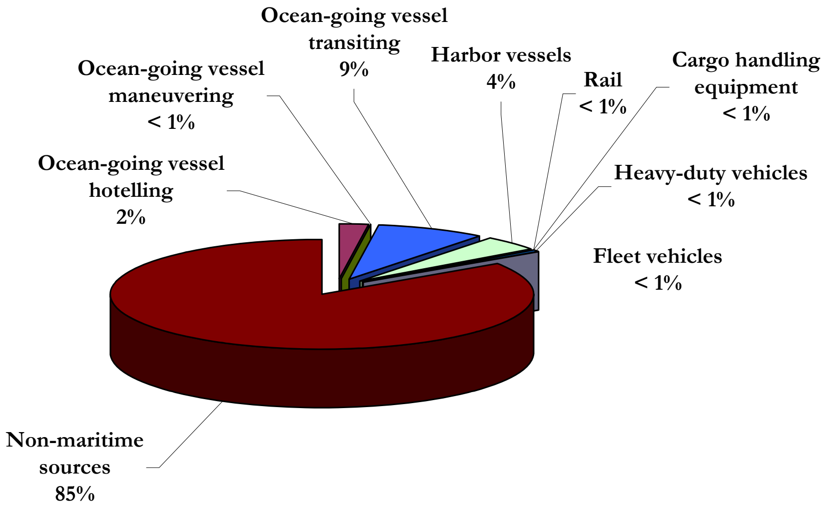


Table ES.5: Comparison of 2005 Maritime and Non-Maritime Emissions for the Olympic Region Clean Air Agency Region, tpy

Source Category	NOx	VOC	CO	SO_2	$PM_{2.5}$	DPM
Maritime sources:						
Ocean-going vessel:						
Hotelling	163	6	14	469	21	8
Maneuvering	50	4	6	38	3	3
Transiting	7,605	266	623	5,346	379	442
Harbor vessel	892	464	2,386	85	35	31
Rail locomotive	201	10	26	15	6	6
Cargo handling equipment	32	3	22	4	3	3
Heavy-duty vehicle	121	6	32	3	3	3
Fleet vehicle	0	0	0	0	0	0
Maritime subtotal	9,064	759	3,109	5,961	449	495
Non-maritime sources	13,464	16,939	128,731	1,252	3,125	257
Regional emissions	**22,527**	**17,698**	**131,839**	**7,213**	**3,574**	**753**

Figure ES.10: Comparison of 2005 Maritime and Non-Maritime Emissions for the Olympic Region Clean Air Agency, %

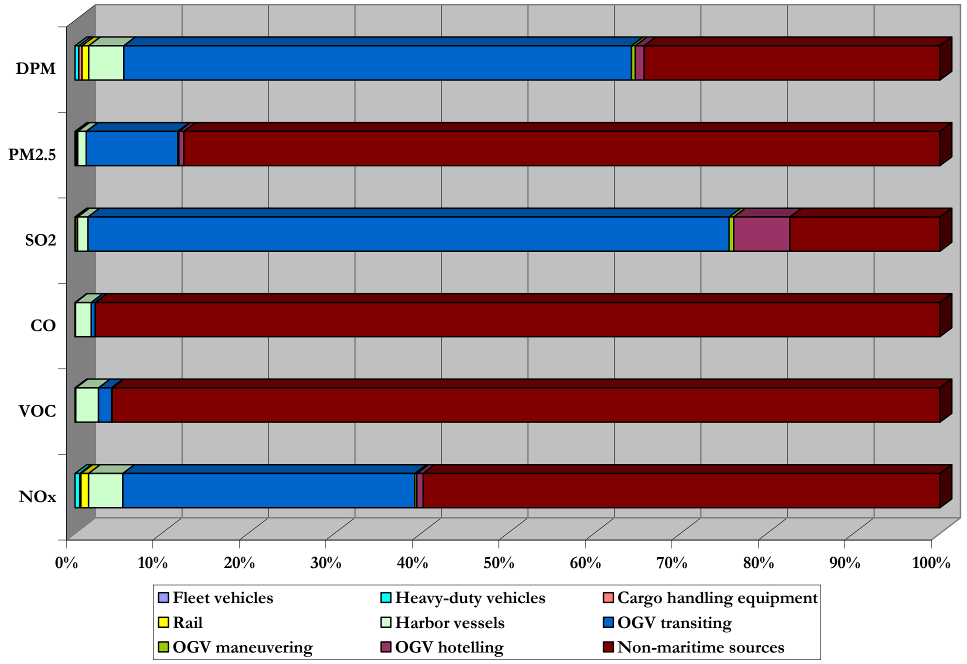


Figure ES.11: Comparison of 2005 Maritime and Non-Maritime $PM_{2.5}$ Emissions for the Olympic Region Clean Air Agency Region, tpy

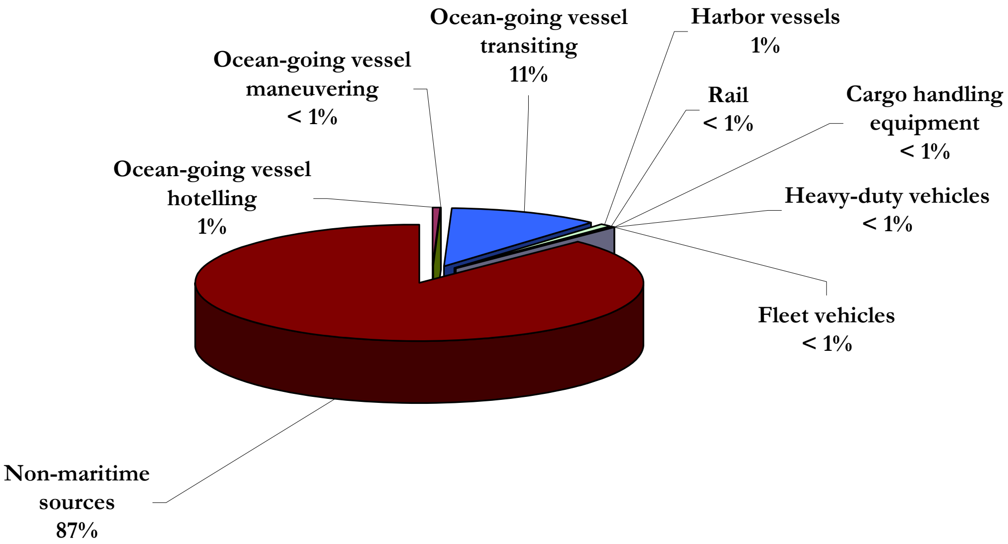


Figure ES.12: Comparison of 2005 Maritime and Non-Maritime DPM Emissions for the Olympic Region Clean Air Agency Region, tpy

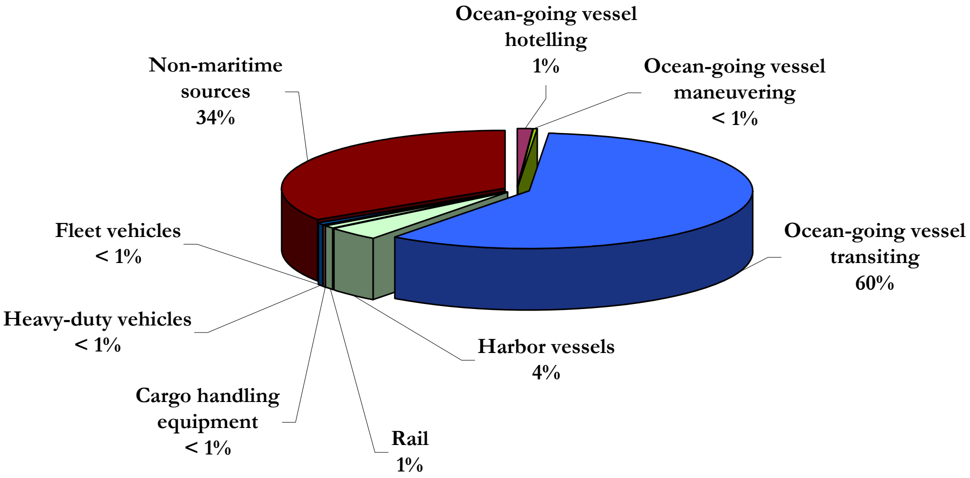


Figure ES.13: Comparison of 2005 Maritime and Non-Maritime SO_2 Emissions for the Olympic Region Clean Air Agency Region, tpy

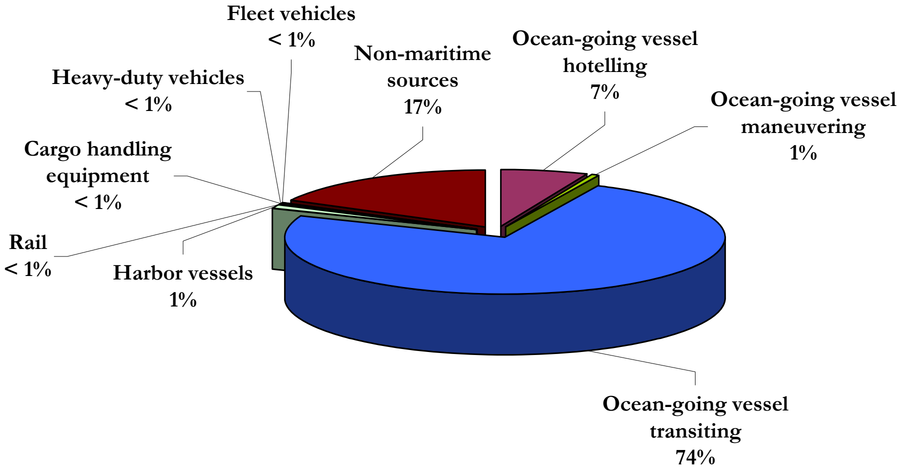


Figure ES.14: Comparison of 2005 Maritime and Non-Maritime NO_x Emissions for the Olympic Region Clean Air Agency Region, tpy

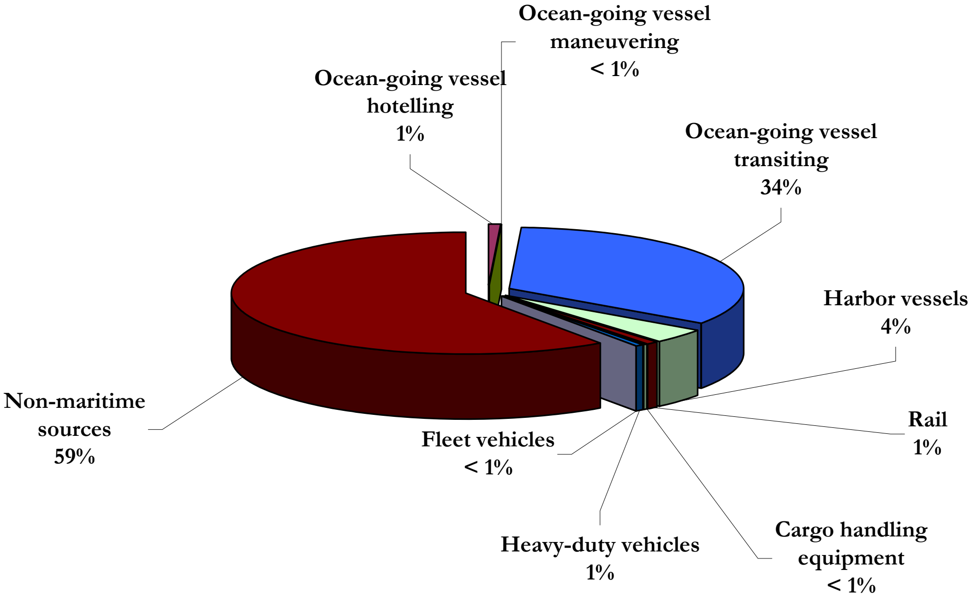


Table ES.6: Comparison of 2005 Maritime and Non-Maritime Emissions for the Puget Sound Clean Air Agency Region, tpy

Source Category	NOx	VOC	CO	SO_2	$PM_{2.5}$	DPM	GHG
Maritime sources:							
Ocean-going vessel:							
Hotelling	1,611	50	133	2,064	115	102	133,923
Maneuvering	236	17	24	133	13	16	8,787
Transiting	1,851	65	151	1,228	90	107	76,848
Harbor vessel	7,654	1,724	8,462	351	374	382	537,688
Rail locomotive	2,264	114	293	173	59	62	98,640
Cargo handling equipment	1,123	100	896	76	69	71	109,402
Heavy-duty vehicle	1,095	63	395	33	36	36	148,359
Fleet vehicle	10	5	50	0	0	0	3,346
Maritime subtotal	15,843	2,137	10,403	4,058	756	777	1,116,994
Non-maritime sources	127,642	105,860	1,111,923	8,139	19,403	2,003	41,562,997
Regional emissions	**143,485**	**107,997**	**1,122,327**	**12,197**	**20,159**	**2,780**	**42,679,991**

Figure ES.15: Comparison of 2005 Maritime and Non-Maritime Emissions for the Puget Sound Clean Air Agency Region, %

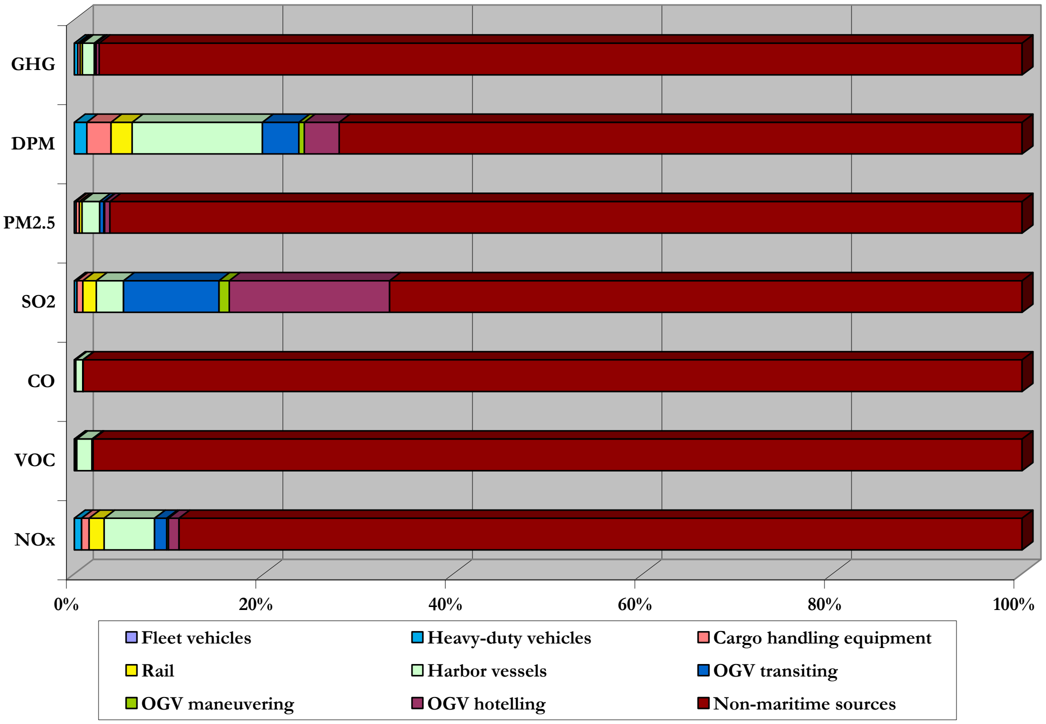


Figure ES.16: Comparison of 2005 Maritime and Non-Maritime $PM_{2.5}$ Emissions for the Puget Sound Clean Air Agency Region, tpy

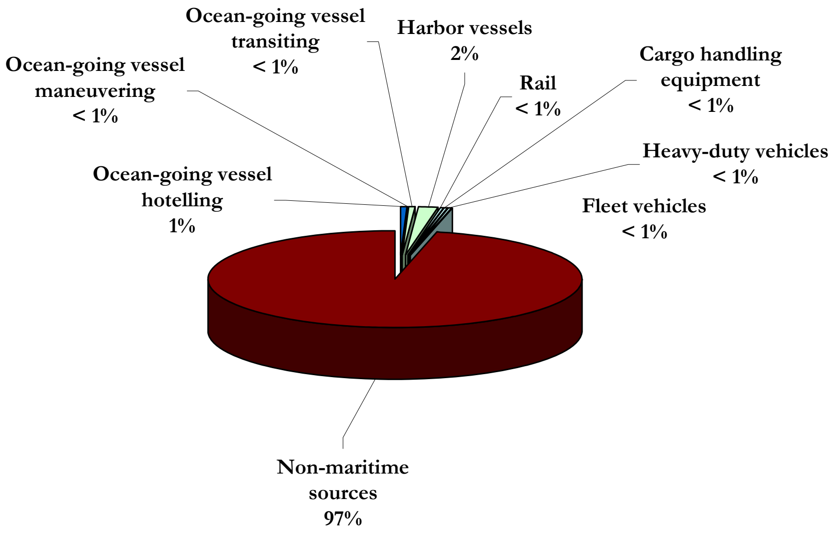


Figure ES.17: Comparison of 2005 Maritime and Non-Maritime DPM Emissions for the Puget Sound Clean Air Agency Region, tpy

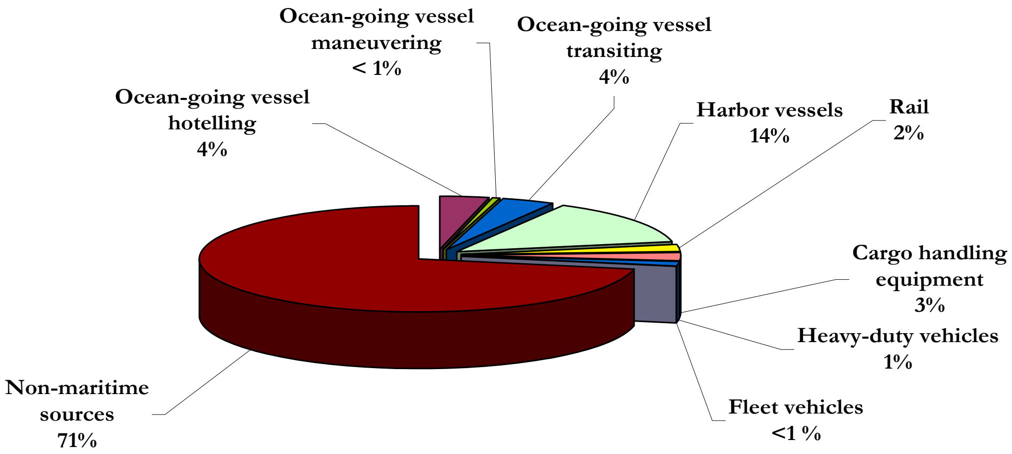


Figure ES.18: Comparison of 2005 Maritime and Non-Maritime SO_2 Emissions for the Puget Sound Clean Air Agency Region, tpy

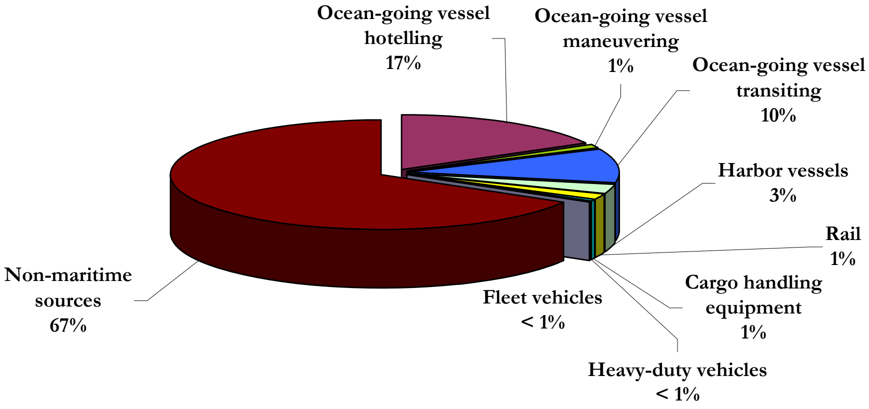


Figure ES.19: Comparison of 2005 Maritime and Non-Maritime NO_x Emissions for the Puget Sound Clean Air Agency Region, tpy

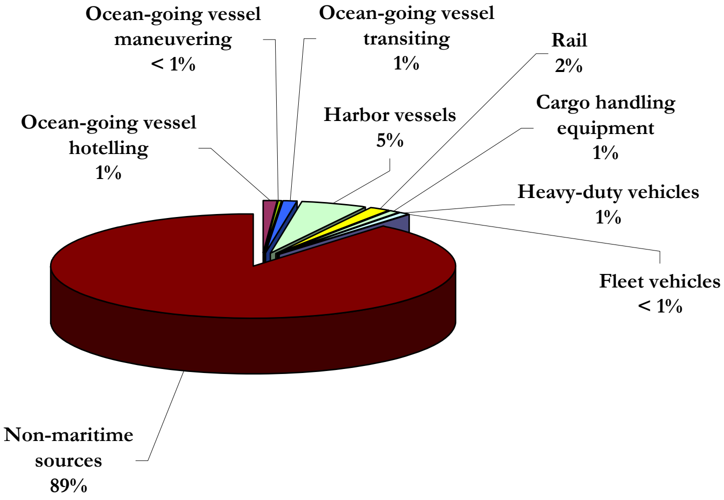


Figure ES.20: Comparison of 2005 Puget Sound Clean Air Agency Region Heavy-duty Vehicle Emissions, %

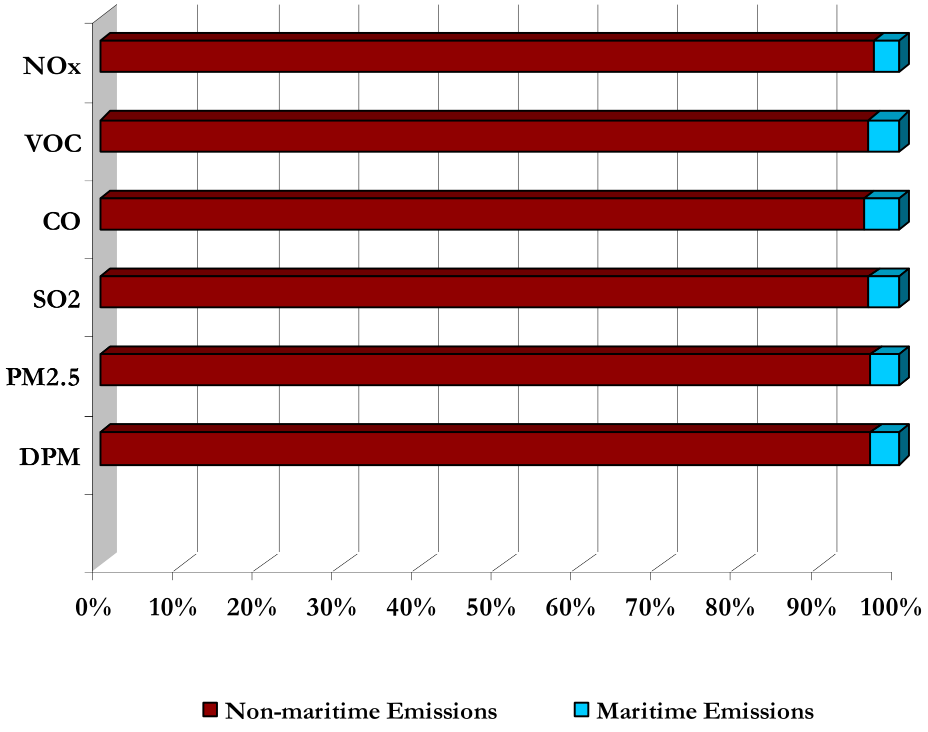
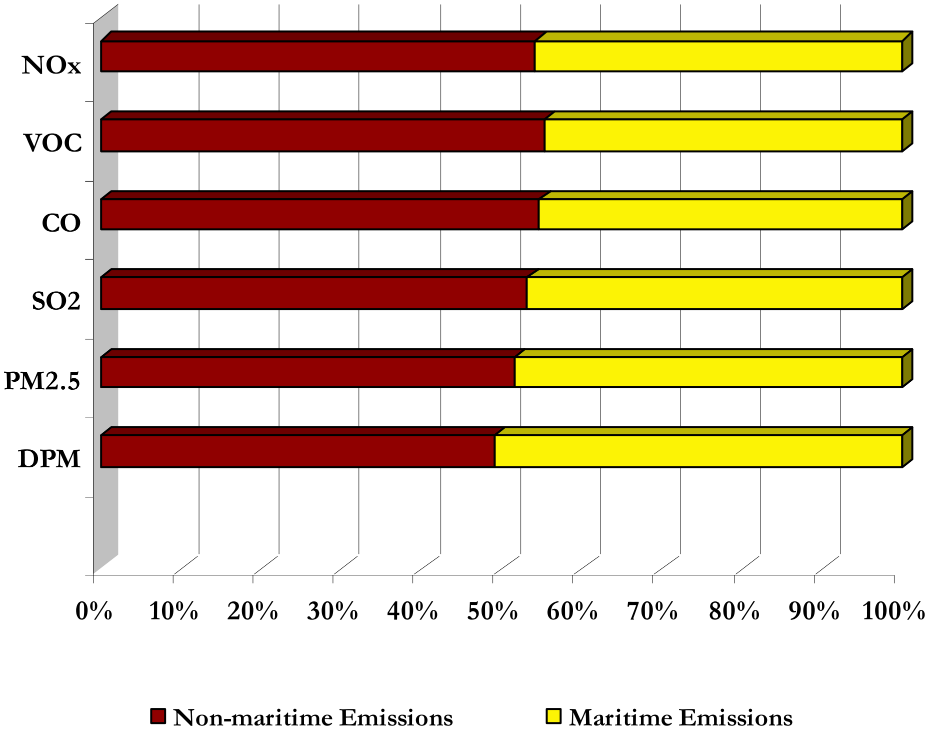


Figure ES.21: Comparison of 2005 Puget Sound Clean Air Agency Region Rail Locomotive Emissions, %



The Puget Sound Maritime Air Emissions Inventory shows that in 2005 maritime-related sources within the regional clean air agency jurisdictions were responsible for the following percentages of emissions:[3]

- Northwest Clean Air Agency –
  - 6% of fine particulate matter,
  - 40% of diesel particulate matter,
  - 16% of oxides of nitrogen,
  - 19% of sulfur dioxide,
  - 5% of carbon monoxide, and
  - 6% of volatile organic compounds.

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[3] In a few cases, the total non-maritime versus maritime emissions percentages vary by one percent from the figures presented previously; this is due to rounding error.

- Olympic Region Clean Air Agency –
  - 13% of fine particulate matter,
  - 66% of diesel particulate matter,
  - 40% of oxides of nitrogen,
  - 83% of sulfur dioxide,
  - 2% of carbon monoxide, and
  - 4% of volatile organic compounds.

- Puget Sound Clean Air Agency –
  - 4% of fine particulate matter,
  - 28% of diesel particulate matter,
  - 11% of oxides of nitrogen,
  - 33% of sulfur dioxide,
  - 1% of carbon monoxide, and
  - 2% of volatile organic compounds.

ES.1.3 The Puget Sound Maritime Air Forum

The Puget Sound Maritime Air Forum is a voluntary association of private and public maritime organizations, regional clean air agencies, environmental and public health advocacy groups, and other parties with operational or regulatory responsibilities related to the maritime industry. The greater Puget Sound region currently meets federal, state and local air quality standards and Forum partners want to keep it that way. Reduction of diesel emissions is a top priority of Puget Sound Clean Air Agency, the Olympic Region Clean Air Agency, the Northwest Clean Air Agency, the Washington Department of Ecology, the EPA, and others. The Forum is committed to supporting their efforts by accurately quantifying and voluntarily reducing air emissions related to maritime transportation of goods and passengers when and where it is feasible.

The purpose of the Forum as stated in its charter is to work collaboratively to:

- Build greater technical understanding of maritime-related air emissions and their impacts on public health and the environment, starting with the maritime air emissions inventory;
- Support implementation of cost-effective maritime air pollution control strategies by sharing expertise and resources and building partnerships when activities require the cooperation of multiple organizations for success; and
- Serve as the Puget Sound forum for the ports and vessels track of the West Coast Diesel Emissions Reduction Collaborative — a public-private partnership working to reduce air pollution emissions from diesel sources along the West Coast. The Collaborative is part of an overall national campaign to reduce diesel emissions.

ES.1.4 Maritime Air Pollution Prevention

In addition to participating in the emissions inventory project, Forum partners are also working within their own organizations, in local initiatives, nationally and internationally on efforts to reduce emissions. The Port of Seattle, Port of Tacoma and Vancouver Fraser Port Authority in British Columbia, for example, are collaborating on a joint action plan for reducing air emissions from their operations. Other actions being implemented by Forum partners include switching to cleaner fuels, using shore power instead of ship engines when cruise ships are in port, replacing old engines with cleaner engines, retrofitting older engines with advanced pollution control devices, rebuilding engines, and implementing systems to use equipment more efficiently. Additionally, a number of important pilot projects are underway to test new technologies and fuels, such as a seawater scrubber demonstration project, and alternative fuels testing on different types of equipment. The voluntary reductions achieved to date by the maritime industry in the Puget Sound region and other West Coast ports are unprecedented among industrial sectors.

ES.1.5 Technical Approach

The methodology, including a detailed Quality Assurance Project Plan (see Appendix C) for the emissions inventory project, was developed by the consultant, Starcrest Consulting Group, LLC, and Port of Seattle staff based on recommendations by the Technical Working Group and approved by the Steering Committee formed by all the project funding partners. The Technical Approach was developed in advance, and then utilized to guide the technical work for the Emissions Inventory project. Descriptions of the Technical Approach are incorporated into the technical sections of this report. An activity-based "bottom up" approach was implemented, based on interviews and conversations with individuals who own, operate, maintain, and/or charter the equipment and vessels included in the inventory. This included ports, terminal owners, vessel captains and engineers, equipment operators, and others having firsthand knowledge of either equipment details or operational parameters. Data also was provided by agencies and associations such as the Marine Exchange, the U.S. Coast Guard, the Washington Departments of Ecology and Transportation, and the Western States Petroleum Association. Forum members and the consultant worked with regulatory agencies to project activity or emissions levels for those facilities not actually surveyed in accordance with the Technical Approach.

The data collection approach for each source category was similar, focusing on two primary areas: vessel or equipment details and operational profiles or activity data. Examples include: vessel or equipment type (fishing vessel, yard tractor, etc.); rated power (primarily horsepower or kilowatts); equipment manufacturer and model year, engine make, model, model year, and technology; type of fuel used (e.g., offroad diesel, ultra-low sulfur diesel, liquefied petroleum gas); and any emission reduction technologies implemented. Operational profiles were developed for each emission source type based on activity data such as: duty-cycle information such as hours operated, miles traveled, gallons of fuel used (per day, per trip, or per year); accumulated engine hours; operational specifics such as travel distances, terminal operation descriptions; vessel or truck operating speeds; and vessel hotelling times.

For ocean-going vessels data from the Marine Exchange of Puget Sound, Lloyd's Register of Ships, the American Bureau of Shipping, and nautical charts and maps was used. The consultant and Forum staff also conducted an extensive Vessel Boarding Program on vessels calling in the Puget Sound area. Data for some vessels that call in both the Pacific Northwest and Southern California was collected during boardings in the Ports of Los Angeles or Long Beach. Data collected includes specific vessel and sister ship characteristics and operational data, engine data (manufacturer, model year, and age), fuel types and characteristics, and details of how the vessels transit, maneuver, and operate in port.

For harbor craft, recreational vessel and tank barges, data was collected for main and auxiliary engine number and characterizations (age, horsepower or kilowatts), hours and location of operations in Puget Sound in 2005, fuel consumption and characteristics, details regarding vessel service, and any emission reduction strategies were collected.

For cargo handling equipment data collected included operational profiles, equipment type, rated power, equipment manufacturer and model year, engine data (make, model, model year, and technology) type of fuel used and any emissions reduction technology.

For the rail related source category data collected included operational profiles, characteristics of equipment used to load cargo onto railcars and, when available locomotive make and model year, fuel consumption, and fuel characteristics.

For heavy-duty vehicles, data gathered includes types of vehicles, terminal entry and exit queue times, times spent on terminals, distances traveled on terminals, terminal speeds, age distribution of the vehicles, and fuel types and characteristics. The off-terminal estimates included the schedules, routes, and estimated distances traveled. Travel demand data modeled by the Puget Sound Regional Council and others was used in conjunction with emission factors generated by the EPA MOBILE6 model.

For fleet vehicles, data regarding the vehicle distances and speeds traveled, gross vehicle weight ratings, vehicle age distribution, and fuel types and characteristics were collected. Emission factors were generated by the MOBILE6 model.

ES.1.6 Limitations

Relative resolution and quality of emissions inventories. The inventory activity data in this emissions inventory is very detailed and accurate compared to earlier maritime emissions inventories conducted for the study area and current mobile source emissions inventories by the regional clean air agencies. The best emission factors available at the time were used in this emissions inventory, but more source testing is needed to improve the accuracy of emission factors, especially for vessels in general and equipment using alternative fuels and advanced pollution controls and vessels. Also, additional studies of use patterns for maritime-related diesel equipment will enhance future emissions inventories.

Comparison with similar studies in other regions. Comparing summary data from this emissions inventory with similar inventories produced for other maritime areas should be undertaken with attention to details. Many differences and assumptions underlie data from one area to another. For example, the Puget Sound Maritime Air Emissions Inventory reflects a much longer transit of 140 nautical miles in from the sea compared to many other port areas of the country. Additional examples of major variations that must be taken into account include the nature of specific maritime operations, geography, fuel characteristics, selection of inventory boundaries, and the choice of sources to include or exclude in the inventories.

Total emissions relative to emissions details. The total emissions values do not tell the whole story. The characteristics, duration and distribution of emissions are significant with respect to public health and the environment. The potency and effects of one pollutant may differ dramatically from others. For example, a ton of emissions emitted at locations adjacent to dense urban populations is of greater significance to public health than the same emissions distributed over a sparsely-populated 100 mile area. This emissions inventory has been prepared in sufficient detail to allow the maritime community, regional clean air agencies, and others to consider the effects of such considerations during air policy development in the future.

ES.1.7 Next Steps

Industry leadership in stimulating proactive early emissions reductions from maritime operations will continue and be supported by the inventory data. The Puget Sound Maritime Air Forum and participating organizations are recognized nationwide as leaders in voluntarily working to prevent air pollution from maritime related sources. The Ports of Seattle, Tacoma, Vancouver, Everett and other ports are working together with industry organizations such as the Washington Public Ports Association, the American Association of Port Authorities, the Pacific Merchant Shipping Association, the NorthWest CruiseShip Association, the Puget Sound Clean Cities Coalition, the Seattle Climate Partnership, the Western States Petroleum Association, the Transportation Institute, Clean Air Northwest, the West Coast Diesel Collaborative, the EPA's SmartWay Transportation Program, Cascade Sierra Solutions, CleanPorts USA, and other related organizations. That effort will continue within the region, the nation and the Pacific Rim. Strong coordination among seaports in the region and elsewhere is growing.

Emissions reductions projects will be more effectively focused by this emissions inventory. Maritime organizations in the Puget Sound region are committed to working together collaboratively to further reduce the public health risks and environmental impacts from their operations. Examples include truck projects, cruise ship shore power, expanded use of electricity and other alternative fuels, fleet modernization, continuous terminal efficiency improvements, and retrofitting diesel equipment. The Forum will continue to facilitate the sharing of technical expertise and funding support for diesel emission reduction projects.

Further analysis will be enhanced by the Puget Sound Maritime Air Emissions Inventory. It will be used by organizations with maritime operations and air regulatory responsibilities to identify additional cost-effective air pollution control strategies. Further analysis, modeling and monitoring are examples of air quality planning tools that could be enhanced by this emissions inventory.

ES.1.8 Conclusion

Maritime operations are expected to continue to grow through time. The on-going commitments by Forum participants to minimize pollution from their fleets are critical. Puget Sound Maritime Air Forum partners invite continuing collaborative work by interested parties to increase the scientific understanding of maritime-related air issues and expansion of maritime air pollution prevention projects to protect human health and the environment. The Puget Sound Maritime Air Emissions Inventory provides a sound foundation for future studies and pollution prevention programs.

SECTION 1 INTRODUCTION

This section describes the rationale behind the Puget Sound Maritime Air Emissions Inventory, introduces the Puget Sound Maritime Air Forum that has sponsored the effort, provides an overview of this and related efforts, describes maritime-related entities in the Puget Sound area, including ports, petroleum refineries, ferry terminals, and military installations, and discusses emission reduction efforts identified at these entities.

1.1 Reason for Study

Comprehensive air quality planning requires quality emissions inventories as a foundation. An emissions inventory identifies and quantifies by means of engineering calculations pollutants emitted by sources in a geographic area (or airshed) and their relative contributions to total emissions within the airshed. The emissions inventory is the foundation or baseline for other activities such as air quality analysis and strategy development.

This activity-based emissions inventory provides detailed information on the five major source categories associated with the marine activities, which are ocean-going vessels, harbor vessel, cargo handling equipment, on-road heavy-duty vehicles, and rail operations.

The marine-related inventory must be viewed in context with the other sources of air emissions in the region. Marine-related sources are one component of total air emissions sources present in the Puget Sound air basin. Other categories that contribute to total airshed emissions include point sources (refineries, manufacturing facilities, etc.), on-road mobile sources (cars, trucks, buses and motorcycles), non-road equipment (construction equipment, farming equipment, etc.), and stationary area sources (home wood heating, open burning, auto body shops etc.).

An emissions inventory by itself is a very useful tool to quantify the mass emissions and track emission changes through time from the variety of sources of pollution in a geographic area and to help prioritize those sources for potential emission reductions. Furthermore, the regional emissions inventory, including the marine-related portion, is a critical component of an overall air quality assessment and mitigation strategy development process employed by air regulatory agencies to ensure the area complies with local, state and national air quality standards.

In addition to assuring continued compliance with air quality standards, air agencies work to protect public health and the environment. Adverse health impacts can occur from toxic air emissions (e.g., diesel particulate matter) even if a region is in compliance with air quality standards. Environmental impacts such as visibility impairment can occur at levels significantly less than those standards. Since health impacts are directly related to the concentration and duration of public exposure to specific air pollutants, agencies use additional tools to help them understand the impacts of air pollution. They operate air quality monitoring networks to measure ambient concentrations at representative locations. They also perform computer modeling based on local meteorological data to convert emissions inventory data to estimated ambient concentrations across specific areas. Air quality managers use the data from monitors and modeling to plan and select strategies that reduce emissions sufficiently to meet air quality standards and protect health and environmental goals everywhere in the airshed.

The greater Puget Sound region is a significant airshed encompassing a large population. The region is currently in attainment with federal, state and local ambient air quality standards.[4] The greater Puget Sound region includes the following areas designated as maintenance areas with respect to the EPA's National Ambient Air Quality Standards:

- King, Pierce and Snohomish Counties for ozone;[5]
- the Seattle-Tacoma urbanized area for carbon monoxide;[6]
- Thurston County for particulate matter greater than 10 microns, or PM_{10};[7] and
- Kent (King County), Seattle (King County) and Tacoma (Pierce County) for PM_{10}.[8]

Diesel engines, like many other mobile, stationary, and area sources, are significant generators of criteria pollutants and toxic emissions. Excessive exposure to these pollutants can contribute to increased rates of lung cancer, chronic respiratory disease, impaired lung development in children, cardiovascular disease, and other health effects. Given these implications for public health, the reduction and minimization of these emissions are a top priority of the Puget Sound Maritime Air Forum as well as the Puget Sound Clean Air Agency, the Olympic Region Clean Air Agency, the Northwest Clean Air Agency, the Washington Department of Ecology, the EPA, and others. This emission inventory will support that effort by increasing the understanding of the emission contributions from the maritime-related sources, one component of the state's air quality concerns. Because the health impacts of toxic emissions can be proximity dependant, this inventory will contribute to a better understanding of where emission reductions could provide the best public health

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[4] The Puget Sound Clean Air Agency has concerns about the areas of Darrington, Marysville and the South end of Tacoma on meeting the new particulate matter standard, primarily, they believe, from fireplace/wood stove activity. Additional monitoring has been positioned to enable the Agency to characterize the ambient air appropriately. John Anderson, Puget Sound Clean Air Agency, e-mail to Sarah Flagg, Port of Seattle, 17 November 2006.

[5] Effective 25 November1996 pursuant to Title 61 of the *Federal Register* (FR), page 50438, 26 September 1996.

[6] Effective 11 October1996 pursuant to 61 FR 53323, 11 October 1996.

[7] Effective 4 December 2000 pursuant to 65 FR 59128, 4 October 2000.

[8] Effective 14 May 2001 pursuant to 66 FR 14492, 13 March 2001.

benefit. While the EPA has not yet officially designated diesel emissions as a hazardous air contaminant, it is important to note that federal regulations are in place to require dramatically cleaner fuels and new diesel engines in the future. In addition, in its Health Assessment Document for Diesel Engine Exhaust [EPA/600/8-90/057F May 2002, page ii, pdf p. 3] EPA concludes that "long-term (i.e. chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure." Puget Sound Maritime Air Forum participants are committed to proactively working with regulatory agencies and others to achieve early emissions reductions from maritime-related operations to protect public health and the environment.

In advance of any regulatory requirement, the Puget Sound Maritime Air Forum (Forum), described in Section 1.2, proactively commissioned this air emissions inventory as an important step in the process of reducing maritime-related emissions. During the inventory process, information on the nature, quantity, and sources of air pollutants released from maritime sources has been collected. As the understanding of maritime-related emissions sources improves, the maritime community will be better able to design and implement cost-effective, fact-based air pollution control strategies and deliver air quality benefits to the region.

1.2 Puget Sound Maritime Air Forum

The Puget Sound Maritime Air Forum is a voluntary association of private and public maritime organizations, regional clean air agencies, and other parties with operational or regulatory responsibilities related to maritime industry air quality impacts. Forum participants are committed to accurately identifying and quantifying maritime-related sources of air pollution and seeking ways to voluntarily reduce air pollution impacts from this transportation sector.

Forum participants include the following organizations:[9]

- American Lung Association of Washington
- American President Lines
- Apollo Alliance
- BNSF Railway
- Campbell Marine
- Clean Energy
- Cleaner Production International
- Community Coalition for Environmental Justice
- Cummins Northwest
- Eagle Marine
- Environmental Coalition of South Seattle
- Georgia Basin Marine Vessels Work Group

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[9] Additional information on Forum participants is presented in Appendix A.

- Holland American Line
- International Longshore and Warehouse Union
- Imperium Renewables
- Kitsap Transit
- Manson Construction Company
- Marine Terminals Corporation
- North Pacific Fishing Vessel Owner's Association
- Northwest Clean Air Agency
- NorthWest CruiseShip Association
- Olympic Region Clean Air Agency
- Pacific Merchant Shipping Association
- People for Puget Sound
- Port of Anacortes
- Port of Bellingham
- Port of Everett
- Port of Olympia
- Port of Seattle
- Port of Tacoma
- Prometheus Energy
- Puget Sound Clean Air Agency
- Puget Sound Clean Cities
- Puget Sound Regional Council
- Starcrest Consulting Group, LLC
- Stevedoring Services of America (SSA) Marine
- Transportation Institute
- U.S. Coast Guard
- U.S. EPA
- U.S. Navy
- Victoria Clipper
- Washington Department of Ecology
- Washington Department of Transportation
- Washington Public Ports Association
- Washington State Ferries
- Western States Petroleum Association

The Forum coordinates its efforts with:

- British Columbia Chamber of Shipping
- Environment Canada
- Greater Vancouver Regional District
- Vancouver-Fraser Port Authority

The purpose[10] of the Forum is to work collaboratively to:

1. Build greater technical understanding of marine air emissions and their impacts on public health and the environment, starting with preparation of a high quality maritime emissions inventory;
2. Support implementation of cost effective maritime air pollution control strategies by sharing expertise and resources and building partnerships when activities require the cooperation of multiple organizations for success; and
3. Serve as the Puget Sound forum for the ports and vessels track of the West Coast Diesel Emission Reduction Collaborative.

For more information about the Puget Sound Maritime Air Forum and the Puget Sound Maritime Air Emissions Inventory see the Internet site hosted by the Port of Seattle and maintained by the Puget Sound Clean Air Agency: *http://maritimeairforum.org/*.

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1.3 Related Efforts

Four other air emissions inventory efforts relate to this Puget Sound Maritime Air Emissions Inventory: One effort is conducted by the Washington Department of Ecology and the regional clean air agencies: the Puget Sound Clean Air Agency, the Northwest Clean Air Agency, and the Olympic Region Clean Air Agency; another by Environment Canada; and two others, occurring concurrently with the Puget Sound effort, by the Ports of Los Angeles and Long Beach.

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[10] Puget Sound Maritime Air Forum Charter, 18 July 2006.

The Washington Department of Ecology, the Northwest Clean Air Agency, the Olympic Region Clean Air Agency, and the Puget Sound Clean Air Agency have provided regional air emissions inventory data for 2005 for significant stationary point, mobile and area source categories, by county. These regional emissions estimates are compared, in Section 2.2, to those for the maritime sector that are the subject of this study.

Environment Canada, in cooperation with the B.C. Chamber of Shipping, Vancouver-Fraser Port Authority, the Greater Vancouver Regional District, and others, conducted an inventory to characterize and quantify emissions from ocean-going vessels that operate in the Georgia Basin/Puget Sound Airshed. During the Puget Sound Maritime Air Emissions Inventory, vessel data collection was coordinated with Environment Canada to reduce the likelihood that vessels transiting both U.S. and Canadian waters would be miscounted. More details on this effort are provided in Section 1.12.2.

The Ports of Los Angeles and Long Beach are each preparing comprehensive EI updates concurrently with the Puget Sound Maritime Air Emissions Inventory. The Forum is coordinating with these ports to share data obtained on ocean-going vessels that frequent either of those ports and the ports in Puget Sound and British Columbia. More details on the data sharing are provided in Section 3.2.

This international coordination will help to ensure that consistent methodologies are used to prepare the Puget Sound Maritime Air Emissions Inventory as well as to further facilitate voluntary emissions reductions from maritime-related sources. Significant differences between these inventories are noted in this report.

1.4 Scope of Study

The scope of the study is described in terms of the pollutants quantified, the year of operations used as the basis of emission estimates, the included and excluded source categories, and the geographical extent.

1.4.1 Pollutants

Exhaust emissions of the following pollutants have been estimated:

- criteria pollutants, surrogates, and precursors
  - oxides of nitrogen (NO_x)
  - sulfur dioxide (SO_2)
  - particulate matter (PM) (10-micron, 2.5-micron)
  - volatile organic compounds (VOCs)
  - carbon monoxide (CO)
- the air toxic[11] contaminant, diesel particulate matter (DPM), a fraction of PM_{10}
- greenhouse gases
  - carbon dioxide (CO_2)
  - methane (CH_4)
  - nitrous oxide (N_2O)

Tables 1.1 and 1.2[12] provide further description of the pollutants and their relation to national ambient air quality standards.

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[11] In 1998, the California Air Resources Board (CARB) identified diesel particulate matter as a toxic air contaminant. California EPA Air Resources Board, Resolution 98-35, 27 August 1998. See: *http://www.arb.ca.gov/regact/diesltac/res98-35.pdf.*

[12] Barbara Cole, Port of Seattle.

Table 1.1: Ambient Air Quality Standards

Pollutant	National (EPA)		Washington	Local
	Primary	**Secondary**	**Ecology**	**PSCAA**
Total Suspended Particulate Matter				
Annual Geometric Mean ($\mu g/m^3$)			60	
24-Hour Average ($\mu g/m^3$)			150 (a)	
Inhalable Coarse Particulate Matter (PM10)				
Annual Average ($\mu g/m^3$)	(b)		50	54 (c)
24-Hour Average ($\mu g/m^3$)	150 (a)		150 (a)	154 (d)
Fine Particulate Matter (PM2.5)				
Annual Average ($\mu g/m^3$)	15 (e)	15 (e)		15 (c)
24-Hour Average ($\mu g/m^3$)	35 (f)			35 (g)
Sulfur Dioxide (SO2)				
Annual Average (ppm)	0.03	--	0.02	0.02
24-Hour Average (ppm)	0.14 (a)	--	0.10 (a)	0.10
3-Hour Average (ppm)	--	0.50 (a)	--	--
1-Hour Average (ppm)	--	--	0.25 (h)	0.25 (h)
1-Hour Average (ppm)	--	--	0.40 (a)	0.40
Carbon Monoxide (CO)				
8-Hour Average (ppm) (a)	9		9	9.4
1-Hour Average (ppm) (a)	35		35	35
Ozone (O_3)				
8-Hour Average (ppm)(I)	0.08	0.08		0.08
1-Hour Average (ppm)	(j)	(j)	0.12	(j)
Nitrogen Dioxide (NO_2)				
Annual Average (ppm)	0.053	0.053	0.05	0.053
Lead (Pb)				
Quarterly Average ($\mu g/m^3$)	1.5	1.5		1.5

NOTES: $\mu g/m^3$ = micrograms per cubic meter; **ppm** = parts per million; **blank cells** indicate no standard

All values not to be exceeded except as noted; all averages arithmetic except TSP annual geometric mean.

(a) Not to be exceeded more than once per year

(b) Particles <10 micrometers in size; Federal annual PM10 standard revoked as of Sept. 21, 2006

(c) The 3-year annual average of the daily concentrations must not exceed level

(d) The 3-year average of the 99th percentile (based on the number of samples taken) of the daily concentrations must not exceed level

(e) Attainment based on the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors not exceeding level

(f) Attainment based on the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area not exceeding level

(g) The federal 24-hour standard for PM2.5 was revised as of Sept. 21, 2006. PSCAA has not yet adopted this standard, but soon will.

(h) Not to be exceeded more than twice in seven consecutive days

(I) Attainment based on 3-year average of the 4th highest daily maximum 8-hour ozone concentration at each monitoring location

(j) Federal 1-hour ozone standard was revoked in all areas except 14 remaining nonattainment areas. The federal and the PSCAA 1-hour standard lapsed on June 15, 2005.

Source: Geomatrix Consultants, Inc. based on most recent local, state, and federal rules.

Table 1.2: Pollutant Description

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Ozone (O_3)* is a pungent-smelling, colorless gas produced in the atmosphere when nitrogen oxides (NO_x) and volatile organic compounds (VOC) chemically react under sunlight. The highest O_3 levels occur on hot summer afternoons. This inventory does not include O_3 because it is not directly emitted; this inventory does include the O_3 ingredients nitrogen oxides and volatile organic compounds.	The region has not violated national ambient standards for O_3 since 1992, and in 1996 the region was re-designated to "attainment" status by EPA. O_3 levels have not decreased significantly. Concentrations often exceed, but don't violate, standards a few times each summer.	Most O_3-causing NO_x and VOC come from the transportation sector - cars and light trucks, marine vessels, and heavy-duty diesel vehicles. Other sources include gasoline-powered yard equipment; gasoline refueling; industrial solvents; and auto-body paint shops, among others. Natural emissions from biogenic (vegetation) sources also contribute to O_3 formation.	Exposure to ground-level O_3 can reduce lung function, cause respiratory irritation, aggravate asthma symptoms, and weaken the immune system. O_3 has environmental impacts as well; studies show that O_3 can damage agricultural crops and forests.
Oxides of Nitrogen (NO_x) is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Most NO_x are colorless and odorless. **Nitrogen dioxide (NO_2)*** is one form of NO_x. NO_2, along with particles in the air can often be seen as a reddish-brown layer over many urban areas.	NO_2 levels are well-below federal air quality standards in the Puget Sound Region. See information above for information about the role of NO_x in O_3 formation.	NO_x form when fuel is burned at high temperatures, as in a combustion process. The primary manmade sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Other sources include industrial boilers and processes, home heaters, and gas stoves. NO_x can also be formed naturally.	Exposure to NO_2 has been connected to a range of respiratory diseases and infections. NO_2 plays an essential role in the photochemical reactions that produce O_3, the major component in smog. NO_x can react with other compounds in the air to form tiny particles adding to PM concentrations.

*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**

Table 1.2: Pollutant Description, cont'd

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Volatile organic compounds (VOC) VOC are included in the emissions inventory because they are an ozone ingredient, see ozone information above	No ambient standards. VOCs are not classified as criteria pollutants but can contribute to the formation of ozone.	See ozone information above.	In addition to contributing to the formation of ozone, some VOC are air toxics which can contribute to a wide range of adverse health effects.
Carbon monoxide (CO) Carbon monoxide is a colorless, odorless, toxic gas commonly formed when carbon-containing fuel is not burned completely. Motor vehicles are the predominant source of carbon monoxide in the Puget Sound region.	CO levels are well below federal standards and no longer considered a pollutant of concern in the Puget Sound area. This region was designated as "attainment" status in 1996 and has not violated the carbon monoxide standard since 1990.	CO forms during incomplete combustion of fuels. The majority of CO comes from on and off road vehicle engine exhaust. Other contributing CO source categories in the Puget Sound region include woodstoves and fireplaces, outdoor burning and industrial sources.	CO combines with hemoglobin in red blood cells and decreases the oxygen-carrying capacity of the blood. CO weakens heart contractions, reducing the amount of blood pumped through the body. It can affect brain and lung function. People with heart disease and pregnant women are especially at risk.
Sulfur dioxide (**SO_2**)***** is a colorless, corrosive gas produced burning of fuel containing sulfur like coal and oil, and by industrial processes such as smelters, paper mills, power plants and steel manufacturing plants. Sulfur dioxide (SO_2)* is one form of SO_x.	SO_x levels in the Puget Sound region are well below federal standards.	Over the past decade our area has experienced a significant decrease in SO_2 from sources such as pulp mills, cement plants, and smelters. Additionally, levels of sulfur in diesel and gasoline fuels are decreasing due to federal regulations set by the Environmental Protection Agency.	SO_2 is associated with a variety of respiratory diseases. Inhalation of SO_2can cause increased airway resistance by constricting lung passages. Some of the SO_x become sulfate particles in the atmosphere adding to measured PM levels.
*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**			

Table 1.2: Pollutant Description, cont'd

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Particulate Matter (PM_{10} * & $PM_{2.5}$*) refers to tiny, discrete solid or aerosol particles in the air. Dust, dirt, soot, and smoke are considered particulate matter (PM). Two types of PM are included in this emissions inventory: PM_{10}, which consists of particles measuring up to 10 micrometers in diameter; and $PM_{2.5}$, which consists of fine particles measuring 2.5 micrometers in diameter or smaller.	The region is in attainment with federal air quality standards for PM. Some areas do not meet the Puget Sound Clean Air Agency local health goal for $PM_{2.5}$, which is stricter than the federal standard and more protective of human health. Some areas in the region will not comply with new stricter federal $PM_{2.5}$ standards.	In the winter, most PM comes from wood burning in fireplaces and wood stoves particularly in residential neighborhoods. During the summer, vehicle exhaust (cars, trucks, buses, among others) are the predominant sources of fine particles in urban areas. In rural areas, land-clearing burning and backyard burning of yard waste contribute to summer time levels.	Fine particles are a concern because their very tiny size allows them travel more deeply into lungs, increasing the potential for health risks. Exposure to $PM_{2.5}$ is linked with respiratory disease, decreased lung function, asthma attacks, heart attacks and premature death. Some PM, such as diesel particulate matter, and smoke from wood and waste burning, are classified as toxic due to the concentrations of harmful chemicals bound to the particles.
Diesel Particulate Matter (DPM) is a significant component of PM. Diesel exhaust also includes more than 40 substances that are listed as hazardous pollutants. DPM is considered a surrogate for the effects of both the PM and gaseous component of diesel exhaust. Because of their microscopic size, DPM can become trapped in the small airways of the lungs.	No ambient standards - Air agencies have made it a priority to lower DPM emissions as soon and as much as is practical due to its relative toxicity even though the total tons of DPM in this and other inventories are usually much lower than for other pollutants.	Sources of diesel emissions include diesel-powered trucks, buses and cars (on-road sources); diesel-powered marine vessels, construction equipment, trains and aircraft support equipment (non-road sources).	DPM has been shown to contribute up to 80% of the carcinogenic health risk related to the portion of outdoor air pollutants classified as "toxics". DPM is linked with health effects typical of all PM, including heart problems, aggravated asthma, chronic bronchitis and premature death.
*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**			

Table 1.2: Pollutant Description, cont'd

Pollutant	Ambient Standard Compliance Status	Sources	Health & Environmental Effects
Greenhouse Gases (GHG) included in this emissions inventory are carbon dioxide, methane, and nitrous oxide. Additional gases that are not significantly emitted in by maritime-related sources or included in this inventory also contribute to climate change.	No ambient standards	GHG come from natural processes as well as human activities, though increases of human-made GHG are most responsible for disrupting the balance of the atmosphere. Most GHG come from transportation and electricity generation.	Climate change, also referred to as global warming, occurs when excessive amounts of GHG accumulate in our atmosphere. These gases trap heat, causing the temperature of the earth to rise.
*** Indicates a criteria pollutant which National Ambient Air Quality Standards have been established by EPA.**			

A description of the methods used to obtain emission estimates for these pollutants is presented generally in Section 1.12.1, and specifically for each source category in the applicable methodology subsection.

Reliable emission factors were not available for all source categories for all speciated air toxics. The best emission factors available, in the judgment of the Forum Steering Committee, are provided in Appendix D.

1.4.2 Temporal Extent

The activity year for the Puget Sound Maritime Air Emissions Inventory is calendar year 2005. To the extent practicable, the emission estimates are based on activities that occurred during this period. If information specific to 2005 was not available, reasonable estimates of operational characteristics were developed; these cases are identified.

1.4.3 Emission Sources

The Puget Sound Maritime Air Emissions Inventory includes the following source categories:

- Ocean-going vessels (OGVs)
- Harbor vessels, including harbor craft, recreational vessels and tank barges
- Cargo handling equipment (CHE)
- Rail locomotives and associated rail yard CHE and trucks
- Heavy-duty vehicles (HDV)
- Fleet vehicles

1.4.4 Geographical Extent

The Puget Sound Maritime Air Emissions Inventory covers activities within delineated geographical areas depending on emission source type. In general, the area covered includes the U.S. portions of the Georgia Basin/Puget Sound Airshed, as depicted in Figure 1.1.[13] The Georgia Basin airshed comprises the Canadian portion of the Georgia Basin/Puget Sound Airshed, including Whatcom and San Juan Counties and the southern coastline of the Strait of Juan de Fuca, while the Puget Sound airshed encompasses the counties to the south of Whatcom County in Washington State (see Figure 2.1). The solid red line is the boundary of the Georgia Basin/Puget Sound Airshed and also by Steering Committee decision the study area boundary. The red dashed line is the boundary between the Georgia Basin and Puget Sound airsheds. The black dashed line is the international border between Canada and the U.S. and the northern study area boundary for this EI.

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[13] Puget Sound Clean Air Agency.

This includes the twelve counties located within the Puget Sound Maritime Air Emissions Inventory study area, as shown in Figure 1.2:

- Clallam County
- Island County
- Jefferson County
- King County
- Kitsap County
- Mason County
- Pierce County
- San Juan County
- Skagit County
- Snohomish County
- Thurston County
- Whatcom County

- The major ports in the area include the:
  - Port of Seattle in King County
  - Port of Tacoma in Pierce County
  - Port of Everett in Snohomish County
  - Port of Anacortes in Skagit County
  - Port of Olympia in Thurston County
  - Port of Port Angeles in Clallam County

Figure 1.1: Georgia Basin/Puget Sound Airshed

An overview of the geographical extent for each of the source categories is provided below.

Figure 1.2: Puget Sound Counties and Major Ports

Ocean-going Vessels

For OGVs, data was collected for the greater Puget Sound area and associated waterways, and the Strait of Juan de Fuca out to the JA buoy (located at the entrance to the Strait of Juan de Fuca).

Emissions have been estimated from OGVs that arrived at a U.S. berth from sea or departed to sea from a U.S. berth, regardless of whether the vessels traveled on the U.S. side or the Canadian side of the international border. For OGVs that shifted to Canadian berths, or shifted from Canadian berths to U.S. berths, this inventory includes emissions only in U.S. waters. To avoid double-counting, boundary delineation was coordinated with the B.C. Marine Vessel Air Quality Work Group. Guidelines were established for both emissions inventories to follow for all vessel trips that transit through the over-water international boundary (see Section 3.2). OGV call data was compiled, reviewed, and quality assured, and the two groups met to ensure that OGV shifts and overall calls were consistent between the two inventories. After completion of the emission estimates, the results will be shared between Environment Canada and the Forum on a geographically specified basis, to allow appropriate allocation for modeling and other purposes.

Harbor Vessels

The geographical scope for harbor vessels is the same as for OGVs. Emissions from vessels such as ferries that routinely cross the international border have been estimated for the U.S. portions of their routes. Emissions from U.S.-based harbor vessels that traverse the Strait of Juan de Fuca are estimated regardless of whether the vessels travel on the U.S. side or the Canadian side of the international border, using the same approach as for OGVs.

Cargo Handling Equipment

The geographical scope for cargo handling equipment is the ports and associated terminals or other facilities on which they operate (for example, near-dock railroad switching yards).

Rail Locomotives

Emissions from switching and line haul locomotives were estimated for on-dock rail yards, off-dock rail yards, intermodal yards, the rail lines linking these facilities, and off-terminal port-related locomotive emissions to the edge of the study area.

Heavy-duty Vehicles

Emissions from heavy-duty onroad trucks hauling cargo were estimated for queuing at terminal entry gates, traveling and idling within the terminals, queuing at the terminal exit gates, and off-terminal port-related activity from point of pick-up in the case of port-bound cargo and to the first drop or the edge of the study area in the case of cargo outbound from a port.

Emissions from buses transporting cruise line customers between airports and/or hotels and the cruise terminals were also included in the HDV source category. Emissions were estimated for idling at terminal drop-offs, travel within the terminal and trips to and from the airport.

Fleet Vehicles

Emissions from on-terminal vehicles, including fleet vehicles, passenger-owned vehicles parking at the cruise terminals, minivans shuttling cruise passengers, and new import/export vehicles transfer to and from ocean-going vessels have been estimated. Emissions from personal vehicles owned by employees that are not used in terminal operations were not included in the inventory.

1.5 Agency Grants

The Forum gratefully acknowledges agency grants that helped to make this Emissions Inventory possible. EPA Regions 9 and 10 provided a $100,000 Collaborative Diesel Emissions Reduction Grant (grant no. XA-960107-01-0), the Northwest Clean Air Agency provided a grant of $20,000, the Olympic Region Clean Air Agency provided a grant of $5,000 and the Puget Sound Clean Air Agency provided a grant of $30,000. Agency contacts are:

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1.6 Puget Sound Ports Descriptions

According to the Washington Public Ports Association,[14] there are 76 public ports in the state. Of these, 33 are located within the Puget Sound Maritime Air Emissions Inventory study area. Six of these have cargo handling equipment, rail activity, heavy-duty vehicles, fleet vehicles, and/or regular cruise ship calls and associated activities, in addition to marinas, as listed in Table 1.3. Table 1.4 lists public ports comprised only of marinas and public docks. These ports had no, or nominal quantities, of cargo handling equipment and fleet vehicles, and no rail or truck activity; however, they had recreational harbor craft, the emissions of which are included in the Puget Sound Maritime Air Emissions Inventory.

Table 1.3: Greater Puget Sound Public Ports with Recreational Marinas/Public Docks

Port	County
Anacortes	Skagit
Everett	Snohomish
Olympia	Thurston
Port Angeles	Clallam
Seattle	King
Tacoma	Pierce

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[14] Washington Public Ports Association, 2006. See: *http://www.washingtonports.org/*.

Table 1.4: Greater Puget Sound Public Ports with Recreational Marinas

Port	County
Allyn	Mason
Anacortes	Skagit
Bellingham	Whatcom
Bremerton	Kitsap
Brownsville	Kitsap
Coupeville	Island
Dewatto	Mason
Edmonds	Snohomish
Eglon	Kitsap
Friday Harbor	San Juan
Grapeview	Mason
Hoodsport	Mason
Illahee	Kitsap
Indianola	Kitsap
Keyport	Kitsap
Kingston	Kitsap
Lopez	San Juan
Mabana	Island
Manchester	Kitsap
Orcas	San Juan
Port Townsend	Jefferson
Poulsbo	Kitsap
Shelton	Mason
Silverdale	Kitsap
Skagit	Skagit
South Whidbey Island	Island
Tracyton	Kitsap
Waterman	Kitsap

The six ports that had cargo handling equipment, rail and truck activity, onroad vehicles and/or regular cruise ship calls and associated activities that are specifically included in the Puget Sound Maritime Air Emissions Inventory are described below in order of largest to smallest. Each port is described as it was in 2005. Port size relative to container and cargo traffic is presented in Table 1.5:[15]

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[15] Each port supplied the statistic for their port.

Table 1.5: Puget Sound 2005 Port Statistics

Port	2005 Cargo Tonnage
Port of Seattle	20,564,860
Port of Tacoma	20,384,213
Port of Anacortes	252,500
Port of Everett	225,394
Port of Olympia	127,268
Port of Port Angeles	not available

The Port of Port Angeles reported 1,328,000 board feet of logs offloaded, and 29 tankers at berth for repairs in 2005.

Figure 1.3 shows the location on the Washington State port districts.[16]

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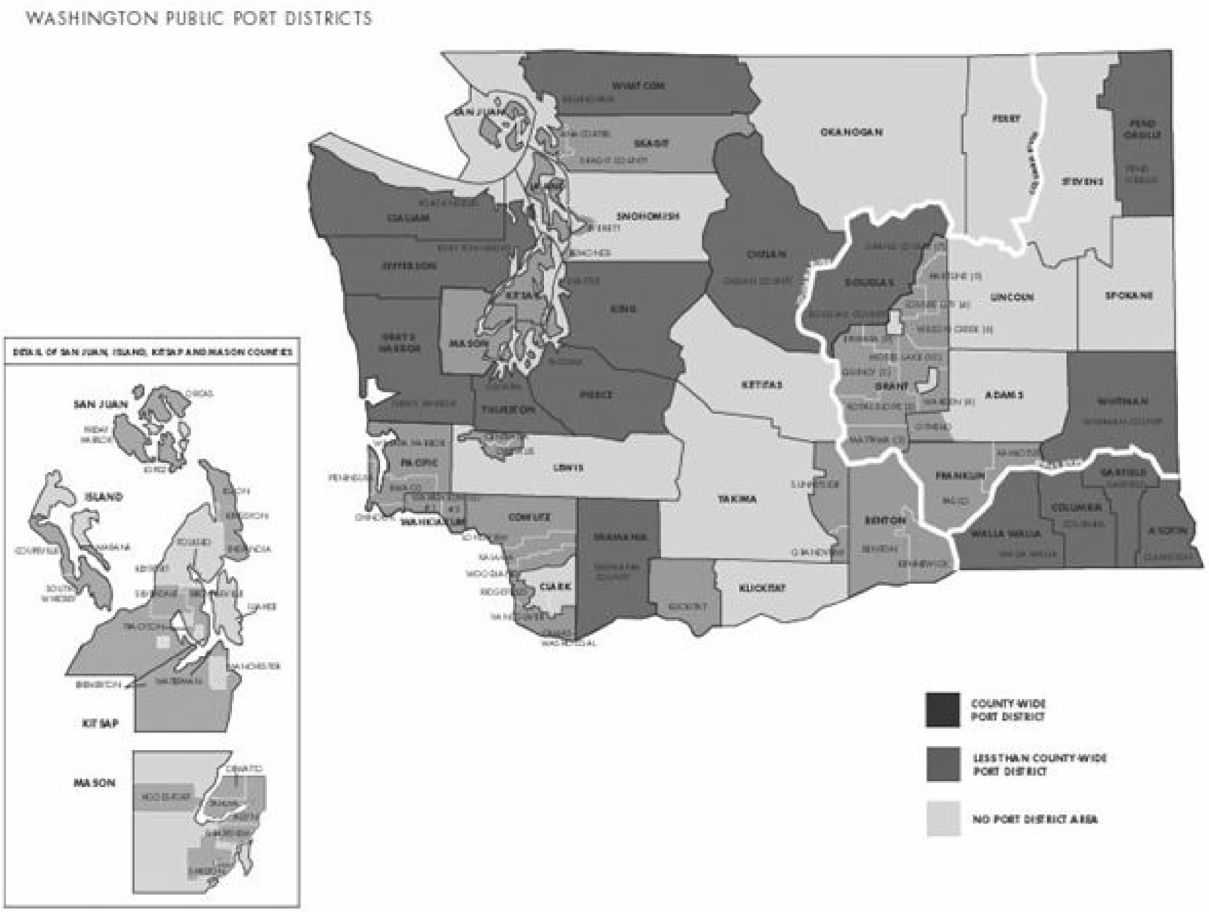
[16] Washington Public Ports Association.

Figure 1.3: Washington State Port Districts



1.6.1 Port of Seattle

The Port of Seattle[17] (Figure 1.5) has four container terminals (Figure 1.6):

- Terminal 5,
- Terminal 18,
- Terminal 25, and
- Terminal 46;

three bulk terminals:

- Pier 86 (grain handling facility) (Figure 1.7)
- Terminal 91 (Figure 1.7), and
- Terminal 115 (Figure 1.6);

two cruise terminals, with a total of three berths:

- Terminal 30 (Figure 1.6) and
- Pier 66 (Figure 1.7);

and four marinas:

- Shilshole Bay Marina (Figure 1.8) ;
- Fishermen's Terminal (Figure 1.8);
- Bell Harbor Marina; and
- Harbor Island Marina.

Figure 1.4: Port of Seattle Panoramic View[18]

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[17] Port of Seattle, *http://www.portseattle.org/about/maps/*.

[18] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

Figure 1.5: Port of Seattle Overview

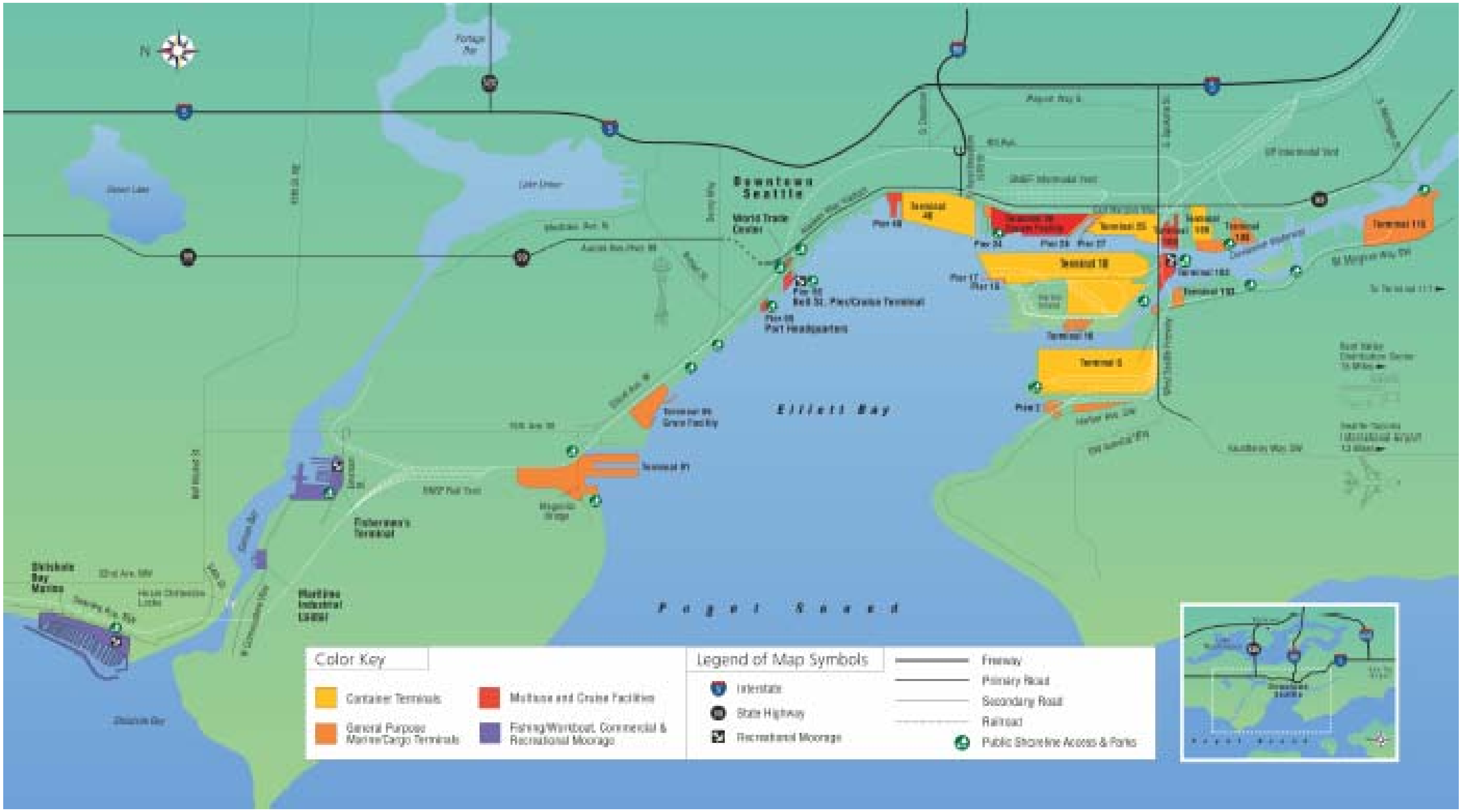


Figure 1.6: Port of Seattle South Harbor

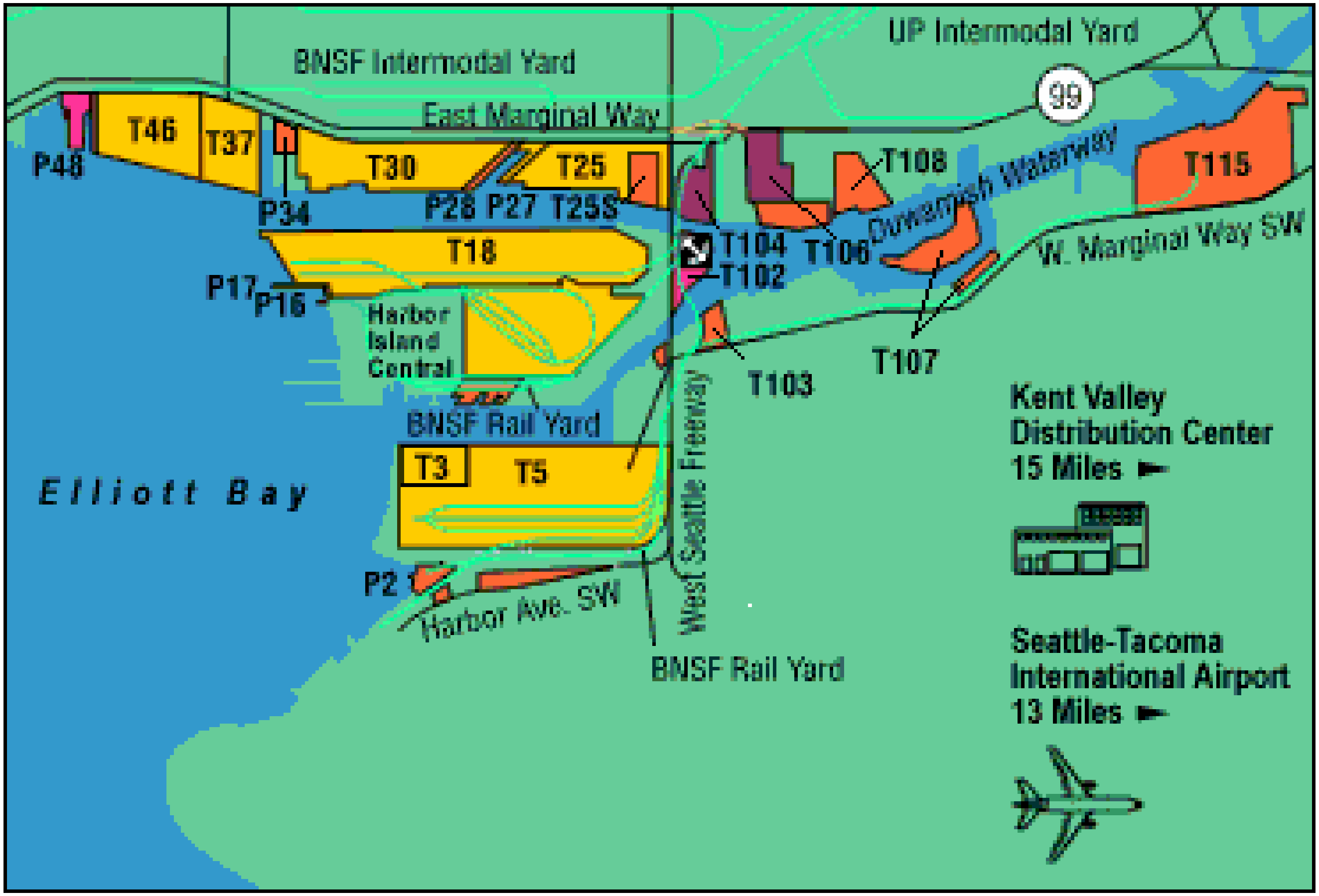


Figure 1.7: Port of Seattle Central Harbor

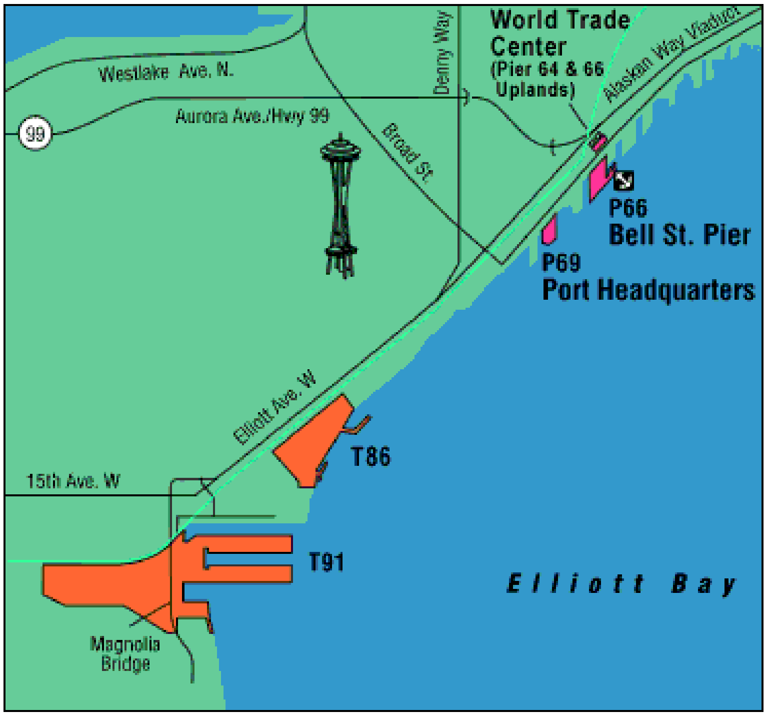
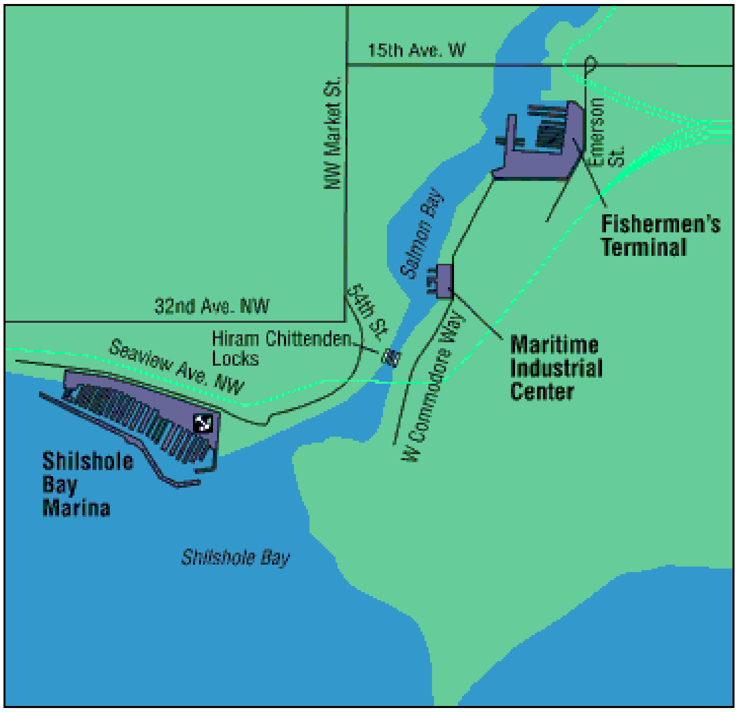


Figure 1.8: Port of Seattle North Harbor



Terminal 5, shown in Figure 1.9[19], is leased by American Presidents Line (APL) and operated by Eagle Marine Services. The terminal is 182 acres in size and has three berths and six post-Panamax cranes. The terminal has on-dock intermodal rail facilities and is capable of loading for both BNSF Railway and Union Pacific Railroad (UP). The terminal also has 600 reefer plugs. Shipping lines carrying cargo into and out of Terminal 5 include APL, Hyundai, MOL, Westwood and Alaska Ocean.

Figure 1.9: Port of Seattle Terminal 5

Terminal 18, shown in Figure 1.10[20], is the Port of Seattle's largest container terminal and one of the largest in North America. Operated by Stevedoring Services of America (SSA) Terminals, the 196 acre terminal has intermodal container rail capacity with BNSF Railway and UP, four berths, eleven container-handling cranes (four super post-Panamax, six post-Panamax, one Panamax) and 1,227 reefer plugs.

Shipping lines taking cargo into and out of Terminal 18 include Compañía Chilena de Navegación Interoceánica S.A. (CCNI), China Ocean Shipping (COSCO), Compañía Sudamericana de Vapores (CSAV), China Shipping Container Line (CSCL), CMA-CGM, Far Eastern Shipping (FESCO), Hamburg-Sud, Hanjin, Hapag-Lloyd, Kawasaki Kisen Kaisha (K-Line), Maersk Line, Maruba Lines, Nippon Yusen Kaisha Line (NYK), Orient Overseas Container Line (OOCL), Yang Ming Line, and Zim Israeli Navigation Company Ltd.

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[19] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

[20] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

Figure 1.10: Port of Seattle Terminal 18

Terminal 25 is leased by Matson Navigation and operated by SSA Terminals. The 35-acre terminal has one berth, three Panamax cranes, and 307 reefer plugs. It is located two miles from the UP and BNSF Railway rail yards. Matson Navigation, Horizon Lines, and APL shipping lines bring cargo into and out of the terminal.

Terminal 46 is located on 88 acres and is operated by Total Terminals, Inc. (TTI). The terminal has two berths and six cranes, including three super post-Panamax, two post-Panamax and one Panamax. Vessel lines bringing cargo to and from the terminal include Hanjin Shipping, COSCO, K-Line, and Yang Ming.

Terminal 90/91, shown in Figure 1.11[21], is located on 212 acres. Operated by the Port of Seattle, it has 20 berths and is predominately used by the Pacific Factory Trawler fishing fleet. Equipped with shore power, the larger commercial fishing vessels use this terminal.

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[21] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

Figure 1.11: Port of Seattle Terminal 90/91

Terminal 115, operated by Northland Services and shown in Figure 1.12[22], is located on 70 acres. It has four berths and is typically used for receipt and shipment of import/export cargo, special projects and barge operations, and roll-on/roll-off (RoRo) cargo.

Figure 1.12: Port of Seattle Terminal 115

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[22] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

Pier 86, the grain handling facility, is operated by Louis Dreyfus Corporation. It is located on 40 acres, has a 3.99-million bushel capacity, and has one berth, as shown in Figure 1.13[23].

Figure 1.13: Port of Seattle Grain Handling Facility

The Port of Seattle has two cruise terminals for passengers traveling to Alaska. Norwegian Cruise Line and Celebrity Cruises depart from the Bell Street Pier Cruise Terminal at Pier 66. Holland America Line, Princess Cruises and Royal Caribbean use the Terminal 30 Cruise Facility.

The Port of Seattle marinas include four locations for recreational moorage:

- Bell Harbor Marina,
- Fishermen's Terminal,
- Harbor Island Marina, and
- Shilshole Bay Marina.

Fishermen’s Terminal serves primarily as home port for a large part of the North Pacific commercial fishing fleet and other work boats, but also provides moorage for some recreational vessels.

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[23] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

1.6.2 Port of Tacoma

The Port of Tacoma, located in Pierce County, operates on 2,400 acres that are used for shipping terminal activity and warehousing, distributing, and manufacturing.[24] The Port of Tacoma (Figures 1.14 and 1.15[25]) has six container terminals:

- A.P. Moller (APM) Terminals,
- Husky Terminal,
- Olympic Container Terminal (OCT),
- Pierce County Terminal (PCT),
- Washington United Terminals (WUT), and
- Totem Ocean Trailer Express (TOTE) Terminal (RoRo terminal);

three other facilities:

- Terminal 7-AB (break-bulk terminal),
- Blair Terminal (break-bulk terminal), and
- the Marshall Avenue Auto Facility (a vehicle transfer facility);

and four intermodal yards:

- North Intermodal Yard (NIM), operated by Port of Tacoma,
- Hyundai Intermodal Yard (HIY), operated by WUT,
- Pierce County Intermodal Yard, operated by Marine Terminals Corporation (MTC), and
- South Intermodal Yard, operated by Pacific Rail.

Wood chips were exported through a Port-owned facility operated by Weyerhaeuser Company in 2005.

APM Terminals operates on 135 acres and has near dock access to the South Intermodal Yard, served by BNSF Railway and UP railroads. The terminal has two berths and is frequented by Maersk Line, Horizon Lines and Safmarine, and has five cranes (four Hitachi, one Mitsubishi). APM has 875 reefer plugs.

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[24] Port of Tacoma.

[25] Port of Seattle, *http://www.portseattle.org/about/maps/*.

Figure 1.14: Port of Tacoma Panoramic View

Figure 1.15: Port of Tacoma Overview

Husky Terminal is located on 93 acres and has on-dock access to the NIM, served by BNSF Railway and UP railroads. K-Line, Hanjin, and Yang Ming Line use the terminal, which has two berths. Husky has four cranes (two Zhenhua Port Machinery Co [ZPMC] and two Kone cranes). The terminal has 460 reefer plugs. Husky Terminal & Stevedoring relocated from Terminal 7-C/D in 2005; the renovated Husky Terminal opened in June 2005.

The Olympic Container Terminal opened in July 2005 on 54 acres, and is operated by MTC. The terminal has on-dock rail access to the NIM, served by BNSF Railway and UP. Shipping lines using the terminal include Yang Ming Line, COSCO, and Hanjin. The terminal has one berth with four cranes (three Sumitomo and one IHI), and 300 reefer plugs.

The Pierce County Terminal (PCT), operated by MTC, is located on 171 acres including the 23 acres that is the on-dock PCT Intermodal yard, served by BNSF Railway and UP railroads. Shipping lines using the terminal include Evergreen Marine, Italia Marittima, Hatsu Marine Ltd., and CMA-CGM. The terminal has two berths, seven ZPMC cranes, and 764 reefer plugs. PCT opened in January 2005.

TOTE Terminal operates a RoRo terminal on 47 acres. It has two dolphin piers: one is an operating berth and one is a lay-up berth. The terminal has 140 reefer plugs.

Washington United Terminals is located on 80 acres. The terminal has on-dock rail access to HIM, served by BNSF Railway and UP. Hyundai Merchant Marine, APL and MOL use this terminal, which has two berths and four Hyundai/Paceco cranes. The terminal has 352 reefer plugs. In 2006, WUT is scheduled for expansion to 100 acres.

Break-bulk, auto and bulk facilities include:

- Terminal 7-A/B
- Marshall Avenue Auto Facility
- Temco Grain Terminal

Terminal 7-A/B has four container cranes available at berths C/D (Olympic Container Terminal), two rail spurs along shed and two along berth, and access to North Intermodal Yard. A Port-owned and operated facility, Terminal 7 handles break-bulk and RoRo cargoes, including automobiles and a wide range of tracked and wheeled heavy equipment.

Marshall Avenue Auto Facility is port owned and operated by Auto Warehousing Company (AWC) and is located on 146.5 acres. AWC facilitates the movement of Isuzu, Kia, Mazda, Mitsubishi and Suzuki vehicles. Vehicles unloaded at Blair Terminal access the Auto Facility via a dedicated bridge over Port of Tacoma Road. The Marshall Avenue Auto Facility is directly connected to BNSF Railway and UP.

The Port of Tacoma is a major export center for corn and soybeans from the Midwest U.S. The Port-owned grain terminal, located on 11 acres, is leased and operated by Cargill. It has a capacity of 3 million bushels, and a dolphin pier.

The Port of Tacoma's four dockside intermodal rail yards are served by BNSF Railway and UP, with switching and terminal rail service provided by Tacoma Rail, a division of Tacoma Public Utilities.

The North Intermodal Yard, operated by the Port of Tacoma, is located on 20 acres on the main Port peninsula between Husky Terminal and Terminal 7. Containers move between the terminals and the intermodal yard without leaving Port property or traveling on public rights-of-way. K-Line and Yang Ming are the primary customers.

The South Intermodal Yard is located on 17 acres adjacent to APM Terminal. Operated by Pacific Rail Services for the Port of Tacoma, the terminal's primary customer is Maersk.

The Hyundai Intermodal Yard, located on 23 acres and operated by WUT, serves Hyundai Merchant Marine and has four reachstacker lift trucks.

Pierce County Intermodal Yard is an on-dock facility located on 23 acres, operated by Marine Terminals Corporation. Primary customers are Evergreen Line, Hatsu Marine, and Lloyd Tristino.

1.6.3 Port of Everett

The Port of Everett[26] is situated on Port Gardner Bay, a deep-water bay on Puget Sound, 25 miles north of Seattle.

The Port (Figure 1.16) currently operates three terminals, Hewitt (Figure 1.17), Pacific (Figure 1.18), and South (Figure 1.19), and is comprised of eight berths situated on approximately 100 acres of land. Its primary exports are empty aerospace containers, break-bulk cargoes, lumber and other containerized cargoes. Its primary imports are specialized aircraft parts for the local aerospace industry, heavy equipment, bulk material, and other containerized cargoes. The Port's Marine Terminals are served by BNSF Railway's mainline service, which carries goods to and from the East Coast, West Coast, Canada, and also serves commuter uses for Sounder and Amtrak. The Port also operates the largest public marina on the West Coast, and is constructing a new, 220 slip marina. The Port's marina is a full-service marina, and offers moorage space for approximately 2,050 vessels. Additionally, the Port co-owns (with the City of Everett and Snohomish County) and manages the 10th Street Boat Launch, which has total of 13 lanes for launching/retrieving boats and is the largest public boat launch in Western Washington. Riverside Business Park was not included in the inventory, as it is non-maritime use.

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[26] Port of Everett. See: *http://www.portofeverett.com/about.shtml.*

Figure 1.16: Port of Everett Overview

Figure 1.17: Port of Everett Hewitt Terminal

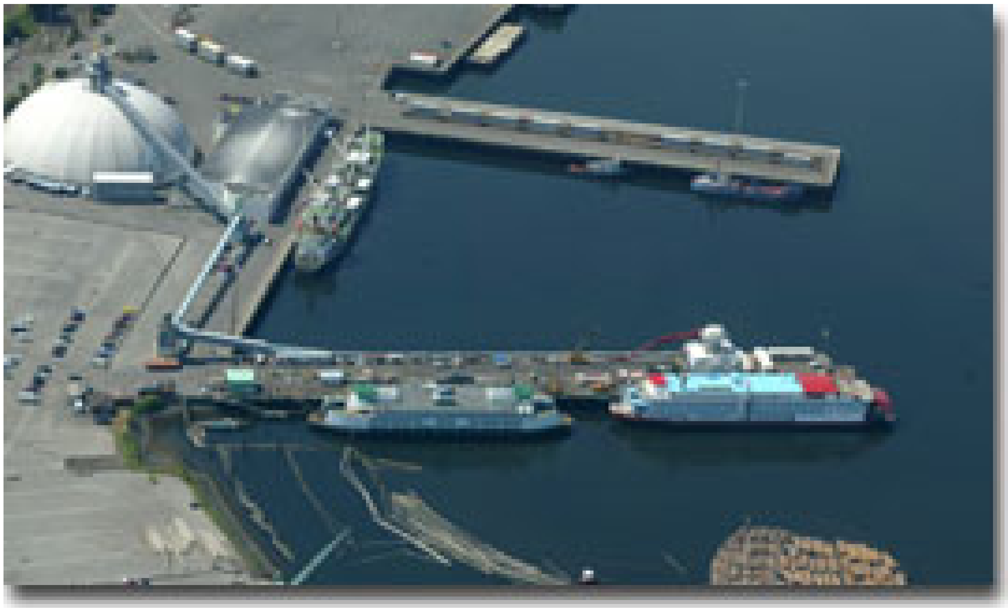

Figure 1.18: Port of Everett Pacific Terminal

Figure 1.19: Port of Everett South Terminal

1.6.4 Port of Port Angeles

The Port of Port Angeles[27] is located 80 miles north and west of Seattle on the Strait of Juan de Fuca. The pilot station for pilots boarding ocean-going vessels entering the greater Puget Sound is located at Port Angeles. The Port owns and operates four deep water marine terminals (T-1, T-3, T-5 and T-7), and is a leading forest products port. Port Angeles is the center of log handling, storage and exporting on the Olympic Peninsula.

There are also terminals used for ferry service and other marine related activities, as shown in Figure 1.20.

Figure 1.20: Port of Port Angeles Overview

The legend for Figure 1.20 is:

1) Terminal 7
2) Port Angeles Boat Haven & Boat Launch
3) Port Angeles Boat Yard
4) Terminal 3
5) Terminal 1
6) Terminal 4
7) Terminal 2, Ferry Terminal
8) Terminal 2, The Landing

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[27] Port of Port Angeles, *http://www.portofpa.com/*.

Terminal 1, shown in Figure 1.21, is operated by the Port of Port Angeles and is used for topside and voyage ship repair, and shipment and discharge of general cargo. The terminal has log stacking capability.

Figure 1.21: Port of Port Angeles Terminal 1

Terminal 3, shown in Figure 1.22, is the primary cargo loading terminal, loading forest products destined to Pacific Rim countries, and ocean log barges shipping to domestic markets. The terminal is supported by a 5-acre back-up logyard.

Figure 1.22: Port of Port Angeles Terminal 3 ("T" Pier)

Terminal 5 is used as a barge loading facility for wood chips. The Port of Port Angeles has also designated it a lay berth and construction activities pier.

Terminal 7 is designated as a lay berth facility for vessels up to 750 feet (228 meters) and 50,000 DWT. This terminal was formerly used as a chip export facility.

Port of Port Angeles marinas include the Port Angeles Boat Haven and the John Wayne Marina

1.6.5 Port of Olympia

The Port of Olympia, as shown in Figure 1.23,[28] includes a 60-acre marine terminal that consists of three deepwater berths, on-dock rail, a warehouse, and a container yard.[29] On-dock rail service is provided by UP and BNSF Railway railroads with daily switching service provided by the Tri-City and Olympia Railroad. The Port has two 40-ton gantry cranes and 250 reefer plugs. The Port also owns and operates the Swantown Marina, which maintains more than 700 slips.

Figure 1.23: Port of Olympia Overview

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[28] Washington Department of Ecology, Shoreline Aerial Photos, Olympia, Budd Inlet, *http://apps.ecy.wa.gov/shorephotos/scripts/bigphoto.asp?id=THU0148.*

[29] Port of Olympia, *http://www.portolympia.com/marine_term_entry.asp.*

1.6.6 Port of Anacortes

The Port of Anacortes, shown in Figure 1.24, is a deepwater port located midway between Seattle, Washington and Vancouver, British Columbia, Canada.[30] The City of Anacortes is located on Fidalgo Island, the easternmost of the San Juan Islands, in Skagit County.

Figure 1.24: Port of Anacortes Overview

Dakota Creek Industries, Inc., a port tenant, operates a major shipbuilding and repair facility located strategically between the Port's Piers 1 and 2. The primary use of Pier 1, shown in Figure 1.25, is support of Dakota Creek Industries and the housing of Port offices and maintenance facilities.

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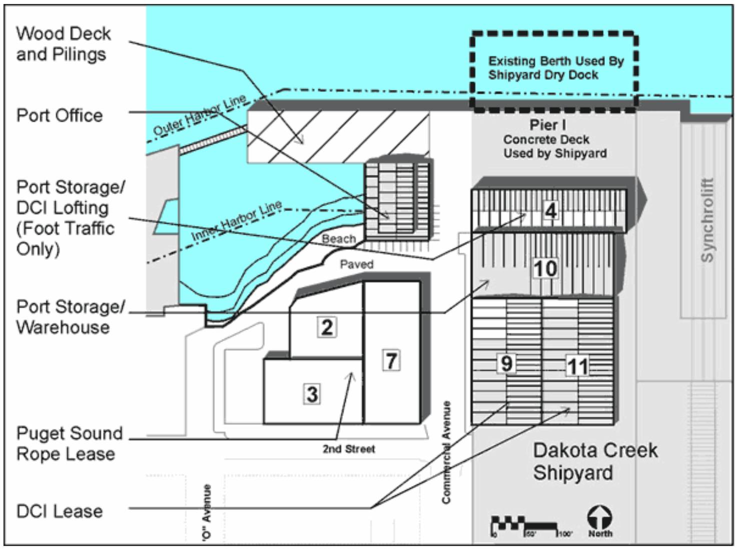
[30] Port of Anacortes. See: *http://www.portofanacortes.com/shipping.html.*

Figure 1.25: Port of Anacortes Pier 1



Current operations at Port Dock Number 2, shown in Figure 1.26, include the handling of petroleum coke delivered from a local Texaco refinery. Petroleum coke received from Puget Sound Refining is loaded onto vessels and barges, with an estimated throughput of 330,000 metric tons per year. To efficiently handle petroleum coke and other bulk commodities, such as sulfur, Metropolitan's shiploader is capable of loading 1,100 metric tons per hour and can accommodate up to "Panamax" size vessels.[31]

Figure 1.26: Port of Anacortes Port Dock Number 2

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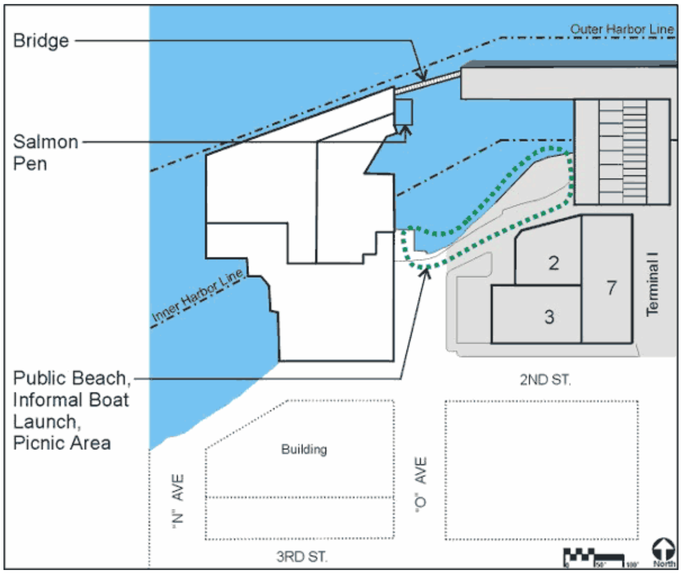
[31] Metropolitan Stevedore Company. See: *http://www.metsteco.com/anacortes.aspx*.

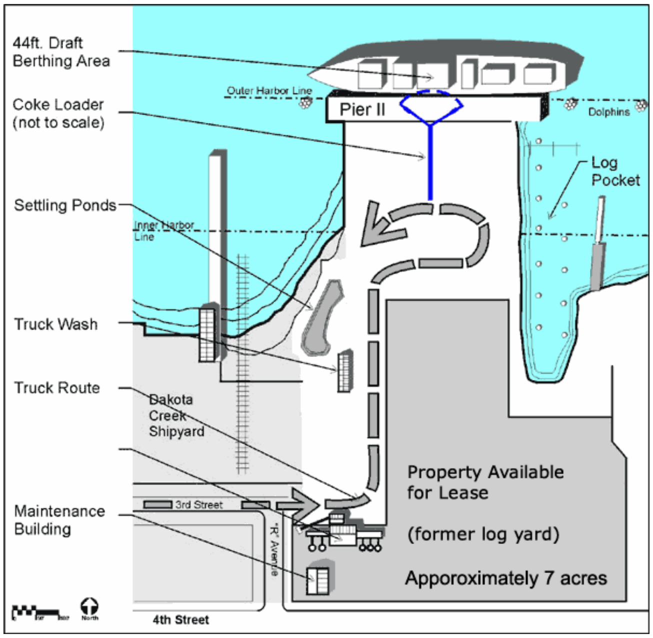
Curtis Wharf, show in Figure 1.27, is currently used as a working wharf and dock for commercial boats and ships. The site provides periodic vessel moorage to a range of users, including the U.S. Navy, tenants staging project cargoes, and short term project assembly tenants.

Figure 1.27: Port of Anacortes Curtis Wharf



Pier 2, shown in Figure 1.28, is used primarily for exporting logs and dry bulk cargoes.

Figure 1.28: Port of Anacortes Pier 2



The Port of Anacortes Cap Sante Boat Haven, shown in Figure 1.29, is a customs port-of-entry located in downtown Anacortes. Permanent and transient moorage is available, with 150-200 berths used for guest moorage.[32]

Figure 1.29: Port of Anacortes Cap Sante Boat Haven

1.7 Puget Sound Petroleum Refineries

Washington State has five refineries,[33] all located on Puget Sound, as shown in Figure 1.30. Tankers bring crude oil into these facilities for refining, and carry refined products out of the facilities.

- British Petroleum in Ferndale has a capacity of 225,000 barrels per day.
- ConocoPhillips in Ferndale has a capacity of 96,000 barrels per day.
- Shell Anacortes has a capacity of 145,000 barrels per day.
- Tesoro Anacortes has a capacity of 120,000 barrels per day.
- U.S. Oil in Tacoma has a capacity of 37,850 barrels per day.

Section 3.7.6 discusses the tanker vessel movements within Puget Sound for 2005.

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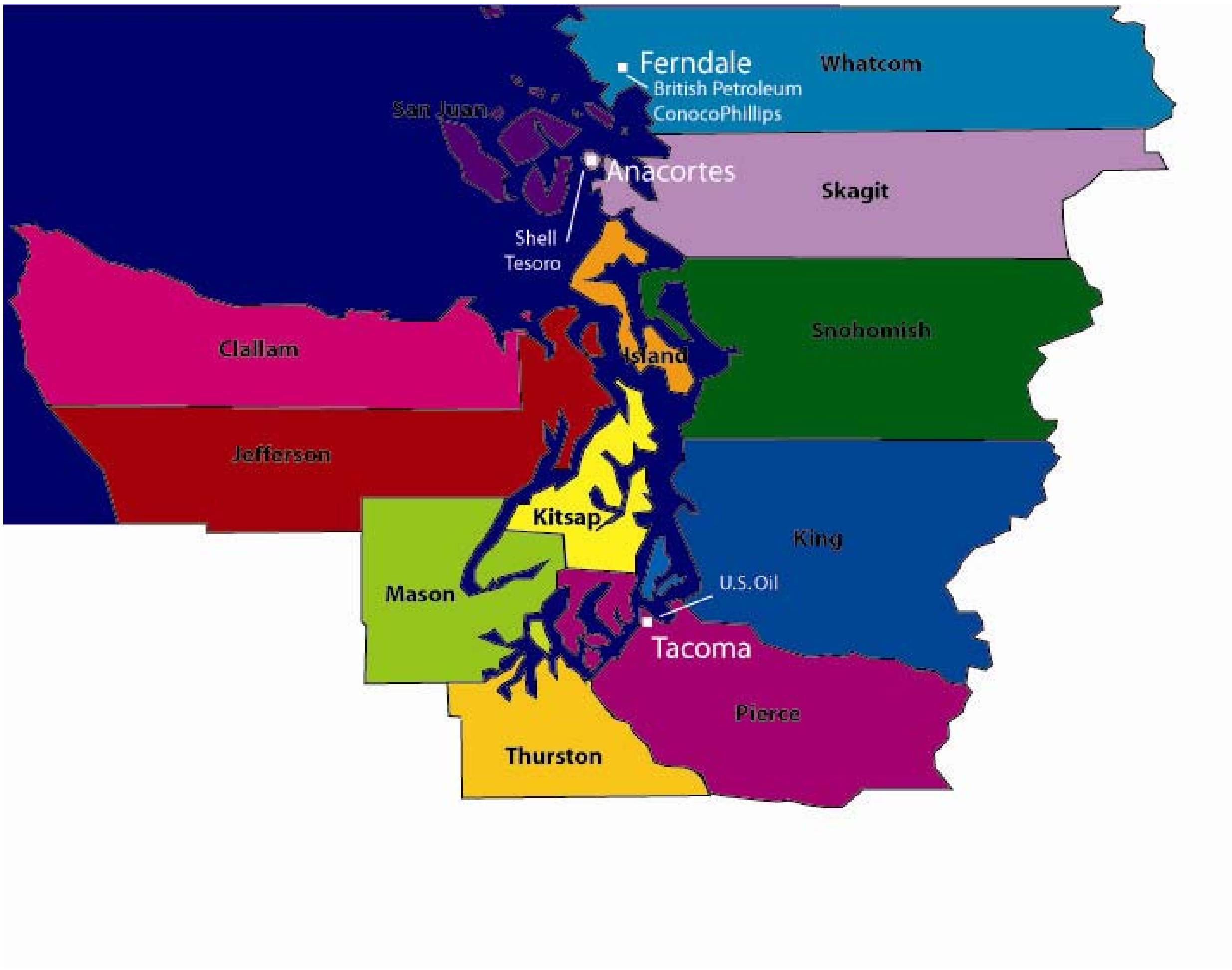
[32] Port of Anacortes. See: *http://www.nwboat.com/anacortes/*.

[33] Office of the Attorney General, *Refineries in Washington State*, 2006. See: *http://www.atg.wa.gov/*.

Figure 1.30: Puget Sound Petroleum Refineries



1.8 Puget Sound Ferry Terminals

Washington State Ferries is the largest ferry system in the U.S., serving eight counties within Washington and the Province of British Columbia in Canada. The Washington State ferry system has 10 routes and 20 terminals that are served by 28 vessels.[34] Figure 1.31 shows the location of the Washington State Ferries routes and terminals, for 2006.[35] More information is provided in Section 4.4.4.

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[34] Washington State Ferries, 2006. See: *http://www.wsdot.wa.gov/ferries/your_wsf/*.

[35] Washington State Ferries, 2006. See: *http://www.wsdot.wa.gov/ferries/info_desk/route-maps/*.

Figure 1.31: Washington State Ferries Routes and Terminal Locations

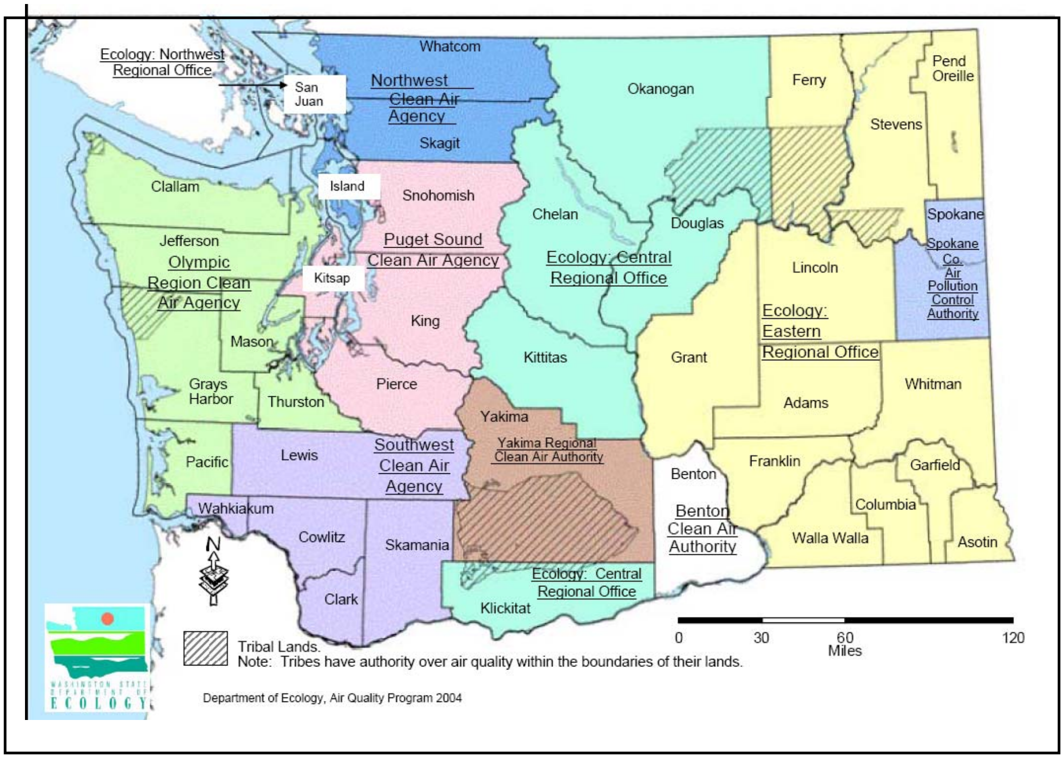
1.9 Puget Sound Military Facilities

There are major U.S. Navy and Coast Guard installations within the study area, however, details regarding their operations were not included due to security considerations. Although these organizations were not contacted directly, the U.S. Navy, U.S. Maritime Administration (MARAD), and U.S. Navy Military Sealift Command ships that were in the Puget Sound MarEx database are included as ocean-going vessels. Also, Coast Guard vessels that operated primarily in Puget Sound are included as harbor craft.

1.10 Background Air Quality Conditions

The Washington Department of Ecology is the State of Washington's EPA. For air program purposes, Washington State is divided into ten regions; seven of these regions are regulated by regional clean air agencies and two are regulated by Department of Ecology regional offices, as shown in Figure 1.32.[36]

Figure 1.32: Clean Air Agencies of Washington



Four agencies have jurisdiction over the counties included in this emissions inventory:[37]

- Northwest Clean Air Agency (Island, Skagit, and Whatcom Counties, all bordering Puget Sound)
- Puget Sound Clean Air Agency (King, Kitsap, Pierce, and Snohomish Counties; all bordering Puget Sound)
- Olympic Region Clean Air Agency (Clallam, Grays Harbor, Jefferson, Mason, Pacific, and Thurston Counties; Pacific and Grays Harbor do not border Puget Sound and were not included in the inventory)
- Washington Department of Ecology Northwest Regional Office (San Juan County, within Puget Sound)

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[36] Washington State Department of Ecology, Air Quality Program, 2004. WADOE 2004. See: *http://www.ecy.wa.gov/programs/air/pdfs/local_map.pdf*

[37] Washington State Department of Ecology. See: *http://www.ecy.wa.gov/programs/air/local.html.*

The study area is currently in compliance with all federal, state, and local ambient air quality standards. EPA has identified a number of common air pollutants that can injure health, harm the environment and cause property damage at elevated levels. These pollutants are referred to as criteria air pollutants because EPA has regulated them by first developing health-based criteria (science-based guidelines) as the basis for setting permissible levels. One set of limits (primary standard) protects health; another set of limits (secondary standard) is intended to prevent environmental and property damage. A geographic area that meets or does better than the primary standard is called an attainment area; areas that don't meet the primary standard are called nonattainment areas. Former nonattainment areas that have reduced emissions sufficiently to come back into compliance with ambient standards are called maintenance areas. Washington Department of Ecology and regional clean air agencies have promulgated similar ambient standards. Puget Sound (King, Pierce and Snohomish Counties) is an EPA designated Clean Air Act (CAA) maintenance area for carbon monoxide and ozone. For particulate matter, the Kent Valley, Seattle Duwamish, Tacoma Tideflats, and Thurston County areas are EPA designated CAA maintenance areas (as well as other counties outside the study area).[38]

Background levels of pollutants for the emissions inventory study area were presented in Table 1.1 above (Section 1.4.1).

1.11 Previous Emissions Inventories

Maritime air emissions have been included in previous emissions inventories prepared by local, state, and regional agencies, but emissions from maritime-related operations were not identified separately. These agency-based inventories did not have access to the level of detail compiled in this inventory.

Previous emission inventories for the Puget Sound Clean Air Agency can be obtained from the websites:

- *http://www.pscleanair.org/news/library/reports/2003AQDSFinalAppendix.pdf* (see pages 6-16, A-1 - A-15); and
- *ftp://ftp.epa.gov/EmisInventory/*.

The Washington Department of Ecology has published the *Draft Washington State Base Year 2005 County Inventories*, 2006. (WADOE 2006a)

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[38] Washington State Department of Ecology, Air Quality Maps of Maintenance Areas. See: *http://www.ecy.wa.gov/programs/air/other/namaps/Web_Map_Intro.htm.*

1.12 Inventory Methodologies

This section describes the process used to develop the Puget Sound Maritime Air Emissions Inventory, compares it to the BCMVEI being prepared concurrently by Environment Canada, and describes the strengths and limitations of the process.

1.12.1 Puget Sound Maritime Air Emissions Inventory Methodology

Technical Approach and Quality Assurance Project Plan

A draft Technical Approach document was developed by the consultant, with the input and approval of the Forum Steering Committee and Technical Working Group. The draft Technical Approach described the pollutants to be considered, the temporal and spatial aspects of the Puget Sound Maritime Air Emissions Inventory, and the methodologies to be used for each source category, including emissions factors, load factors, emissions estimation and transportation models and model versions, and other variables. The draft Technical Approach served as a working document; methodologies, emission factors and other elements were refined over the course of the study. The final methodologies and other aspects are incorporated into this report within each source category section. In addition, a Quality Assurance Project Plan was developed in accordance with EPA grant requirements, and is presented in Appendix C.

Data Collection

The data acquisition and emissions estimation methodologies that are unique to each source category are presented in the corresponding source category section. In general, data was collected during in-person interviews with port staff, terminal owners, equipment operators, and others having firsthand knowledge of either equipment details or operational parameters. Additional information was requested during or after the initial interview if it was not readily available during the initial visit. The collected information was compared with information previously collected to provide an order-of-magnitude "reasonableness check" on the quality of the data. Due to new clean technology emerging in recent years, the data collection process included requesting information regarding methods of emission reductions such as fuel changes, retrofits, repowers, add-on technologies, and/or changes in operations that the facilities have implemented as of 2005. In addition, data regarding emission reduction strategies being implemented in 2006 was collected where available.

The data collection approach for each of the source categories was similar, focusing on two primary areas: vessel or equipment details and operational profiles (activity data). Some examples of equipment details that were collected include such parameters as:

- Vessel or equipment type (e.g., fishing vessel, yard tractor)
- Rated power (primarily horsepower or kilowatts)
- Equipment manufacturer and model year
- Engine manufacturer, model, model year, and technology
- Type of fuel used (e.g., offroad diesel, ultra-low sulfur diesel [ULSD], liquefied petroleum gas [LPG]; sulfur content information as available)
- Exhaust stack heights (if known)
- Emission reduction technology (if any)

Operational profiles were developed for each emission source type. These profiles included activity data such as:

- Duty-cycle information (e.g., hours operated, miles traveled, gallons of fuel used [per day, per trip, or per year])
- Accumulated engine hours
- Temporal variability factors (daily, monthly)
- Operational specifics such as travel distances, terminal operation descriptions
- Vessel or truck operating speeds
- Vessel hotelling times

For those source categories (cargo handling equipment, heavy-duty vehicles, on-terminal fleet vehicles), which are tied directly to a port or port entity, terminal identification numbers were assigned. Specific terminal identities are not disclosed in order to maintain confidentiality; however, the port abbreviations are provided below. The formula used for each entity was made from abbreviations for [Puget Sound] [Port Name] [Entity ID], i.e., PSE010 identifies a terminal or operation at the Port of Everett.

- PSA – Port of Anacortes
- PSE – Port of Everett
- PSO – Port of Olympia
- PSP – Port of Port Angeles
- PSS – Port of Seattle
- PST – Port of Tacoma

There may not be a one-to-one correlation of terminal identification number to port entity, as in some cases entities were divided or combined within a given source category to distinguish between different operators or operations at the same location.

Emissions Estimation Methodologies

A Microsoft SQL 2000 database system was developed to calculate emissions from ocean-going vessels, harbor vessels, and rail. The EPA NONROAD[39] model was used to estimate emissions from cargo handling equipment, and the EPA MOBILE6[40] model was used for heavy- and light-duty vehicles. MOBILE6 is an emission factor model that estimates emissions, in grams per mile, of nitrogen oxides, carbon monoxide, hydrocarbons, particulate matter, sulfur oxides, and carbon dioxide from a series of vehicle type classifications representing all types of onroad vehicles.

Since the NONROAD model (used for cargo handling equipment) and MOBILE6 (used for heavy- and light-duty vehicles) output emissions for a limited set of pollutants, post-processing is required to develop emission estimates for VOC, $PM_{2.5}$,[41] DPM, CH_4, and N_2O. VOC correction factors were applied based on fuel type.[42] For purposes of this analysis, total particulate matter is assumed to be equal to PM_{10} (because virtually all PM emitted from internal combustion engines is PM_{10}). $PM_{2.5}$ is calculated as 97%[43] of PM_{10} for diesel-fueled equipment, 92%[44] of PM_{10} for gasoline-fueled equipment, 100% of PM_{10} for propane and other alternative fueled equipment, and 80%[45] of PM_{10} for OGV main engines.

DPM includes only the PM_{10} emissions from those vehicles fueled by diesel fuel, as opposed to those fueled by propane or gasoline, for example. PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together. Particulate emission estimates were limited to engine and boiler exhaust and do not include estimates of fugitive emissions (e.g., road dust, construction emissions or petroleum vapors from tanker loading/unloading).

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[39] EPA, draft NONROAD Model, version 1.2. See: *http://www.epa.gov/otaq/nonrdmdl.htm.* (EPA NONROAD)

[40] EPA, MOBILE6 Vehicle Emission Modeling Software, version 6.2, 2004. (EPA MOBILE6)
See: *http://www.epa.gov/otaq/m6.htm.*

[41] $PM_{2.5}$ can be modeled by MOBILE6, however, not when the FORTRAN ‘database' command is used, as required for a by-model year output to match the exact model years to the activity data. Likewise, when the ‘database' command is used, there is no output for PM_{10}. Instead, PM_{10} was estimated as being the sum of three components: brake wear particulate (brake), diesel particulate matter (from ecarbon + ocarbon + SO_4) and tire wear particulate (tire). While NONROAD outputs $PM_{2.5}$ and VOC in the Reports Module, the generic test output was not used in most cases, since matching was by model year in the database output.

[42] EPA, *Conversion Factors for Hydrocarbon Emission Components*, EPA420-R-05-015, December 2005. (EPA 2005)
See: *http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2005/420r05015.pdf.*

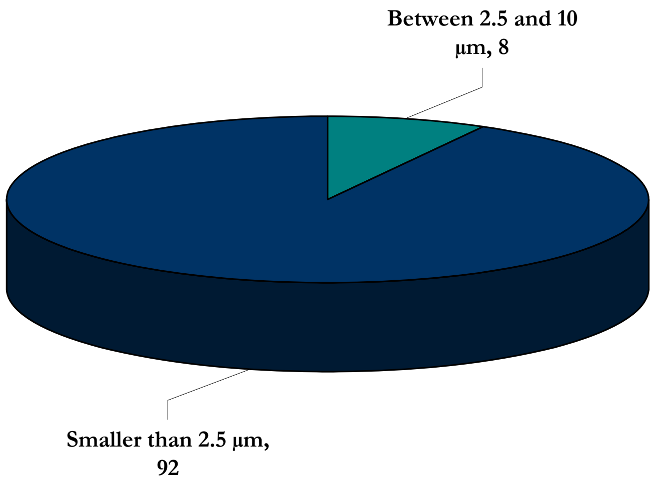
[43] EPA, Memo to the docket (Docket A-2001-28, Document IV-B-21) from Bruce Cantrell, 17 October 2003. (EPA 2003)

[44] EPA NONROAD.

[45] Lyyranen, *et al*, ‘Aerosol Characterization in Medium-Speed Diesel Engines Operating with Heavy Fuel Oils," *Journal of Aerosol Science* 30:6, 1999.

Figure 1.33 represents all of the PM emitted from the engine. All of the particles are less than 10 micrometers (µm) in diameter – therefore, it is all PM_{10}. Most of the particles are less than 2.5 µm in diameter (dark blue), which is the $PM_{2.5}$ fraction, while a few are between 2.5 µm and 10 µm (green). The particles in the green slice are PM_{10} but not $PM_{2.5}$ (because they are larger than 2.5 µm). The particles in the dark blue slice are PM_{10} and $PM_{2.5}$ because they are smaller than 10 and 2.5 µm. If these particles have been emitted from a diesel-fueled internal combustion engine, then they are all diesel PM (DPM).

Figure 1.33: PM_{10} and $PM_{2.5}$ Explained



The emissions estimate tables in each source category section are divided into criteria pollutants and greenhouse gases for presentation purposes; DPM is included with the EPA criteria pollutants, but is actually a CARB air toxic. Likewise, VOC is not a criteria pollutant, but contributes to ozone formation, and ozone is a criteria pollutant. Finally, NO_2 is the criteria pollutant; NO_x is its surrogate, and SO_x is the criteria pollutant; SO_2 its surrogate.

Fuel sulfur content for SO_2 emissions calculations for cargo handling equipment and heavy-duty and light-duty vehicles, as applicable, was estimated to be 310 parts per million (ppm) sulfur for on-highway diesel fuel; [46] and 2,284 ppm sulfur for off-highway diesel fuel.[47] Harbor vessel offroad diesel was estimated at 3,100 ppm sulfur based on a supplier interview. Offroad diesel used in rail locomotives was estimated at 3,500 ppm sulfur and ULSD used in rail locomotives was estimated at 50 ppm ULSD. OGV residual oil fuel sulfur content was estimated at 2.7%. For vessels or engines operating on different fuels, see Section 3.6.11. In the future, new EPA regulations are expected to significantly lower diesel sulfur content. This will require the use of a fuel sampling program to identify average diesel sulfur content as ultra low sulfur diesel as it is introduced into the on-road and off- road markets.[48]

The greenhouse gases, CO_2, CH_4, N_2O, have been estimated based on emission factors presented in the corresponding source category sections. The NONROAD and MOBILE6 models do not estimate CH_4 and N_2O, and thus emission factors from the EPA national greenhouse gas emissions inventory[49] are used as referenced in the relevant source category methodology descriptions.

To normalize these values into a single greenhouse gas value (a CO_2 equivalent), further refinements were required. Each greenhouse gas differs in its ability to absorb heat in the atmosphere.[50] Methane traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule than carbon dioxide. Often estimates of greenhouse gas emissions are presented in units of carbon equivalents, which weights each gas by its global warming potential (GWP) value. While GWP values have been refined over the years, values consistent with those used by EPA in its annual inventory[51] have been used in this report. These values are as follows:

- CO_2 – 1
- CH_4 – 21
- N_20 – 310

Emissions are presented in tons per year (tpy).

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[46] Washington State Department of Ecology Air Quality Program, *Puget Sound Ozone Modeling Emissions Inventory Documentation* (draft), 29 March 2006. (WADOE 2006)

[47] EPA, NONROAD Guidance, 2004. (EPA NONROAD Guidance) See: *http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2004/sulfur.txt.*

[48] EPA, Control of Air Pollution from New Motor Vehicles; Revisions to Motor Vehicle Diesel Fuel Sulfur Transition Provisions; and Technical Amendments to the Highway Diesel, Nonroad Diesel, and Tier 2 Gasoline Programs, 2005. See: http://www.epa.gov/EPA-AIR/2005/November/Day-22/a22807.htm.

[49] EPA, *U.S. Emissions Inventory 2005: Inventory of U.S. Green House Gas Emissions and Sinks: 1990-2003*, April 2006, EPA 430-R-05-003. (EPA 2006) The report in its entirety may be viewed at: *http://yosemite.epa.gov/oar/globalwarming.nsf/content/Resrouce CenterPublicationsGHGEmissionsUSEmissionsInventory2005.html.*

[50] EPA. See: *http://Yosemite.epa.gov/oar/globalwarming.nsf/content/emissions.html.*

[51] EPA 2006, Annex 3.

1.12.2 British Columbia Marine Vessel Emissions Inventory

Environment Canada[52] has developed an initiative to address emissions from the bulk cargo, container and passenger ocean-going ships and coastal vessels that are loaded and unloaded at the Ports of Vancouver, Fraser, Seattle, Tacoma and other smaller ports and harbors that operate in the Georgia Basin/Puget Sound Airshed. Objectives of the initiative are to:

- Learn of new emission management policies and techniques by monitoring and sharing information about marine shipping and port air quality issues and air emission reduction initiatives within the Georgia Basin/Puget Sound Airshed, in other major port and shipping locations in North America, and in other nations and international organizations.
- Facilitate research, feasibility studies, pilot testing and application of new ship and port emission reduction technologies and measures within the Georgia Basin/Puget Sound Airshed.
- Develop and implement improved methods and processes to record ship movements, port visits, engine characteristics, and fuel quality for use in future emission inventories.
- Participate in the evaluation of the feasibility and effectiveness of an International Maritime Organization (IMO) The International Convention for the Prevention of Pollution from Ships (MARPOL)[53] Annex VI Sulfur Oxides Emission Control Area (SECA). A SECA allows national governments to restrict fuel sulfur content used by marine vessels to 1.5% (15,000 ppm). This work will be done in collaboration with related initiatives on the west coast of North America and other coastal and Great Lakes regions in North America.
- Prepare a ship emission inventory for the year 2005 in the Georgia Basin. It will be as comprehensive and as accurate as possible within available data and budget resources.

The BCMVEI will include the same pollutants as the Puget Sound Maritime Air Emissions Inventory, except for DPM, and with the following additions:

- Ammonia
- Air toxics, where emission factors are available (benzene, 1,3-butadiene, acetaldehyde, formaldehyde, acrolein)

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[52] Environment Canada, Georgia Basin/Puget Sound International Airshed Strategy, Marine Vessel and Port Emission Reductions Initiative, *http://www.pyr.ec.gc.ca/airshed/Marine_Vessel_e.htm.*

[53] International Maritime Organization, *International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78),* Annex VI Prevention of Air Pollution from Ships (entry into force 19 May 2005). (MARPOL Annex VI) See: *http://www.imo.org/* (search for 'MARPOL').

The BCMVEI baseline year is slightly different from the time period covered by the Puget Sound Maritime Air Emissions Inventory (calendar year 2005). The BCMVEI baseline year is from April 2005 to April 2006. The geographical extent of the Puget Sound Maritime Air Emissions Inventory includes the Canadian portions of the Georgia Basin/Puget Sound Airshed. The BCMVEI does not include harbor vessels, cargo handling equipment, heavy- and light-duty vehicles, or rail. The BCMVEI was finalized in March 2007. It is our understanding that there is BC EI underway that will include shore side maritime-related sources.

1.12.3 Emissions Inventory Limitations

Emissions inventories are inherently limited in scope. An emissions inventory provides only an average estimate of emissions by source category over a defined period of time: during the time period covered by an emissions inventory, the tenants and operators can change locations; equipment types, engines, and fuels can change; and operational modes of marine container terminals change with the availability of land (i.e., wheeled vs. grounded modes). In addition, emissions are estimated from hundreds of pieces of offroad and onroad equipment and marine vessels that operate using a vast variety of engine types, under a range of duty cycles, and that consume different fuel types. The equipment is also operated within variable spatial and temporal parameters. For each source category, the limitations regarding data collected, activity and emissions estimates, and other limiting elements are identified and discussed at the end of each respective section.

Emissions from permitted sources were not estimated during the development of this inventory. However, the Puget Sound Clean Air Agency, the Northwest Clean Air Agency, and the Olympic Region Clean Air Agency have provided regional air emissions inventory data for 2005 for significant stationary point source and area source categories by county. Section 2.2 presents these regional emissions estimates and compares them to those for the maritime sector as defined by this Puget Sound Maritime Air Emissions Inventory. Differences in methodologies and assumptions are identified.

Emission factors for specific toxic air contaminants are not available for all source categories, so emissions of air toxics were not estimated for the Emissions Inventory. Emissions for specific air toxics and source categories may be calculated based on the emission factors presented in Appendix D, including:

- Selected organic compounds (e.g., benzene, acetaldehyde, butadiene, formaldehyde)
- Metals (e.g., chromium, lead, vanadium, mercury)
- Polyaromatic hydrocarbons (PAH), and others

1.13 Emission Reduction Strategies Identified during Inventory Process

Emission reduction methods (fuels and technologies) identified during the inventory process are listed below for the Ports of Seattle, Tacoma and Everett, and the Washington State Ferries. Control measures were not provided for the Ports of Port Angeles, Olympia or Anacortes.

1.13.1 Port of Seattle

The Port of Seattle has implemented a variety of projects and programs, and is participating in several collaborative projects, to reduce emissions from maritime sources.[54]

Seaport Air Quality Program Elements

Under its Seaport Air Quality Program, the Port of Seattle has:

- Switched to a 99% biodiesel – ULSD fuel blend for Seaport Maintenance fleet.
- Received grant from Washington Department of Ecology to retrofit all eligible heavy-duty diesel equipment at Seaport Maintenance with diesel oxidation catalysts.
- Installed Stage II Vapor Recovery Equipment, though not required, at the Seaport Maintenance refueling station.
- Made biodiesel available at the Shilshole Bay Marina Fuel Dock, and boaters are encouraged by the Port to use it.
- Encouraged cleaner vehicle purchases. A hybrid vehicle is used for high vehicle-miles-traveled mail runs between Port facilities, and the Seaport Environmental Program staff is replacing fleet minivans with hybrid vehicles.
- Implemented an award-winning employee trip reduction program.
- Built bike and pedestrian paths across and adjacent to terminals.
- Created programs to educate Port employees, tenants, and customers regarding actions they can take to protect air quality.
- Became an Airwatch Northwest Partner. Under this program people and organizations are alerted when air quality approaches levels that might lead to an exceedance of a National Ambient Air Quality Standard, and encourages further voluntary emissions reductions for the duration of the episode.

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[54] Port of Seattle. See: *http://www.portseattle.org/community/environment/airsea.shtml.*

- Served in a number of organizations working collaboratively to reduce air pollution in the region:

  - Puget Sound Clean Cities Coalition Steering Committee
  - Mayor Greg Nickels, Seattle Climate Partnership (charter member)
  - Puget Sound Clean Air Agency Climate Protection Advisory Committee stakeholder process, co-chair
  - Clean Air Northwest Leadership Committee
  - Cascade Sierra Solutions Advisory Committee, working to address emissions from heavy-duty onroad trucks.

Freight Mobility Emission Reduction Strategies
The Port has implemented a number of emission reduction strategies related to freight mobility:

- Converted all Panamax and post-Panamax seaport cargo cranes from diesel to 100% electric.
- Initiated a radio-frequency identification (RFID) pilot project with SSA to equip 1,200-1,500 trucks with RFID tags and Terminal 18 with RFID readers, which will reduce gate wait times and improve terminal efficiency.
- Terminal operators have initiated cargo-handling equipment fleet modernization programs and are encouraged to purchase equipment with 2007 onroad standard engines.
- Redeveloped Seaport cargo terminals to increase efficiency, including improving nearby road networks.
- Coordinated draw bridge openings with truckers so they can route accordingly to minimize idling.
- Piloted computer tracking systems at cargo terminals to quickly locate containers and thus reduce truck wait times.
- Provided electric plug-ins instead of diesel units for refrigerated containers on the docks.
- Purchased bigger cranes to load and unload more efficiently, so ships are at the dock for less time.
- Partnered in a regional anti-idling effort.

Cargo Handling Equipment Diesel Emissions Reduction Project

The goal of this multi-faceted, collaborative project is to improve air quality by voluntarily reducing exhaust emissions from diesel-fueled equipment used by the Port of Seattle and its Seaport tenants. These vehicles include cargo handling equipment, onroad trucks and heavy-duty equipment.

- Implemented retrofits (retrofit, replace, repower, repair, refuel) for diesel-powered vehicles and equipment. Fleet selections are made in collaboration with Puget Sound Clean Air Agency and the equipment owners and/or operators,
- Purchased 169 diesel oxidation catalysts to retrofit cargo handling equipment. This represents all eligible cargo-handling equipment that is operated on the Port of Seattle container terminals,
- Encouraged voluntary use of cleaner and alternative fuels. SSA and APL switched their operations from high sulfur offroad diesel fuel to a 20% biodiesel and 80% ULSD blend; MTC switched their operations to ULSD fuel, and
- Implemented education and outreach programs to equipment owners/operators on strategies for reducing emissions.

Collaborative Projects and Programs to Reduce Maritime Emissions

The following collaborative projects were also implemented:

- *Cruise Vessel Shore Power Project* - Most Princess Cruises and Holland America Line cruise vessels home ported in Seattle now turn off their engines and "plug in" while calling to the Terminal 30 Cruise Facility, effectively reducing emissions to zero while at the dock. Princess Cruises and Holland America Line have each built shore side electrical infrastructure on the terminal and retrofitted vessels to be shore power compatible. Juneau, Alaska is the only other cruise port in the world that offers shore power to cruise ships. Princess Cruises and Holland America Line partnered with the Port of Seattle, Puget Sound Clean Air Agency, EPA and Seattle City Light to implement these projects.

- *Shore Power Provided at Terminal 91* - At Port of Seattle's Terminal 91, shore power is provided to the various vessel types that berth there. For example, the large commercial fishing vessels that process fish in Alaska and make return trips to the area use shore power while at Terminal 91.

- *Cruise Vessel Seawater Scrubber Study* - The Port of Seattle is a partner on a study to determine the feasibility of using seawater scrubbers to remove pollutants from cruise ship diesel emissions. The Holland America Line's *MS Zaandam*, which will home port in Vancouver, B.C. in 2007, will test the seawater scrubbing equipment. This study is made possible with the generous assistance of a grant from the EPA/West Coast Diesel Collaborative and contributions from the Puget Sound Clean Air Agency and the Port of Seattle. Other funding partners in the study include: BP, Environment Canada, B.C. Ministry of the Environment, B.C. Clean Air Research Fund, and the Vancouver-Fraser Port Authority (Canada).

- *NorthWest CruiseShip Association Use of Low Sulfur Fuel* The members of the NorthWest CruiseShip Association have committed to procure and use low sulfur fuel while at berth in Seattle and at sea in Washington, British Columbia and in Alaska waters. In support of this study, NWCA has received reports on fuel purchases from all the lines operating out of Seattle and reviewed those reports. The results show that the average sulfur content of fuel procured in Seattle was approximately 1.6% for the 2005 season. NWCA will continue to procure and burn low sulfur fuel while operating in the Pacific Northwest.

- *American President Lines (APL) Commitment to Use of Lower Sulfur Fuels* APL has committed to using lower sulfur fuels in their vessel's auxiliary engines while at berth at the Port of Seattle.

1.13.2 Port of Tacoma

The Port of Tacoma has been actively pursuing projects to make immediate reductions in emissions from marine-related sources. These include:

- The Port of Tacoma's brownfield conversion projects have significantly and further abated the air quality impact from industrial sources since 2001. The shut-down of the Kaiser Aluminum Smelter and subsequent purchase by the Port of Tacoma has eliminated 149 tons of particulate matter per year, 121 tons of sulfur oxides per year and 21 tons of ammonia per year.

- In 2005, the Port of Tacoma purchased and installed EPA-verified diesel oxidation catalysts on 30 straddle carriers ("strads"). The Port of Tacoma received a $75,000 EPA grant to help fund this project. The catalysts reduced per-vehicle PM by at least 20 %– from 0.143 tons per year to less than 0.114 tons per year. Per-vehicle NO_x emissions, meanwhile, were reduced from 4.71 tons per year to less than 2.35 tons per year.

- The Port of Tacoma Commission authorized staff to begin using ULSD fuel in port-operated equipment, reducing emissions for a total PM reduction up to 50% per vehicle.

- The Port initiated an automobile purchase policy to replace retiring Port-owned vehicles with new gasoline-electric hybrid vehicles where practical. These hybrid vehicles travel approximately 50 miles per gallon of regular unleaded gasoline. Today, the Port owns several hybrid vehicles.

- The Port Maintenance Department staff is conducting a biodiesel test project to determine its operating efficacy in straddle carriers and other Port-operated equipment. The use of biodiesel has potential to further lower SO_x and diesel particulate matter emissions.

- Of the Port of Tacoma's 54 forklifts, 22 are powered by propane, a clean fuel.

Tacoma Rail

- Since July 2006, ULSD has been used in the locomotives for switching operations at the Port of Tacoma. In the port sector, D5000 use in switching operation is the norm; this practice eliminates 99.7% sulfur oxides emission from the yard switching operations.

- Tacoma Rail received a total of $100,000 from the Olympic Region Clean Air Agency, the Puget Sound Clean Air Agency, and the Washington Department of Ecology, and matched that with $100,000, to retrofit four of its locomotives with technology that will reduce emissions. The anti-idling system will protect the engines in cold weather and also improve air quality, save fuel that locomotives use at about three to four gallons an hour at idle, and reduce engine noise.

Totem Ocean Trailer Express Terminal

- TOTE redesigned RoRo vessels that are powered by diesel-electric motors in series achieving 30% fuel savings and significant emission reduction.

- This terminal operator also implements the "Paperless Gate" that uses RFID technology to reduce truck gate congestion.

Pierce County Terminal

- The Evergreen Group, the leaseholder at Pierce County Terminal, purchased lighter straddle carriers that use 30% less fuel, and equipped new Tier 2, fuel efficient onroad engines for the entire new cargo handling equipment fleet. This voluntary action conserves energy and reduces both the greenhouse gases and diesel exhaust emission by 30%.

- Evergreen was the first leased terminal operator to mandate the on-terminal use of ULSD. Today, five of the Port of Tacoma's six container terminals use ULSD.

- The first of Evergreen's "green" ships is now calling in Tacoma. In addition to numerous other environmentally friendly design features, the vessels produce less diesel emissions.

APM Terminal

- APM Terminals extended gate hours to minimize pre-gate idling and implemented web-based truck booking technology to reduce truck gate congestion. APM also switched to ULSD for on-terminal equipment.

- APM Terminals is using low-emission "onroad" diesel engines in 55% of its yard tractor fleet.

Husky Terminal

- In March 2006, Husky Terminal & Stevedoring, a major Port of Tacoma terminal operator, began using biodiesel fuel (20% biodiesel, 80% low-sulfur diesel) for all diesel-operated vehicles and container handling equipment. Husky increased the biodiesel fuel portion of the blend to 50% in the summer of 2006. Subsequently, the low-sulfur diesel (500 ppm sulfur) was replaced with ULSD (15 ppm sulfur).

- "K" Line has committed to the use of distillate fuel of 0.5% sulfur or less while at berth at the Port of Tacoma. The switch to distillate fuel will generate significant emission reductions of SO_x and PM.

Washington United Terminal

- Since December 2006, ULSD has been used in the diesel engines for all terminal operations at the Port of Tacoma.

Grain Terminal

- Grain terminal operator TEMCO has implemented a successful anti-idling operational policy that conserves energy and reduced both the greenhouse gases and diesel exhaust emission by a total of 35%.

1.13.3 Port of Everett

The Port of Everett has more than 20% of its cargo handling equipment (14 of 62 pieces) on non-diesel fuels, including six electric fork lifts, five propane fork lifts, and three gasoline fork lifts, and has implemented several emission reduction initiatives:

- Purchased and took delivery, in 2006, of an electric vehicle for use by the Harbor Attendant in marina operations, replacing a fossil-fuel vehicle. The Global Electric vehicle is ideally suited for slow-speed, stop and go type travel.
- Obtained a local government's heavy-duty diesel retrofit grant from the Department of Ecology to retrofit at least two fleet vehicles with emission control technology, also in 2006.
- Specified the use of an electric rail mounted gantry crane for cargo at the Rail/Barge Transfer facility, instead of a diesel-powered crane.
- In 2003, the Port of Everett obtained two electric gantry cranes, which are subsequently operating at Pacific Terminal.
- Developing an Environmental Management System (EMS) through an American Association of Port Authorities (AAPA)-sponsored training program for the purpose of integrating and managing existing environmental programs, including air emissions.

1.13.4 Washington State Ferries

Since 2002 Washington State Ferries (WSF) has worked to reduce maritime air emissions through both internal programs and collaborative projects. These efforts include programs to upgrade engine equipment, convert to clean fuels and implement operational changes.

Engine Equipment Upgrades

In 2002 WSF initiated a program of engine equipment upgrades throughout the fleet to meet MARPOL standards. This effort has included upgrading fuel injectors, upgrading or replacing main engines and replacement of ship-service generators. Upgrades completed include fuel injectors for 44 Electro-Motive-Diesel (EMD) engines, 12 General Electric engine replacements and the replacement of 30 ship-service generators.

Clean Fuels

In 2003 WSF began an ongoing process of evaluating, and adopting when practicable, the use of cleaner fuels in the ferry fleet.

- 2003 - Conducted preliminary operational and emissions tests of low sulfur diesel, ULSD and biodiesel.
- 2004 - Converted entire ferry fleet to low sulfur diesel.
- 2004 and 2005 - Undertook pilot test of B20 biodiesel (in partnership with Puget Sound Clean Air Agency and Seattle City Light).
- 2004 and 2005 - Undertook pilot test of ULSD (in partnership with the Puget Sound Clean Air Agency and the EPA).
- 2006 - WSF is partnering with Puget Sound Clean Air Agency and Seattle City Light on a biodiesel research project and second biodiesel pilot test.
- 2006 - Started conversion of the ferry fleet to ULSD.

Operational Fuel Conservation Measures

The majority (89%) of the ferry fleet power down main and auxiliary engines, and connect to shore-power during tie-up at night.

A WSF working group, focused on fuel conservation efforts fleet wide, is exploring the following initiatives:

- Route profiling, identifying optimum speeds to meet schedules and save fuel
- Positive restraint system while vessel is in dock alleviating need to run engines while loading/unloading
- Reducing to two engine operation on certain vessel classes
- Reducing on-board fuel storage to minimize weight load
- Installation of heat recovery systems that would alleviate need for heating boilers.

1.13.5 BNSF Railway

BNSF Railway has implemented a number of strategies system-wide to reduce emissions from rail operations.

- BNSF "Green Goat®," an environmentally-friendly hybrid switch engine, which has been in service for several years in the Los Angeles area. The cabless Green Goat units are planned for use in Texas. The Green Goat® uses a relatively small, clean, and efficient diesel genset in conjunction with over 300 batteries to improve fuel economy and reduce pollution. Remanufactured from existing switcher locomotives, the Green Goat can reduce oxides of nitrogen (NO_x) and particulates while reducing greenhouse gases and diesel fuel consumption when compared to conventional yard switchers.

- In Los Angeles, BNSF's Los Angeles Junction Railroad utilizes the four existing liquefied natural gas (LNG) locomotives in the nation servicing industry in the LA basin.
- The Green Goat® and LNG locomotives are part of BNSF's commitment to improving air quality across its system. The railway also is acquiring new locomotives and retiring older and less efficient ones. Between 1996 and 2004, BNSF acquired over 2000 cleaner- burning and fuel-efficient locomotives.
- BNSF GenSet Switchers BNSF has acquired new three Genset locomotives, which are powered by three truck diesel engines. These locomotives are currently providing services in BNSF switch yards.
- BNSF is also working with major locomotive manufacturers to develop a hybrid high horsepower locomotive that would capture and reuse the regenerative braking energy for traction.
- BNSF performs routine stack opacity tests on locomotives to ensure engines are in good operating condition. An inspection program also is in place for locomotives in the Southern California air basin. The program helps reduce visible emissions and helps improve air quality and locomotive efficiency.

BNSF is also reducing emissions on locomotives by:

- Installing idle control mechanisms on switch engines including auxiliary power units (APU), diesel-driven heating system (DDHS), and automatic start-stop technology on locomotives
- Increasing the number of cleaner-burning locomotives
- Implementing a locomotive visible emissions-reduction program
- Reducing train resistance (drag) through low torque bearings
- Adjusting train speeds
- Implementing the wheel/rail lubrication (especially on curved track and turnouts) to reduce friction and aerodynamic drag – rail lubrication extends rail and wheel life and increases fuel efficiency
- Maximizing use of low sulfur diesel-CARB diesel being used within California

BNSF is also reducing emissions at Intermodal yards by:

- Improvement in lift efficiencies at intermodal yards through electrification of lift equipment and improved traffic flows
- Implementing RFID (radio frequency identification) system at intermodal yards to increase productivity/efficiency by reducing queue times for trucks
- Initiating cargo handling equipment diesel emissions reduction program and
- Planning implementation of CARB/EPA verified diesel retrofit technologies

Current BNSF Research Programs

- Diesel Particulate Filter (DPF) Research & Development – work being performed by Southwest Research Institute ("SWRI") through the Association of American Railroads
- Fuel Cell Technology on Locomotives – involves development and demonstration of a prototype fuel cell hybrid switcher locomotive. The vehicle integration will take place at BNSF Topeka shop.

1.14 Report Organization

In addition to this introduction, this report is organized as follows:

- Section 2 presents the summary results and comparisons to regional non-maritime emissions.
- Section 3 presents the ocean-going vessel data, methodology and emissions estimates.
- Section 4 presents the harbor vessels including harbor craft, recreational vessel, and tank barge data, methodology and emissions estimates.
- Section 5 presents the cargo handling equipment data, methodology and emissions estimates.
- Section 6 presents the rail locomotive and associated rail yard cargo handling equipment and truck data, methodology and emissions estimates.
- Section 7 presents the heavy-duty vehicle data, methodology and emissions estimates.
- Section 8 presents the on-terminal fleet and other vehicle data, methodology and emissions estimates.
- Section 9 presents the conclusions, limitations, strengths and recommendations of the emissions inventory.
- Appendix A describes the Forum participant organizations.
- Appendix B is a glossary of terms.
- Appendix C is the EPA Quality Assurance Project Plan.
- Appendix D presents emission factors for air toxics.
- Appendix E is supporting data for the Puget Sound Maritime Air Emissions Inventory source categories.
- Appendix F is supporting data for the Northwest Clean Air Agency, Olympic Region Clean Air Agency, Puget Sound Clean Air Agency, and Washington Department of Ecology regional emissions inventories.

SECTION 2 SUMMARY RESULTS

This section presents the summary results for the Puget Sound Maritime Air Emissions Inventory. Detailed information and data on each source category, including the methodology for determining the emission estimates presented here, are provided in subsequent sections. Section 2.1 presents the results, Section 2.2 provides regional comparisons of the maritime emissions presented in this report to the agency regional emissions, Section 2.3 presents the emissions associated with selected entities such as ports and petroleum facilities and comparisons of maritime and non-maritime related emissions for HDV and rail locomotives for the Puget Sound Clean Air Agency region, and Section 2.4 presents concluding remarks.

2.1 Results

The section presents the findings by source category (2.1.1) and by regional clean air agency and by county (2.1.2).

2.1.1 Maritime Emissions by Source Category

The maritime source categories include:

- Ocean-going vessels (including hotelling, maneuvering, and transiting modes)
- Harbor vessels (including harbor craft, recreational vessels, and tank barges)
- Cargo handling equipment
- Rail locomotives (including associated rail yard cargo handling equipment and heavy-duty vehicles, and on-terminal and off-terminal port-related locomotive emissions, except where specified)
- Heavy-duty vehicles (including on-terminal and off-terminal port-related trucks and buses, except where specified)
- Fleet vehicles (including on-terminal fleet light- and heavy-duty vehicles, cruise terminal passenger-owned vehicles using cruise terminal parking areas, minivans shuttling cruise passengers, and new import or export vehicles that are driven onto or off of ocean-going vessels)

Table 2.1 and Figures 2.1 and 2.2 present the total Puget Sound 2005 maritime air emissions by source category. Figures 2.3 through 2.10 illustrate the contribution of the various source categories to the maritime emissions for NO_x, VOC, CO, SO_2, PM_{10}, $PM_{2.5}$, DPM and greenhouse gases, respectively. Greenhouse gases are presented in CO_2 equivalents (abbreviated as 'eq' in the tables) for carbon dioxide, nitrous oxide, and methane, combined. Source category data supporting the development of the maritime emissions is presented in Appendix E, as detailed in the corresponding source category sections.

Table 2.1: Puget Sound 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Ocean-going vessels:								
Hotelling	2,259	74	191	4,229	262	209	131	274,421
Maneuvering	313	24	33	191	22	17	21	12,481
Transiting	11,390	399	932	7,953	709	566	663	496,844
Harbor vessels	9,555	3,363	16,854	529	495	456	445	689,649
Rail, off-terminal	1,285	57	166	96	35	32	32	59,854
Rail, on-terminal	1,180	67	154	93	35	32	35	48,135
Cargo handling equipment	1,155	103	918	80	74	72	74	111,592
Heavy-duty vehicles, off-terminal	1,120	58	307	35	45	39	39	156,242
Heavy-duty vehicles, on-terminal	203	18	148	4	4	4	4	17,845
Fleet vehicles	10	5	50	0	0	0	0	3,365
Total	**28,469**	**4,167**	**19,752**	**13,211**	**1,682**	**1,427**	**1,444**	**1,870,429**

Figure 2.1: Puget Sound 2005 Maritime Air Emissions Inventory Summary, tpy

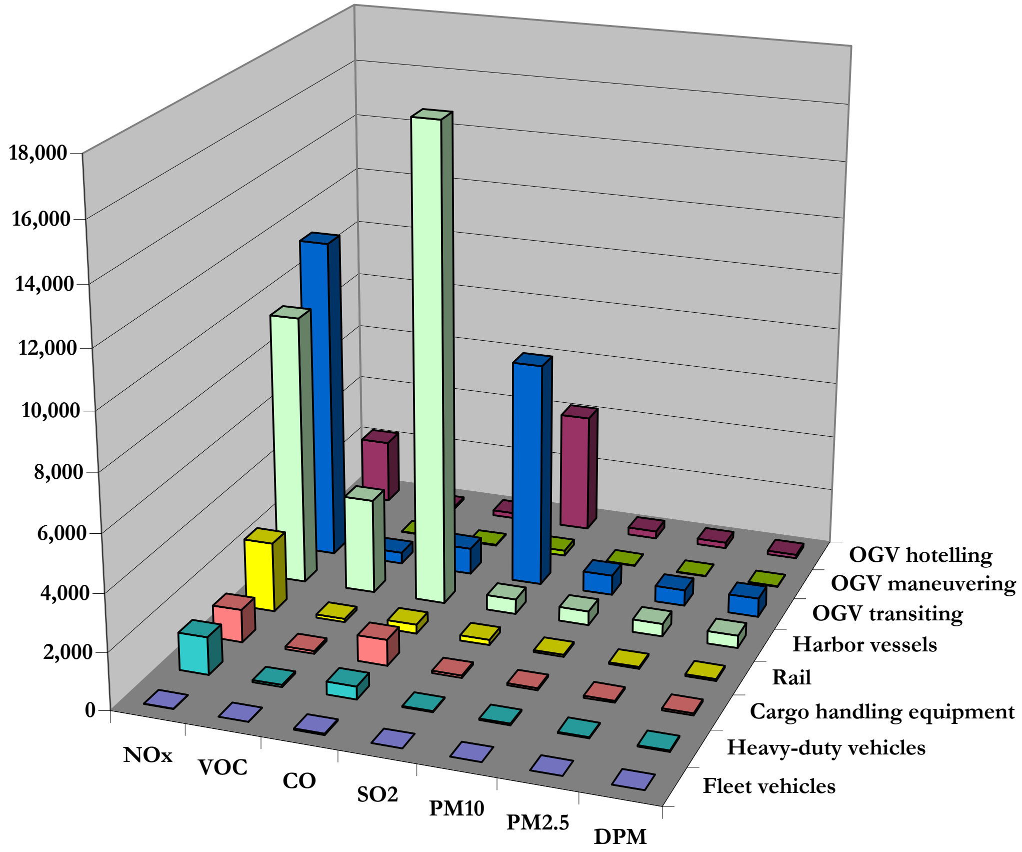


Figure 2.2: Puget Sound 2005 Maritime Air Emissions Inventory Summary, %

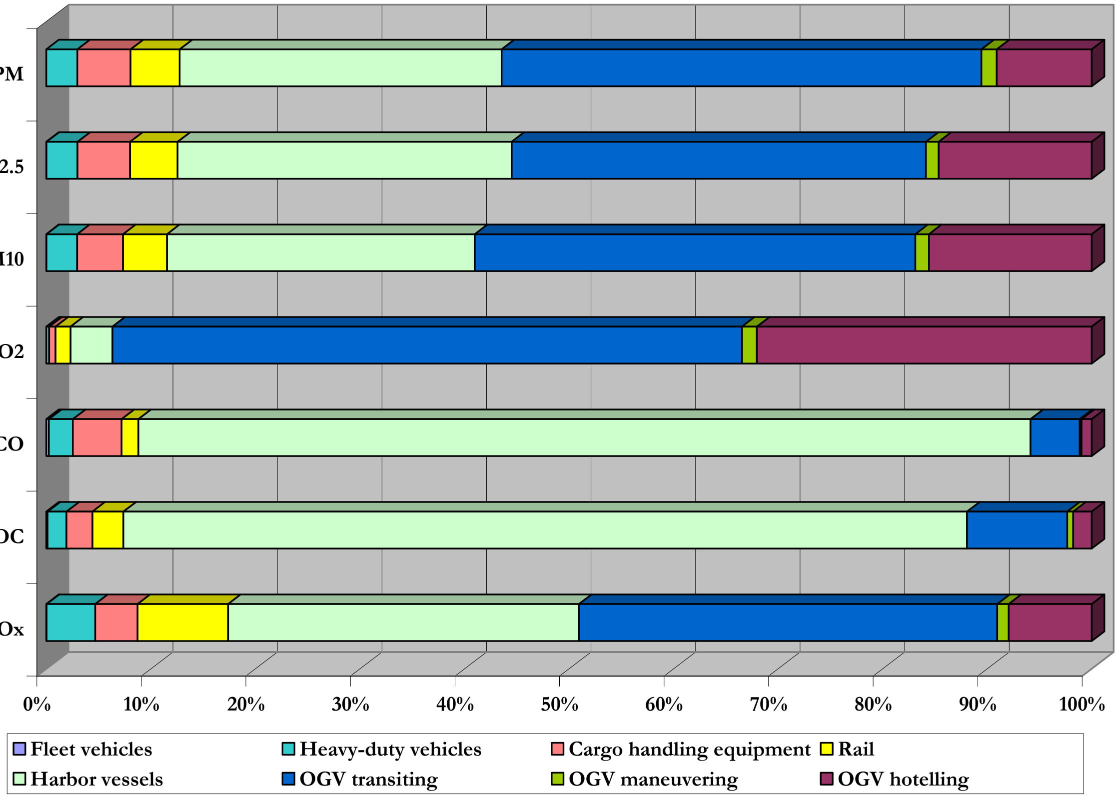


Figure 2.3: Puget Sound 2005 Maritime NO_x Emissions by Source Category, tpy

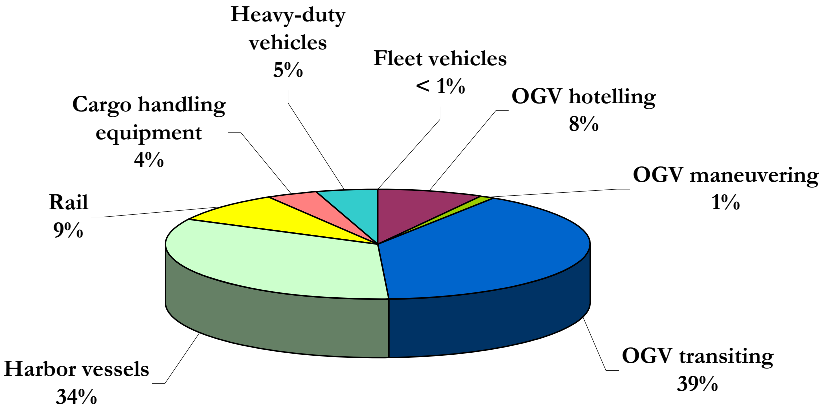


Figure 2.4: Puget Sound 2005 Maritime VOC Emissions by Source Category, tpy

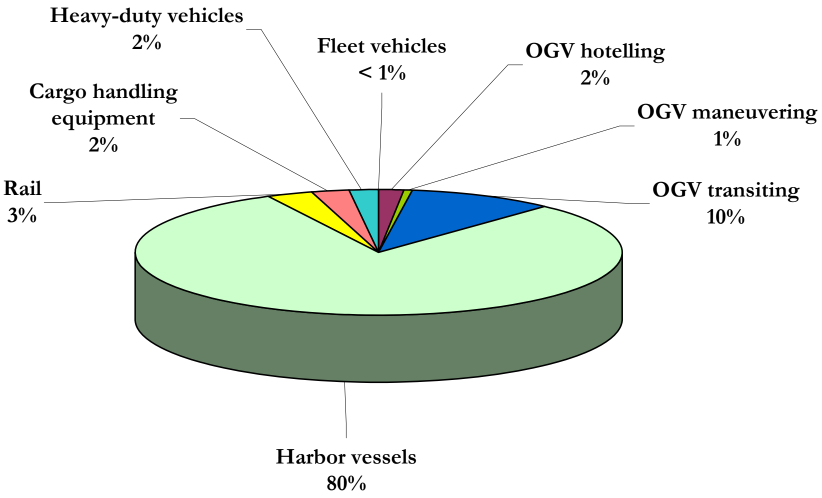


Figure 2.5: Puget Sound 2005 Maritime CO Emissions by Source Category, tpy

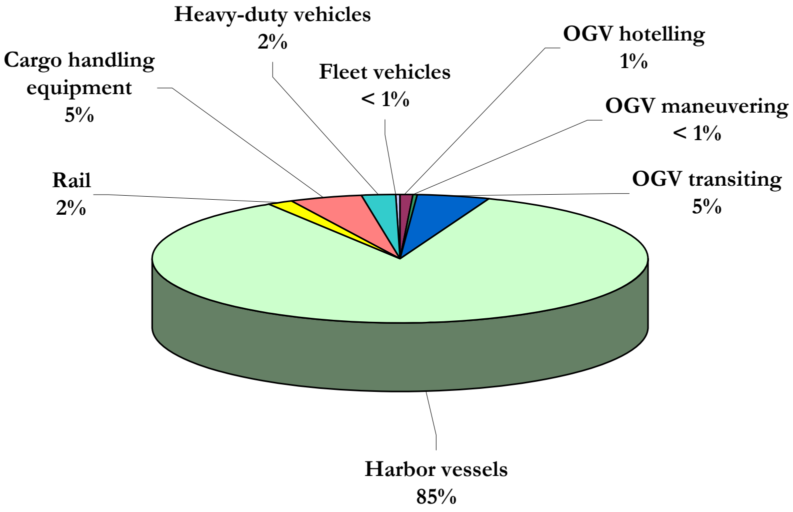


Figure 2.6: Puget Sound 2005 Maritime SO_2 Emissions by Source Category, tpy

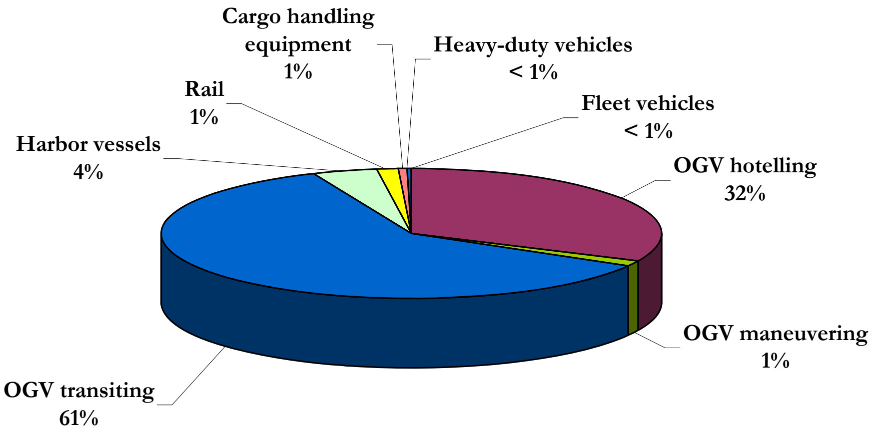


Figure 2.7: Puget Sound 2005 Maritime PM_{10} Emissions by Source Category, tpy

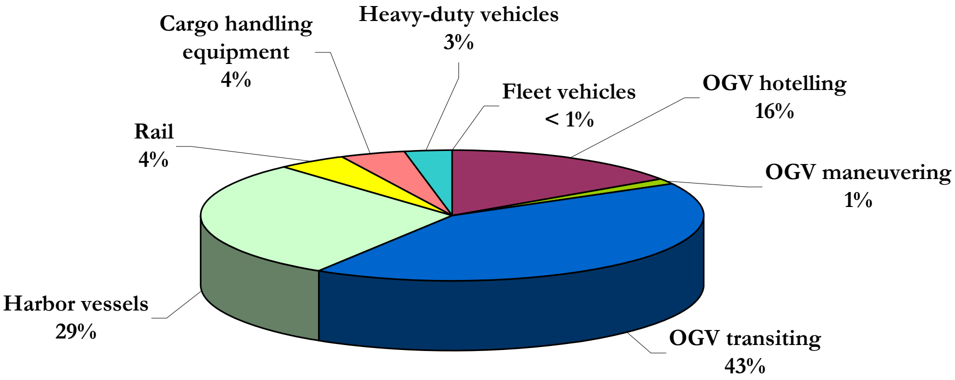


Figure 2.8: Puget Sound 2005 Maritime $PM_{2.5}$ Emissions by Source Category, tpy

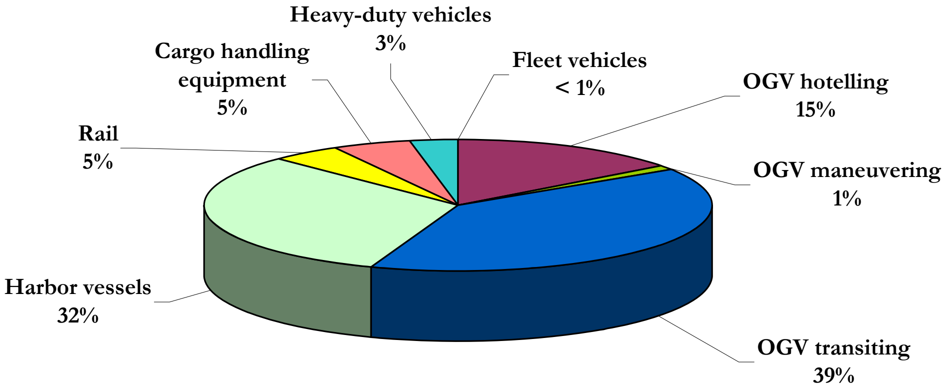


Figure 2.9: Puget Sound 2005 Maritime DPM Emissions by Source Category, tpy

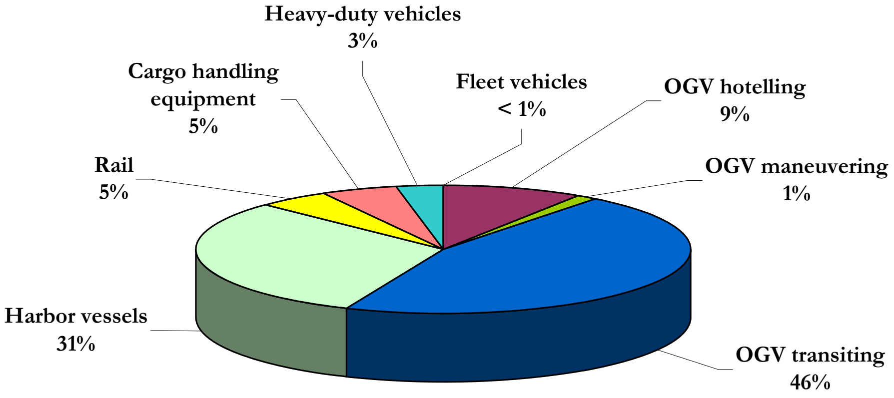
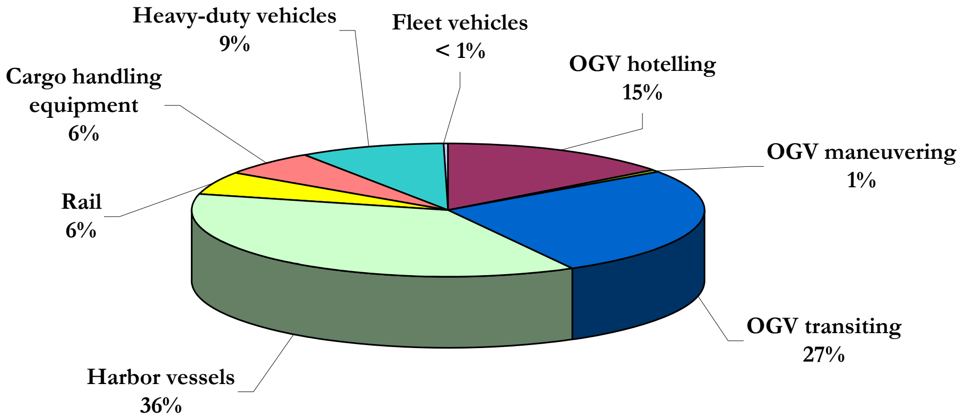


Figure 2.10: Puget Sound 2005 Maritime Greenhouse Gas Emissions by Source Category, CO_2 equivalent, tpy



2.1.2 Maritime Emission by Regional Clean Air Agency and County

Table 2.2 presents maritime emissions by regional clean air agency jurisdiction, and Table 2.3 presents maritime emissions by county. Following these, Tables 2.4 through 2.9 break down the county emissions by maritime emission source category – ocean-going vessels, harbor vessels, cargo handling equipment, rail, and heavy- and light-duty vehicles. Figures 2.11 through 2.18 illustrate emissions by regional clean air agency for NO_x, VOC, CO, SO_2, PM_{10}, $PM_{2.5}$, DPM, and greenhouse gases, respectively. Figures 2.19 through 2.26 illustrate emissions by regional clean air agency for NO_x, VOC, CO, SO_2, PM_{10}, $PM_{2.5}$, DPM, and greenhouse gases, respectively. The values not assigned to a county or regional air agency include primarily tank barges, and a small number of ocean-going vessel emissions (e.g., for NO_x approximately 24 tons of tank barge emissions, and approximately two tons of ocean-going vessel emissions – less than 0.001% of emissions). (See Sections 3.8 and 4.8 for detailed explanations)

The regional clean air agencies, their acronyms as used in the tables that follow, and the counties within their jurisdictions are:

- Northwest Clean Air Agency (NWCAA) – Island, Skagit, Whatcom, San Juan
- Olympic Region Clean Air Agency (ORCAA) – Clallam, Jefferson, Mason, Thurston
- Puget Sound Clean Air Agency (PSCAA) – King, Kitsap, Pierce, Snohomish

Maritime-related emissions for San Juan County are included in the totals for the Northwest Clean Air Agency even though the air program in San Juan County is administered by the Washington Department of Ecology. Pacific and Grays Harbor Counties, which are in the Olympic Region Clean Air Agency jurisdiction, are outside the Puget Sound airshed and EI study area

Table 2.2: Puget Sound 2005 Maritime Emissions by Regional Clean Air Agency, tpy

Agency	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
NWCAA	3,562	1,271	6,240	3,192	270	222	171	294,708
ORCAA	9,064	759	3,109	5,961	556	449	495	456,948
PSCAA	15,818	2,137	10,400	4,053	855	755	776	1,116,994
Not assigned	26	1	4	5	1	1	1	1,779
Total	**28,469**	**4,167**	**19,752**	**13,211**	**1,682**	**1,427**	**1,444**	**1,870,429**

Table 2.3: Puget Sound 2005 Maritime Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	7,556	408	1,428	5,286	474	382	423	373,674
Island	1,389	164	733	788	80	65	75	65,468
Jefferson	973	151	681	620	59	48	55	44,502
King	6,924	876	4,426	1,837	383	338	350	504,902
Kitsap	2,244	440	2,072	827	131	112	121	130,006
Mason	108	62	318	9	5	4	4	8,676
Pierce	3,321	388	1,868	1,134	177	156	150	259,949
San Juan	893	324	1,593	503	55	45	46	49,917
Skagit	733	349	1,740	1,295	86	70	30	109,650
Snohomish	3,330	433	2,033	254	164	150	155	222,137
Thurston	426	137	682	46	18	16	14	30,096
Whatcom	547	433	2,174	606	50	42	20	69,673
Not assigned	26	1	4	5	1	1	1	1,779
Total	**28,469**	**4,167**	**19,752**	**13,211**	**1,682**	**1,427**	**1,444**	**1,870,429**

Table 2.4: Puget Sound 2005 Ocean-Going Vessel Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	6,870	243	566	5,218	447	356	398	328,135
Island	1,160	40	94	765	70	56	67	48,084
Jefferson	933	32	76	619	57	45	54	38,793
King	1,641	60	138	1,556	125	100	105	98,563
Kitsap	1,166	40	95	787	71	57	68	49,431
Mason	0	0	0	0	0	0	0	14
Pierce	793	27	67	975	68	54	47	65,081
San Juan	648	23	54	480	42	33	38	29,562
Skagit	425	17	38	1,270	71	56	20	81,191
Snohomish	97	3	8	105	8	6	6	6,484
Thurston	14	1	1	16	1	1	1	987
Whatcom	212	9	19	580	33	26	11	37,296
Not assigned	2	0	0	2	0	0	0	125
Total	**13,962**	**497**	**1,156**	**12,374**	**993**	**792**	**815**	**783,746**

Table 2.5: Puget Sound 2005 Harbor Vessels Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	664	163	853	67	27	24	24	43,299
Island	215	123	635	22	10	9	8	15,777
Jefferson	29	119	603	1	2	2	0	4,447
King	3,083	664	3,215	117	168	155	159	218,785
Kitsap	1,071	399	1,976	40	59	55	53	79,599
Mason	93	61	314	9	4	4	3	6,941
Pierce	941	264	1,366	87	43	39	39	65,196
San Juan	243	301	1,539	23	13	12	8	20,224
Skagit	265	331	1,690	24	13	12	8	23,560
Snohomish	2,535	396	1,902	103	135	124	130	174,108
Thurston	107	121	615	9	5	5	3	9,165
Whatcom	286	420	2,142	24	15	14	8	26,895
Not assigned	24	1	4	3	1	1	1	1,654
Total	**9,555**	**3,363**	**16,854**	**529**	**495**	**456**	**445**	**689,649**

Table 2.6: Puget Sound 2005 Cargo Handling Equipment Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	6	1	4	1	0	0	0	419
Island	0	0	0	0	0	0	0	0
Jefferson	0	0	0	0	0	0	0	0
King	514	58	648	67	34	33	34	47,085
Kitsap	0	0	0	0	0	0	0	0
Mason	0	0	0	0	0	0	0	0
Pierce	586	39	226	7	34	33	34	60,925
San Juan	0	0	0	0	0	0	0	0
Skagit	0	0	0	0	0	0	0	15
Snohomish	23	2	22	2	2	2	2	1,392
Thurston	26	3	17	3	2	2	2	1,756
Whatcom	0	0	0	0	0	0	0	0
Total	**1,155**	**103**	**918**	**80**	**74**	**72**	**74**	**111,592**

Table 2.7: Puget Sound 2005 Locomotive Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	0	0	0	0	0	0	0	0
Island	0	0	0	0	0	0	0	0
Jefferson	0	0	0	0	0	0	0	0
King	977	49	134	77	29	26	28	45,098
Kitsap	0	0	0	0	0	0	0	0
Mason	0	0	0	0	0	0	0	0
Pierce	718	39	88	56	21	19	21	28,836
San Juan	0	0	0	0	0	0	0	0
Skagit	0	0	0	0	0	0	0	0
Snohomish	569	26	71	41	15	13	14	24,707
Thurston	201	10	26	15	6	6	6	9,349
Whatcom	0	0	0	0	0	0	0	0
Total	**2,464**	**124**	**319**	**188**	**71**	**65**	**68**	**107,989**

Table 2.8: Puget Sound 2005 Heavy-Duty Vehicle Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	16	0.8	4.4	0.4	0.6	0.4	0.4	1,822
Island	14	0.6	3.7	0.4	0.5	0.4	0.4	1,608
Jefferson	11	0.5	2.9	0.3	0.4	0.3	0.3	1,261
King	704	40	259	21	26	23	23	93,963
Kitsap	7	0.3	1.6	0.2	0.3	0.2	0.2	976
Mason	15	0.7	3.9	0.4	0.5	0.4	0.4	1,721
Pierce	278	17	106	8	11	9	9	38,099
San Juan	1.2	0.1	0.3	0.0	0.0	0.0	0.0	131
Skagit	43	2.0	11	1.1	1.5	1.2	1.2	4,865
Snohomish	105	5.1	28	3.4	4.4	3.8	3.8	15,321
Thurston	79	3.7	21	1.9	2.7	2.2	2.2	8,839
Whatcom	48	4.4	12	1.2	1.7	1.4	1.4	5,481
Total	**1,322**	**76**	**455**	**39**	**49**	**42**	**43**	**174,086**

Table 2.9: Puget Sound 2005 Fleet Vehicle Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jefferson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
King	4.7	3.2	31.1	0.0	0.0	0.0	0.0	1,409
Kitsap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mason	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pierce	4.3	1.7	15.6	0.0	0.4	0.4	0.0	1,812
San Juan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Skagit	0.1	0.1	0.5	0.0	0.0	0.0	0.0	19
Snohomish	0.7	0.4	3.1	0.0	0.0	0.0	0.0	126
Thurston	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Whatcom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**9.8**	**5.4**	**50.2**	**0.0**	**0.4**	**0.4**	**0.1**	**3,365**

Figure 2.11: Puget Sound 2005 Maritime NO_x Emissions by Regional Clean Air Agency, tpy

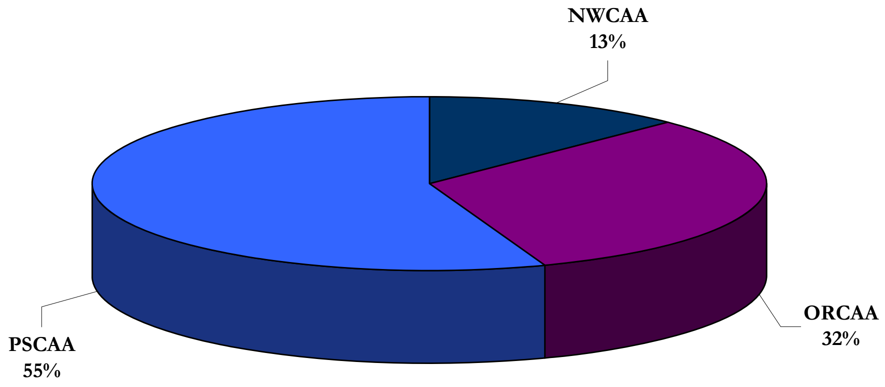


Figure 2.12: Puget Sound 2005 Maritime VOC Emissions by Regional Clean Air Agency, tpy

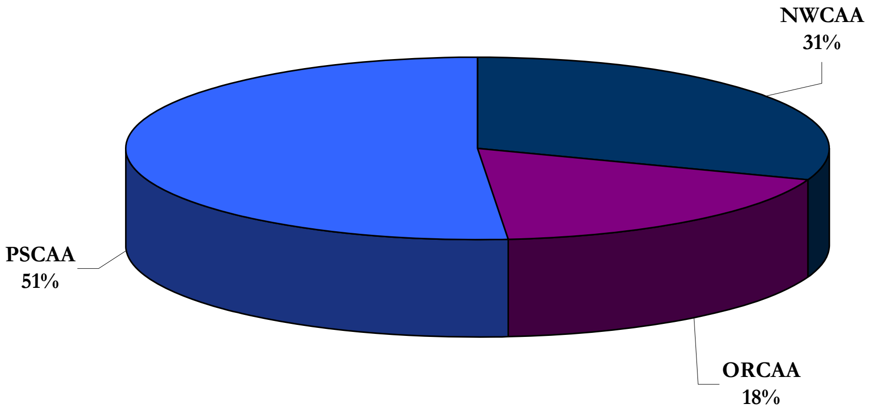


Figure 2.13: Puget Sound 2005 Maritime CO Emissions by Regional Clean Air Agency, tpy

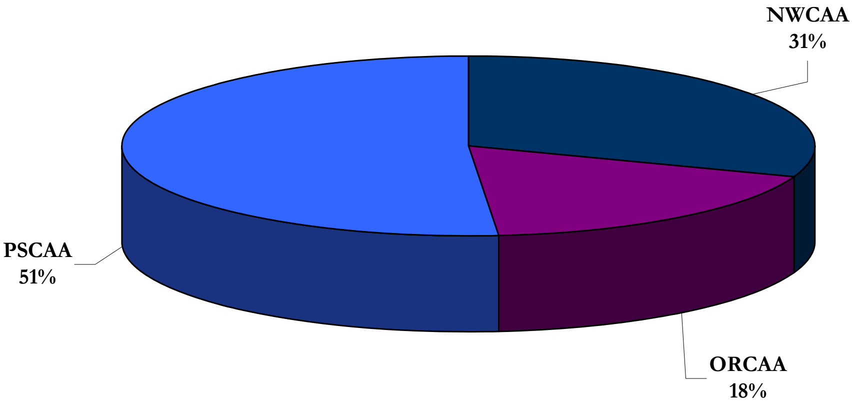


Figure 2.14: Puget Sound 2005 Maritime SO_2 Emissions by Regional Clean Air Agency, tpy

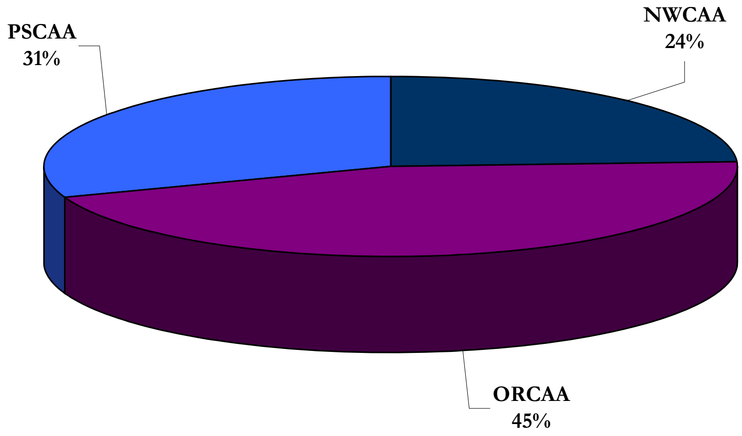


Figure 2.15: Puget Sound 2005 Maritime PM_{10} Emissions by Regional Clean Air Agency, tpy

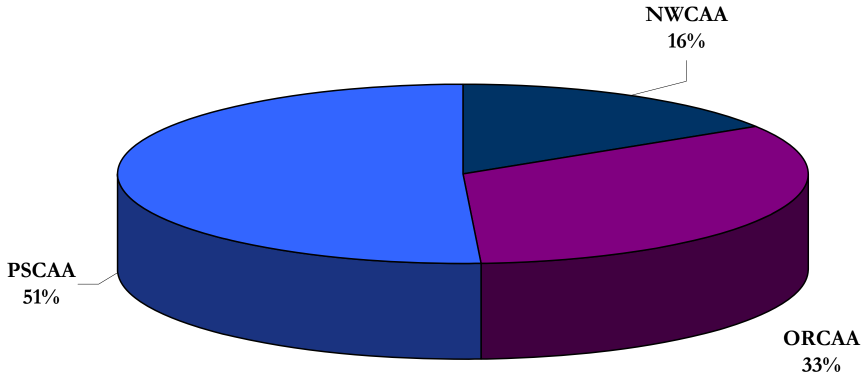


Figure 2.16: Puget Sound 2005 Maritime $PM_{2.5}$ Emissions by Regional Clean Air Agency, tpy

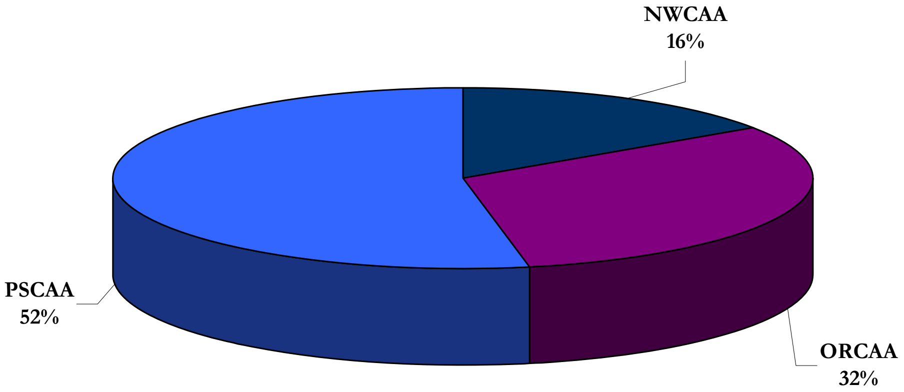


Figure 2.17: Puget Sound 2005 Maritime DPM Emissions by Regional Clean Air Agency, tpy

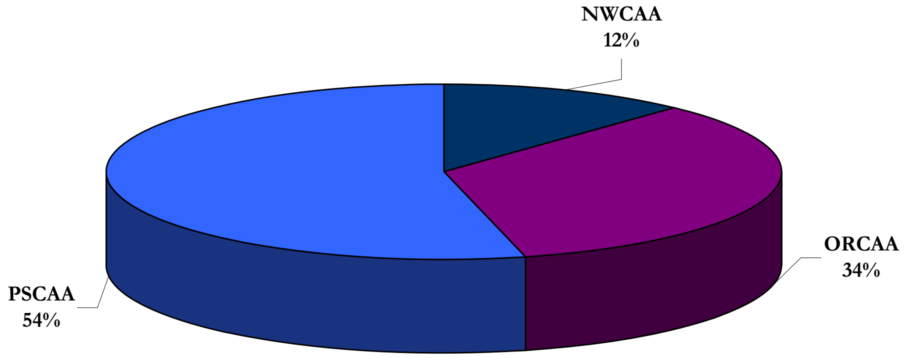


Figure 2.18: Puget Sound 2005 Maritime Greenhouse Gas Emissions by Regional Clean Air Agency, CO_2 equivalent, tpy

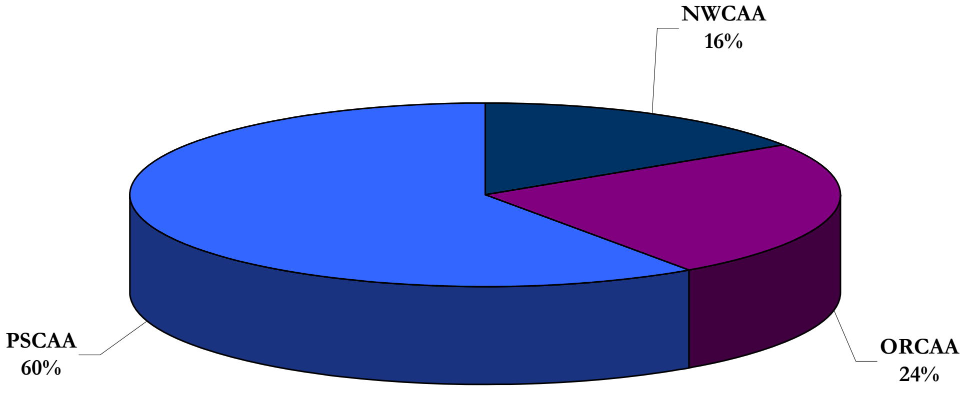


Figure 2.19: Puget Sound 2005 Maritime NO_x Emissions by County, tpy

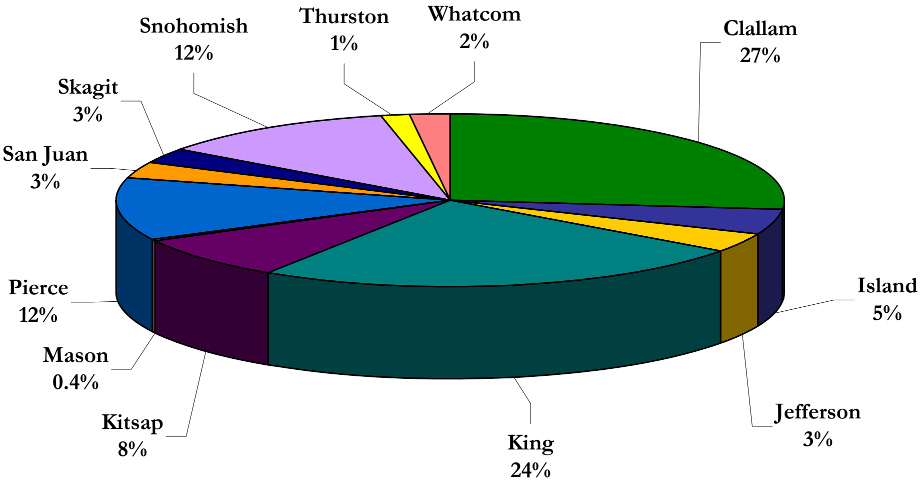


Figure 2.20: Puget Sound 2005 Maritime VOC Emissions by County, tpy

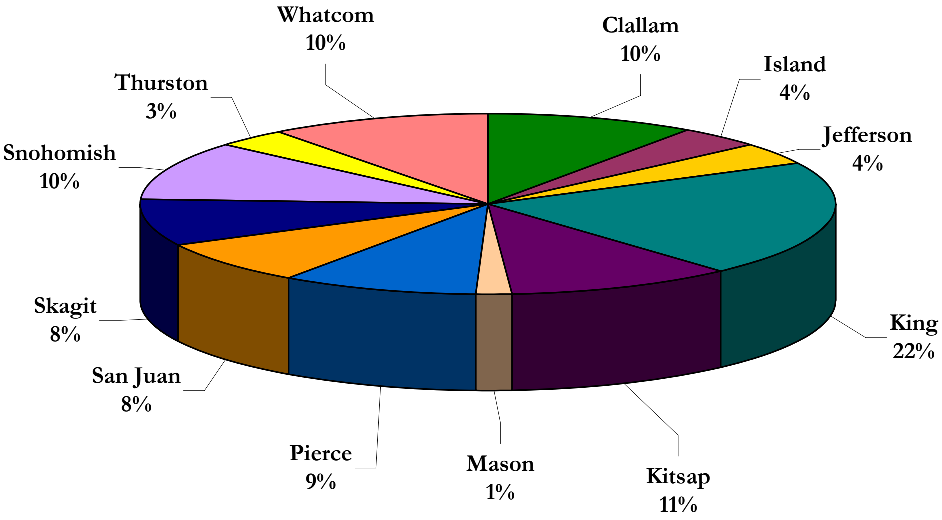


Figure 2.21: Puget Sound 2005 Maritime CO Emissions by County, tpy

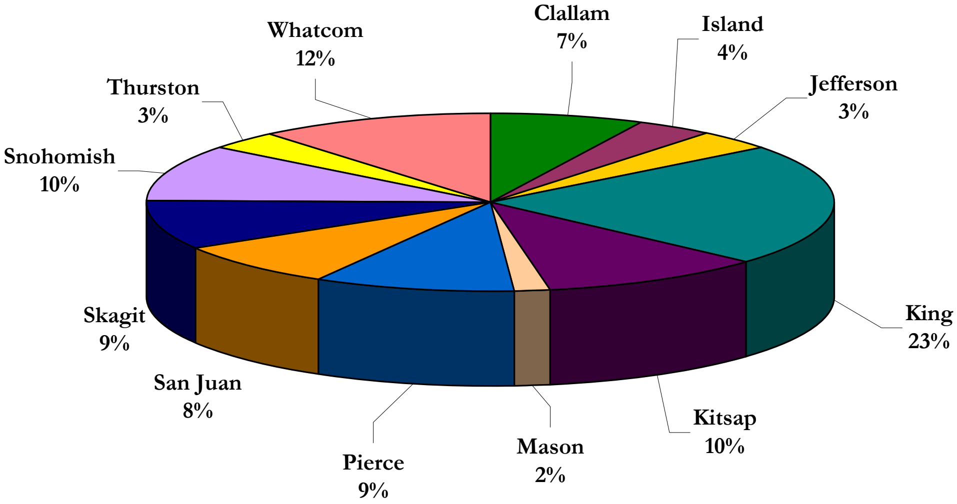


Figure 2.22: Puget Sound 2005 Maritime SO_2 Emissions by County, tpy

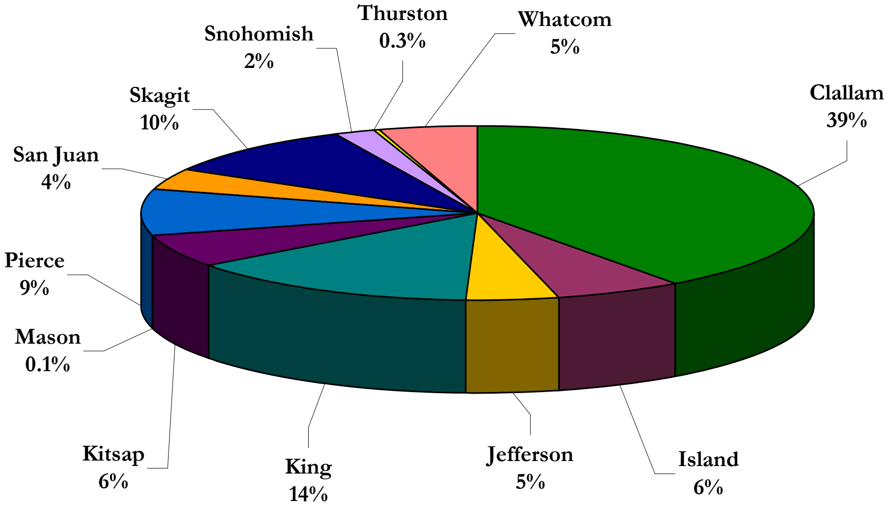


Figure 2.23: Puget Sound 2005 Maritime PM_{10} Emissions by County, tpy

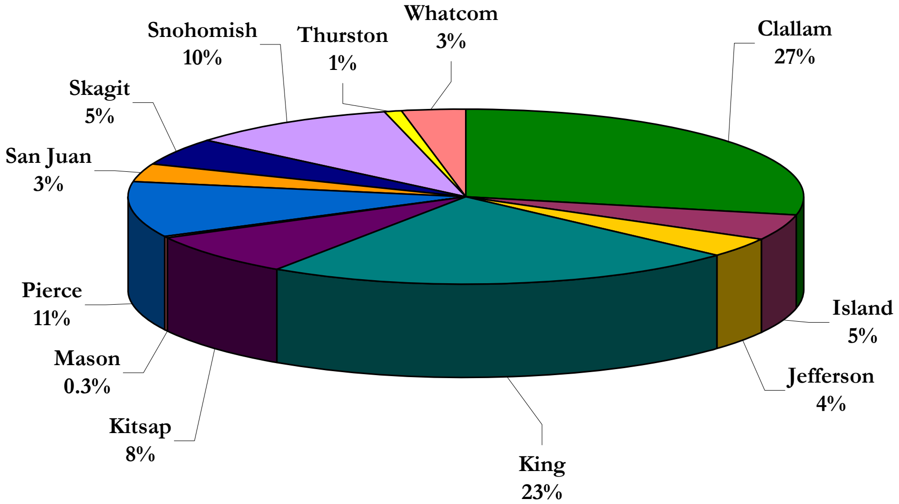


Figure 2.24: Puget Sound 2005 Maritime $PM_{2.5}$ Emissions by County, tpy

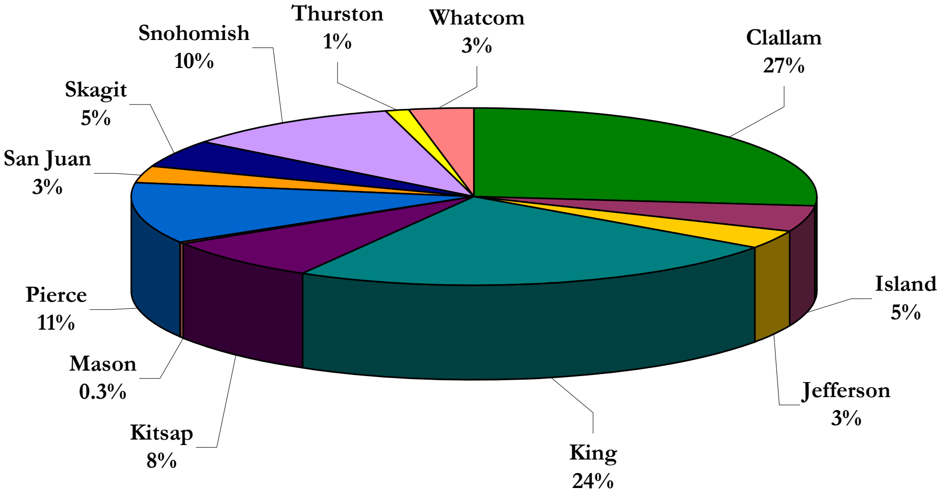


Figure 2.25: Puget Sound 2005 Maritime DPM Emissions by County, tpy

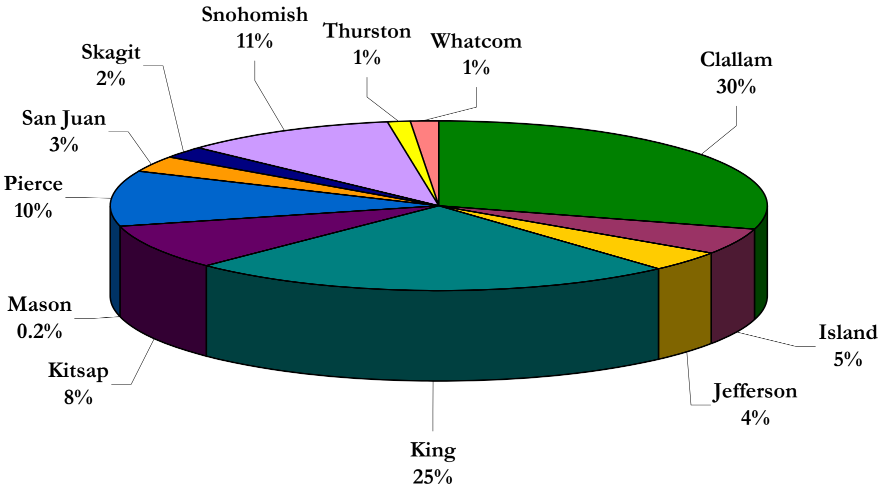
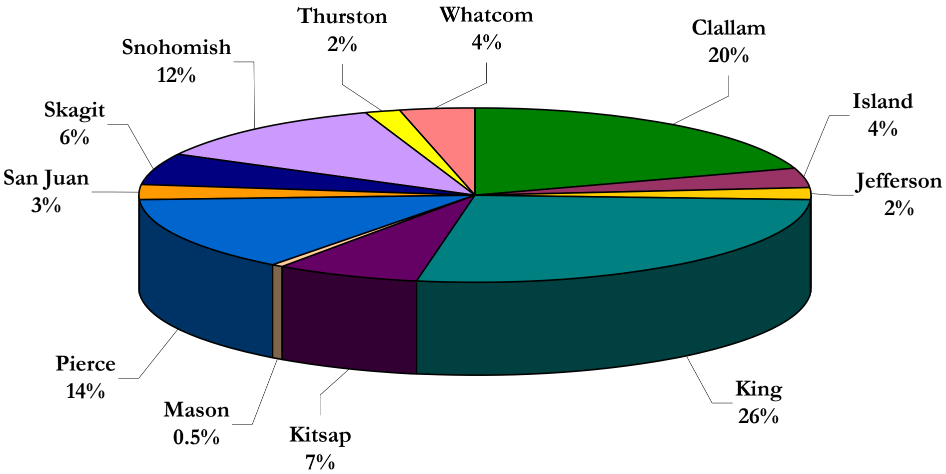


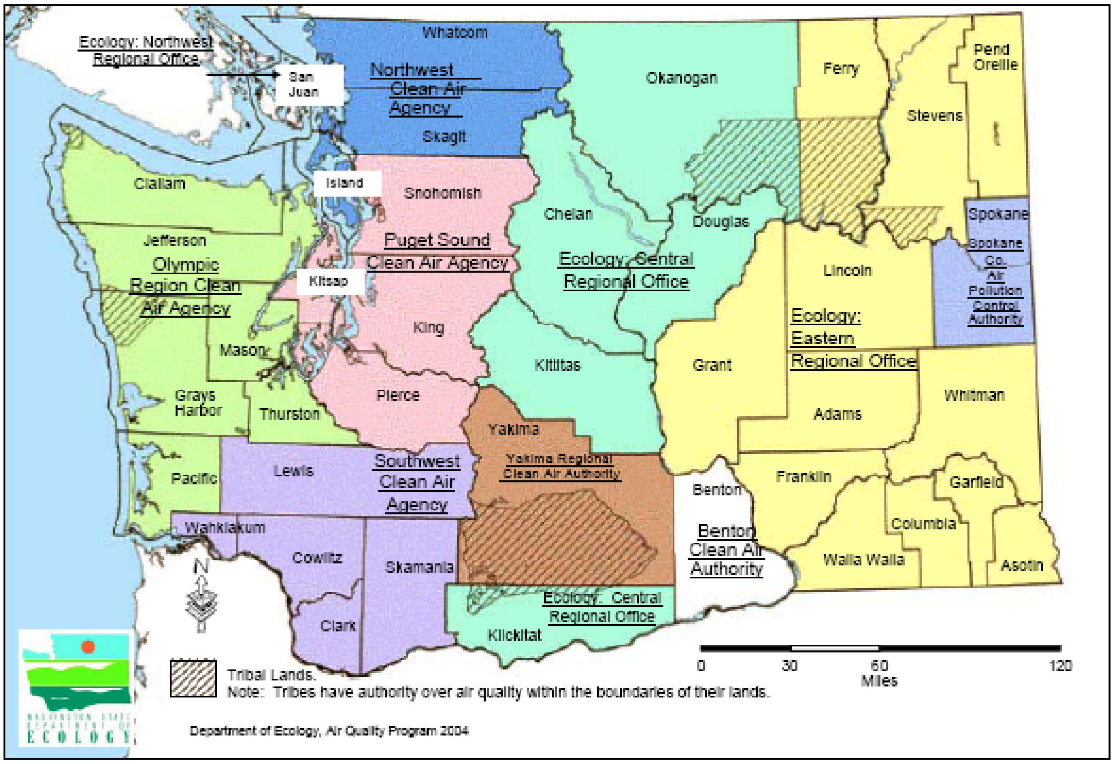
Figure 2.26: Puget Sound 2005 Maritime Greenhouse Gas Emissions by County, CO_2 equivalents, tpy



2.2 Regional Emissions Comparison

This section summarizes total regional air emissions for 2005, and compares the maritime emissions presented in this report to the non-maritime emissions inventories developed by the regional clean air agencies. These agencies include the Northwest Air Pollution Authority, the Olympic Region Clean Air Agency, and the Puget Sound Clean Air Agency, as shown in Figure 2.27.

Figure 2.27: Regional Clean Air Agencies of Washington



2.2.1 Source of Regional Emissions Estimates

The agencies have compiled emissions inventory updates for sources within their jurisdictions for 2005. The non-maritime sources include point sources (large industrial sources), onroad mobile sources (vehicles that are licensed for highway use), offroad mobile sources (vehicles that are not licensed for use on highways), locomotive mobile sources, and area sources (a broad category that includes everything else such as wood burning and small business operations). The pollutants and specific source categories that were reported by the regional clean air agencies varied from agency to agency so the emissions inventories from the three agencies can not be accurately summed across the entire study area for the Puget Sound Maritime Air Emissions Inventory. Therefore, comparisons of regional emissions with maritime-related emissions are made on the basis of regional clean air agency jurisdiction only. The agencies were consulted closely with regard to assumptions and decisions about how the discrepancies in methodology among them were handled in this emissions inventory.

The non-maritime sources include point sources (large industrial sources), onroad mobile sources (vehicles that are licensed for highway use), offroad mobile sources (vehicles that are not licensed for use on highways), locomotive mobile sources, and area sources (a broad category that includes everything else such as wood burning and small business operations).

Northwest Clean Air Agency Data
For counties within the Northwest Clean Air Agency's jurisdiction, the Washington Department of Ecology provided non-maritime regional emissions estimates for area, locomotive, offroad and onroad sources. The Northwest Clean Air Agency did not provide a maritime inventory, except for a small component in the offroad category; however, the Washington Department of Ecology considered this component to not be large enough to be of concern regarding double-counting of emissions. There was potential for more significant double-counting in the pleasure craft (recreational vessel) category, since the NONROAD model specifically estimates this category, but this concern is somewhat alleviated since the Puget Sound Maritime Emissions Inventory only counted pleasure craft moored in public/port marinas (about 12% of the total registered craft). To reduce the likelihood of double counting with the Puget Sound Maritime Air Emissions Inventory, recreational boat emissions were removed from the agency offroad emissions estimates. See Section 4.9 for more detailed information regarding how recreational vessel estimates were developed for the Puget Sound Maritime Emissions Inventory.

The Northwest Clean Air Agency provided the point source data. Point sources were assumed to not emit DPM. Since $PM_{2.5}$ emissions were not provided, $PM_{2.5}$ was estimated to be 92% of PM_{10} emissions.

For the Washington Department of Ecology locomotive data, fine particulate matter ($PM_{2.5}$) emissions were used to represent DPM emissions because DPM values were not reported. For the onroad data, $PM_{2.5}$ was used to represent DPM for diesel-fueled vehicles.

Although San Juan County lies within the jurisdiction of the Washington Department of Ecology, its emissions were included with those for the Northwest Clean Air Agency for simplicity. The Washington Department of Ecology provided all non-maritime emissions estimates for San Juan County.

To develop the total regional emissions, the Puget Sound Maritime Air Emissions Inventory emissions were added to the agency non-maritime source emissions.

Olympic Region Clean Air Agency Data
A similar effort was implemented for counties within the Olympic Region Clean Air Agency's jurisdiction. The Washington Department of Ecology provided non-maritime regional emissions estimates for area, locomotive, offroad and onroad sources. The Olympic Region Clean Air Agency did not provide a maritime inventory, except for a small component in the offroad category; however, as in the case of the Northwest Clean Air Agency, the Washington Department of Ecology considered this component to not be large enough to be of concern regarding double-counting of emissions. To reduce the likelihood of double counting with the Puget Sound Maritime Air Emissions Inventory, recreational boat emissions were removed from the agency offroad emissions estimates.

The Olympic Region Clean Air Agency provided the point source data. Point sources were assumed to not emit DPM. The agency reported that $PM_{2.5}$ emissions were incomplete, therefore, nulls were set equal to PM_{10}.

For the Washington Department of Ecology locomotive data, $PM_{2.5}$ emissions were used to represent DPM emissions because DPM values were not reported. For the onroad data, $PM_{2.5}$ was used to represent DPM for diesel-fueled vehicles.

As with the Northwest Clean Air Agency, in order to develop the total regional emissions, the Puget Sound Maritime Air Emissions Inventory maritime source emissions were added to the agency non-maritime source emissions.

Puget Sound Clean Air Agency Data
In contrast to the method used for determining regional emissions for the Northwest Clean Air Agency and the Olympic Region Clean Air Agency, for counties within the Puget Sound Clean Air Agency's jurisdiction, the Puget Sound Clean Air Agency provided the total regional emissions estimates for point, area, offroad, onroad and locomotive sources. Also in contrast to the two other regional agencies, VOC emissions from evaporative sources (non-combustion sources) were included. The Puget Sound Clean Air Agency emissions are intended to represent all maritime and non-maritime emissions for the region. Fine particulate matter ($PM_{2.5}$) emissions from diesel-fueled equipment were used to represent DPM emissions because DPM estimates were not reported.

Although Washington Department of Ecology data was available for the Puget Sound Clean Air Agency Counties for the same sources as for the other regions, the Puget Sound Clean Air Agency data was available and was therefore used. There are some differences in the emissions estimates from the two agencies, however the Puget Sound Clean Air Agency deemed them to be insignificant.

Because the Puget Sound Clean Air Agency included maritime sources in their emissions inventory, their emissions were considered to represent the region, and the Puget Sound Maritime Air Emissions Inventory estimates were subtracted from the agency regional emissions to obtain the non-maritime emissions.

All Agency Data
Not all counties have emissions for all source categories – Clallam, Island, San Juan and Jefferson Counties do not have locomotive traffic; San Juan County does not have point sources.

The agencies varied in the naming of the pollutants, and for this analysis, nitrogen oxides and nitrogen dioxide, and sulfur oxides and sulfur dioxide were considered the same. Carbon dioxide, nitrous oxide, methane emissions were not provided for all sources, thus greenhouse gas emission comparisons could not be made; likewise for PM_{10}. The emissions data provided by the agencies, as well as the summary list, are presented in Appendix F.

2.2.2 Regional Emissions Estimate Comparisons

The regional emissions estimate comparisons are presented by regional clean air agency, as follows:

- Northwest Clean Air Agency
- Olympic Region Clean Air Agency
- Puget Sound Clean Air Agency

Northwest Clean Air Agency
The Northwest Clean Air Agency administers air quality programs in Island, Skagit and Whatcom Counties. San Juan County is included in the Washington Department of Ecology's jurisdiction, but emissions are counted with the Northwest Clean Air Agency Counties. Table 2.10 and Figures 2.28 and 2.29 compare the regional maritime and non-maritime emissions. Figures 2.30 through 2.34 illustrate the relative contributions for NO_x, VOC and CO, SO_2, $PM_{2.5}$ and DPM, respectively.

Table 2.10: Comparison of 2005 Maritime and Non-Maritime Emissions for the Northwest Clean Air Agency Region, tpy

Source Category	NOx	VOC	CO	SO_2	$PM_{2.5}$	DPM
Maritime sources:						
Ocean-going vessel:						
Hotelling	484	18	43	1,696	73	21
Maneuvering	27	3	3	20	2	2
Transiting	1,934	68	159	1,380	97	113
Harbor vessel	1,009	1,175	6,006	93	47	32
Rail locomotive	0	0	0	0	0	0
Cargo handling equipment	0	0	0	0	0	0
Heavy-duty vehicle	107	7	28	3	3	3
Fleet vehicle	0	0	0	0	0	0
Maritime subtotal	3,562	1,271	6,240	3,192	222	171
Non-maritime sources	19,347	19,217	130,887	13,935	3,600	257
Regional emissions	**22,909**	**20,488**	**137,127**	**17,126**	**3,822**	**428**

Figure 2.28: Comparison of 2005 Maritime and Non-Maritime Emissions for the Northwest Clean Air Agency Region, tpy

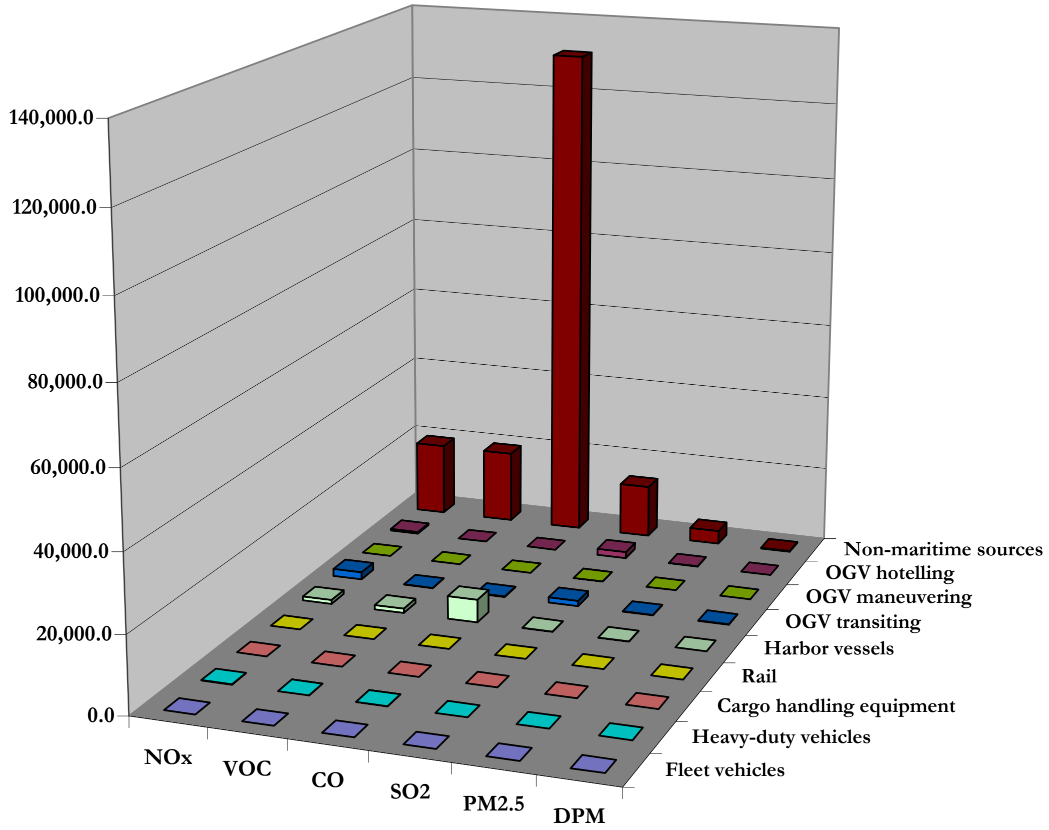


Figure 2.29: Comparison of 2005 Maritime and Non-Maritime Emissions for the Northwest Clean Air Agency Region, %

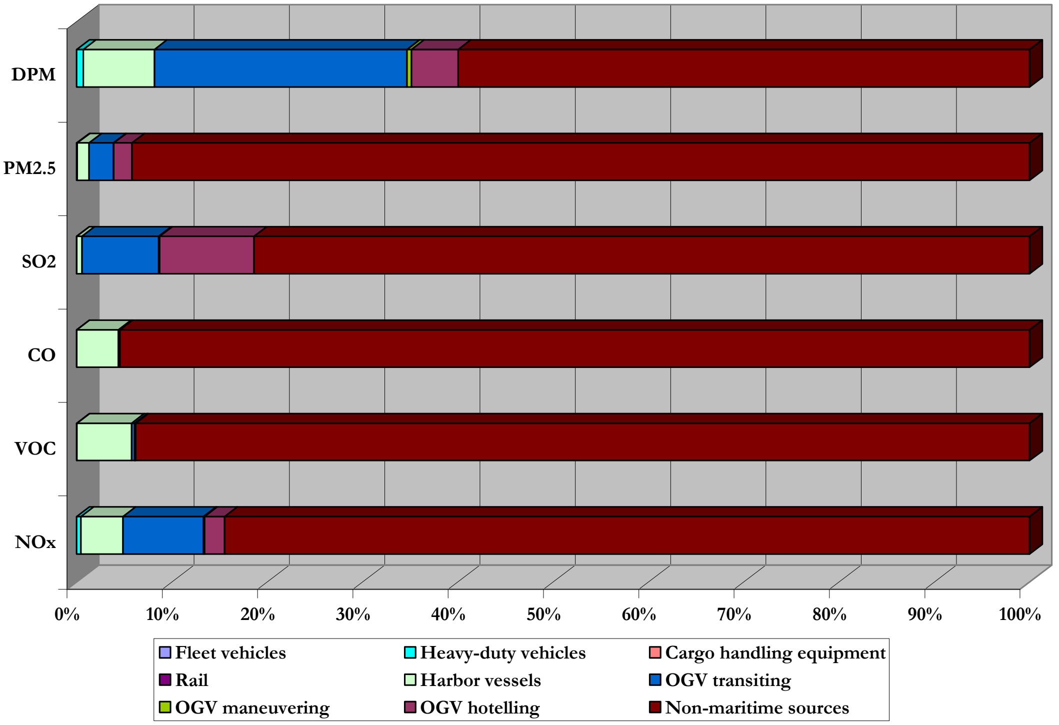


Figure 2.30: Comparison of 2005 Maritime and Non-Maritime NO_x Emissions for the Northwest Clean Air Agency Region, tpy

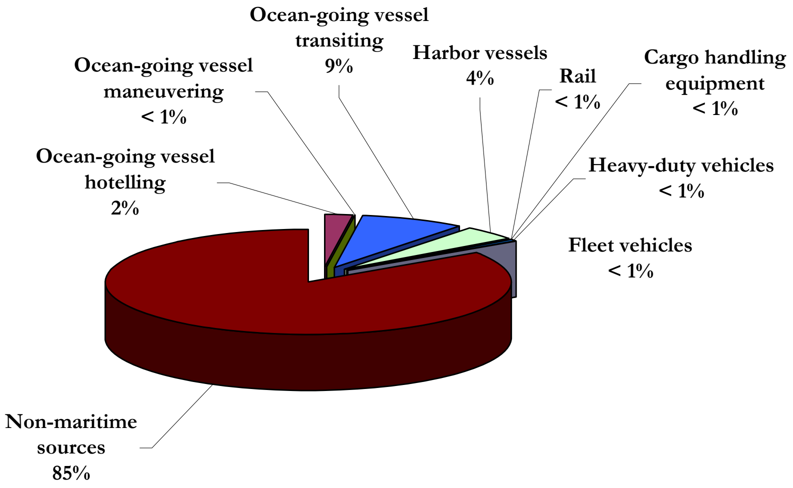


Figure 2.31: Comparison of 2005 Maritime and Non-Maritime VOC Emissions for the Northwest Clean Air Agency Region, tpy

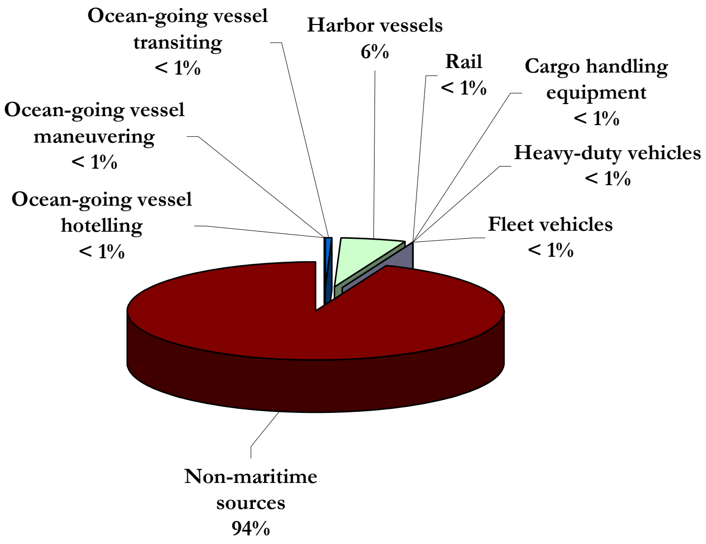


Figure 2.32: Comparison of 2005 Maritime and Non-Maritime CO Emissions for the Northwest Clean Air Agency Region, tpy

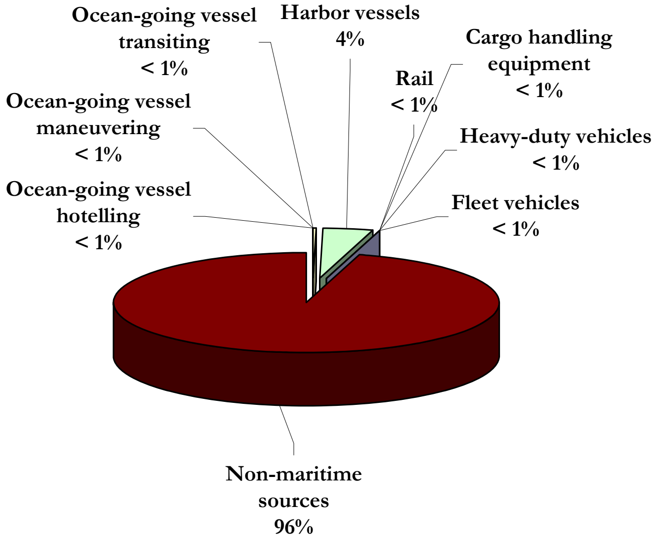


Figure 2.33: Comparison of 2005 Maritime and Non-Maritime SO_2 Emissions for the Northwest Clean Air Agency Region, tpy

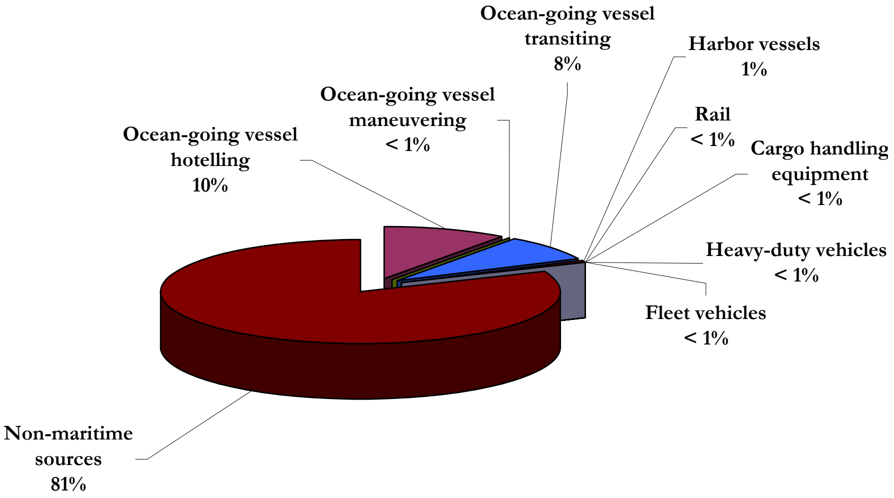


Figure 2.34: Comparison of 2005 Maritime and Non-Maritime $PM_{2.5}$ Emissions for the Northwest Clean Air Agency Region, tpy

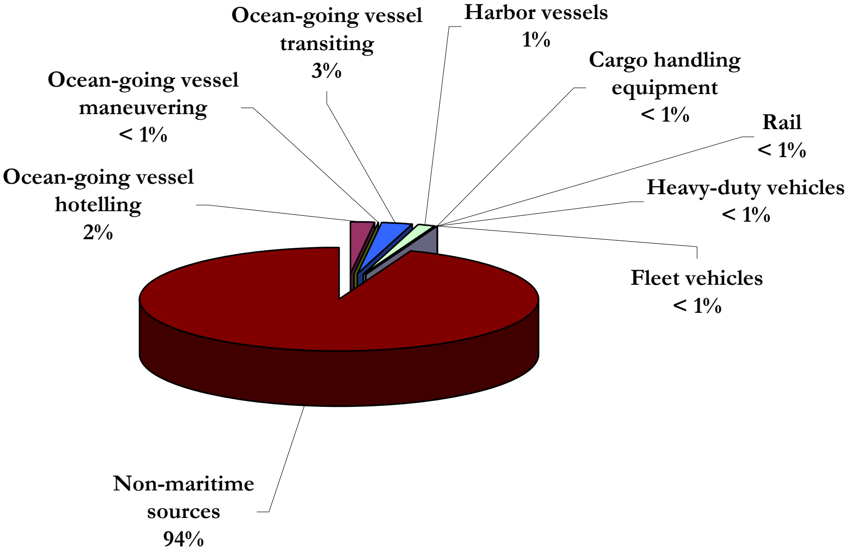
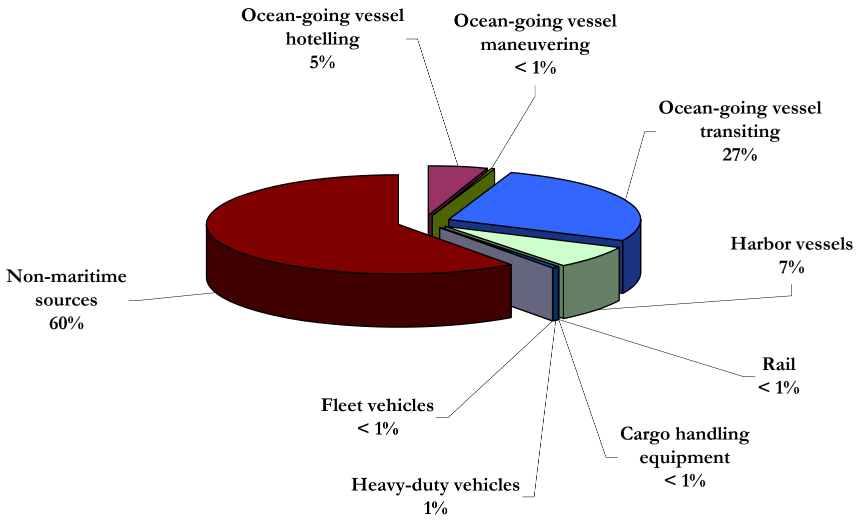


Figure 2.35: Comparison of 2005 Maritime and Non-Maritime DPM Emissions for the Northwest Clean Air Agency Region, tpy



Olympic Region Clean Air Agency

Within the study area the Olympic Region Clean Air Agency administers air quality programs in Clallam, Jefferson, Mason and Thurston Counties. Table 2.11 and Figures 2.36 and 2.37 compare the regional maritime and non-maritime emissions. Figures 2.38 through 2.43 illustrate the relative contributions for NO_x, VOC, CO, SO_2, $PM_{2.5}$ and DPM, respectively.

Table 2.11: Comparison of 2005 Maritime and Non-Maritime Emissions for the Olympic Region Clean Air Agency Region, tpy

Source Category	NOx	VOC	CO	SO_2	$PM_{2.5}$	DPM
Maritime sources:						
Ocean-going vessel:						
Hotelling	163	6	14	469	21	8
Maneuvering	50	4	6	38	3	3
Transiting	7,605	266	623	5,346	379	442
Harbor vessel	892	464	2,386	85	35	31
Rail locomotive	201	10	26	15	6	6
Cargo handling equipment	32	3	22	4	3	3
Heavy-duty vehicle	121	6	32	3	3	3
Fleet vehicle	0	0	0	0	0	0
Maritime subtotal	9,064	759	3,109	5,961	449	495
Non-maritime sources	13,464	16,939	128,731	1,252	3,125	257
Regional emissions	**22,527**	**17,698**	**131,839**	**7,213**	**3,574**	**753**

Figure 2.36: Comparison of 2005 Maritime and Non-Maritime Emissions for the Olympic Region Clean Air Agency Region, tpy

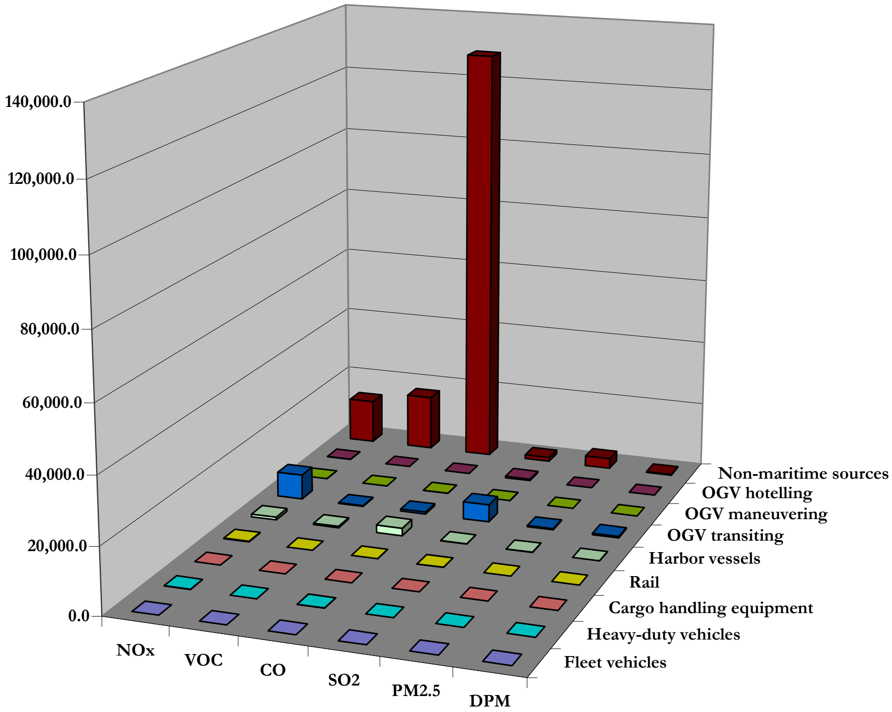


Figure 2.37: Comparison of 2005 Maritime and Non-Maritime Emissions for the Olympic Region Clean Air Agency, %

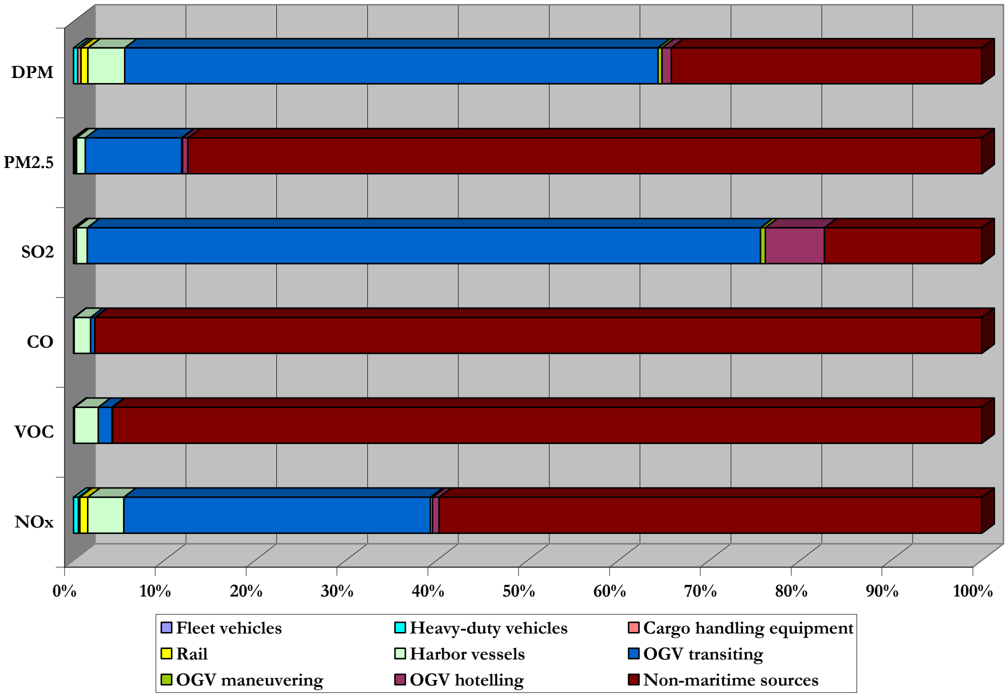


Figure 2.38: Comparison of 2005 Maritime and Non-Maritime NO_x Emissions for the Olympic Region Clean Air Agency Region, tpy

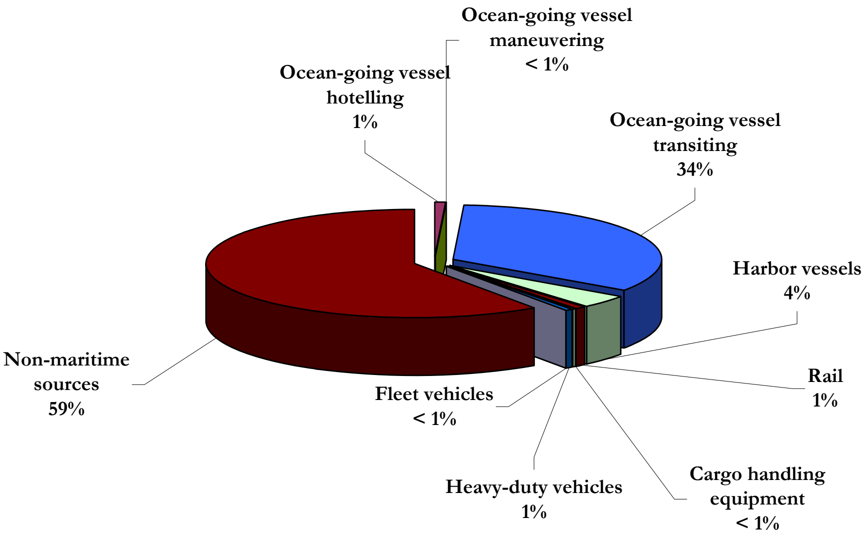


Figure 2.39: Comparison of 2005 Maritime and Non-Maritime VOC Emissions for the Olympic Region Clean Air Agency Region, tpy

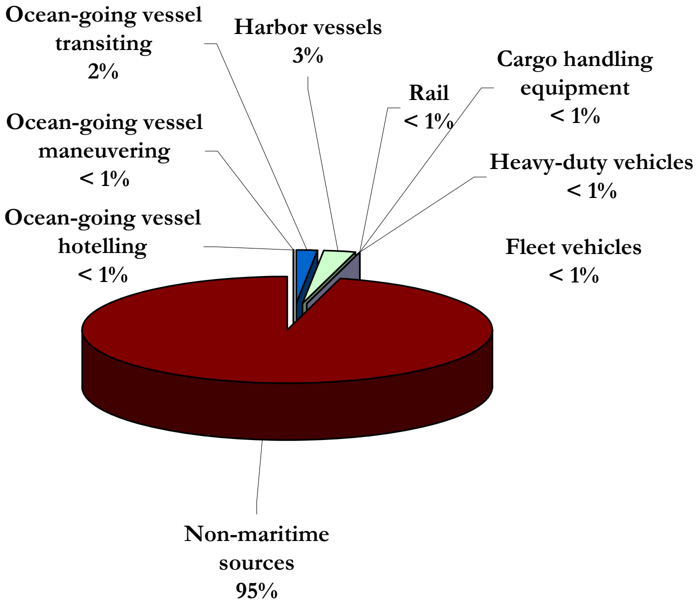


Figure 2.40: Comparison of 2005 Maritime and Non-Maritime CO Emissions for the Olympic Region Clean Air Agency Region, tpy

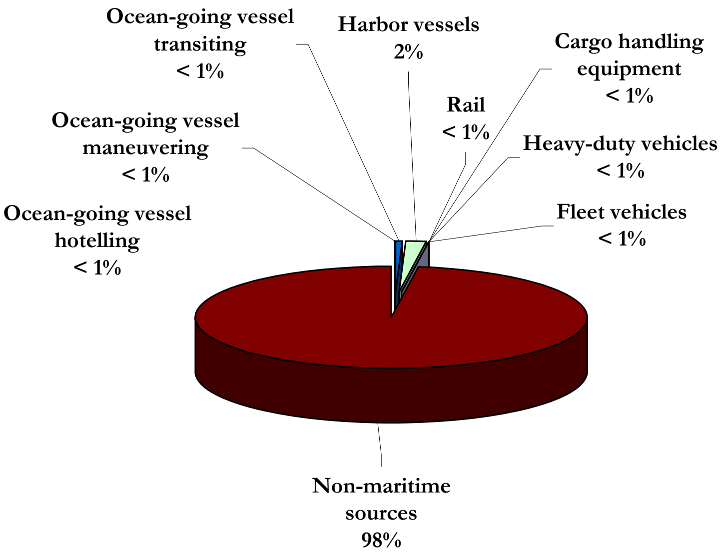


Figure 2.41: Comparison of 2005 Maritime and Non-Maritime SO_2 Emissions for the Olympic Region Clean Air Agency Region, tpy

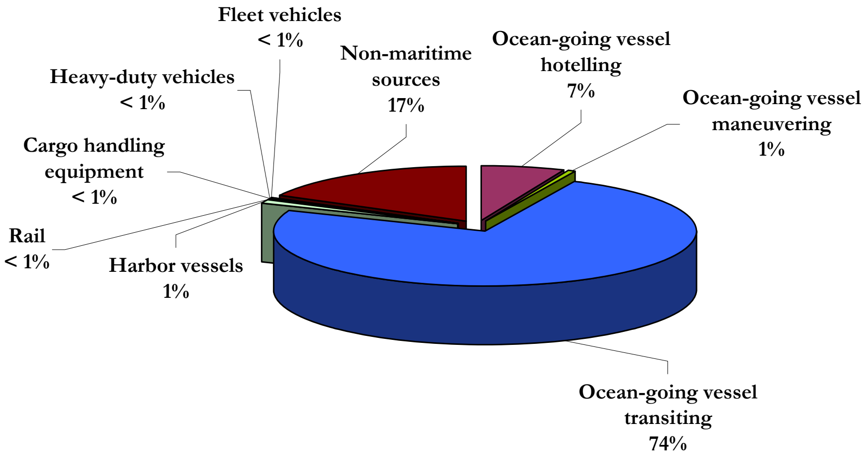


Figure 2.42: Comparison of 2005 Maritime and Non-Maritime $PM_{2.5}$ Emissions for the Olympic Region Clean Air Agency Region, tpy

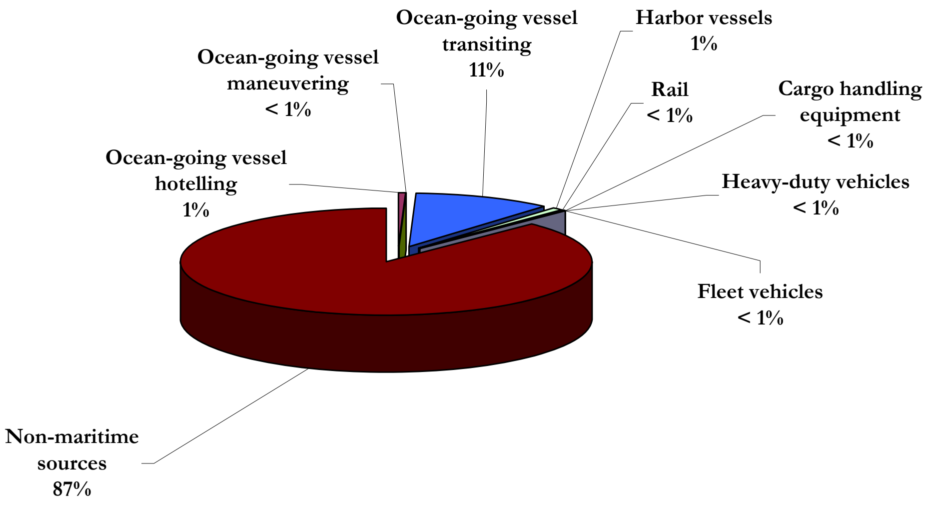
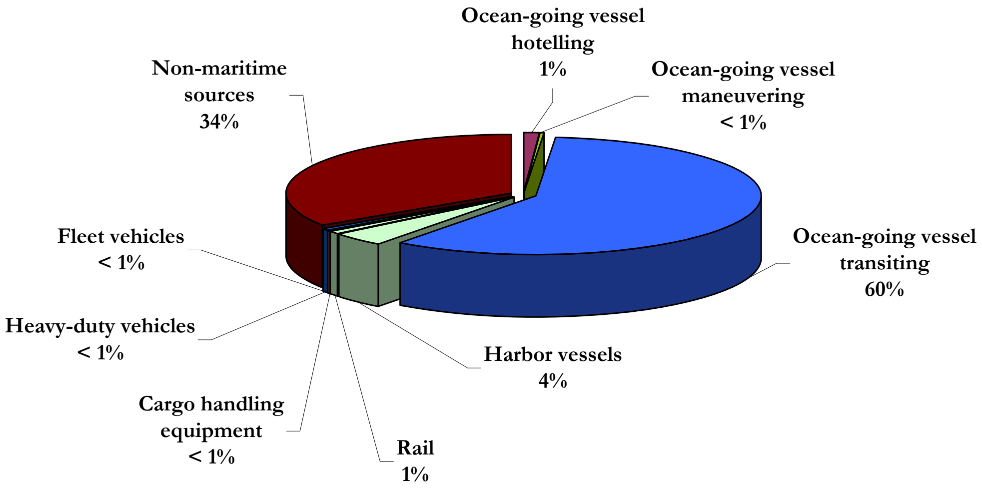


Figure 2.43: Comparison of 2005 Maritime and Non-Maritime DPM Emissions for the Olympic Region Clean Air Agency Region, tpy



Puget Sound Clean Air Agency

The Puget Sound Clean Air Agency administers air quality programs in King, Kitsap, Pierce and Snohomish Counties. Table 2.12 and Figures 2.44 and 2.45 compare the regional maritime and non-maritime emissions. Figures 2.46 through 2.51 illustrate the relative contributions for NO_x, VOC and CO, SO_2, and $PM_{2.5}$ and DPM, respectively.

In addition, maritime and non-maritime heavy-duty vehicle and rail locomotive emissions for the region are compared in Figures 2.92 and 2.93, respectively.

Table 2.12: Comparison of 2005 Maritime and Non-Maritime Emissions for the Puget Sound Clean Air Agency Region, tpy

Source Category	NOx	VOC	CO	SO_2	$PM_{2.5}$	DPM	GHG
Maritime sources:							
Ocean-going vessel:							
Hotelling	1,611	50	133	2,064	115	102	133,923
Maneuvering	236	17	24	133	13	16	8,787
Transiting	1,851	65	151	1,228	90	107	76,848
Harbor vessel	7,654	1,724	8,462	351	374	382	537,688
Rail locomotive	2,264	114	293	173	59	62	98,640
Cargo handling equipment	1,123	100	896	76	69	71	109,402
Heavy-duty vehicle	1,095	63	395	33	36	36	148,359
Fleet vehicle	10	5	50	0	0	0	3,346
Maritime subtotal	15,843	2,137	10,403	4,058	756	777	1,116,994
Non-maritime sources	127,642	105,860	1,111,923	8,139	19,403	2,003	41,562,997
Regional emissions	**143,485**	**107,997**	**1,122,327**	**12,197**	**20,159**	**2,780**	**42,679,991**

Figure 2.44: Comparison of 2005 Maritime and Non-Maritime Emissions for the Puget Sound Clean Air Agency Region, tpy

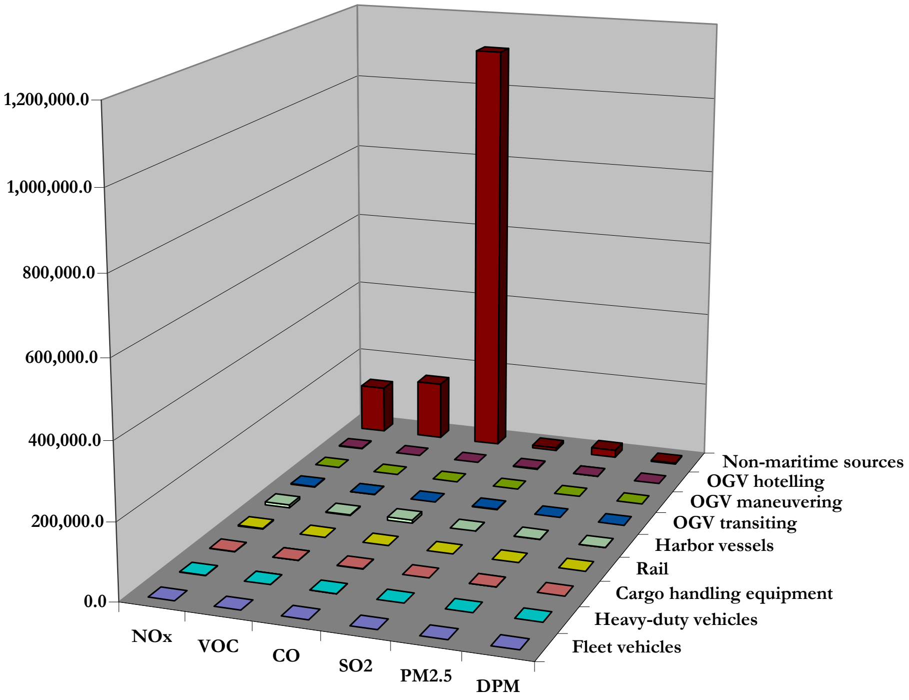


Figure 2.45: Comparison of 2005 Maritime and Non-Maritime Emissions for the Puget Sound Clean Air Agency Region, %

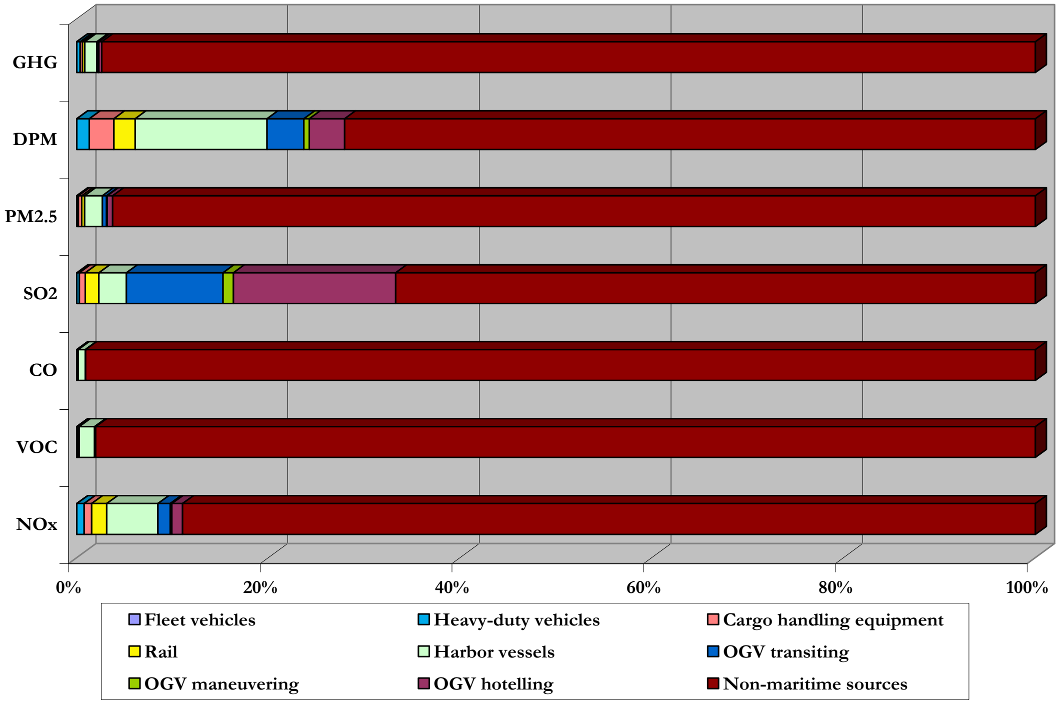


Figure 2.46: Comparison of 2005 Maritime and Non-Maritime NO_x Emissions for the Puget Sound Clean Air Agency Region, tpy

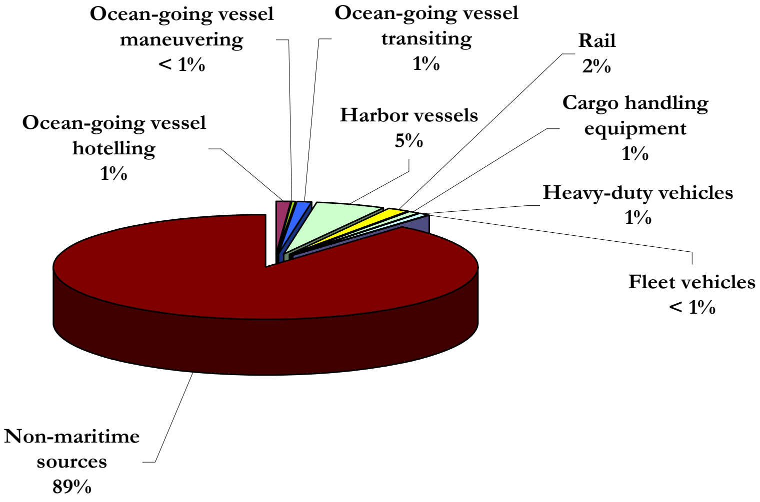


Figure 2.47: Comparison of 2005 Maritime and Non-Maritime VOC Emissions for the Puget Sound Clean Air Agency Region, tpy

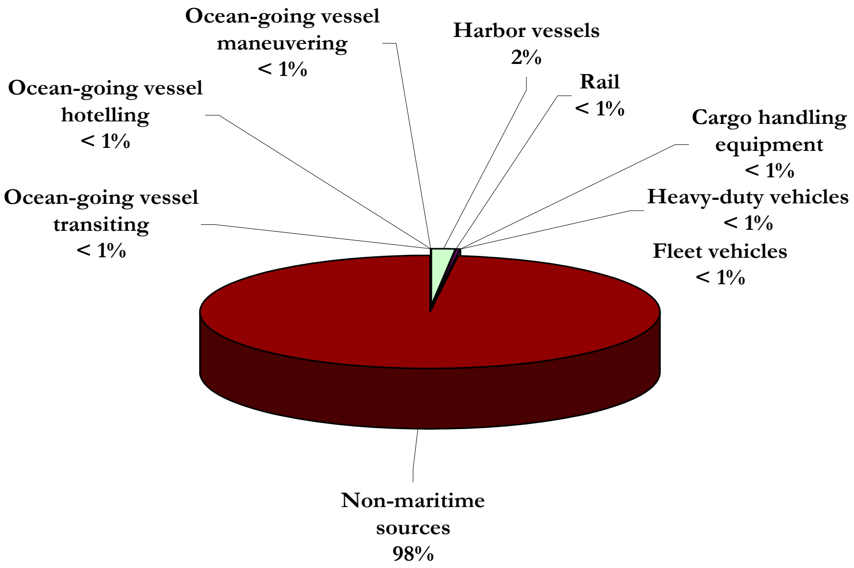


Figure 2.48: Comparison of 2005 Maritime and Non-Maritime CO Emissions for the Puget Sound Clean Air Agency Region, tpy

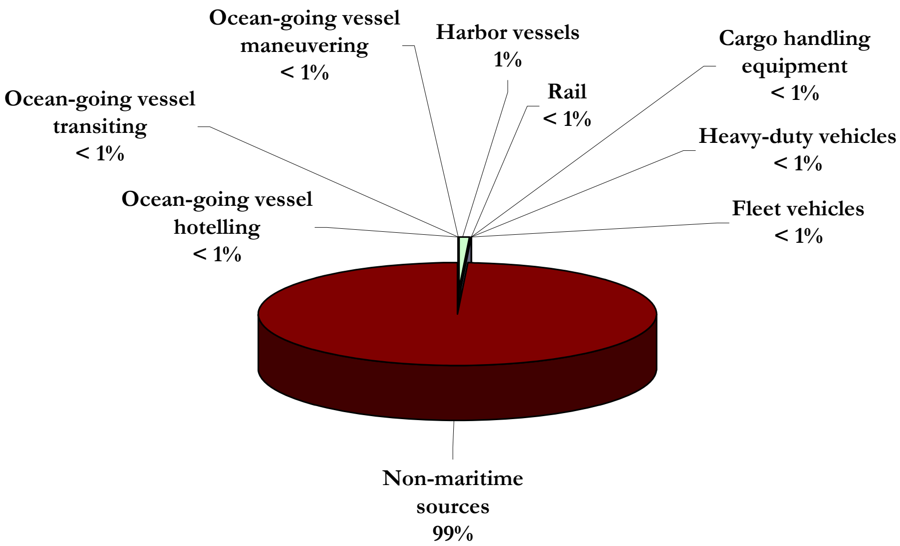


Figure 2.49: Comparison of 2005 Maritime and Non-Maritime SO_2 Emissions for the Puget Sound Clean Air Agency Region, tpy

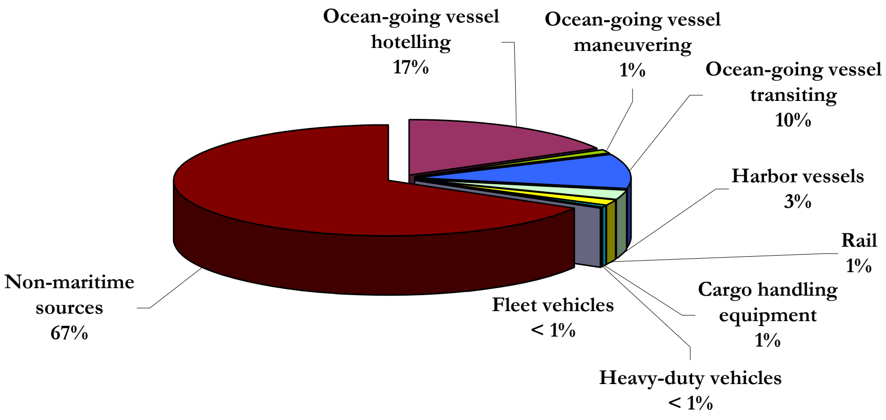


Figure 2.50: Comparison of 2005 Maritime and Non-Maritime $PM_{2.5}$ Emissions for the Puget Sound Clean Air Agency Region, tpy

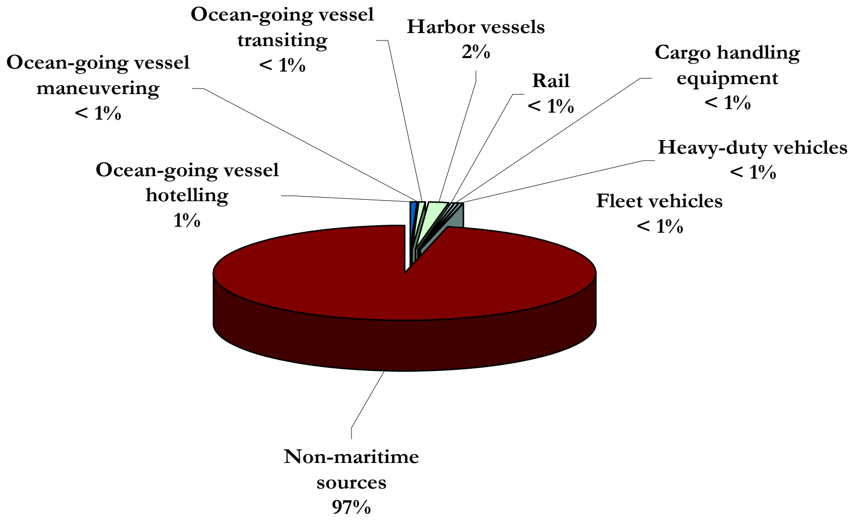
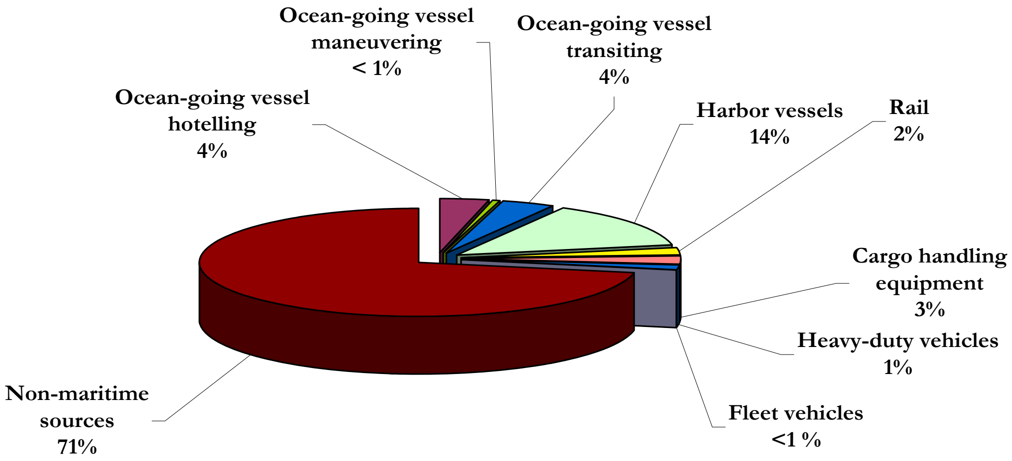


Figure 2.51: Comparison of 2005 Maritime and Non-Maritime DPM Emissions for the Puget Sound Clean Air Agency Region, tpy



Figures 2.52 and 2.53 compare 2005 maritime and non-maritime related emissions from heavy-duty vehicles and rail locomotives, respectively, for the Puget Sound Clean Air Agency region.

Figure 2.52: Comparison of 2005 Puget Sound Clean Air Agency Region Heavy-Duty Vehicle Emissions, %

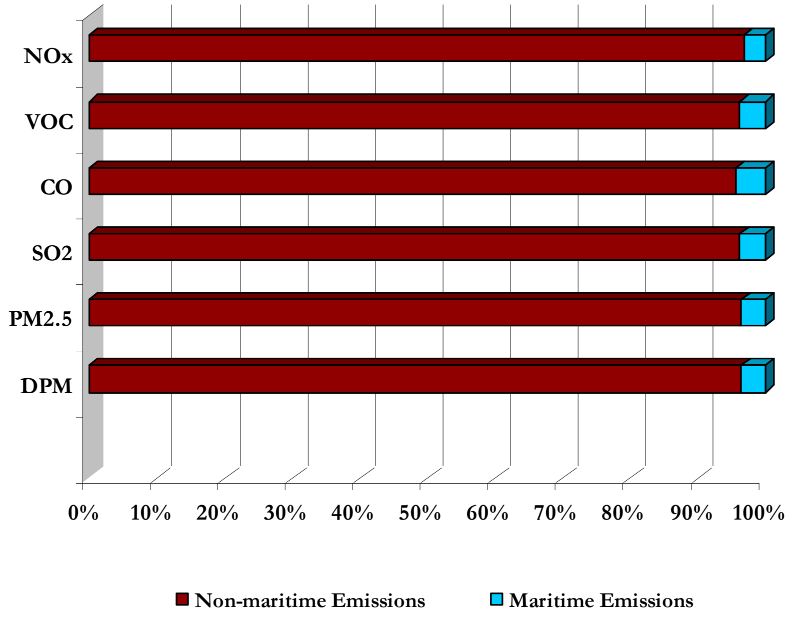
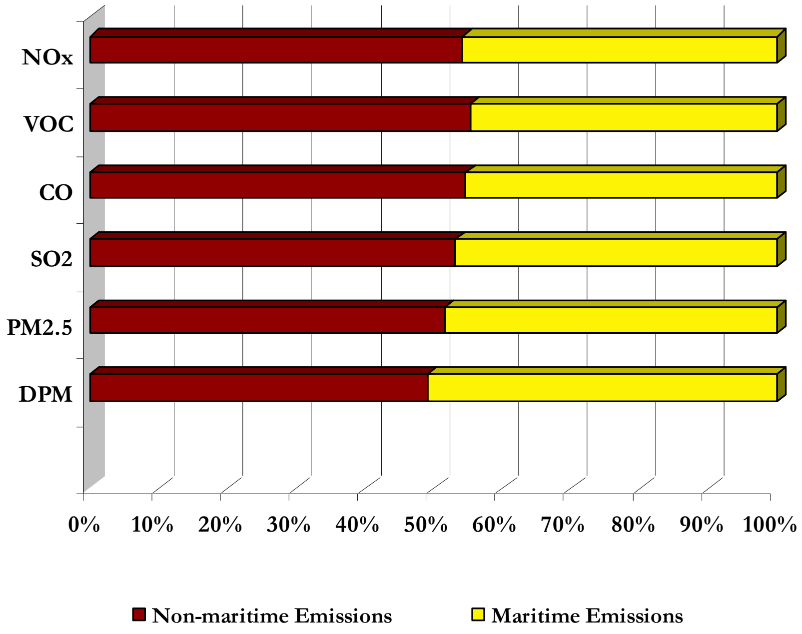


Figure 2.53: Comparison of 2005 Puget Sound Clean Air Agency Region Rail Locomotive Emissions, %



2.3 Port and Petroleum Facility Summaries

This section includes summaries of maritime emissions associated with the Ports of Seattle, Tacoma and Everett. Ocean-going vessel hotelling and maneuvering emissions for petroleum facilities are also included. For these summaries, the source category emissions were tabulated as follows:

- Ocean-going vessels (including hotelling and maneuvering only; transiting mode does not occur near the ports or petroleum facilities).
- Harbor vessels (including recreational vessels only; harbor craft and tank barges are typically not associated with a port or petroleum facility).
- Cargo handling equipment (including rail yard cargo handling equipment).
- Rail locomotives, off-terminal (including line haul activity for the Ports of Seattle and Tacoma). These estimates are included as line items in the Port of Tacoma and Port of Seattle tables but are not included in the corresponding figures.
- Rail locomotives, on-terminal (including line haul and switching activity).
- Heavy-duty vehicles, off-terminal (has not been included because the method of developing the estimates does not support associating the emissions with a specific port or petroleum facility).
- Heavy-duty vehicles, on-terminal (including heavy-duty vehicle activity associated with rail yards).
- Fleet vehicles (including, where applicable, on-terminal fleet light- and heavy-duty vehicles, cruise terminal passenger-owned vehicles using cruise terminal parking areas, minivans shuttling cruise passengers, and new import or export vehicles that are driven onto or off of ocean-going vessels).

Table 2.13 and Figures 2.52 through 2.61 represent emissions associated with the Port of Seattle. Table 2.14 and Figures 2.62 through 2.69 represent emissions associated with the Port of Tacoma. Table 2.15 and Figures 2.70 through 2.77 represent emissions associated with the Port of Everett. Table 2.16 and Figures 2.78 through 2.85 represent emissions associated with the petroleum facilities, described further in Section 3.8.2. Select maneuvering areas are illustrated in Appendix E-1.2.

Table 2.13: Port of Seattle 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Ocean-going vessels:								
Hotelling	720	22	60	867	64	51	49	55,738
Maneuvering	150	13	17	79	11	8	10	5,586
Transiting	--	--	--	--	--	--	--	--
Harbor (recreational) vessels	52	214	1,089	1	4	4	0	8,033
Rail, off-terminal	578	27	76	44	16	14	16	27,337
Rail, on-terminal	448	25	55	40	13	12	13	18,023
Cargo handling equipment	547	60	656	68	37	35	36	50,401
Heavy-duty vehicles, off-terminal	--	--	--	--	--	--	--	--
Heavy-duty vehicles, on-terminal	166	15	119	3	3	3	3	14,743
Fleet vehicles	5	3	31	0	0	0	0	1,409
Total	**2,665**	**379**	**2,102**	**1,102**	**147**	**128**	**128**	**181,271**

Figure 2.52: Port of Seattle 2005 Maritime Air Emissions Inventory Summary, tpy

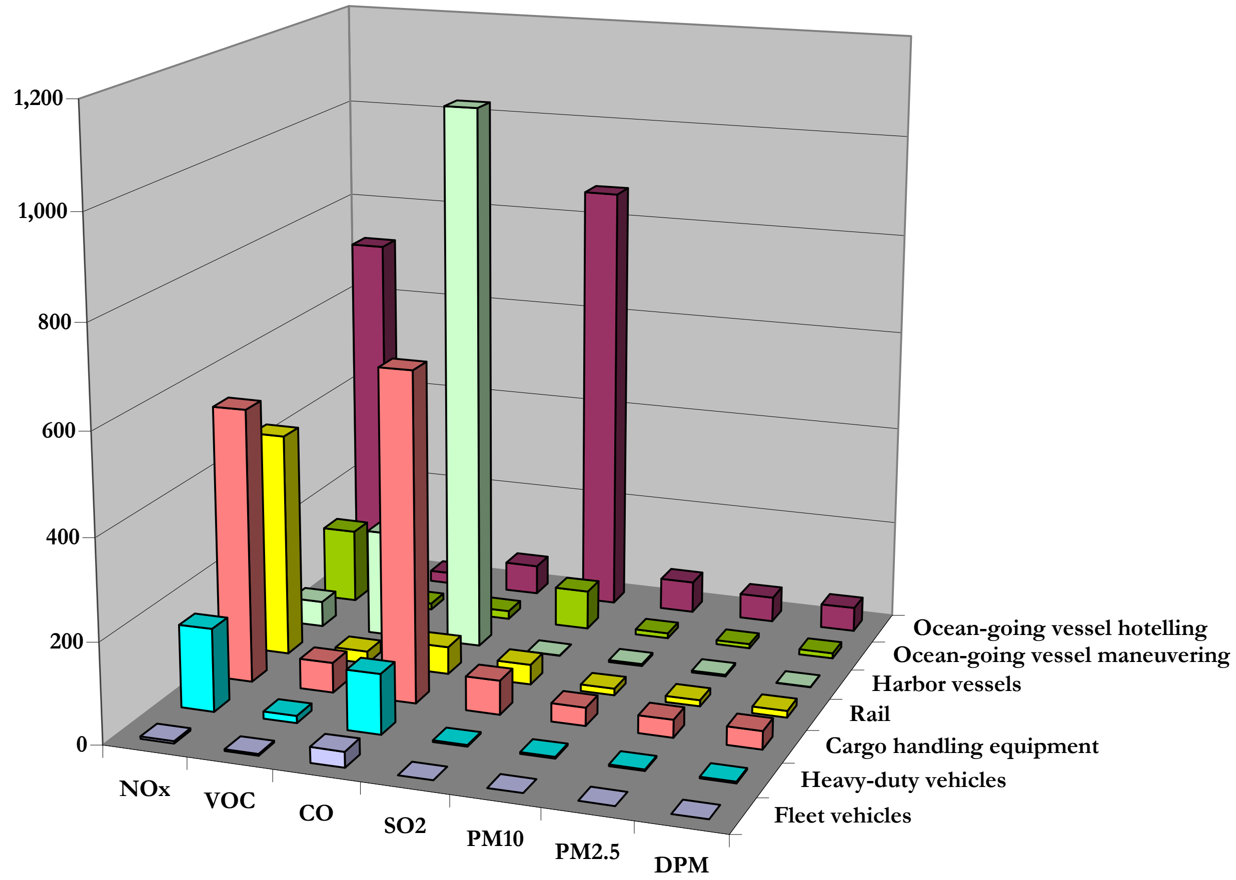


Figure 2.53: Port of Seattle 2005 Maritime Air Emissions Inventory Summary, %

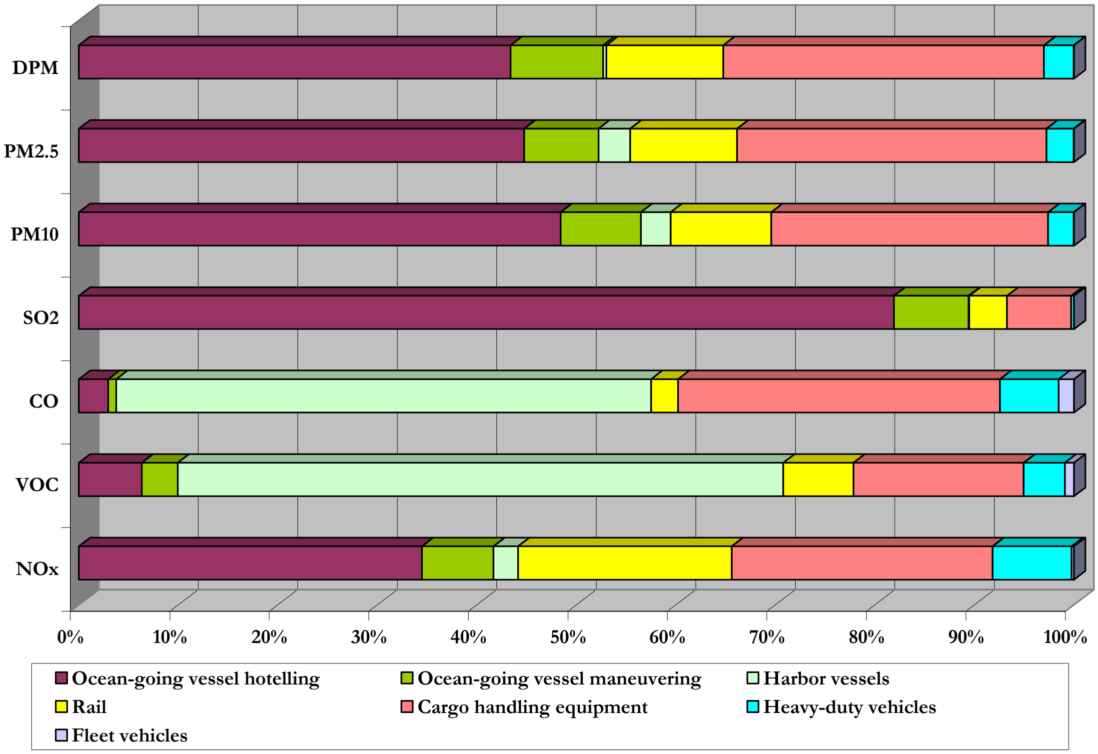


Figure 2.54: Port of Seattle 2005 Maritime NO$_x$ Emissions by Source Category, tpy

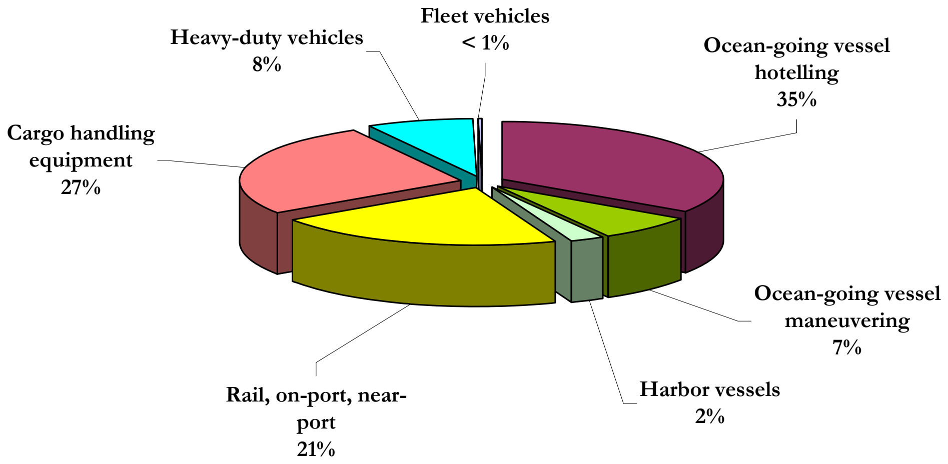


Figure 2.55: Port of Seattle 2005 Maritime VOC Emissions by Source Category, tpy

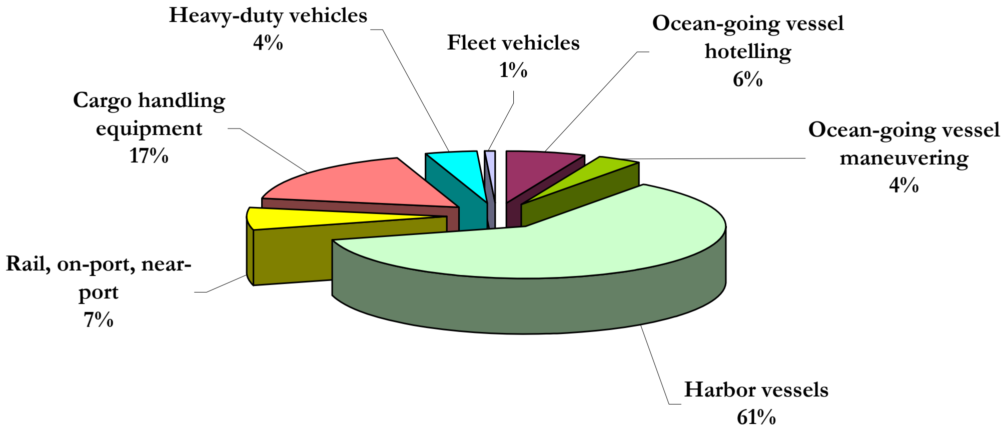


Figure 2.56: Port of Seattle 2005 Maritime CO Emissions by Source Category, tpy

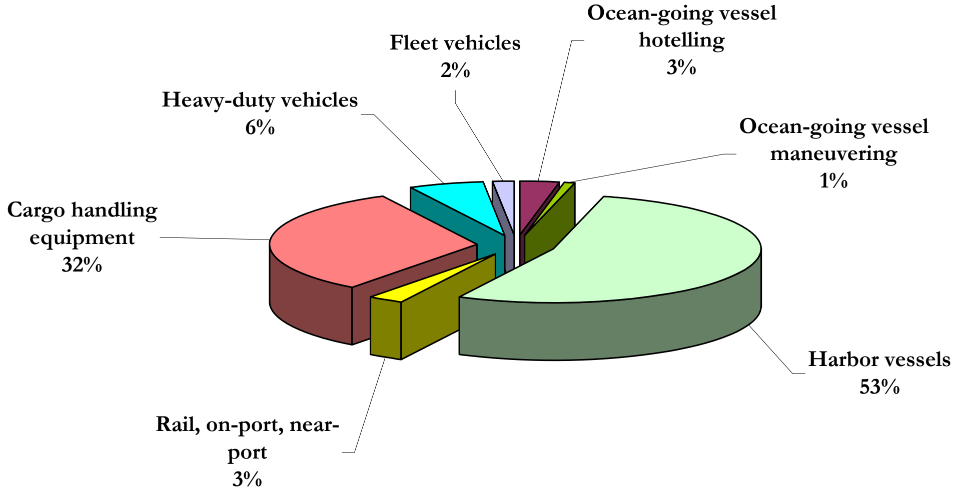


Figure 2.57: Port of Seattle 2005 Maritime SO_2 Emissions by Source Category, tpy

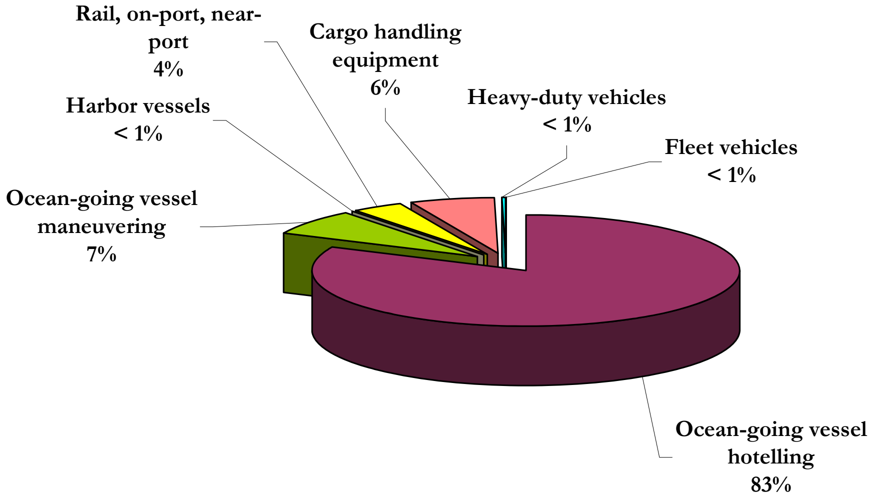


Figure 2.58: Port of Seattle 2005 Maritime PM_{10} Emissions by Source Category, tpy

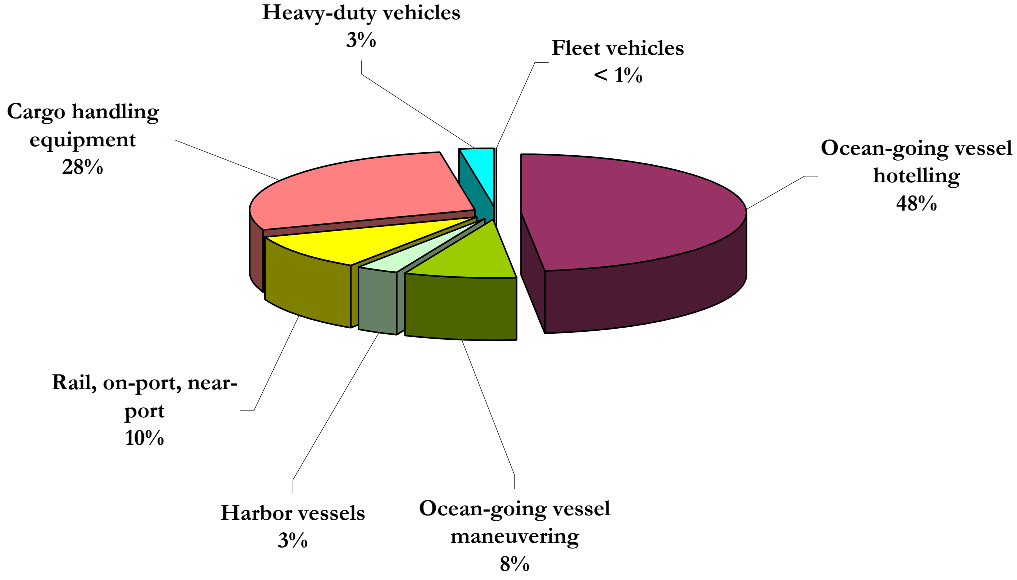


Figure 2.59: Port of Seattle 2005 Maritime $PM_{2.5}$ Emissions by Source Category, tpy

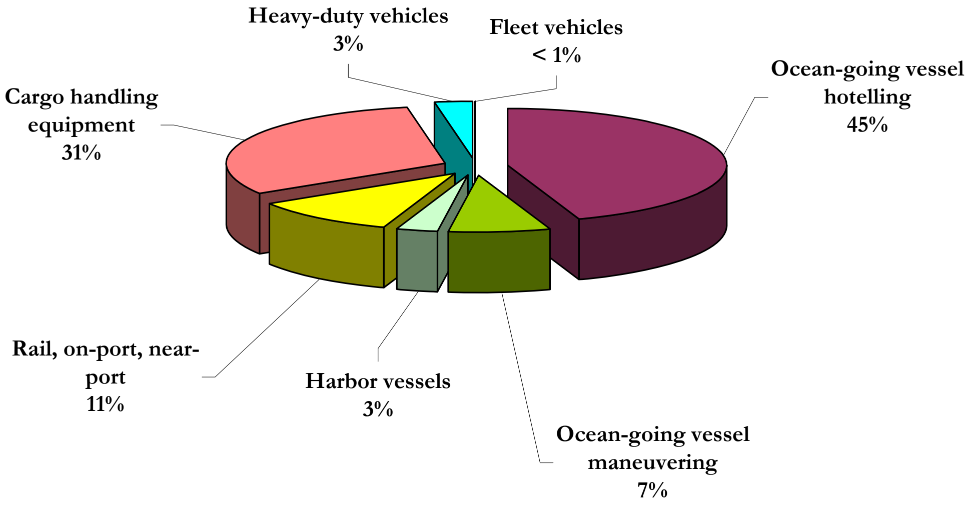


Figure 2.60: Port of Seattle 2005 Maritime DPM Emissions by Source Category, tpy

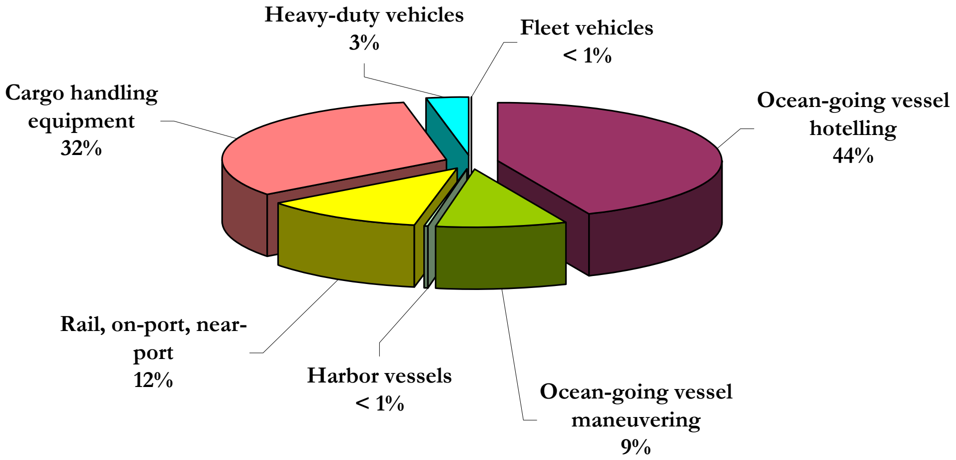


Figure 2.61: Port of Seattle 2005 Maritime Greenhouse Gas Emissions by Source Category, CO_2 equivalent, tpy

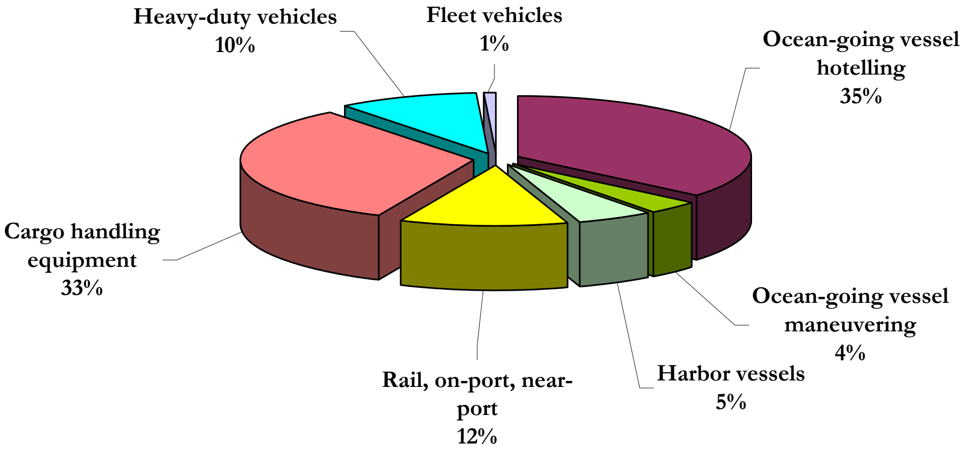


Table 2.14: Port of Tacoma 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Ocean-going vessels:								
Hotelling	513	16	43	611	42	34	29	43,026
Maneuvering	94	5	9	57	6	5	6	3,509
Transiting	--	--	--	--	--	--	--	--
Harbor (recreational) vessels	2	8	42	0	0	0	0	309
Rail, off-terminal	706	30	90	52	17	15	17	32,517
Rail, on-terminal	589	33	71	46	17	16	17	22,679
Cargo handling equipment	586	39	226	7	34	33	34	60,925
Heavy-duty vehicles, off-terminal	--	--	--	--	--	--	--	--
Heavy-duty vehicles, on-terminal	48	4	35	1	1	1	1	4,162
Fleet vehicles	4	2	16	0	0	0	0	1,812
Total	**2,542**	**138**	**531**	**773**	**118**	**104**	**104**	**168,939**

Figure 2.62: Port of Tacoma 2005 Maritime Air Emissions Inventory Summary, tpy

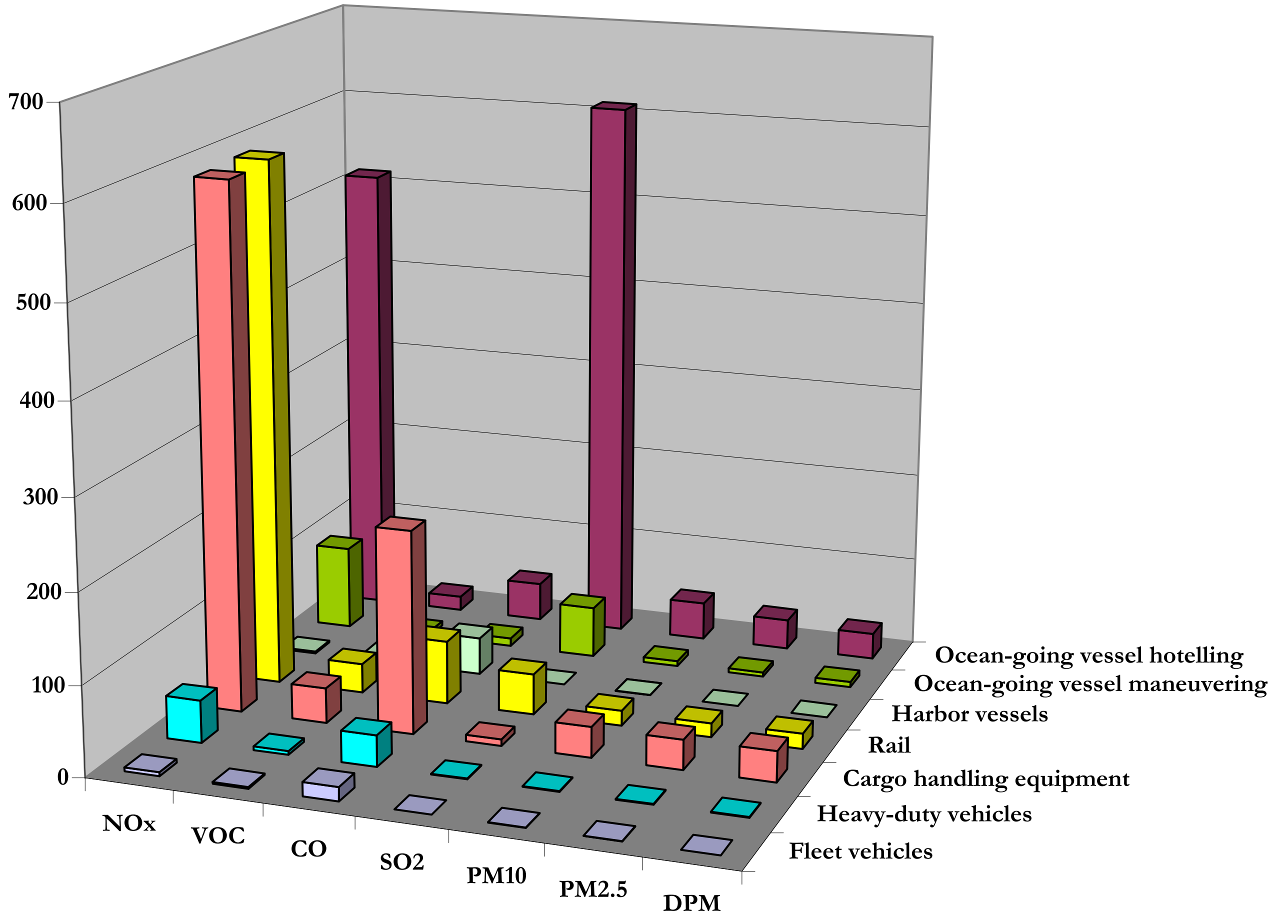


Figure 2.63: Port of Tacoma 2005 Maritime Air Emissions Inventory Summary, %

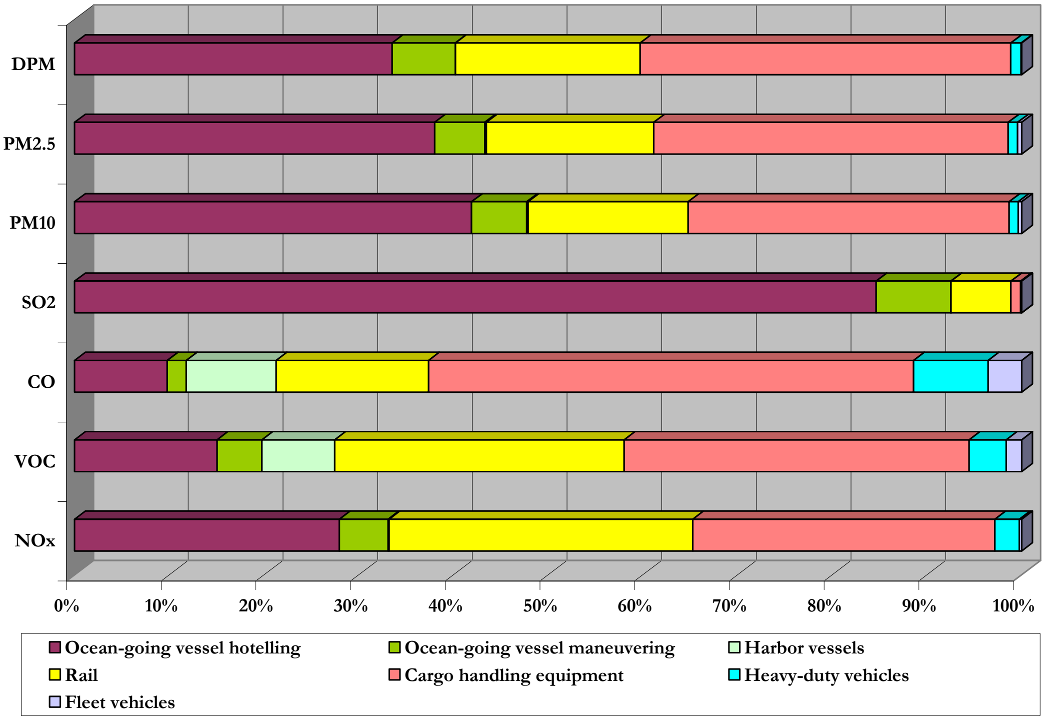


Figure 2.64: Port of Tacoma 2005 Maritime NO_x Emissions by Source Category, tpy

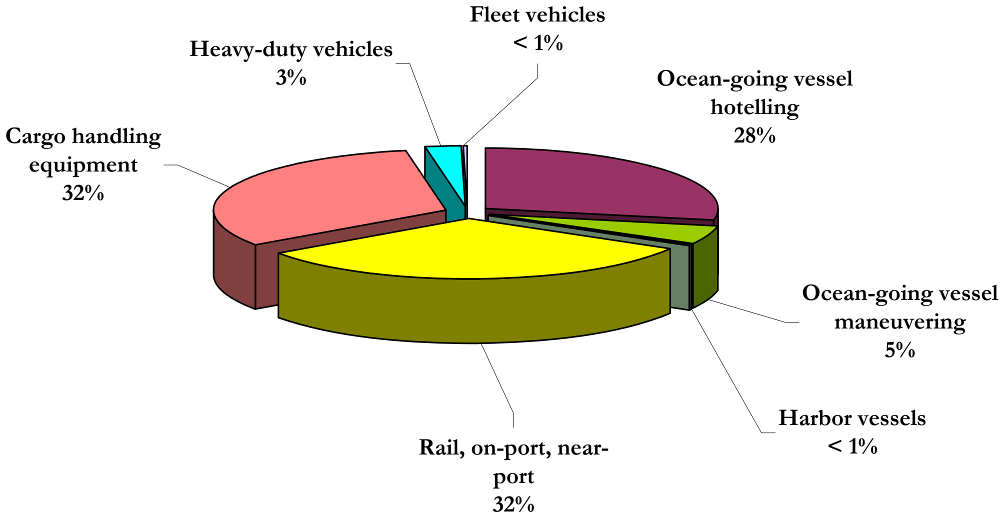


Figure 2.65: Port of Tacoma 2005 Maritime VOC Emissions by Source Category, tpy

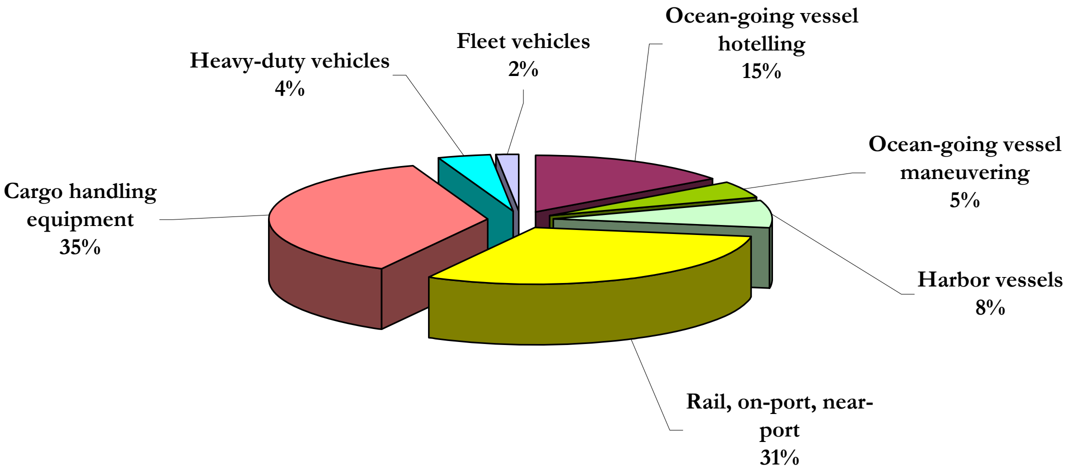


Figure 2.66: Port of Tacoma 2005 Maritime CO Emissions by Source Category, tpy

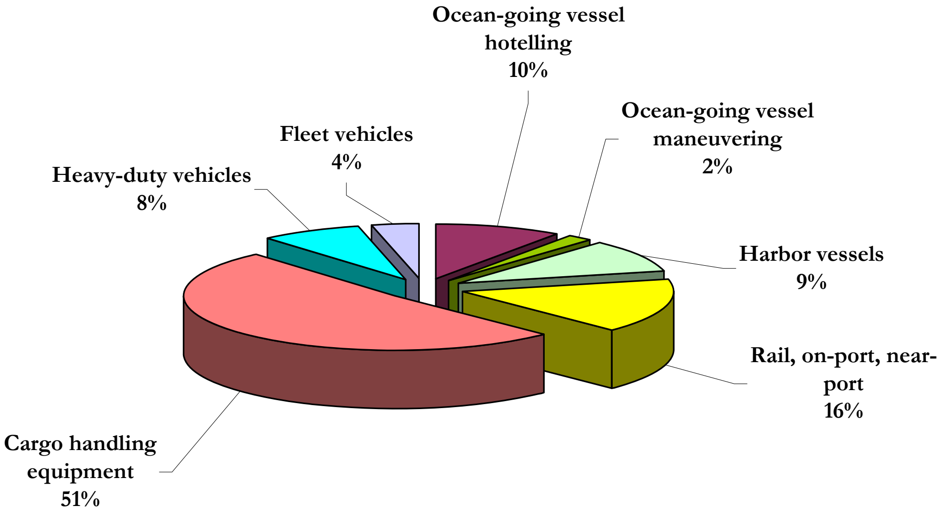


Figure 2.67: Port of Tacoma 2005 Maritime SO_2 Emissions by Source Category, tpy

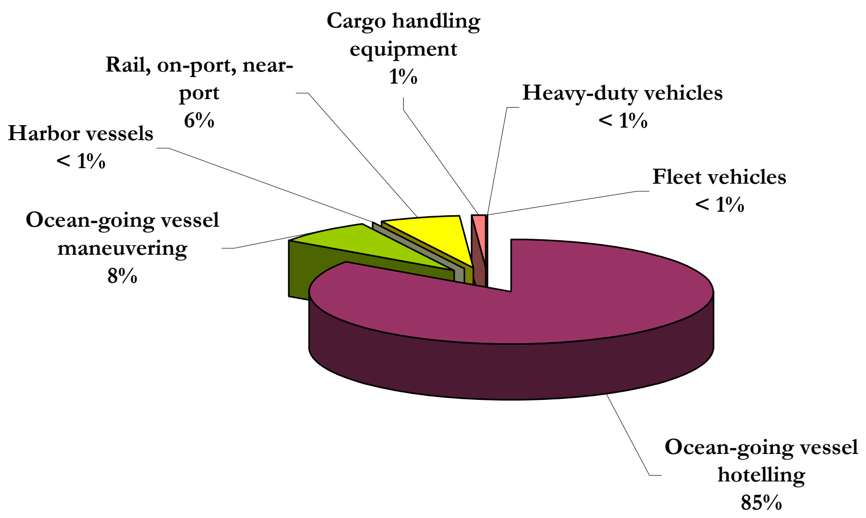


Figure 2.68: Port of Tacoma 2005 Maritime PM_{10} Emissions by Source Category, tpy

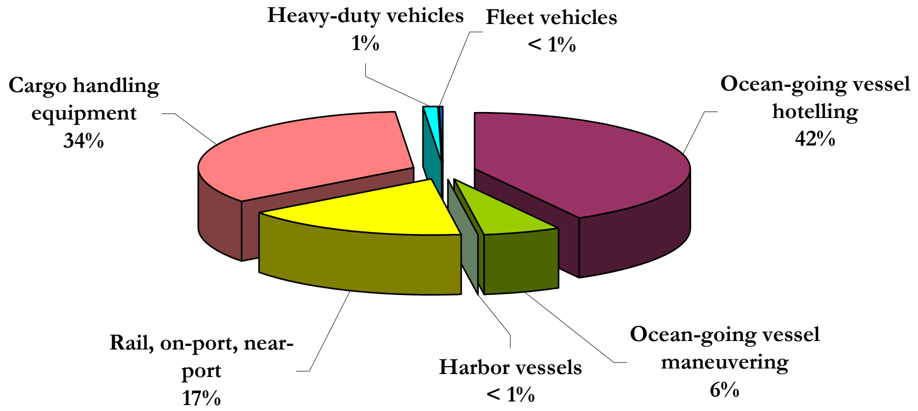


Figure 2.69: Port of Tacoma 2005 Maritime $PM_{2.5}$ Emissions by Source Category, tpy

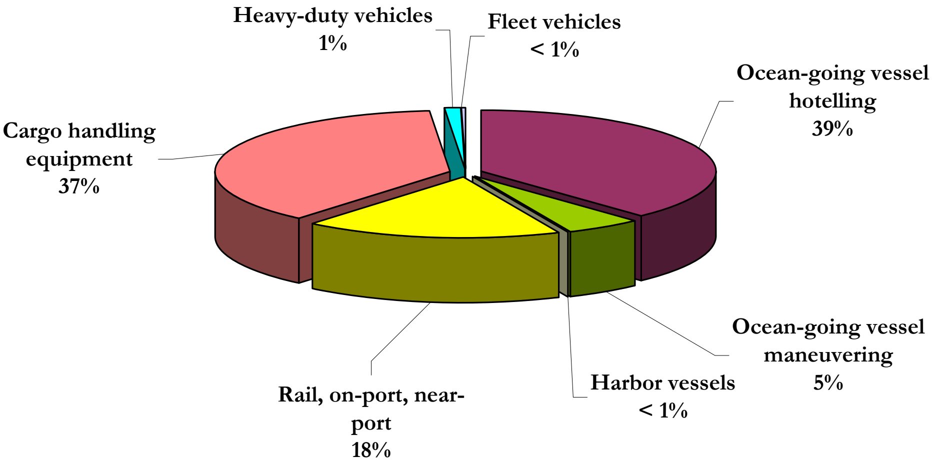


Figure 2.70: Port of Tacoma 2005 Maritime DPM Emissions by Source Category, tpy

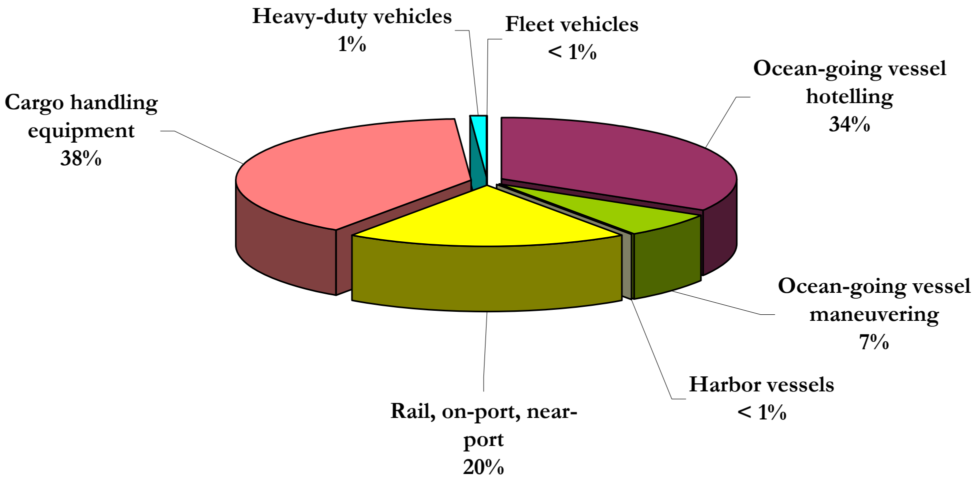


Figure 2.71: Port of Tacoma 2005 Maritime Greenhouse Gas Emissions by Source Category, CO_2 equivalent, tpy

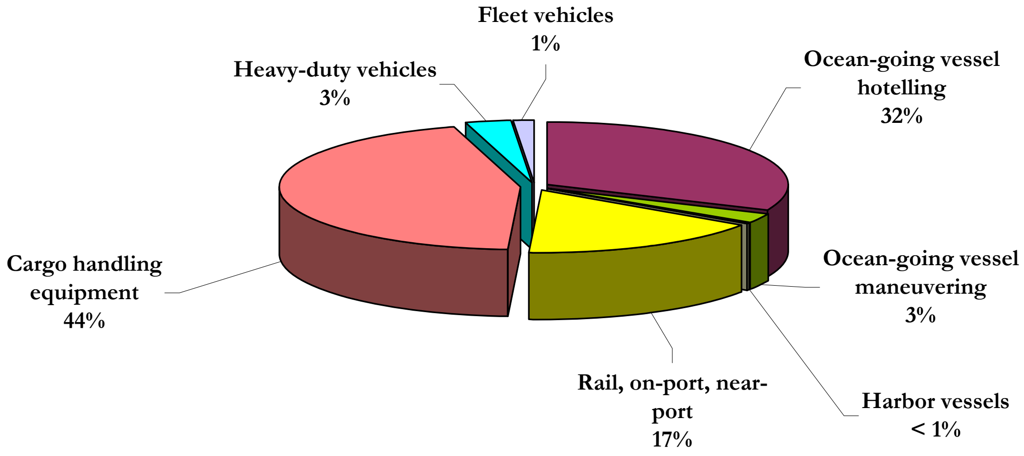


Table 2.15: Port of Everett 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Ocean-going vessels:								
Hotelling	21	1	2	33	2	2	1	1,996
Maneuvering	2	0	0	1	0	0	0	64
Transiting	--	--	--	--	--	--	--	--
Harbor (recreational) vessels	63	259	1,316	1	5	4	0	9,710
Rail, off-terminal	--	--	--	--	--	--	--	--
Rail, on-terminal	80	5	8	5	2	2	2	2,241
Cargo handling equipment	23	2	22	2	2	2	2	1,392
Heavy-duty vehicles, off-terminal	--	--	--	--	--	--	--	--
Heavy-duty vehicles, on-terminal	1	0	1	0	0	0	0	130
Fleet vehicles	1	0	3	0	0	0	0	126
Total	**191**	**267**	**1,353**	**42**	**12**	**11**	**6**	**15,660**

Figure 2.72: Port of Everett 2005 Maritime Air Emissions Inventory Summary, tpy

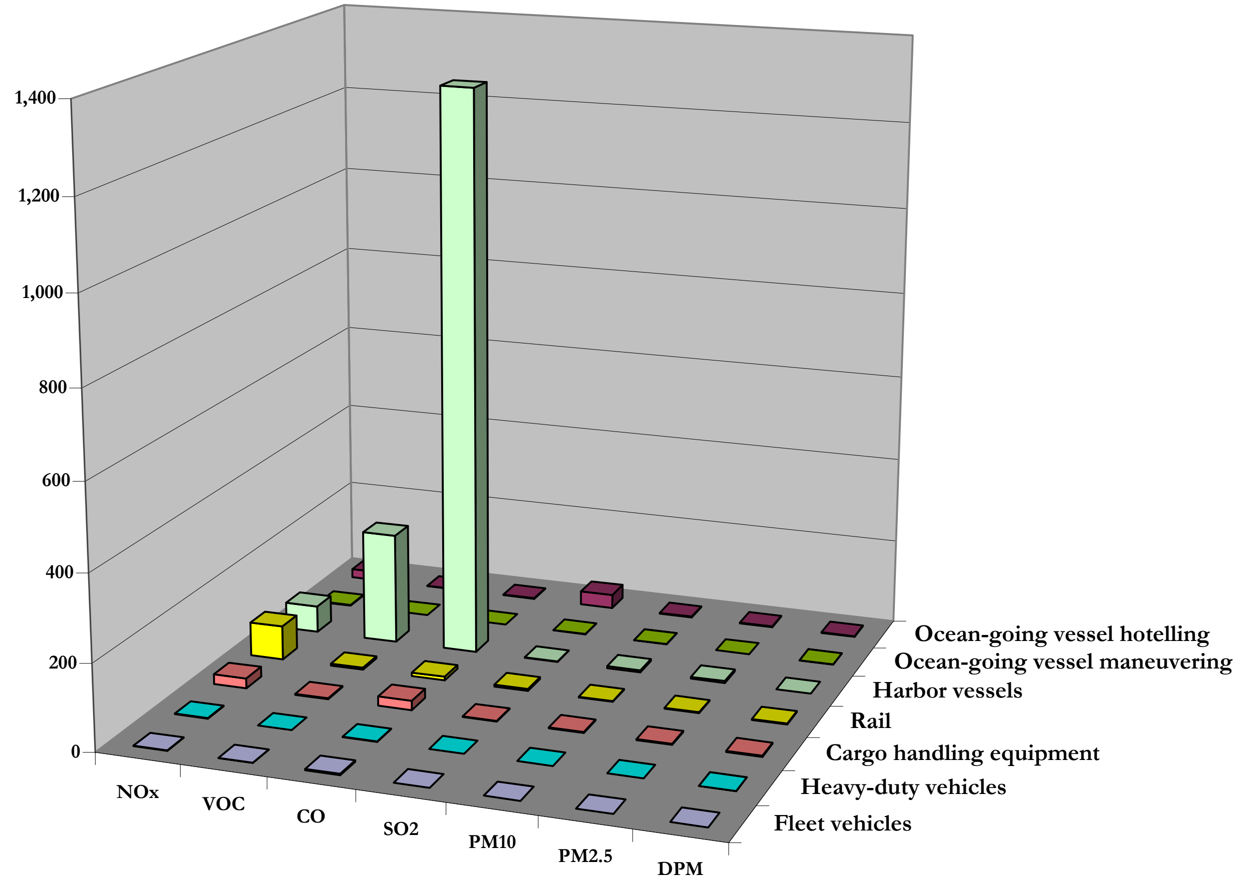


Figure 2.73: Port of Everett 2005 Maritime Air Emissions Inventory Summary, %

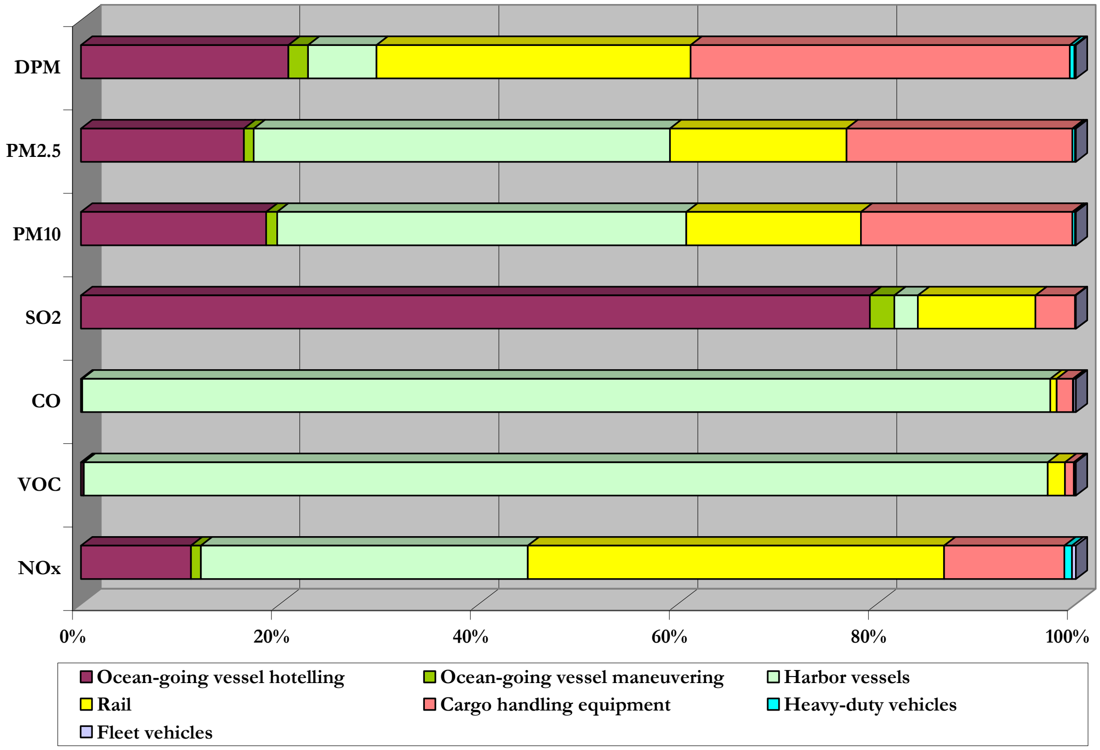


Figure 2.74: Port of Everett 2005 Maritime NO_x Emissions by Source Category, tpy

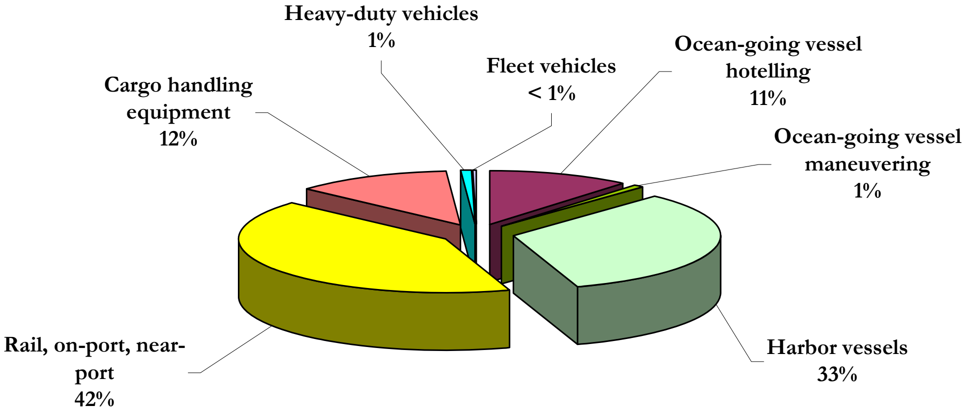


Figure 2.75: Port of Everett 2005 Maritime VOC Emissions by Source Category, tpy

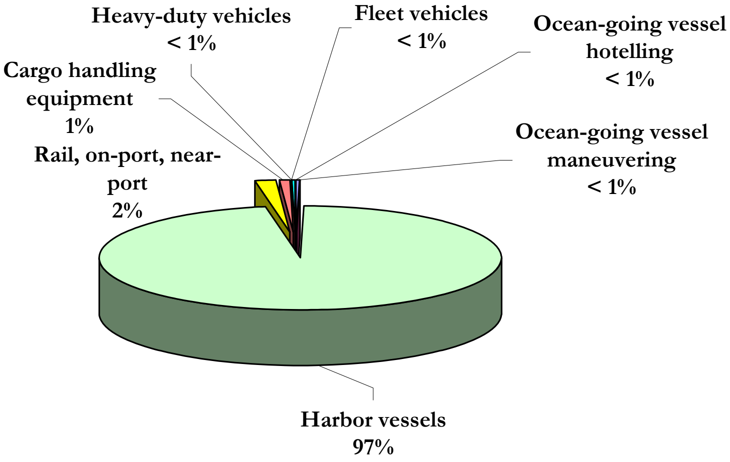


Figure 2.76: Port of Everett 2005 Maritime CO Emissions by Source Category, tpy

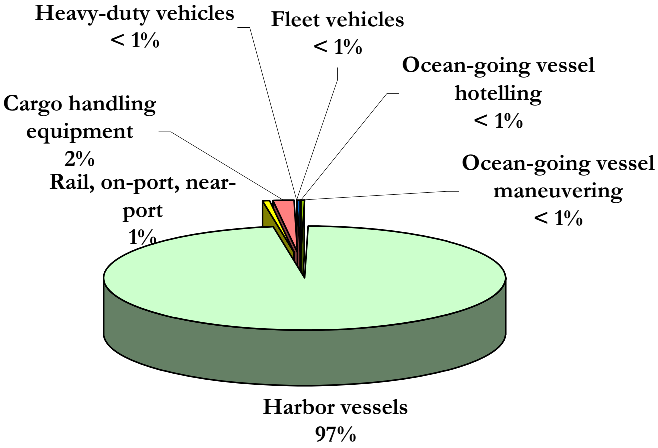


Figure 2.77: Port of Everett 2005 Maritime SO_2 Emissions by Source Category, tpy

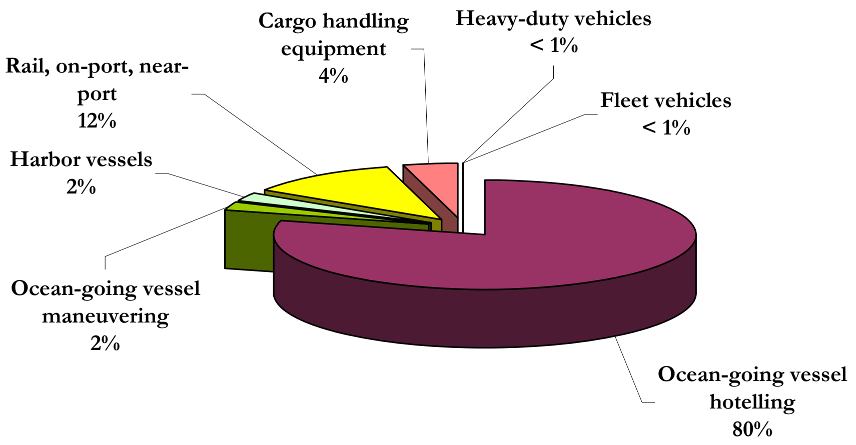


Figure 2.78: Port of Everett 2005 Maritime PM_{10} Emissions by Source Category, tpy

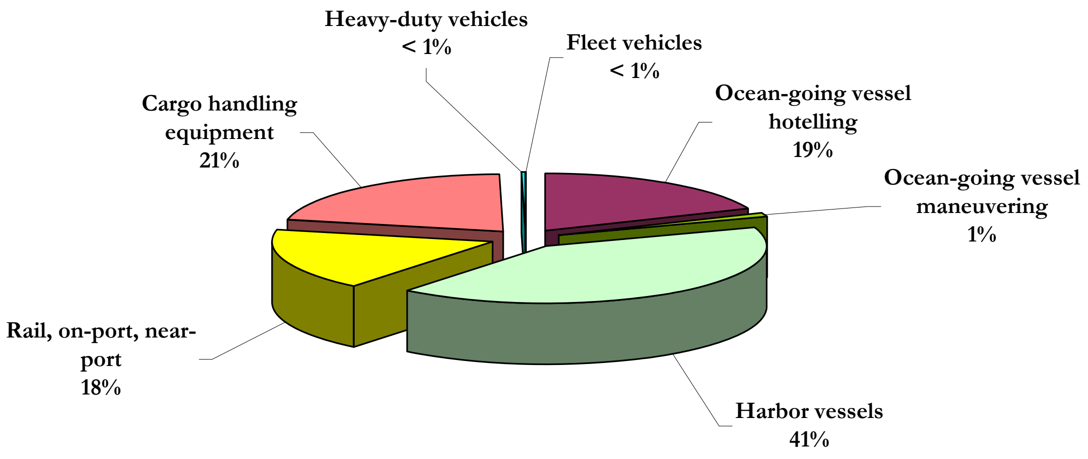


Figure 2.79: Port of Everett 2005 Maritime $PM_{2.5}$ Emissions by Source Category, tpy

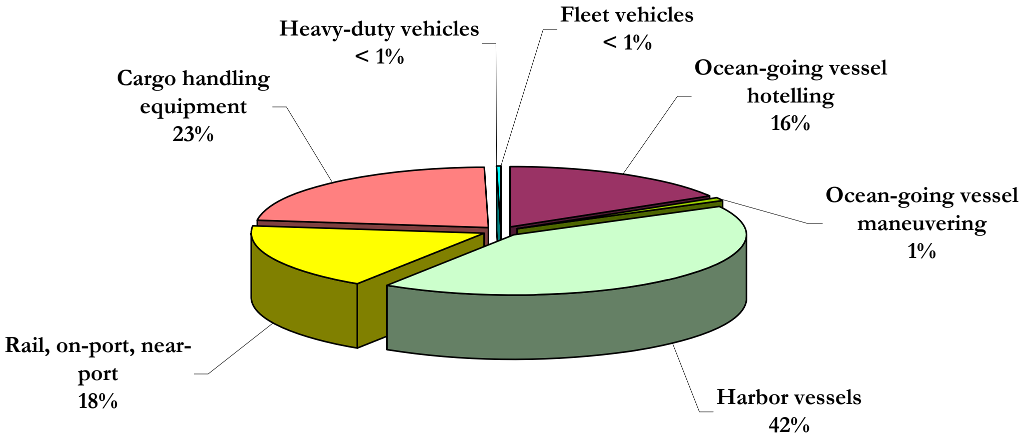


Figure 2.80: Port of Everett 2005 Maritime DPM Emissions by Source Category, tpy

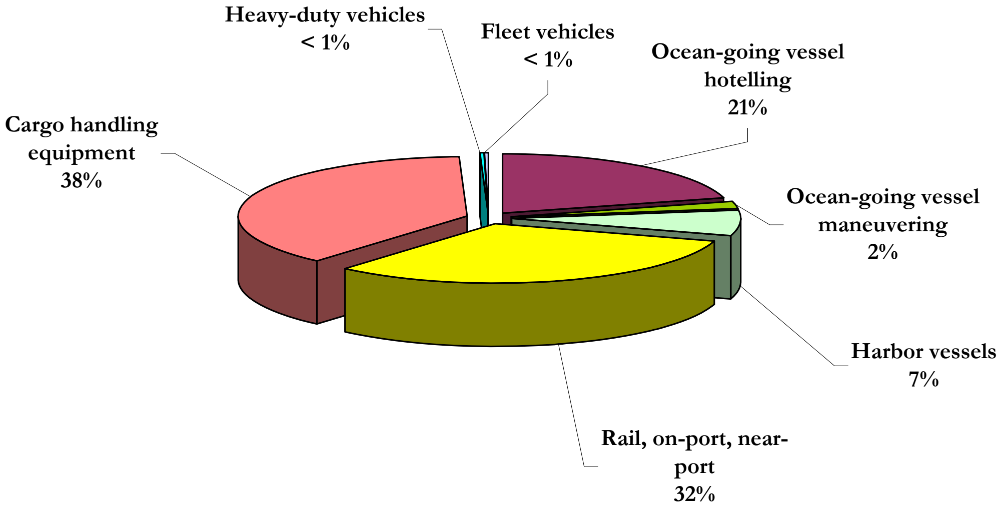


Figure 2.81: Port of Everett 2005 Maritime Greenhouse Gas Emissions by Source Category, CO_2 equivalent, tpy

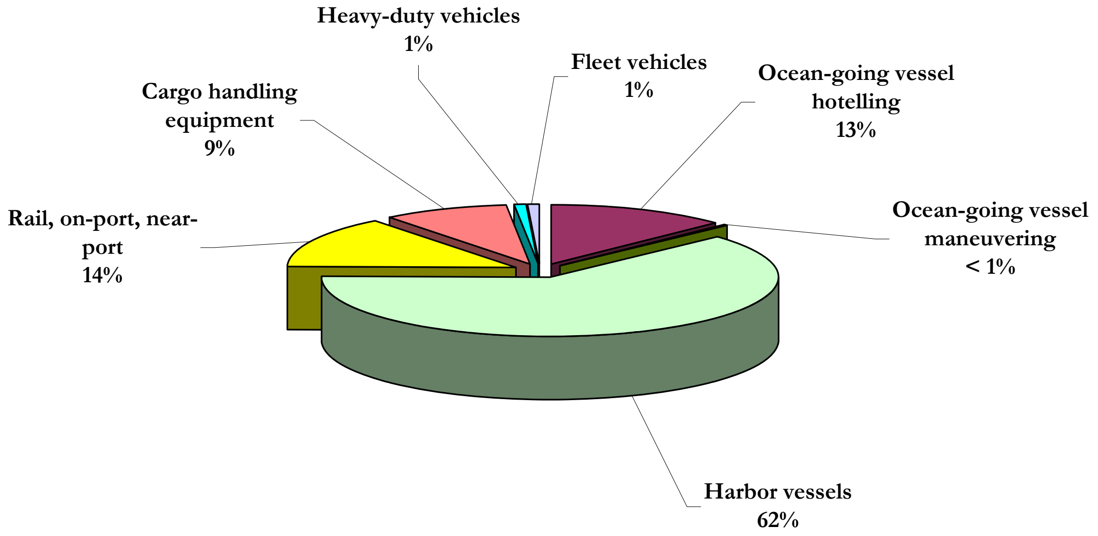


Table 2.16: Refinery Related 2005 Maritime Air Emissions Inventory Summary, tpy

Source Category	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Ocean-going vessels:								
Hotelling	477	18	43	1,713	92	73	20	110,135
Maneuvering	43	4	5	38	4	3	3	2,351
Transiting	--	--	--	--	--	--	--	--
Harbor (recreational) vessels	--	--	--	--	--	--	--	--
Rail, off-terminal	--	--	--	--	--	--	--	--
Rail, on-terminal	--	--	--	--	--	--	--	--
Cargo handling equipment	--	--	--	--	--	--	--	--
Heavy-duty vehicles, off-terminal	--	--	--	--	--	--	--	--
Heavy-duty vehicles, on-terminal	--	--	--	--	--	--	--	--
Fleet vehicles	--	--	--	--	--	--	--	--
Total	**520**	**22**	**48**	**1,751**	**96**	**76**	**23**	**112,486**

Figure 2.82: Refinery Related 2005 Maritime Air Emissions Inventory Summary, tpy

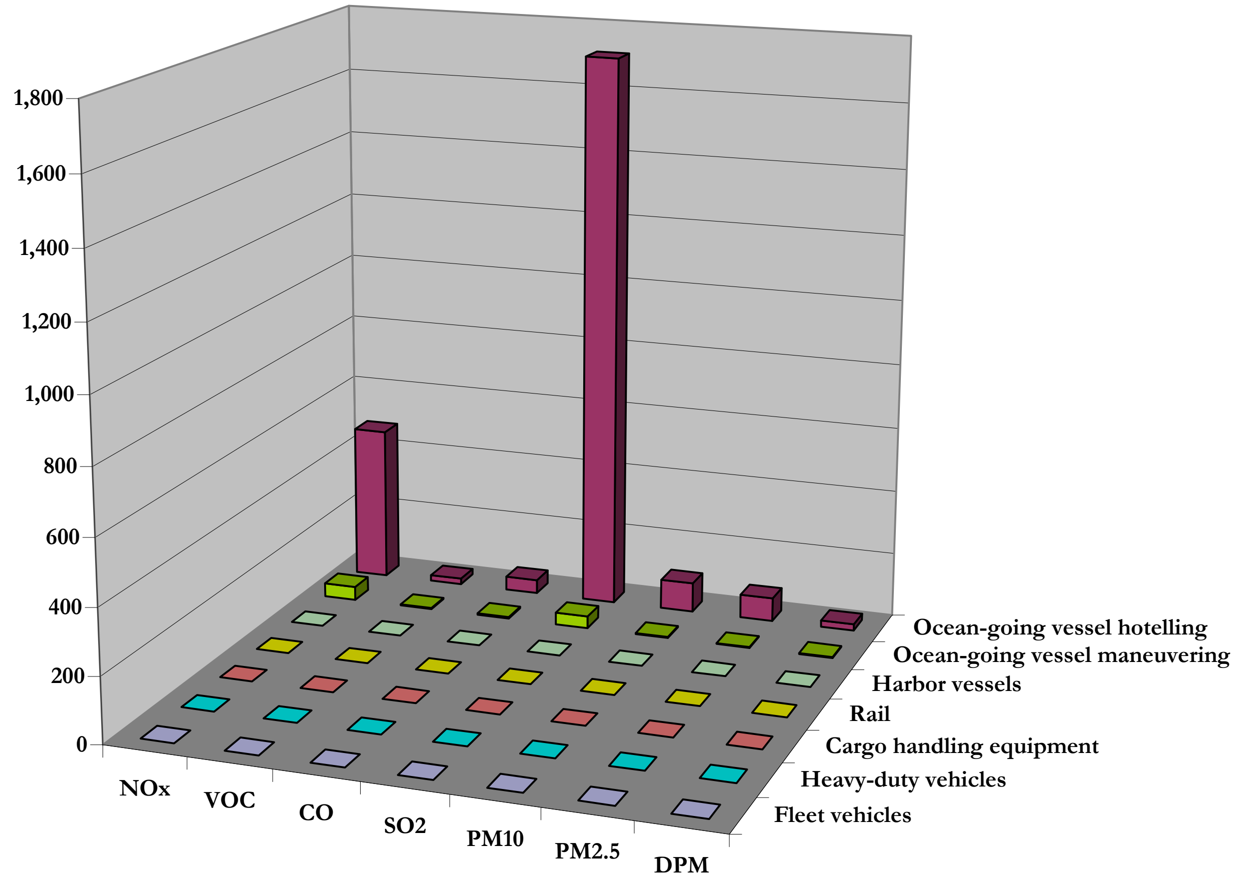


Figure 2.83: Refinery Related 2005 Maritime Air Emissions Inventory Summary, %

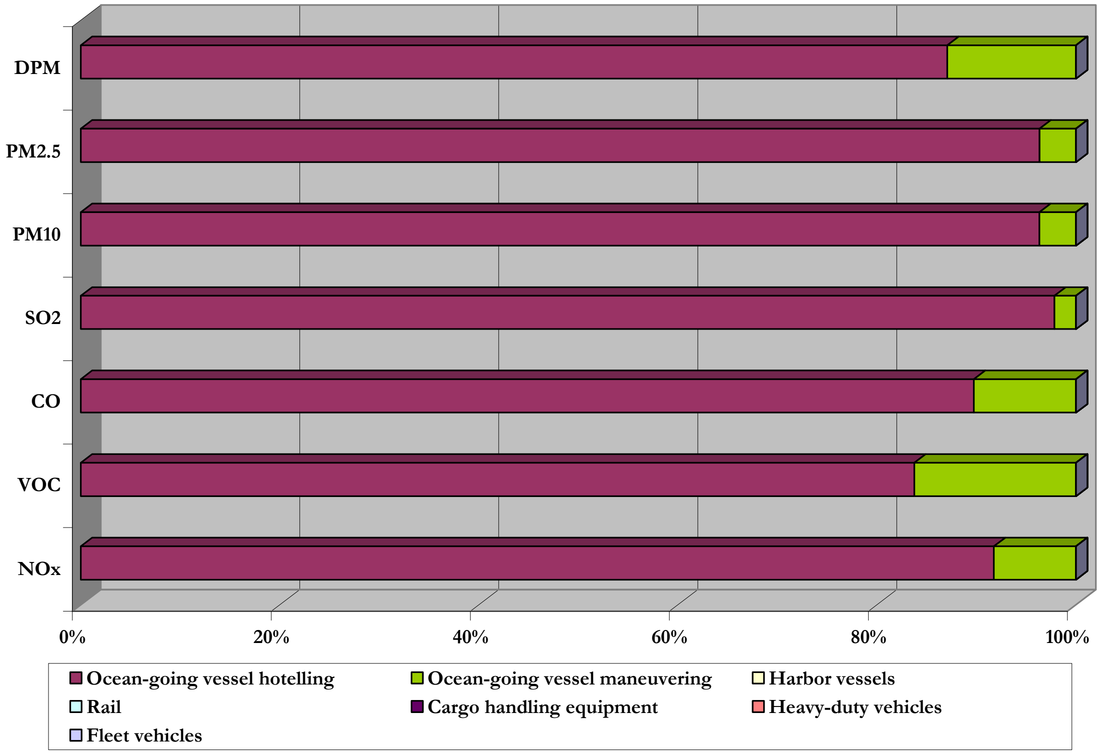


Figure 2.84: Refinery Related 2005 Maritime NO_x Emissions by Source Category, tpy

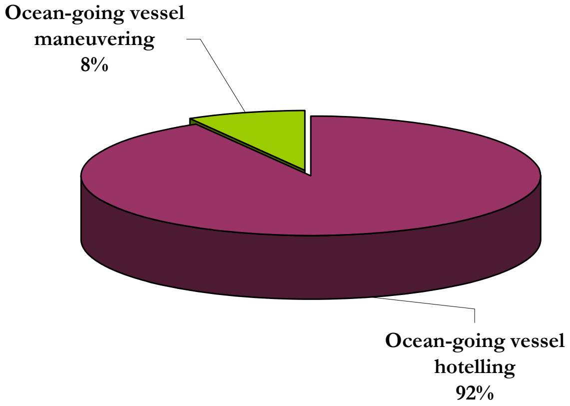


Figure 2.85: Refinery Related 2005 Maritime VOC Emissions by Source Category, tpy

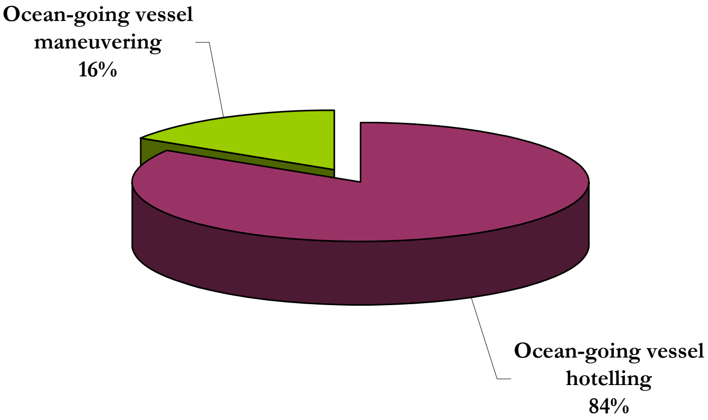


Figure 2.86: Refinery Related 2005 Maritime CO Emissions by Source Category, tpy

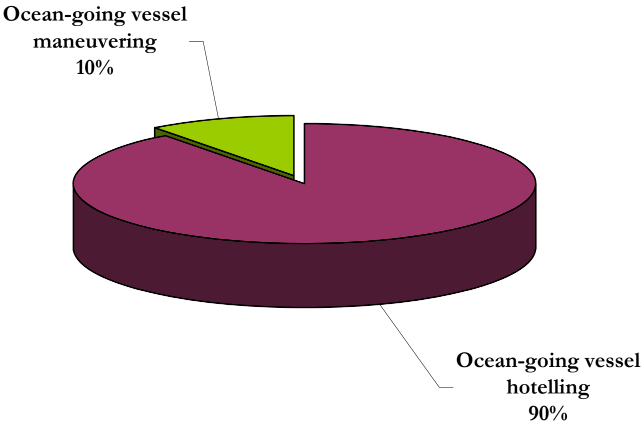


Figure 2.87: Refinery Related 2005 Maritime SO_2 Emissions by Source Category, tpy

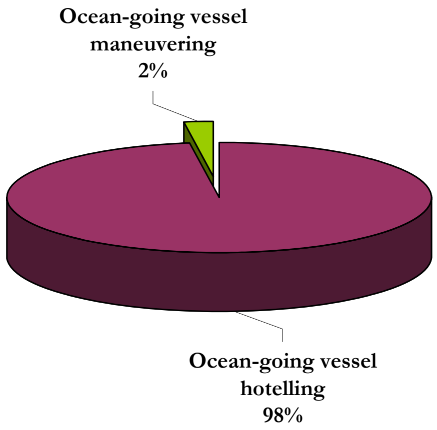


Figure 2.88: Refinery Related 2005 Maritime PM_{10} Emissions by Source Category, tpy

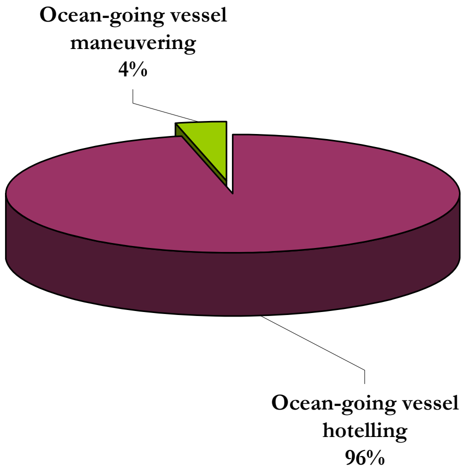


Figure 2.89: Refinery Related 2005 Maritime $PM_{2.5}$ Emissions by Source Category, tpy

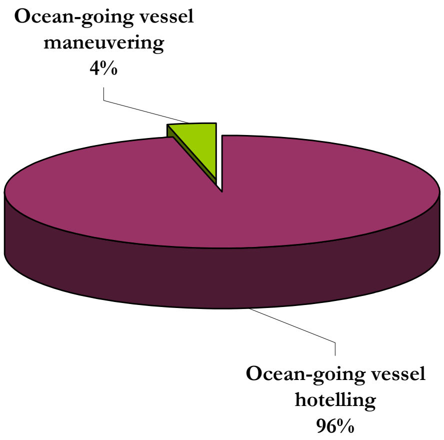


Figure 2.90: Refinery Related 2005 Maritime DPM Emissions by Source Category, tpy

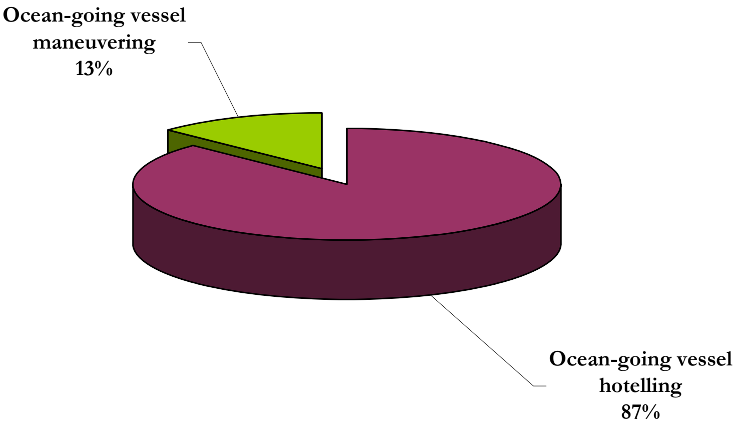
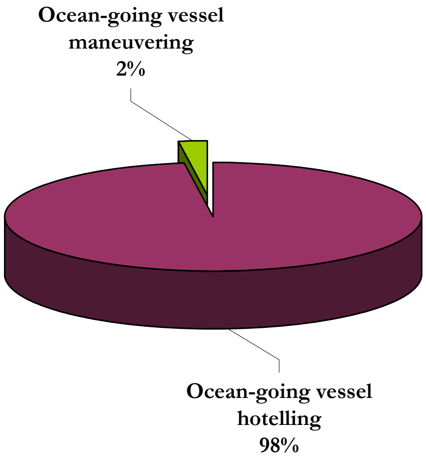


Figure 2.91: Refinery Related 2005 Maritime Greenhouse Gas Emissions by Source Category, CO_2 equivalent, tpy



2.4 Conclusions

The Puget Sound Maritime Air Emissions Inventory shows that in 2005 maritime-related sources within the regional clean air agency jurisdictions were responsible for the following percentages of overall regional emissions:[55]

- Northwest Clean Air Agency –
  - 16% of oxides of nitrogen,
  - 6% of volatile organic compounds,
  - 5% of carbon monoxide,
  - 19% of sulfur dioxide,
  - 6% of fine particulate matter, and
  - 40% of diesel particulate matter.

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[55] In a few cases, the total non-maritime versus maritime emissions percentages vary by one percent from the figures presented previously; this is due to rounding error.

- Olympic Region Clean Air Agency –
    - 40% of oxides of nitrogen,
    - 4% of volatile organic compounds,
    - 2% of carbon monoxide,
    - 83% of sulfur dioxide,
    - 13% of fine particulate matter, and
    - 66% of diesel particulate matter.

- Puget Sound Clean Air Agency –
    - 11% of oxides of nitrogen,
    - 2 % of volatile organic compounds,
    - 1% of carbon monoxide,
    - 33% of sulfur dioxide,
    - 4% of fine particulate matter, and
    - 28% of diesel particulate matter.

The county with the highest maritime related emissions of NO_x (27% of maritime related emissions), SO_2 (40%), and DPM (29%) is Clallam County (within the Olympic Region), because its waters include the inbound lane of the Strait of Juan de Fuca and ocean-going vessels make up the largest percentage of maritime-related emissions by source category. These emissions are primarily transiting emissions, as opposed to hotelling emissions which occur near land. The emissions attributed to vessels in Clallam County also include departing vessels that actually traveled on the Canadian side of the international border. Emissions from vessels bound for Canadian destinations were not included in this inventory, even though the emissions were released on the U.S. side of the border. Coordination of these cross-border emissions is discussed in Section 1.12.2 and Section 3.2.1.

King County (within the Puget Sound Region) is second in the emissions of NO_x (24%), SO_2 (14%), and DPM (24%), and has the highest emissions of VOCs (21%), CO (22%), and CO_2 (27%). This status reflects the fact that King County sees a large number of ocean-going vessels, including the vessels transiting through to destinations in Pierce and Thurston Counties, and also sees a relatively large amount of harbor vessel activity which results in relatively higher VOC and CO emissions because of the use of gasoline engines in many harbor vessels.

Because emissions from ocean-going vessels and harbor vessels drive the emission totals, it is reasonable to see the distribution described above, in which the highest emissions are seen in Clallam County where almost all vessels entering the area pass through and the next highest county, King County, is the location of one of the largest ports in the region. All ocean-going vessels and many harbor vessels traveling to or from the south end of Puget Sound pass through King County

SECTION 3 OCEAN-GOING VESSELS

Section 3 provides an overview of the ocean-going vessels calling at U.S. maritime facilities located within the Georgia Basin/Puget Sound Airshed. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

3.1 Source Category Description

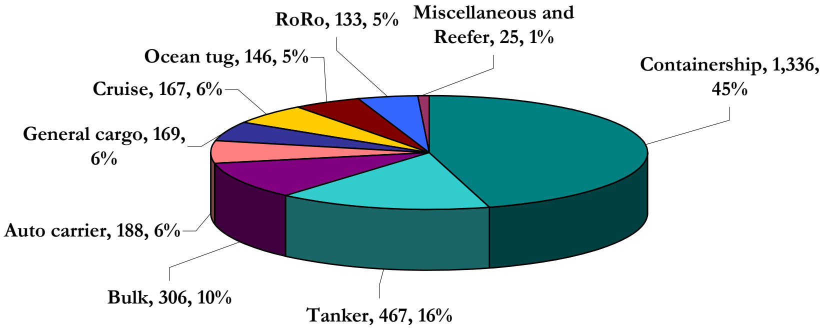
The ocean-going vessel source category typically consists of cargo carrying vessels equipped with large marine propulsion engines known as slow speed engines. These are in contrast to harbor vessels, which are typically equipped with medium speed and high speed propulsion engines and are discussed in Section 4. Ocean-Going vessels are categorized by the following main vessel types for purposes of this emissions inventory:

- Auto carrier
- Bulk carrier
- Containership
- Passenger cruise vessels
- General cargo
- Integrated tug and barge (ITB) and articulated tug and barge (ATB)
- Miscellaneous vessels
- Refrigerated vessels (Reefer)
- Roll-on roll-off vessels (RoRo)
- Tankers

Military vessels, such as aircraft carriers, U.S. Coast Guard vessels, and submarines, are not included in the inventory due to security considerations.

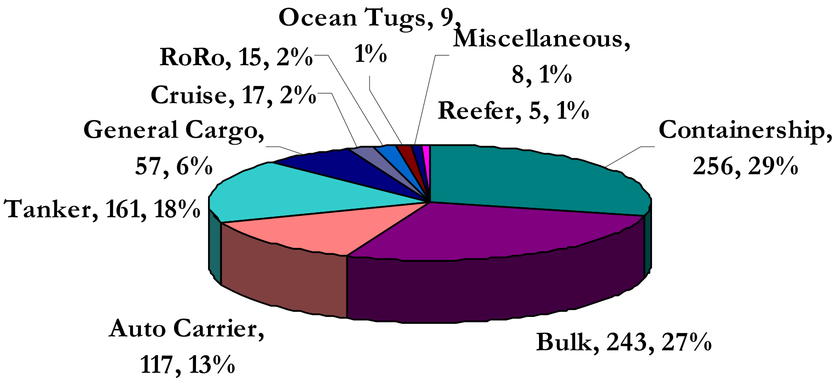
Based on 2005 Marine Exchange (MarEx) of Puget Sound data (see Section 3.3.1), there were a total of 2,937 inbound calls of ocean-going vessels to the Puget Sound region in 2005. Containerships made the majority (45%) of the calls, followed by tankers (16%), bulk carriers (10%), auto carriers (6%), cruise vessels (6%) and general cargo vessels (6%). Ocean-going tugboats (ITB and ATB only) and roll-on roll-off vessels account for 5% each. The miscellaneous and reefer vessels account for the remaining 1% of the vessels. Figure 3.1 shows the percentage of ocean-going vessels for the inbound calls in 2005 in Puget Sound.

Figure 3.1: Puget Sound 2005 Distribution of OGV by Inbound Calls



There were a total of 832 discrete vessels that called the Puget Sound study area in 2005. Figure 3.2 shows the distribution of discrete vessels by vessel type.

Figure 3.2: Puget Sound 2005 Distribution of Discrete OGV Types



Most OGVs are foreign flagged ships, whereas harbor craft are almost exclusively domestic. Approximately 89% of the OGVs that visited Puget Sound in 2005 were registered outside the U.S. Although 11% of the individual OGVs are registered in the U.S., they comprise 29% of all calls. This is most likely because the U.S. flagged OGVs make shorter, more frequent stops within Puget Sound. Some examples of U.S. vessels that make more than one stop are tankers and ocean-going tugboats.

Figure 3.3 shows the breakdown of the ships' registered country or flag by discrete vessel. The remaining 41% of "other" ships represents 65 discrete ships from 21 countries. The count of discrete vessels by flag is higher than the actual number of discrete vessels that called the Puget Sound area because some vessels that visited multiple ports in Puget Sound were double counted for the flag comparison.

Figure 3.4 shows the breakdown of the ships' registered country or flag by the number of calls. The remaining 30% of "other" vessel calls represents 925 calls from 21 other countries.

Figure 3.3: Puget Sound 2005 Flag of Ship by Discrete Vessel

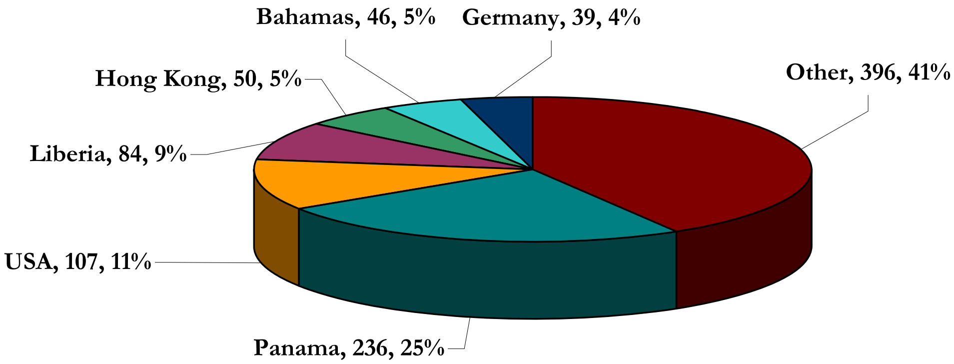
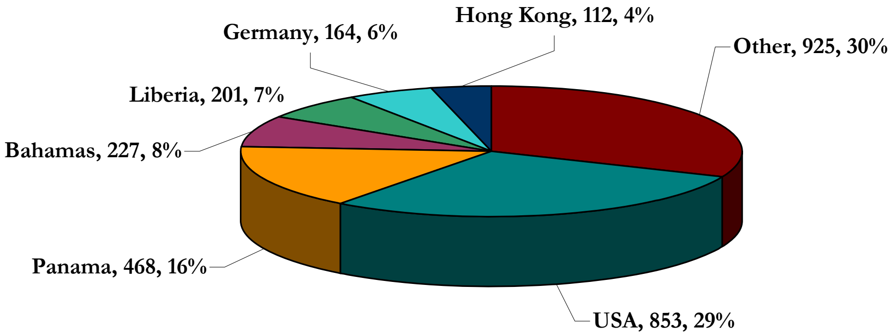


Figure 3.4: Puget Sound 2005 Flag of Ship by Vessel Call



3.1.1 Auto Carriers

Transportation of imported vehicles is the primary use of the auto carrier, although a few domestic vehicles are exported overseas. Auto carriers are very similar in design to RoRos (discussed below) because they have drivable ramps. Both can have substantial ventilation systems so as to prevent vehicle fuel vapors from pooling in the lower decks, which could present a major risk for explosion or fire. Emissions related to vessel cargo are outside the scope of the study. Auto carriers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. Figure 3.5 presents a typical car carrier.

Figure 3.5: Auto Carrier

3.1.2 Bulk Carriers

Bulk carriers have open holds with giant hatches to carry dry goods that can be loaded from a conveyor belt and chute, such as coal, coke, salt, sugar, cement, gypsum, lime mix, agricultural products, alumina, and other similar fine-grained commodities that can be poured, scooped or augured. Bulk carriers span the range between small "tramp" ships and the Panamax (approximately 50,000+ deadweight tonnage, DWT) and Capesize (approximately 140,000+ DWT) bulk carriers that can also haul containers as well as general cargo. Bulk carriers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. Figure 3.6 presents a typical bulk carrier.

Figure 3.6: Bulk Carrier

3.1.3 Containerships

Ships that carry 20- and 40-foot containers on their decks are known as containerships. These ships are the fastest, largest, and most common OGVs in Puget Sound. These vessels are primarily used by shipping lines to transport retail goods across the Pacific Rim, mostly originating in Asia. Because of their efficiency as a mode of ocean transportation, containership traffic will continue to grow. Cargo types include almost everything that can be made to fit in the 20- or 40-foot containers. The container business operates on tight margins and high volume so OGVs need to be fast and efficient to compete in the market place, thus the trend to newer, larger containerships. The container vessels have been divided into eight subtypes based on their twenty-foot equivalent unit (TEU) capacity, between 1000 and 8000+ TEU. A typical containership is shown in Figure 3.7.

Figure 3.7: Containership

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3.1.4 Passenger Cruise Vessels

There is a significant passenger cruise service operating from the Port of Seattle. In 2005, shore power was provided for the Princess Cruise Line at Terminal 30. In the 2006 cruise season, both Princess Cruise Line and Holland America Line utilized shore power. Cruise vessels are known not only for their speed but also their heavy auxiliary engine demands, since they often provide heating and electricity for over 1,000 to 3,000 passengers at times. Cruise vessels vary significantly in overall size, onboard auxiliary power, engine configuration, fuel type and characteristics, and frequency of calls. Typically, newer cruise ships work on a diesel-electric configuration with some using turbines to generate electricity, while older cruise ships use direct drive and auxiliary engines. Passenger cruise ships are shown in Figure 3.8.

Figure 3.8: Cruise Vessels

3.1.5 General Cargo Vessels

Like the bulk carriers, general cargo ships tend to be slower. They can carry diverse cargoes such as steel, palletized goods, turbines, a few containers (usually on the top deck), large excavating machinery, and other heavy loads. Most general cargo ships have electric boom cranes for loading and unloading. General cargo ships are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. A typical general cargo ship is shown in Figure 3.9[56].

Figure 3.9: General Cargo Ship

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[56] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp* .

3.1.6 Ocean-Going Tugboats

Ocean-going towboats and tugboats, which are considered harbor vessels, are not included in this section and are discussed in Section 4 of this report. ITB and ATB vessels, however, are included in this section since they are seen as a specialized single vessel. The barge stern is notched to accept a special tug which can be rigidly connected to the barge in the form of a normal ship's hull. The tugboats, like all other ocean-going tugs, are typically configured with two propulsion engines and separate auxiliary engines to supply electrical needs. ITB and ATB may have larger horsepower in their engines than the typical ocean-going tug. Figure 3.10 shows an integrated tug and barge.

Figure 3.10: Integrated Tug and Barge

3.1.7 Refrigerated Vessels

Refrigerated vessels, often called "reefers," are dominated by fruit carriers, which require cooling to prevent cargo spoilage. These are similar to bulk or general cargo carriers, but these ships typically carry fruits, vegetables, meats, and other perishable cargos. Most of the cargo is stored below deck on pallets or transported inside refrigerated containers that are placed on top of the closed cargo hold. Reefers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs for the vessel and the refrigeration units. A typical refrigerated vessel is presented in Figure 3.11.

Figure 3.11: Refrigerated Vessel

3.1.8 RoRo Vessel

These OGVs are similar to the automobile carrier but can accommodate larger wheeled equipment such as excavators, bulldozers, trucks, and loaders. RoRo ships are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. A typical RoRo vessel is presented in Figure 3.12.

Figure 3.12: RoRo Vessel

3.1.9 Tanker Vessels

The tanker activity in Puget Sound is comprised mainly of crude oil tankers, as well as a few chemical tankers. Tankers range from approximately 10,000 to over 100,000 DWT. Tankers are typically configured with direct drive propulsion engines and separate auxiliary engines to supply electrical needs. The tankers have been divided into subcategories of tanker (general), chemical and crude tankers. The various types of tankers that do not fall into the crude or chemical tanker category are included in the general tanker category. These tankers may include:

- Ore/bulk/oil carriers
- Oil product tankers
- Tankers with specialty products

The crude tankers fall into several size categories depending on their dimensions:

- Handyboat - 400 to 60,000 DWT
- Panamax - 60,000 to 80,000 DWT
- Aframax - 80,000 to 120,000 DWT
- Suezmax - 120,000 to 200,000 DWT
- VLCC - 200,000 to 300,000 DWT
- ULCC - 300,000 DWT

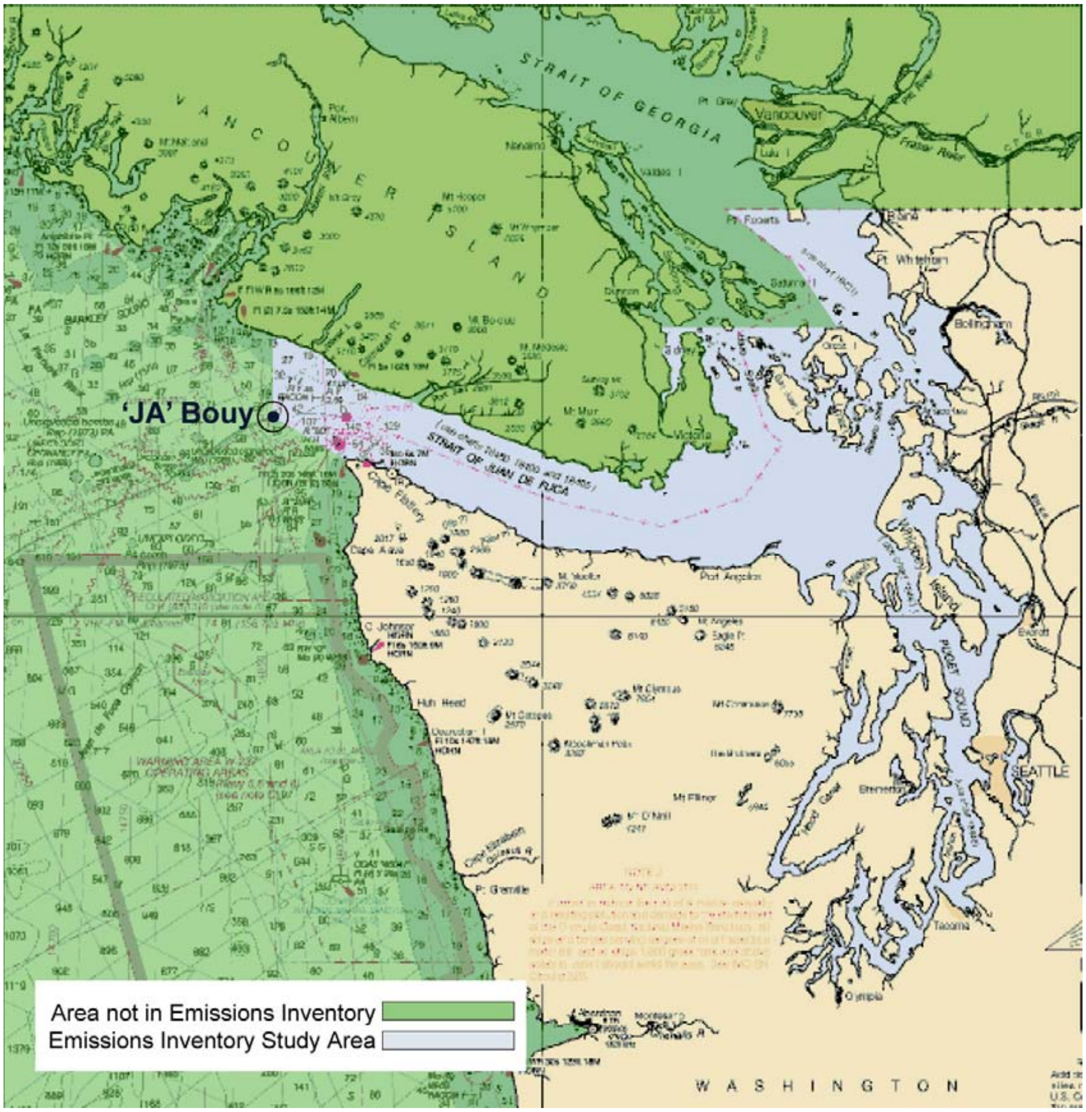
Very Large Crude Carriers (VLCC) and Ultra Large Crude Carriers (ULCC) are the large ships that cannot fit through most canals and hence they are also known as "Capesize" ships. Figure 3.13 presents a typical tanker.

Figure 3.13: Tanker

3.2 Geographical Delineation

The geographical area for ocean-going vessels includes the Puget Sound airshed and portions of the Georgia Basin airshed as shown in Figure 3.14.

Figure 3.14: Puget Sound 2005 Maritime Air Emissions Inventory OGV Boundaries



This area includes the twelve counties and six ports described in Section 1.4.4. Other maritime facilities within the geographical boundary are included in this inventory. These facilities include privately-owned facilities, anchorages, ferry terminals and smaller ports in the study area. There are also oil and chemical facilities in the study area located in Cherry Point, Ferndale, and March Point.

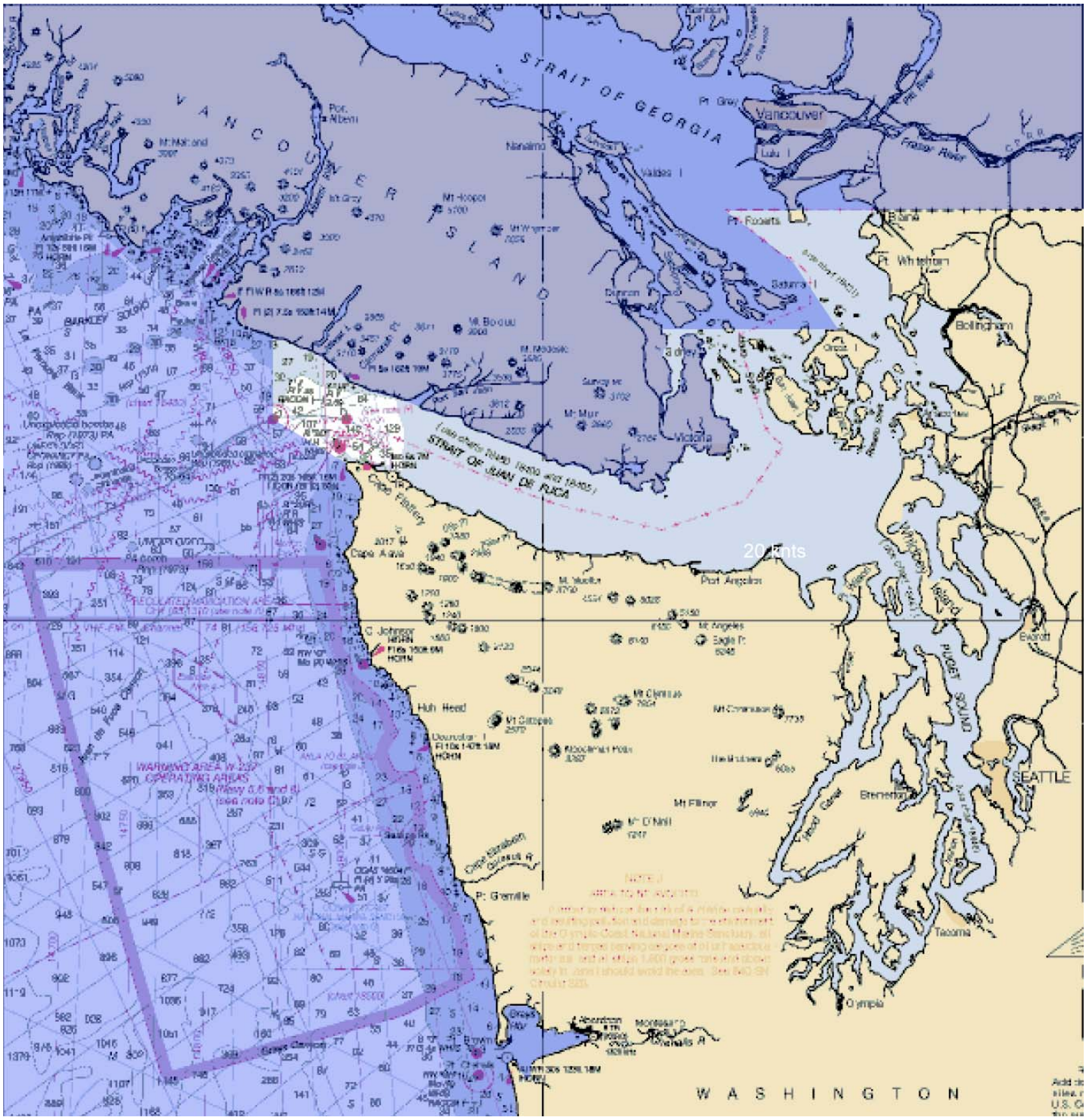
Data from the MarEx of Puget Sound (see Section 3.3.1) and the Vessel Traffic System (VTS) was used to determine the shipping routes for the purposes of this study within the inventory's geographical area. Concurrent with the Puget Sound Maritime Air Emissions Inventory efforts, the British Columbia Chamber of Shipping (BCCS) conducted an emissions inventory associated with OGVs calling at Canadian ports in the Georgia Basin/Puget Sound Airshed. The BCMVEI was coordinated with Environment Canada, the Greater Vancouver Regional District, the Vancouver-Fraser Port Authority, and others, as well as the Puget Sound Maritime Air Forum to assure quality and consistency and avoid duplication and omissions between the two inventories. Analysis of the MarEx data (used in the Puget Sound Maritime Air Emissions Inventory) and analysis of Arrival Information Systems (AIS) data (used in the Canadian inventory) determined that the AIS data was not reliable with respect to origin and destination data. Using the MarEx data, it was determined that there were five general types of routing. In an effort to reduce double counting or omissions of ship activity and emissions, an agreement was reached on which inventory would account for which emissions and where those emissions would be counted.

Inbound and outbound vessels travel on specific VTS travel lanes. Since the U.S./Canadian border generally lies between the inbound and outbound vessel travel lanes (i.e., inbound lane lies on the U.S. side of the border, while the outbound lane lies on the Canadian border in Strait of San Juan de Fuca), the agreement included discussion on inbound and outbound transit emissions.

The agreements reached for the five general types of trans-boundary routing included are:

> 1) All inbound ship transits from sea buoy (JA Buoy) to the arrival point be assigned with U.S. or Canadian transit leg for the whole transit based on the arrival point. For example, a vessel that transits from sea to a U.S. marine facility will be assigned as a U.S. transit regardless of which side of the international boundary the ship transits, as shown in Figure 3.14.
>
> 2) All outbound ship transits from the last departure point to the sea buoy (JA Buoy) will be assigned with U.S. or Canadian transit legs for the whole transit based on the departure point. For example, a vessel that leaves a U.S. maritime facility and transits out to sea will be assigned a U.S. transit regardless of which side of the international boundary the ships transits, as shown in Figure 3.15.

Figure 3.15: Puget Sound 2005 Maritime Air Emissions Inventory–JA Buoy to/from U.S. Marine Facility



3) All ship transits between Victoria, Canada and a U.S. port will be split between both inventories in the following ways as shown in Figure 3.16:

Victoria -> US Marine Facility

a) The BCMVEI inventory will estimate emissions from Victoria Harbor to the international boundary in the Strait of Juan de Fuca (en-route to Port Angeles to pick up a U.S. Pilot).

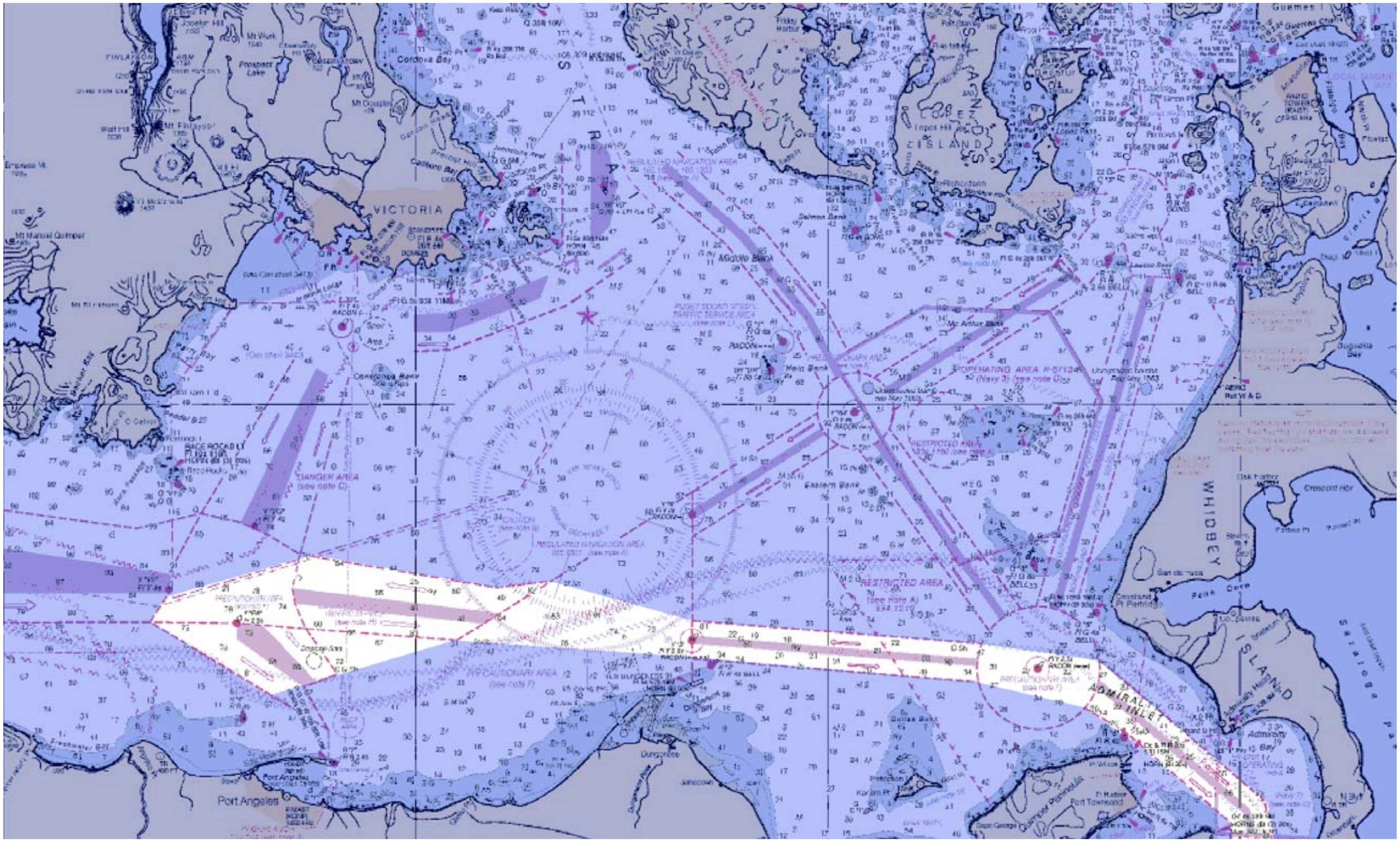
b) The Puget Sound Maritime Air Emissions Inventory will estimate emissions from the international boundary to the pick up of U.S. Pilots (north of Port Angeles) and to the arrival point.

US Port -> Victoria

a) The Puget Sound Maritime Air Emissions Inventory will estimate emissions from the departure point to Port Angeles (to drop off Pilots) and north to the international boundary (heading to Victoria).

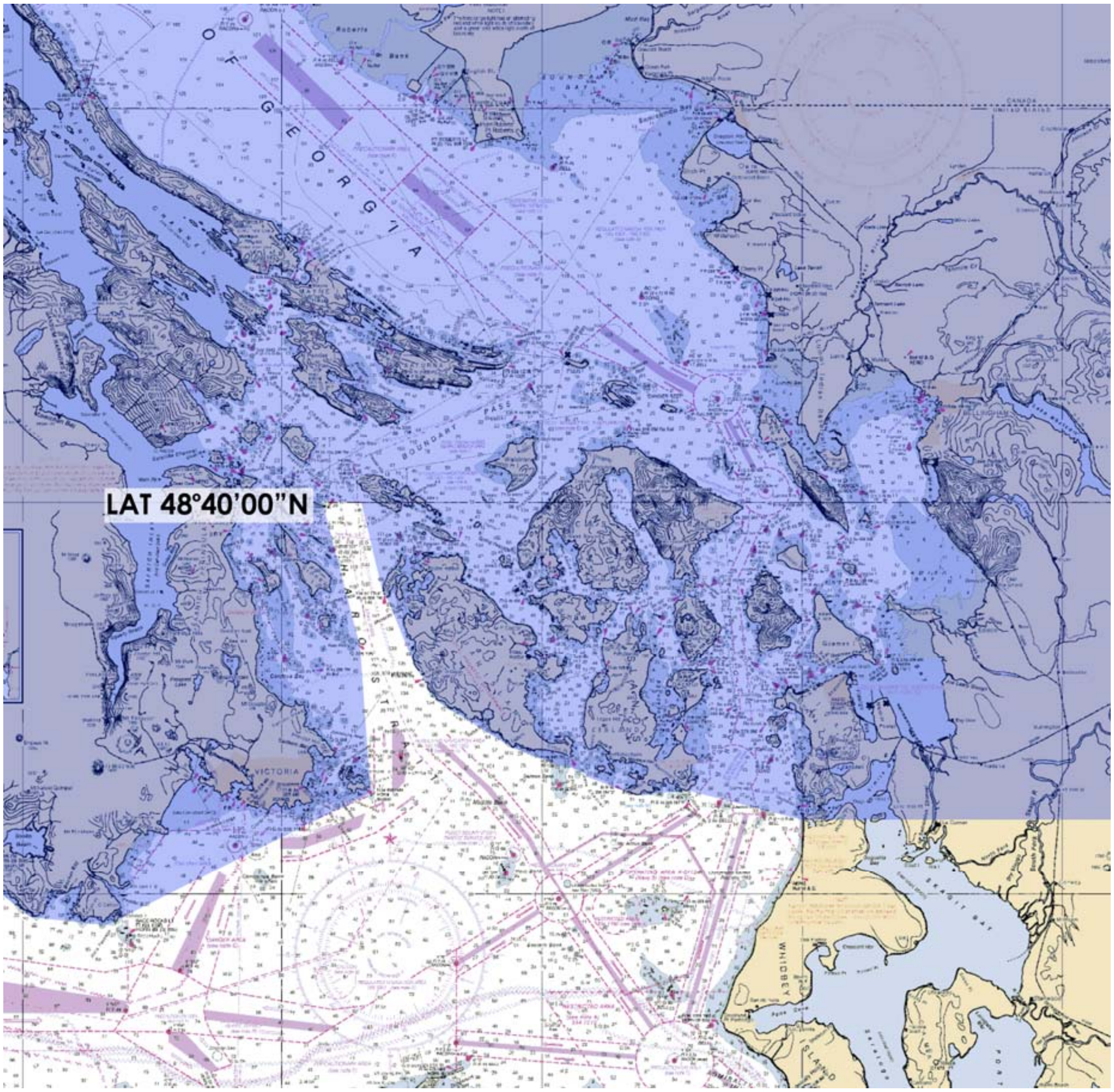
b) The BCMVEI inventory will estimate emissions on the Canadian side international boundary to Victoria Harbor

Figure 3.16: Puget Sound 2005 Maritime Air Emissions Inventory–Victoria to/from U.S. Marine Facility



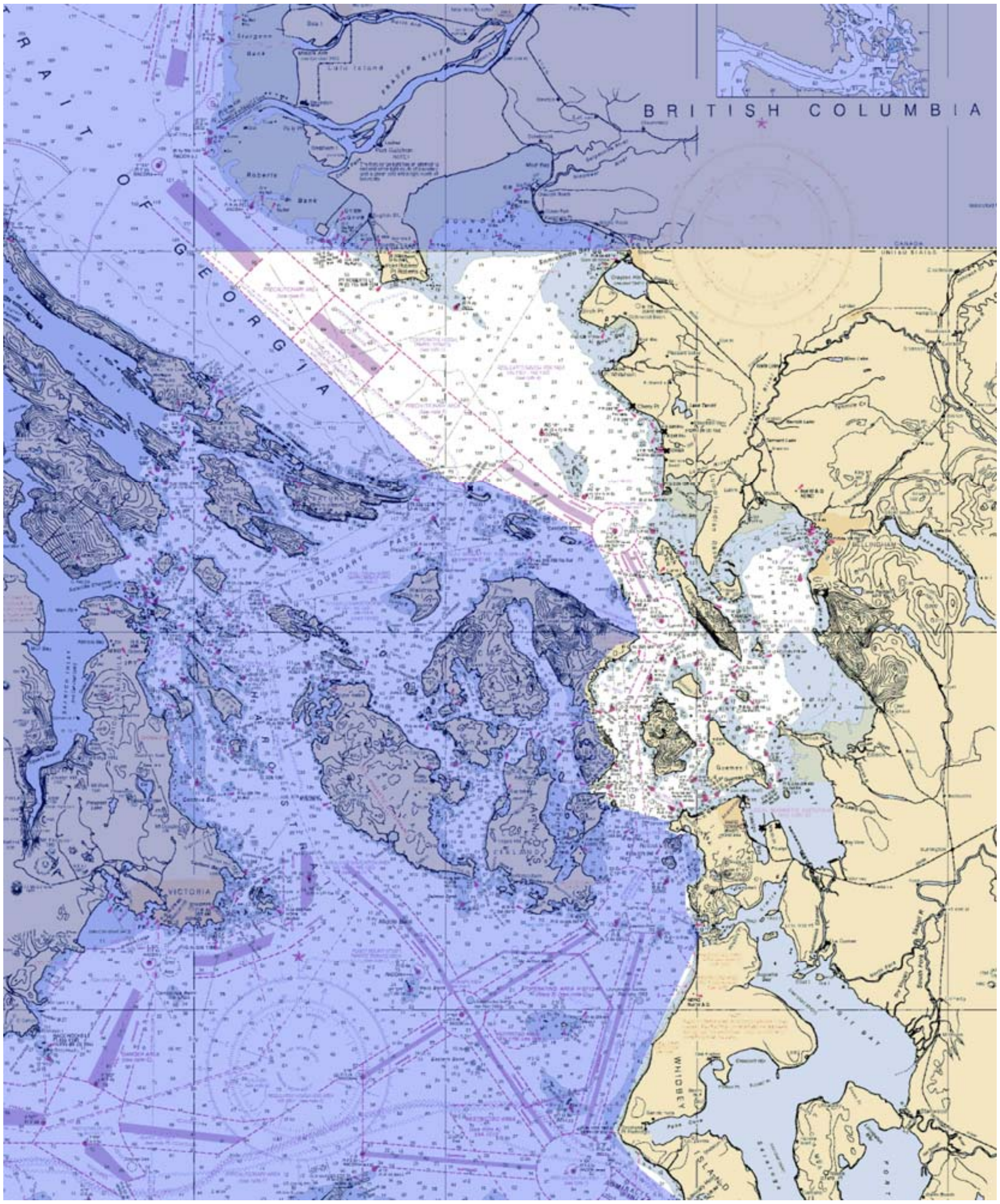
4) All non-tanker ships transiting between a Canadian marine facility (other than Victoria) and a U.S. marine facility), in either direction, will be divided at latitude 48° 40' 00" north in the Haro Strait. All emissions north of this line will be included in the BCMVEI inventory and all emissions south of this line will be included in the Puget Sound Maritime Air Emissions Inventory, as shown in Figure 3.17.

Figure 3.17: Puget Sound 2005 Maritime Air Emissions Inventory–Vancouver to/from U.S. Marine Facility



5) All tanker ships calling to or from Anacortes, Cherry Point, Ferndale, and March Point, to Vancouver, British Columbia will be divided at latitude 48° 55' 08" in the shipping lanes located in the Strait of Georgia. All emissions south of this line will be included in the Puget Sound Maritime Air Emissions Inventory and all emissions north of this line will be included in the BCMVEI, as shown in Figure 3.18.

Figure 3.18: Puget Sound 2005 Maritime Air Emissions Inventory–Vancouver to/from Anacortes, Cherry Point, Ferndale, March Point, and Sandy Point



3.3 Data and Information Acquisition

Sources used to compile the data necessary to prepare the emission estimates included:

- MarEx of Puget Sound
- Lloyd's Register of Ships
- American Bureau of Shipping
- Vessel Boarding Program data
- Nautical charts and maps

Each data source is detailed in the following subsections.

3.3.1 MarEx of Puget Sound

The MarEx of Puget Sound is a non-profit organization established in 1981 to provide comprehensive communication services for the maritime industry. MarEx maintains a complete database which captures information on every vessel arriving in Puget Sound. It is a founding member of the Maritime Information Service of North America (MISNA) which is the national organization of the marine exchanges.

The MarEx data that was evaluated in developing the emission estimates includes vessel names, arrival and departure dates and times, transit speeds and directions, berth of destination, and other information. This data source was the primary basis for establishing:

- Vessel types
- Estimated hotelling time
- Distribution of arrival and departure travel directions by route
- Number of ship calls to each port
- Names of vessels
- Vessel routes (origination and destination)

3.3.2 Lloyd's Register of Ships

Lloyd's Register of Ships[57] (Lloyd's) is considered to be the leading resource for obtaining ship characteristics such as tonnage, speed, engine power plant configuration, age, and other parameters. The company is known as a classification society for the purpose of insuring many of the vessels on an international basis. The data are quite complete for vessels classified by Lloyd's; however; for other ships using a different insurance certification authority, the data are less complete and/or accurate. Lloyd's was used for obtaining information such as main and auxiliary engine power and vessel speed ratings because it is the best available source of such information. The survey results from the Vessel Boarding Program suggest that the current Lloyd's data are fairly accurate for propulsion horsepower and vessel speed.

The company Fairplay has the rights to Lloyd's ship data and sells the software containing information on commercial marine vessels, which includes ocean-going vessels. The software allows users to download the IMO number along with other ship information. The version used in this report was an October 2004 edition updated in January 2005. The worldwide fleet of OGVs was assembled in a common database and a query was completed to match with the MarEx vessel data. There were a high percentage of matches, over 95%, between the Lloyd's data and MarEx data. The remaining 5% were either matched to another dataset (see Section 3.3.3) or defaults were used from averages by vessel type from Lloyd's worldwide fleet data query.

3.3.3 American Bureau of Shipping

Another source of ship data that was used for U.S. flagged domestic vessels, including the integrated and articulated tugs, was the American Bureau of Shipping (ABS), a major classification society. Data obtained included engine information such as horsepower for all the ocean-going tugboats.

3.3.4 Vessel Boarding Program Survey Data

The best source of local activity data and ship parameters is from the individuals who own and/or operate the vessels. Building on studies undertaken at other ports, the Forum engaged in a Vessel Boarding Program in the Puget Sound, and shared data from similar programs conducted by Starcrest for the Ports of Los Angeles and Long Beach, as some vessels that call on those ports also call on ports in the Puget Sound.

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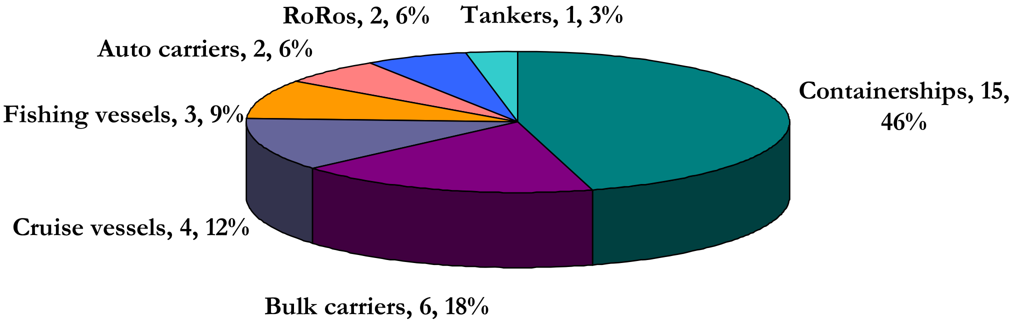
[57] Lloyd's – Fairplay, Ltd., *Lloyd's Register of Ships*, January 2005.
See: *http://www.lr.org/code/home.htm.*

Port environmental staff and consultants boarded 32 vessels operated by 19 shipping lines during 2006. The captains and chief engineers of these vessels were interviewed and provided information about ship movements, engine specifications, and other pertinent operational data. A total of 33 boardings were conducted, including 28 while at berth, and five in transit. Three transits were from Port of Seattle to Canada (including Victoria and Vancouver, British Columbia), and two transits were from Port of Tacoma to Port of Seattle. In addition, vessel specifications were obtained from 14 vessels that were not boarded; these vessels were either sister ships or from the same fleet as a vessel that was boarded, or from a vessel request in the absence of a boarding.

Figure 3.19 presents the percent and count of vessels boarded by vessel type, including 15 containerships, six bulk carriers, four cruise vessels, three fishing vessels (this data was used in the harbor craft portion of the EI), two auto carriers, two RoRos, and one tanker.

Figure 3.19: Percent of Vessels Boarded in Puget Sound by Vessel Type



The purpose of the Vessel Boarding Program was to gain firsthand information/data on the ship's activities and characteristics and observe various operational parameters around ports during arrival, hotelling, and departure. In addition to the interviews, when possible, printed information such as pilot cards and computerized engine readings were obtained. Transit characteristics such as vessel speed, engine speed, main and auxiliary engine loads, and various other parameters (depending on vessel configuration) were recorded as well as related tug assist and escort activities and pilot transfers.

The vessel data that was collected regarding propulsion engines and cruise speeds were compared to the Lloyd's database to evaluate the accuracy of Lloyd's data. The parameters that were compared - deadweight tonnage, maximum engine power, and maximum vessel speed - are crucial to developing accurate estimates of vessel emissions, so it was important to validate the information being obtained from the Lloyd's database. For example, maximum speed is a critical component of the load factor calculation. Maximum power is multiplied by the load factor, a time component, and an emission factor to estimate emissions. These calculations are explained in detail in Section 3.6.

The amount and type of data collected for each vessel was determined by numerous factors, many of which were beyond the control of the EI project team. These include the technology on board the ship, language barriers, the willingness of the captain and/or crew to provide information, and the individual interests of the captains and chief engineers. Because the top priority of the ship's captain and the crew is to safely arrive and depart, they provided information on a time-available basis. In several cases, complete data was not available for all parameters.

The Vessel Boarding Program made important contributions and refinements to the methodology used for the OGV portion of the EI. Section 2.4.4 of the *Port of Los Angeles Baseline Air Emissions Inventory – 2001*,[58] details many of the insights obtained during the Vessel Boarding Program conducted there in 2003. Some of the 2003 OGV insights include:

- Validation of Lloyd's data set by comparing it to actual on-board engine and vessel parameters, such as maximum vessel speed and engine power.
- Establishment of relationship between maximum and actual at-sea ship service speed.
- Evaluation of time-in-setting mode data and real time load readings for transit and in-port maneuvering modes.
- Significant improvements over Lloyd's data to the characterization of auxiliary engines.

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[58] Starcrest Consulting Group, LLC, July 2005. (Starcrest 2005)

Further refinements obtained from the 2005 - 2006 Puget Sound, Port of Los Angeles and Port of Long Beach Vessel Boarding Programs include:

- Refined vessel defaults by vessel type and subtype.
- Revised boiler emission methodology based on actual average boiler fuel consumption.
- Use of sister ships to maximize data collection.

One way to maximize data collected from vessel boardings is to apply data to known sister ships. Sister ships are vessels that are in the same class and have identical engine parameters. Shipping lines may order several vessels of the same vessel class at the same time, resulting in "sister ships" that have the same engine specifications and vessel characteristics. During vessel boarding, vessel captains were asked if there were any sister ships and if so, vessel names were noted to later see if they matched with vessels calling at the Puget Sound ports. In addition to the vessel data gathered through the Vessel Boarding Program, several companies provided main and auxiliary engine data on their fleet by submitting the information electronically.

Table 3.1 presents the source of the data for the almost 274 vessels included in the Vessel Boarding Programs conducted in the Puget Sound, and at the Ports of Los Angeles and Long Beach. Not all vessels from the survey data necessarily made a call to Puget Sound ports in 2005 and therefore not all of data from the boardings listed below was used.

Table 3.1: Starcrest Vessel Boarding Programs

Number of Vessels	Program
32	Puget Sound Boarding Program (2006)
58	Ports of Long Beach and Los Angeles VBP (2005 – 2006)
79	Vessel Fleet Data Provided (2003-2006)
40	Sister Vessel Specifications Provided (2003-2006)
65	Port of Los Angeles Boarding Program (2001 - 2003)
274	**Total Vessels**

The following Vessel Boarding Program survey data was used specifically for emission estimation methodologies in this study:

- Main engine power
- Auxiliary engine power
- Auxiliary engine load
- Boiler fuel consumption
- Type of fuel used while in Puget Sound during transit and hotelling
- Emission reduction technologies such as slide valves
- Routing and speeds

The specific values used for emission estimations are discussed in Section 3.6. Other data collected and other findings are summarized in Section 3.7. For main engine data, the match with Lloyd's and ABS data was greater than 98%, so defaults for main engine power were only used for 2% of the vessels. If actual Vessel Boarding Program data was available, it was used for that vessel. Main engine defaults are discussed and listed in Section 3.6.7.

Auxiliary Engine Data

Because auxiliary engine information is usually not provided to Lloyd's by vessel owners, Lloyd's contains minimal auxiliary engine information. For the 832 discrete vessels that called Puget Sound in 2005, 22% of the vessels had actual data derived from Vessel Boarding Program (VBP) surveys, Lloyd's, ABS, and matching sister vessels. Table 3.2 provides a summary of the count of auxiliary engine data used by vessel type. Approximately 78% of the vessels did not have actual information for auxiliary engines and defaults were used for their engines. Auxiliary engine defaults are discussed and listed in Section 3.6.9.

Table 3.2: Auxiliary Engine Information Used from Vessel Boarding Program and Lloyd's Data

Vessel Type	VBP	Sister	Lloyds	ABS	Default	Total
Auto Carrier	1	0	12	0	104	117
Bulk - General	1	0	27	0	202	230
Bulk - Heavy Load	0	0	2	0	2	4
Bulk Self-Discharging	0	0	2	0	0	2
Bulk Wood Chips	0	0	0	0	7	7
Container - 1000	1	0	0	0	17	18
Container - 2000	2	0	1	0	62	65
Container - 3000	9	0	10	0	20	39
Container - 4000	6	9	5	0	39	59
Container - 5000	8	27	1	0	19	55
Container - 6000	1	4	5	0	1	11
Container - 7000	1	0	0	0	2	3
Container - 8000	0	0	0	0	3	3
Cruise	0	0	9	0	8	17
General Cargo	7	0	5	0	45	57
Ocean Tugs	0	0	0	9	0	9
Miscellaneous	0	0	0	0	8	8
Reefer	0	0	0	0	5	5
RoRo	2	0	0	0	13	15
Tanker - General	1	0	5	0	38	44
Tanker - Chemical	0	0	0	0	6	6
Tanker - Crude - Aframax	0	0	4	0	16	20
Tanker - Crude - Handyboat	0	0	2	0	2	4
Tanker - Crude - Panamax	0	0	2	0	4	6
Tanker - Crude - Suezmax	1	0	2	0	22	25
Tanker - Crude - VLCC	1	0	0	0	0	1
Tanker - Oil Products	0	0	0	0	2	2
Total	**42**	**40**	**94**	**9**	**647**	**832**
Percentage of total	**5%**	**5%**	**11%**	**1%**	**78%**	**100%**

3.4 Operational Profiles

The operational profiles for OGVs are based on vessel activity and routing, as discussed below.

3.4.1 Vessel Activity

Vessel activity is defined as the number of ship trips by trip type and segment. Trip types include arrivals, departures, and shifts. Shifts are vessel movements from one berth within the Puget Sound area to another. The MarEx data was processed to identify arrivals, departures and shifts in a logical sequence. Arrivals were assumed to come from the "last port of call" or from the sea. For departures, vessels were assumed to depart from the designated port and pier and travel to the "next port of call" or travel out to sea. Shifts which involved trips internal to the area of study were processed as being from the last arrival to the next departure. One result of the data processing was the creation of three variables: trip origin, trip destination, and elapsed time (for hotelling estimates).

There are a variety of definitions for "ship call" or "vessel call". For the purpose of this report, the basic definition of a ship call is an arrival from the sea, Canada or another port to a berth or anchorage. Inbound calls to anchorages associated with maritime facilities are also included, and thus the number of calls described in this report may not completely match the port statistics on ship calls for 2005. The arrivals as determined by this study approximate the true number of ship calls, but underestimate the number of terminal calls typically reported for port statistics, which include shifts or movements within a port facility. This study separates shifts from arrivals and departures since shifts do not have a "transit" component as do arrivals and departures. Ship movements are tracked as to:

- Arrivals (vessels arriving from the sea or another facility to a terminal).
- Departures (vessels leaving a terminal to go out to sea or another facility).
- Shift (vessels that move within a facility to another terminal or anchorage).
- Total movements (sum of all the above).

While many vessels make only one arrival and departure at a time, some vessels make multiple terminal calls within a port or maritime facility. There are two broad categories of shifts:

- Inter-port shifts – movements within a port from one terminal or berth to another.
- Anchorage shifts – movements between a terminal and anchorage. One example is: a vessel went to a terminal, loaded a partial load, went to anchorage, and then came back to the terminal to complete loading.

Table 3.3 presents the arrivals, departures, shifts and total movements for the Puget Sound study area in 2005 by vessel type. Due to the complexity of the study area, the number of inbound and outbound trips does not match. For example, in Table 3.3, the total inbound trips are less than the total outbound trips. This is because vessels that shifted from another dock, anchorage or terminal within the port or maritime facility are counted as shifts instead of arrivals from the sea or another port or maritime facility.

Table 3.3: Puget Sound 2005 OGV Movements by Vessel Type

Vessel Type	Inbound	Outbound	Shift	Movements
Auto Carrier	188	188	18	394
Bulk - General	280	282	277	839
Bulk - Heavy Load	4	4	8	16
Bulk Self-Discharging	17	17	7	41
Bulk Wood Chips	9	9	2	20
Container - 1000	171	171	10	352
Container - 2000	307	306	33	646
Container - 3000	168	168	12	348
Container - 4000	308	308	71	687
Container - 5000	298	297	10	605
Container - 6000	71	71	3	145
Container - 7000	3	3	0	6
Container - 8000	10	10	0	20
Cruise	167	169	14	350
General Cargo	169	169	38	376
Ocean Tugs	146	146	144	436
Miscellaneous	16	16	14	46
Reefer	5	5	0	10
RoRo	133	133	3	269
Tanker - General	129	129	135	393
Tanker - Chemical	10	10	4	24
Tanker - Crude - Aframax	89	89	149	327
Tanker - Crude - Handyboat	33	34	45	112
Tanker - Crude - Panamax	7	7	5	19
Tanker - Crude - Suezmax	177	178	322	677
Tanker - Crude - VLCC	3	3	1	7
Tanker - Oil Products	19	19	19	57
Total	**2,937**	**2,941**	**1,344**	**7,222**

Figure 3.20 shows that 67% of the inbound calls in 2005 by ocean-going vessels were to the six main public ports in the area. Other maritime facilities, such as privately-owned terminals and anchorages throughout the study area had 19% of the inbound calls in 2005. Petroleum terminals and their associated anchorages had 14% of the inbound calls in 2005.

Figure 3.20: Puget Sound 2005 Inbound Calls by Facility Type, %

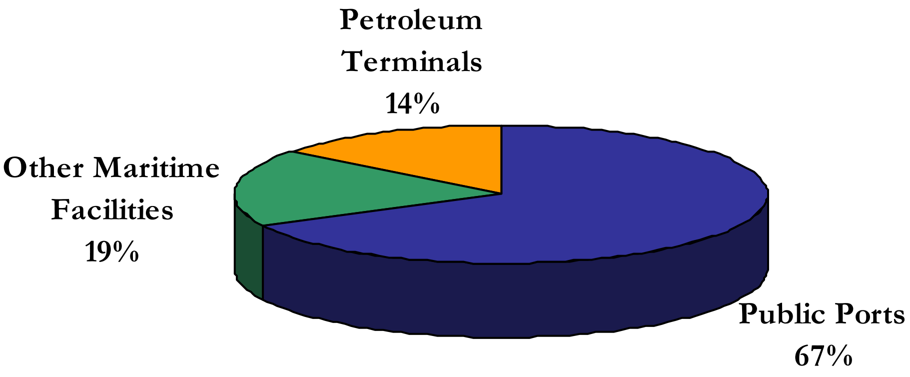
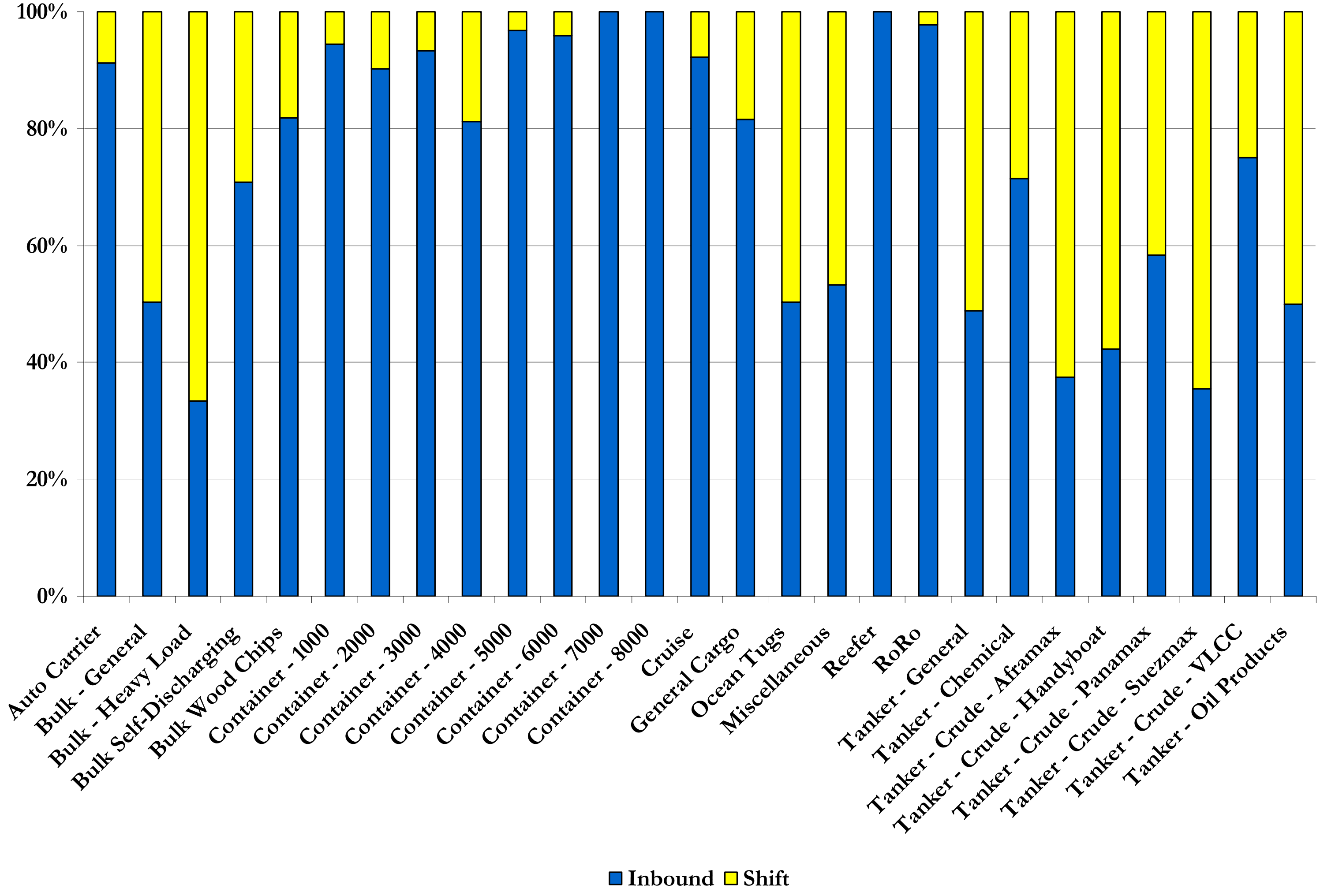


Figure 3.21 presents the percentage of shift vs. inbound calls by vessel type. Tankers, ocean tugboats, bulk vessels and miscellaneous vessels have a higher percentage of shifts than other vessel types. Tankers tend to use more anchorages and therefore shift from anchorage to oil and chemical terminals instead of coming straight from the sea to the terminal. Bulk vessels make more than one stop at terminals within a port to load and unload their cargo.

Figure 3.21: Puget Sound 2005 Percentage of Shifts vs. Inbound Calls by Vessel Type, %



3.4.2 Vessel Routing

Vessel routing is the underlying geographic element that the emissions estimates are based on. Using the 2005 MarEx of Puget Sound data, distinct trip routes were derived. There were a total of 153 distinct ship routes in the MarEx data. As shown in Table 3.4, 145 distinct ship routes were within the study area and scope. As shown in Table 3.5 eight distinct routes were outside the scope of the inventory.

The term "port" in the following tables refers to any stop made by a vessel and does not necessarily refer to a public port. In Table 3.1, routes that have the same "from port" and "to port" (i.e., Everett to Everett) are included for shifts within the port. Vessels may make a movement or shift within the port from one terminal to another or from an anchorage to a terminal.

Due to the routing complexity of the region and the multiple movements, including arrivals, departures and shifts, some routes may have reciprocal routes included in Table 3.4 (i.e., Tacoma to Seattle and Seattle to Tacoma), while others may not. For example, Olympia to Everett is listed, but there is no reciprocal Everett to Olympia route listed. This indicates that in 2005, vessels may have traveled from Olympia to Everett, but there were no movements from Everett to Olympia. The distinct routes are from the 2005 MarEx data and depict the movements made that year.

Table 3.4: OGV Vessel Routes Used in Puget Sound Maritime Air Emissions Inventory

From Port	To Port
ANACORTES	CHERRY POINT
ANACORTES	FERNDALE
ANACORTES	MARCH POINT
ANACORTES	OUT SEA
ANACORTES	SEATTLE
BELLINGHAM	BELLINGHAM
BELLINGHAM	OUT SEA
BELLINGHAM	TACOMA
BELLINGHAM	VANCOUVER BC
BLAKE ISLAND	PORT ANGELES
BREMERTON	PORT TOWNSEND
BREMERTON	SEATTLE
CHERRY POINT	FERNDALE
CHERRY POINT	MANCHESTER
CHERRY POINT	MARCH POINT
CHERRY POINT	OUT SEA
CHERRY POINT	PORT ANGELES
CHERRY POINT	SANDY POINT
CHERRY POINT	SEATTLE
CHERRY POINT	TACOMA
CHERRY POINT	VANCOUVER BC
CHERRY POINT	VENDOVI ISLAND
EVERETT	EVERETT
EVERETT	OUT SEA
EVERETT	SEATTLE
EVERETT	TACOMA
EVERETT	VANCOUVER BC
FERNDALE	ANACORTES
FERNDALE	CHERRY POINT
FERNDALE	MARCH POINT
FERNDALE	OUT SEA
FERNDALE	PORT ANGELES
FERNDALE	SANDY POINT
FERNDALE	TACOMA
FERNDALE	VANCOUVER BC
FERNDALE	VENDOVI ISLAND
INDIAN ISLAND	OUT SEA
MANCHESTER	CHERRY POINT
MANCHESTER	INDIAN ISLAND
MANCHESTER	MARCH POINT
MANCHESTER	OUT SEA
MANCHESTER	PORT ANGELES
MANCHESTER	SEATTLE
MARCH POINT	ANACORTES
MARCH POINT	CHERRY POINT
MARCH POINT	FERNDALE
MARCH POINT	OUT SEA
MARCH POINT	POINT WELLS
MARCH POINT	PORT ANGELES
MARCH POINT	SEATTLE
MARCH POINT	TACOMA
MARCH POINT	VANCOUVER BC
MARCH POINT	VENDOVI ISLAND
OLYMPIA	EVERETT
OLYMPIA	OLYMPIA
OLYMPIA	OUT SEA
OLYMPIA	SEATTLE
ORCAS ISLAND	ANACORTES
OUT SEA	ANACORTES
OUT SEA	BELLINGHAM
OUT SEA	BREMERTON
OUT SEA	CHERRY POINT
OUT SEA	EVERETT
OUT SEA	FERNDALE
OUT SEA	INDIAN ISLAND
OUT SEA	MANCHESTER
OUT SEA	MARCH POINT
OUT SEA	OLYMPIA
OUT SEA	OUT SEA
OUT SEA	POINT WELLS
OUT SEA	PORT ANGELES
OUT SEA	PORT TOWNSEND
OUT SEA	SANDY POINT
OUT SEA	SEATTLE
OUT SEA	TACOMA
OUT SEA	VENDOVI ISLAND
POINT WELLS	MARCH POINT
POINT WELLS	OUT SEA
POINT WELLS	PORT ANGELES
PORT ANGELES	ANACORTES
PORT ANGELES	CHERRY POINT
PORT ANGELES	FERNDALE
PORT ANGELES	INDIAN ISLAND
PORT ANGELES	MARCH POINT
PORT ANGELES	ORCAS ISLAND
PORT ANGELES	OUT SEA
PORT ANGELES	POINT WELLS
PORT ANGELES	PORT ANGELES
PORT ANGELES	SANDY POINT
PORT ANGELES	SEATTLE
PORT ANGELES	TACOMA
PORT ANGELES	VANCOUVER BC
PORT TOWNSEND	BREMERTON
PORT TOWNSEND	INDIAN ISLAND
PORT TOWNSEND	OUT SEA
SANDY POINT	CHERRY POINT
SANDY POINT	FERNDALE
SANDY POINT	OUT SEA
SANDY POINT	VANCOUVER BC
SEATTLE	ANACORTES
SEATTLE	BLAKE ISLAND
SEATTLE	CHERRY POINT
SEATTLE	EVERETT
SEATTLE	MANCHESTER
SEATTLE	MARCH POINT
SEATTLE	NANIAMO
SEATTLE	OUT SEA
SEATTLE	PORT ANGELES
SEATTLE	PORT TOWNSEND
SEATTLE	SEATTLE
SEATTLE	TACOMA
SEATTLE	VANCOUVER BC
SEATTLE	VENDOVI ISLAND
SEATTLE	VICTORIA
TACOMA	BELLINGHAM
TACOMA	CHERRY POINT
TACOMA	EVERETT
TACOMA	MARCH POINT
TACOMA	OUT SEA
TACOMA	PORT ANGELES
TACOMA	SEATTLE
TACOMA	TACOMA
TACOMA	VANCOUVER BC
TACOMA	VICTORIA
VANCOUVER BC	ANACORTES
VANCOUVER BC	CHERRY POINT
VANCOUVER BC	EVERETT
VANCOUVER BC	FERNDALE
VANCOUVER BC	MARCH POINT
VANCOUVER BC	OLYMPIA
VANCOUVER BC	PORT ANGELES
VANCOUVER BC	SANDY POINT
VANCOUVER BC	SEATTLE
VANCOUVER BC	TACOMA
VANCOUVER BC	VENDOVI ISLAND
VENDOVI ISLAND	ANACORTES
VENDOVI ISLAND	CHERRY POINT
VENDOVI ISLAND	FERNDALE
VENDOVI ISLAND	MARCH POINT
VENDOVI ISLAND	TACOMA
VICTORIA	EVERETT
VICTORIA	PORT ANGELES
VICTORIA	SEATTLE
VICTORIA	TACOMA

Table 3.5: OGV Routes Not Included in Puget Sound Maritime Air Emissions Inventory

From Port	To Port
ABERDEEN	ABERDEEN
ABERDEEN	OUT TO SEA
ABERDEEN	VANCOUVER BC
OUT TO SEA	ABERDEEN
OUT TO SEA	WESTPORT
VANCOUVER BC	ABERDEEN
VANCOUVER BC	WESTPORT
WESTPORT	ABERDEEN

The trip combinations were then applied to specific routes using nautical chart software Maptech Offshore Navigator, v5.07. Each unique trip, inbound or outbound, was mapped and then divided into logical trip segments. These segments were aligned by precautionary zones, places where ships could take different routes, speed reduction zones, curves or bends in the fairway, major channel markers, and county lines. For an added level of assurance, the routing segments were reviewed with the Puget Sound Pilots and modified based on their input.[59]

As an example of trip segmentation, the Port of Everett to out to sea route is discussed in more detail. In this effort, there was one trip route and 21 trip segments or links using the partitioning techniques described earlier. For the Port of Everett to the out to sea route:

- The shortest segment was 0.8 nautical miles (miles)
- The longest segment was 34.1 miles (the Strait of San Juan de Fuca)
- The average segment was 5.7 miles

Each port-to-port combination was modeled differently, depending also on whether it was inbound or outbound. Service speeds (knots) for each vessel were taken from Lloyd's data. Reduced speeds were assigned for each vessel type, depending on whether they were:

- Fast – containerships, auto carriers, and cruise ships
- Medium – reefers and RoRos
- Slow – tankers and all other vessel types

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[59] Meeting between Captain Richard McCurdy, Puget Sound Pilots, and Bruce Anderson, Starcrest, 15 February 2007. See also *http://www.pspilots.org*.

Although there is no industry standard that assigns ranges for speed category, in general, fast vessels are considered to have a maximum speed range of 20 to 25 knots, while slow vessels have a maximum speed range of 17 knots or less, and the medium speed vessels fall between the speed ranges of 17 to 20 knots.

Based on information gathered from various shipping lines and the Vessel Boarding Program, unique speeds were also created for others, including:

- TOTE
- Maersk
- Evergreen
- K-Line
- Holland America Line

For the maneuvering, a list of destinations for each port area was derived from the 2005 MarEx data. Some of the destinations listed in the following tables may not be property of the ports listed. These include port-owned berths, private facilities, and anchorages that are located near that port. Tables 3.6 through 3.13 list the destinations by Port area:

Table 3.6: Anacortes Destinations

PORT	DESTINATION
ANACORTES	CURTIS WHARF
ANACORTES	PORT DOCK 1
ANACORTES	PORT DOCK 2

Table 3.7: Everett Destinations

PORT	DESTINATION
EVERETT	1-NORTH
EVERETT	3-SOUTH
EVERETT - ANCHORAGE	ANCHOR
EVERETT	HEWITT
EVERETT	PACIFIC TERM
EVERETT	SOUTH TERMINAL

Table 3.8: Olympia Destinations

PORT	DESTINATION
OLYMPIA - ANCHORAGE	ANCHOR
OLYMPIA	PORT DOCK 1
OLYMPIA	PORT DOCK 2
OLYMPIA	PORT DOCK 3

Table 3.9: Port Angeles Destinations

PORT	DESTINATION
PORT ANGELES	1-NORTH
PORT ANGELES - ANCHOR	ANCHOR
PORT ANGELES	CITY DOCK
PORT ANGELES	T PIER
PORT ANGELES - PRIVATE	TESORO

Table 3.10: Tacoma Destinations

PORT	DESTINATION
TACOMA	3-SOUTH
TACOMA	4-A
TACOMA	4-A&B
TACOMA	4-B
TACOMA	7-A
TACOMA	7-B
TACOMA	7-C
TACOMA	7-D
TACOMA	BLAIR-A
TACOMA	BLAIR-B
TACOMA	MAERSK
TACOMA	PCT-A
TACOMA	PCT-B
TACOMA	TEMCO
TACOMA	TOTE
TACOMA	WA UNITED 1
TACOMA	WA UNITED 2
TACOMA	WEYCO CHIP
TACOMA	WEYCO LOG 1
TACOMA	WEYCO LOG 2
TACOMA - ANCHORAGE	ANCHOR
TACOMA - PRIVATE	PIONEER
TACOMA - PRIVATE	PNW TERMINAL
TACOMA - PRIVATE	SCHNITZER
TACOMA - PRIVATE	SPERRY
TACOMA - PRIVATE	US OIL

For the Seattle area, there are four anchorages (EBE, EBW, SCE, and SCW) not listed in the Table 3.11, but are included in this study.

Table 3.11: Seattle Destinations

PORT	DESTINATION
SEATTLE	15
SEATTLE	18-1
SEATTLE	18-2
SEATTLE	18-3
SEATTLE	18-4
SEATTLE	18-5
SEATTLE	20-1
SEATTLE	20-2
SEATTLE	25-NORTH
SEATTLE	25-SOUTH
SEATTLE	30-NORTH
SEATTLE	30-SOUTH
SEATTLE	37
SEATTLE	46
SEATTLE	5-CENTER
SEATTLE	5-NORTH
SEATTLE	5-SOUTH
SEATTLE	66-1
SEATTLE	66-2
SEATTLE	66-3
SEATTLE	66-4
SEATTLE	66-NORTH
SEATTLE	86
SEATTLE	90-3
SEATTLE	90-3&5
SEATTLE	90-5&7
SEATTLE	90-7
SEATTLE	91-E&F
SEATTLE	91-H&I
SEATTLE	91-J&K
SEATTLE - PRIVATE	BP
SEATTLE - PRIVATE	BPB
SEATTLE - PRIVATE	EB MARINA
SEATTLE - PRIVATE	GLACIER
SEATTLE - PRIVATE	KINDER MORGAN
SEATTLE - PRIVATE	LAFARGE
SEATTLE - PRIVATE	SHELL
SEATTLE - PRIVATE	SHILSHOLE
SEATTLE - PRIVATE	TODD-4
SEATTLE - PRIVATE	TODD-5
SEATTLE - PRIVATE	TODD-DD3
SEATTLE - PRIVATE	TODD-E
SEATTLE - PRIVATE	TODD-F
SEATTLE - PRIVATE	TODD-H

Table 3.12 lists "other ports" destinations. The term "other ports" refers to any stop made by a vessel not included in the other port areas and does not necessarily refer to a public port. Some of these "ports" may not be typical vessel stops, (e.g., Blake Island) but were listed in the MarEx and therefore included in the routing for completeness.

Table 3.12: Other Ports Destinations

PORT	DESTINATION
BELLINGHAM	ANCHOR
BELLINGHAM	COLD STORAGE
BELLINGHAM	PORT DOCK 1
BELLINGHAM	PORT DOCK 2
BLAKE ISLAND	ANCHOR
BREMERTON	PSNS
CHERRY POINT	BP
CHERRY POINT	NA
FERNDALE	INTALCO
FERNDALE	CONOCOPHILLIPS
INDIAN ISLAND	AMMO
MANCHESTER	FUEL
MARCH POINT	ANCHOR
MARCH POINT	SHELL
MARCH POINT	TESORO
ORCAS ISLAND	ANCHOR
OUT SEA	ANCHOR
OUT SEA	NA
POINT WELLS	CHEVRON
PORT TOWNSEND	ANCHOR
SANDY POINT	ANCHOR
VENDOVI ISLAND	ANCHOR
VENDOVI ISLAND	ISLAND

The Foss Shipyard, Lake Union, Salmon Bay and Northlake piers listed in Table 3.13 are located in Lake Washington which is outside the scope of this study and were not included in the inventory. There were only a few trips made to these piers.

Table 3.13: Excluded Piers in Lake Washington

Port	Pier
LWSC	FOSS SHIPYARD
LWSC	LAKE UNION
LWSC	NORTHLAKE
LWSC	SALMON BAY

3.5 Emission Reduction Technologies Identified

In 2005, slide fuel valves were used by 14 known vessels that called at the Port of Tacoma. This new type of fuel valve leads to better combustion, less smoke, and lower fuel consumption, resulting in reduced overall NO_x and PM emissions. Some new engines, specifically propulsion engines manufactured by MAN B&W, may have this type of fuel valve, and some companies are retrofitting MAN B&W main engines with the slide fuel valves. Since the use of slide valves is not called out specifically in the information available for each vessel, the inventory may not have captured all the vessels with slide valves that called at Puget Sound maritime facilities in 2005. The emission reductions used for the slide fuel valves are based on MAN B&W Diesel A/S emission measurements of marine vessel *Sine Maersk*. The reductions are:

- 30% reduction for NO_x
- 25% reduction for PM

At the Port of Seattle, Princess Cruise Line vessels used shore power during the 2005 cruise season at Terminal 30. These vessels had zero emissions while at berth. Holland America Line and Westwood Shipping vessels have received 'Clean Class' or 'Environmental Notation' designations, allowing for lower NO_x emission factors to be applied on specific vessels (See Section 3.6.4 and Table 3.16).

3.6 Methodology

In developing an activity-based emissions inventory for marine vessels, emissions are estimated as a function of vessel power demand (expressed in kW-hrs) multiplied by an emission factor, where the emission factor is expressed in terms of grams per kilowatt-hour (g/kW-hr). Emission factors and emission factor adjustments for low propulsion engine load were then applied to the various activity data.

The process for estimating emissions from propulsion engines is illustrated in Figure 3.22. This diagram indicates the sources of information discussed in the previous subsection and how they are used to develop the components of the emission calculations, as described below. Equations 3.1 and 3.2 report the basic equations used in estimating emissions, and are labeled in Figure 3.21. The variables are discussed in more detail in this section following Figure 3.21.

$$E = Energy \times EF \times FCF \qquad \text{Equation 3.1}$$

Where:

- E = Emissions from the engine(s) that are included in the "Energy" term discussed below, usually calculated as grams of emissions per unit of time (e.g., per year), but converted to tons of emissions by dividing by 453.6 grams per pound and 2,000 pounds per ton.
- Energy = Energy demand, in kW-hrs, calculated using Equation 3.2 below as the energy output of the engine (or engines) over the period of time covered by the estimate.
- EF = Emission factor, usually expressed in terms of g/kW-hr, discussed in more detail in Section 3.6.4.
- FCF = Fuel correction factor (unitless), used to account for other fuels used and fuel switching, discussed in Section 3.6.11.

The 'Energy' term of the equation is where most of the location-specific information is used. Energy is calculated using Equation 3.2:

$$Energy = MCR \times LF \times A \qquad \text{Equation 3.2}$$

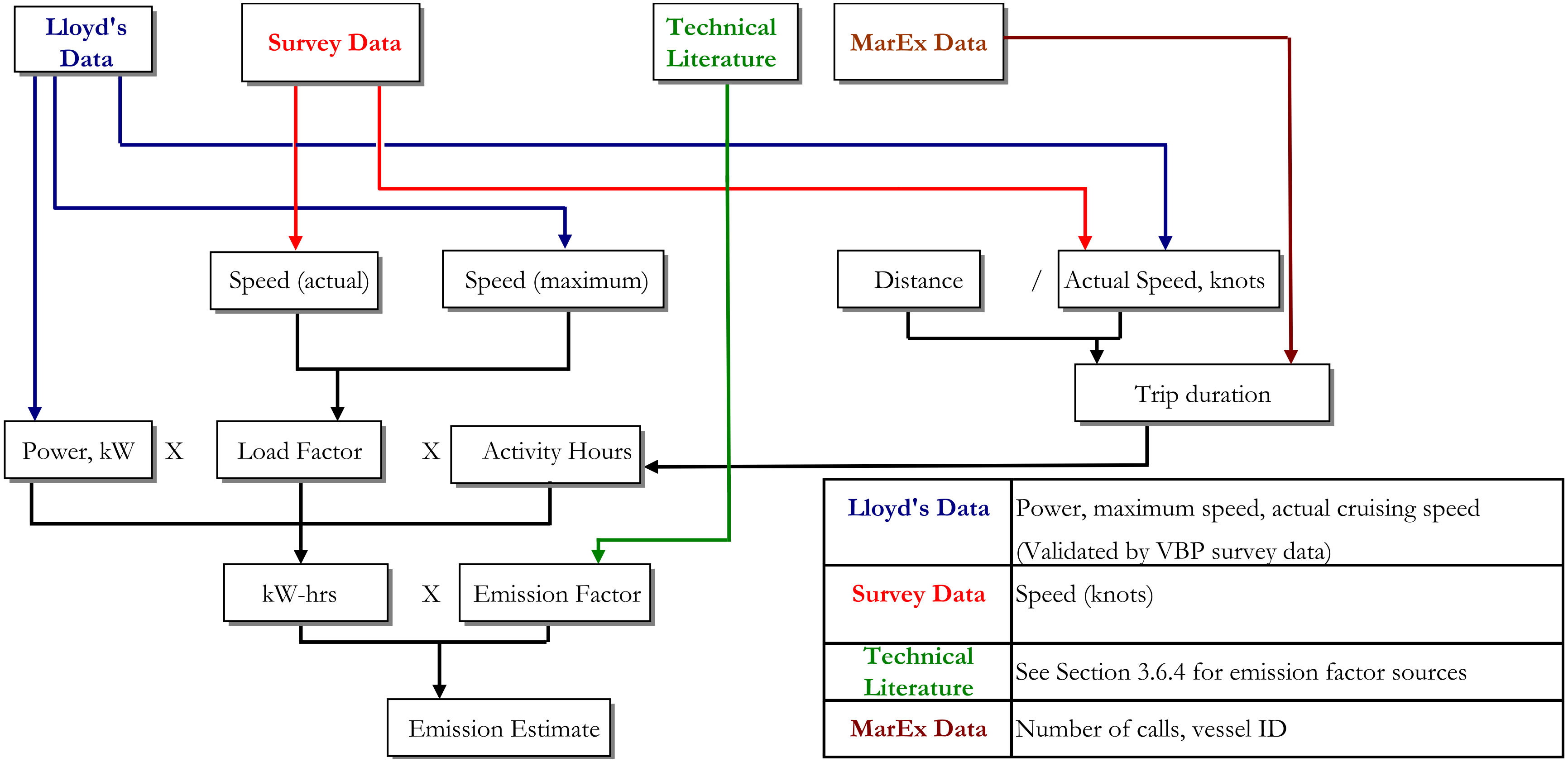
Where:

- MCR = maximum continuous rated engine power, kW
- LF = load factor (unitless)
- A = activity, hours

The emissions estimation section discusses the methodology used for propulsion engines (Sections 3.6.1 to 3.6.7), auxiliary engines (Sections 3.6.8 and 3.6.9) and auxiliary boilers (Section 3.6.10). Propulsion engines are also referred to as main engines.

Incinerators are not included in the emissions estimates because incinerators are not used within the study area. Interviews with the vessel operators and marine industry, in general, report that vessels do not use their incinerators while at berth or near coastal waters. The Puget Sound Clean Air Agency requires a permit to operate an incinerator on an ocean-going vessel within their jurisdiction and no permits have been issued to date.

Figure 3.22: Propulsion Engine Emission Estimation Flow Diagram



Lloyd's Data	Power, maximum speed, actual cruising speed (Validated by VBP survey data)
Survey Data	Speed (knots)
Technical Literature	See Section 3.6.4 for emission factor sources
MarEx Data	Number of calls, vessel ID

3.6.1 Propulsion Engine Maximum Continuous Rated Power

MCR power is defined as the manufacturer's tested engine power; for this study, it is assumed that the Lloyd's 'Power' value is the MCR power. The international specification is to report MCR in kilowatts, and it is related to the highest power available from a ship engine during average cargo and sea conditions. However, operating a vessel at 100% of its MCR power is very costly from a fuel consumption and engine maintenance perspective, so most operators limit their maximum power to about 80% of MCR.

3.6.2 Propulsion Engine Load Factor

Load factor is expressed as the ratio of a vessel's power output at a given speed to the vessel's MCR power. At maximum power (100% MCR) and maximum speed, the load is 100%. Service speed is 94% of the maximum speed.[60] As suggested above, at normal service speed, a ship probably has a load factor of close to 80%. Every vessel has a different maximum, service, and intermediate speeds (the range is 2% to 83% load on the engine). For the purpose of computation, actual speeds from Lloyd's data are used. For intermediate speeds (20% - 83% load), the Propeller Law[61] is used to estimate ship propulsion engine loads, based on the theory that propulsion power varies by the cube of speed.

$$LF = (AS / MS)^3 \qquad \text{Equation 3.3}$$

Where:

LF = load factor, percent
AS = actual speed, knots
MS = maximum speed, knots

The output from Equation 3.3 is illustrated in Figure 3.23, showing the load factor curve of a hypothetical ship with 20,000 kW main engine power and a top speed of 22 knots at that power output. The shape of the curve illustrates why vessels typically operate at less than their MCR power – at the top of the curve, the increase in power is much greater than the increase in speed, meaning that the vessel uses comparatively more power (and fuel) to obtain a small increase in speed.

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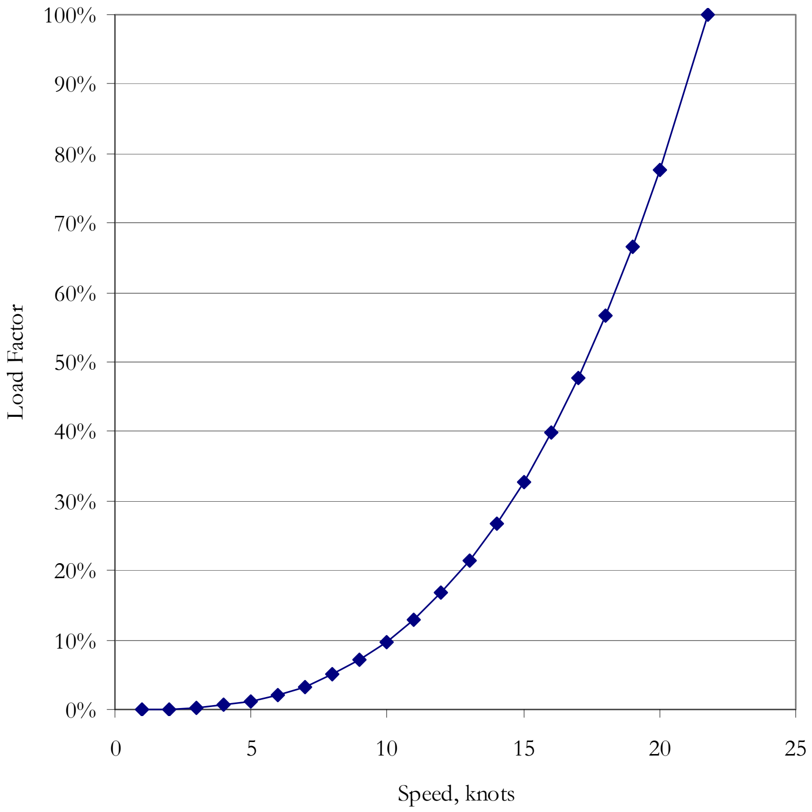
[60] Starcrest 2005.
[61] Man B & W, Basic Principles of Ship Propulsion

As an example, at a speed of 20 knots, the hypothetical vessel's engine would be operating with a load factor of 75% [$(20/22)^3$ = 0.75, or 75%]. At 21 knots the load factor would be 87% [$(21/22)^3$ = 0.87, or 87%]. That's an increase of 12% of the vessel's power output for a 1-knot increase in speed. At the lower end of the speed range, at a speed of 10 knots, the hypothetical vessel's engine would be operating with a load factor of 9% [$(10/22)^3$ = 0.09, or 9%]. At 9 knots the load factor would be 7% [$(9/22)^3$ = 0.07, or 7%]; this would give a 1-knot speed increase at an increase of only 2% of the vessel's power output. At 6 knots the load factor would be 2% [$(6/22)^3$ = 0.02, or 2%].

Figure 3.23: Propeller Law Curve of Power Demand



3.6.3 Propulsion Engine Time in Mode

Time in mode or activity is measured in hours of operation. The transit times were estimated by dividing the distance traveled by ship speed. The distance and ship speed are from the routing data discussed in Section 3.2.

$$A = D/S \qquad \text{Equation 3.4}$$

Where:

A = activity, hours
D = distance, nautical miles
S = ship speed, knots

In addition to transit time, there are also maneuvering and hotelling times that are used. For maneuvering time, the same Equation 3.4 is used to calculate time during maneuvering. For hotelling time, departure time was subtracted from the arrival time to estimate hours of hotelling for both at berth and anchorage.

3.6.4 Propulsion Engine Emission Factors

The main engine emission factors used in this study were reported in a 2002 Entec study[62], except for the PM emission factor. The source and value of each emission factor for the main engines is discussed in this section.

Vessels are assumed to operate their main engines on residual oil (RO) which is intermediate fuel oil (IFO 380) or one with similar specifications with an average sulfur constant of 2.7%. This is supported by information collected during the Vessel Boarding Program; exceptions are made for those vessels that use a different fuel other than residual fuel. For vessels using a different fuel, a fuel correction factor is applied in the equation and this is discussed in a separate subsection.

Three vessel technologies are reported:

- Slow speed diesel engines, having maximum engine speeds less than 130 revolutions per minute (rpm) based on the EPA definition for ship engines as described in a 1999 Regulatory Impact Analysis.[63]
- Medium speed diesel engines, having maximum engine speeds over 130 rpm (and typically greater than 400 rpm).
- Gas and steam boiler turbines.

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[62] Entec, UK Limited, *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community, Final Report*, July 2002. Prepared for the European Commission.

[63] EPA, *Control of Emissions from Marine Diesel Engines, Regulatory Impact Analysis*, November 1999. EPA 420-R-99-026. (EPA 1999) See: *http://www.epa.gov/otaq/inventory.htm.*

The emission factors for main engines using residual fuel and built prior to 1999 are listed in Table 3.14.

Table 3.14: Emission Factors for 1999 and Older OGV Main Engines using RO, g/kWhr

Engine	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	CO_2	N_2O	CH_4
Slow speed diesel	18.1	0.6	1.4	10.5	1.0	0.8	1.0	620	0.03	0.06
Medium speed diesel	14.0	0.5	1.1	11.5	1.0	0.8	1.0	677	0.03	0.04
Gas turbine	6.1	0.1	0.2	16.5	0.5	0.4	0.0	970	0.08	0.02
Steam turbine	2.1	0.1	0.2	16.5	0.8	0.6	0.0	970	0.08	0.02

The emission factors for the newer model main engines using residual fuel and built after 2000 are listed in Table 3.15. Only the NO_x emission factor changes for the newer engines. All other emissions stay the same.

Table 3.15: Emission Factors for 2000 and Newer OGV Main Engines using RO, g/kWhr

Engine	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	CO_2	N_2O	CH_4
Slow speed diesel	17.0	0.6	1.4	10.5	1.0	0.8	1.0	620	0.03	0.06
Medium speed diesel	13.0	0.5	1.1	11.5	1.0	0.8	1.0	677	0.03	0.04

NO_x Emission Factor

The IMO established OGV propulsion engine standards in Annex VI and engine manufacturers have been in compliance with the NO_x Technical Code since 2000. The engine standards are baseline standards to prevent back sliding on emission levels from 2000 and newer engine models. In this study, the 17.0 g/kW-hr NO_x emission factor is used for slow speed vessels built after the year 2000.

Medium speed engine standards under the IMO program are based on engine revolutions per minute (rpm). For medium speed engines built after the year 2000, the 13.0 g/kW-hr NO_x emission factor is used. Engine manufacturers design their engines to emit well below the calculated standards, but it is difficult to establish an "in-use" average without the benefit of measurements.

Emission Factors for Clean Class or Environmental Notation

Classification societies have introduced environmental standards for vessels and also provide independent verification of shipboard environmental performance. Vessels are assigned an environmental notation once it meets certain environmental requirements. The notation may vary by name and requirement depending on the class society providing the service. Based on interviews with ship owners and engine test data certified on their environmental notation, vessels from two shipping lines, Holland America Line (HAL) and Westwood Shipping, were given a lower NO_x emission factor. Table 3.16 lists the NO_x emission factors used for these vessels.

Table 3.16: NO_x Emission Factors for Engines on Specific Vessels, g/KW-hr

Engine	NO_x
HAL vessels with medium speed diesel	10.0
Westwood vessels with slow speed diesel	12.1
Westwood vessel with medium speed diesel	9.4

CO Emission Factor

CO emission factors were developed from information provided in the Entec 2002 appendices because they are not explicitly stated in the text. They were confirmed with IVL Swedish Environmental Research Institute Ltd.[64]

PM Emission Factor

Recent discussions with EPA have cited PM emission factors in the range of 0.99 to 1.11 g/kW-hr for slow and medium speed engines. In order to be consistent with EPA and the concurrent BCMVEI, an average emission factor of 1.0 g/kW-hr was used for this study. The PM emission factor is derived from the results of an equation that is based on PM and sulfate relationship[65] since the factor is not explicitly listed in the Entec study. CARB is using 1.5 g/kW-hr for the PM emission factor in their state emissions inventory, but this value is not being used outside of California. PM_{10} is assumed to be 100% of PM. Fine particulate matter, $PM_{2.5}$, was estimated to be 80% of $PM_{10.}$[66] For internal combustion diesel engines, the same PM_{10} emission factor is used for DPM. For other types of engines that do not meet the definition of internal combustion, such as steam boilers and gas turbines, diesel particulate matter is zero.

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[64] Cooper, David, IVL Swedish Environmental Research Institute Ltd., 16 January 2004 e-mail correspondence with C.H. Wells, Starcrest Consulting Group, LLC. (IVL 2004)

[65] US EPA, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression Ignition Engines*, EPA Report No. EPA420-P-04-099, April 2004.

[66] Lyyranen et al 1999. 'Aerosol Characterization in Medium-Speed Diesel Engines Operating with Heavy Fuel Oils,' *Journal of Aerosol Science* 30:6.

SO_2 Emission Factor

The SO_2 emission factor is dependent on the fuel used; the baseline emission factor for Puget Sound is based on a sulfur content of 2.7%, which is an average for residual fuel. If a lower sulfur fuel content is used, fuel correction factors are applied, as discussed in Section 3.6.11.

Greenhouse Gas Emission Factors

Table 3.17 lists the greenhouse gas emission factors used for the main engines of ocean-going vessels. The sources for the emissions factors are Entec 2002 for the CO_2 emission factor and IVL 2004 for the N_2O and CH_4 emission factors.

Table 3.17: Greenhouse Gas Emission Factors for OGV Main Engines using Residual Fuel, g/kW-hr

Engine	CO_2	N_2O	CH_4
Slow speed diesel	620	0.03	0.06
Medium speed diesel	677	0.03	0.04
Gas turbine	970	0.08	0.02
Steam turbine	970	0.08	0.02

3.6.5 Varying Emission Factors for Low Loads for Propulsion Engines

This section addresses emission factors for propulsion engines powered by compression ignition engines. The discussion does not include steamships or ships having gas turbines because Energy and Environmental Analysis, Inc. (EEIA), in a study conducted for EPA, observed a rise in emissions for diesel engines, only.[67]

In general terms, diesel-cycle engines are not as efficient when operated at low loads or very high loads. The EEIA study established a formula for calculating emission factors for low engine load conditions such as those encountered during harbor maneuvering and when traveling slowly at sea such as in the reduced speed zone. While mass emissions (e.g., pounds per hour) tend to go down as vessel speeds and engine loads decrease, the emission factors (e.g., g/kW-hr) increase. This is based on observations that compression-cycle combustion engines are less efficient at low loads. Low load emission factor equations were developed from EPA emission factors for marine vessels at full load.

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[67] EEIA for Sierra Research, for EPA, *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data,* February 2000. Sierra Research work assignment No. 1-10. EPA420-R-002. (EEIA 2000)

These equations work well to describe the low-load effect where emission rates can increase, based on a limited set of data from Lloyd's Maritime Program and the U.S. Coast Guard. It was first cited in a study conducted for the EPA in 2002 by ENVIRON.[68] The equation is based on the variables provided in Table 3.18.

Table 3.18: Low-Load Emission Factor Regression Equation Variables

Pollutant	**Exponent**	**Intercept (b)**	**Coefficient (a)**
PM	1.5	0.25	0.0059
NO_x	1.5	10.45	0.1255
CO	1.0	0.15	0.8378
VOC	1.5	0.39	0.0667

The equations were used for the entire spectrum of load factors from 1% to 20% for each pollutant, as follows:

$$y = a(\text{fractional load})^{-x} + b \qquad \text{Equation 3.5}$$

Where:

y = emissions in g/kW-hr
a = coefficient
b = intercept
x = exponent (negative)
fractional load = derived by the Propeller Law

The EEIA 2000 equations were used to generate emission factors at loads between one and 20% main engine power. Each of the 20 EEIA factors was divided by the emission factor at 20% EEAI load. This resulted in numbers greater than or equal to one, since emissions increased as load decreased. At 20% load, the value was exactly 1.0 since it was divided into itself. These numbers are called low-load adjustment factors (LLA). The LLA multipliers were then applied to any at sea emission factor. The database then computes the resulting emission factor for each pollutant.

Alternative methods were explored, such as using the EEAI equations to span the entire spectrum between 1% and 100% load, using revised emission factors as the intercept (the starting place at 100% load). Unfortunately, such adjustments cause the shape of the graphed curves to change, and such changes could not be validated with empirical or measurement results. Thus the low load adjustments are used in a relative sense, based on the original published data.

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[68] EPA, *Commercial Marine Inventory Development,* July 2002. EPA 420-R-02-019.

The low load adjustment multipliers are reported in Table 3.19.

Table 3.19: Low-Load Adjustment Multipliers for Emission Factors

Load	NO_X	CO	VOC	PM	SO_2
1%	11.47	19.32	59.28	19.17	1
2%	4.63	9.68	21.18	7.29	1
3%	2.92	6.46	11.68	4.33	1
4%	2.21	4.86	7.71	3.09	1
5%	1.83	3.89	5.61	2.44	1
6%	1.60	3.25	4.35	2.04	1
7%	1.45	2.79	3.52	1.79	1
8%	1.35	2.45	2.95	1.61	1
9%	1.27	2.18	2.52	1.48	1
10%	1.22	1.96	2.20	1.38	1
11%	1.17	1.79	1.96	1.30	1
12%	1.14	1.64	1.76	1.24	1
13%	1.11	1.52	1.60	1.19	1
14%	1.08	1.41	1.47	1.15	1
15%	1.06	1.32	1.36	1.11	1
16%	1.05	1.24	1.26	1.08	1
17%	1.03	1.17	1.18	1.06	1
18%	1.02	1.11	1.11	1.04	1
19%	1.01	1.05	1.05	1.02	1
20%	1	1	1	1	1

3.6.6 Propulsion Engine Maneuvering Loads

Maneuvering is the transition between transit and docking or vice versa. Maneuvering includes docking and a small amount of harbor transit which is transit from/to the main channel. Main engines during maneuvering tend to use a small percentage of total power, especially when coasting on the way into port. During docking, when the ship is being positioned against the wharf, the assist tugboats do most of the work. Emissions from assist tugs are included in the harbor craft section of this report. Estimation of main engine maneuvering loads is the composite of several factors, such as:

- Variable loads for inbound and outbound segments
- Variable transit maneuvering time dependent on distance and speed
- 2% load during docking

The docking aspect is routine with the exception that some ships require extra backing and turning, either on entry or exit. Maneuvering times vary by port, terminal, and ship type.

Docking requires about 2% load on the main engines,[69] but the harbor transit load has to be calculated by the Propeller Law. The transit main engine loads are below 20% during the harbor transit mode, therefore the low load adjustments are also applied to the emission factors. Results are then weighted together by percentage of time in docking and harbor transit modes. Results are shown in Table 3.20.

Table 3.20: Composite Maneuvering Load Factors

Vessel Type	Load_In	Load_Out
Auto Carrier	0.04	0.06
Bulk	0.04	0.05
Containership	0.03	0.03
Cruise	0.03	0.04
General Cargo	0.03	0.04
ITB	0.04	0.06
MISC	0.03	0.04
Reefer	0.02	0.03
RoRo	0.02	0.02
Tanker	0.03	0.05

Load in is an arrival to the harbor and load out is a departure from a dock or pier. The load out is higher than load in because the engine power is used to leave the dock, while the vessel usually coasts in on arrival.

3.6.7 Propulsion Engine Power Defaults

Approximately 5% of the vessels had unknown main engine power because it could not be obtained from Lloyd's data, Vessel Boarding Program data, or any other data files. For this small percentage of vessels, an average main engine power was given by vessel type which is summarized in Table 3.21. These averages were computed from a worldwide query for each vessel type from Lloyd's Register of Ships data.

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[69] Starcrest 2005.

Table 3.21: Main Engine Power Defaults

Vessel Type	Main Engine Power (kW)
Auto Carrier	11,502
Bulk	9,028
Container - 1000	9,642
Container - 2000	22,028
Container - 3000	27,694
Container - 4000	39,091
Container - 5000	46,574
Container - 6000	63,898
Container - 7000	63,898
Container - 8000	63,898
Cruise	na
General Cargo	8,201
Ocean Tug	9,959
Miscellaneous	10,019
Reefer	9,878
Ro/Ro	19,856
Tankers - All Small	6,242
Tankers - Panamax	11,109
Tankers - Afranax	13,784
Tankers - Suezmax	16,742
Tankers - VLCC	23,457
Tankers - ULCC	24,967
Tankers (Diesel/Electric)	13,196

A default was not used for cruise ships since there is so much variability with their propulsion types and sizes. Instead each cruise vessel was studied on an individual basis. This was based on information provided by the cruise industry.

3.6.8 Auxiliary Engine Emission Factors

The process of estimating emissions from auxiliary engines is generally the same as for main engines, with differing details. One main difference is that the load factor is not calculated but rather is estimated from reports in the technical literature (i.e., Entec 2002 and IVL 2004 studies) and from discussions with experts such as ships' engineers. Calculating auxiliary engine load factors from empirical data is theoretically possible but would require detailed fuel consumption data that is not typically available. Figure 3.24 illustrates the auxiliary engine emission estimation process.

The Entec auxiliary engine emission factors used in this study are presented in Table 3.22 for medium speed engines using residual fuel oil and marine diesel oil that have a model year of 1999 or older. For medium speed engines built after the year 2000, the 13.0 g/kW-hr NO_x emission factor is used.

Table 3.22: Auxiliary Engine Emission Factors, g/kW-hr

Engine	Fuel	NO_x	VOC	CO[70]	SO_2	PM
Medium speed diesel	Residual oil	14.7	0.4	1.1	12.3	1.0
Medium speed diesel	Diesel oil	13.9	0.4	1.1	4.3	0.3

It is assumed that vessels operate their auxiliary engines on residual fuel oil with an average sulfur content of 2.7%. If it is known that a vessel switches fuel while in Puget Sound to a lower sulfur fuel, a fuel correction factor is used. The fuel correction factors are discussed in Section 3.6.11.

Table 3.23 lists the greenhouse gas emission factors used for the medium speed auxiliary engines of ocean-going vessels. The sources for the emissions factors are Entec 2002 for the CO_2 emission factor and IVL 2004 for the N_2O and CH_4 emission factors.

Table 3.23: Greenhouse Gas Emission Factors for OGV Auxiliary Engines using Residual Oil Fuel, g/kW-hr

Engine	CO_2	N_2O	CH_4
Medium speed diesel	722	0.03	0.04

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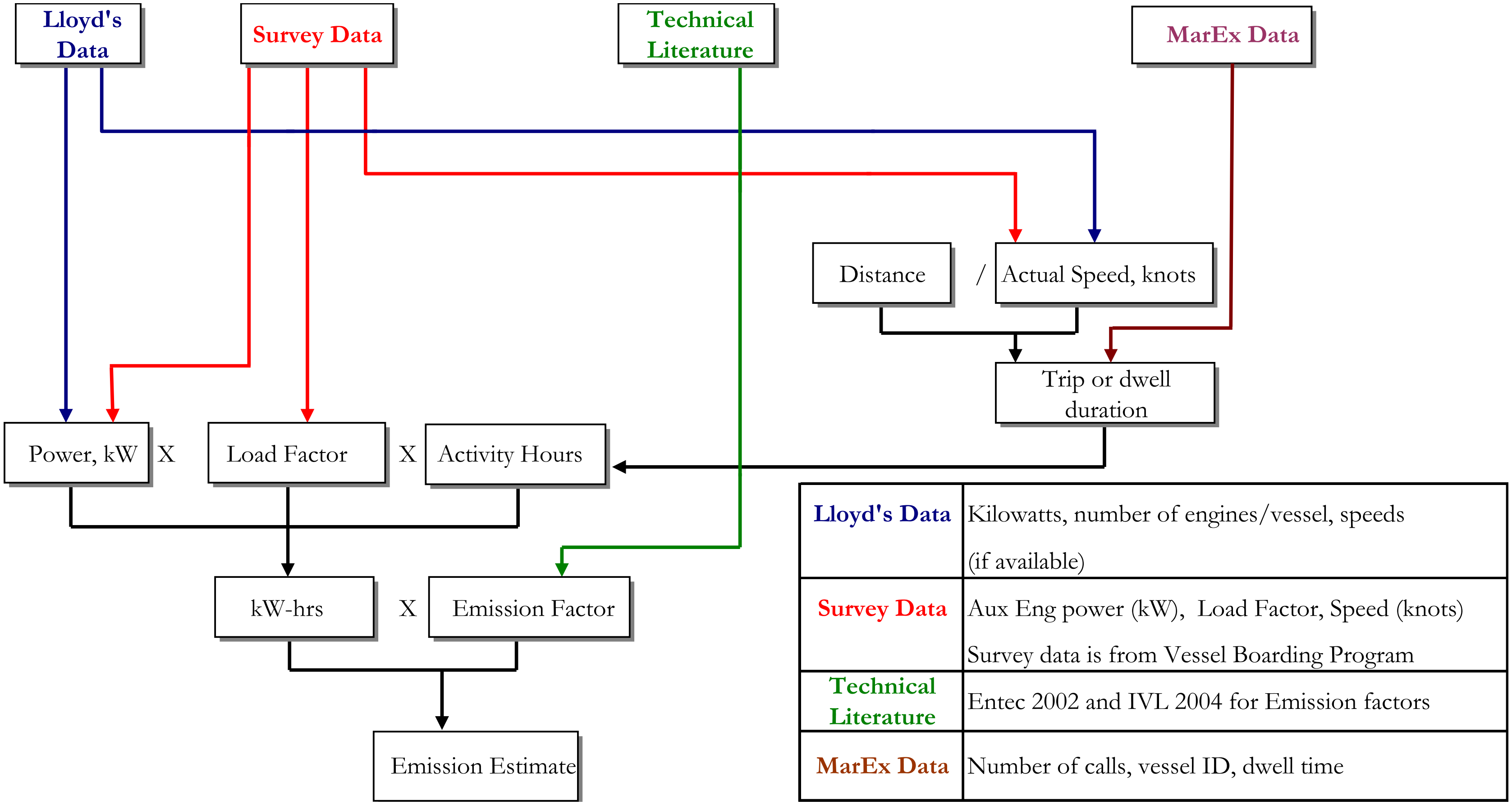
[70] IVL 2004.

Figure 3.24: Auxiliary Engine Emission Estimation Flow Diagram



Lloyd's Data	Kilowatts, number of engines/vessel, speeds (if available)
Survey Data	Aux Eng power (kW), Load Factor, Speed (knots) Survey data is from Vessel Boarding Program
Technical Literature	Entec 2002 and IVL 2004 for Emission factors
MarEx Data	Number of calls, vessel ID, dwell time

3.6.9 Auxiliary Engine Defaults

As explained earlier, auxiliary engine information is usually not provided to Lloyd's by vessel owners since it is not required by IMO or the classification societies, thus Lloyd's data contains minimal auxiliary engine information. Therefore, auxiliary engine data gathered from the Vessel Boarding Program and Lloyd's data on ships making local calls was used to generate profiles or defaults for the purpose of "gap filling" when there was missing data.

Vessels do not use the total auxiliary engine installed power when at sea, during hotelling and during maneuvering. For each mode and vessel type, a different number of engines may be used and at varying loads depending on several factors, such as temperature and number of reefers onboard. Hotelling load is primarily what is needed to meet the power needs of the lights, heating/ventilation/air conditioning systems, communications, computers, ship cranes, pumps, reefer load, and various other power demands while the vessel is at dock. Maneuvering generally requires the highest auxiliary load mode for OGVs in order to provide power to the bow thrusters that are used intermittently. Transit periods, or "at sea mode," generally requires the lowest auxiliary loads, as additional auxiliary power is not required for maneuvering. Many vessels also have shaft generators and exhaust turbine generators that help provide power to the ship with greater fuel efficiency than auxiliary generators.

From the inception of the Vessel Boarding Program, the average or typical number of auxiliary engines used and the corresponding load at sea, during maneuvering and at berth, have been studied to gain a better understanding of the how the auxiliary engines are used in relation to the total number and total power installed. The load default in kilowatts is based on the percent load which takes into account the average number of actual engines used and their load. Another way to view auxiliary engine load is the kilowatts actually used as a fraction of the total power available. For example, a 1,000 TEU container vessel equipped with three auxiliary engines may use just one of them at berth at 60% load. The resulting total hotelling load is 0.33 multiplied by 0.6, which equals 0.2 or 20%. The 0.33 figure represents one of the three engines in use, while the 0.6 represents the 60% load on that engine. Table 3.24 summarizes the total power and load defaults used for this study by vessel subtype.

Table 3.24: Auxiliary Engine Power and Load Defaults

Vessel Type	Total Aux Eng Power (kW)	Load Defaults (%)			Load Defaults (kW)		
		Sea	Maneuvering	Hotelling	Sea	Maneuvering	Hotelling
Auto Carrier	2,850	15%	45%	26%	428	1,283	741
Bulk	2,850	17%	45%	10%	485	1,283	285
Container - 1000	2,090	13%	50%	18%	272	1,045	376
Container - 2000	4,925	13%	43%	22%	640	2,118	1,084
Container - 3000	5,931	13%	43%	22%	771	2,550	1,305
Container - 4000	7,121	13%	50%	18%	926	3,561	1,282
Container - 5000	11,360	13%	49%	16%	1,477	5,566	1,818
Container - 6000	13,501	13%	50%	15%	1,755	6,751	2,025
Container - 7000	13,501	13%	50%	15%	1,755	6,751	2,025
Container - 8000	13,501	13%	50%	15%	1,755	6,751	2,025
Cruise	na	na	na	na	na	na	na
General Cargo	1,776	17%	45%	22%	302	799	396
Ocean Tug	600	17%	45%	22%	102	270	134
Miscellaneous	1776	17%	45%	22%	302	799	396
Reefer	3,900	15%	45%	32%	585	1,755	1,248
Ro/Ro	2,850	15%	45%	26%	428	1,283	741
Tankers - All Small	1,911	24%	33%	26%	459	631	497
Tankers - Panamax	2,520	24%	33%	26%	605	832	655
Tankers - Afranax	2,544	24%	33%	26%	611	840	661
Tankers - Suezmax	2,865	24%	33%	26%	688	945	745
Tankers - VLCC	3,388	24%	33%	26%	813	1,118	881
Tankers - ULCC	3,667	24%	33%	26%	880	1,210	953
Tankers (D/E)	1,985	24%	33%	26%	476	655	516

3.6.10 Auxiliary Boilers

In addition to the auxiliary engines that are used to generate electricity for on-board uses, most OGVs have one or more boilers used for fuel heating and for producing hot water. These boilers are not typically used during transit at sea because most vessels are equipped with exhaust heat recovery systems ("economizers") that use heat from the main engine's exhaust for their hot water needs. The fuel-fired boilers are used when the main engine exhaust flow and/or temperature fall below what is needed for the economizer to provide adequate heat, such as during maneuvering and when the main engines are shut down at berth.

For this inventory, boiler fuel consumption data was collected for approximately 50 vessels during the Vessel Boarding Programs, and different values were used for the various vessel types, instead of using a default for all vessels. The boiler fuel consumption was converted to equivalent kilowatts using Specific Fuel Consumption (SFC) factors found in the Entec report. The average specific fuel consumption value for using residual fuel is 305 grams of fuel per kW-hour. Using the following equation, the average power in kilowatts was calculated for auxiliary boilers.

Average kW = ((daily fuel/24) x 1,000,000 g/tonne)/305 Equation 3.6

Auxiliary boiler energy defaults used for each vessel type are presented in Table 3.25. The cruise ships and tankers (except for diesel electric tankers) have much higher auxiliary boiler usage rates than the other vessel types. Cruise ships have higher boiler usage due to the number of passengers and need for hot water. Tankers provide steam for steam-powered liquid pumps, inert gas in fuel tanks, and to heat fuel for pumping.

Table 3.25: Auxiliary Boiler Energy Defaults

Vessel Type	**Boiler Energy Defaults (kW)**		
	Sea	**Maneuvering**	**Hotelling**
Auto Carrier	0	371	371
Bulk	0	109	109
Container - 1000	0	506	506
Container - 2000	0	506	506
Container - 3000	0	506	506
Container - 4000	0	506	506
Container - 5000	0	506	506
Container - 6000	0	506	506
Container - 7000	0	506	506
Container - 8000	0	506	506
Container - 9000	0	506	506
Cruise	0	1,000	1,000
General Cargo	0	106	106
Oceant Tug	0	0	0
Miscellaneous	0	371	371
Reefer	0	464	464
Ro/Ro	0	109	109
Tankers - All Small	0	371	3,000
Tankers - Panamax	0	371	3,000
Tankers - Afranax	0	371	3,000
Tankers - Suezmax	0	371	3,000
Tankers - VLCC	0	371	3,000
Tankers - ULCC	0	371	3,000
Tankers (D/E)	0	346	346

3.6.11 Fuel Correction Factors

Fuel correction factors are used to account for variations in fuel parameters between different types of fuel, so these variations can be accounted for in the emission estimates. As discussed earlier, emission factors were given for engines using residual fuel with an average 2.7% sulfur content and marine diesel oil with an average 1.5% sulfur content. Table 3.26 lists the fuel correction factors in this study which are based on fuel correction factors used in the San Pedro Bay Clean Air Action Plan.[71]

Table 3.26: Fuel Correction Factors

Actual Fuel	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	N_2O	CH_4
HFO (1.5% S)	1	1	1	0.56	0.82	0.82	1	1	1
MGO (0.5% S)	0.9	1	1	0.18	0.39	0.39	1	0.9	1
MDO (1.5 % S)	0.9	1	1	0.56	0.47	0.47	1	0.9	1
MGO (0.1% S)	0.9	1	1	0.04	0.35	0.35	1	0.9	1

In 2005, the cruise ship industry in Puget Sound used residual fuel with an average of 1.5%S. Other vessels and shipping lines that were known to switch fuel while in Puget Sound were given the appropriate fuel correction factor during the emissions calculation.

3.6.12 Other Correction Factors

Slide valve correction factors (see Section 3.5) are 0.70 for NO_x and 0.75 for PM.

3.7 Data Facts and Findings

Information gathered during the data collection process is summarized in this subsection. Table 3.27 lists the 832 discrete vessels that visited the Puget Sound study area in 2005 by vessel type.

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[71] Port of Los Angeles and Port of Long Beach, *San Pedro Bay Clean Air Action Plan*, 2006. See *http://www.polb.com/environment/air_quality/clean_air_action_plan.asp.*

Table 3.27: Puget Sound 2005 OGVs by Vessel Type

Vessel Type	Discrete Vessel Count
Auto Carrier	117
Bulk - General	230
Bulk - Heavy Load	4
Bulk Self-Discharging	2
Bulk Wood Chips	7
Container - 1000	18
Container - 2000	65
Container - 3000	39
Container - 4000	59
Container - 5000	55
Container - 6000	11
Container - 7000	3
Container - 8000	3
Cruise	17
General Cargo	57
Ocean Tugs	9
Miscellaneous	8
Reefer	5
RoRo	15
Tanker - General	44
Tanker - Chemical	6
Tanker - Crude - Aframax	20
Tanker - Crude - Handyboat	4
Tanker - Crude - Panamax	6
Tanker - Crude - Suezmax	25
Tanker - Crude - VLCC	1
Tanker - Oil Products	2
Total	**832**

The following are some of the main engine manufacturers and models for primarily container vessels from the Vessel Boarding Program survey data:

- MAN B&W 6S60MC
- MAN B&W 8K80MC
- MAN B&W 9K90MC
- MAN B&W 10K90MC
- MAN B&W 10K98MC
- MAN B&W 12K90MC
- MAN B&W 12K98MC
- Sulzer 9RTA84C
- Sulzer 10RTA96C
- Sulzer 12RTA84C
- Sulzer 12RTA96C

The following are the most common auxiliary engine manufacturers and models for container vessels from the Vessel Boarding Program survey data:

- Daihatsu 8dk28
- Daihatsu 8dk32
- Daihatsu 6dk
- MAN B&W 6L27/38
- MAN B&W 6L32
- MAN B&W 7L32/40
- MAN B&W 9L27/38
- Yanmar 8N2801
- Wartsila 6R32LN

The first value in the model is the number of cylinders (i.e., 9RTA84C is 9 cylinders). These lists are based only on the vessels surveyed during the Vessel Boarding Programs for Puget Sound, Ports of Los Angeles and Long Beach.

Although the study is for all maritime facilities, the following data findings are for the main ports. The averages listed in the tables were not used for estimating emissions since actual values were used on a per engine and vessel basis. The purpose of the average vessel characteristic tables included in this subsection is to summarize the data for the readers.

3.7.1 Port of Anacortes Data Findings

Table 3.28 summarizes the vessel movements for Port of Anacortes in 2005.

Table 3.28: Port of Anacortes 2005 Vessel Movements

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk - General	5	7	2	14
Cruise	0	0	1	1
General Cargo	0	1	1	2
Ocean Tug	12	2	8	22
Total	**17**	**10**	**12**	**39**

Table 3.29 summarizes the vessel and engine characteristics by vessel type for those vessels that called at the Port of Anacortes in 2005.

Table 3.29: Vessel Type Characteristics–Port of Anacortes–2005

			Average		
Vessel Type	Year Built	DWT (tons)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk - General	1998	37,038	8,878	1,776	147.8
Cruise	2003	na	5,011	1,253	28.8
General Cargo	2001	9,000	8,201	1,776	10.2
Ocean Tug	2002	9,787	9,959	600	39.4

Table 3.30 summarizes the vessel movements for Port of Port Angeles in 2005. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

Table 3.30: Port of Port Angeles 2005 Vessel Movements

Vessel Type	Inbound	Outbound	Shift	Total Movements
Cruise	0	0	1	1
Ocean Tug	0	2	2	4
Miscellaneous	0	1	1	2
Tanker - General	2	4	5	11
Tanker - Crude - Aframax	1	1	2	4
Tanker - Crude - Handyboat	1	2	3	6
Tanker - Crude - Suezmax	9	15	12	36
Tanker - Crude - VLCC	0	1	1	2
Tanker - Oil Products	1	1	0	2
Total	**14**	**27**	**27**	**68**

Table 3.31 summarizes the vessel and engine characteristics by vessel type for those vessels that called at the Port of Port Angeles in 2005.

Table 3.31: Vessel Type Characteristics for Vessels–Port of Port Angeles–2005

	Average				
Vessel Type	Year Built	DWT (tons)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Cruise	2003	na	5,011	1,253	11.1
Ocean Tug	2002	na	9,959	600	5.8
Miscellaneous	1990	na	10,019	1,776	30.1
Tanker - General	1982	79,184	6,242	1,985	59.0
Tanker - Crude - Aframax	1977	90,638	13,784	2,544	45.0
Tanker - Crude - Handyboat	1984	58,643	14,700	1,985	78.0
Tanker - Crude - Suezmax	1991	165,003	16,742	2,767	128.0
Tanker - Crude - VLCC	1987	214,862	26,480	5,680	97.9
Tanker - Oil Products	1975	125,926	6,242	1,985	333.6

3.7.2 Port of Everett Data Findings

Table 3.32 summarizes the vessel movements for Port of Everett in 2005. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

Table 3.32: Port of Everett 2005 Vessel Movements

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk - General	4	4	0	8
General Cargo	28	22	5	55
Ocean Tug	1	1	0	2
Reefer	1	1	0	2
RoRo	8	7	0	15
Total	**42**	**35**	**5**	**82**

Table 3.33 summarizes the vessel and engine characteristics by vessel type for those vessels that called at the Port of Everett in 2005.

Table 3.33: Vessel Type Characteristics for Vessels–Port of Everett–2005

			Average		
Vessel Type	Year Built	DWT (tons)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk - General	1996	24,741	9,028	1,673	75.6
General Cargo	1994	18,448	7,322	1,915	69.7
Ocean Tug	1978	na	9,959	600	95.8
Reefer	1988	7,190	9,878	3,900	24.8
RoRo	1997	13,043	19,856	2,850	30.7

3.7.3 Port of Olympia Data Findings

Table 3.34 summarizes the vessel movements for Port of Olympia in 2005. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

Table 3.34: Port of Olympia 2005 Vessel Movements

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk - General	6	6	1	13
General Cargo	8	5	0	13
RoRo	5	5	0	10
Total	**19**	**16**	**1**	**36**

Table 3.35 summarizes the vessel and engine characteristics by vessel type for those vessels that called at the Port of Olympia in 2005.

Table 3.35: Vessel Type Characteristics for Vessels–Port of Olympia–2005

	Average				
Vessel Type	Year Built	DWT (tons)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk - General	1998	32,170	9,028	1,776	63.7
General Cargo	1989	19,490	7,988	1,845	86.7
RoRo	1983	27,311	19,829	2,850	46.5

3.7.4 Port of Seattle Data Findings

Table 3.36 summarizes the vessel movements for Port of Seattle in 2005. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

Table 3.36: 2005 Port of Seattle Vessel Movements

Vessel Type	Inbound	Outbound	Shift	Total Movements
Bulk - General	7	83	90	180
Bulk - Heavy Load	0	1	2	3
Container - 1000	21	22	2	45
Container - 2000	122	133	23	278
Container - 3000	96	104	9	209
Container - 4000	177	242	68	487
Container - 5000	240	246	8	494
Container - 6000	4	5	1	10
Container - 7000	2	2	0	4
Container - 8000	10	10	0	20
Cruise	167	167	4	338
General Cargo	101	118	21	240
Ocean Tug	2	5	5	12
Miscellaneous	6	5	3	14
RoRo	3	4	1	8
Tanker - General	2	0	0	2
Total	**960**	**1,147**	**237**	**2,344**

Table 3.37 summarizes the vessel and engine characteristics by vessel type for those vessels that called at the Port of Seattle in 2005.

Table 3.37: Vessel Type Characteristics for Vessels–Port of Seattle–2005

	Average				
Vessel Type	Year Built	DWT (tons)	Main Engine Power (kW)	Aux Engine Power (kW)	Hotelling Time (hours)
Bulk - General	1998	67,448	9,475	1,757	75.8
Bulk - Heavy Load	1975	41,521	14,790	1,776	36.7
Container - 1000	1999	22,618	11,604	2,090	27.4
Container - 2000	1989	33,166	21,550	4,898	37.7
Container - 3000	1993	45,526	28,561	5,344	28.4
Container - 4000	1998	60,800	38,464	7,191	26.9
Container - 5000	2000	67,953	47,687	10,689	34.8
Container - 6000	2004	76,108	68,088	13,946	29.0
Container - 7000	2005	93,346	63,898	13,501	20.0
Container - 8000	2005	93,197	63,898	13,501	13.9
Cruise	2000	8,576	41,527	10,382	10.7
General Cargo	1996	41,615	9,824	2,517	33.2
Ocean Tug	2002	9,787	9,959	600	15.7
Miscellaneous	1971	9,414	25,617	1,776	89.6
RoRo	1997	12,602	19,856	2,850	13.3
Tanker - General	2004	19,998	6,242	1,985	15.9

Figure 3.25: Average Model Year of Vessels that Called Port of Seattle in 2005

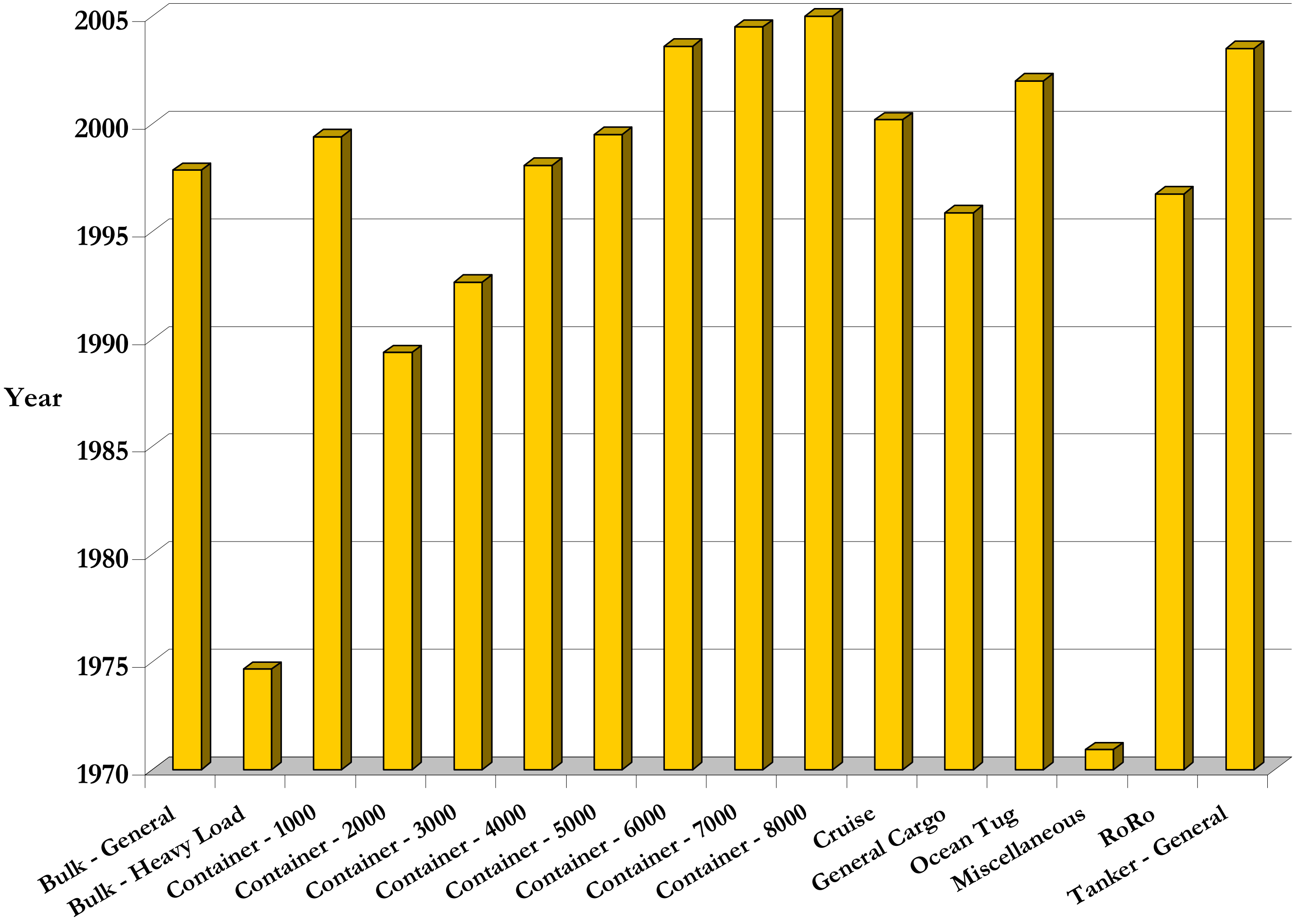


Figure 3.26: Average Deadweight Tonnage of Vessels that Called Port of Seattle in 2005

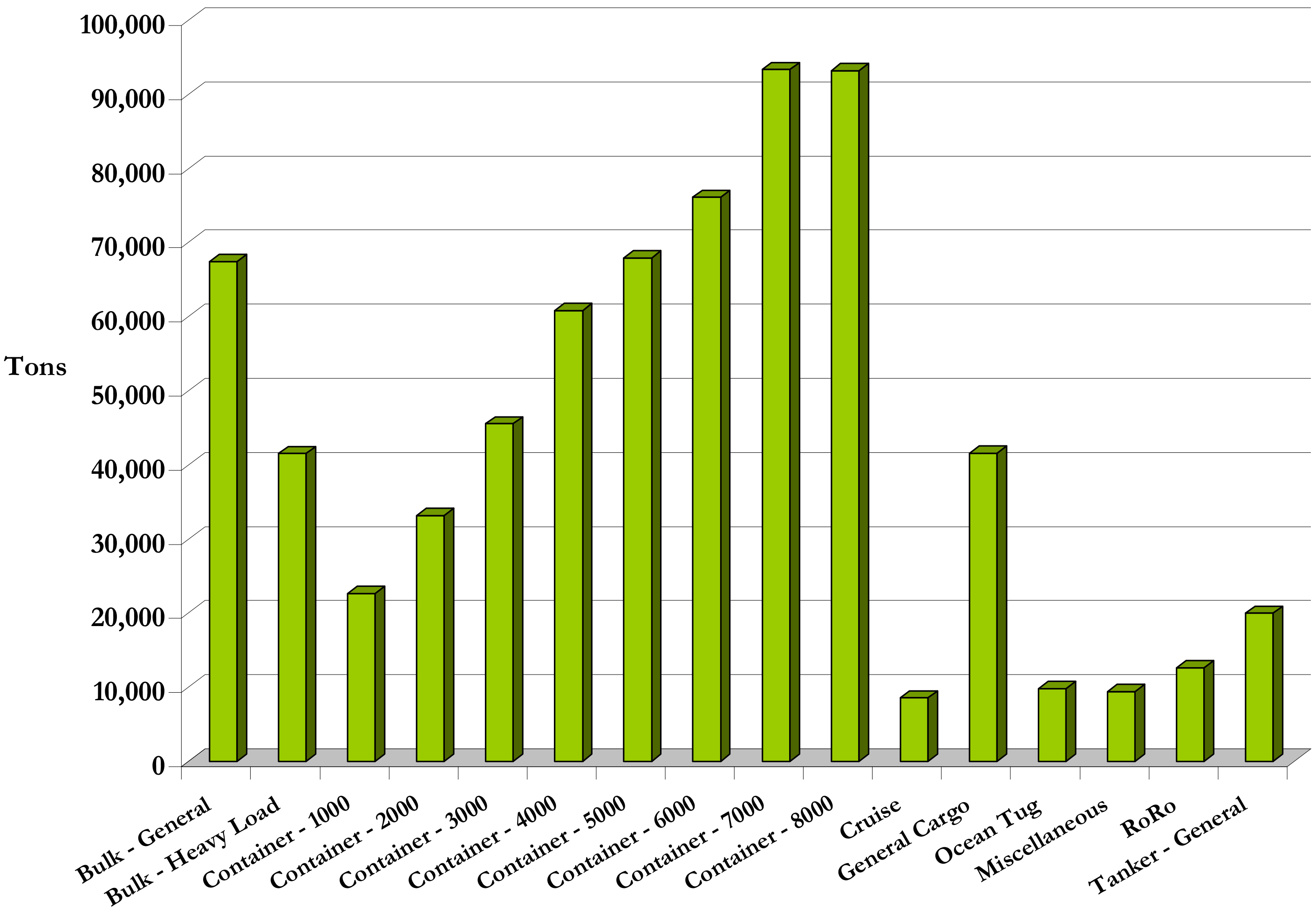
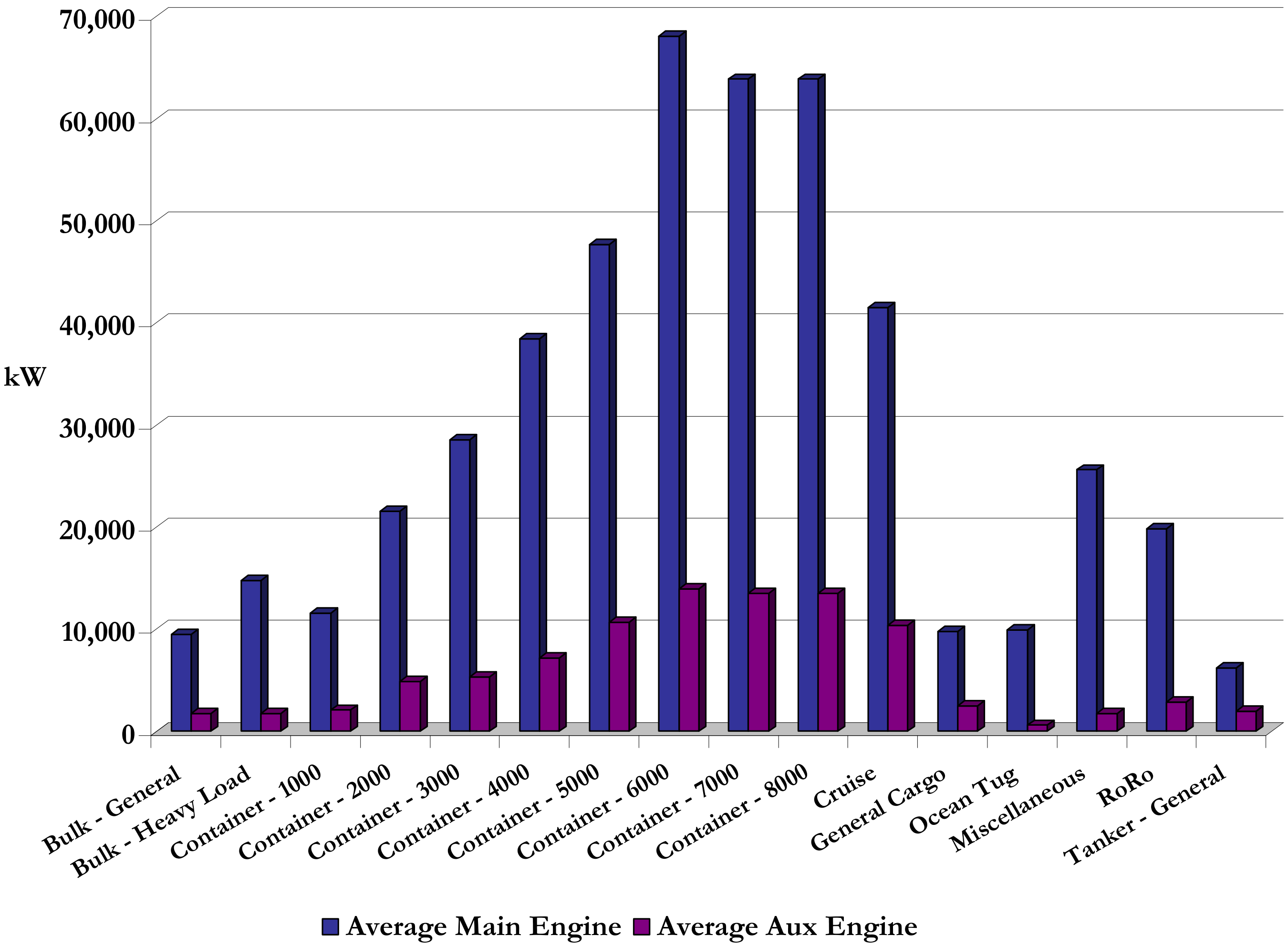


Figure 3.27: Average Main and Auxiliary Engine Power of Vessels that Called Port of Seattle in 2005, kW



3.7.5 Port of Tacoma Data Findings

Table 3.38 summarizes the vessel movements for Port of Tacoma in 2005. The number of inbound and outbound trips does not match due to vessel shifts from another dock or terminal within the port instead of arriving from the sea or another port or maritime facility.

Table 3.38: Port of Tacoma 2005 Vessel Movements

Vessel Type	Inbound	Outbound	Shift	Total Movements
Auto Carrier	173	187	17	377
Bulk - Heavy Load	17	119	120	256
Bulk - Heavy Load	0	0	1	1
Bulk Wood Chips	6	8	2	16
Container - 1000	146	147	5	298
Container - 2000	167	169	6	342
Container - 3000	61	61	1	123
Container - 4000	116	66	3	185
Container - 5000	49	50	1	100
Container - 6000	65	66	2	133
Container - 7000	1	1	0	2
General Cargo	11	14	5	30
RoRo	112	112	0	224
Tanker - Crude - Aframax	0	0	3	3
Tanker - Crude - Handyboat	0	0	2	2
Tanker - Crude - Suezmax	0	0	1	1
Total	**924**	**1,000**	**169**	**2,093**

Table 3.39 summarizes the vessel and engine characteristics by vessel type for those vessels that called at the Port of Tacoma in 2005.

Table 3.39: Vessel Type Characteristics for Vessels–Port of Tacoma–2005

Vessel Type	Year Built	DWT (tons)	Average Main Engine Power (kW)	Average Aux Engine Power (kW)	Average Hotelling Time (hours)
Auto Carrier	1989	15,922	11,786	2,906	17.4
Bulk - Heavy Load	1998	65,952	9,401	1,788	73.0
Bulk - Heavy Load	1974	26,082	14,790	1,776	108.3
Bulk Wood Chips	1989	44,539	8,830	1,776	84.8
Container - 1000	1988	20,700	11,230	3,045	31.3
Container - 2000	1987	37,974	20,425	4,789	35.2
Container - 3000	1986	46,063	26,559	3,155	43.6
Container - 4000	2000	62,936	40,025	7,336	46.5
Container - 5000	1999	63,279	37,080	11,103	43.2
Container - 6000	2001	78,263	41,087	13,161	36.7
Container - 7000	2005	78,693	54,900	12,360	49.9
General Cargo	1994	20,575	8,184	1,732	33.0
RoRo	2002	21,555	19,856	3,533	18.5
Tanker - Crude - Aframax	1977	91,483	13,784	2,544	6.7
Tanker - Crude - Handyboat	1984	58,643	14,700	1,985	8.5
Tanker - Crude - Suezmax	1978	122,805	16,742	1,250	141.9

Figure 3.28: Average Model Year of Vessels that Called Port of Tacoma in 2005

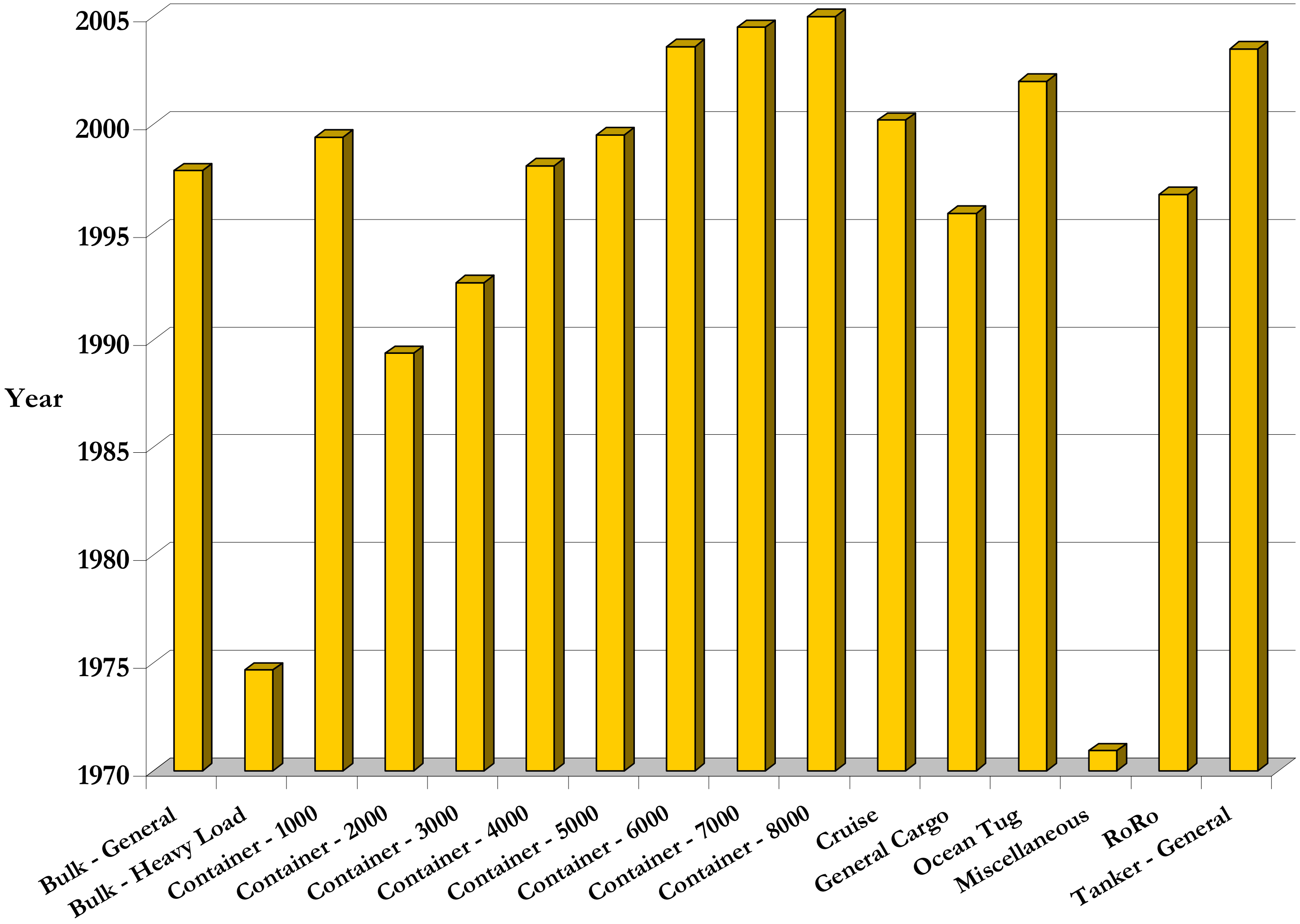


Figure 3.29: Average Deadweight Tonnage of Vessels that Called Port of Tacoma in 2005

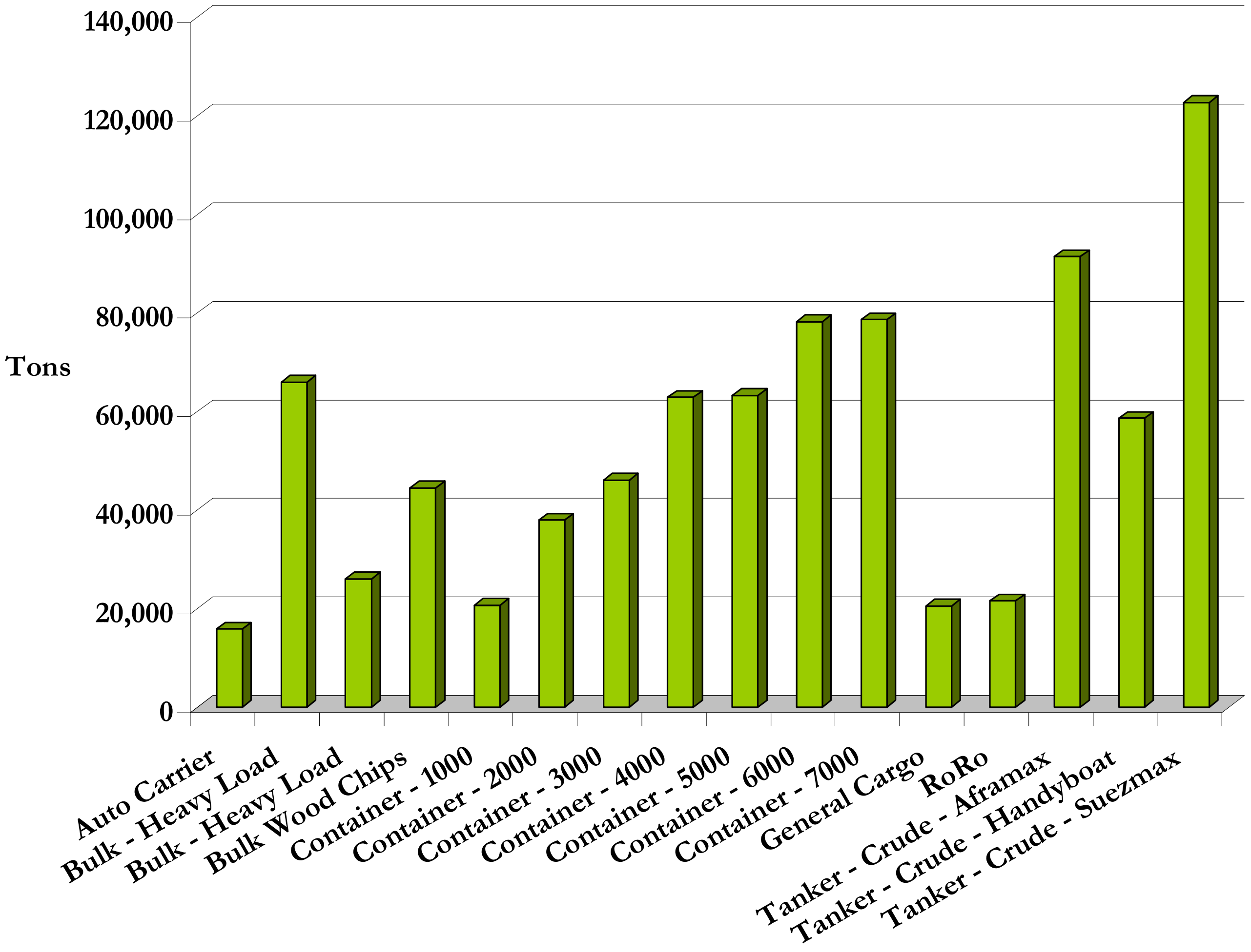
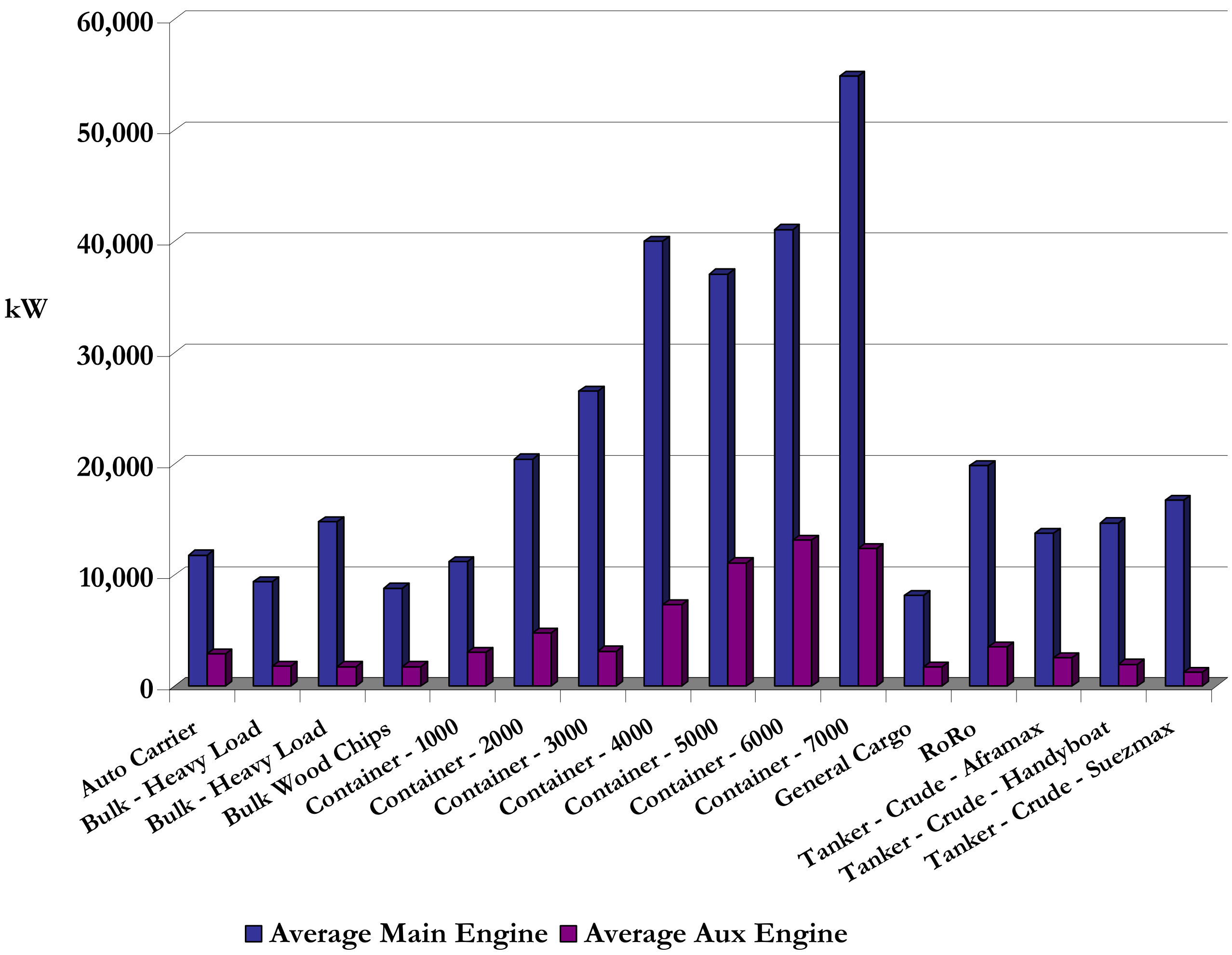


Figure 3.30: Average Main and Auxiliary Engine Power of Vessels that Called Port of Tacoma in 2005, kW



3.7.6 Tankers in Puget Sound

Table 3.40 summarizes the vessel movements for tankers in Puget Sound in 2005. The number of inbound and outbound trips does not match due to shifts tankers make from one dock to another within a facility or from anchorage to a dock. Arrivals are strictly defined as a vessel arriving from the sea or another maritime facility and do not include shifts from a dock within the facility or anchorage near the facility.

Table 3.40: Puget Sound 2005 Tanker Vessel Movements

Associated Port	Inbound	Outbound	Shift	Total Movements
CHERRY POINT	71	79	196	346
FERNDALE	71	24	47	142
MANCHESTER	6	2	8	16
MARCH POINT	127	140	293	560
POINT WELLS	5	11	17	33
PORT ANGELES	14	24	23	61
PORT ANGELES ANCHOR	115	137	0	252
SANDY POINT	4	0	4	8
SEATTLE	2	0	0	2
SEATTLE ANCHOR	2	2	3	7
SEATTLE-PRIVATE	0	2	2	4
TACOMA	0	0	6	6
TACOMA ANCHOR	3	5	10	18
TACOMA-PRIVATE	25	43	32	100
VENDOVI ISLAND	22	0	39	61
Total	**467**	**469**	**680**	**1,616**

The MarEx of Puget Sound data was used for tankers, as for all other vessels in the area due to its detailed information on arrivals, departures and shifts. Western States Petroleum Agency (WSPA) also provided a general number for tanker calls for 2005 in Puget Sound based on a survey of WSPA members. The WSPA tanker survey verified the number of calls and vessel characteristics used this study.

3.8 Emission Estimates

The 2005 ocean-going vessel emissions for Puget Sound are summarized in this section. Tables 3.40 through 3.47 include the transit, maneuvering, and hotelling emission estimates for all vessel movements in the study area. Tables 3.26 through 3.33 include anchorage emissions.

Table 3.41 presents the 2005 ocean-going vessel criteria pollutant emission by county and regional air agency in tons per year. The links in the routing were cut at the county lines so that all links within a county could be easily divided up by county and their respective emissions summarized. One vessel did not have a county assigned. The vessel *Fivos* arrived to anchor (an outer anchorage not assigned with a county) and stayed there for more than 285 hours. Originally it was assumed that it had departed after that; however, upon closer inspection, it shifted to the Port of Tacoma's TEMCO facility. Thus the unassigned OGV emissions are associated with the Port of Tacoma in Pierce County.

Relative to the criteria pollutant emissions values, the reader is advised that PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together.

Table 3.41: Puget Sound 2005 OGV Criteria Pollutant Emissions by County and Regional Clean Air Agency, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Island	1,160.5	40.3	94.3	765.1	70.3	56.2	67.4
San Juan	648.1	23.0	53.6	479.9	41.6	33.2	38.2
Skagit	425.0	16.6	38.1	1,270.3	70.6	56.1	20.2
Whatcom	212.0	9.3	19.5	580.4	33.1	26.3	10.6
Total NWCAA	**2,445.6**	**89.2**	**205.5**	**3,095.7**	**215.6**	**171.8**	**136.4**
Clallam	6,869.5	243.2	565.6	5,217.8	446.9	356.4	398.0
Jefferson	933.4	32.3	75.7	618.6	56.6	45.2	54.1
Mason	0.4	0.0	0.0	0.2	0.0	0.0	0.0
Thurston	14.2	0.1	1.2	16.5	1.2	1.0	0.9
Total ORCAA	**7,817.5**	**275.6**	**642.5**	**5,853.1**	**504.7**	**402.6**	**453.0**
King	1,640.7	60.5	138.1	1,555.6	125.1	100.0	105.5
Kitsap	1,166.1	40.4	94.7	786.7	71.4	57.0	67.5
Pierce	793.3	27.2	67.0	975.3	67.9	54.2	46.5
Snohomish	96.5	3.4	7.9	105.3	7.8	6.2	5.6
Total PSCAA	**3,696.7**	**131.5**	**307.7**	**3,422.9**	**272.2**	**217.4**	**225.1**
No County	1.9	0.1	0.1	2.1	0.2	0.1	0.1
Total	**13,961.7**	**496.4**	**1,155.8**	**12,373.8**	**992.7**	**791.9**	**814.6**

Table 3.42 presents the 2005 ocean-going vessels greenhouse gas emissions by county and regional air agency. The values include the transit, maneuvering, and hotelling emission estimates for all vessel movements in the study area.

Table 3.42: Puget Sound 2005 OGV Greenhouse Gas Emissions by County and Regional Clean Air Agency, tpy

				CO$_2$ Equivalent			
County	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
Island	47,323.9	2.4	0.4	47,323.9	751.5	8.4	48,083.8
San Juan	29,080.7	1.5	0.2	29,080.7	476.3	4.8	29,561.8
Skagit	79,410.7	5.7	0.2	79,410.7	1,775.4	4.8	81,191.0
Whatcom	36,486.0	2.6	0.1	36,486.0	807.8	2.6	37,296.4
Total NWCAA	**192,301.3**	**12.3**	**1.0**	**192,301.3**	**3,810.9**	**20.6**	**196,132.8**
Clallam	322,666.4	17.5	2.5	322,666.4	5,417.0	51.5	328,134.9
Jefferson	38,178.0	2.0	0.3225	38,178.0	608.6	6.8	38,793.3
Mason	14.1	0.001	0.0002	14.1	0.2	0.0	14.3
Thurston	969.5	0.1	0.01	969.5	17.8	0.1	987.4
Total ORCAA	**361,828.0**	**19.5**	**2.8**	**361,828.0**	**6,043.6**	**58.4**	**367,930.0**
King	96,905.7	5.3	0.6	96,905.7	1,643.7	13.1	98,562.5
Kitsap	48,642.1	2.5	0.4	48,642.1	780.5	8.5	49,431.0
Pierce	63,914.1	3.7	0.3	63,914.1	1,160.7	6.3	65,081.1
Snohomish	6,361.2	0.4	0.04	6,361.2	121.7	0.8	6,483.6
Total PSCAA	**215,823.1**	**12.0**	**1.4**	**215,823.1**	**3,706.6**	**28.6**	**219,558.3**
No County	123.2	0.01	0.001	123.2	2.0	0.0	125.3
Total	**770,075.5**	**43.8**	**5.1**	**770,075.5**	**13,563.2**	**107.6**	**783,746.3**

Table 3.43 presents the 2005 ocean-going vessel criteria pollutant emission by vessel type. The values include the transit, maneuvering, and hotelling emission estimates for all vessel movements in the study area. DPM emissions are lower than PM$_{10}$ emissions for ocean-going vessels, especially tankers, because boilers do not meet the definition of an internal combustion engine and therefore do not have DPM emissions associated with them. Tankers typically have higher boiler loads at berth while unloading, so they will have higher PM$_{10}$ emissions and the difference between PM$_{10}$ and DPM emissions will be greater.

Table 3.43: Puget Sound 2005 OGV Criteria Pollutant Emissions by Vessel Type, tpy

Vessel Type	NOx	VOC	CO	SO$_2$	PM$_{10}$	PM$_{2.5}$	DPM
Auto Carrier	694.2	23.4	54.4	421.0	39.8	31.8	38.7
Bulk - General	1,171.5	39.1	93.7	876.0	75.4	60.3	70.6
Bulk - Heavy Load	24.4	0.8	1.9	24.4	1.8	1.5	1.4
Bulk Self-Discharging	54.7	1.8	4.2	35.1	3.2	2.6	3.1
Bulk Wood Chips	36.6	1.2	2.8	24.0	2.2	1.7	2.1
Container - 1000	534.1	18.2	42.1	414.5	34.7	27.8	30.2
Container - 2000	1,243.2	42.4	99.0	1,206.2	91.0	72.8	67.6
Container - 3000	991.8	33.8	78.0	651.8	58.4	46.7	55.9
Container - 4000	2,218.0	79.0	181.9	1,528.1	136.8	109.2	131.4
Container - 5000	1,936.0	68.9	159.1	1,329.7	120.1	96.1	115.3
Container - 6000	611.7	23.3	55.2	406.4	35.6	28.0	34.5
Container - 7000	28.5	1.2	2.7	20.3	1.8	1.4	1.7
Container - 8000	107.9	4.0	9.0	70.1	6.6	5.3	6.5
Cruise	1,279.0	44.0	108.1	798.1	81.6	65.3	79.4
General Cargo	440.4	16.6	39.0	287.3	28.5	22.8	25.8
Ocean Going Tugboat (ITB)	419.2	15.6	34.6	363.1	31.5	25.2	31.5
Miscellaneous	54.0	1.8	4.3	81.1	5.1	4.1	2.9
Reefer	18.4	0.6	1.4	16.8	1.3	1.0	1.1
RoRo	530.4	19.2	43.6	432.8	37.6	30.0	36.6
Tanker - General	360.6	12.9	29.5	692.8	42.0	33.6	18.0
Tanker - Chemical	26.6	0.9	2.1	33.0	2.3	1.8	1.5
Tanker - Crude - Aframax	297.1	11.2	25.3	849.3	47.2	37.8	13.5
Tanker - Crude - Handyboat	153.9	5.3	12.2	222.7	14.5	11.6	7.9
Tanker - Crude - Panamax	34.6	1.3	2.9	71.3	4.3	3.4	1.8
Tanker - Crude - Suezmax	650.4	28.8	65.2	1,396.9	82.7	64.8	33.8
Tanker - Crude - VLCC	18.1	0.6	1.4	20.7	1.5	1.2	1.0
Tanker - Oil Products	26.5	1.0	2.2	100.4	5.3	4.2	1.0
Total	**13,961.7**	**496.7**	**1,155.9**	**12,373.9**	**992.6**	**792.0**	**814.7**

Table 3.44 presents the 2005 ocean-going vessels greenhouse gas emissions by vessel type. The values include the transit, maneuvering, and hotelling emission estimates for all vessel movements in the study area.

Table 3.44: Puget Sound 2005 OGV Greenhouse Gas Emissions by Vessel Type, tpy

				CO_2 Equivalent			
Vessel Type	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
Auto Carrier	26,255.9	1.3	0.2	26,255.9	414.5	4.9	26,675.3
Bulk - General	51,610.3	2.7	0.4	51,610.3	825.4	8.3	52,444.1
Bulk - Heavy Load	1,436.9	0.1	0.01	1,436.9	26.3	0.2	1,463.4
Bulk Self-Discharging	2,069.3	0.1	0.02	2,069.3	31.9	0.4	2,101.6
Bulk Wood Chips	1,412.2	0.1	0.01	1,412.2	22.2	0.3	1,434.6
Container - 1000	24,694.8	1.4	0.2	24,694.8	432.5	3.9	25,131.3
Container - 2000	72,987.9	4.5	0.5	72,987.9	1,390.3	9.5	74,387.6
Container - 3000	38,518.5	2.0	0.3	38,518.5	614.5	7.2	39,140.2
Container - 4000	90,369.9	4.6	0.8	90,369.9	1,424.7	16.7	91,811.3
Container - 5000	80,172.5	4.1	0.7	80,172.5	1,267.0	14.6	81,454.2
Container - 6000	27,619.4	1.3	0.2	27,619.4	389.3	4.9	28,013.6
Container - 7000	1,283.9	0.1	0.01	1,283.9	17.7	0.2	1,301.8
Container - 8000	4,134.6	0.2	0.04	4,134.6	64.3	0.8	4,199.7
Cruise	63,023.9	3.0	0.4	63,023.9	925.0	8.9	63,957.9
General Cargo	21,635.0	1.2	0.2	21,635.0	362.0	3.6	22,000.6
Ocean Going Tugboat (ITB)	21,370.3	1.0	0.1	21,370.3	302.3	2.6	21,675.2
Miscellaneous	4,772.7	0.3	0.02	4,772.7	100.6	0.4	4,873.7
Reefer	987.4	0.1	0.01	987.4	16.5	0.1	1,004.1
RoRo	25,486.6	1.2	0.2	25,486.6	379.8	3.6	25,870.0
Tanker - General	40,756.2	3.0	0.2	40,756.2	915.6	3.3	41,675.0
Tanker - Chemical	1,941.3	0.1	0.01	1,941.3	39.7	0.2	1,981.2
Tanker - Crude - Aframax	49,936.2	3.8	0.2	49,936.2	1,174.5	3.2	51,114.0
Tanker - Crude - Handyboat	13,106.8	0.9	0.1	13,106.8	281.8	1.3	13,389.9
Tanker - Crude - Panamax	4,193.8	0.3	0.02	4,193.8	94.4	0.3	4,288.5
Tanker - Crude - Suezmax	93,177.0	6.1	0.4	93,177.0	1,884.0	7.4	95,068.4
Tanker - Crude - VLCC	1,219.1	0.1	0.01	1,219.1	24.1	0.1	1,243.4
Tanker - Oil Products	5,903.1	0.5	0.02	5,903.1	142.4	0.3	6,045.8
Total	**770,075.5**	**43.8**	**5.1**	**770,420.6**	**13,563.2**	**107.6**	**783,746.3**

Table 3.45 presents the total 2005 OGV emissions by engine type. The engines include main (i.e., propulsion) engines, auxiliary engines and auxiliary boilers. The main engines are used during transit and maneuvering. Auxiliary engines are used during transit, maneuvering and hotelling. Hotelling can be at a berth or at an anchorage. All vessels, except the ocean tugboats, have auxiliary boilers. Auxiliary boilers are assumed to be used during maneuvering and hotelling, but not used during transit since vessels are equipped with an exhaust gas recovery system or "economizer" that uses main engine exhaust for heating purposes. DPM is zero for auxiliary boilers since boilers do not meet the definition of a compression ignition internal combustion engine.

Table 3.45: Puget Sound 2005 OGV Criteria Pollutant Emissions by Engine Type, tpy

Engine Type	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Main Engine	11,093.5	404.2	914.5	7,670.4	688.7	549.8	641.8
Auxiliary Engine	2,520.2	75.3	207.1	2,026.9	172.8	138.0	172.8
Auxiliary Boiler	348.0	17.2	34.3	2,676.6	131.0	104.3	0.0
Total	**13,961.7**	**496.7**	**1,155.9**	**12,373.9**	**992.6**	**792.0**	**814.7**

Table 3.46 presents the 2005 ocean-going vessels greenhouse gas emissions by engine type.

Table 3.46: Puget Sound 2005 OGV Greenhouse Gas Emissions by Engine Type, tpy

				CO_2 Equivalent			
Engine Type	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Main Engine	467,754.9	24.8	4.0	467,754.9	7,683.5	84.6	475,523.1
Auxiliary Engine	135,926.8	5.7	0.8	135,926.8	1,770.0	15.8	137,712.6
Auxiliary Boiler	166,393.8	13.3	0.3	166,393.8	4,109.7	7.2	170,510.7
Total	**770,075.5**	**43.8**	**5.1**	**770,075.5**	**13,563.2**	**107.6**	**783,746.3**

Table 3.47 presents the total 2005 OGV emissions by mode in Puget Sound in tons per year. The transit includes all transits within the study area. Hotelling and maneuvering is for all movements within the study area, including public and private facilities and anchorages.

Table 3.47: Puget Sound 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Transit	11,389.7	399.2	932.3	7,953.5	708.6	565.7	662.5
Maneuvering	313.4	23.5	33.1	191.0	21.9	17.5	21.1
Hotelling	2,258.5	74.0	190.6	4,229.4	262.0	208.9	131.0
Total	**13,961.7**	**496.7**	**1,155.9**	**12,373.9**	**992.6**	**792.0**	**814.7**

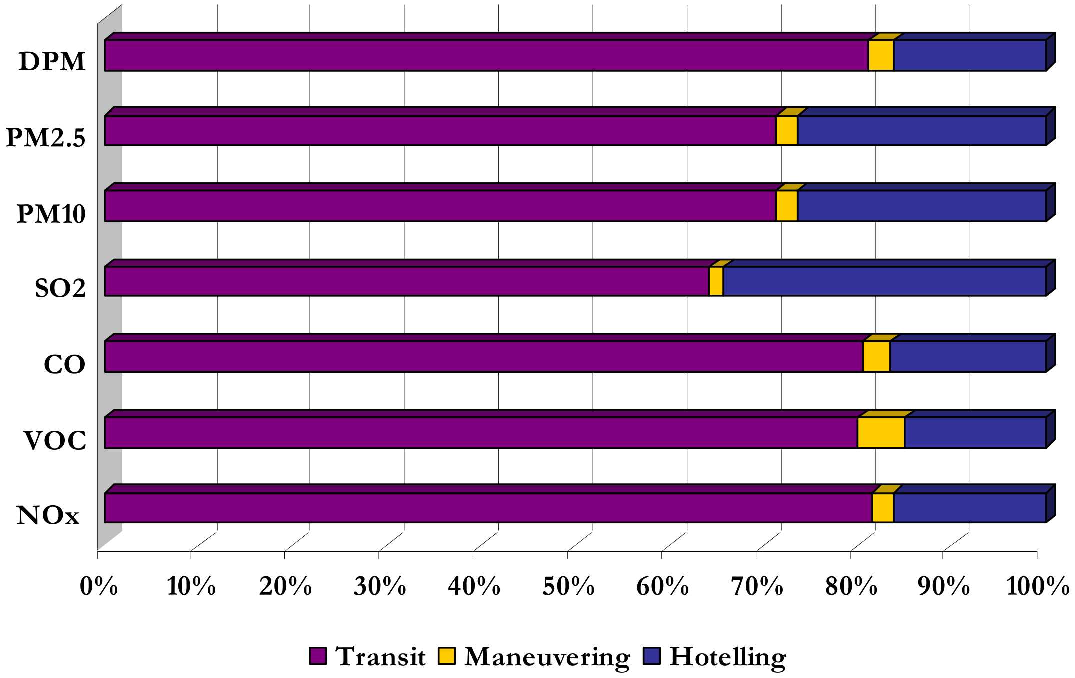
Table 3.48 presents the 2005 ocean-going vessels greenhouse gas emissions by mode in Puget Sound in tons per year.

Table 3.48: Puget Sound 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO_2 Equivalent			
Mode	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Transit	488,854.5	25.5	4.0	488,854.5	7,906.3	83.5	496,844.4
Maneuvering	12,262.7	0.7	0.2	12,262.7	213.2	4.9	12,480.8
Hotelling	268,958.3	17.6	0.9	268,958.3	5,443.7	19.1	274,421.2
Total	**770,075.5**	**43.8**	**5.1**	**770,075.5**	**13,563.2**	**107.6**	**783,746.3**

Figure 3.31 summarizes the percentage of Puget Sound 2005 ocean-going vessels emissions for criteria pollutants by transit, maneuvering and hotelling mode. The figure shows that 65% to 80% of the emissions occur during transit; less than 5% occur during maneuvering, and 12% to 35% occur while the vessel is at berth.

Figure 3.31: Distribution of Puget Sound OGV Emissions by Transit, Maneuvering and Hotelling Mode



3.8.1 Main Port Emission Estimates

This subsection presents the emissions associated with the main ports in Puget Sound for maneuvering and hotelling. The emissions by port do not include the transit emissions within Puget Sound. The maneuvering emissions include a short transit time in the harbor area near the port and the docking into the berth for arrivals. The maneuvering emissions include the maneuvering for all movements (i.e., arrivals, departures and shifts). The hotelling emissions include emissions while the vessel is at berth.

The port emissions do not include any anchorages or private facilities near the Port area, only the port-controlled terminals. Emissions at the anchorages near the ports were not attributed to the ports because the vessels that stopped at anchorage may not have called at the public port. For example, vessels may stop to refuel at anchorages near Port Angeles before continuing on their transit, but do not call at the Port of Port Angeles terminals.

Tables 3.49 and 3.50 list the maneuvering and hotelling emission estimates associated with the Port of Anacortes.

Table 3.49: Port of Anacortes 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Hotelling	8.5	0.3	0.7	10.0	0.7	0.6	0.6
Maneuvering	0.9	0.04	0.1	0.7	0.06	0.05	0.06
Total	**9.4**	**0.3**	**0.8**	**10.7**	**0.8**	**0.6**	**0.7**

Table 3.50: Port of Anacortes 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO_2 Equivalent			
Mode	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Hotelling	586.9	0.03	0.003	586.9	9.7	0.1	596.7
Maneuvering	38.7	0.002	0.0004	38.7	0.6	0.01	39.3
Total	**625.6**	**0.03**	**0.003**	**625.6**	**10.3**	**0.1**	**636.0**

Tables 3.51 and 3.52 list the maneuvering and hotelling emission estimates associated with the Port of Port Angeles.

Table 3.51: Port of Port Angeles 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Hotelling	63.7	2.2	5.4	195.5	10.8	8.6	2.9
Maneuvering	1.2	0.1	0.1	1.0	0.1	0.1	0.08
Total	**64.9**	**2.3**	**5.5**	**196.5**	**10.9**	**8.7**	**3.0**

Table 3.52: Port of Port Angeles 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO$_2$ Equivalent			
Mode	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
Hotelling	11,955.9	0.9	0.03	11,955.9	276.0	0.7	12,232.5
Maneuvering	64.9	0.004	0.0010	64.9	1.2	0.0	66.1
Total	**12,020.7**	**0.9**	**0.03**	**12,020.7**	**277.2**	**0.7**	**12,298.6**

Tables 3.53 and 3.54 list the maneuvering and hotelling emission estimates associated with the Port of Everett.

Table 3.53: Port of Everett 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	**NOx**	**VOC**	**CO**	**SO$_2$**	**PM$_{10}$**	**PM$_{2.5}$**	**DPM**
Hotelling	21.1	0.6	1.7	33.0	2.2	1.7	1.3
Maneuvering	1.9	0.1	0.2	1.0	0.1	0.1	0.1
Total	**23.0**	**0.8**	**1.9**	**34.0**	**2.3**	**1.8**	**1.5**

Table 3.54: Port of Everett 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO$_2$ Equivalent			
Mode	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
Hotelling	1,958.2	0.1	0.007	1,958.2	38.1	0.2	1,996.5
Maneuvering	62.9	0.004	0.001	62.9	1.1	0.0	64.0
Total	**2,021.1**	**0.1**	**0.01**	**2,021.1**	**39.3**	**0.2**	**2,060.5**

Tables 3.55 and 3.56 list the maneuvering and hotelling emission estimates associated with the Port of Olympia.

Table 3.55: Port of Olympia 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Hotelling	10.5	0.3	0.8	14.4	1.0	0.8	0.7
Maneuvering	2.2	0.2	0.3	1.1	0.15	0.12	0.15
Total	**12.7**	**0.5**	**1.1**	**15.6**	**1.1**	**0.9**	**0.8**

Table 3.56: Port of Olympia 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO_2 Equivalent			
Mode	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Hotelling	848.4	0.05	0.003	848.4	15.6	0.1	864.1
Maneuvering	66.3	0.004	0.002	66.3	1.3	0.0	67.7
Total	**914.7**	**0.1**	**0.0**	**914.7**	**16.9**	**0.1**	**931.8**

Tables 3.57 and 3.58 list the maneuvering and hotelling emission estimates associated with the Port of Seattle.

Table 3.57: Port of Seattle 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Hotelling	719.6	22.2	59.8	866.6	63.6	50.9	49.0
Maneuvering	150.0	12.8	16.5	79.2	10.6	8.5	10.5
Total	**869.6**	**35.0**	**76.3**	**945.8**	**74.2**	**59.4**	**59.5**

Table 3.58: Port of Seattle 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO$_2$ Equivalent			
Mode	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
Hotelling	54,784.1	3.1	0.2	54,784.1	949.1	5.1	55,738.3
Maneuvering	5,486.6	0.3	0.1	5,486.6	96.9	2.7	5,586.2
Total	**60,270.7**	**3.4**	**0.4**	**60,270.7**	**1,046.1**	**7.7**	**61,324.5**

Tables 3.59 and 3.60 list the maneuvering and hotelling emission estimates associated with the Port of Tacoma.

Table 3.59: Port of Tacoma 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	**NOx**	**VOC**	**CO**	**SO$_2$**	**PM$_{10}$**	**PM$_{2.5}$**	**DPM**
Hotelling	513.3	16.2	43.2	610.6	42.4	33.8	29.4
Maneuvering	94.3	5.1	8.9	57.0	5.9	4.7	5.8
Total	**607.7**	**21.3**	**52.1**	**667.6**	**48.3**	**38.5**	**35.2**

Table 3.60: Port of Tacoma 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO$_2$ Equivalent			
Mode	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
Hotelling	42,284.0	2.4	0.2	42,284.0	738.1	3.7	43,025.8
Maneuvering	3,453.0	0.2	0.1	3,453.0	55.4	1.1	3,509.5
Total	**45,737.0**	**2.6**	**0.2**	**45,737.0**	**793.4**	**4.8**	**46,535.3**

3.8.2 Petroleum Facilities Emission Estimates

Emissions associated with the petroleum facilities in Puget Sound include only those for maneuvering and hotelling. The maneuvering emissions include a short transit time in the harbor area near the port and the docking into the berth for arrivals. The maneuvering emissions include the maneuvering for all movements (i.e., arrivals, departures and shifts). The hotelling emissions include emissions while the vessel is at berth. The terminals and anchorages associated with the petroleum facilities in the study area are located at:

- Cherry Point
- Ferndale
- March Point
- Anchorages near Point Wells, Sandy Point, Vendovi Island

Tables 3.61 and 3.62 list the maneuvering and hotelling emission estimates associated with the petroleum facilities.

Table 3.61: Petroleum Facilities 2005 OGV Criteria Pollutant Emissions by Mode, tpy

Mode	**NOx**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**DPM**
Hotelling	477.3	18.1	42.7	1,713.3	92.0	73.2	20.2
Maneuvering	42.9	3.5	4.9	38.0	3.5	2.8	3.0
Total	**520.1**	**21.7**	**47.6**	**1,751.3**	**95.5**	**75.9**	**23.2**

Table 3.62: Petroleum Facilities 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO_2 Equivalent			
Mode	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
Hotelling	107,676.9	7.9	0.3	107,676.9	2,452.1	5.8	110,134.8
Maneuvering	2,308.3	0.1	0.04	2,308.3	42.1	0.7	2,351.1
Total	**109,985.2**	**8.0**	**0.3**	**109,985.2**	**2,494.1**	**6.5**	**112,485.8**

3.8.3 Other Maritime Facilities Emission Estimates

Tables 3.63 and 3.64 list the maneuvering and hotelling emission estimates associated with the other maritime facilities. The maneuvering emissions include a short transit time in the harbor area near the port and the docking into the berth for arrivals as well as the maneuvering for all movements (i.e., arrivals, departures and shifts). The hotelling emissions include emissions while the vessel is at berth.

Table 3.63: Other Maritime Facilities 2005 OGV Criteria Pollutant Emissions by Mode, tpy

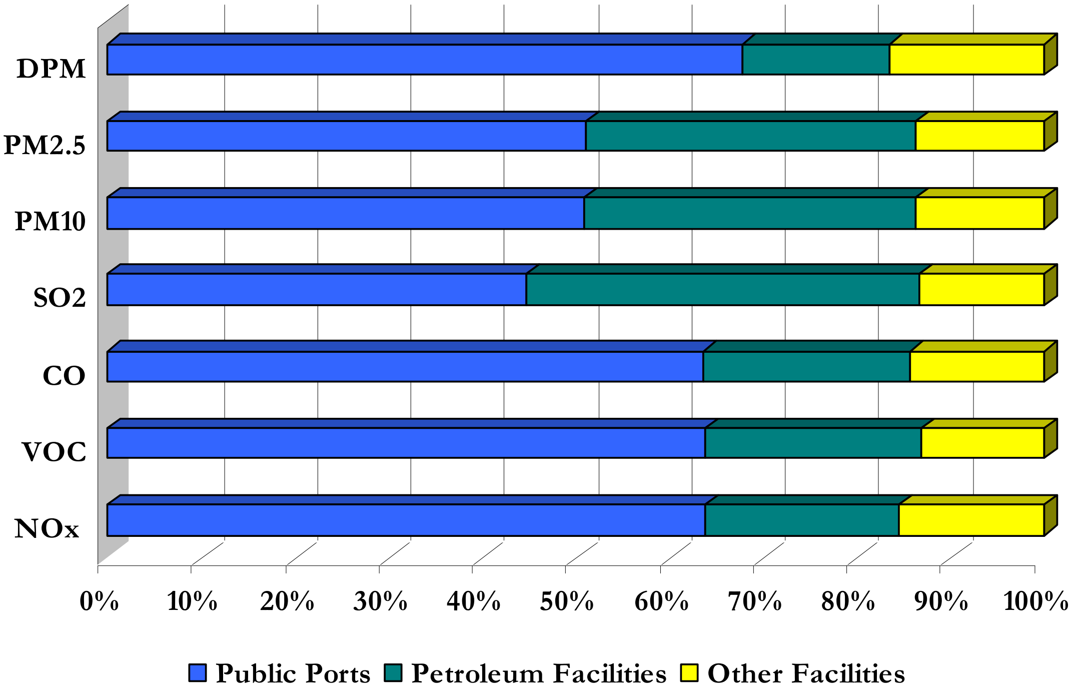
Mode	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Hotelling	366.8	11.0	29.0	545.4	35.9	28.8	23.5
Maneuvering	16.2	1.4	1.7	9.7	1.2	0.9	1.1
Total	**383.1**	**12.4**	**30.7**	**555.1**	**37.1**	**29.7**	**24.6**

Table 3.64: Other Maritime Facilities 2005 OGV Greenhouse Gas Emissions by Mode, tpy

				CO_2 Equivalent			
Mode	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Hotelling	32,142.2	2.0	0.1	32,142.2	613.0	2.6	32,757.8
Maneuvering	576.8	0.0	0.01	576.8	10.9	0.3	588.0
Total	**32,719.0**	**2.0**	**0.1**	**32,719.0**	**623.9**	**2.9**	**33,345.8**

Figure 3.32 summarizes the percentage of maneuvering and hotelling emissions for the main public ports, petroleum facilities, and other maritime facilities. Approximately 60% of the NO_x, VOC, CO and DPM maneuvering and hotelling emissions are associated with public ports, about 20% of emissions are associated with petroleum facilities, and about 20% are associated with the other maritime facilities. For the PM_{10}, $PM_{2.5}$ and SO_2 emissions, approximately 45% of the emissions are associated with public ports, 35% of the emissions are associated with petroleum facilities, and 20% are associated with other maritime facilities. Petroleum facilities may have a higher percentage of PM_{10}, $PM_{2.5}$ and SO_2 emissions than the other pollutants due to the higher boiler loads needed during unloading.

Figure 3.32: Distribution of Maneuvering and Hotelling Emissions



3.9 Emissions Control Measure Benefits

The 2005 emission benefits due to the known vessels with slide valves, shore power and switching fuel in Puget Sound while transiting and/or during hotelling are presented in Tables 3.65 and 3.66.

Table 3.65: Puget Sound 2005 OGV Criteria Pollutant Emission Control Benefits, tpy

Emissions	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Without Reductions	14,251.1	499.7	1,161.4	13,126.9	1,036.2	829.0	852.1
2005 Emissions	13,961.7	496.7	1,155.9	12,373.9	992.6	792.0	814.7
Emission Reduction	**289.5**	**2.97**	**5.5**	**752.9**	**43.6**	**37.0**	**37.4**
Percent Reduced	**2%**	**1%**	**0.5%**	**6%**	**4%**	**5%**	**5%**

Table 3.66: Puget Sound 2005 OGV Greenhouse Gas Emission Control Benefits, tpy

				CO_2 Equivalent			
Emissions	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Without Reductions	773,104.5	44.8	5.2	773,104.5	13,879.9	108.2	787,092.6
2005 Emissions	770,075.5	43.8	5.1	770,420.6	13,563.2	107.6	783,746.3
Emission Reduction	**3,028.9**	**1.0**	**0.0**	**2,683.9**	**316.7**	**0.6**	**3,346.3**
Percent Reduced							**0.4%**

The emissions benefits for the lower NO_x emission factors allowed for the Holland America Line and Westwood Shipping vessels with 'Clean Class' or 'Environmental Notation' designations are included in the overall OGV emissions estimates.

3.10 Strengths, Limitations and Recommendations

As explained earlier, the primary source of information on the physical parameters of ocean-going vessels (Lloyd's) that is typically used for emissions inventories provides only a limited amount of information on auxiliary engines. Such information is usually not provided to Lloyd's by vessel owners since it is not required by the IMO or the classification societies. Therefore, auxiliary engine data gathered from the Vessel Boarding Program and Lloyd's limited data on ships making local calls were used to generate profiles or defaults to assign to missing data. For the vessels that called on destinations in the Puget Sound area in 2005, only 22% of the vessels had actual data available from Vessel Boarding Progam surveys, Lloyd's, ABS, or matching sister vessels. The profiles developed from the vessel-specific data were used to estimate the characteristics of the other 78% of vessels.

The IMO established OGV propulsion engine standards in MARPOL Annex VI and engine manufacturers have been in compliance with the NO_x Technical Code since 2000. The engine standards are baseline standards to prevent backsliding on emission levels from 2000 and newer engine models. In this study, the IMO standard of 17.0 g/kW-hr NO_x is used for slow speed vessels built after the year 2000.

Medium speed engine standards under the IMO program are based on design engine speed in revolutions per minute. For medium speed engines built after the year 2000, the 13.0 g/kW-hr NO_x emission standard is used. It should be qualified that the engine manufacturers design their engines to emit well below the standards, but it is difficult to establish an "in-use" average without the benefit of measurements. Therefore, the use of the IMO standards as emission factors probably overestimates actual vessel engine emissions.

The Vessel Boarding Program made important contributions and refinements to the methodology used for the OGV portion of the Puget Sound Maritime Air Emissions Inventory. Data sharing between the Vessel Boarding Programs for the concurrent emissions inventories developed by the Port of Los Angeles, the Port of Long Beach and the Puget Sound Maritime Air Forum resulted in unprecedented sharing of detailed field-validated vessel data among West Coast ports. While the latest California port emissions inventories have not been finalized, Section 2.4.4 of the Port of Los Angeles Baseline Air Emissions Inventory – 2001,[72] details many of the insights obtained during the Vessel Boarding Program conducted there in 2003.

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[72] Starcrest 2005.

Some of the 2003 OGV insights include:

- Validation of Lloyd's data by comparing it to actual on-board engine and vessel parameters, such as maximum vessel speed and engine power.
- Establishment of relationship between maximum and actual at-sea ship service speed.
- Evaluation of time-in-setting mode data and real time load readings for transit and in-port maneuvering modes.
- Significant improvements over Lloyd's data to the characterization of auxiliary engines.

Further refinements obtained from the 2005 - 2006 Puget Sound, Port of Los Angeles and Port of Long Beach Vessel Boarding Programs include:

- Refined vessel defaults by vessel type and subtype.
- Revised boiler emission methodology based on actual average boiler fuel consumption.
- Use of sister ships to maximize the application of collected data to specific ships.

During vessel boarding, vessel captains were asked if there were any sister ships and if so, vessel names were noted to later see if they matched with vessels calling at the Puget Sound ports. In addition to the vessel data gathered through the Vessel Boarding Program, several companies provided main and auxiliary engine data on their fleet by submitting the information electronically.

The following Vessel Boarding Program survey data was used specifically for emission estimation methodology in this study:

- Main engine power
- Auxiliary engine power
- Auxiliary engine load (at different vessel operating modes)
- Boiler fuel consumption
- Type of fuel used while in Puget Sound during transit and hotelling
- Emission reduction technologies such as slide valves
- Routing and speeds

Lloyd's data on the worldwide fleet of OGVs was assembled in a common database and a query was completed to match with the MarEx vessel data. There were a high percentage of matches, over 95%, between the Lloyd's data and MarEx data. The remaining 5% were either matched to another dataset (see Section 3.3.3) or defaults were used from averages by vessel type from Lloyd's worldwide fleet data query. For main engine data, the match with Lloyd's and ABS data was greater than 98%, so defaults for main engine power were only used for 2% of the vessels, and if actual Vessel Boarding Program data was available, it was used for that vessel.

The BCMVEI was coordinated with Environment Canada, the Greater Vancouver Regional District, the Vancouver-Fraser Port Authority, and others as well with the Puget Sound Maritime Air Forum to assure quality and consistency and avoid duplication and omissions between the two inventories. Analysis of the MarEx data (used in the Puget Sound Maritime Air Emissions Inventory) and analysis of AIS data (used in the BCMVEI) determined that the AIS data was not reliable with respect to origin and destination data. Using the MarEx data, it was determined that there were five general types of routing. In an effort to reduce double counting of ship activity and emissions, it was agreed between the two groups, which inventory would account for which emissions and where those emissions would be counted. Inbound and outbound vessels travel on specific travel lanes. Since the U.S./Canadian border divides the inbound and outbound vessel travel lanes (i.e., inbound lane lies on the U.S. side of the border, while the outbound lane lies on the Canadian border in the Strait of San Juan de Fuca), the agreement included discussion on inbound and outbound transit emissions.

Vessel routing is the underlying geographic element upon which the OGV emissions estimates are based. Using the 2005 MarEx of Puget Sound data, distinct trip routes were derived, taking into account the routing complexity of the region and the multiple movements, including arrivals, departures and shifts. There were a total of 153 distinct ship routes in the MarEx data. Of these, 145 distinct routes were within the study area and scope, leaving eight distinct routes outside the scope of the inventory. The vessel routing was reviewed by the Puget Sound Pilots in part of the validation effort. This detailed vessel routing allowed OGV emission to be allocated by county, by port, and by mode (hotelling, maneuvering, and transiting), allowing for detailed analysis of this source category.

In late February 2007, pilot billing data was obtained by the Pacific Merchant Shipping Association and checked against the MarEx data for inbound, outbound, and shifts. For inbound and outbound trips, the data seems to match very closely what was provided by MarEx. For shifts there was a difference that is most likely due to differences associated between billing (pilot's data) and activity (MarEx data). These differences include:

- Some jobs are cancelled but invoiced if the cancellation involved the dispatch of a pilot before cancellation
- Some jobs or moves include two pilots which would show up as two billing records and one activity record,
- Some yacht moves actually have a pilot onboard, which would show up as one billing record, one activity record, and would not included in the ocean-going vessel emissions (as it would have been included in recreational vessels), and
- Accounting of short shifts between berths vs. activity.

Currently the two data sets are being further evaluated to determine if there is an actual change in the number of shifts. At the time of publishing, this analysis has not been completed. Significant changes in emissions are not anticipated even if the number of shifts is increased as these movements represent a very minor fraction of the total ocean-going vessel emissions. For the next inventory update, it is recommended that these issues be understood and resolved. Also it is expected that for the next inventory update, that Coast Guard data will also be available to provide yet another quality assurance check with the MarEx and pilot data.

It is recommended that the maritime community engage in additional discussions related to emission reduction methods, especially during vessel hotelling and while in the greater Puget Sound area. Continued support of the Vessel Boarding Program to obtain data which is unavailable from Lloyd's, e.g., for auxiliary engines is also recommended. OGV engine testing for NO_x in order to establish "in-use" averages of NO_x emissions, which should be below manufacturer design standards, would be a refinement to the emissions estimation methodology. Finally, the emission control measures in place, including slide valves and cold ironing, use of cleaner fuels and other strategies to reduce emissions should be expanded, where appropriate.

SECTION 4 HARBOR VESSELS

Section 4 provides an overview of the harbor vessels operating in Puget Sound, describes the methodology used to estimate emissions, and summarizes the emission estimates for this source category. The harbor vessels designation is used to identify harbor craft, (commercial vessels that spend the majority of the time within or near the ports and harbors), and the recreational vessels and tank barges that are included in this section.

4.1 Source Description

Harbor craft included in this inventory are divided into the following vessel types:

- Assist and escort tugboats
- Harbor and ocean tugboats
- Government vessels
- Work boats
- Commercial fishing vessels
- Ferry vessels
- Excursion vessels

The engine characteristics are further described for each vessel type in Section 4.4. Recreational vessels and tank barges are not considered to be commercial harbor craft or ocean-going vessels; therefore they are presented in this section, but separately from the harbor craft emissions. Information about tank barges and recreational vessels and their related emissions are summarized in sections 4.7 and 4.8, respectively.

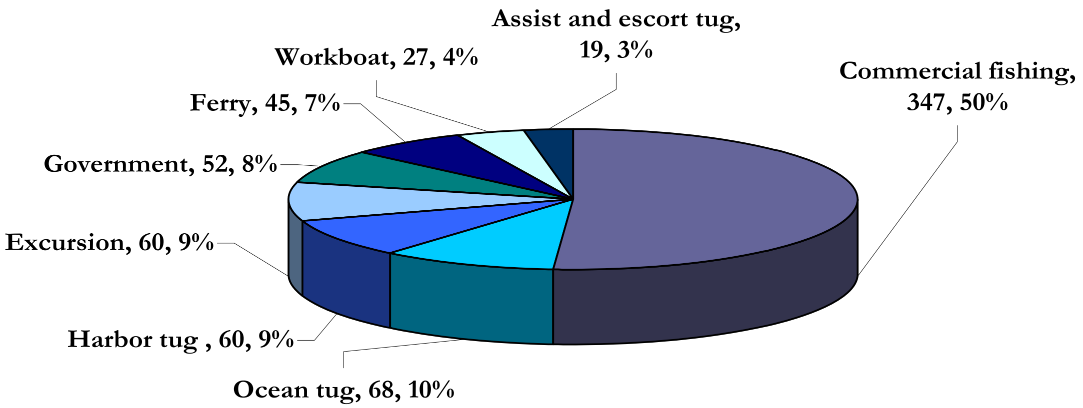
Table 4.1 presents the number of commercial harbor craft inventoried for Puget Sound in 2005 for each vessel type (this number does not include recreational vessels or tank barges).

Table 4.1: Puget Sound 2005 Commercial Harbor Craft by Vessel Type

Harbor Craft Vessel Type	Number Vessels
Commercial fishing	347
Ocean tug	68
Harbor tug	60
Excursion	60
Government	52
Ferry	45
Workboat	27
Assist and escort tug	19
Total	**678**

Figure 4.1 presents the distribution of the 678 commercial harbor craft inventoried for Puget Sound in 2005.

Figure 4.1: Puget Sound 2005 Commercial Harbor Craft by Vessel Type



4.2 Geographical Delineation

The geographical area in which the harbor vessels operate is similar to that of the area included for ocean-going vessels. This area includes the U.S. portions of the Georgia Basin/Puget Sound Airshed, as shown in Figure 1.1, and the twelve counties and six ports described in Section 1.4.4. Emissions from harbor vessels such as ferries that routinely cross the international border are estimated for the U.S. portions of their routes. Emissions from U.S. based harbor vessels that traverse the Strait of Juan de Fuca are estimated regardless of whether the vessels travel on the U.S. side or the Canadian side of the international border, the same approach as for OGVs.

4.3 Data and Information Acquisition

To collect data for the harbor vessels inventory, vessel owners and operators were identified and interviewed on key operating parameters. The operating parameters of interest included the following:

- Vessel type
- Number, type and horsepower (or kilowatts) of main engine(s)
- Number, type and horsepower (or kilowatts) of auxiliary engines
- Hours of operation in Puget Sound for 2005
- Information on percentage of time operating within Puget Sound regions
- Annual fuel consumption
- Qualitative information regarding how the vessels are used in service
- Engine model years, and if engines on vessels had been replaced
- Emission reduction strategies including but not limited to: alternative fuels, retrofits with after-treatment, shore power

The data collected for harbor vessels is summarized in Appendix E-2.

4.4 Operational Profiles

Commercial harbor craft companies were identified and contacted to obtain the operating parameters of their vessels. Tables 4.2 and 4.3 summarize the main and auxiliary engine data respectively for the harbor craft. A main engine may also be referred to as a propulsion engine since it is normally used for propulsion. Auxiliary engines may also be referred to as diesel generators. While in transit, most harbor craft only use one auxiliary engine along with the main engine. The activity hours for all engines are reflected in this inventory.

When data is not available or applicable, “na” is used in the tables. The averages in the table below, by vessel type for engine model year, horsepower, and activity hours, are used as defaults in the database input data file for those vessels for which data was unavailable. For vessel types that do not have an average value for a given parameter, the average for all harbor craft in Puget Sound is used. For defaults, a straight line arithmetic average was used. For excursion vessels, the auxiliary engine model year was missing from data on 67% of the vessels. Since the model year average for most vessels in Puget Sound was less than the year 1999 (i.e., Tier 0 for pre-1999 model year), it was assumed that excursion vessels had Tier 0 engines. The majority (87%) of commercial fishing vessels did not have data available for auxiliary engine horsepower. Information received from approximately 45 commercial fishing vessels was used to assign a default horsepower to these auxiliary engines.

Table 4.4 and Figure 4.2 summarize the fuel types that are in use for the harbor craft inventoried. Almost 90% of the harbor craft are fueled by offroad diesel. Gasoline and onroad diesel fuel the remaining vessels, with the exception of five vessels on alternative fuels (biodiesel and ULSD).

Table 4.2: Puget Sound 2005 Harbor Craft Main Engines Inventory

Harbor	Vessel	Engine Count		Model year		Horsepower		Annual Operating Hours	
Vessel Type	**Count**	**Fleet Total**	**Avg/Vessel**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Assist and escort tug	19	39	2.1	1966 - 2005	1986	200 - 4,000	2,123	110 - 4,113	2,673
Harbor tug	60	104	1.7	1944 - 2004	1979	135 - 3,600	856	0 - 5,000	1,540
Ocean tug	68	135	2.0	1966 - 2004	1981	365 - 5,100	2,156	0 - 5,000	498
Commercial fishing	347	661	1.9	1913 - 1998	1973	70 - 6,200	750	48 - 144	49
Ferry	45	110	2.4	1967 - 2005	1996	300 - 4,400	1,845	0 - 6,993	3,695
Excursion	60	98	1.6	1970 - 2005	1992	85 - 2,990	432	10 - 3,000	862
Government	50	76	1.5	1940 - 2004	1990	10 - 3,500	880	40 - 2,500	654
Pilot boat	2	4	2.0	1999 - 2001	2000	1,100 - 1,100	1,100	2,353 - 2,819	2,675
Workboat	27	45	1.7	1963 - 2004	1983	45 - 600	376	60 - 1,000	554
Total	**678**	**1,272**							

Note: The engine hours for commercial fishing do no include hours used outside of the study area. Most commercial fishing vessels use shore power when at berth, if they need auxiliary engine power while at berth, and others turn their engines off altogether when at berth.

Table 4.3: Puget Sound 2005 Harbor Craft Auxiliary Engines Inventory

Harbor	Vessel	Engine Count		Model year		Horsepower		Annual Operating Hours	
Vessel Type	**Count**	**Fleet Total**	**Avg/Vessel**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Assist and escort tug	19	34	1.8	1966 - 2002	1985	40 - 250	134	342 - 6,081	3,644
Harbor tug	60	81	1.4	1945 - 2004	1977	30 - 190	86	0 - 3,500	1,024
Ocean tug	68	139	2.0	1966 - 2006	1982	51 - 240	133	0 - 6,840	498
Commercial fishing	347	333	1.0	1913 - 1998	1973	na - na	na	48 - 144	49
Ferry	45	91	2.0	1959 - 2004	1994	13 - 1,210	363	0 - 7,015	1,836
Excursion	60	28	0.5	na - na	na	13 - 150	43	30 - 2,000	607
Government	50	22	0.4	1940 - 1984	1945	40 - 425	143	7 - 2,700	664
Pilot boat	2	4	2.0	1999 - 2001	2000	43 - 50	47	1,000 - 1,000	1,000
Workboat	27	14	0.5	1964 - 2005	1976	90 - 180	173	180 - 900	577
Total	**678**	**746**							

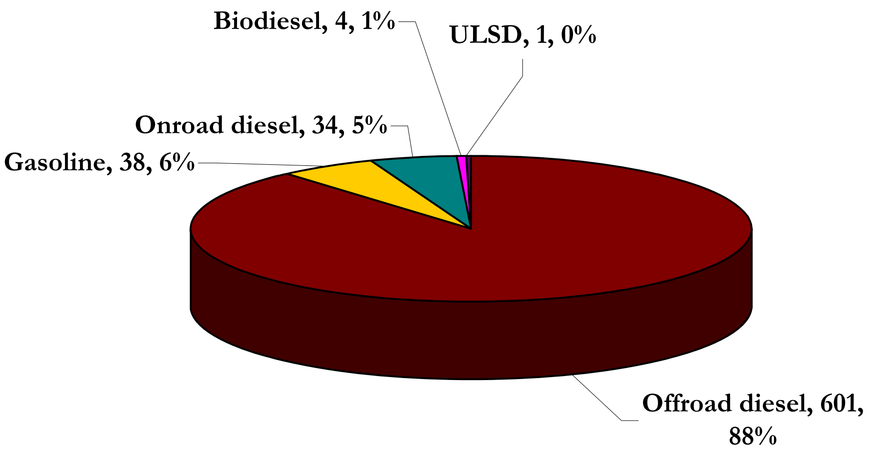
Note: The engine hours for commercial fishing do no include hours used outside of the study area. Most commercial fishing vessels use shore power when at berth, if they need auxiliary engine power while at berth, and others turn their engines off altogether when at berth.

For excursion vessels, "na" means not enough information is available to provide model year range and average.

Table 4.4: Puget Sound 2005 Harbor Craft Fuel Types

Type	Total	Diesel, offroad	Gasoline	Diesel, onroad	Biodiesel	Diesel, ultra low sulfur
Commercial fishing	347	347	0	0	0	0
Ocean tug	68	68	0	0	0	0
Excursion	60	56	2	0	2	0
Harbor tug	60	58	0	0	2	0
Government	50	19	27	4	0	0
Ferry	45	16	0	28	0	1
Workboat	27	18	9	0	0	0
Assist and escort	19	19	0	0	0	0
Pilot boat	2	0	0	2	0	0
Total	**678**	**601**	**38**	**34**	**4**	**1**

Figure 4.2: Puget Sound 2005 Harbor Craft Fuel Types



4.4.1 Assist and Escort Tugboats

The main function of assist and escort tugboats is to assist the ocean-going vessels in making turns, reducing speed, providing propulsion, and docking. The tugboats assist the OGVs to maneuver during arrival, departure and shifts from berth.

There are approximately 19 tugboats from two companies that mainly provide assist and escort services in the Puget Sound area. These tugboats may be assigned to a certain port or geographical area to lessen the transit time between jobs. The largest tugs are used for Puget Sound tanker escort service in Anacortes region where the oil terminals are mainly located.

Most of the tugboats have twin-screw propulsion engines with a total rated horsepower ranging from 400 hp to 8,000 hp. The main engines had several models of Caterpillar and GM EMD engines. About half of the engines had Category 2 engines. The categories are defined in Section 4.6 of this report. The horsepower, per engine, ranged from 200 hp to 4,000 hp with an average of 2,123 hp. The annual operating hours for main engines ranged from 110 hours to 4,113 hours, with an average of 2,673 hours. The main engines model years ranged from 1966 to 2005, with an average of 1986.

Most of the assist tugboats have two auxiliary engines to supply on-board power and only one auxiliary engine is used at a time. The activity hours in this inventory reflect the interchangeable use of auxiliary engines. The horsepower for each auxiliary engine ranged from 40 hp to 250 hp, with an average of 134 hp. The annual operating hours ranged from 342 hours to 6,081 hours, with an average of 3,644 hours. The auxiliary engines model years ranged from 1966 to 2002, with an average of 1985.

4.4.2 Harbor and Ocean Tugboats

In Puget Sound, tugboats, towboats and push-boats are mainly referred to as harbor tugs or ocean tugs, depending on the type of work they do. Harbor tugs mainly stay within Puget Sound and ocean tugs mainly work outside the Puget Sound boundary and may transit in and out of their home facility a few times per year. Only the hours spent in Puget Sound were included in the inventory. The inventory includes 60 harbor tugs and 68 ocean tugs for a total of 128 tugboats (not including the 19 assist and escort tugs). Some harbor and ocean tugs included in the inventory were inactive in Puget Sound in 2005. They were out due to maintenance or were temporarily working in another region. However, the companies reported that the vessels usually operate in Puget Sound and therefore are reflected in the inventory with zero hours of activity for 2005.

The main companies that provide tugboat services in the Puget Sound area include:

- Foss Maritime
- Olympic Tug and Barge
- Crowley
- Fremont Tugboat
- Island Tug and Barge
- Sea Coast Towing
- Western Towboat Co.
- Dunlap Towing

Most of the harbor tugboats have twin-screw propulsion engines, although some are single-screw. The majority of the engines had Category 1 Caterpillar and Detroit Diesel engines. The horsepower of each engine ranged from 200 hp to 3,600 hp with an average of 856 hp. The annual operating hours for main engines ranged from zero to 5,000 hours, with an average of 1,540 hours. The main engines model years ranged from 1944 to 2004, with an average model year of 1979.

The harbor tugboats had one or two auxiliary engines. The horsepower for each auxiliary engine ranged from 30 hp to 190 hp, with an average of 86 hp. The annual operating hours ranged from zero hours to 3,500 hours, with an average of 1,024 hours. The auxiliary engines model years ranged from 1945 to 2004, with an average model year of 1977.

The ocean tugboats have twin-screw propulsion engines. The majority of the engines had Category 1 Caterpillar engines and Category 2 GM EMD engines. The horsepower of each engine ranged from 365 hp to 5,100 hp with an average of 2,156 hp. The annual operating hours for main engines ranged from zero to 5,000 hours, with an average of 494 hours. The main engines model years ranged from 1966 to 2004, with an average model year of 1981.

The harbor tugboats had one or two auxiliary engines. The horsepower for each auxiliary engine ranged from 51 hp to 240 hp, with an average of 133 hp. The annual operating hours ranged from zero hours to 6,840 hours, with an average of 498 hours. The auxiliary engines model years ranged from 1966 to 2006, with an average model year of 1982.

4.4.3 Commercial Fishing Vessels

Commercial fishing vessels are vessels dedicated to procuring fish and other seafood such as crabs for the purpose of sale. There are numerous vessels classified as fishing vessels in the Puget Sound area. These range from the smaller fishing charter vessels to the larger commercial fishing vessels that go to Alaska. Charter vessels, which are largely used for recreational fishing excursions, are not included in the commercial fishing vessel category but instead are included as excursion vessels. For the purpose of this inventory, commercial fishing vessels are those larger vessels that procure fish and other seafood for sale, in many cases seasonal. Seiners, crabbers, trollers, trawlers, longliners and gillnetters were included along with the processing ships. The larger fishing vessels are used as factory ships where the fish can be processed while at sea. These large fishing vessels generally make one or two trips out to Alaska or the Bearing Sea and into Puget Sound per year. While at dock, these vessels use shore power.

Data was acquired through a combination of databases and interviews with fishing companies and fishing associations. The North Pacific Fishing Vessel Owners' Association provided information for fishing companies and fishing vessel associations, who were then contacted directly. Activity data includes times per year in the Puget Sound area, frequency of transits out to sea, and number of hours engines were used while in Puget Sound. Some of the companies also provided specific engine information for their fleets which aided in developing defaults or averages for the commercial fishing category. Interviews with the operators of several commercial fishing vessels were conducted while at dock. For the large processing vessels, a visit included a tour of the engine room and discussion with the chief engineer on how the engines operate at sea, in transit in Puget Sound, and at berth. For the other commercial fishing vessels, engine power, loads, engine make and model were discussed.

In addition to the face-to-face interviews, and because not all owners of fishing vessel companies could provide information required for inventory purposes, data for vessels that had a home port in the Puget Sound study area were obtained from the following databases:

- Vessel Traffic Service[73]
- Merchant Vessels of the U.S.
- Washington Department Fish and Wildlife
- Alaska Commercial Fisheries Entry Commission (CFEC)

The discussions with the fishing industry validated the findings of the database research. The VTS database included commercial fishing vessels that transited Puget Sound in 2005.

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[73] World Vessels Traffic Services Guide. See: *http://www.worldvtsguide.org*.

Another data source for commercial fishing vessels is the Merchant Vessels of the U.S. database[74], current up to October 2004. By law, the vessels are required to be registered with the U.S. Coast Guard. The database was queried for commercial fishing vessels and Washington home ports; however, this database was too general and could not be used to gauge the number of actual commercial fishing vessels in use or in Puget Sound waters in 2005.

Information was gathered from Alaska since the majority of the commercial fishing vessels visited the State. The State of Alaska's Commercial Fisheries Entry Commission[75] tracks individual permits and vessel information by year for the State of Alaska. A file was obtained and queried for permits given to commercial fishing vessels listing their home port in Washington State. The vessels from the CFEC file were matched with the VTS file and horsepower information was included for these vessels.

The Washington Department of Fish and Wildlife[76] keeps a list of commercial fishing vessels that applied for commercial fishing licenses in the State of Washington. This file contains good records on vessel horsepower information for small to medium fishing boats, as well as the larger commercial fishing vessels. However, horsepower information could not be readily matched to the base file because it did not contain a Coast Guard number. The horsepower information was used to supplement the base file by providing average horsepower for those vessels that did not have an actual horsepower listed and could not be matched with a vessel from the Alaskan database. The vessels from the WDFW file were sorted by engine size, as indicated by vessel length:

- Vessels less than 30 feet that contain gasoline outboard or small diesel engines with an average horsepower of 200 hp (which are mostly vessels used within Puget Sound waters).
- Vessels 30 to 60 feet that contain diesel engines with an average horsepower of about 270 hp (which are used to fish either within the Puget Sound or offshore).
- Vessels over 60 feet that contain large diesel engines (which are used mainly for offshore fishing). Actual horsepower was used from the Coast Guard and Alaskan databases. For vessels that did not list the horsepower, an average of 750 hp was applied.

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[74] U.S. Coast Guard National Vessel Documentation Center. See: *http://www.uscg.mil/hq/g-m/vdoc/nvdc.htm.*

[75] State of Alaska Commercial Fisheries Entry Commission. See: *http:// www.cfec.state.ak.us/*

[76] Washington Department of Fish and Wildlife Licensing. See: *http://www.wdfw.wa.gov/lic/formpage.htm.*

In summary, the average commercial fishing vessels included in the 2005 Puget Sound inventory typically have two main engines and one auxiliary engine. Main engine power ranged from 70 hp to 6,200 hp with an average of 750 hp. The annual operating hours for main engines ranged from 48 hours to 144 hours, with an average of 49 hours. The low hours are due to the fact that these vessels do not fish in Puget Sound and only transit time was included. While in port, the main engines are turned off. In comparison to the other vessel types, the population for commercial fishing vessels is larger but the actual hours used are lower than the other vessel types. The main engines had a model year range from 1913 to 1998, with an average model year of 1973. The 1913 year found in the database may have been the vessel year more than likely instead of engine model year. This could not be verified with the vessel owner; therefore the year is listed but not included in the average for commercial fishing average model year.

4.4.4 Ferry Vessels

Ferry vessels are self-propelled vessels that carry more than six passengers. Ferry vessels include the large ferries operated by Washington State Ferries along with a few local ferries in the Puget Sound area. The WSF vessels have medium speed propulsion engines, several auxiliary engines used mainly for house load, one emergency generator not normally used but tested once a month and one or two small auxiliary boilers used during the colder months of the year. In this respect, their engines are similar to the ocean-going vessels; however, they are considered harbor vessels since they only operate within the harbor. Some of the WSF ferries are diesel-electric with four diesel generators that generate electricity for propulsion power and house load.

The ferries in the inventory had at least two main engines. The engine power ranged from 300 to 4,400 hp, averaging 1,845 hp. The annual operating hours ranged from zero hours to 6,993 hours, with an average of 3,695 hours. The engine model years ranged from 1967 to 2005, with an average of 1996.

The ferries had two auxiliary engines. The horsepower for each auxiliary engine ranged from 13 hp to 1,210 hp, with an average of 363 hp. The annual operating hours ranged from zero hours to 7,015 hours, with an average of 1,836 hours. The auxiliary engines model years ranged from 1959 to 2004, with an average of 1994.

The 28 WSF vessels had a total of 39 auxiliary boilers, with each vessel having mostly one or two boilers. Some WSF vessels did not have an auxiliary boiler. Those that had two boilers only used one boiler at a time. Boilers were only used for six months out of the year during the colder months for an average 1,200 hours.

WSF has regular schedules and routes, as described in Section 1.8 and depicted in Figure 1.30. The ferries are operated at different locations throughout Puget Sound.

4.4.5 Excursion Vessels

Excursion vessels are smaller than ferry vessels and are used for harbor cruises, dining cruises, whale watching and other specialty cruises. Included with the excursion vessels are charter vessels that may be used for half day, one day or multiple day fishing trips. In the Puget Sound area, there are numerous excursion vessel companies that may own one or two vessels. Approximately 60 excursion vessels were identified.

The excursion vessels had one to two main engines ranging in power from 85 hp to 2,990 hp, with an average of 432 hp. The annual operating hours for main engines ranged from 60 hours to 3,000 hours, with an average of 862 hours. The main engines had a model year range from 1970 to 2005, with an average model year of 1992.

The excursion vessels had either one or no auxiliary engines. The power for each auxiliary engine ranged from 13 hp to 150 hp, with an average of 43 hp. The annual operating hours ranged from 30 hours to 2,000 hours, with an average of 607 hours.

4.4.6 Government Vessels

Pilot boats, Coast Guard vessels, National Oceanic and Atmospheric Administration (NOAA) research vessels, police patrol boats and fireboats, are included in this vessel type. A total of 50 government vessels are included in this Puget Sound Maritime Air Emissions Inventory, including two pilot boats. Although the pilot boats are not considered government vessels, they share the same load factors for emissions estimation purposes.

Government vessels may have one or two main engines. Engine power ranged from 10 hp to 3,500 hp with an average of 880 hp. The annual operating hours from main engines ranged from 40 hours to 2,500 hours, with an average of 654 hours. The main engines had model years ranging from 1940 to 2004, with an average of model year of 1990.

The engine power for each auxiliary engine ranged from 40 hp to 425 hp, with an average of 143 hp. The annual operating hours ranged from seven hours to 2,700 hours, with an average of 664 hours. The auxiliary engines had a model year range from 1940 to 1984, with an average of 1945.

The two pilot boats have two main engines and two auxiliary engines with relatively new fuel-efficient engines. The horsepower of the main engines is 1,100 hp each. The activity hours averaged 2,675. The auxiliary engines have an average of 47 hp and were used approximately 1,000 hours in 2005.

4.4.7 Work Boats

Work boats perform numerous duties within the harbor, such as utility inspection, surveying, spill/response, training and construction. There were a total of 27 workboats, including nine derrick barges and one dredger.

The workboats for the most part had one main engine with a horsepower range of 45 hp to 600 hp, and an average of 376 hp. The annual operating hours for main engines ranged from 60 hours to 1,000 hours, with an average of 554 hours. The main engines had a model year range from 1963 to 2004, with an average model year of 1983.

The workboats had either one or no auxiliary engines. The horsepower for each auxiliary engine ranged from 90 hp to 180 hp, with an average of 173 hp. The annual operating hours ranged from 180 hours to 900 hours, with an average of 577 hours. The auxiliary engines had model years ranging from 1964 to 2005, with an average of 1976.

4.5 Emission Reduction Technologies Identified

Harbor craft emissions are reduced by emission reduction strategies such as shore power, engine rebuilds (e.g., the new cleaner injectors on the Washington State Ferries), and lower sulfur content diesel fuels. In the Puget Sound, shore power is used among the harbor craft that require electricity for house load after operations are complete. These vessels use shore power instead of auxiliary engines when they are off-duty. Shore power refers to vessels that are provided electricity from the shore side (i.e. berth); it does not refer to vessels that turn off their engines when at berth and not being used. The companies that use shore power indicate that it lowers noise levels, reduces fuel costs, and protects the environment. Tugboat companies, commercial fishing vessels, and ferry vessels use shore power. The tugboat companies have shore power capabilities at their facilities, which are mostly located outside port property, and use it for their fleet of assist and escort tugs, and harbor and ocean-going vessels. Terminal 91 at the Port of Seattle provides shore power to the larger commercial fishing vessels and other vessels that berth at the Port. At least 50% of WSF vessels have shore power capability and are able to plug in one auxiliary engine used for house load at night while at the home berth. Table 4.5 presents the estimated percent of harbor craft vessels using shore power.

Table 4.5: Puget Sound 2005 Harbor Craft Using Shore Power, %

Harbor Vessel Type	Shore Power Usage
Assist and escort tug	68%
Harbor and ocean tug	25%
Commercial fishing	> 50%
Ferry	50%
Excursion	0%
Government	12%
Workboat	0%

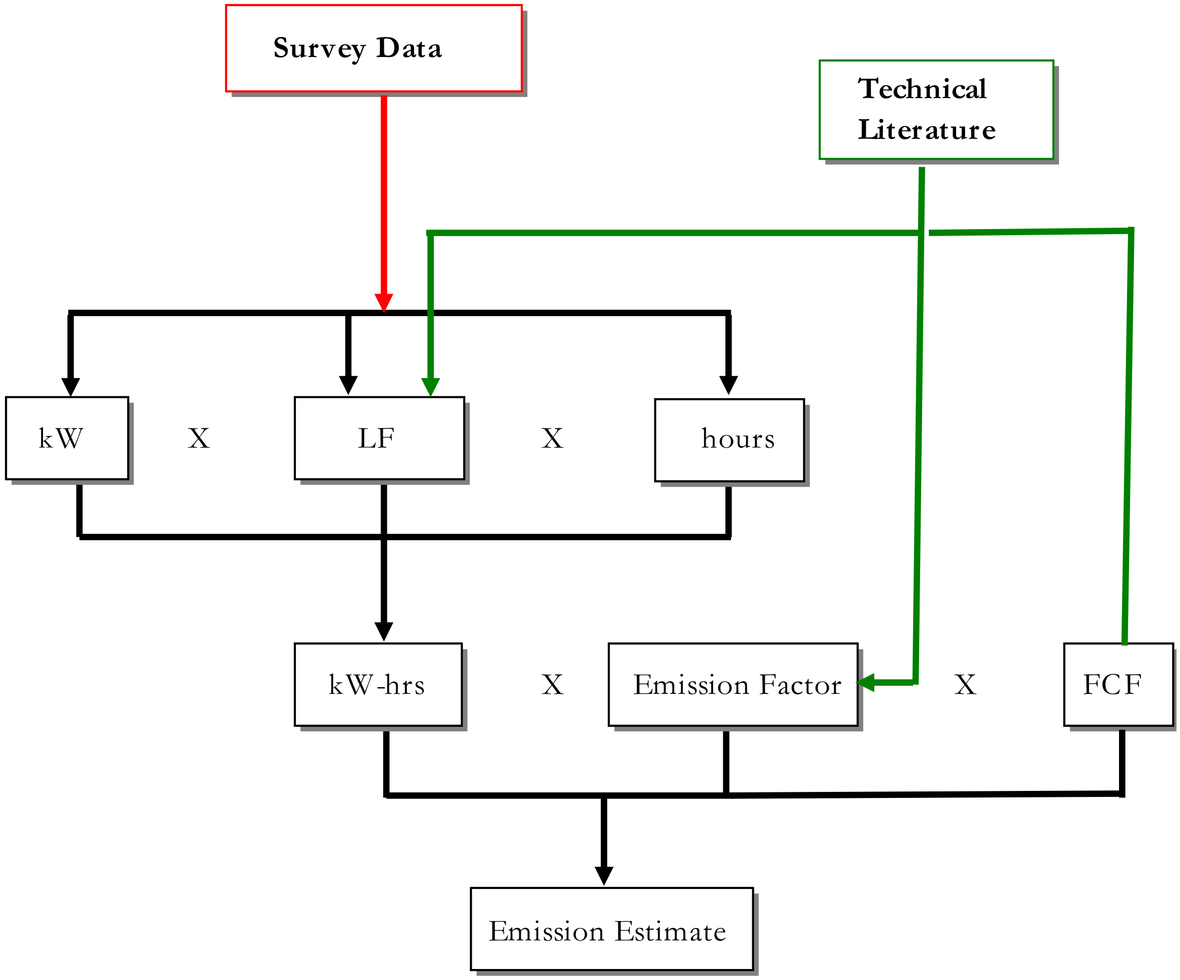
In 2005, over 90% of the vessels in Puget Sound used EPA offroad diesel fuel. Approximately 7% of the vessels inventoried used another type of diesel fuel. Two vessels used biodiesel, one ferry used ULSD and the remainder, about 31 vessels including the Washington State Ferries and pilot boats, used onroad diesel fuel with a sulfur content less than 500 parts per million (ppm).

A small percentage of companies repowered some of their vessels at their own expense. The Washington State Ferries retrofitted most of their propulsion engines with fuel-efficient injectors which also help reduce NO_x emissions. The engines were EMD models and used the ECOTIP fuel injectors.

4.6 Methodology

The methodology generally follows the description in Section 1.12.1. Exceptions or additional calculations specific to the harbor vessels source category are described here. The flow chart in Figure 4.3 graphically breaks down the steps taken to estimate commercial harbor vessels emissions. Survey data comes from the data collected from the harbor vessels companies. Technical literature includes data for emission factors and load factors which are discussed in later subsections.

Figure 4.3: Harbor Craft Emission Estimation Flow Chart



Technical Literature - emission factors, load factors, fuel correction factors	
Survey Data - number of engines, power, assist tug load factor, activity hours	

4.6.1 Emission Equations

The basic equation used to estimate harbor vessels emissions is:

Equation 4.1

$$E = kW \times Act \times LF \times EF \times FCF$$

Where:

E = Emission, g/year
kW = Kilowatts
Act = Activity, hours/year
LF = Load Factor
EF = Emission Factor, g/kW-hr
FCF = Fuel Correction Factor

The EPA emission factors are in g/kW-hr, therefore the engine horsepower was converted to kilowatts by dividing the horsepower by 1.341 (one horsepower is equal to 0.746 kilowatts). The hours represent annual hours of use in 2005 within the Puget Sound. The total annual hours were used to calculate the harbor vessels emissions. The calculated emissions were converted to tons per year by dividing the emissions by 907,200 (which is 2,000 lb/ton x 453.6 g/lb).

4.6.2 Emission Factors for Diesel Engines

The emission factors for harbor vessels are based on marine engine standards (i.e., Tier 0 or Tier 1) and the EPA engine category. In addition, EPA identified three categories for commercial marine vessel main propulsion engines and auxiliary engines:

- Category 1: 1-5 liters per cylinder displacement
- Category 2: 5-30 liters per cylinder displacement
- Category 3: over 30 liters per cylinder displacement

Most harbor craft have Category 1 engines, except for some of the larger tugboats and the larger commercial fishing vessels that have Category 2 engines. In Puget Sound, approximately 90% of the harbor craft inventoried had EPA Category 1 engines. The other 10% have EPA Category 2 engines.

The majority, 93%, of the marine engines in this inventory have Tier 0 unregulated engines; the rest of the engines meet Tier 1 or Tier 2 engine standards. The various marine engine standards are listed below.

- Tier 0 marine engines are unregulated, older engines (1999 and below)
- Tier 1 marine engine standards are voluntary under MARPOL Annex VI NO_x limits (model year 2000+)
- Tier 2 marine engine standards have been promulgated (mainly 2005+ model year engines)
- Tier 3 marine engine standards are not yet promulgated

Based on the best available data to date, the following sources were used to obtain the appropriate emission factors:

- 1999 EPA *Regulatory Impact Analysis*[77] (RIA), for Tier 0 and Tier 2 engines
- 2002 Entec *Quantification of Emissions from Ships*,[78] for Category 2/medium speed main engines
- IMO NO_x limit, for Tier 1 engines (IMO MARPOL Annex VI NO_x Emission Limit for medium speed engines)

The EPA RIA emission factors used for Category 1 engines were developed specifically for commercial marine engines and are based on a blend of pre-1999 marine engines. The emission factors reported in a 2002 Entec study for medium speed vessels using diesel oil were used for the Category 2 engines.

The use of a specific emission factor is dependent on engine power, engine model year, and engine cylinder displacement. A tiered approach was used and the engines were divided accordingly:

- Tier 0-Category 1 - 1999 or older year engine, Category 1 engines
- Tier 0-Category 2 - 1999 or older year engine, Category 2 engines
- Tier 1-Category 1 - 2000 to 2003 year engine, Category 1 engines
- Tier 1-Category 2 - 2000 to 2003 year engine, Category 2 engines
- Tier 2-Category 1 - 2004 and newer year engine, Category 1 engines
- Tier 2-Category 2 - 2004 and newer year engine, Category 2 engines

In summary, the use of a specific emission factor is dependent on engine power, engine model year, and engine cylinder displacement. The source of emission factors is listed in Table 4.6.

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[77] EPA 1999.

[78] Entec 2002. See: *http://ec.europa.eu/environment/air/pdf/chapter2_ship_emissions.pdf.*

Table 4.6: Source of Emission Factors

Engine Standard	EPA Eng Category	Model Year Range	Source of Emission Factor
Tier 0	Cat 1	1999 and older	1999 EPA RIA
Tier 0	Cat 2	1999 and older	2002 Entec
Tier 1	Cat 1	2000 to 2003	1999 EPA RIA, IMO NO_X
Tier 1	Cat 2	2000 to 2003	2002 Entec, IMO NO_X
Tier 2	Cat 1	2004 and newer	1999 EPA RIA
Tier 2	Cat 2	2004 and newer	2002 Entec, 1999 EPA RIA

The emission factors used for this study are listed in Table 4.7 by engine horsepower range for diesel-fueled main propulsion and auxiliary engines. The emission factors units are in grams per kilowatt-hour. The engine horsepower was converted to kilowatts before applying the emission factor. For engines for which the model year is unavailable, the average engine model year for that vessel type was applied.

The SO_2 emission factor was estimated based on the average sulfur content of the diesel fuel sold to the harbor vessels in Puget Sound based on a supplier interview. The majority of the harbor vessels used offroad diesel fuel in 2005. The SO_2 emission factor was estimated for offroad diesel fuel based on an average sulfur content of 3,100 parts per million.

The emission factor for SO_2 was calculated using the following equation for offroad diesel fuel:

$$\frac{3{,}100 \text{ g S}}{1{,}000{,}000 \text{ g fuel}} \quad \text{x} \quad \frac{210 \text{ g fuel}}{\text{kW-hr}} \quad \text{x} \quad \frac{2 \text{ g } SO_2}{\text{g S}} \quad = \quad 1.3 \text{ g } SO_2/\text{kW-hr}$$

For those vessels that used onroad diesel and ULSD, fuel correction factors listed in Section 4.6.3.

Table 4.7: Harbor Craft Emission Factors, g/kW-hr

Power, minimum kW	NOx	VOC	CO	PM	SO_2	CO_2	N_2O	CH_4
Tier 0 Engines								
37	11.0	0.27	2.0	0.90	1.3	690	0.02	0.09
75	10.0	0.27	1.7	0.40	1.3	690	0.02	0.09
130	10.0	0.27	1.5	0.40	1.3	690	0.02	0.09
225	10.0	0.27	1.5	0.30	1.3	690	0.02	0.09
450	10.0	0.27	1.5	0.30	1.3	690	0.02	0.09
560	10.0	0.27	1.5	0.30	1.3	690	0.02	0.09
1,000	13.0	0.27	2.5	0.30	1.3	690	0.02	0.09
Category 2 engines	13.20	0.50	1.1	0.72	1.3	690	0.02	0.09
Tier 1 Engines								
37	9.8	0.27	2.0	0.90	1.3	690	0.02	0.09
75	9.8	0.27	1.7	0.40	1.3	690	0.02	0.09
130	9.8	0.27	1.5	0.40	1.3	690	0.02	0.09
225	9.8	0.27	1.5	0.30	1.3	690	0.02	0.09
450	9.8	0.27	1.5	0.30	1.3	690	0.02	0.09
560	9.8	0.27	1.5	0.30	1.3	690	0.02	0.09
1,000	9.8	0.27	2.5	0.30	1.3	690	0.02	0.09
Category 2 engines	9.8	0.50	1.1	0.72	1.3	690	0.02	0.09
Tier 2 Engines								
37	6.8	0.27	5.0	0.40	1.3	690	0.02	0.09
75	6.8	0.27	5.0	0.30	1.3	690	0.02	0.09
130	6.8	0.27	5.0	0.30	1.3	690	0.02	0.09
225	6.8	0.27	5.0	0.30	1.3	690	0.02	0.09
450	6.8	0.27	5.0	0.30	1.3	690	0.02	0.09
560	6.8	0.27	5.0	0.30	1.3	690	0.02	0.09
1,000	6.8	0.27	5.0	0.30	1.3	690	0.02	0.09
Category 2 engines	9.8	0.50	5.0	0.72	1.3	690	0.02	0.09

4.6.3 Fuel Correction Factors for Diesel Alternatives

Fuel correction factors, shown in Table 4.8, were applied to the vessels using onroad diesel, ULSD and biodiesel. The emission factors used for this study and listed in Table 4.7, are based on use of EPA offroad diesel fuel and thus need to be adjusted to account for alternative fuels.

In the absence of data specific to offroad engines,[79] the EPA biodiesel reduction spreadsheet calculation file[80] for heavy-duty highway two- and four- cycle engines was used to determine reductions of NO_x, CO, VOC and PM for B99 use. A copy of that file is provided in Appendix E-2. EPA indicates that biodiesel may increase NO_x emissions in heavy-duty highway engines, and thus the fuel correction factor used is greater than one.

The CO_2 fuel correction factor for biodiesel was calculated by determining the difference in CO_2 emissions for biodiesel as compared to diesel using the same method that the NONROAD model uses.[81] The NONROAD model uses in-use adjusted brake-specific fuel consumption (BSFC) to compute CO_2 emissions directly, as shown in the equation below. The carbon that goes to exhaust hydrocarbon (HC) emissions is subtracted as the correction for unburned fuel.

Equation 4.2

$$CO_2 = (BSFC \times 453.6 - HC) \times Fuel\ C \times (44/12)$$

Where:

CO_2 = g/hp-hr
BSFC = the in-use adjusted fuel consumption in lb/hp-hr (0.367 for diesel[82]; biodiesel assumed to be 7% greater than diesel)
453.6 = the conversion factor from pounds to grams
HC = the in-use adjusted hydrocarbon emissions in g/hp-hr (0.150 for diesel[83]; biodiesel assumed to be 50% less than diesel)
Fuel C = the carbon mass fraction of the fuel (0.864 for diesel; 0.773 for B100)[84]
44/12 = the ratio of CO_2 mass to carbon mass

The results for diesel are compared to the results for biodiesel, and show a 4% reduction in CO_2 emissions for biodiesel, and yielding a fuel correction factor of 0.96.

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[79] EPA, *A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions*, Draft Technical Report, EPA420-P-02-001, October 2002. (EPA 2002).

[80] EPA, Voluntary Diesel Retrofit Program, Retrofit Technologies – Biodiesel. See: *http://www.epa.gov/otaq/retrofit/techlist-biodiesel.htm.*

[81] EPA NONROAD and EPA, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling--Compression-Ignition*, EPA420-P-04-009, April 2004 (Equation 6). (EPA 2004) See: *http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2004/420p04009.pdf.*

[82] EPA NONROAD and EPA 2004.

[83] EPA 2004.

[84] National Renewable Energy Laboratory, Advanced Vehicles and Fuels Research,Petroleum-Basd Fuels Property Database NREL Database, 2006. (NREL 2006).
See: *http://www.nrel.gov/vehiclesandfuels/apbf/progs/search2.cgi?.*

Table 4.8: Fuel Correction Factors

Fuel	NO_X	VOC	CO	SO_2	PM	CO_2
Diesel, offroad	1.00	1.00	1.00	1.00	1.00	1.00
Diesel, onroad	1.00	1.00	1.00	0.10	0.87	1.00
Diesel, ultra low sulfur	1.00	1.00	1.00	0.005	0.86	1.00
Biodiesel (B99)	1.17	0.50	0.65	1.00	0.68	0.96

4.6.4 Emission Factors for Gasoline Engines

Two percent of the commercial harbor craft, had gasoline engines. The vessels with gasoline engines are mainly government vessels, such as patrol boats with 2-stroke and 4-stroke gasoline engines. The emission factors for gasoline engines are different than those described previously for diesel engines. The emission factor units, taken from EPA's guidance for recreational marine exhaust emission factors,[85] were converted from grams per brake horsepower-hour (g/BHP-hr) to g/kW-hr. Evaporative emissions from gasoline engines are not included since they are insignificant for the small number of gasoline-powered commercial harbor craft in this inventory. The emission factor for particulate matter is listed in Table 4.9. PM_{10} is 100% of PM, $PM_{2.5}$ is 92%[86] of PM, and DPM is zero for gasoline.

Table 4.9: Harbor Craft Emission Factors for Gasoline Engines, g/kW-hr

Power (kW)	Stroke	NO_X	VOC	CO	SO_2	PM	CO_2	N_20	CH_4
7 to 12	2	2.6	229.0	314.7	3.1	3.9	2,376.0	0.06	0.13
12 to 19	2	2.6	189.0	273.8	3.2	3.1	2,297.9	0.06	0.13
19 to 30	2	2.6	149.1	273.8	2.9	3.0	1,980.0	0.05	0.11
30 to 37	2	2.6	143.8	273.8	2.8	2.8	1,901.9	0.05	0.11
37 to 75	2	2.6	137.5	273.8	2.3	2.5	1,631.6	0.04	0.09
75 to 130	2	2.6	124.0	273.8	2.3	2.5	1,584.0	0.04	0.09
75 to 130	4	7.3	7.8	182.9	2.5	0.1	1,321.3	0.03	0.07
131 to 745	4	7.3	7.8	188.7	2.4	0.1	1,250.8	0.03	0.07

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[85] EPA, *Exhaust Emission Factors for Nonroad Engine Modeling: Spark Ignition,* EPA420-R-05-019, December 2005.
[86] EPA NONROAD.

4.6.5 Engine Load Factors

Engine load factors represent the load applied to an engine or the percent of rated engine power that is applied during the engine's operation. Depending on the duration period that is being estimated, the load factor can represent an hourly average, daily average, or annual average load applied to an engine while it is in operation. Table 4.10 summarizes the average engine load factors that were used in this inventory for the harbor craft vessel types for their propulsion and auxiliary engines.

Table 4.10: Load Factors

Harbor Vessel Type	Load Factor
Assist and escort tug	0.31
Harbor and ocean tug	0.68
Ferry/excursion	0.76
Crew boat	0.45
Work boat	0.45
Government	0.51
Commercial fishing	0.27
Auxiliary engines	0.43

The 31% engine load factor for assist tugboats is based on actual vessel engine load readings published in the 2001 *Port of Los Angeles Baseline Air Emissions Inventory*.[87] The 43% engine load factor used for the auxiliary engines is obtained from the EPA NONROAD model guidance[88] which used some direct measurements and has been used in previous studies.[89] The engine load factor for harbor and ocean tugboats, ferry vessels, excursion vessels, crew boats, work boats, government and commercial fishing vessels is based on a 2004 California survey of harbor craft.[90]

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[87] Starcrest 2005.

[88] EPA, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, December 2002, EPA 420-P-02-014. See: *http://www.epa.gov/OMS/models/nonrdmdl/p02014.pdf#search=%22EPA420-P-02-014%22.*

[89] Starcrest Consulting Group, LLC for ERG, *Update to the Commercial Marine Inventory for Texas to Review Emission Factors, Consider a Ton-mile EI Method, and Revise Emissions for the Beaumont-Port Arthur Non-Attainment Area*, January 2004.

[90] California Air Resources Board, *Statewide Commercial Harbor Craft Survey*, Final Report, March 2004. See: *http://www.arb.ca.gov/msprog/offroad/marinevess/documents/hcsurveyrep0304.pdf.*

4.7 Harbor Craft Emissions Estimates

The 2005 harbor craft emissions for Puget Sound are summarized in this section. Table 4.11 presents the 2005 harbor craft emissions by vessel type for Puget Sound in tons per year.

Table 4.11: Puget Sound 2005 Harbor Craft Criteria Pollutant Emissions by Vessel Type, tpy

Vessel Type	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Assist and escort tug	823.9	18.0	112.1	86.8	36.1	33.3	36.1
Commercial fishing	97.3	2.3	13.9	11.3	3.5	3.2	3.5
Excursion	271.0	6.7	46.5	32.6	7.9	7.3	7.9
Ferry	5,550.5	244.2	875.6	145.1	311.3	286.4	311.3
Government	307.8	11.7	139.9	27.2	13.7	12.6	13.7
Harbor tug	870.3	21.2	133.1	102.9	29.2	26.9	29.2
Ocean tug	851.7	19.2	123.4	91.9	35.3	32.5	35.3
Workboat	41.0	13.5	32.3	5.5	1.7	1.5	1.4
Total	**8,813.4**	**336.7**	**1,476.8**	**503.3**	**438.8**	**403.7**	**438.5**

Table 4.12 presents the 2005 harbor craft greenhouse gas emissions by vessel type for Puget Sound in tons per year.

Table 4.12: Puget Sound 2005 Harbor Craft Greenhouse Gas Emissions by Vessel Type, tpy

				CO_2 Equivalents			
Vessel Type	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Assist and escort tug	46,078.2	1.3	6.0	46,078.2	414.0	126.2	46,618.5
Commercial fishing	5,991.4	0.2	0.8	5,991.4	53.8	16.4	6,061.6
Excursion	17,258.3	0.5	2.3	17,258.3	155.3	47.3	17,461.0
Ferry	376,206.3	10.9	49.1	376,206.3	3,380.4	1,030.5	380,617.2
Government	18,290.6	0.5	2.4	18,290.6	165.3	49.6	18,505.5
Harbor tug	54,611.8	1.6	7.1	54,611.8	491.0	149.7	55,252.4
Ocean tug	48,765.2	1.4	6.4	48,765.2	438.2	133.6	49,337.0
Workboat	2,914.2	0.1	0.4	2,914.2	26.6	7.9	2,948.7
Total	**570,116.1**	**16.5**	**74.3**	**570,116.1**	**5,124.6**	**1,561.2**	**576,801.9**

The emissions were first estimated by regional clean air agency jurisdiction, as described in Section 2.1.2, based on discussions with vessel owners. They were then subdivided by county based on knowledge of where the various vessels types transit.

The emission results for each of the three regional clean air agency regions covered by this inventory are summarized in Table 4.13.

Table 4.13: Puget Sound 2005 Harbor Craft Criteria Pollutant Emissions by Regional Clean Air Agency, tpy

Clean Air Agency	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
NWCAA	743.6	18.0	128.1	84.5	30.0	27.6	30.0
ORCAA	784.6	18.8	124.9	82.1	29.8	27.4	29.8
PSCAA	7,285.2	300.0	1,223.9	336.7	379.0	348.8	378.7
Total	**8,813.4**	**336.7**	**1,476.8**	**503.3**	**438.8**	**403.8**	**438.5**

Table 4.14 presents the 2005 harbor craft greenhouse gas emissions divided among the regional clean air agency regions in tons per year.

Table 4.14: Puget Sound 2005 Harbor Craft Greenhouse Gas Emissions by Clean Air Agency Region, tpy

				CO_2 Equivalents			
Clean Air Agency	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
NWCAA	44,792.0	1.3	5.8	44,792.0	402.9	122.7	45,317.6
ORCAA	46,627.6	1.4	6.1	46,627.6	419.1	127.7	47,174.4
PSCAA	478,696.5	13.9	62.4	478,696.5	4,312.0	1,310.8	484,319.4
Total	**570,116.1**	**16.6**	**74.3**	**570,116.1**	**5,134.1**	**1,561.2**	**576,811.3**

The emission results for each of the 12 counties covered by this inventory and the three regional clean air agencies are summarized in Table 4.15 and Table 4.16 by county.

Table 4.15: Puget Sound 2005 Harbor Craft Criteria Pollutant Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Clallam	627.7	15.0	99.9	65.6	23.8	21.9	23.8
Island	185.9	4.5	32.0	21.1	7.5	6.9	7.5
Jefferson	0.0	0.0	0.0	0.0	0.0	0.0	0.0
King	2,953.5	130.4	501.9	112.8	158.7	146.0	158.5
Kitsap	984.5	43.5	167.3	37.6	52.9	48.7	52.8
Mason	78.5	1.9	12.5	8.2	3.0	2.7	3.0
Pierce	883.9	26.9	160.0	85.6	38.2	35.2	38.2
San Juan	185.9	4.5	32.0	21.1	7.5	6.9	7.5
Skagit	185.9	4.5	32.0	21.1	7.5	6.9	7.5
Snohomish	2,463.4	99.2	394.7	100.7	129.2	118.9	129.2
Thurston	78.5	1.9	12.5	8.2	3.0	2.7	3.0
Whatcom	185.9	4.5	32.0	21.1	7.5	6.9	7.5
Total	**8,813.4**	**336.7**	**1,476.8**	**503.3**	**438.8**	**403.8**	**438.5**

Table 4.16: Puget Sound 2005 Harbor Craft Greenhouse Gas Emissions by County, tpy

				CO_2 Equivalents			
County	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Clallam	37,302.1	1.1	4.9	37,302.1	335.3	102.1	37,739.5
Island	11,198.0	0.3	1.5	11,198.0	100.7	30.7	11,329.4
Jefferson	0.0	0.0	0.0	0.0	0.0	0.0	0.0
King	196,460.7	5.7	25.6	196,460.7	1,772.7	538.0	198,771.3
Kitsap	65,486.9	1.9	8.5	65,486.9	590.9	179.3	66,257.1
Mason	4,662.8	0.1	0.6	4,662.8	41.9	12.8	4,717.4
Pierce	55,648.5	1.6	7.3	55,648.5	500.8	152.3	56,301.5
San Juan	11,198.0	0.3	1.5	11,198.0	100.7	30.7	11,329.4
Skagit	11,198.0	0.3	1.5	11,198.0	100.7	30.7	11,329.4
Snohomish	161,100.5	4.7	21.0	161,100.5	1,447.7	441.2	162,989.4
Thurston	4,662.8	0.1	0.6	4,662.8	41.9	12.8	4,717.4
Whatcom	11,198.0	0.3	1.5	11,198.0	100.7	30.7	11,329.4
Total	**570,116.1**	**16.6**	**74.3**	**570,116.1**	**5,134.1**	**1,561.2**	**576,811.3**

4.8 Tank Barges

Tank barges were not included with the commercial harbor craft vessels because they are not self-propelled vessels. Tank barges, like other barges used in the harbor, do not have propulsion engines and are towed by tugboats. Tank barges haul liquid cargo, such as petroleum liquids, in holding tanks inside the barge's hull. They are different from other barges, such as flat barges, in that they have auxiliary engines used at berth to unload its cargo. The auxiliary engines are not used during transit. The engine emissions for the tugboats that tow these barges are part of the inventory.

Tank barge data was collected from the tugboat companies that were contacted for the harbor and ocean tugs. The tank barge count, shown in Table 4.17, is not a complete number of barges used in Puget Sound in 2005. Tank barges belonging to companies not included in the inventory and/or those that may have a home base outside of Puget Sound are not included in the count. In addition, information to allow for spatial allocation by county was not provided. Table 4.18 shows engine power and activity hours for the tank barges.

Table 4.17: Puget Sound 2005 Tank Barge Count and Auxiliary Engine Model Year

	Vessel	Engine Count		Model year		
	Count	**Total**	**Avg/Vessel**	**Range**		**Average**
Tank Barge	26	81	3	1970	2004	1987

Table 4.18: Puget Sound 2005 Tank Barge Auxiliary Engine Horsepower and Activity Hours

	Horsepower			Annual Operating Hours		
	Range		**Average**	**Range**		**Average**
Tank Barge	40	353	188	0	3000	455

The same emissions methodology used for the commercial harbor craft was used to estimate the tank barge emissions, presented in Table 4.19 for criteria pollutants, and Table 4.20 for greenhouse gases. The hours for 2005 reflect activity hours for auxiliary engine used while at berth to unload and therefore the emissions reflect this. The emissions related to tank barges are not included in the emissions inventory roll-up. Emissions related to cleaning barge holds are not included and are outside the scope of the study.

Relative to the criteria pollutant emissions values, the reader is advised that PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together.

Table 4.19: Puget Sound 2005 Tank Barge Criteria Pollutant Emissions, tpy

Vessel Type	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Tank barge	23.7	0.6	3.6	3.1	1.0	0.9	1.0

Table 4.20: Puget Sound 2005 Tank Barge Greenhouse Gas Emissions, tpy

				CO_2 Equivalents			
Vessel Type	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Tank barge	1,634.6	0.05	0.2	1,634.6	14.7	4.5	1,653.7

4.9 Recreational Vessels

In the counties in and surrounding Puget Sound, there are roughly 200,000 registered recreational vessels. The State of Washington requires registration of dingies, kayaks, row boats and canoes that may not be powered by engines. Also, state registration does not necessarily mean that a vessel is moored at a marina; there are numerous small power and sailboats that are parked in backyards or in dry moorage rather than a marina slip. Recreational vessels with a motor (i.e., sailboats with motor and motorboats) are included in the inventory. The State of Washington requires the registration of dinghies unless they are used strictly as tenders and they are excluded from this study. Personal water craft (i.e., jet skis) and non-motorboats (i.e., kayaks, canoes) are excluded.

This study includes approximately 24,300 recreational vessels that use the public port-owned and privately owned marinas within Puget Sound, and this section presents the emissions for those vessels only. The vessel count for the marinas was compiled from data collected from the marinas and by using the Washington Ports list of 2005 Recreational Boating Facilities in Washington State.[91] A number of recreational vessels use mooring balls or lie at anchor; mooring balls at privately owned marinas were included when information was available.

In most of Puget Sound, occupancy rates at marinas are above 93% throughout the year. Transient moorage peaks during the months of May through September. The most typical uses for the motorboats are fishing, cruising, swimming, and water skiing.

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[91] Washington Ports Marina Committee, *Recreational Boating Facilities in Washington State,* 2005.

The marinas listed in Table 4.21 are included in the study and are a list of the public marinas associated with public port authorities. For purposes of calculating emissions, slip count was considered to be the same as vessel count, although in actuality a slip may contain more than one vessel and slips are sometimes unoccupied.

Table 4.21: Public Marinas Located in Puget Sound Counties

Marina	County	Associated Port	Vessel Count
John Wayne Marina	Clallam	Port Angeles	280
Port Angeles Boat Haven	Clallam	Port Angeles	520
Coupeville Wharf	Island	Port of Coupeville	340
Point Hudson	Jefferson	Port of Port Townsend	45
Boat Haven	Jefferson	Port of Port Townsend	475
Herb Beck Marina	Jefferson	Port of Port Townsend	50
Fishermen's Terminal	King	Port of Seattle	100
Harbor Island	King	Port of Seattle	80
Shilshole Bay Marina	King	Port of Seattle	1,576
Bell Harbor Marina	King	Port of Seattle	80
Bremerton	Kitsap	Port of Bremerton	45
Port Orchard	Kitsap	Port of Bremerton	375
Port of Brownsville	Kitsap	Port of Brownsville	335
Keyport Marina	Kitsap	Port of Keyport	28
Cove Marina	Kitsap	Port of Kingston	300
Poulsbo Marina	Kitsap	Port of Poulsbo	400
Shelton Marina	Mason	Port of Shelton	50
City Marina	Pierce	Port of Tacoma	70
Friday Harbor	San Juan	Port of Friday Harbor	500
Cap Sante Boat Haven	Skagit	Port of Anacortes	1,000
La Conner Marina	Skagit	Port of Skagit County	460
Everett Marina	Snohomish	Port Everett	2,050
Edmonds Marina	Snohomish	Port of Edmonds	292
Swantown	Thurston	Port of Olympia	700
Blaine Harbor	Whatcom	Port of Bellingham	629
Squalicum	Whatcom	Port of Bellingham	1,415
			12,195

Table 4.22 lists the marinas owned by private and other non-port public entities included in this study. The vessel count included permanent slips, transient slips, moorage balls, and transient dock space. The dock space was converted from linear feet to number of vessels by dividing by 15 feet, an average length for recreational vessels in the area.

Table 4.22: Private Marinas and Other Non-Port Public Entities in Puget Sound

Marina	Location	County	Total Vessel Count
La Push Marina	La Push	Clallam	92
Port of Neah Bay	Neah Bay	Clallam	303
City of Langley Boat Harbor	Langley	Island	67
Deception Pass Marina	Oak Harbor	Island	70
Oak Harbor Marina	Oak Harbor	Island	404
Pleasant Harbor Marina	Brinnon	Jefferson	312
Port Hadlock Marina	Port Hadlock	Jefferson	164
Point Hudson Marina	Port Townsend	Jefferson	150
Port Ludlow Marina	Port Ludlow	Jefferson	353
City of des Moines Marina	Des Moines	King	915
Elliott Bay Marina	Seattle	King	1,200
Fairview Marina	Seattle	King	157
Harbour Village Marina	Kenmore	King	137
Sagstad Marina	Seattle	King	40
Salmon Bay Marina	Seattle	King	168
Bainbridge Island Marina	Bainbridge Is.	Kitsap	173
Harbour Marina	Bainbridge Is.	Kitsap	50
Eagle Harbor Marina	Bainbridge Is.	Kitsap	107
Liberty Bay Marina	Poulsbo	Kitsap	177
Port Orchard Yacht Club	Port Orchard	Kitsap	78
Port Washington Marina	Bremerton	Kitsap	81
Seabeck Marina	Seabeck	Kitsap	125
Winslow Wharf Marina	Bainbridge Is.	Kitsap	239
Hood Canal Marina	Union	Mason	300
Jarrell's Cove Marina	Shelton	Mason	20
Port of Allyn	Allyn	Mason	10
Arabella's Landing	Gig Harbor	Pierce	103
Breakwater Marina	Tacoma	Pierce	154
Chinook Landing Marina	Tacoma	Pierce	240
Crow's Nest Marina	Tacoma	Pierce	144
Fair Harbor Marina	Grapeview	Pierce	78
Foss Waterway Marina	Tacoma	Pierce	50

Table 4.22: Private Marinas and Other Non-Port Public Entities in Puget Sound, (cont'd)

Marina	Location	County	Total Vessel Count
Longbranch Marina	Longbranch	Pierce	86
Murphy's Landing	Gig Harbor	Pierce	85
Narrows Marina	Tacoma	Pierce	26
Peninsula Yacht Basin	Gig Harbor	Pierce	100
Point Defiance Boathouse Marina	Tacoma	Pierce	320
Totem Marina	Tacoma	Pierce	420
Blakely Island Marina	Blakely Island	San Juan	45
Cayou Quay Marina	Deer Harbor	San Juan	118
Deer Harbor Marina	Deer Harbor	San Juan	125
Islands Marina Center	Lopez Island	San Juan	100
Lopez Islander Resort & Marina	Lopez Island	San Juan	110
Quartermaster Yacht Club	Burton	San Juan	65
Roche Harbor Resort & Marina	Roche Harbor	San Juan	377
Rosario Resort Marina	Eastbound	San Juan	35
Snug Harbor Marina Resort	Friday Harbor	San Juan	72
Stuart Island	Stuart Island	San Juan	83
Sucia Island	Sucia Island	San Juan	95
West Beach Resort & Marina	Eastbound	San Juan	55
West Sound Marina	Orcas Island	San Juan	157
Anchor Cove Marina	Anacortes	Skagit	166
LaConner City Floats	LaConner	Skagit	7
Lovric's Landing	Anacortes	Skagit	87
Skyline Marina	Anacortes	Skagit	600
Shelter Bay Marina	LaConner	Skagit	330
12th St Yacht Basin	Everett	Snohomish	155
Boston Harbor Marina	Olympia	Thurston	110
Zittles Marina	Olympia	Thurston	200
Fisherman's Cove Marina	Bellingham	Whatcom	58
Point Roberts Marina	Point Roberts	Whatcom	1,048
Semiahmoo Marina	Blaine	Whatcom	296
			12,192

EPA's NONROAD model was used to estimate recreational vessel emissions for outboard gasoline engines, inboard gasoline engines and inboard diesel engines. Average horsepower, listed in Table 4.23, was used for each engine type based on interviews and literature on recreational vessels. Evaporative emissions from the gasoline engines are included in the emissions estimates for the recreational vessels.

Table 4.23: Puget Sound 2005 Recreational Vessel -Average Horsepower by Vessel Type

Vessel Type	Fuel	Power (hp)
Vessel outboard engines, runabouts	Gasoline	40
Vessel outboard engines, cabin boats	Gasoline	150
Vessel inboard engines	Gasoline	70
Vessel inboard engines	Diesel	400
Sailboat auxiliary outboard engines	Gasoline	6
Sailboat auxiliary inboard engines	Diesel	34

Table 4.24 presents the total 2005 recreational vessel emissions by county in Puget Sound in tons per year. These emissions include vessels utilizing both port-owned marinas and marinas owned by private and other non-port public entities.

Table 4.24: Puget Sound 2005 Recreational Vessel Criteria Pollutant Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Clallam	35.9	148.3	753.6	1.1	2.7	2.5	0.3
Island	28.7	118.6	602.9	0.9	2.2	2.0	0.2
Jefferson	28.7	118.6	602.9	0.9	2.2	2.0	0.2
King	129.2	533.9	2,713.0	4.0	9.8	9.1	0.9
Kitsap	86.1	355.9	1,808.7	2.7	6.5	6.0	0.6
Mason	14.4	59.3	301.4	0.4	1.1	1.0	0.1
Pierce	57.4	237.3	1,205.8	1.8	4.4	4.0	0.4
San Juan	57.4	296.6	1,507.2	2.2	5.4	5.0	0.5
Skagit	79.0	326.3	1,657.9	2.5	6.0	5.5	0.6
Snohomish	71.8	296.6	1,507.2	2.2	5.4	5.0	0.5
Thurston	28.7	118.6	602.9	0.9	2.2	2.0	0.2
Whatcom	100.5	415.2	2,110.1	3.1	7.6	7.0	0.7
Total	**717.9**	**3,025.4**	**15,373.5**	**22.8**	**55.5**	**51.3**	**5.2**

Table 4.25 presents the 2005 recreational vessels greenhouse gas emissions by county in Puget Sound in tons per year. These emissions include both port-owned marinas and marinas owned by private and other non-port public entities.

Table 4.25: Puget Sound 2005 Recreational Vessels Greenhouse Gas Emissions by County, tpy

				CO_2 Equivalents			
County	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
Clallam	5,509.4	0.1	0.3	5,509.4	43.2	6.6	5,559.2
Island	4,407.5	0.1	0.3	4,407.5	34.6	5.3	4,447.4
Jefferson	4,407.5	0.1	0.3	4,407.5	34.6	5.3	4,447.4
King	19,833.7	0.5	1.1	19,833.7	155.6	23.9	20,013.2
Kitsap	13,222.5	0.3	0.8	13,222.5	103.8	15.9	13,342.1
Mason	2,203.7	0.1	0.1	2,203.7	17.3	2.7	2,223.7
Pierce	8,815.0	0.2	0.5	8,815.0	69.2	10.6	8,894.7
San Juan	8,815.0	0.2	0.5	8,815.0	69.2	10.6	8,894.7
Skagit	12,120.6	0.3	0.7	12,120.6	95.1	14.6	12,230.3
Snohomish	11,018.7	0.3	0.6	11,018.7	86.5	13.3	11,118.4
Thurston	4,407.5	0.1	0.3	4,407.5	34.6	5.3	4,447.4
Whatcom	15,426.2	0.4	0.9	15,426.2	121.0	18.6	15,565.8
Total	**110,187.1**	**2.8**	**6.3**	**110,187.1**	**864.6**	**132.5**	**111,184.3**

Table 4.26 presents the 2005 recreational vessel emissions for only port-owned marinas in Puget Sound in tons per year. These values are included in the total recreational vessel emissions reported in Tables 4.18 and 4.19, but are listed separately here for the benefit of port authorities that are interested in emissions for a marina associated with their port.

Table 4.26: Puget Sound 2005 Recreational Vessel Criteria Pollutant Emissions by Public Marinas Associated with a Port, tpy

Marina	Associated Port	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
John Wayne Marina	Port Angeles	8.0	33.0	167.5	0.1	0.6	0.6	0.1
Port Angeles Boat Haven	Port Angeles	14.8	61.2	311.1	0.2	1.1	1.0	0.1
Everett Marina	Port Everett	62.7	259.0	1,316.3	1.0	4.8	4.4	0.4
Cap Sante Boat Haven	Port of Anacortes	28.5	117.7	598.3	0.4	2.2	2.0	0.2
Blaine	Port of Bellingham	17.9	74.1	376.4	0.3	1.4	1.3	0.1
Squalicum	Port of Bellingham	39.2	162.1	823.9	0.6	3.0	2.7	0.3
Bremerton	Port of Bremerton	14.2	58.9	299.2	0.2	1.1	1.0	0.1
Port Orchard	Port of Bremerton	4.8	20.0	101.7	0.1	0.4	0.3	0.03
Port of Brownsville	Port of Brownsville	2.7	11.3	57.4	0.04	0.2	0.2	0.02
Coupeville Wharf	Port of Coupeville	9.7	40.0	203.4	0.2	0.7	0.7	0.1
Edmonds Marina	Port of Edmonds	22.8	94.2	478.7	0.4	1.7	1.6	0.2
Friday Harbor	Port of Friday Harl	11.0	45.3	230.4	0.2	0.8	0.8	0.1
Keyport Marina	Port of Keyport	0.8	3.3	16.8	0.01	0.1	0.1	0.01
Cove Marina	Port of Kingston	7.8	32.4	164.5	0.1	0.6	0.5	0.1
Manchester	Port of Manchester	14.8	61.2	311.1	0.2	1.1	1.0	0.1
Swanton	Port of Olympia	4.3	17.7	89.8	0.1	0.3	0.3	0.03
Point Hudson	Port of Townsend	1.3	5.3	26.9	0.02	0.1	0.1	0.01
Boat Haven	Port of Townsend	11.4	47.1	239.3	0.2	0.9	0.8	0.1
Quilcene	Port of Townsend	1.4	5.9	29.9	0.02	0.1	0.1	0.01
Poulsbo Marina	Port of Poulsbo	11.4	47.1	239.3	0.2	0.9	0.8	0.1
Fishermen's Terminal	Port of Seattle	4.3	17.7	89.8	0.1	0.3	0.3	0.03
Harbor Island	Port of Seattle	2.3	9.4	47.9	0.04	0.2	0.2	0.02
Shilshole Bay Marina	Port of Seattle	42.7	176.6	897.5	0.7	3.2	3.0	0.3
Bell Harbor Marina	Port of Seattle	1.1	4.7	23.9	0.02	0.1	0.1	0.01
Shelton Marina	Port of Shelton	1.4	5.9	29.9	0.02	0.1	0.1	0.01
La Conner Marina	Port of Skagit	15.4	63.6	323.1	0.2	1.2	1.1	0.1
City Marina	Port of Tacoma	2.0	8.2	41.9	0.03	0.2	0.1	0.01
Total		**358.9**	**1,483.0**	**7,536.1**	**5.7**	**27.2**	**25.2**	**2.5**

Table 4.27 presents the 2005 recreational vessels greenhouse gas emissions by public marinas associated with a port authority in Puget Sound in tons per year.

Table 4.27: Puget Sound 2005 Recreational Vessels Greenhouse Gas Emissions by Public Marinas Associated with a Port, tpy

					CO_2 Equivalents			
Marina	**Associated Port**	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
John Wayne Marina	Port Angeles	1,224.8	0.03	0.1	1,224.8	9.6	1.5	1,235.9
Port Angeles Boat Haven	Port Angeles	2,274.6	0.1	0.1	2,274.6	17.8	2.7	2,295.2
Everett Marina	Port Everett	9,623.3	0.2	0.6	9,623.3	75.5	11.6	9,710.4
Cap Sante Boat Haven	Port of Anacortes	4,374.2	0.1	0.3	4,374.2	34.3	5.3	4,413.8
Blaine	Port of Bellingham	2,751.4	0.1	0.2	2,751.4	21.6	3.3	2,776.3
Squalicum	Port of Bellingham	6,023.3	0.2	0.3	6,023.3	47.3	7.2	6,077.8
Bremerton	Port of Bremerton	2,187.1	0.1	0.1	2,187.1	17.2	2.6	2,206.9
Port Orchard	Port of Bremerton	743.6	0.02	0.04	743.6	5.8	0.9	750.4
Port of Brownsville	Port of Brownsville	419.9	0.01	0.02	419.9	3.3	0.5	423.7
Coupeville Wharf	Port of Coupeville	1,487.2	0.04	0.1	1,487.2	11.7	1.8	1,500.7
Edmonds Marina	Port of Edmonds	3,499.4	0.1	0.2	3,499.4	27.5	4.2	3,531.1
Friday Harbor	Port of Friday Harb	1,684.1	0.04	0.1	1,684.1	13.2	2.0	1,699.3
Keyport Marina	Port of Keyport	122.5	0.003	0.007	122.5	1.0	0.1	123.6
Cove Marina	Port of Kingston	1,202.9	0.03	0.1	1,202.9	9.4	1.4	1,213.8
Manchester	Port of Manchester	2,274.6	0.1	0.1	2,274.6	17.8	2.7	2,295.2
Swanton	Port of Olympia	656.1	0.02	0.04	656.1	5.1	0.8	662.1
Point Hudson	Port of Townsend	196.8	0.005	0.01	196.8	1.5	0.2	198.6
Boat Haven	Port of Townsend	1,749.7	0.04	0.1	1,749.7	13.7	2.1	1,765.5
Quilcene	Port of Townsend	218.7	0.01	0.01	218.7	1.7	0.3	220.7
Poulsbo Marina	Port of Poulsbo	1,749.7	0.0	0.1	1,749.7	13.7	2.1	1,765.5
Fishermen's Terminal	Port of Seattle	656.1	0.02	0.04	656.1	5.1	0.8	662.1
Harbor Island	Port of Seattle	349.9	0.01	0.02	349.9	2.7	0.4	353.1
Shilshole Bay Marina	Port of Seattle	6,561.4	0.2	0.4	6,561.4	51.5	7.9	6,620.7
Bell Harbor Marina	Port of Seattle	175.0	0.004	0.01	175.0	1.4	0.2	176.6
Shelton Marina	Port of Shelton	218.7	0.01	0.01	218.7	1.7	0.3	220.7
La Conner Marina	Port of Skagit	2,362.1	0.1	0.1	2,362.1	18.5	2.8	2,383.5
City Marina	Port of Tacoma	306.2	0.01	0.02	306.2	2.4	0.4	309.0
Total		**55,093.6**	**1.4**	**3.2**	**55,093.6**	**432.3**	**66.3**	**55,592.1**

4.10 Emissions Control Measure Benefits

In 2005, over 90% of the harbor craft in Puget Sound used EPA offroad diesel fuel. The other vessels inventoried used another diesel fuel, other than the offroad diesel fuel and emission benefits were estimated for those vessels. The emission control benefits due to the vessels using an alternative fuel instead of the standard offroad diesel are presented in Tables 4.28 and 4.29.

Table 4.28: Puget Sound 2005 Harbor Craft Criteria Pollutant Emission Benefits, tpy

	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Emissions as offroad diesel fuel only	8,810.2	337.0	1,478.1	1,074.7	481.6	443.1	481.3
Emissions as calculated	8,813.4	336.7	1,476.8	503.3	438.8	403.7	438.5
Emission reduction (or increase)	-3.2	0.3	1.3	571.4	42.8	39.4	42.8
Percent reduced	-0.04%	0.1%	0.1%	53%	9%	9%	9%

In 2005, sulfur dioxide was significantly reduced by 53% by the use of lower sulfur fuel, such as onroad diesel and ULSD for the Washington State Ferries vessels. In 2005, a 9% emission reduction for particulate matter emissions was also estimated for the 7% of vessels using fuels other than the offroad diesel fuel. There was a slight increase in NO_x emissions due to the use of biodiesel, which may increase NO_x emissions while lowering other pollutants, such as VOC, CO, and PM.

Table 4.29: Puget Sound 2005 Harbor Craft Greenhouse Gas Emission Control Benefits, tpy

				CO_2 Equivalents			
	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Emissions as offroad diesel fuel only	570,169.8	16.5	74.3	570,169.8	5,124.6	1,561.2	576,855.6
Emissions as calculated	570,116.1	16.5	74.3	570,116.1	5,124.6	1,561.2	576,801.9
Emission reduction (or increase)							53.8
Percent reduced							0.01%

No emission control measures were identified for recreational vessels or tank barges.

4.11 Strengths, Limitations, and Recommendations

Profiles were developed by vessel type for engine model year, horsepower, and activity hours and were used as defaults in the database input data file for those vessels for which specific data was unavailable. For vessel types that did not have an average value for a given parameter, the average for all harbor craft in the Puget Sound study area was used. For excursion vessels, the auxiliary engine model year was not available for 67% of the vessels. Since the model year average for most vessels in Puget Sound was earlier than the year 1999 (i.e., Tier 0 for pre-1999 model year), it was assumed that excursion vessels had Tier 0 engines. Auxiliary engine horsepower was not available for the majority (87%) of commercial fishing vessels. Information received from approximately 45 commercial fishing vessels was used to assign a default horsepower to the auxiliary engines for which specific data was not available.

In the absence of specific information, fuel correction factors for the use of biodiesel in harbor craft were based on data related to heavy-duty highway vehicles, and may not closely reflect use in offroad engines. Testing of emissions from biodiesel use in harbor craft to determine emission reductions to improve the pollutant fuel correction factors is recommended.

In the counties in and surrounding the Puget Sound, there are roughly 200,000 registered recreational vessels in the study area. These registered recreational vessels may be stored in garages, mooring buoys or private docks instead of marinas. There are approximately 24,300 recreational vessels that use the public port-owned and privately owned marinas within the Puget Sound, and this section presents the emissions for those vessels only.

SECTION 5 CARGO HANDLING EQUIPMENT

Section 5 provides an overview of the cargo handling and related equipment found at Puget Sound ports. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

5.1 Source Description

Cargo handling equipment includes equipment used to move cargo (containers, general cargo, and bulk cargo) to and from marine vessels, railcars, and onroad trucks. This includes cranes, straddle carriers, yard tractors, top and side handlers, forklifts, and other related equipment found in smaller quantities such as various loaders, sweepers, backhoes, aerial lifts, pallet jacks, and generator sets. The equipment typically only operates at marine terminals or at rail yards and is assumed not to operate on public roadways or land. This inventory includes cargo handling equipment of 25 hp or greater using diesel, gasoline, or alternative fuels, such as propane. Although the inventory's primary focus is diesel equipment, the total count includes zero-emitting electrical equipment. Emissions from cargo handling equipment associated with rail yards are included with the rail locomotive emissions presented in Section 6.

As shown in Tables 5.1 and 5.2 and Figures 5.1 and 5.2, a total of 1,145 pieces of equipment were inventoried, including 120 electric-powered pieces. These units are included in the equipment counts, but not in the emissions estimates since they do not have exhaust. Over one-third of the equipment was yard tractors (35%) and nearly 30% was forklifts. Each port's equipment is summarized in detail in Section 5.4.

Table 5.1: Puget Sound 2005 Cargo Handling Equipment Distribution by Equipment Type

Equipment	Count
Yard tractor	398
Forklift	322
Container handler	126
Straddle carrier	79
Crane	74
Generator set	41
Pallet jack	21
Log handler	19
Compressor	16
Wheelloader	11
RTG crane	10
Other	28
Total	**1,145**

Figure 5.1: Puget Sound 2005 Cargo Handling Equipment Distribution by Type

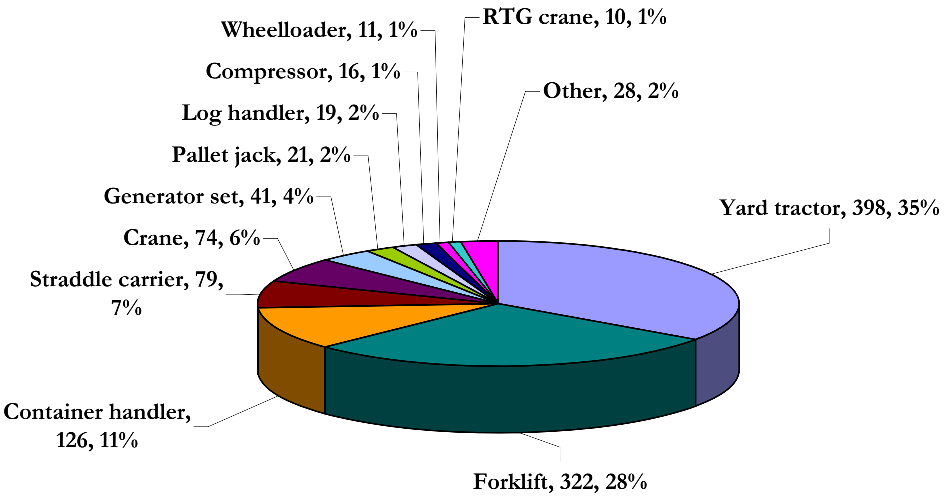
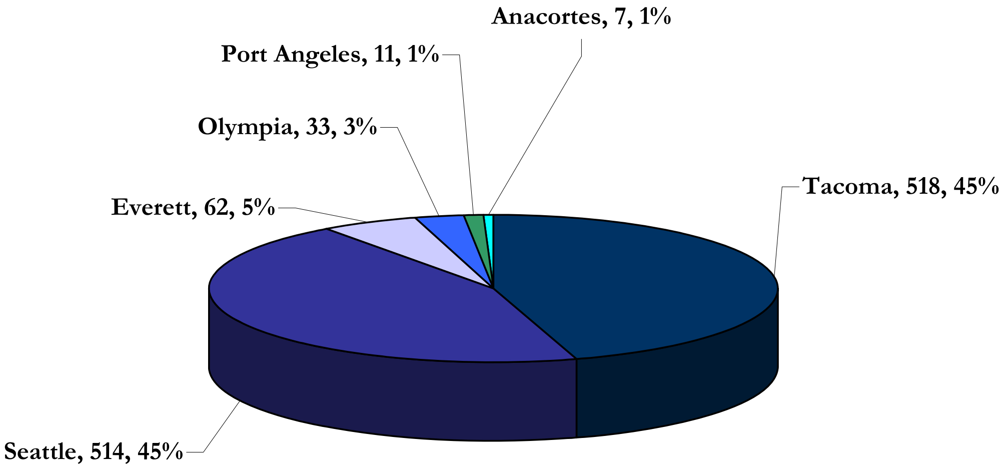


Table 5.2: Puget Sound 2005 Cargo Handling Equipment Distribution by Port

Port	Petroleum Fueled	Electric	Total
Tacoma	464	54	518
Seattle	454	60	514
Everett	56	6	62
Olympia	33	0	33
Port Angeles	11	0	11
Anacortes	7	0	7
Total	**1,025**	**120**	**1,145**

Figure 5.2: Puget Sound 2005 Cargo Handling Equipment Distribution by Port



5.1.1 Crane

The crane category encompasses various types of cranes, such as overhead, gantry, stacking, and container cranes found at the ports. Crane photos are courtesy of the Port of Tacoma's Website Photo Gallery.

The container crane, shown in Figure 5.3 and otherwise known as dockside, ship to shore, or quayside crane, is electrical and is used mainly at container terminals to load/unload the vessels.

Figure 5.3: Container Crane

The rubber tired gantry (RTG) crane, shown in Figure 5.4 may also be known as a transtainer. The diesel-powered RTG crane moves containers to and from the container stacks.

Figure 5.4: Rubber Tired Gantry Crane

5.1.2 Forklift

Forklifts or lift trucks, shown in Figure 5.5, were the second most common piece of equipment found at the ports, after the yard tractor. They vary in capacity and engine size and can have diesel, gasoline or propane engines. Electric forklifts were also inventoried.

Figure 5.5: Forklift

5.1.3 Side Handler

Side picks, side handlers, side loaders, and empty container handlers, shown in Figure 5.6[92], describe the cargo handling equipment that typically move and stack the empty containers at a terminal.

Figure 5.6: Side Handler

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[92] Photo courtesy of Don Wilson, Port of Seattle. *http://www.portseattle.org/news/imagelibrary.shtmlhttp*

5.1.4 Straddle Carrier

A straddle carrier, shown in Figure 5.7, is specialized equipment that removes the containers from delivering trucks by straddling the chassis and lifting the container using an overhead crane. The straddle carrier then drives away with the container.

Figure 5.7: Straddle Carrier

5.1.5 Top Handler

The top loaders or top handler, shown in Figure 5.8, moves, stacks and loads containers using an overhead telescopic boom. The top handler has higher horsepower and lifting capacity than the side handler.

Figure 5.8: Top Loader

5.1.6 Yard Tractor

The majority of the equipment inventoried was yard tractors, also known as terminal tractors, yard hustlers, or hostlers and shown in Figure 5.9.[93] The typical offroad yard tractor is a close relative of the onroad truck tractor chassis; however, most terminal yard tractors have an offroad engine that does not meet the EPA standards required to be registered for public roads. Some terminals may use yard tractors that are specifically purchased with onroad engines. Yard tractors are used throughout the terminal to move containers to and from the ship and to move containers within the terminal. Yard tractors are also used for intermodal rail container transfers. Equipment and emissions from intermodal rail yards are included in the rail section.

Figure 5.9: Yard Tractor

5.2 Geographical Delineation

The geographical extent for the cargo handling equipment is the marine terminals and facilities associated with the following Puget Sound ports:

- Port of Anacortes
- Port of Port Angeles
- Port of Everett
- Port of Olympia
- Port of Seattle
- Port of Tacoma

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[93] Kalmar Industries, *http://www.kalmarind.com/show.php?id=1029362.*

5.3 Data and Information Acquisition

Data was collected during in-person interviews with terminal owners, equipment operators, and others having firsthand knowledge of either equipment details or operational parameters. Additional information was requested during or after the initial interview. The collected information was compared with information acquired during the emissions inventory process for other ports in order to provide an order-of-magnitude "reasonableness check" on the quality of the data.

The data collection approach focused on equipment details and operational profiles (activity data). The data is summarized by port, and discussed in the following subsections. Some examples of equipment details that were collected include such parameters as:

- Equipment type (e.g., yard tractor)
- Rated power (primarily horsepower)
- Equipment manufacturer and model year
- Engine make, model, model year, and technology
- Type of fuel used (e.g., offroad diesel, ULSD, liquefied petroleum gas)
- Emission reduction technology (if any)

Where data was unavailable, reasonable assumptions based on similar equipment in the inventory were used. For the cargo handling equipment, values were assigned for 162 engine powers, 46 operating hours, and 50 model years. A list of the equipment inventory data provided by the terminal operators is provided in Appendix E-3. Within the appendix, the values which were assigned are in red text.

During data collection, some terminals presented data for barge generators. These are distinct from tank barges (see Section 4.8). The barge generators consist of containerized generators which are loaded onto some barges while at dock, in order to supply power. Because comprehensive data was not available, these units were not included in the emission estimates. Further consideration should be given to inclusion of this equipment, the appropriate source category designation, and the method for data collection.

5.4 Operational Profiles

This section summarizes the equipment inventoried at each port. It provides equipment characteristics such as the average, minimum and maximum engine power, model year and estimated annual operating hours for the port as a whole and also for each facility or entity within the port. Each facility has an assigned identification number to maintain confidentiality regarding terminal-specific information on count and types of equipment. The majority of the pieces of equipment have diesel engines, unless noted otherwise in the tables under equipment name. For the diesel-powered equipment, the most common fuel used is EPA offroad diesel.

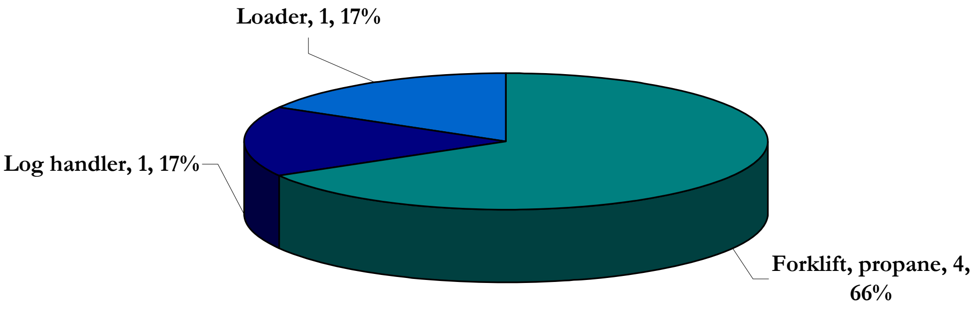
5.4.1 Port of Anacortes

The Port of Anacortes is primarily an export port that handles bulk and break-bulk cargoes such as log and petroleum coke.[94] Table 5.3 summarizes the equipment count by type, engine power, model year and estimated annual operating hours. Figure 5.9 presents the distribution of the seven pieces of equipment operated at the Port Anacortes in 2005. There were five forklifts, accounting for 72% of the equipment inventoried. The remainder of the equipment included a log handler and a loader.

Table 5.3: Port of Anacortes 2005 Cargo Handling Equipment Characteristics

		Power (horsepower)				Model Year				Annual Operating Hours			
Equipment	Count	Range			Average	Range			Average	Range			Average
Forklift, diesel	1	200	-	200	200	1982	-	1982	1982	63	-	63	63
Forklift, propane	4	50	-	200	100	1963	-	1995	1976	31	-	94	60
Log handler	1	200	-	200	200	1972	-	1972	1972	21	-	21	21
Loader	1	150	-	150	150	1991	-	1991	1991	56	-	56	56
Total	**7**												

Figure 5.10: Port of Anacortes 2005 Cargo Handling Equipment Distribution



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[94] Port of Anacortes. See: *http://www.portofanacortes.com.*

5.4.2 Port of Port Angeles

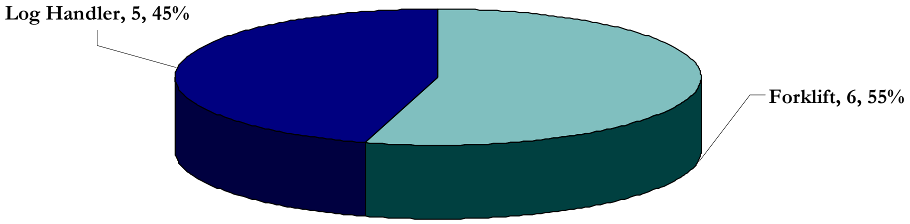
The Port of Port Angeles[95] is located 80 miles north and west of Seattle on the Strait of Juan de Fuca. The Port owns and operates four deep water marine terminals (T-1, T-3, T-5 and T-7), and is a leading forest products port. Port Angeles is the center of log handling, storage and exporting on the Olympic Peninsula. Table 5.4 summarizes the cargo handling equipment at Port of Port Angeles which includes six forklifts and five log handlers.

Table 5.4: Port of Port Angeles 2005 Cargo Handling Equipment Characteristics

		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, diesel	3	NA - NA	NA	NA - NA	NA	360 - 360	360
Forklift, propane	3	NA - NA	NA	NA - NA	NA	360 - 360	360
Log handler	5	NA - NA	NA	NA - NA	NA	480 - 480	480
Total	**11**						

Figure 5.11 presents the distribution of the 11 pieces of equipment operated at the Port of Port Angeles in 2005.

Figure 5.11: Port of Port Angeles 2005 Cargo Handling Equipment Distribution



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[95] Port of Port Angeles, *http://www.portofpa.com/*.

5.4.3 Port of Everett

The Port of Everett's primary exports are lumber and agricultural products. Primary imports are bulk and break-bulk cargos, such as alumina ore and aircraft parts. The Port operates terminals, the cold storage or chill facility, and marina operations that use cargo handling equipment. Port tenant operations include a log sorting yard, and container and general cargo operations. There were a total of 62 pieces of equipment at the Port of Everett.

Table 5.5 summarizes the equipment count by type, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Everett. Figure 5.11 presents the distribution of the 62 pieces of equipment operated at the Port Everett in 2005.

Table 5.5: Port of Everett 2005 Cargo Handling Equipment Characteristics

Equipment	Count	Power (horsepower)		Model Year		Annual Operating Hours	
		Range	Average	Range	Average	Range	Average
Backhoe	1	63 - 63	63	1988 - 1988	1988	300 - 300	300
Compressor, gasoline	1	50 - 50	50	1978 - 1978	1978	250 - 250	250
Crane, diesel	3	160 - 330	247	1968 - 2000	1987	150 - 280	193
Forklift, diesel	13	75 - 175	121	1984 - 1995	1989	32 - 354	210
Forklift, electric	6	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, gasoline	3	76 - 175	109	1968 - 1974	1970	200 - 250	NA
Forklift, propane	5	93 - 93	93	1982 - 1982	1982	300 - 300	300
Generator set	2	71 - 210	141	1992 - 2000	1996	50 - 150	100
Light tower	1	25 - 25	25	1991 - 1991	1991	300 - 300	300
Loader	3	25 - 101	76	1968 - 1968	1968	100 - 200	167
Log shovel	2	177 - 177	177	1994 - 2001	1998	1,000 - 1,500	1,250
Manlift, gas/propane	1	82 - 82	82	1998 - 1998	1998	300 - 300	300
Reachstacker	2	200 - 200	200	1995 - 1995	1995	400 - 400	400
Sweeper, diesel	1	36 - 36	36	1987 - 1987	1987	300 - 300	300
Top pick	2	200 - 200	200	1993 - 1993	1993	104 - 600	352
Truck	1	200 - 210	210	1993 - 1993	1993	600 - 600	600
Welder	1	76 - 76	76	1968 - 1968	1968	250 - 250	250
Wheelloader	8	177 - 400	300	1973 - 1991	1983	100 - 2,000	725
Yard tractor	6	175 - 175	175	1986 - 1995	1993	94 - 266	193
Total	**62**						

Figure 5.12: Port of Everett 2005 Cargo Handling Equipment Distribution

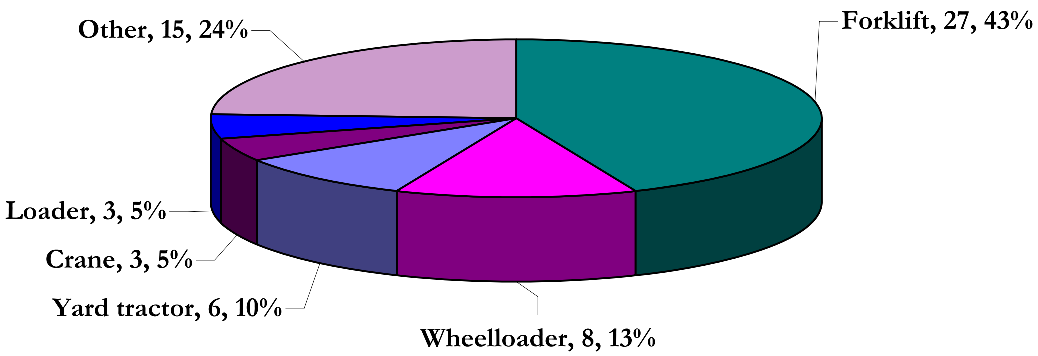


Table 5.6 summarizes by terminal, the equipment count, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Everett.

Table 5.6: Port of Everett 2005 Cargo Handling Equipment Characteristics by Terminal

PSE010		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Backhoe	1	63 - 63	63	1988 - 1988	1988	300 - 300	300
Compressor, gasoline	1	50 - 50	50	1978 - 1978	1978	250 - 250	250
Crane, diesel	2	160 - 330	245	1968 - 1992	1980	150 - 150	150
Forklift, diesel	4	85 - 175	130	1974 - 1976	1975	250 - 300	275
Forklift, electric	6	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, gasoline	3	76 - 175	109	1968 - 1974	1970	200 - 250	217
Forklift, propane	5	93 - 93	93	1982 - 1982	1982	300 - 300	300
Generator set	2	71 - 210	141	1992 - 2000	1996	50 - 150	100
Light tower	1	25 - 25	25	1991 - 1991	1991	300 - 300	300
Loader	3	25 - 101	76	1968 - 1974	1971	100 - 200	167
Manlift, gas/propane	1	82 - 82	82	1998 - 1998	1998	300 - 300	300
Sweeper, diesel	1	36 - 36	36	1987 - 1987	1987	300 - 300	300
Truck	1	210 - 210	210	1992 - 1992	1992	350 - 350	350
Welder	1	76 - 76	76	1968 - 1968	1968	250 - 250	250
Total	**32**						

PSE020		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Log shovel	2	177 - 177	177	1994 - 2001	1998	1000 - 1500	1,250
Wheelloader	8	177 - 400	300	1973 - 1991	1983	100 - 2000	725
Total	**10**						

PSE030		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, diesel	5	75 - 150	105	1984 - 1990	1985	32 - 354	167
Top pick	2	200 - 200	200	1993 - 1993	1993	104 - 600	352
Yard tractor	2	175 - 175	175	1986 - 1993	1990	94 - 266	180
Total	**9**						

PSE040		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Crane, diesel-electric	1	250 - 250	250	2000 - 2000	2000	280 - 280	280
Forklift, diesel	4	75 - 150	131	1990 - 1995	1994	200 - 200	200
Reachstacker	2	200 - 200	200	1995 - 1995	1995	400 - 400	400
Yard tractor	4	175 - 175	175	1995 - 1995	1995	200 - 200	200
Total	**11**						

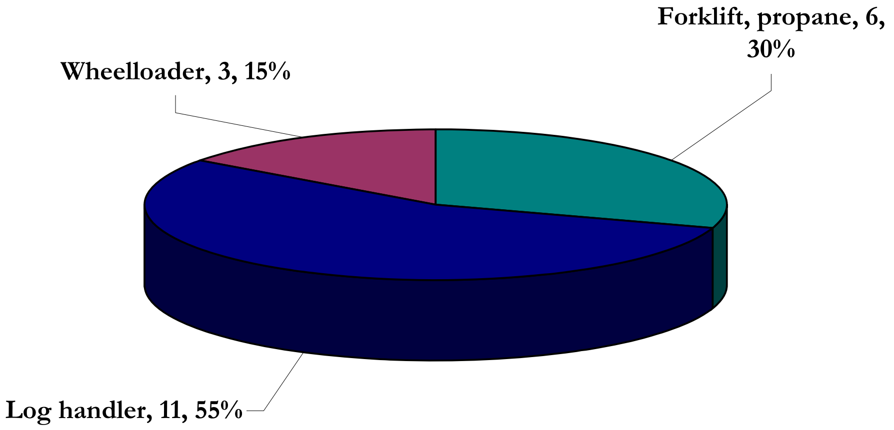
5.4.4 Port of Olympia

The Port of Olympia has a 60-acre terminal with three deepwater berths that handle break-bulk, roll-on/roll-off, forest products and containerized cargoes. Table 5.7 summarizes the equipment count by type, engine power, model year and estimated annual operating hours for the equipment inventoried. Figure 5.13 presents the distribution of the 33 pieces of equipment operated at the Port Olympia in 2005. There were 19 forklifts, accounting for 58% of the equipment inventoried. The remainder of the equipment included log handlers and loaders.

Table 5.7: Port of Olympia 2005 Cargo Handling Equipment Characteristics

Equipment	Count	Power (horsepower)		Model Year		Annual Operating Hours	
		Range	Average	Range	Average	Range	Average
Forklift, diesel	13	85 - 159	95	1975 - 2001	1993	400 - 400	400
Forklift, propane	6	49 - 116	72	1958 - 2003	1990	400 - 400	400
Log handler	11	310 - 415	373	1968 - 1990	1990	1,500 - 1,500	1,500
Wheelloader	3	160 - 197	177	1963 - 1987	1978	400 - 400	400
Total	**33**						

Figure 5.13: Port of Olympia 2005 Cargo Handling Equipment Distribution



5.4.5 Port of Seattle

The Port of Seattle's marine cargo facilities handle worldwide trade, grain exports and the cruise industry. The majority of the Port's trade is with Asia/Pacific nations along with the Alaska market. Section 1 discusses each terminal and facility at the Port of Seattle. The port-owned equipment that may be used at more than one facility is also included in the inventory.

Cargo handling equipment was found at the four container facilities:

- Terminal 5,
- Terminal 18,
- Terminal 25/28, and
- Terminal 46;

three bulk facilities:

- Terminal 115,
- Pier 86, and
- Terminal 91; and

two cruise terminals (combined for Puget Sound Maritime Air Emissions Inventory purposes):

- Terminal 30 and
- Pier 66.

Table 5.8 summarizes the equipment count by type, engine power, model year and estimated annual operating hours for equipment inventoried at Port of Seattle. Figure 5.14 presents the distribution of the 514 pieces of equipment operated at the Port Seattle in 2005. The diesel forklift category includes eight forklifts fueled with onroad diesel and ten forklifts fueled with ULSD for the entire 2005 operating year. For the last two months of the year, an additional 31 forklifts were fueled with onroad diesel and an additional eight forklifts were fueled with ULSD.

Table 5.8: Port of Seattle 2005 Cargo Handling Equipment Characteristics

		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Car loader	8	150 - 150	150	1969 - 2001	1985	500 - 500	500
Crane, electric	26	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, electric	13	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	80	85 - 350	160	1961 - 2005	1994	0 - 4,053	823
Forklift, gasoline	17	85 - 100	99	1975 - 2001	1987	1,000 - 2,000	1,941
Forklift, propane	42	85 - 125	89	1982 - 2005	1992	7 - 2,000	1,992
Generator set	33	5 - 470	130	1962 - 2005	1990	113 - 2,183	873
Manlift, propane	1	60 - 60	60	1986 - 1986	1986	113 - 113	113
Pallet jack, electric	21	NA - NA	NA	NA - NA	NA	NA - NA	NA
RTG crane	4	900 - 900	900	2005 - 2005	2005	0 - 1,100	550
Side handler	11	152 - 205	195	1993 - 2005	2001	0 - 2,112	771
Sweeper, diesel	2	50 - 50	50	1997 - 1998	1997	20 - 862	441
Top handler	68	250 - 335	282	1985 - 2005	1998	88 - 8,404	2,095
Yard tractor	188	174 - 240	188	1984 - 2005	1999	54 - 4,056	1,956
Total	**514**						

Figure 5.14: Port of Seattle 2005 Cargo Handling Equipment Distribution

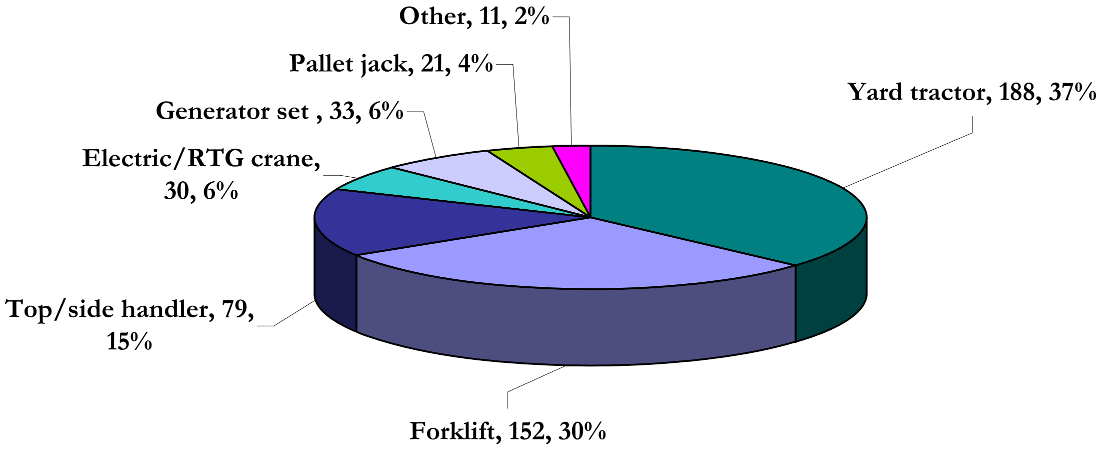


Table 5.9 summarizes by terminal, the equipment count, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Seattle.

Table 5.9: Port of Seattle 2005 Cargo Handling Equipment Characteristics by Terminal

PSS010		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	Range	Average	Range	Average	Range	Average
Carloader	8	150 - 150	150	1961 - 1989	1985	500 - 500	500
Forklift, electric	6	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	10	200 - 200	200	1961 - 1977	1973	1,160 - 4,053	2,177
Forklift, gasoline	17	85 - 100	99	1975 - 2001	1987	1,000 - 2,000	1,941
Forklift, propane	1	100 - 100	100	1994 - 1994	1994	2,000 - 2,000	2,000
Generator sets	23	110 - 470	143	1964 - 2005	1985	1,000 - 2,183	1,035
Total	**65**						

PSS020		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	Range	Average	Range	Average	Range	Average
Forklift, electric	5	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	11	85 - 150	120	1991 - 1995	1993	530 - 530	530
Forklift, propane	17	85 - 85	85	1987 - 2005	1994	530 - 530	530
Pallet jacks, electric	21	NA - NA	NA	NA - NA	NA	NA - NA	NA
Total	**54**						

PSS030		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	Range	Average	Range	Average	Range	Average
Forklift, diesel	19	120 - 350	240	1995 - 2005	1997	0 - 1,850	1,287

PSS040		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	Range	Average	Range	Average	Range	Average
Forklift, diesel	1	100 - 100	100	1995 - 1995	1995	1,000 - 1,000	1,000

PSS050		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	**Count**	Range	Average	Range	Average	Range	Average
Crane, electric	11	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	17	85 - 150	109	1982 - 2004	1999	250 - 1,800	341
RTG crane	4	900 - 900	900	2005 - 2005	2005	0 - 1,100	550
Side handler	5	205 - 205	205	2001 - 2005	2004	0 - 2,112	1,042
Top handler	31	260 - 335	291	1992 - 2005	1998	0 - 3,543	2,095
Yard tractor	69	177 - 177	177	1996 - 2005	2001	54 - 3,951	1,853
Total	**137**						

Table 5.9: Port of Seattle 2005 Cargo Handling Equipment Characteristics by Terminal, cont'd

PSS060		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Crane, electric	3	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	3	85 - 190	120	2004 - 2005	2004	250 - 1,800	767
Generator sets	10	130 - 130	130	2001 - 2001	2001	500 - 500	500
Side handler	4	205 - 205	205	1998 - 2001	2000	98 - 1,279	764
Top handler	6	330 - 355	334	1997 - 2004	2003	2,422 - 3,745	3,184
Yard tractor	21	177 - 177	177	2002 - 2004	2003	1,030 - 2,493	1,770
Total	**47**						

PSS070		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Crane, electric	6	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	8	100 - 275	124	1970 - 2004	1999	250 - 250	250
Side handler	1	152 - 152	152	1995 - 1995	1995	40 - 40	40
Top handler	18	250 - 250	250	1995 - 1995	1995	1,600 - 1,600	1,600
Yard tractor	28	174 - 240	186	1984 - 2005	1996	1,270 - 1,270	1,270
Total	**61**						

PSS080		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Crane, electric	6	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, electric	2	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	11	100 - 215	147	1988 - 2001	1996	64 - 707	263
Forklift, propane	24	85 - 125	91	1982 - 1999	1990	7 - 845	354
Manlift, propane	1	60 - 60	60	1986 - 1986	1986	113 - 113	113
Side handler	1	152 - 152	152	1993 - 1993	1993	176 - 176	176
Sweeper, diesel	2	50 - 50	50	1986 - 1987	1986	20 - 862	441
Top handler	13	225 - 330	278	1985 - 2001	1996	88 - 8,404	2,279
Yard tractor	70	174 - 215	203	1991 - 2005	1998	258 - 4,056	2,388
Total	**130**						

5.4.6 Port of Tacoma

The Port of Tacoma ranks as the fifth largest container port in North America and handles Pacific Rim Trade along with waterborne commerce between Alaska and the other states. The Port encompasses 2,400 acres of land and handles containerized cargo, automobiles, roll-on/roll-off cargoes, bulk and break-bulk cargoes. The Port and tenants own and operate the equipment, at the following facilities:

- APM Terminal
- Blair Terminal
- Husky Terminal
- Olympic Container Terminal
- Pierce County Terminal
- Temco Grain Terminal
- Terminal 7 – A/B
- Totem Ocean Trailer Express (TOTE) Terminal
- Washington United Terminal

This section includes the cargo handling equipment used at the on-dock rail and intermodal yards at the Port of Tacoma.

Table 5.10 summarizes the equipment count by type, engine power, model year and estimated annual operating hours for equipment inventoried at Port of Tacoma. In 2005, there are a total of 518 pieces of equipment at the Port.

Table 5.10: Port of Tacoma 2005 Cargo Handling Equipment Characteristics

		Power (horsepower)		Model Year		Annual Operating Hours	
Equipment	Count	Range	Average	Range	Average	Range	Average
Backhoe	2	350 - 350	350	1985 - 1998	1992	7 - 195	101
Compressor, electric	3	NA - NA	NA	NA - NA	NA	NA - NA	NA
Compressor, gasoline	6	10 - 10	10	1989 - 2001	1997	0 - 0	0
Compressor, diesel	6	10 - 10	10	1977 - 2004	1989	0 - 110	37
Crane, electric	45	NA - NA	NA	NA - NA	NA	NA - NA	NA
Empty handler	2	190 - 190	190	1995 - 1995	1995	1,877 - 2,088	1,983
Forklift, electric	5	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, gasoline	4	100 - 180	120	1966 - 1982	1975	43 - 73	54
Forklift, diesel	62	155 - 200	180	1968 - 2005	1988	0 - 3,757	380
Forklift, propane	42	50 - 100	62	1971 - 2002	1983	0 - 2,000	282
Generator	6	50 - 100	58	1982 - 2002	1994	0 - 26	5
Manlift, electric	1	NA - NA	NA	NA - NA	NA	NA - NA	NA
Manlift, gasoline	3	60 - 60	60	1984 - 1996	1991	14 - 158	65
Manlift, diesel	1	120 - 120	120	2005 - 2005	2005	231 - 231	231
Manlift, propane	2	60 - 60	60	1995 - 2000	1998	11 - 224	118
Rail pusher	1	120 - 120	120	1999 - 1999	1999	25 - 25	25
Reachstacker	11	190 - 200	195	1995 - 2003	1998	860 - 3,410	2,350
RTG crane	6	300 - 300	300	1984 - 2005	1993	18 - 1,169	692
Side pick	8	210 - 210	210	2000 - 2005	2003	72 - 1,850	1,269
Straddle carrier	79	320 - 455	404	1986 - 2005	2001	0 - 4,200	2,920
Sweeper, gasoline	1	130 - 130	130	2003 - 2003	2003	7,670 - 7,670	7,670
Sweeper, diesel	3	50 - 150	125	1994 - 2004	1999	111 - 1,332	588
Sweeper, propane	1	50 - 50	50	1984 - 1984	2004	84 - 84	84
Top loader	14	300 - 300	300	1984 - 2004	1999	250 - 2,821	1,683
Yard tractor	204	110 - 380	211	1968 - 2005	1998	0 - 4,353	1,958
Total	**518**						

Figure 5.15: Port of Tacoma 2005 Cargo Handling Equipment Distribution

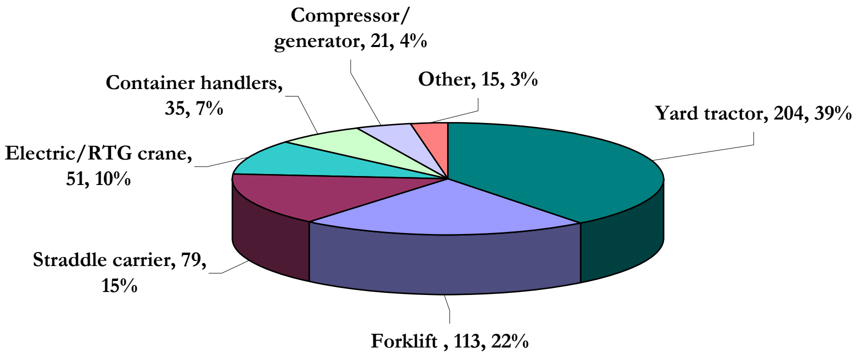


Table 5.11 summarizes by terminal, the equipment count, engine power, model year and estimated annual operating hours for equipment inventoried at the Port of Tacoma.

Table 5.11: Port of Tacoma 2005 Cargo Handling Equipment Characteristics by Terminal

PST010		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Backhoe	2	350 - 350	350	1985 - 1998	1992	7 - 195	101
Compressor, electric	3	NA - NA	NA	NA - NA	NA	NA - NA	NA
Compressor, gasoline	6	10 - 10	10	1989 - 2001	1997	0 - 0	0
Compressor, diesel	6	10 - 10	10	1977 - 2004	1989	0 - 110	37
Crane, electric	38	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	31	200 - 200	200	1968 - 2004	1983	0 - 3,757	265
Forklift, propane	32	60 - 80	75	1971 - 1989	1981	0 - 538	116
Generator	6	50 - 100	58	1982 - 2002	1994	0 - 26	5
Manlift, electric	1	NA - NA	NA	NA - NA	NA	NA - NA	NA
Manlift, gasoline	3	60 - 60	60	1984 - 1996	1991	14 - 158	65
Manlift, diesel	1	120 - 120	120	2005 - 2005	2005	231 - 231	231
Straddle carrier	30	336 370	350	1986 2004	1996	0 1,644	833
Sweeper, gasoline	1	130 - 130	130	2003 - 2003	2003	7,670 - 7,670	7,670
Sweeper, diesel	2	50 - 125	88	1994 - 2004	1999	111 - 321	216
Sweeper, propane	1	50 - 50	50	1984 - 1984	2004	84 - 84	84
Yard tractor	3	110 - 110	110	1987 - 2003	1994	93 - 575	256
Total	**166**						

The straddle carriers listed below have two engines and the horsepower shown is for the total combined horsepower.

PST020		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Crane, electric	7	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	8	155 - 180	170	2005 - 2005	2005	800 - 900	850
Side pick	5	210 - 210	210	2005 - 2005	2005	1,850 - 1,850	1,850
Straddle carrier	49	455 - 455	455	2004 - 2005	2004	4,200 - 4,200	4,200
Yard tractor	3	180 - 180	180	2005 - 2005	2005	1,500 - 1,500	1,500
Total	**72**						

PST030		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, diesel	4	100 - 100	100	1982 - 2004	1996	200 - 200	200
RTG crane	6	300 - 300	300	1984 - 2005	1992	18 - 1,169	692
Top loader	8	300 - 300	300	1984 - 2004	1997	250 - 2,821	2,080
Yard tractor	31	174 - 174	174	1985 - 2005	1999	46 - 2,250	1,395
Total	**49**						

Table 5.11: Port of Tacoma 2005 Cargo Handling Equipment Characteristics by Terminal, cont'd

PST040		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Yard tractor	33	174 - 174	174	1983 - 2000	1998	240 - 2,148	1,664

PST050		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, diesel	9	120 - 215	141	1975 - 2005	1997	44 - 524	267
Manlift, diesel	1	120 - 120	120	2005 - 2005	2005	231 - 231	231
Reachstacker	5	200 - 200	200	1998 - 2003	2000	860 - 2,141	1,728
Sweeper, diesel	1	150 - 150	150	2000 - 2000	2000	1,332 - 1,332	1,332
Top loader	5	300 - 300	300	2000 - 2004	2002	427 - 2,268	1,070
Yard tractor	60	174 - 245	208	1983 - 2005	2002	0 - 2,826	1,784
Total	**81**						

PST055		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, electric	5	NA - NA	NA	NA - NA	NA	NA - NA	NA
Forklift, diesel	5	50 - 100	75	1975 - 1988	1984	250 - 2,000	1,450
Forklift, propane	9	50 - 50	50	1976 - 1990	1987	500 - 2,000	861
Reachstacker	1	200 - 200	200	2000 - 2000	2000	200 - 200	200
Yard tractor	39	174 - 380	306	1968 - 2000	1995	2,500 - 2,500	2,500
Total	**59**						

PST060		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Empty handler	2	190 - 190	190	1995 - 1995	1995	1,877 - 2,088	1,983
Forklift, diesel	2	130 - 130	130	1995 - 1995	1995	69 - 124	97
Reachstacker	5	190 - 190	190	1995 - 1995	1995	2,743 - 3,410	3,042
Yard tractor	32	190 - 190	190	1995 - 1995	1995	424 - 3,721	2,815
Total	**41**						

Table 5.11: Port of Tacoma 2005 Cargo Handling Equipment Characteristics by Terminal, cont'd

PST070		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, gasoline	4	100 - 180	120	1966 - 1982	1974	48 - 73	54
Forklift, diesel	3	100 - 100	100	1967 - 1998	1986	83 - 700	334
Manlift, propane	1	60 - 60	60	1995 - 1995	1995	11 - 11	11
Rail pusher	1	120 - 120	120	1999 - 1999	1999	25 - 25	25
Side pick	3	210 - 210	210	2000 - 2000	2000	72 - 492	302
Top loader	1	300 - 300	300	1995 - 1995	1995	1,575 - 1,575	1,575
Yard tractor	3	174 - 174	174	1984 1984	1984	297 - 660	440
Total	**16**						

PST080		**Power (horsepower)**		**Model Year**		**Annual Operating Hours**	
Equipment	**Count**	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Forklift, propane	1	100 - 100	100	2002 - 2002	2002	660 - 660	660

5.5 Emission Reduction Technologies Identified

For cargo handling equipment operated at the Puget Sound ports in 2005, the identified control measures included the use of electric equipment, diesel oxidation catalyst retrofits, lower sulfur content diesel fuel, and onroad engines in the place of offroad engines. Details for the ports and equipment using emission control measures are provided in Sections 5.6.1 and 5.8

For 2006 and beyond, some ports have expressed their intentions to implement additional emission control measures, such as wider use of retrofits, replacement of older equipment with newer equipment, and increased use of alternative fuels and cleaner diesel fuel.

5.6 Methodology

Cargo handling equipment emissions were estimated using the NONROAD model, a tool developed by EPA to estimate fleet emissions of offroad equipment. As an overview, the NONROAD model estimates emissions for a population of equipment as being:

Equation 5.1

$$E_{MY} = EF \text{ x } HP \text{ x } LF \text{ x } A$$

Where:

E_{MY} = emissions from a given model year of equipment
EF = emission factor
HP = maximum rated horsepower
LF = load factor
A = Activity (hours of use per year)

For SO_2 emissions calculations, highway diesel was estimated at 310 parts ppm sulfur[96]; off-highway diesel (also known as nonroad or offroad diesel) was estimated at 2,284 ppm sulfur.[97]

Since NONROAD outputs emissions for a limited set of pollutants, post-processing is required to develop emission estimates for VOC, $PM_{2.5}$, DPM, CH_4, and N_2O. VOC correction factors were applied based on fuel type.[98] For purposes of this analysis, total particulate matter is set equal to PM_{10}, and $PM_{2.5}$ is calculated as 97% of PM_{10} for diesel fueled equipment, and 100% of PM_{10} for other equipment.[99] Diesel particulate matter includes the emissions from those vehicles fueled by diesel fuel only, as opposed to those fueled by propane or gasoline.

Equipment with zero hours in 2005, due to new purchases or lack of use, as well as the electric equipment, are included in the inventory count, but do not have emissions associated with them.

Post-processing factors were applied to NONROAD emissions for emission control measures and nitrous oxide and methane, as discussed below.

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[96] WADOE 2006b.
[97] EPA NONROAD Guidance 2004.
[98] EPA 2005
[99] EPA 2003.

5.6.1 Emission Control Factors

Table 5.12 summarizes the emission control measure pollutant reductions for the various emission control measures implemented at the major Puget Sound ports. For onroad engines, CARB test data of onroad engines on yard tractors was used as the source.[100] The diesel oxidation catalyst (DOC) reductions are based on EPA verified technology factors that indicate that a DOC retrofit may reduce PM by 20 – 26%, CO by 38 – 41% and hydrocarbon by 46 – 66%.[101] CARB verified technology data stipulates a minimum 25% PM reduction for DOCs.[102] For purposes of this analysis, conservative factors based on the EPA ranges were applied.

The emission control factors related to fuel changes are based on comparisons of similar equipment modeled using NONROAD with the various fuel types, calculating the differences, and taking average values.

Table 5.13 presents the emission control measure pollutant reductions as emission control factors that were used in the emissions calculations.

Table 5.12: Emission Control Efficiencies for Cargo Handling Equipment Emission Control Measures

Technology or Fuel	NO_x	VOC	CO	SO_2	PM
Diesel oxidation catalyst	--	50%	40%	--	20%
Onroad engine	56%	69%	69%	--	29%
Onroad engine with DOC	56%	69%	69%	--	47%
Onroad diesel, from offroad diesel	--	--	--	90%	13%
ULSD, from offroad diesel	--	--	--	99.5%	14%
ULSD, from onroad diesel	--	--	--	95%	2%

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[100] CARB, *Cargo Handling Equipment Yard Truck Emission Testing*, September 2006. See: *http://www.arb.ca.gov/msprog/offroad/cargo/documents/yttest.pdf.*

[101] EPA, Verified Retrofit Technologies. See: *http://www.epa.gov/OMS/retrofit/retroverifiedlist.htm.*

[102] CARB Verified Technologies, Level 1 - 25 %or Greater Reduction in Particulate Matter. *See: http://www.arb.ca.gov/diesel/verdev/level1/level1.htm.*

Table 5.13: Emission Control Factors for Cargo Handling Equipment

Technology or Fuel	NO_x	VOC	CO	SO_2	PM
Diesel oxidation catalyst	--	0.50	0.60	--	0.80
Onroad engine	0.44	0.31	0.31	--	0.71
Onroad engine with DOC	0.44	0.31	0.31	--	0.53
Onroad diesel, from offroad diesel	--	--	--	0.10	0.87
ULSD, from offroad diesel	--	--	--	0.005	0.86
ULSD, from onroad diesel	--	--	--	0.05	0.98

These factors were applied to the following equipment at the Port of Seattle:

The Port of Seattle had the following emission control measures in place in 2005:

- One diesel oxidation catalyst installed on one yard tractor
- 168 pieces of equipment switched from offroad diesel to highway diesel the last two months of 2005
- 17 pieces of equipment used ULSD all of 2005
- 55 pieces of equipment used onroad diesel all of 2005, then switched to ULSD the last month of 2005

These factors were applied to the following equipment at the Port of Tacoma:

- All diesel-powered equipment used either ULSD or highway diesel
- 60 diesel oxidation catalysts were retrofit on 30 straddle carriers
- 64 yard tractors used fuel-efficient onroad engines

5.6.2 Greenhouse Gas Emission Factors

The NONROAD model outputs CO_2 emissions, but does not estimate CH_4 and N_2O, thus alternative processing calculations were used to derive values for these greenhouse gases. The emission factors for CH_4 and N_2O are based on fuel consumption (and are the same for gasoline and diesel fuel, and in the absence of literature, assumed to be the same for propane)[103]:

- 0.0800 g N_2O/kg fuel consumed
- 0.1800 g CH_4/kg fuel consumed

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[103] EPA 2006. See Annex 3, Table A-97.

However, fuel consumption data was not collected. In order to convert operational hours to volume of fuel consumed, a method was found to activate the fuel economy feature of the NONROAD model by locating it in the by-model-year-output and re-running the data file.[104] Fuel consumption was then transformed into pounds. Diesel is assumed to be 7.0 pounds per gallon and gasoline (along with propane) was assumed to be 6.2 pounds per gallon.[105]

Equation 5.2

Emissions, tpy = (FUELCONS, gal x fuel density, lb/gal x 0.454 kg/lb x EF, g/kg)/(453.6 g/lb x 2,000 lb/ton)

5.7 Emission Estimates

The cargo handling emissions are summarized by port in Tables 5.14 and 5.15, for criteria pollutants and greenhouse gases, respectively.

Relative to the criteria pollutant emissions values, the reader is advised that PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together.

Table 5.14: Puget Sound 2005 Cargo Handling Equipment Criteria Pollutant Emissions, tpy

Port	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Anacortes	0.24	0.04	0.40	0.02	0.01	0.01	0.01
Everett	23.04	2.38	22.08	1.66	2.46	2.38	2.45
Olympia	25.79	2.71	17.46	3.23	2.26	2.19	2.25
Port Angeles	6.26	0.65	4.23	0.76	0.44	0.42	0.44
Seattle	514.12	58.17	647.99	67.42	34.43	33.40	34.21
Tacoma	585.80	37.80	226.04	7.44	34.32	33.30	34.30
Total	**1155.25**	**101.73**	**918.19**	**80.53**	**73.91**	**71.70**	**73.66**

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[104] This variable is called FUELCONS and the units are gallons per year (estimated by NONROAD). NONROAD estimates fuel consumption empirically and no actual fuel consumption data was used.

[105] Adapted from NREL 2006.

Table 5.15: Puget Sound 2005 Cargo Handling Equipment Greenhouse Gases Emissions, tpy

				CO_2 Equivalents			
Port	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
Anacortes	15	0.0004	0.0010	15	0.14	0.02	15
Everett	1,379	0.0347	0.0782	1,379	10.77	1.64	1,392
Olympia	1,741	0.0437	0.0984	1,741	13.56	2.07	1,756
Port Angeles	415	0.0105	0.0236	415	3.25	0.50	419
Seattle	46,669	1.1643	2.6196	46,669	360.93	55.01	47,085
Tacoma	60,390	1.4998	3.3745	60,390	464.93	70.86	60,925
Total	**110,609**	**2.7535**	**6.1953**	**110,609**	**853.58**	**130.10**	**111,592**

5.7.1 Port of Anacortes Emission Estimates

Tables 5.16 and 5.17 present Port of Anacortes cargo handling equipment emission estimates for criteria pollutants and greenhouse gases, respectively.

Table 5.16: Port of Anacortes 2005 Cargo Handling Equipment Criteria Pollutant Emissions, tpy

Terminal	**NO_x**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**DPM**
PSA010	0.24	0.04	0.40	0.02	0.01	0.01	0.01

Table 5.17: Port of Anacortes 2005 Cargo Handling Equipment Greenhouse Gas Emissions, tpy

				CO_2 Equivalents			
Terminal	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
PSA010	15	0.0004	0.0010	15	0.14	0.02	15

5.7.2 Port of Port Angeles Emission Estimates

Tables 5.18 and 5.19 present Port of Port Angeles cargo handling equipment emission estimates for criteria pollutants and greenhouse gases, respectively.

Table 5.18: Port of Port Angeles 2005 Cargo Handling Equipment Criteria Pollutant Emissions, tpy

Terminal	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSP010	6.26	0.65	4.23	0.76	0.44	0.42	0.44

Table 5.19: Port of Port Angeles 2005 Cargo Handling Equipment Greenhouse Gas Emissions, tpy

				CO_2 Equivalents			
Terminal	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
PSP010	415	0.0105	0.0236	415	3.25	0.50	419

5.7.3 Port of Everett Emission Estimates

Tables 5.20 and 5.21 present Port of Everett cargo handling equipment emission estimates for criteria pollutants and greenhouse gases, respectively.

Table 5.20: Port of Everett 2005 Cargo Handling Equipment Criteria Pollutant Emissions by Terminal, tpy

Terminal	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSE010	3.33	0.76	12.61	0.01	0.20	0.19	0.19
PSE020	15.86	1.25	7.55	1.31	1.95	1.89	1.95
PSE030	1.68	0.17	0.80	0.13	0.16	0.16	0.16
PSE040	2.15	0.21	1.13	0.21	0.15	0.14	0.15
Total	**23.04**	**2.38**	**22.08**	**1.66**	**2.46**	**2.38**	**2.45**

Table 5.21: Port of Everett 2005 Cargo Handling Equipment Greenhouse Gas Emissions by Terminal, tpy

				CO$_2$ Equivalents			
Terminal	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
PSE010	200	0.0054	0.0122	200	1.68	0.26	202
PSE020	937	0.0233	0.0524	937	7.22	1.10	946
PSE030	92	0.0023	0.0051	92	0.71	0.11	93
PSE040	150	0.0037	0.0084	150	1.16	0.18	152
Total	**1,379**	**0.0347**	**0.0782**	**1,379**	**10.77**	**1.64**	**1,392**

5.7.4 Port of Olympia Emission Estimates

Tables 5.22 and 5.23 present Port of Olympia cargo handling equipment emission estimates for criteria pollutants and greenhouse gases, respectively.

Table 5.22: Port of Olympia 2005 Cargo Handling Equipment Criteria Pollutant Emissions by Terminal, tpy

Terminal	**NO$_x$**	**VOC**	**CO**	**SO$_2$**	**PM$_{10}$**	**PM$_{2.5}$**	**DPM**
PSO010	9.16	1.07	7.44	1.16	0.79	0.77	0.79
PSO020	16.63	1.63	10.01	2.08	1.47	1.42	1.47
Total	**25.79**	**2.71**	**17.46**	**3.23**	**2.26**	**2.19**	**2.25**

Table 5.23: Port of Olympia 2005 Cargo Handling Equipment Greenhouse Gas Emissions by Terminal, tpy

				CO$_2$ Equivalents			
Terminal	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
PSO010	647	0.0166	0.0373	647	5.14	0.78	653
PSO020	1,093	0.0272	0.0611	1,093	8.42	1.28	1,103
Total	**1,741**	**0.0437**	**0.0984**	**1,741**	**13.56**	**2.07**	**1,756**

5.7.5 Port of Seattle Emission Estimates

Tables 5.24 and 5.25 present Port of Seattle cargo handling equipment emission estimates for criteria pollutants and greenhouse gases, respectively.

Table 5.24: Port of Seattle 2005 Cargo Handling Equipment Criteria Pollutant Emissions by Terminal, tpy

Terminal	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSS010	55.34	21.80	454.15	0.48	2.36	2.29	2.16
PSS020	5.60	1.00	12.49	0.39	0.31	0.30	0.30
PSS030	26.75	2.18	13.91	3.92	1.98	1.92	1.98
PSS040	0.37	0.06	0.33	0.06	0.06	0.06	0.06
PSS050	161.72	11.60	52.72	26.01	10.74	10.42	10.74
PSS060	49.54	3.10	13.39	8.57	2.95	2.86	2.95
PSS070	49.21	4.49	24.45	0.74	3.24	3.14	3.24
PSS080	165.59	13.92	76.56	27.26	12.79	12.41	12.78
Total	**514.12**	**58.17**	**647.99**	**67.42**	**34.43**	**33.40**	**34.21**

Table 5.25: Port of Seattle 2005 Cargo Handling Equipment Greenhouse Gas Emissions by Terminal, tpy

				CO_2 Equivalents			
Terminal	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
PSS010	4,396	0.1116	0.2511	4,396	34.60	5.27	4,436
PSS020	392	0.0116	0.0262	392	3.61	0.55	396
PSS030	2,061	0.0512	0.1151	2,061	15.86	2.42	2,080
PSS040	33	0.0008	0.0018	33	0.25	0.04	33
PSS050	16,104	0.3994	0.8986	16,104	123.81	18.87	16,247
PSS060	5,277	0.1308	0.2944	5,277	40.56	6.18	5,324
PSS070	3,891	0.0966	0.2174	3,891	29.95	4.57	3,925
PSS080	14,514	0.3622	0.8150	14,514	112.29	17.11	14,643
Total	**46,669**	**1.1643**	**2.6196**	**46,669**	**360.93**	**55.01**	**47,085**

5.7.6 Port of Tacoma Emission Estimates

Tables 5.26 and 5.27 present Port of Tacoma cargo handling equipment emission estimates for criteria pollutants and greenhouse gases, respectively.

Table 5.26: Port of Tacoma 2005 Cargo Handling Equipment Criteria Pollutant Emissions by Terminal, tpy

Terminal	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PST010	47.02	3.38	34.03	0.05	2.26	2.19	2.25
PST020	220.59	8.94	47.31	0.22	7.33	7.11	7.33
PST030	38.88	3.35	15.90	0.66	2.56	2.48	2.56
PST040	27.78	2.00	7.61	0.51	1.87	1.81	1.87
PST050	58.12	4.04	14.98	1.49	4.07	3.94	4.07
PST055	58.37	2.81	24.14	2.13	5.97	5.79	5.96
PST060	126.00	12.37	75.84	1.57	9.66	9.37	9.66
PST070	3.50	0.37	2.84	0.06	0.22	0.22	0.22
PST080	0.21	0.05	0.76	0.00	0.00	0.00	0.00
PST100	5.33	0.49	2.62	0.75	0.39	0.38	0.39
Total	**585.80**	**37.80**	**226.04**	**7.44**	**34.32**	**33.30**	**34.30**

Table 5.27: Port of Tacoma 2005 Cargo Handling Equipment Greenhouse Gas Emissions by Terminal, tpy

				CO_2 Equivalents			
Terminal	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
PST010	3,411	0.0855	0.1923	3,411	26.49	4.04	3,442
PST020	22,666	0.5616	1.2635	22,666	174.09	26.53	22,867
PST030	3,456	0.0858	0.1930	3,456	26.59	4.05	3,486
PST040	2,699	0.0669	0.1506	2,699	20.75	3.16	2,723
PST050	7,863	0.1950	0.4387	7,863	60.44	9.21	7,932
PST055	11,310	0.2816	0.6336	11,310	87.30	13.31	11,411
PST060	8,282	0.2059	0.4632	8,282	63.82	9.73	8,356
PST070	296	0.0074	0.0166	296	2.28	0.35	299
PST080	12	0.0004	0.0010	12	0.14	0.02	12
PST100	394	0.0098	0.0220	394	3.03	0.46	398
Total	**60,390**	**1.4998**	**3.3745**	**60,390**	**464.93**	**70.86**	**60,925**

5.8 Emission Control Measure Benefits

This section discusses the emission control measures identified at each port and lists the estimated amount of pollutants not emitted each year they were in place. If these measures had not been implemented prior to the emissions inventory process, the emissions estimates presented in the previous section would have been increased by the amounts listed in Tables 5.28 and 5.29. The emission control measures implemented at the Port of Everett, the Port of Seattle and the Port of Tacoma are discussed in more detail in the following subsections.

Table 5.28: Puget Sound 2005 Cargo Handling Equipment Criteria Pollutant Emission Control Benefits, tpy

Puget Sound	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Anacortes	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Port Angeles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Everett	0.7	2.6	0.2	0.02	0.03	0.03	0.03
Olympia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seattle	83.5	15.7	4.8	30.0	4.2	4.1	4.2
Tacoma	157.3	15.0	44.0	119.1	9.1	9.0	9.2
Total	**241.5**	**33.3**	**49.0**	**149.2**	**13.3**	**13.1**	**13.4**

Table 5.29: Puget Sound 2005 Cargo Handling Equipment Greenhouse Gas Emission Control Benefits, tpy

				CO_2 Equivalents			
Puget Sound	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	Total
Anacortes	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Port Angeles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Everett	37.7	0.001	0.002	37.7	0.02	0.7	38.4
Olympia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seattle	6,949.6	0.2	0.4	6,949.6	3.9	128.7	7,082.2
Tacoma	6,566.0	0.2	0.4	6,566.0	3.7	121.6	6,691.3
Total	**13,553.3**	**0.4**	**0.8**	**13,553.3**	**7.6**	**251.0**	**13,811.9**

5.8.1 Port of Everett

A total of 62 pieces of equipment are used at the Port of Everett, including six electric forklifts, with emissions from 56 pieces of equipment accounted for in this emissions inventory. The port-owned equipment at the Port of Everett uses highway diesel fuel to power its diesel equipment, as opposed to offroad diesel used by the tenants. Besides the diesel equipment, the Port owns electric, propane and gasoline equipment.

For the six electrical pieces of equipment inventoried, emissions savings were estimated assuming the electrical two ton capacity forklifts replaced propane forklifts. Default horsepower for two ton forklifts were used along with the baseline highway diesel.

The Port-owned equipment used highway diesel fuel in 2005 instead of offroad diesel fuel. The tenants did not switch to highway diesel fuel in 2005 and there were no other emission reduction technologies. Tables 5.30 and 5.31 present the emission reductions for cargo handling equipment operated at the Port of Everett in 2005.

Table 5.30: Port of Everett 2005 Cargo Handling Equipment Criteria Pollutant Emission Control Benefits, tpy

Everett	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Fuel/retrofits	0.00	0.00	0.00	0.02	0.03	0.03	0.03
Electric power	0.7	2.6	0.2	0.001	0.003	0.003	0.0
Total	**0.7**	**2.6**	**0.2**	**0.02**	**0.03**	**0.03**	**0.03**

Table 5.31: Port of Everett 2005 Cargo Handling Equipment Greenhouse Gas Emission Control Benefits, tpy

				CO_2 Equivalents			
Everett	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	Total
Fuel/retrofits	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power	37.7	0.001	0.002	37.7	0.02	0.7	38.4
Total	**37.7**	**0.001**	**0.002**	**37.7**	**0.02**	**0.7**	**38.4**

5.8.2 Port of Seattle

The Port of Seattle has a total of 514 pieces of cargo handling equipment, of which 60 are electric and have zero emissions. All of the ship-to-shore cranes at the Port of Seattle are electric powered. The majority of the equipment has diesel engines, while the rest have gasoline and propane engines. The majority of the diesel equipment used offroad diesel for the first ten months in 2005 and have switched to highway diesel. One terminal that was using highway diesel in 2005 switched to ULSD near the end of 2005 for 17 pieces of equipment. In 2005, one piece of equipment had a diesel oxidation catalyst. None of the cargo handling equipment had onroad engines in 2005.

In 2005, the following emission control measures were in place:

- One diesel oxidation catalyst installed on one yard tractor
- 168 CHE switched from offroad diesel to highway diesel last 2 months of 2005
- 17 CHE used ULSD all of 2005
- 55 CHE used onroad diesel all of 2005, then switched to ULSD the last month of 2005

Table 5.32 shows the distribution of power or fuel used by equipment type.

Table 5.32: Port of Seattle 2005 Cargo Handling Equipment by Fuel Type

Equipment	Diesel	Electric	Gasoline	Propane
Car loader	0	0	8	0
Crane	0	26	0	0
Forklift	80	13	17	42
Generator set	17	0	16	0
Manlift	0	0	0	1
Pallet jacks	0	21	0	0
RTG crane	4	0	0	0
Side handler	11	0	0	0
Sweeper	2	0	0	0
Top handler	68	0	0	0
Yard tractor	188	0	0	0
Total	**370**	**60**	**41**	**43**

For the 60 electrical pieces of equipment inventoried, emissions savings were estimated assuming the electrical equipment replaced diesel-powered equipment. Default horsepower of similar equipment types were used along with the baseline highway diesel.

For technologies that were in place less than the twelve months in 2005, emission reductions were pro-rated for actual number of months in effect. Table 5.32 summarizes the emissions reductions in 2005 for the Port of Seattle by terminal not including the electrical equipment. Tables 5.32 and 5.33 present the emission reductions for 2005 cargo handling equipment at the Port of Seattle.

Table 5.33: Port of Seattle 2005 Cargo Handling Equipment Criteria Pollutant Emission Control Benefits by Terminal, tpy

Seattle	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSS010	0.00	0.00	0.00	4.06	0.36	0.35	0.36
PSS020	0.00	0.00	0.00	0.07	0.01	0.01	0.01
PSS030	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSS040	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSS050	0.00	0.00	0.00	4.59	0.24	0.23	0.24
PSS060	0.00	0.00	0.00	1.46	0.08	0.08	0.08
PSS070	0.00	0.00	0.00	6.65	0.48	0.47	0.48
PSS080	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.0**	**0.0**	**0.0**	**16.8**	**1.2**	**1.1**	**1.2**

Tables 5.34 and 5.35 present the emission reductions for 2005 cargo handling equipment at the Port of Seattle. Seattle City Light, the electricity provider for the Port of Seattle, produces zero "net" greenhouse gases.[106]

Table 5.34: Port of Seattle 2005 Cargo Handling Equipment Criteria Pollutant Emission Control Benefits, tpy

Seattle	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Fuel/retrofits	0.0	0.0	0.0	16.8	1.2	1.1	1.2
Electric power	83.5	15.7	4.8	13.2	3.0	2.9	3.0
Total	**83.5**	**15.7**	**4.8**	**30.0**	**4.2**	**4.1**	**4.2**

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[106] Seattle City Light. See: *http://www.seattle.gov/light/enviroment.*

Table 5.35: Port of Seattle 2005 Cargo Handling Equipment Greenhouse Gas Emission Control Benefits, tpy

				CO_2 Equivalents			
Seattle	**CO_2**	**CH_4**	**N_2O**	**CO_2**	**CH_4**	**N_2O**	**Total**
Fuel/retrofits	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power	6,949.6	0.2	0.4	6,949.6	3.9	128.7	7,082.2
Total	**6,949.6**	**0.2**	**0.4**	**6,949.6**	**3.9**	**128.7**	**7,082.2**

5.8.3 Port of Tacoma

The Port of Tacoma has a total 518 cargo handling equipment, of which 54 are electric and have zero emissions. All of the ship-to-shore cranes at the Port of Tacoma are electric powered. Seventy-seven percent of the equipment has diesel engines, of which 35% use ULSD and the rest use either highway diesel, which is a reduction from the offroad diesel typically used by the offroad equipment such as cargo handling equipment. In 2005, 30 straddle carriers owned by the Port had diesel oxidation catalysts. There were 64 yard tractors with onroad engines.

Table 5.36 shows the distribution of power or fuel used by equipment type.

Table 5.36: Port of Tacoma 2005 Cargo Handling Equipment by Fuel Type

Equip Type	**Diesel**	**Electric**	**Gasoline**	**Propane**
Backhoe	2	0	0	0
Compressor	6	3	6	0
Crane	0	30	0	0
Crane, container	0	15	0	0
Empty handler	2	0	0	0
Forklift	62	5	4	42
Generator	1	0	5	0
Manlift	1	1	3	2
Rail pusher	1	0	0	0
Reachstacker	11	0	0	0
RTG crane	6	0	0	0
Side pick	8	0	0	0
Straddle carrier	79	0	0	0
Sweeper	3	0	1	1
Top loader	14	0	0	0
Yard tractor	203	0	1	0
Total	399	54	20	45

For the 54 electrical pieces of equipment inventoried, emissions savings were estimated assuming the electrical equipment replaced diesel-powered equipment. Default horsepower of similar equipment types were used along with the baseline highway diesel.

In 2005, the Port of Tacoma had the following emission reductions technologies in place for the whole year:

- All diesel powered equipment used either ULSD or highway diesel which lowered SO_2 emissions by 94%
- 60 diesel oxidation catalysts installed on 30 straddle carriers
- 64 yard tractors with fuel-efficient onroad engines which lowered the NO_x emissions by 12%

The straddle carrier DOCs and onroad engines on the yard tractors helped reduce VOC emissions by 12%, and CO emissions by 15%. The combined reduction technologies reduced PM emissions by 17%. Table 5.37 summarizes the emissions reductions in 2005 for the Port of Tacoma by terminal not including electrical equipment.

Table 5.37: Port of Tacoma 2005 Cargo Handling Equipment Criteria Pollutant Emission Control Benefits by Terminal, tpy

Tacoma	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PST010	0.00	0.00	3.93	6.14	0.52	0.50	0.52
PST020	0.00	0.00	0.00	42.85	1.23	1.20	1.23
PST030	0.00	0.00	0.00	6.05	0.45	0.43	0.45
PST040	0.00	0.00	0.00	4.62	0.31	0.30	0.31
PST050	15.13	1.42	4.72	13.44	0.87	0.84	0.87
PST055	67.03	3.96	31.39	19.16	1.88	1.83	1.88
PST060	0.00	0.00	0.00	14.16	1.44	1.40	1.44
PST070	0.00	0.00	0.00	0.49	0.03	0.03	0.03
PST080	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**82.2**	**5.4**	**40.0**	**106.9**	**6.7**	**6.5**	**6.7**

Tables 5.38 and 5.39 present the emission reductions for 2005 cargo handling equipment at the Port of Tacoma. Tacoma Power supplies electricity to the Port of Tacoma. Their energy source is primarily hydropower (88%), followed by nuclear (8%), coal (3%), natural gas (1%) and other (<1%).[107]

Table 5.38: Port of Tacoma 2005 Cargo Handling Equipment Criteria Pollutant Emission Control Benefits, tpy

Tacoma	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Fuel/retrofits	82.2	5.4	40.0	106.9	6.7	6.5	6.7
Electric power	75.1	9.7	3.9	12.2	2.4	2.4	2.4
Total	**157.3**	**15.0**	**44.0**	**119.1**	**9.1**	**9.0**	**9.2**

Table 5.39: Port of Tacoma 2005 Cargo Handling Equipment Greenhouse Gas Emissions Control Benefits, tpy

				CO_2 Equivalents			
Tacoma	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	Total
Fuel/retrofits	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power	6,566.0	0.2	0.4	6,566.0	3.7	121.6	6,691.3
Total	**6,566.0**	**0.2**	**0.4**	**6,566.0**	**3.7**	**121.6**	**6,691.3**

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[107] Tacoma Power. See: *http://www.tacoma.power.com/AboutUs/electricity.source.com.*

5.9 Strengths, Limitations, and Recommendations

Some cargo handling and related operations that result in emissions were not included within the scope of this emissions inventory. Some of these emissions are included in stationary source permits such as grain and petroleum terminals, but others are not. For example, activities in and around Lake Washington, Lake Union and the Duwamish River (beyond Port of Seattle facilities) are outside the scope of this inventory.

Where actual data was unavailable, reasonable assumptions based on similar equipment in the inventory were used. Out of 1,145 pieces of cargo handling equipment, default values were assigned for horsepower for 162 pieces of equipment, operating hours for 46 pieces of equipment, and model years for 50 pieces of equipment. Actual equipment horsepowers, model years, and operating hours for all covered equipment will provide more refined estimates.

The NONROAD default value for offroad diesel fuel sulfur content was used. The inventory may be improved upon by conducting a fuel survey to obtain actual fuel sulfur content of diesel fuel used in cargo handling equipment.

SECTION 6 RAIL

Section 6 provides an overview of the railroad locomotives and associated equipment and heavy-duty vehicles in and around the Puget Sound study area. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

6.1 Source Description

The types of activity covered in this section include locomotive operations and also the operations of cargo handling equipment and heavy-duty trucks at near-port rail yards such as those near the Port of Seattle. Locomotive operations are typically described in terms of two different types of operation, line haul and switching. Line haul refers to the movement of cargo over long distances (e.g., cross-country) and occurs within a port, marine terminal, or rail yard as the initiation or termination of a line haul trip, as cargo is either picked up for transport to destinations across the country or is dropped off for shipment overseas. Switching refers to the assembling and disassembling of trains, sorting of the cars of inbound cargo trains into contiguous "fragments" for subsequent delivery to terminals, and the short distance hauling of rail cargo within a port or rail yard.

Locomotives used for line haul operations are typically large, powerful diesel engines of 3,000 hp or more, while switch engines are smaller, typically having 1,200 to 3,000 hp. Older line haul locomotives have often been converted to switch duty as newer line haul locomotives with more horsepower have become available. Rather than having finely adjustable throttle controls such as those used in automobiles and most powered equipment, locomotive throttles are operated in a series of discrete power steps called notches, which range from positions one through eight (with one being the lowest power setting and eight providing full power), plus an idle setting. Many locomotives also have a setting called dynamic braking, which is a means of slowing the locomotive using the drive system.

Cargo handling equipment is used in rail yards to load and unload cargo to and from railcars, and heavy-duty trucks transport cargo, especially containerized cargo, between the ports and nearby rail yards. Emissions from cargo loading/unloading equipment within the ports are included in Section 5, and emissions from heavy-duty trucks calling at port terminals are included in Section 7. Emissions from cargo handling equipment and heavy-duty trucks operating at the rail yards are included in this section. At the Port of Tacoma, the rail facilities are located on-port, therefore their cargo handling equipment is included in Section 5. For the Port of Seattle, the rail facilities are located off-port, therefore their cargo handling equipment is included in this section.

The cargo handling equipment operated by the railroads (either directly or through contractors) consists of lifting equipment to place or remove cargo containers onto or off of railcars, and yard tractors that move the containers from place to place within the terminal or rail yard. This equipment is similar to the cargo handling equipment in use at Port terminals. The onroad heavy-duty trucks that transfer cargo over public roads between terminals and rail yards are the same type of truck as discussed in Section 7.

Emissions from locomotives transporting cargo to or from the ports on the rail lines outside the ports have also been estimated along with estimates of the emissions from line haul locomotive activity in the region. These estimates have been coordinated to avoid double counting of emissions.

6.2 Geographical Delineation

The geographical parameters of the emissions inventory summarized in this section for railroad-related sources include the Port of Olympia, the Port of Seattle, the Port of Tacoma, and the Port of Everett, as well as several off-port rail yards: the Fife Yard in Tacoma (a storage and switching yard), the Seattle International Gateway (SIG) Yard, the Argo Yard in Seattle, and rail yard operations in Everett. The SIG and Argo yards are intermodal yards (where cargo is transferred from or to railcars prior to or following international shipment). The off-terminal rail emissions were estimated for rail lines typically utilized in moving port-related cargo within the Puget Sound airshed.

Two mainline railroad companies, Union Pacific (UP) and BNSF Railway service the Puget Sound area.[108] These railroads are known as Class 1 railroads, a designation based on annual revenues.[109] The Class 1 railroads, of which there are currently seven in the U.S., are the largest of the railroads in terms of revenue. In addition, at the Port of Tacoma, switching and terminal rail service is provided by Tacoma Rail, a division of Tacoma Public Utilities, and the Port of Olympia is served by the Tri-City and Olympia Railroad. Figure 6.1[110] illustrates an overall view of the rail system within the State of Washington. This map shows UP's tracks running north and south from Seattle through Tacoma and south toward Portland, Oregon, whereas BNSF Railway's tracks run north to Canada and east from Seattle and Tacoma to points in eastern Washington and further east.

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[108] American Association of Railroads website. See: *http://www.aar.org.*

[109] Railroad classes are based on annual revenues and the Class 1 railroads are the largest of the railroads in terms of revenue. There are currently seven Class 1 railroads in the U.S.

[110] Union Pacific, *Maps of the Union Pacific*, 2006. See: *http://www.uprr.com/aboutup/maps/index.shtml.*

Figure 6.1: State of Washington Rail System Map

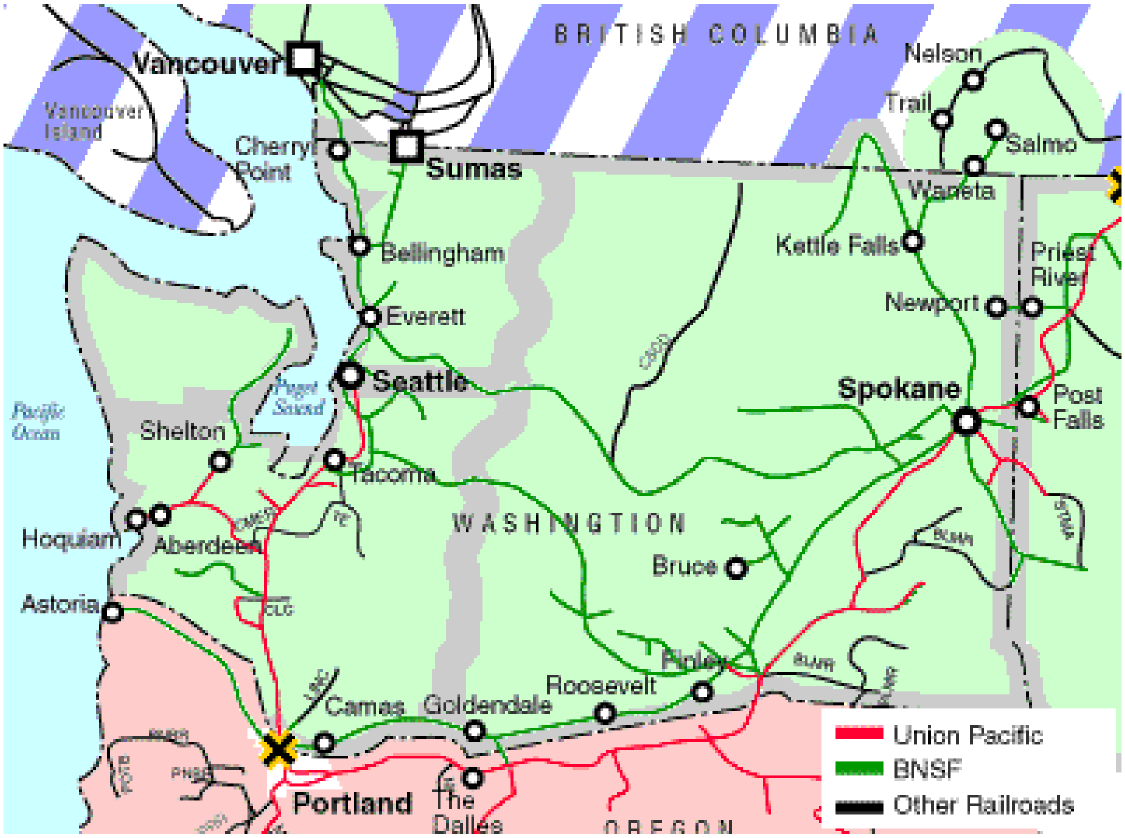


Figure 6.2 provides detail on the rail system within and near the Port of Seattle, while Figure 6.3 shows the Port of Tacoma's rail lines, and Figure 6.4 shows the Port of Olympia's rail lines. These graphics were provided by the respective ports.

Figure 6.2: Seattle Harbor Rail Network Map

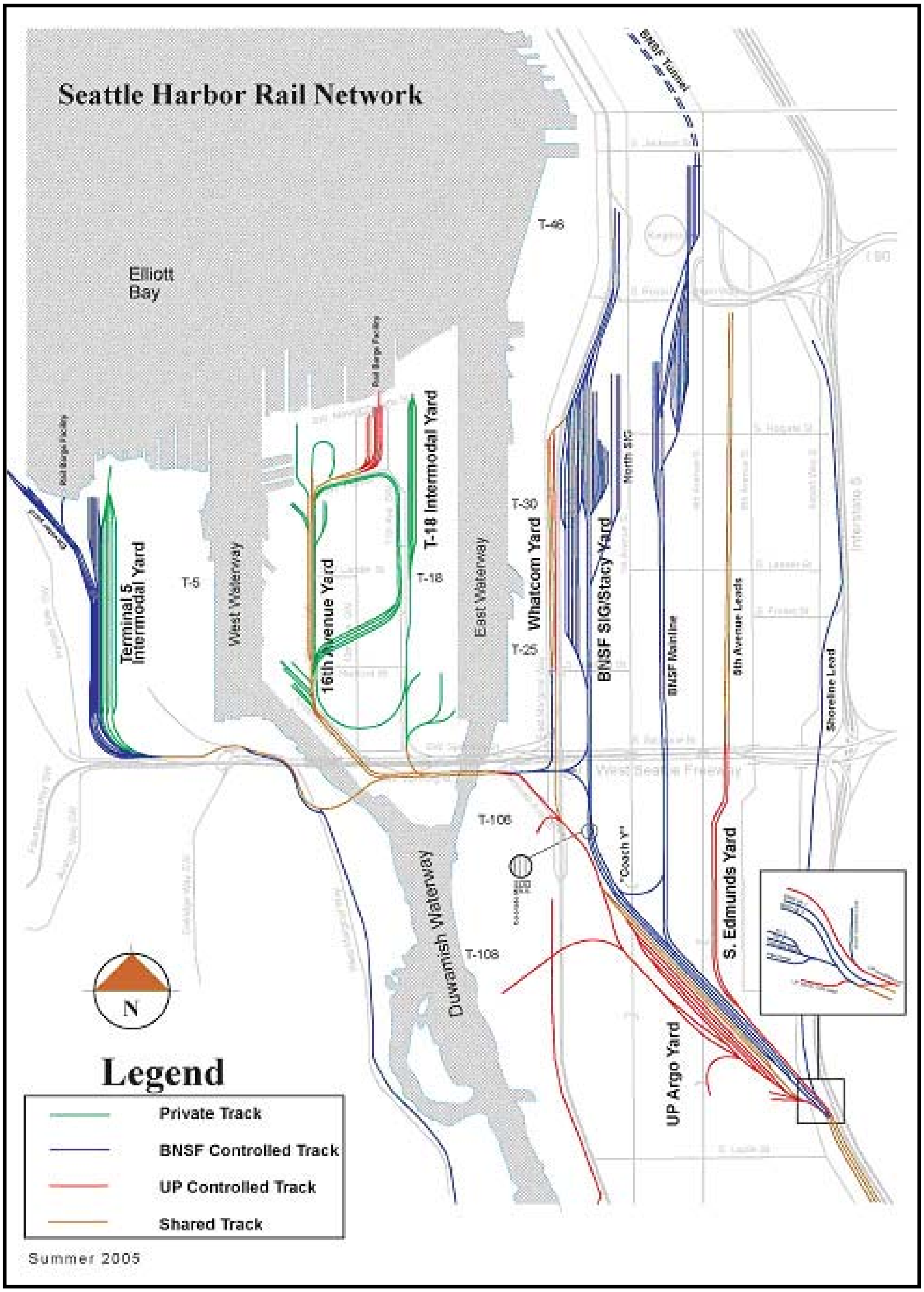


Figure 6.3: Tacoma Rail System Map

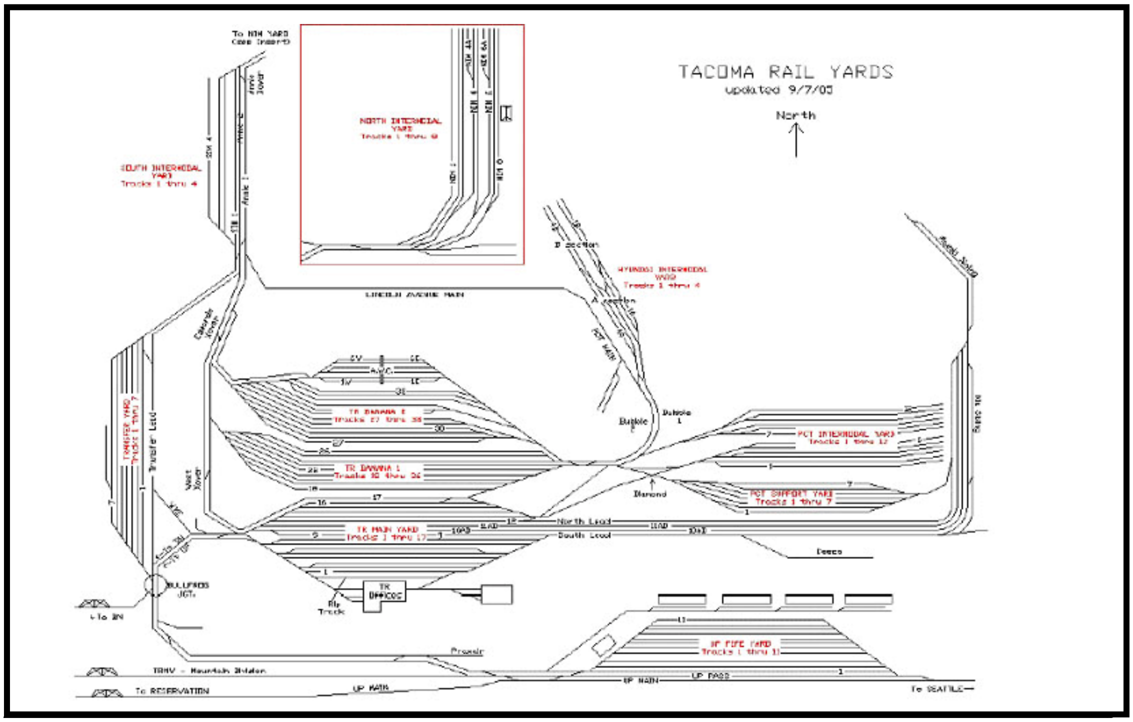
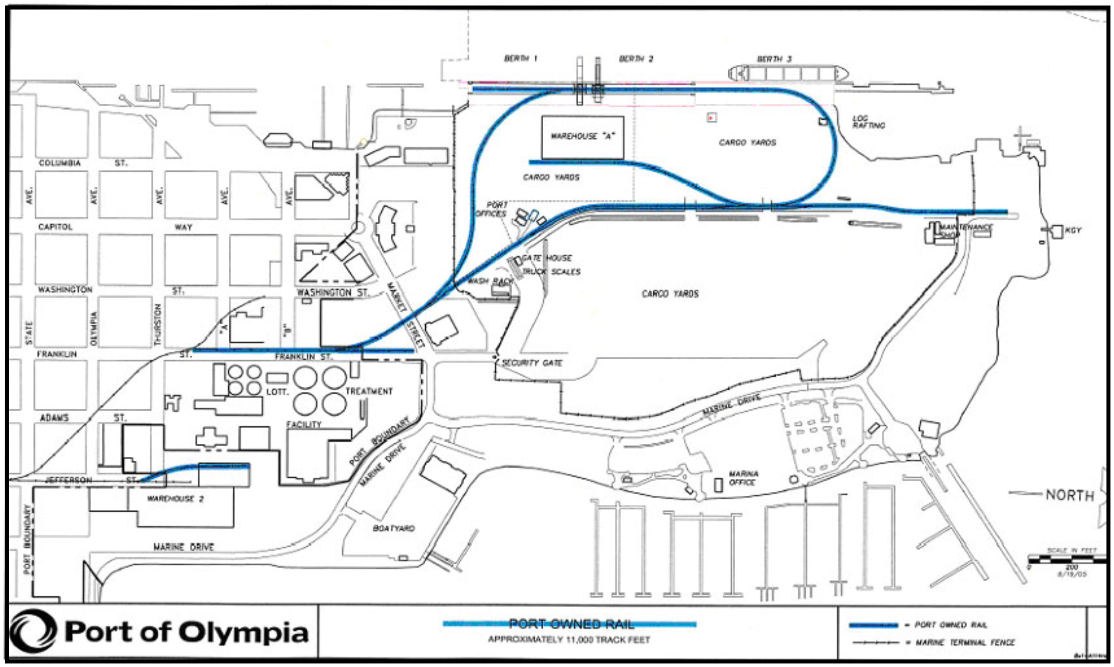


Figure 6.4: Tri-City and Olympia Rail System Map



6.3 Data and Information Acquisition

The rail locomotive source category is comprised of two components: on-terminal and off-terminal, port-related. The data collection processes for each are summarized below.

6.3.1 On-Terminal

Information used to develop the emission estimates presented in this report was provided by the Class 1 railroads (BNSF Railway and UP), from the local railroad Tacoma Rail, from the Ports of Seattle, Tacoma, and Olympia, and from individuals with expertise in the local rail transportation system.

The two Class 1 railroads provided information at different levels of detail. BNSF Railway, a member of the Forum's Steering Committee, provided survey data on HDV activity within their Seattle area rail yards, characteristics of the equipment used to load cargo onto railcars at the rail yards, and fuel consumption information for switching and line haul locomotives by county within the state of Washington. The other major railroad, UP, provided fuel consumption information for switching and line haul activities by county within the state of Washington; no additional operational information regarding switching or intermodal activities was provided. Neither railroad provided line haul locomotive information specific to a particular rail yard or port terminal. The companies providing this information have designated it confidential material, so while the emission estimates are presented in the following subsections the data underlying those estimates has not been released, and thus no supporting data is provided in the appendices. Most of the data provided by the railroads were also provided to Puget Sound Clean Air Agency and the Washington Department of Ecology.

Tacoma Rail provided detailed information on their switching locomotives (e.g., make, model, and year), fuel consumption information, and operational information such as the fact that they switched to low-sulfur diesel fuel mid-way through 2005.

The Ports of Seattle and Tacoma provided information on the number of trains and the amount of cargo entering and leaving their terminals in 2005, which was invaluable in estimating emissions from line haul locomotives operating within and near the Ports. The Port of Olympia provided operating information for the Tri-City and Olympia switch engine that operates there, moving cargo from the Port to an off-port location for pick-up by the Class 1 railroads. While specific data related to the Port of Everett were not available, emissions related to their rail operations are reflected in the area totals for Snohomish County, based on data provided by BNSF Railway.

6.3.2 Off-Terminal

The off-terminal port-related locomotive emission estimates have been based primarily on information provided by the railroads, the Port of Seattle, and the Port of Tacoma, in the form of fuel consumption information (by county) and cargo movement information.

6.4 Operational Profiles

The railroad system is a nationwide enterprise consisting of national and local railroad companies that together serve to move a diverse variety of cargo over long distances. The activity and emission estimates presented in this section represent emissions from locomotive activities that take place within and between ports and the near-dock railyards that handle port-related cargos. Port terminals that offer on-dock rail service, such as the Port of Seattle's Terminal 5, are able to load cargo directly onto railcars, which are either taken from the terminal to destinations across the country or are moved to a rail yard for consolidation into a cross-country train. Near-dock services, such as offered at the Port of Tacoma's on-port intermodal yards, require the cargo to be moved a short distance off-terminal by truck before it is loaded onto railcars. In addition to these on-port rail-related activities, cargo can be moved between the ports and nearby rail yards, which may also handle cargo that is not related to port activity. The cargo movements are bidirectional, with cargo being brought into the ports by rail for export on ships as well as being transported from the ports to points around the country.

6.4.1 Line Haul Locomotives

The Puget Sound area is served by two major Class 1 railway companies, BNSF Railway and UP. The Port of Tacoma offers on-dock or near-dock rail service at four locations, the North Intermodal Rail Yard, the South Intermodal Rail Yard, the Hyundai Intermodal Rail Yard, and the Pierce County Intermodal Rail Yard. In each of these yards, containers are loaded onto railcars for rail shipment across the country or are unloaded from railcars for placement onto ships for export. As mentioned, the Port of Seattle's Terminal 5 offers on-dock rail service; the other Port of Seattle terminals move rail-bound cargo to one of the near-port rail yards operated by BNSF Railway or UP. Cargo moving through the Port of Everett is transported by BNSF Railway.

Table 6.1 lists the estimated number of trains arriving and departing to and from the major port areas in 2005. These numbers are primarily intermodal trains, based on Port records, 2005 for the Port of Tacoma, and 2004 for the Port of Seattle, adjusted to account for annual growth.

Table 6.1: Average Frequencies of Intermodal Line Haul Locomotives, 2005

Port		Eastbound	Westbound	Total
Port of Seattle	annual	1,537	2,021	3,558
	daily	4.2	5.5	10
Port of Tacoma	annual	2,384	1,292	3,675
	daily	6.5	3.5	10
Total	annual	3,921	3,313	7,233
	daily	10.7	9.1	20

The number of locomotives that are assigned to pull each train varies with the weight of the train. Estimates were made of the number of locomotives used to pull each train. Typically, eastbound trains carry more cargo (imported goods) than westbound trains. Accordingly, the assumption was made that eastbound trains average four locomotives while westbound trains average three locomotives. The eastbound estimate is consistent with Port of Tacoma records of trains departing their on-dock facilities, and the westbound estimate is a conservative judgment based on Port of Seattle data that show westbound trains contain 50% to 80% of the number of railcars as eastbound trains (depending on which terminal or rail yard is considered).

When a westbound train enters a port terminal or an off-port rail yard, the locomotives can be detached from the railcars and can depart in a fairly short period of time, leaving the railcars to be emptied of their cargo and to wait for reloading. Eastbound trains can be loaded and made ready before the locomotives that will pull them arrive. An eastbound train, however, must go through lengthy safety checks attached to the locomotives before it can depart. The line haul railroads were not able to provide records of actual on-site times, however, so estimates of one hour per train for westbound trains and two hours per train for eastbound trains were used in the emission calculations.

The locomotives in line haul service vary in their horsepower ratings. While the line haul railroads were not able to provide information on specific locomotives that called on the Puget Sound area in 2005, UP has published their nation-wide locomotive roster on their Internet web site.[111] This roster has been used to develop an estimate of the rated horsepower of the locomotives covered by this emissions inventory. According to the UP roster, one of the most common locomotives in their fleet of 7,565 line haul locomotives is the EMD SD70M with 4,000 hp. The 1,564 SD70M and other SD70 models with similar engines make up 20% of UP's fleet. Another common locomotive is the GE AC4400 series whose models are rated at approximately 4,400 hp. The 2,074

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[111] Union Pacific, Locomotive Roster, 1 January 2006. See: *http://www.uprr.com/aboutup/reference/locorost.shtml.*

AC4400s make up 27% of the fleet. Other common examples are the GP40 (4-axle) and SD40 (6-axle) models with 3,000-hp engines that together make up 17% of UP's fleet. Together these locomotives have a weighted average of slightly less than 4,000 hp. While there are additional locomotives with greater and lesser horsepower ratings, in the absence of data from the railroads it has been assumed that the UP fleet is reasonably representative of the line haul locomotives operating in the Puget Sound area and that 4,000 hp represents the average rated power of locomotives servicing the Puget Sound ports.

In addition to the rated horsepower it is necessary to estimate the in-use horsepower of the locomotives because the emission factors are expressed in terms of mass of emissions per horsepower-hour. Information from a Regulatory Support Document (RSD) published by EPA in support of rulemaking[112] was used to estimate the power produced by locomotive engines in the various throttle settings. This document includes an appendix that lists test data for a variety of locomotive engine types, including the percentage of rated power that the engines develop while in each throttle notch setting. The document also includes an estimate of the amount of time locomotives spend in each throttle notch setting during line haul operation. This is less than ideal because it represents the average of normal overall line haul locomotive activity, which includes cross-country travel as well as activity at each end of a trip, so the percentages of time in each notch setting may not accurately represent rail yard or port terminal activity. However, the RSD averages have been used in lieu of locally specific information or information specifically representing the activities at each end of a line haul trip.

Table 6.2 illustrates the development of a composite load factor for line haul locomotives using the averages presented in the RSD. For each throttle notch setting, the percentage of time in that setting was multiplied by the percentage of full power in that setting. The resulting fractions were summed to arrive at the composite load factor. This load factor was multiplied by the assumed average rated locomotive horsepower to estimate the average in-use horsepower output during line haul operations. In throttle notch position 8, according to the EPA document, the engines exceed their rated power output by a small amount.

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[112] EPA, *Locomotive Emission Standards Regulatory Support Document*, revised, April 1998.

Table 6.2: Average In-Use Load Factor for Line Haul Locomotives

Throttle Setting	Power in notch % of Full	Average time in mode %	Composite load
Dynamic Brake	2.1%	12.5%	0.0026
Idle	0.4%	38.0%	0.0015
1	5.0%	6.5%	0.0033
2	11.4%	6.5%	0.0074
3	23.5%	5.2%	0.0122
4	34.3%	4.4%	0.0151
5	48.1%	3.8%	0.0183
6	64.3%	3.9%	0.0251
7	86.6%	3.0%	0.0260
8	102.5%	16.2%	0.1661
Composite line haul load factor:			**28%**

This composite load factor can be combined with the assumptions of average locomotive horsepower, number of locomotives per train, and annual number of trains to develop estimates of locomotive horsepower-hours, as described in Section 6.6, Methodology.

6.4.2 Switching Locomotives

In addition to moving line haul trains into and out of the port areas, BNSF Railway and UP operate switching locomotives in their rail yards. Switching activities are also performed by Tacoma Rail within and near the Port of Tacoma and by Tri-City and Olympia Railroad within the Port of Olympia. Switching consists of short distance moves of rail cars and the assembly of trains in a pre-ordered sequence. A train is organized according to where the cargo in each railcar is destined and the nature of the cargo. There are safety requirements concerning whether certain materials can be in adjacent cars and by how many cars they must be separated.

The information provided by BNSF Railway, UP, and Tacoma Rail was the annual amount of fuel used in their rail yard locomotives. UP cited an EPA estimate of 82,490 gallons of fuel per year[113], basing their estimate on the number of locomotives and their normal operating schedule. BNSF Railway used an estimate of 50,000 gallons of fuel per yard locomotive, citing an internal yard equipment fuel study. Tacoma Rail provided an estimate of the amount of fuel consumed annually by their locomotives. These annual fuel use amounts were combined with emission factors expressed in terms of mass of emissions per gallon of fuel burned. The information provided by the Port of Olympia was in hours of operation per week, as well as the operational characteristics of the switching locomotive. Fuel usage was estimated using fuel consumption factors (lbs fuel/hp-hr) from the EPA RSD and emissions were estimated as for the other switching locomotives.

6.4.3 Cargo Handling Equipment

Cargo is loaded onto railcars by diesel-fueled equipment, and additional equipment (i.e., yard tractors) is used to move the containers about the yard. Section 5 covers the equipment operated on or by the respective terminal operators in the on-dock or near-dock rail yards such as operated at the Port of Tacoma, but the equipment at the near-port rail yards (such as SIG and Argo Yards near the Port of Seattle) has been included in this section. One of the railroads provided a list of the cargo handling equipment used at their port-related intermodal yard near Seattle – this equipment has been used as a model to estimate equipment usage for the other Seattle area intermodal yard. The method used to estimate equipment usage is to calculate the average equipment operating time per container (lift) based on the throughput of the yard for which the equipment population is known. For lift equipment, an average of approximately 4.5 operating minutes per lift was estimated – for the yard tractors the average is approximately two minutes per lift. These estimates are based on an estimated eight hours per day, five days per week and include all operations, such as moving about the yard, as well as actually lifting cargo onto or off of railcars.

6.4.4 Heavy-Duty Vehicles

Heavy-duty vehicles move cargo from the port terminals to the off-port rail yards. These are the same types of vehicles addressed in Section 7. Emission estimates are presented in this section for HDVs as they enter, travel through, and exit the off-dock rail yards. One of the railroads provided data on the number of trucks and containers entering and leaving their rail yard over a defined period of time. Most trucks either entered carrying a container or departed carrying a container, but few trucks both entered and departed with a container, so it has been generally assumed that the container throughput or number of lifts is equivalent to the number of truck round trips through the rail yard. This assumption was used to estimate HDV throughput for the other rail yards.

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[113] EPA, *Procedures for Emission Inventory Preparation – Vol. IV: Mobile Source*, December 1992. EPA420-R-92-009, p. 207.

6.5 Emission Reduction Technologies Identified

Tacoma Rail reported that they started using ULSD with 50 ppm sulfur content in their switch locomotives in mid-2005. This change has been reflected in the emission estimates presented in the following section.

6.6 Methodology

Emissions estimation methodologies for the on-terminal and off-terminal port-related locomotives are summarized below.

6.6.1 On-Terminal

A combination of emission estimation methods was used due to the differences in type and level of detail of the data that was provided by the railroad companies. For line haul locomotives, horsepower-hour estimates were developed from the operating parameters described above, and emission factors expressed in terms of mass of emissions per horsepower-hour were used to estimate emissions. The following terms are multiplied in the basic calculation:

- Number of trains per year
- Average number of locomotives per train
- Average locomotive rated horsepower
- Average in-use locomotive load factor
- Average on-port time per train

The equation can be summarized as:

Equation 6.1

Activity, hp-hours/year = trains/year x locomotives/train x HP x LF x hours

The result is multiplied by a pollutant-specific emission factor in grams per horsepower-hour (and divided by 453.6 g/lb x 2,000 lbs/ton) to calculate tons per year.

Equation 6.2

Emissions, tpy = hp-hours/year x g/hp-hr / (453.6 g/lb x 2,000 lbs/ton)

The switching locomotive emissions were developed from fuel consumption estimates and emission factors expressed in terms of mass of emissions per gallon of fuel. This is a simpler calculation but was not used for line haul locomotives because the fuel consumption information provided by the railroads for line haul activity was not differentiated between port and non-port related rail activity. In addition, the EPA RSD document that is the source of emission factors includes fleet average emission factors, in grams per horsepower-hour, for line haul locomotives for multiple years based on anticipated fleet turnover and the introduction of new lower-emitting locomotives. The emission factors for 2005 were used for the line haul locomotive calculations.

The switching locomotive emission calculation can be summarized as:

Equation 6.3

Emissions, tpy = gallons/year x g/gallon / (453.6 g/lb x 2,000 lbs/ton)

Emissions from cargo handling equipment and HDVs were estimated using methods consistent with those described in the respective report sections covering those source types. An exception is the yard equipment for the rail yard that did not provide specific equipment information. For this yard, the average equipment activity per container move (discussed in Section 6.4.3 above) was used to estimate equipment hours by multiplying the time per container by the container throughput for that rail yard. Emissions were calculated by multiplying the equipment hours by pound-per-hour emission factors representing typical yard equipment that were developed for the environmental impact review process for the Port of Seattle's Terminal 30 project.

For SO_2 emissions calculation, offroad diesel was estimated at 3,500 ppm sulfur and ULSD was estimated at 50 ppm sulfur.

6.6.2 Off-Terminal

Off-terminal port-related locomotive emissions have been estimated using emission factors provided by one of the railroads and from an EPA document containing year-by-year projections of average locomotive emission factors.[114]

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[114] EPA Office of Mobile Sources, EPA420-F-97-051, *Technical Highlights,* issued in support of locomotive emission standards rulemaking, December 1997.

Emission estimates for overall locomotive activity and for maritime-related locomotive activity were developed using fuel consumption information and fuel-based emission factors. The railroads provided information on locomotive fuel use by county but were unable to differentiate maritime from non-maritime activity. Therefore, an attempt was made to estimate fuel usage on the basis of estimated numbers of trains and fuel consumption averages based on information provided by the Port of Tacoma and the Port of Seattle.

The Puget Sound Regional Council provided overall locomotive emission estimates for King, Pierce, and Snohomish Counties. In addition, the two Class 1 railroads provided fuel use information for Skagit and Whatcom Counties from which overall locomotive emission estimates have been made. The remaining counties in the study area are assumed to have no significant locomotive activity, with the exception of Thurston County, through which trains operated by one of the Class 1 railroads travel on their way southward out of the area. No fuel information was provided for this county, but an attempt has been made to estimate their port-related emissions.

The methodology for port-related emission estimates centers around estimates of the numbers of trains servicing the Ports of Tacoma and Seattle and the amount of fuel used by the trains as they travel to or from those ports.

6.7 Emission Estimates

Locomotive emission estimates for on-terminal and near-dock activities, and off-terminal port-related locomotives are presented below.

6.7.1 On-Terminal

The 2005 maritime related rail yard emissions for Puget Sound are summarized in this section. Tables 6.3 and 6.4 present the 2005 criteria pollutant and greenhouse gas emissions, respectively, from line haul locomotives as they move maritime-related cargo within the Ports of Seattle and Tacoma, and within the near-port rail yards in King and Pierce Counties that handle port cargo. Emissions from line haul locomotive operations associated with the Ports of Olympia and Everett have not been included in these tables because sufficient information was not collected to differentiate maritime-related from other locomotive activities in the region.

Relative to the criteria pollutant emissions values, the reader is advised that PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together.

Table 6.3: Puget Sound 2005 Port and Near-Port Line Haul Locomotive Criteria Pollutant Emissions, tpy

Port	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Port of Seattle	199.8	10.4	29.0	24.9	7.0	6.4	7.0
Port of Tacoma	226.0	11.8	32.8	28.2	7.9	7.2	7.9
Total	**425.9**	**22.2**	**61.8**	**53.1**	**14.8**	**13.6**	**14.8**

Table 6.4: Puget Sound 2005 Port and Near-Port Line Haul Locomotive Greenhouse Gas Emissions, tpy

				CO_2 Equivalents			
Port	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
Port of Seattle	10,947	0.3	0.9	10,947	84.3	18.1	11,050
Port of Tacoma	12,381	0.3	1.0	12,381	95.4	20.5	12,497
Total	**23,328**	**0.6**	**1.8**	**23,328**	**179.7**	**38.5**	**23,547**

Tables 6.5 and 6.6 present the 2005 criteria pollutant and greenhouse gas emissions, respectively, from switching locomotives as they operate in port-cargo service in rail yards in King and Pierce Counties, and in the Port of Olympia in Thurston County.

Table 6.5: Puget Sound 2005 Switching Locomotive Criteria Pollutant Emissions, tpy

Port	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
Port of Seattle	248.3	14.4	26.1	15.3	6.3	5.8	6.3
Port of Tacoma	362.6	21.0	38.2	17.5	9.2	8.5	9.2
Snohomish Co.	79.8	4.6	8.4	4.9	2.0	1.9	2.0
Port of Olympia	15.0	0.9	1.6	0.9	0.4	0.4	0.4
Total	**705.7**	**40.9**	**74.3**	**38.6**	**17.9**	**16.5**	**17.9**

Table 6.6: Puget Sound 2005 Switching Locomotive Greenhouse Gas Emissions, tpy

				CO$_2$ Equivalents			
Port	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
Port of Seattle	6,908	0.2	0.5	6,908	54.1	11.5	6,973
Port of Tacoma	10,086	0.3	0.8	10,086	79.0	16.7	10,182
Snohomish Co.	2,220	0.1	0.2	2,220	17.4	3.7	2,241
Port of Olympia	417	0.0	0.0	417	3.3	0.7	421
Total	**19,631**	**0.5**	**1.6**	**19,631**	**153.8**	**32.6**	**19,817**

Tables 6.7 and 6.8 present the 2005 criteria pollutant and greenhouse gas emissions, respectively, from cargo handling equipment operating in the line haul railroad companies' off-port rail yards (SIG and Argo) in Seattle. The rail yard cargo handling equipment at the Port of Tacoma is included in Section 5 covering on-port cargo handling equipment.

Table 6.7: Puget Sound 2005 Rail Yard Cargo Handling Equipment Criteria Pollutant Emissions, tpy

Rail Yard	**NO$_x$**	**VOC**	**CO**	**SO$_2$**	**PM$_{10}$**	**PM$_{2.5}$**	**DPM**
SIG Yard	20.9	1.3	4.8	0.4	1.4	1.3	1.4
Argo Yard	12.0	0.8	2.8	0.2	0.8	0.7	0.8
Total	33.0	2.1	7.5	0.6	2.1	2.0	2.1

Table 6.8: Puget Sound 2005 Rail Yard Cargo Handling Equipment Greenhouse Gas Emissions, tpy

				CO$_2$ Equivalents			
Rail Yard	**CO$_2$**	**N$_2$O**	**CH$_4$**	**CO$_2$**	**N$_2$O**	**CH$_4$**	**Total**
SIG Yard	2,086	0.05	0.12	2,086	16.3	2.4	2,105
Argo Yard	1,200	0.03	0.07	1,200	9.4	1.4	1,211
Total	3,286	0.08	0.18	3,286	25.6	3.8	3,316

Tables 6.9 and 6.10 present the 2005 criteria pollutant and greenhouse gas emissions, respectively, from heavy-duty trucks operating in the SIG and Argo Yards.

Table 6.9: Puget Sound 2005 Rail Yard Heavy-Duty Vehicle Criteria Pollutant Emissions, tpy

Rail Yard	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
SIG Yard	8.8	0.7	5.7	0.2	0.2	0.2	0.2
Argo Yard	6.3	0.5	4.3	0.1	0.1	0.1	0.1
Total	15.0	1.3	9.9	0.3	0.3	0.3	0.3

Table 6.10: Puget Sound 2005 Rail Yard Heavy-Duty Vehicle Greenhouse Gas Emissions, tpy

				CO_2 Equivalents			
Rail Yard	CO_2	N_2O	CH_4	CO_2	N_2O	CH_4	Total
SIG Yard	863	0.003	0.003	863	0.80	0.06	864
Argo Yard	591	0.002	0.002	591	0.55	0.04	591
Total	1,453	0.004	0.005	1,453	1.35	0.10	1,455

Tacoma Rail switched to ULSD in their switching locomotives at mid-year. The switch is estimated to have reduced SO_2 emissions by 4.9 tons or 49% in 2005, with an annualized reduction of 98%. If their activity level in 2006 is the same as 2005, the use of ULSD will result in a reduction of 9.7 tons (compared with 9.9 tons if regular offroad diesel were to be used).

6.7.2 Off-Terminal

As noted above, the Puget Sound Regional Council provided the emission estimates shown below in Table 6.11 for King, Pierce, and Snohomish Counties within their jurisdiction. Emissions for Skagit and Whatcom Counties in the Northwest Clean Air Agency's jurisdiction have been estimated from the information provided by the Class 1 railroads. Emissions for Thurston County, through which locomotives travel on their way from the Tacoma/Seattle area south through Centralia, have not been included at this time because fuel use data was not provided by the Class 1 railroad whose trains travel on that line.

The emission estimates provided by the Puget Sound Regional Council included estimates of $PM_{2.5}$ emissions but not of PM_{10}. To fill these gaps the reported $PM_{2.5}$ emissions were divided by 0.92 to account for the assumption that 92% of diesel engine PM_{10} is $PM_{2.5}$. The EPA emission factors used to estimate emissions for Skagit and Whatcom Counties do not include factors for $PM_{2.5}$ or CO_2 – in these cases $PM_{2.5}$ was estimated by multiplying the PM_{10} emissions by 0.92, and CO_2 emissions were estimated using the ratio of CO_2 to CO from the three counties reported by the Puget Sound Regional Council.

Table 6.11: Puget Sound 2005 Regional Locomotive Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	CO_2
Clallam	---	---	---	---	---	---	---	---
Island	---	---	---	---	---	---	---	---
Jefferson	---	---	---	---	---	---	---	---
King	1,662	80	219	121	43	40	40	79,233
Kitsap	---	---	---	---	---	---	---	---
Mason	---	---	---	---	---	---	---	---
Pierce	1,106	64	155	80	29	27	27	57,316
San Juan	---	---	---	---	---	---	---	---
Skagit	244	10	31	18	6	6	6	11,211
Snohomish	1,052	48	136	77	27	25	25	47,891
Thurston	---	---	---	---	---	---	---	---
Whatcom	271	12	34	20	6	6	6	12,296
Total	**4,335**	**214**	**575**	**316**	**112**	**103**	**103**	**207,947**

The estimated locomotive emissions from trains related to the Ports of Seattle and Tacoma are shown below in Table 6.12 below.

Table 6.12: Puget Sound 2005 Off-Terminal Port-Related Locomotive Emissions by County, tpy

County	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	Greenhouse Gases, CO_2 eq
Clallam	0	0	0	0	0	0	0	0
Island	0	0	0	0	0	0	0	0
Jefferson	0	0	0	0	0	0	0	0
King	481	21	62	36	13	12	12	22,304
Kitsap	0	0	0	0	0	0	0	0
Mason	0	0	0	0	0	0	0	0
Pierce	129	6	17	10	4	4	4	6,157
San Juan	0	0	0	0	0	0	0	0
Skagit	0	0	0	0	0	0	0	0
Snohomish	489	21	62	36	13	12	12	22,466
Thurston	186	9	25	15	6	5	5	8,928
Whatcom	0	0	0	0	0	0	0	0
Total	**1,285**	**57**	**166**	**97**	**35**	**33**	**33**	**59,855**

6.8 Emission Control Measure Benefits

Tacoma Rail began using ULSD with 50 ppm sulfur in switch engines in mid-2005. The benefit of this alternate fuel is included within the overall emissions estimates.

6.9 Strengths, Limitations, and Recommendations

The emission estimates presented in this section have been based on numerous assumptions made necessary because complete information was not available from all parties involved in the complex railroad operations in the Puget Sound area. While both of the major railroad companies provided some level of information, they did not provide the same types of data, which would have been helpful in developing detailed emission estimates. For example, only one of the Class 1 railroads (BNSF Railway) provided information related to their rail yard operations in terms of cargo handling equipment and onroad truck operations.

Emissions from line haul locomotives have been estimated using national average throttle notch frequencies published by the EPA. However, the activities of line haul locomotives as they arrive at and depart marine terminals and rail yards may not be well represented by the national average data because arrivals and departures involve slower speeds and potentially more idling than typical operations involving cross-country trips. Activity-specific (e.g., arrivals and departures) data on throttle notch frequency would be a helpful addition to the data collected from railroad operators in future emissions inventories.

In addition, the amount of time locomotives spend in rail yards and marine terminals upon arrival and before departure affects the estimates of emissions from these locations. However, the railroads did not provide detailed information on these activities so order-of-magnitude estimates were used. Site-specific information, such as from individuals working in specific areas, on the amount of time typically spent in different activities would be another helpful addition to future data collection.

Given the amount of time it may take the railroads to develop the information discussed above, careful consideration should be given to providing the railroads with adequate lead time in any future data requests.

Future inventories should use on-site survey work to develop the types of information that the railroads find difficult to provide because of time, personnel, financial, or confidentiality concerns.

The off-terminal port-related locomotive emission estimates are based on a variety of information sources because the Class 1 railroads are not able to provide detailed information on their port-related locomotive activities separately from overall locomotive activity. The use of disparate data sources often results in potential disconnects that require additional evaluation to resolve.

SECTION 7 HEAVY-DUTY VEHICLES

Section 7 provides an overview of the emissions from onroad heavy-duty diesel-fueled vehicles that transport port-related cargo, and from buses that transport cruise line passengers to and from the airport and area hotels. A description of the methodology used to estimate emissions is provided in this section, as well as the emissions estimates for this source category.

7.1 Source Description

Heavy-duty trucks are used extensively to move cargo to and from the terminals that serve as the bridge between land and sea transportation. Trucks deliver cargo to and from local and national destinations, and they also transfer cargo between terminals and off-port railcar loading facilities, an activity known as drayage. In the course of their daily operations, trucks are driven onto and through the terminals, where they deliver and/or pick up cargo. They are also driven on the public roads near ports and throughout the region. Marine cargo transportation by truck is a complex system because generally the vehicles are not under the direct control of the ports, their terminals, or the shippers who use the terminals. The vehicles are largely a combination of fleet vehicles owned by transport companies and independently owned and operated trucks. Emissions from heavy-duty trucks associated with the off-port rail yards are presented with the rail locomotive emissions in Section 6.

This section details the estimated emissions from truck activities within the ports' terminals as they drop off or pick up cargo. The on-terminal cargo truck activities covered include idling at terminal gates, idling within the terminals, and travel within the terminals. Estimates of emissions from the diesel-fueled buses that transport cruise line passengers to and from the airport and hotels in the area are also included in the on-terminal HDV emissions. Emissions from trucks transporting cargo to or from the ports on the public roadways, including travel between the Port of Seattle and near-port rail yards, have been estimated by the Puget Sound Regional Council and the Washington State Department of Ecology Air Quality Section in an effort led by the Port of Seattle and the Puget Sound Clean Air Agency, and are also presented in this section as representing off-terminal, port-related, emissions.

The EPA MOBILE6[115] model has been used to estimate emissions presented for onroad mobile sources, including heavy-duty trucks and buses. Virtually all of these vehicles are diesel-fueled because of the economic and operational characteristics of diesel engines as opposed to engines fueled by gasoline or other fuels.

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[115] EPA MOBILE6.

The most common configuration of HDVs in maritime freight service is the articulated tractor-trailer (truck and semi-trailer) having five axles, including the trailer axles. A common type of trailer in the study area is the container trailer, built to accommodate standard-sized cargo containers. Additional trailer types include tankers, boxes, and flatbeds. A tractor traveling without an attached trailer is called a "bobtail." A tractor pulling an unloaded trailer chassis is known simply as a "chassis." These vehicles are all classified as HDVs regardless of their actual weight because the classification is based on gross vehicle weight rating (GVWR), which is a rating of the vehicle's total carrying capacity. Because MOBILE6 does not distinguish between loaded and unloaded trucks, the emission estimates include all of the different configurations combined. This may result in a slight overestimation of emissions from the unloaded HDVs, but the inertial effects of the additional weight of a loaded truck would probably limit the overestimate to periods of acceleration.

Off-terminal port-related, or drayage, trucking is a unique subset of the overall truck activity that occurs in the Puget Sound region. Unlike long-haul trucking, which transports goods out of the region to destinations such as Portland, Oregon, drayage trucks drive short distances to deliver containers to and from terminals, intermodal yards, and local distribution centers. In Seattle the intermodal yards are approximately one to two miles from the terminals, while the local distribution centers, concentrated in the Green River Valley area, are approximately 10 to 35 miles from the terminals; additionally, many port-related truck trips stay within the Duwamish Industrial Area. In Tacoma, the majority of containers bound to and from intermodal yards are transported via on-dock rail, while containers bound for the local distribution centers travel approximately 15 to 25 miles to the Green River Valley.

As examples of typical HDVs, Figure 7.1 shows a container truck transporting a container in a terminal, and Figure 7.2 shows a bobtail. The equipment images shown in the figures are not photographs of actual pieces of equipment used at the surveyed terminals but are for illustrative purposes only.

Figure 7.1: Truck with Container

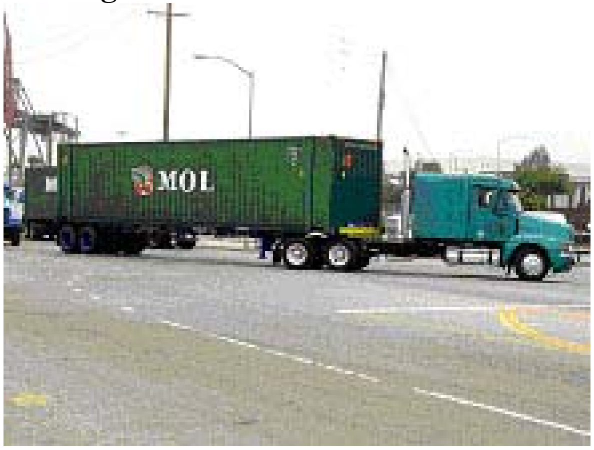

Figure 7.2: Bobtail Truck

7.2 Geographical Delineation

The heavy-duty vehicle emissions were estimated separately for on-terminal and off-terminal port-related areas. The geographical extent for the on-terminal portion is the marine terminals and associated facilities of the following Puget Sound area ports:

Port of Anacortes
Port of Everett
Port of Olympia
Port of Seattle
Port of Tacoma

The Port of Port Angeles did not report HDV activity.

The locations of the ports and their respective marine terminals are illustrated in the figures in Section 1.

The geographical extent for the off-terminal port-related emissions is shown in Figure 7.3,[116] and is comprised of the public roadways and rail corridors within the Puget Sound airshed, including Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom Counties. This includes trips between the terminals and the first pickup/drop or the boundary of the study area for cargo being transported in or out of the study area directly to or from the terminals, as well as trips between terminals and nearby rail yards. Queuing time for entering terminals is included in the on-terminal portion.

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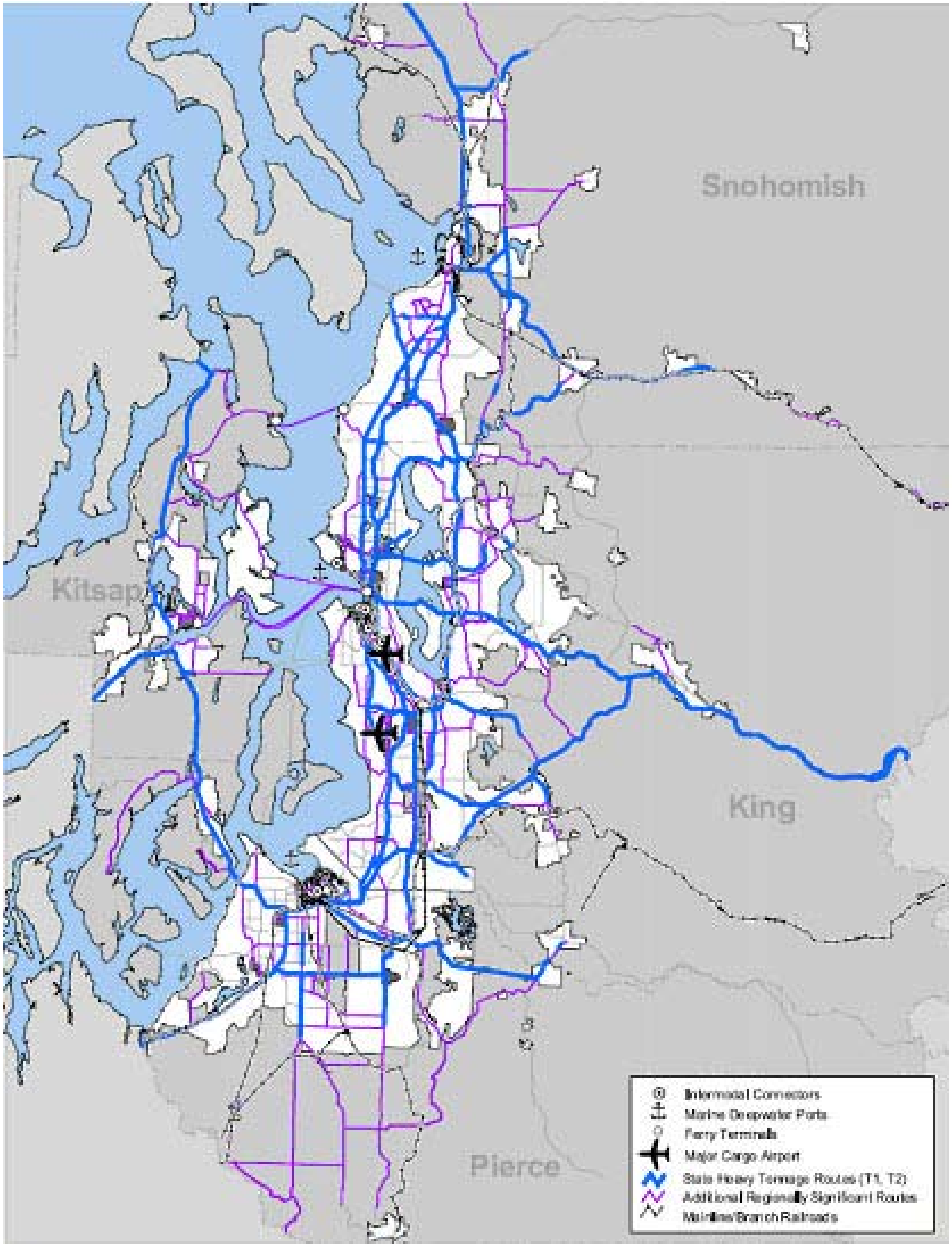
[116] Puget Sound Regional Council, *Destination 2030 Plan*, 2001. See: *http://www.psrc.org/projects/mtp/appendix4d.pdf.*

Figure 7.3: Puget Sound Metropolitan Transportation System Map



7.3 Data and Information Acquisition

The HDV source category is comprised of two components: on-terminal, and off-terminal port-related. The data collection methods for each are summarized below.

7.3.1 On-Terminal

Terminal operators provided information on truck throughput for calendar year 2005, the terminal gate schedule (when trucks are admitted for drop-off or pick-up of cargo), the average speed and distance driven on-terminal, and the average amounts of time trucks wait at the entrance gate, the exit gate, and while loading/unloading. The most complete information was available from the container terminals and other terminals at the Ports of Seattle and Tacoma, with other terminals and ports providing only numbers of trucks. Assumptions (based on average values from the other terminals) have been made to account for lack of discrete data in these cases. The terminals for which activity assumptions were used represent only 7% of the truck trips to the terminals whose activity figures went into the assumptions. That is, data from ten terminals representing two million HDV trips were used to develop assumptions to estimate emissions from an additional 133,000 trips to five smaller terminals or ports. The parameters for which assumptions were developed are idling times and on-terminal driving distances. The data used in the development of the heavy-duty vehicle emission estimates is summarized in Appendix E-4.

No suitable information was available on the model years of the trucks (model year is a variable that affects truck emissions) so the model year distribution provided by the Washington Department of Ecology was used in their 2006 State Implementation Plan (SIP) modeling was used as the distribution in MOBILE6. This distribution is illustrated in Figure 7.4, which shows the percentage of the fleet in each model year.

In comparison, the Ports of Los Angeles and Long Beach in Southern California have developed a port-specific truck age distribution by obtaining license plate information recorded electronically by several container terminals at the two ports. The California Department of Motor Vehicles queried their registration database with the license plate numbers and provided the ports with the model year of the registered trucks. The resulting port-specific age distribution is reproduced in Figure 7.5 below.[117]

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[117] Draft Methodology for Estimating Heavy-duty Diesel Truck Activity at the Ports of Los Angeles and Long Beach, November 2006. See:
http://www.polb.com/environment/air_quality/clean_air_action_plan.asp.

Figure 7.4: 2006 Heavy-Duty Vehicle Age Distribution, Washington Diesel HDV7, 8A, 8B

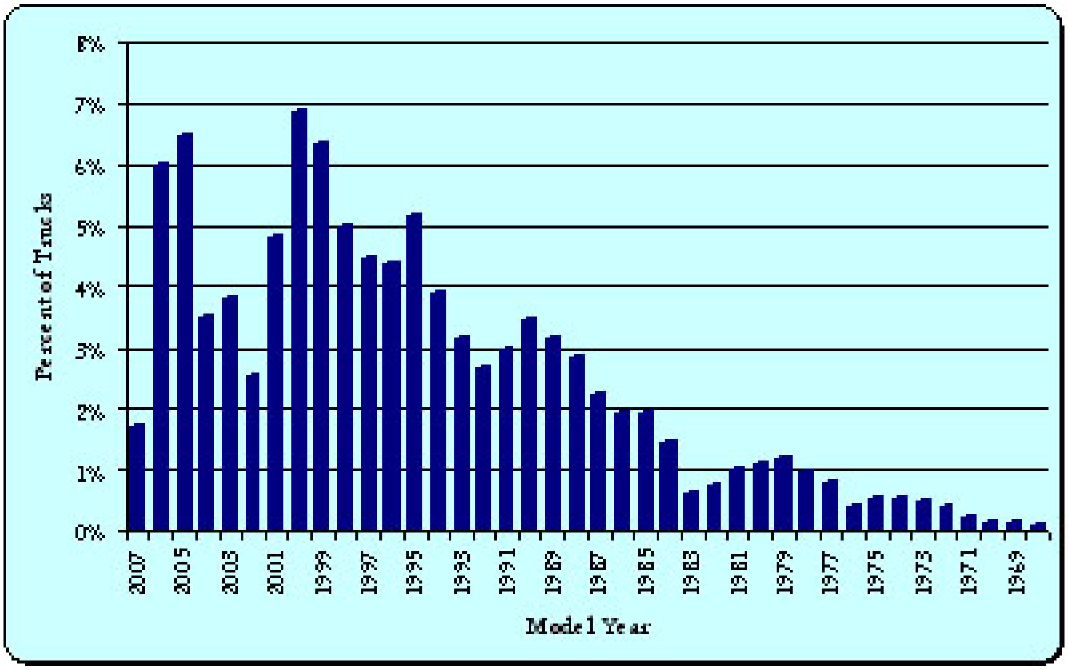
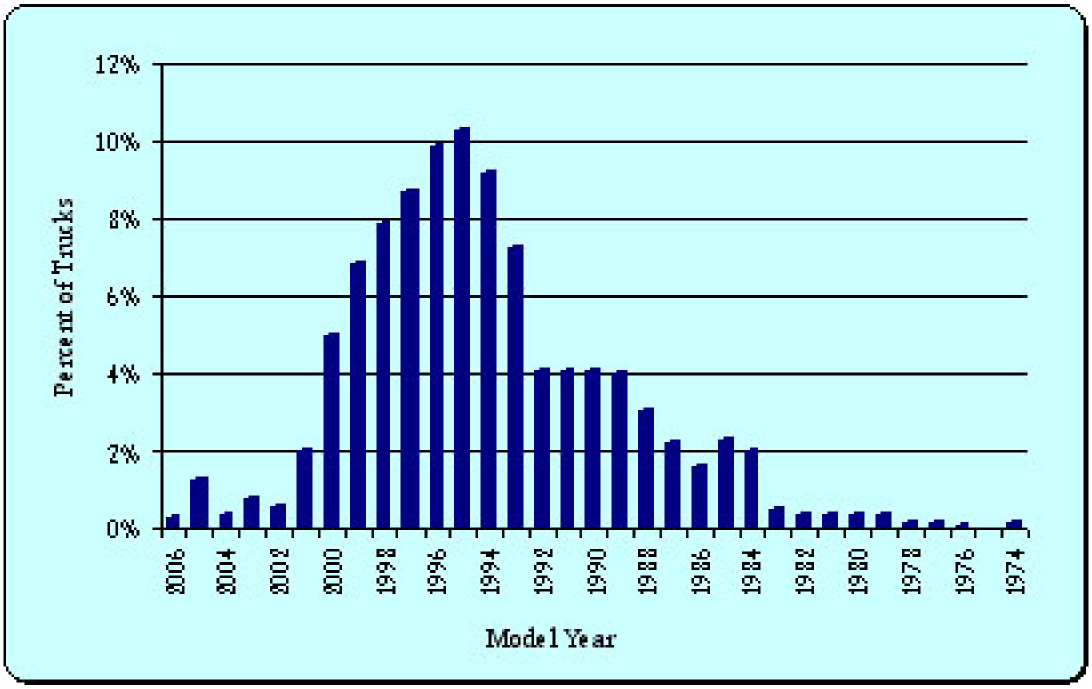


Figure 7.5: 2005 Heavy-Duty Vehicle Age Distribution, Ports of Long Beach and Los Angeles



The most notable difference between the two distributions is the presence in the Washington distribution of a significant number of trucks less than five years old. Trucks in this age range are not numerous in the California ports distribution. In addition, of the trucks more than five years old, the most numerous model years in the Washington distribution (1999 and 2000) are newer than the most numerous model years in the California ports distribution (1995 and 1996). This is a 3- to 4-model year difference even when accounting for the one-year difference between the distributions (the Washington distribution is 2006, the California ports distribution is 2005).

The most significant uncertainty, of course, is how well the Washington state-wide distribution reflects the population of trucks serving the marine terminals covered by the emission estimates presented in this report. The newest trucks in the Washington distribution may not be involved in maritime cargo movements, in which case the distributions would be fairly similar (except for the peak year offset mentioned above). In their 2001 baseline emissions inventory[118] the Port of Los Angeles found that the newest trucks (five years old and less) in the CARB South Coast Air Basin truck fleet age distribution were under-represented in the port-specific age distribution developed from terminal data as described above. The Port of Los Angeles also noted that the average age of the port-related fleet was less than one model year older than the average age of the regional fleet.

7.3.2 Off-Terminal

The information on which the HDV emission estimates have been based was provided by the Puget Sound Regional Council, the Puget Sound Clean Air Agency, the Port of Seattle, the Port of Tacoma, and the Washington State Department of Transportation (WSDOT). The vehicle mile traveled estimates were obtained from the Puget Sound Regional Council Travel Demand Model[119] and adjusted by truck travel estimates from the Port of Seattle Container Terminals Access Study[120] (CTAS) and the Strategic Freight Transportation Analysis (SFTA).[121] Information provided includes the number of port-related HDV in the Puget Sound region, location of distribution centers, travel patterns, average speed, and vehicle miles traveled (VMT); port truck travel and idling estimates were obtained from Starcrest based on their knowledge and experience.

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[118] Starcrest 2005.

[119] Cambridge Systematics, Inc. for Washington Department of Transportation and Puget Sound Regional Council, *Puget Sound Regional Council Travel Model Documentation, Updated for Congestion Relief Analysis*, Draft Final Report, May 2006. See: *http://www.psrc.org/data/tdmodel/model_doc(draftfinal).pdf.*

[120] Heffron Transportation, Inc., *Port of Seattle Container Terminal Access Study, Year 2003 Update*, 27 October 2003. (HTI 2003)

[121] Washington State University, Strategic Freight Transportation Analysis, 2005.
See: *http://www.sfta.wsu.edu/*.

7.4 Operational Profiles

The number of HDV trips through the terminals is a function of cargo throughput (or number of cruise passengers and frequency of cruises, for the buses). For each trip, the vehicles have periods of idling, for example while waiting to enter the terminal or while waiting to drop off and/or pick up cargo. The vehicles also travel a certain distance within the terminal from entry gate to drop-off/pick-up locations, and to the exit gate. The amount of on-terminal idling depends in part on the mode of operation – idling is reduced if cargo is ready to be loaded upon the vehicle's arrival compared to operations in which a vehicle must wait for a loader to bring the cargo. On-terminal travel distance depends on the size of the terminal and on the route taken by the vehicles within the terminal. The bus idling times are for idling while loading or discharging passengers. Idling of the buses while in transit, such as at traffic signals, is included in the emission factors produced by the MOBILE6 model.

The operational information provided by the terminals has been summarized and is presented in Table 7.1.[122] The values presented for idling times and driving distances are averages for each terminal, while the assumed speed for cargo terminals is the average reported from all terminals. The Port of Seattle discourages unnecessary bus idling by signage and communications with the companies involved. An example of the signage is shown in Figure 7.6.[123]

Off-terminal port-related HDV VMT depends on the destination of the cargo being transported. Idling of HDV while in transit, such as at traffic signals, is included in the emission factors produced by the MOBILE6 model.

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[122] The terminals identified as PSS020A and B are cruise terminals representing bus trips. The speeds for these terminals are onroad speeds, not on-terminal speeds.

[123] Port of Seattle.

Figure 7.6: Port of Seattle Cruise Terminal Anti-Idling Signage

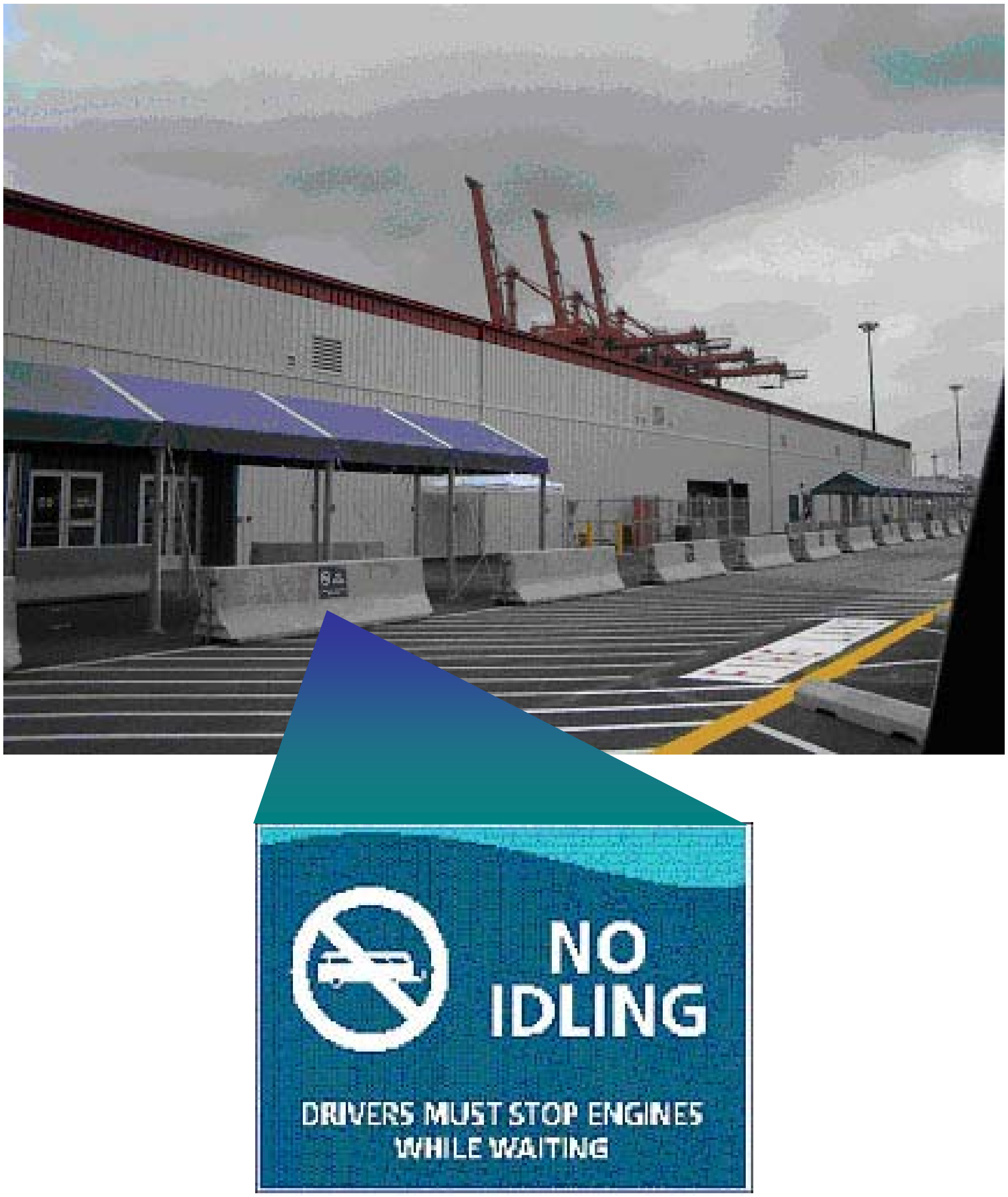

Table 7.1: Puget Sound 2005 On-Terminal Heavy-Duty Vehicle Operational Profiles

Terminal ID	Truck/Bus Trips 2005	Idling (hours)			Avg. Speed (mph)	Distance (miles)	On-terminal		Total Hours Idling		Total Miles Traveled
		Gate In	Loading/ Unloading	Gate Out			Driving (hours)	Idling (hours)	(one trip)	(all trips)	
PSS050	912,500	0.33	0.50	0.17	15	1.75	0.12	0.67	1.00	912,500	1,596,875
PST050	247,000	0.08	0.00	0.08	15	1.0	0.07	0.08	0.17	41,167	247,000
PSS080	220,480	0.07	0.30	0.03	15	1.0	0.07	0.33	0.40	88,192	220,480
PSS070	200,000	0.17	0.13	0.05	15	1.0	0.07	0.18	0.35	70,000	200,000
PST020	141,000	0.08	0.25	0.03	15	1.06	0.07	0.28	0.37	51,700	149,460
PST060	100,000	0.17	0.25	0.08	15	1.6	0.11	0.33	0.50	50,000	160,000
PST040	95,153	0.00	0.23	0.00	15	0.8	0.05	0.23	0.23	21,568	76,122
PSS060	62,400	0.17	0.37	0.08	15	0.5	0.03	0.45	0.62	38,480	31,200
PSS030	62,000	0.13	0.21	0.07	15	1.0	0.07	0.28	0.41	25,420	62,000
PST030	39,863	0.17	0.25	0.08	15	0.95	0.06	0.33	0.50	19,932	37,870
PSOALL	32,760	0.13	0.21	0.07	15	1.0	0.07	0.28	0.41	13,432	32,760
PSEALL	28,158	0.13	0.21	0.07	15	0.75	0.05	0.28	0.41	11,545	21,119
PST070	11,472	0.02	0.02	0.02	15	0.3	0.02	0.03	0.05	574	3,442
PSPALL	6,500	0.13	0.21	0.07	15	1.0	0.07	0.28	0.41	2,665	6,500
PSS020B	5,702	0.00	0.17	0.00	40	12.0	0.30	0.17	0.17	950	68,428
PSAALL	3,600	0.13	0.21	0.07	15	1.0	0.07	0.28	0.41	1,476	3,600
PST090	3,398	0.10	0.21	0.05	15	0.5	0.03	0.26	0.36	1,233	1,699
PSS020A	2,903	0.00	0.17	0.00	40	12.0	0.30	0.17	0.17	484	34,832
PSS020B	559	0.00	0.17	0.00	30	2.0	0.07	0.17	0.17	93	1,118
PSS020A	353	0.00	0.17	0.00	30	2.0	0.07	0.17	0.17	59	706
Total	**2,175,801**	---	---	---	---	---	---	---	---	**1,351,468**	**2,955,210**
Average	---	**0.10**	**0.21**	**0.05**	**19.00**	**2.16**	**0.09**	**0.26**	**0.36**	---	---

7.5 Emission Reduction Technologies Identified

No emission reduction technologies or alternative fuels were identified in use in 2005 in the trucks or buses addressed in this section. However, starting late in 2006, ULSD with a sulfur content of 15 ppm or less will be the default fuel available nation-wide for onroad use. While higher-sulfur diesel will still be available for a limited period, ULSD will be widely available. This will have the immediate effect of reducing sulfate emissions by approximately 95% and particulate emissions by a nominal amount. Significantly, model year 2007 and newer diesel vehicles will take advantage of the reduced sulfur content of the fuel and will meet emission standards that represent reductions of 90% for particulate matter and over 90% for oxides of nitrogen. Fleet turnover to these newer vehicles will have a dramatic effect on reducing overall HDV emissions.

7.6 Methodology

The methodologies for the on-terminal and off-terminal port-related HDV components are presented below.

On-Terminal

The MOBILE6 model was used to calculate emissions for HDVs. The emission factor methodology described in Section 1.12.1 was applied, with source category-specific exceptions described below. The MOBILE6 vehicle types[124] most representative of the trucks and buses that are covered by this section are summarized in Table 7.2. Because the specific make-up of the truck fleet (in terms of the vehicle classifications) is not known, composite emission factors were developed to represent the three EPA heavy-duty diesel-fueled vehicle (HDDV) classes shown below. The composites were based on the MOBILE6 emission factors for the three classes apportioned according to the MOBILE6 mileage distribution for each of the classes.

Table 7.2[125] also shows the HDDV (truck) mileage distribution values assumed by the model, which were used to develop the composite emission factors shown in Tables 7.3 and 7.4. To develop the composites, each class-specific emission factor (HDDV7, 8A, 8B) was multiplied by the corresponding percentage of MOBILE6 VMT; then the three products were summed to calculate the composite value. An example for the NO_x emission factor is:

$$(10.9\ g/mile \times 0.11) + (14.7\ g/mile \times 0.13) + (13.6\ g/mile \times 0.76) = 13.4\ g/mile$$

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[124] EPA, *User's Guide to MOBILE6.1 and MOBILE6.2 Mobile Source Emission Factor Model*, EPA420-R-03-010, 2003. See: *http://www.epa.gov/otaq/models/mobile6/420r03010.pdf.*

[125] Vehicle type HDDBT is described as "Diesel Transit and Urban Buses" – seen as the most appropriate choice to represent the cruise passenger buses. The alternative MOBILE6 bus type is HDDBS, "Diesel School Buses," which seems less appropriate.

Table 7.2: Heavy-Duty Vehicles and Buses Included in Emission Estimates

Classification	Criteria	Percent of MOBILE6 VMT
HDDV7	26,001 - 33,000 lbs. GVWR	11%
HDDV8A	33,000 - 60,000 lbs. GVWR	13%
HDDV8B	over 60,000 lbs. GVWR	76%
HDDBT	Defined by usage	NA

The MOBILE6 model estimates vehicle emissions in terms of grams per mile, and these estimates are specific to the vehicles' average speed. The emission factors presented in Tables 7.3 and 7.4 are specific to the average terminal speed of 15 miles per hour (mph). Emission factors for methane and nitrous oxide were developed from EPA's national greenhouse gas emissions inventory report.[126] In addition, idling emission factors were developed to account for the on-terminal idling periods. These factors were developed according to previous EPA guidance based on the 2.5 mph emission factors (in g/miles) multiplied by 2.5.[127]

Table 7.3: Heavy-Duty Vehicle Emission Factors – Driving, g/mile

Pollutant	HDDV7 g/mile	HDDV8A g/mile	HDDV8B g/mile	Composite HDDV g/mile	Urban Bus g/mile
NO_x	10.9	14.7	13.6	13.4	15.6
CO	5.1	7.9	6.5	6.5	6.4
VOC	1.1	1.2	1.0	1.0	0.5
PM	0.40	0.52	0.34	0.37	0.29
SO_2	0.28	0.32	0.34	0.33	0.48
CO_2	1,356	1,579	1,636	1,596	2,345
CH_4	0.0051	0.0051	0.0051	0.0051	0.0051
N_2O	0.0048	0.0048	0.0048	0.0048	0.0048

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[126] EPA 2006. See Annex 3, Table A-95.

[127] EPA, *Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation*, EPA420-R-04-013, August 2004. See: *http://www.epa.gov/otaq/models/mobile6/420r04013.pdf.*

Table 7.4: Heavy-Duty Vehicle Emission Factors – Idling, g/hour

Pollutant	HDDV7 g/hour	HDDV8A g/hour	HDDV8B g/hour	Composite HDDV g/hour	Urban Bus g/hour
NO_x	42.4	55.3	50.9	50.5	24.6
CO	31.4	48.4	40.2	40.2	15.6
VOC	5.1	5.4	4.5	4.7	1.0
PM	0.99	1.30	0.85	0.92	0.29
SO_2	0.69	0.81	0.84	0.82	0.48
CO_2	3,390	3,948	4,089	3,991	2,345
CH_4	0.0128	0.0128	0.0128	0.0128	0.0128
N_2O	0.0120	0.0120	0.0120	0.0120	0.0120

The general form of the equation for estimating vehicle emissions is:

$$E = EF \times A$$

Where:

E = mass of emissions per defined period
EF = emission factor (g/mile or g/hour)
A = activity (miles driven or hours of idling)

Emissions were estimated by multiplying the miles driven or hours idling by the relevant emission factor.

Off-Terminal

To calculate the off-terminal port-related HDV emissions, data was obtained from the Washington Department of Ecology 2005 onroad mobile sources emission inventory prepared for Washington State, except for King, Pierce, Snohomish and Kitsap Counties.[128] For these counties, the metropolitan planning organization Puget Sound Regional Council conducted an analysis of off-terminal port-related HDV. While existing data on regional port-related truck activity is more detailed than other truck-related data, comprehensive data on regional off-terminal port-related truck activity is not currently available for the Puget Sound region. In order to quantify these emissions, a conservative, that is, high, estimate assumed that 3% of the total onroad heavy-duty diesel vehicle activity in the Puget Sound region, excluding King, Pierce, Snohomish and Kitsap Counties, was port-related. This conservative estimate is based on an origin-destination study conducted in 2004 by Washington State University, which is part of the larger statewide SFTA study scheduled to

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[128] WADOE 2006a.

be complete in 2007.[129] The three largest ports in the Puget Sound region (Ports of Everett, Seattle and Tacoma) are located in Snohomish, King, and Pierce Counties, respectively, and have the highest off-terminal port-related HDV activity levels in the study area. Data for Seattle as the port of origin showed the top ten destination cities for port-related trucks were Tacoma (30%), Portland (9%), Vancouver (5%), Longview (4%), Ellensburg (4%), Bellingham (3%), Yakima (3%), Aberdeen (3%), Fife (3%), and Wenatchee (2%).

The SFTA study, which was based on truck surveys conducted at highway weigh-stations, does not account for activity between ports, intermodal yards, and local distribution centers because they do not use routes that require stopping at weigh stations. In order to better understand off-terminal port-related HDV activities, emissions estimates for these trips within King, Pierce, Snohomish and Kitsap Counties were calculated using a separate methodology created by Puget Sound Clean Air Agency and Puget Sound Regional Council. Kitsap County is included in this methodology because it is within the Puget Sound Regional Council and Puget Sound Clean Air Agency jurisdictions.

Puget Sound Regional Council used the EPA MOBILE6 model to estimate emissions from off-terminal port-related HDV, which is consistent with the methodology used by Starcrest for the on-terminal calculations. Because the specific make-up of the truck fleet (in terms of vehicle classifications) is not known, composite HDV emission factors were developed for each pollutant based on the MOBILE6 emission factors and VMT fraction for each HDV vehicle classification listed in Table 7.5. The MOBILE6 input files used the most current vehicle registration data provided by the Washington Department of Ecology for calendar year 2005.[130] The MOBILE6 vehicle classifications of interest include:

Table 7.5: MOBILE6 Heavy-Duty Vehicle Classifications

Classification	GVWR, lbs
HDDV2b	8,501-10,000
HDDV3	10,001-14,000
HDDV4	14,001-16,000
HDDV5	16,001-19,500
HDDV6	19,501-26,000
HDDV7	26,001-33,000
HDDV8a	33,001-60,000
HDDV8b	>60,000

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[129] Washington State University in cooperation with Washington Department of Transportation, *Strategic Freight Transportation Analysis Freight Truck Origin and Destination Study, Methods, Procedures and Data Dictionary*, December, 2002. See: *http://www.sfta.wsu.edu/research/reports/pdf/Rpt_2_Data_Dictionary.pdf.*

[130] The 2006 vehicle registration data was used for this analysis, since 2005 data was not available.

Puget Sound Regional Council used their Travel Demand Model, which simulates all the travel in the region on an average weekday, to develop the weekday off-terminal port-related truck VMT for 2005. Among the vehicle classes modeled are heavy-duty trucks. The truck trip-ends are generated from estimates of employment, distributed using "typical" distributions of trip lengths, and assigned to the regional road system along with all other vehicles (personal vehicles, and light and medium trucks). The Ports of Seattle and Tacoma generate heavy-duty truck trips in excess of what is typical for their employment, so 'Special Generator' trips are added in before the trips are distributed. The resulting truck volumes are validated against truck counts where the counts are available.

The travel model used 2000 as a base year with forecasting for 2010, 2020, and 2030. Forecast VMT was developed for calendar year 2005 using a growth factor of 1.12.[131] Truck trips to and from the Ports of Everett, Seattle, and Tacoma and the corresponding distances and travel times were extracted from the 2000 model run. The other ends of the trips were aggregated to the following geographies:

- Distribution Centers – all analysis zones in the Green River Valley, from Renton to Sumner
- Interstate 5 South – at the Nisqually River
- Interstate 90 at Snoqualmie Pass
- Interstate 5 North – at the Skagit/Snohomish County line
- All other external stations
- Remainder of King County
- Snohomish County
- Remainder of Pierce County
- Kitsap County

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[131] From Puget Sound Regional Council Travel Demand Modeling calculations.

The key assumptions made by Puget Sound Regional Council for estimating the port-related off-terminal HDV 2005 VMT are summarized below:

- The heavy-duty truck trips to/from the ports are not typical of heavy-duty truck trips in the region, but tend to be either quite short (to the rail yards or the distribution centers) or quite long, leaving the region. Therefore the port trucks are underrepresented in the trips going to the external stations. In the model, the total numbers of truck trips associated with the ports was correct, but the percentages of trips from the Port of Seattle exiting the region on the major freeways was lower than the numbers provided by the Port of Seattle. A flow map from the Port of Tacoma contained similar information. The numbers generated by the model were adjusted manually to better reflect actual activity levels.[132] The internal regional trips were decreased accordingly so that the total trips from each Port remained the same as before.

- Approximately 2,000 trips per day to/from the Port of Seattle have the other ends at either the BNSF Railway or the UP rail yards. Again, because of their special nature, these trips are underrepresented in the model. 2,000 trips were removed from the Port of Seattle-Rest of King County flow and given a length of one mile and an average speed of 10 mph. The consistency of this assumption is found in the fact that, after these trips are subtracted, the Ports of Seattle and Tacoma have virtually the same number of trucks. Trains are loaded differently at the Port of Tacoma, but otherwise the two ports are approximately equal in activity.

- Travel speeds are not affected significantly by these adjustments, since heavy-duty trucks are a minor part of the traffic on most of the roads they use. Therefore these adjustments were applied to the numbers of trips and the resulting VMT, but not to the average speeds. Speeds have not changed appreciably from 2000 to 2005, so the same adjustment procedure (trips and VMT, but not speeds) should be used for any of the ensuing five years.

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[132] Multipliers of 5, 8, and 3 for trucks trips between the Port of Seattle an Interstate 5 South, Interstate 90, and Interstate 5 North, respectively, were applied to the model trips tables; multipliers of 4, 4, and 2 were applied for the Port of Tacoma.

VMT calculated by Puget Sound Regional Council for the ports of Everett, Seattle, and Tacoma is listed in Table 7.6. These calculations represent an estimate of VMT for off-terminal port-related HDV on a "typical" day using the best information available on trip counts, employment data, and travel patterns. As a comparison, the VMT data calculated for the Port of Seattle was compared to the VMT data calculated for the CTAS[133], and it was found that the Puget Sound Regional Council VMT was approximately 20% higher that the CTAS VMT. In particular, the VMT estimated by Puget Sound Regional Council for trips traveling eastbound on I-90 and those traveling to locations in the four-county region, such as east King County and Snohomish County, was higher. CTAS allocated a higher number of trips to the Duwamish River area and fewer trips to east King County and I-90. One possible reason for this discrepancy is the use of employment data by Puget Sound Regional Council to allocate trips, which could result in longer trip lengths. Based on Table 7.6, the total vehicle miles traveled were as follows:

- Year 2000 - 203,723 miles
- Year 2005 - 228,169 miles

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[133] HTI 2003.

Table 7.6: Puget Sound 2005 Regional Off-Terminal Port-Related Heavy-Duty Vehicle, Daily VMT

	Everett				Seattle				Tacoma			
Total Trips	335				4,518.8				2,604			
	# Trips	2000 VMT	2005 VMT	Avg. Speed	# Trips	2000 VMT	2005 VMT	Avg. Speed	# Trips	2000 VMT	2005 VMT	Avg. Speed
Location Distribution Centers	1.0	46.3	51.9	41.4	460.0	6,032.4	6,756.3	29.7	290.8	4,475.8	5,012.9	30.9
I-5 South	70.5	6,103.6	6,836.0	38.0	584.9	32,778.0	36,711.4	34.0	845.1	25,146.4	28,164.0	27.5
I-90	36.0	2,996.2	3,355.7	42.1	519.4	32,539.9	36,444.7	40.0	591.5	42,529.2	47,632.7	39.3
I-5 North	30.7	1,049.0	1174.9	31.5	172.3	11,191.7	12,534.7	37.3	156.2	1,4424.1	16,155.0	39.6
Other Externals	10.4	543.1	608.3	26.3	6.4	553.7	620.1	37.5	4.3	371.2	415.7	36.0
Rest of King County	18.0	506.5	567.3	38.7	699.4	4,696.7	5,260.3	21.5	248.8	4,760.6	5,331.9	33.6
Snohomish County	164.3	1,167.3	1,307.4	24.8	61.7	1,889.8	2,116.6	37.0	21.9	1,414.4	1,584.1	42.1
Rest of Pierce County	2.9	201.9	226.1	42.8		1,447.7	1621.4	38.7	433.0	3,605.5	4,038.2	25.9
Kitsap County	1.2	62.9	70.4	37.9	14.7	683.7	765.7	44.6	12.4	505.2	565.8	41.0
Rail Yards					2,000	2,000	2,240	10				
Total VMT		**12,6777**	**14,198**			**93,814**	**105,071**			**97,232**	**108,900**	

7.7 Emission Estimates

On-terminal and off-terminal port-related HDV emissions are presented separately below.

7.7.1 On-Terminal

The 2005 on-terminal heavy-duty vehicle emissions for Puget Sound are summarized in this section. Tables 7.7 and 7.8 summarize the on-terminal heavy-duty vehicle emission estimates for criteria pollutants and for greenhouse gases, respectively. Tables 7.9 through 7.12 illustrate the breakdown between running (driving) and idling emissions for heavy-duty trucks on-terminal. The limited amounts of idling emissions from cruise terminal buses are presented in Tables 7.13 and 7.14.

Relative to the criteria pollutant emissions values, the reader is advised that PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together.

Table 7.7: Puget Sound 2005 Heavy-Duty Vehicle On-Terminal Criteria Pollutant Emissions, tpy

Terminal ID	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSS050	112.55	10.01	82.30	2.02	2.27	2.09	2.27
PST050	17.41	1.55	12.73	0.31	0.35	0.32	0.35
PSS080	15.54	1.38	11.36	0.28	0.31	0.29	0.31
PSS070	14.10	1.25	10.31	0.25	0.28	0.26	0.28
PST060	11.28	1.00	8.25	0.20	0.23	0.21	0.23
PST020	10.53	0.94	7.70	0.19	0.21	0.20	0.21
PST040	5.37	0.48	3.92	0.10	0.11	0.10	0.11
PSS030	4.37	0.39	3.20	0.08	0.09	0.08	0.09
PST030	2.67	0.24	1.95	0.05	0.05	0.05	0.05
PSOALL	2.31	0.21	1.69	0.04	0.05	0.04	0.05
PSS060	2.20	0.20	1.61	0.04	0.04	0.04	0.04
PSEALL	1.49	0.13	1.09	0.03	0.03	0.03	0.03
PSPALL	0.46	0.04	0.33	0.01	0.01	0.01	0.01
PSAALL	0.25	0.02	0.19	0.00	0.01	0.00	0.01
PST070	0.24	0.02	0.18	0.00	0.00	0.00	0.00
PST090	0.06	0.00	0.03	0.00	0.00	0.00	0.00
Total	**200.82**	**17.85**	**146.83**	**3.60**	**4.05**	**3.73**	**4.05**

Table 7.8: Puget Sound 2005 Heavy-Duty Vehicle On-Terminal Greenhouse Gas Emissions, tpy

				CO_2 Equivalents			
Terminal ID	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
PSS050	9,835.26	0.03	0.03	9,835.26	9.17	0.66	9,845.09
PST050	1,521.29	0.00	0.00	1,521.29	1.42	0.10	1,522.81
PSS080	1,357.95	0.00	0.00	1,357.95	1.27	0.09	1,359.31
PSS070	1,231.81	0.00	0.00	1,231.81	1.15	0.08	1,233.04
PST060	985.45	0.00	0.00	985.45	0.92	0.07	986.44
PST020	920.53	0.00	0.00	920.53	0.86	0.06	921.45
PST040	468.84	0.00	0.00	468.84	0.44	0.03	469.31
PSS030	381.86	0.00	0.00	381.86	0.36	0.03	382.24
PST030	233.24	0.00	0.00	233.24	0.22	0.02	233.48
PSOALL	201.77	0.00	0.00	201.77	0.19	0.01	201.97
PSS060	192.16	0.00	0.00	192.16	0.18	0.01	192.35
PSEALL	130.07	0.00	0.00	130.07	0.12	0.01	130.20
PSPALL	40.03	0.00	0.00	40.03	0.04	0.00	40.07
PSAALL	22.17	0.00	0.00	22.17	0.02	0.00	22.19
PST070	21.20	0.00	0.00	21.20	0.02	0.00	21.22
PST090	7.58	0.00	0.00	7.58	0.01	0.00	7.59
Total	**17,551**	**0.05**	**0.06**	**17,551**	**16.36**	**1.18**	**17,569**

Table 7.9: Puget Sound 2005 Heavy-Duty Vehicle On-Terminal Criteria Pollutant Emissions Breakdown, Driving, tpy

Terminal ID	**NO_x**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**DPM**
PSS050	23.62	1.81	11.50	0.58	0.65	0.60	0.65
PST050	3.65	0.28	1.78	0.09	0.10	0.09	0.10
PSS080	3.26	0.25	1.59	0.08	0.09	0.08	0.09
PSS070	2.96	0.23	1.44	0.07	0.08	0.07	0.08
PST060	2.37	0.18	1.15	0.06	0.07	0.06	0.07
PST020	2.21	0.17	1.08	0.05	0.06	0.06	0.06
PST040	1.13	0.09	0.55	0.03	0.03	0.03	0.03
PSS030	0.92	0.07	0.45	0.02	0.03	0.02	0.03
PST030	0.56	0.04	0.27	0.01	0.02	0.01	0.02
PSOALL	0.48	0.04	0.24	0.01	0.01	0.01	0.01
PSS060	0.46	0.04	0.22	0.01	0.01	0.01	0.01
PSEALL	0.31	0.02	0.15	0.01	0.01	0.01	0.01
PSPALL	0.10	0.01	0.05	0.00	0.00	0.00	0.00
PSAALL	0.05	0.00	0.03	0.00	0.00	0.00	0.00
PST070	0.05	0.00	0.02	0.00	0.00	0.00	0.00
PST090	0.03	0.00	0.01	0.00	0.00	0.00	0.00
Total	**42.16**	**3.24**	**20.53**	**1.03**	**1.16**	**1.07**	**1.16**

Table 7.10: Puget Sound 2005 Heavy-Duty Vehicle On-Terminal Criteria Pollutant Emissions Breakdown, Idling, tpy

Terminal ID	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSS050	88.93	8.19	70.80	1.44	1.62	1.49	1.62
PST050	13.76	1.27	10.95	0.22	0.25	0.23	0.25
PSS080	12.28	1.13	9.77	0.20	0.22	0.21	0.22
PSS070	11.14	1.03	8.87	0.18	0.20	0.19	0.20
PST060	8.91	0.82	7.09	0.14	0.16	0.15	0.16
PST020	8.32	0.77	6.63	0.13	0.15	0.14	0.15
PST040	4.24	0.39	3.37	0.07	0.08	0.07	0.08
PSS030	3.45	0.32	2.75	0.06	0.06	0.06	0.06
PST030	2.11	0.19	1.68	0.03	0.04	0.04	0.04
PSOALL	1.82	0.17	1.45	0.03	0.03	0.03	0.03
PSS060	1.74	0.16	1.38	0.03	0.03	0.03	0.03
PSEALL	1.18	0.11	0.94	0.02	0.02	0.02	0.02
PSPALL	0.36	0.03	0.29	0.01	0.01	0.01	0.01
PSAALL	0.20	0.02	0.16	0.00	0.00	0.00	0.00
PST070	0.19	0.02	0.15	0.00	0.00	0.00	0.00
PST090	0.03	0.00	0.02	0.00	0.00	0.00	0.00
Total	**158.66**	**14.62**	**126.31**	**2.57**	**2.90**	**2.66**	**2.90**

Table 7.11: Puget Sound 2005 Heavy-Duty Vehicle On-Terminal Greenhouse Gas Emissions Breakdown, Driving, tpy

				CO_2 Equivalents			
Terminal ID	CO_2	CH_4	N_2O	CO_2	N_2O	CH_4	Total
PSS050	2,810.07	0.01	0.01	2,810.07	2.78	0.18	2,813.03
PST050	434.65	0.00	0.00	434.65	0.43	0.03	435.11
PSS080	387.99	0.00	0.00	387.99	0.38	0.02	388.39
PSS070	351.95	0.00	0.00	351.95	0.35	0.02	352.32
PST060	281.56	0.00	0.00	281.56	0.28	0.02	281.85
PST020	263.01	0.00	0.00	263.01	0.26	0.02	263.29
PST040	133.96	0.00	0.00	133.96	0.13	0.01	134.10
PSS030	109.10	0.00	0.00	109.10	0.11	0.01	109.22
PST030	66.64	0.00	0.00	66.64	0.07	0.00	66.71
PSOALL	57.65	0.00	0.00	57.65	0.06	0.00	57.71
PSS060	54.90	0.00	0.00	54.90	0.05	0.00	54.96
PSEALL	37.16	0.00	0.00	37.16	0.04	0.00	37.20
PSPALL	11.44	0.00	0.00	11.44	0.01	0.00	11.45
PSAALL	6.34	0.00	0.00	6.34	0.01	0.00	6.34
PST070	6.06	0.00	0.00	6.06	0.01	0.00	6.06
PST090	4.39	0.00	0.00	4.39	0.00	0.00	4.39
Total	**5,017**	**0.02**	**0.02**	**5,017**	**4.97**	**0.32**	**5,022**

Table 7.12: Puget Sound 2005 Heavy-Duty Vehicle On-Terminal Greenhouse Gas Emissions Breakdown, Idling, tpy

				CO_2 Equivalents			
Terminal ID	**CO_2**	**CH_4**	**N_2O**	**CO_2**	**N_2O**	**CH_4**	**Total**
PST020	7,025.19	0.02	0.02	7,025.19	6.96	0.44	7,032.59
PST030	1,086.64	0.00	0.00	1,086.64	1.08	0.07	1,087.78
PST040	969.97	0.00	0.00	969.97	0.96	0.06	970.99
PST050	879.87	0.00	0.00	879.87	0.87	0.06	880.79
PST060	703.89	0.00	0.00	703.89	0.70	0.04	704.63
PST070	657.52	0.00	0.00	657.52	0.65	0.04	658.22
PSS030	334.89	0.00	0.00	334.89	0.33	0.02	335.24
PSS050	272.76	0.00	0.00	272.76	0.27	0.02	273.05
PSS060	166.60	0.00	0.00	166.60	0.16	0.01	166.78
PSS070	144.12	0.00	0.00	144.12	0.14	0.01	144.27
PSS080	137.26	0.00	0.00	137.26	0.14	0.01	137.40
PSAALL	92.91	0.00	0.00	92.91	0.09	0.01	93.01
PSEALL	28.60	0.00	0.00	28.60	0.03	0.00	28.63
PSPALL	15.84	0.00	0.00	15.84	0.02	0.00	15.85
PSOALL	15.14	0.00	0.00	15.14	0.01	0.00	15.16
PST090	0.15	0.00	0.00	0.15	0.00	0.00	0.15
Total	**12,531**	**0.04**	**0.04**	**12,531**	**12.41**	**0.79**	**12,545**

Table 7.13: Puget Sound 2005 Cruise Terminal Bus On-Terminal Criteria Pollutant Idling Emissions, tpy

Terminal ID	**NO_x**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**DPM**
PSS020	0.0430	0.0017	0.0273	0.0008	0.0005	0.0005	0.0005

Table 7.14: Puget Sound 2005 Cruise Terminal Bus On-Terminal Greenhouse Gas Idling Emissions, tpy

				CO_2 Equivalents			
Terminal ID	**CO_2**	**CH_4**	**N_2O**	**CO_2**	**N_2O**	**CH_4**	**Total**
Total	7.13	0.00004	0.00004	7.13	0.0120	0.0008	7.15

7.7.2 Off-Terminal

Puget Sound Regional Council estimated emissions of CO, VOC and NO_x from HDVs based on the average speeds and corresponding VMT illustrated in Table 7.6; the calculations for SO_2, CO_2, and $PM_{2.5}$ were based on total VMT since the emission factors for these pollutants are not affected by differences in speed.[134] DPM estimates were not reported for HDDV and were approximated by the $PM_{2.5}$ values provided by Ecology and Puget Sound Regional Council. Table 7.16 provides the estimated annual emissions for all HDDV activity in the study area by county; Table 7.17 provides the estimated annual emissions of off-terminal port-related HDDV activity by county. The data provided by the Washington Department of Ecology and the Puget Sound Regional Council assumes that off-terminal port-related HDV activity occurs seven days per week/365 days per year. In general, cargo terminals in the Puget Sound region operate only five days per week/260 days per year and operate on nights and weekends on an as-needed basis. The assumption of 365 days of activity results in a very conservative estimate of off-terminal port-related HDV activity in the Puget Sound region. The number of days of off-terminal port-related HDV activity was not scaled back in order to maintain consistency between the Washington Department of Ecology and Puget Sound Regional Council data sets.

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[134] Given the characteristics of port activity, the analysis assumes truck traffic will occur every day throughout the year, rather than only on weekdays; therefore, a conversion factor of 365 was used.

Table 7.16: Puget Sound 2005 Regional Heavy-Duty Vehicle Emissions by County, tpy

County	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	CO_2
Clallam	524	24	135	13	19	14	14	59,390
Island	473	21	122	12	16	13	13	53,593
Jefferson	371	17	95	9	13	10	10	42,047
King	19,253	874	4,953	476	672	549	549	2,181,513
Kitsap	1,872	85	482	46	66	54	54	212,090
Mason	506	23	130	13	18	14	14	57,355
Pierce	7,071	321	1,819	175	247	202	202	801,211
San Juan	39	2	10	1	1	1	1	4,362
Skagit	1,425	65	367	35	49	40	40	161,435
Snohomish	6,146	279	1,581	152	215	175	175	696,338
Thurston	2,541	115	654	63	89	72	72	287,885
Whatcom	1,613	73	415	40	56	46	46	182,716
Total	**41,834**	**1,899**	**10,763**	**1,035**	**1,461**	**1,190**	**1,190**	**4,739,935**

Table 7.17: Puget 2005 Sound Off-Terminal Port-Related Heavy-Duty Vehicle Emissions by County, tpy

County	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM	CO_2
Clallam	15.72	0.72	4.05	0.39	0.57	0.42	0.42	1,781.70
Island	14.19	0.63	3.66	0.36	0.48	0.39	0.39	1,607.79
Jefferson	11.13	0.51	2.85	0.27	0.39	0.30	0.30	1,261.41
King	553.75	27.02	149.86	18.12	23.11	20.00	20.00	80,675.54
Kitsap	6.86	0.29	1.61	0.22	0.28	0.24	0.24	975.70
Mason	15.18	0.69	3.90	0.39	0.54	0.42	0.42	1,720.65
Pierce	230.78	12.98	70.89	7.62	9.72	8.41	8.41	33,936.67
San Juan	1.17	0.06	0.30	0.03	0.03	0.03	0.03	130.86
Skagit	42.75	1.95	11.01	1.05	1.47	1.2	1.2	4,843.05
Snohomish	103.66	4.92	26.92	3.41	4.35	3.76	3.76	15,190.34
Thurston	76.23	3.45	19.62	1.89	2.67	2.16	2.16	8,636.55
Whatcom	48.39	4.38	12.45	1.20	1.68	1.38	1.38	5,481.48
Total	**1,119.81**	**57.6**	**307.12**	**34.95**	**45.29**	**38.71**	**38.71**	**156,241.74**

7.8 Emission Control Benefits

No emission reduction technologies or alternative fuels were identified as in use in 2005 for this source category.

7.9 Strengths, Limitations, and Recommendations

The strengths, limitations and recommendations are summarized separately for the on-terminal and off-terminal port-related components below.

7.9.1 On-Terminal

This inventory represents a terminal-by-terminal estimate of emissions based on the best information available from terminal operators. In some cases the operators track such parameters as time spent on terminal, in other cases the times are estimates based on the operator's best knowledge of operations, so the uncertainty associated with the data is variable. Most of the parameters included in the estimates, such as speeds, distances, and idling times, are estimates that could be refined by closer measurement and/or recordkeeping.

While none of the terminals contacted currently keep the types of records used in California to develop the port-specific age distribution, some means of estimating the age distribution of Puget Sound area trucks engaged in maritime commerce would provide a useful enhancement to the emissions inventory process. The collection of data on the distances traveled by trucks serving marine terminals would be of great value in refining HDV emission estimates, as would more detailed information on trip origins and destinations and on the size classes and ages (model years) of the trucks involved.

7.9.2 Off-Terminal

This inventory represents a region-wide estimate of off-terminal port-related HDV and locomotive emissions based on estimates of 2005 activity levels. Data such as vehicle year, vehicle class (based on GVWR), speed, and VMT were estimated using the MOBILE6 model, the Puget Sound Regional Council Travel Demand Model, and vehicle registration data provided by the Washington Department of Ecology. Most of these parameters could be improved through closer measurement and/or recordkeeping and emissions estimates could be refined using more complete data. Additionally, no data was provided for DPM, which were approximated by the $PM_{2.5}$ reported. Adding DPM from onroad HDV and locomotives to the current emissions inventories conducted by the Washington Department of Ecology and the Puget Sound Clean Air Agency would make this data set complete.

The off-terminal port-related HDV emission estimates are based on the best available data provided by a variety of agencies including WSDOT, Washington Department of Ecology, Puget Sound Clean Air Agency, Puget Sound Regional Council, the ports, and regional and metropolitan planning organizations within the study area.135 At the beginning of this analysis, it was assumed that the necessary data was available from state and local agencies. While data was available on heavy-duty truck activity and freight mobility in general within Washington State, very little data was available on off-terminal port-related HDV activity, which greatly limited the accuracy of this analysis. A comprehensive analysis of off-terminal port-related HDV activity in the Puget Sound region, as well as truck fleet age distribution data, is needed in order to accurately understand and address emissions from this segment of the goods movement chain. The Transportation Northwest at the University of Washington (TransNow) is a University Transportation Center (UTC) administered by the U.S. Department of Transportation through the Research and Innovative Technology Administration (RITA).136 TransNow is currently working on port-related trucking study to improve "Freight Modeling of Containerized Cargo Shipments between Ocean Port, Handling Facility, and Final Market for Regional Policy and Planning". Incorporation of data from the TransNow research and the SFTA Study, when complete, is recommended.

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[135] The regional and metropolitan planning organizations in the Puget Sound region are the Peninsula Regional Transportation Planning Organization (Clallam, Jefferson, and Mason Counties), Puget Sound Regional Council (King, Kitsap, Pierce, and Snohomish Counties), Skagit Metropolitan Planning Organization (Skagit and Island Counties), Thurston Regional Planning Council (Thurston County), and Whatcom Council of Governments (Whatcom County). San Juan County is not in the jurisdiction of a regional or metropolitan planning organization.

[136] TransNow. See: *http://www.transnow.org.*

SECTION 8 FLEET VEHICLES

Section 8 provides an overview of the on terminal-fleet vehicles, primarily light-duty, found at Puget Sound ports, as well as passenger-owned vehicles using cruise terminal parking areas, minivans shuttling cruise passengers, and new import or export vehicles that are driven on to or off ocean-going vessels. A description of the methodology used to estimate emissions is provided in this section, as well as the emission estimates for this source category.

8.1 Source Description

This source category generally includes passenger cars and trucks designed to be licensed for onroad use, but operated primarily on-terminal, including some heavy-duty vehicles. Whether they are actually licensed for onroad travel (many terminal vehicles are not) does not affect the method of estimating their emissions. The heavy-duty vehicles included in the on-terminal fleet vehicle source category typically do not carry cargo to off-terminal destinations, as do the heavy-duty vehicles that make up the heavy-duty vehicle source category. On-terminal fleet vehicles and passenger-owned vehicles parking at the Port of Seattle cruise terminals were included. Also, the emissions from new import or export vehicles driven on or off ocean-going vessels are included. The heavy-duty trucks that carry them are included in Section 7. Employee personal vehicles were not included since they are not owned or operated by the ports or terminal operators, are used primarily off-port property, and are included in agency mobile source emission estimates.

8.2 Geographical Delineation

The geographical extent for the on-terminal vehicles is similar to that of the cargo handling equipment and includes the marine terminals and facilities associated with the following Puget Sound ports:

- Port of Anacortes
- Port of Everett
- Port of Seattle
- Port of Tacoma

The Ports of Olympia and Port Angeles did not report any fleet vehicles (they are likely to have few, if any, fleet vehicles). The Port of Seattle is the only port with a cruise terminal, and thus the only port for which passenger-owned vehicle emissions were estimated. The Port of Tacoma Marshall Auto Facility is the only terminal with new import or export vehicles that are driven on and off ocean-going vessels.

8.3 Data and Information Acquisition

Data was collected by e-mail requests and during in-person and phone interviews with terminal owners and equipment operators during the cargo handling equipment data collection process. The data collection approach focused on VMT. In some cases, annual hours of operation and on-terminal speed limit were used to determine VMT. In a number of cases, data for representative vehicles was averaged and applied to vehicles for which one or more parameters was unavailable. Data was assigned for 49 model years, 377 speeds, and 191 mileage values. Vehicle class was assigned based on vehicle description for all but 12 vehicles, for which GVWR was provided. For passenger-owned vehicles and mini-vans used at cruise terminals, vessel calls and passenger throughput were obtained, and activity data was estimated from that. For new vehicles driven on and off ocean-going vessels, the annual vehicle throughput and miles traveled on terminal was collected. The data used in the development of the fleet vehicle emission estimates is summarized in Appendix E-5.

8.4 Operational Profiles

Operational profiles are described for fleet vehicles and passenger-owned vehicles parking at cruise terminals. Table 8.1 shows the breakdown of the vehicle fleet (not including passenger-owned vehicles) by terminal, number of vehicles, model year range and average, and fuel type. The number of passenger-owned vehicles using the cruise terminals was estimated based on the number of cruise vessels taking on passengers at the Port, and vehicle model years and fuel types were based on assumptions outlined below. The assumptions upon which the new vehicle emissions from the auto transfer facility are based are also provided below.

Table 8.1: Puget Sound 2005 On-Terminal Fleet Vehicle Characteristics

Terminal		Model Year		Fuel Type				
No.	Count	Range	Average	Gasoline	Diesel	Propane	ULSD	Ethanol
PSS010	166	1978 - 2006	1997	161	5	0	0	0
PST010	105	1977 - 2006	1997	98	2	2	2	1
PSS050	85	1979 - 2006	1996	85	0	0	0	0
PSS080	67	1989 - 2006	1999	55	12	0	0	0
PST020	47	1983 - 2005	2000	38	7	0	2	0
PST050	41	1997 - 1997	1997	41	0	0	0	0
PSE010	32	1981 2000	1992	30	2	0	0	0
PSS070	23	1976 - 2000	1994	17	0	6	0	0
PST070	14	1989 - 2002	1993	10	1	3	0	0
PSA101	12	1968 - 2006	1989	12	0	0	0	0
PSE030	7	1982 1993	1992	2	5	0	0	0
PST060	5	1996 - 1996	1996	0	5	0	0	0
PSS060	4	1986 - 2005	1993	4	0	0	0	0
PST100	4	1987 - 1995	1991	4	0	0	0	0
PSS090	2	1990 - 1996	1993	2	0	0	0	0
Totals	**614**			**559**	**39**	**11**	**4**	**1**

8.4.1 On-Terminal Fleet Vehicles

The on-terminal fleet vehicles consisted of 614 passenger cars and trucks with a model year range of 1968 to 2006 (average model year, 1997). Mileage per vehicle for the year 2005 ranged from zero to 74,640, with an average of 7,314. As shown in Table 8.2 and Figure 8.1, the 614 fleet vehicles identified were fueled primarily by gasoline (91%); the remaining 9% were fueled by diesel, propane and ULSD fuel. One vehicle was fueled with ethanol, however, 2005 mileage was reported as zero for this vehicle.

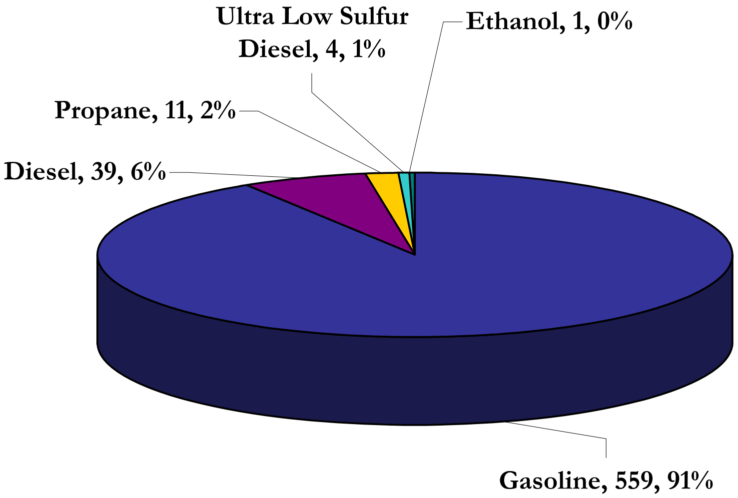
The five PSE030 heavy-duty vehicles included in this source category represent multiple trucks/trips. A log of truck trips for December 2005 was provided by the Port. Data from the first two weeks of December, which averaged 108.3 truck trips per week day, was considered representative. This value was applied to the proportion of trips by various vehicle types (e.g., log carrier or wood chip truck) to obtain annual trip data for each type. Since no individual truck data was provided, characteristics and activity were assumed for various truck types as follows:

- Vehicle year: 1995
- Gross vehicle weight rating: 80,000 pounds
- Fuel: onroad diesel
- Mileage: - log carrier – 10,013; semi-tractor – 7,481; wood chips truck – 2,531; fuel tanker – 281; other equipment – 47

Table 8.2: Puget Sound 2005 On-Terminal Fleet Vehicle Fuel Types

Fuel Type	Vehicle Count
Gasoline	559
Diesel	39
Propane	11
Ultra Low Sulfur Diesel	4
Ethanol	1

Figure 8.1: Puget Sound 2005 On-Terminal Fleet Vehicle Fuel Types



8.4.2 Cruise Terminal Passenger-Owned Vehicles

687,000 passengers passed through the Port of Seattle cruise terminals in 2005 for 169 vessel cruises. It was assumed that 40%[137] of the passengers used vehicles (rather than buses, taxis, ferries, or walking) to get to the cruise terminals, and that each vehicle carried an average of three persons, for a total of 91,600 vehicles. Of the 169 cruises, 80 trips (47%) were from Pier 66 and 89 trips (53%) were from Terminal 30, thus 48,361 vessels were assigned to Pier 66 and 48,239 vehicles were assigned to Terminal 30. At Pier 66, passenger-owned vehicles park in nearby parking garages, often the Port-owned garage across Alaskan Way from Pier 66; parking for Terminal 30 is on terminal. For modeling purposes, the distance traveled on terminal by the passenger-owned vehicles was estimated to be an average of 0.10 miles, and the speed was estimated to be 15 mph.

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[137] Consistent with data reported by Heffron Transportation, Inc. (HTI), *Transportation Technical Report for Draft EIS Cruise Terminal at Terminal 91*, 14 September 2006. This report may be found at the following link for Volume 2, in Appendix D (see Figure 14 in HTI report; page 202 of pdf file). *http://www.portseattle.org/downloads/community/environment/t30containervol2.pdf.*

In addition to the passenger-owned vehicles, minivans used to transport passengers to Pier 66 were included with the passenger-owned vehicles. There were 240 minivan trips in 2005, and the distance traveled on- or near-terminal was estimated to be 0.25 miles, with a speed of 15 mph. All vehicles were assumed to be gasoline-fueled.

Off-terminal vehicles miles traveled and associated emissions are accounted for by the Puget Sound Regional Council and regional clean air agencies in their area emissions inventories. Annual trips related to cruise operations are a very small fraction of total regional vehicle miles traveled and thus are not calculated separately in this inventory.

8.4.3. New Import and Export Vehicles

The Port of Tacoma Marshall Avenue Auto Terminal 2005 throughput was 135,900 vehicles. Model years were assumed to be 2005 or later, and the vehicles were estimated to be driven two miles each. Seventy percent of the vehicles were assumed to be cars (MOBILE6 classification LDGV) and thirty percent of the vehicles were assumed to be light trucks (LDGT2). All vehicles were assumed to be gasoline fueled.

8.5 Emission Reduction Technologies Identified

Data on ultra-low and low emission vehicles (ULEV and LEV) was not provided. Less than three percent of the fleet of 614 vehicles (15 vehicles) is alternatively fueled and thus emission savings are anticipated to be nominal.

The Port of Everett purchased its first electric vehicle in October 2006. The Global Electric Motorcars (GEM) vehicle travels at a maximum of 25 mph, which is suited for its intended use by the Port's Harbor Attendant. If the GEM car performs as envisioned, the Port will look into replacing some of the Marina's smaller trucks with the electric vehicles at the end of their life expectancy.[138]

8.6 Methodology

The EPA MOBILE6 model was used to calculate vehicle emissions as described in Section 7.6. Table 8.3 and Figure 8.2 match the Puget Sound ports' vehicles (not including passenger-owned vehicles or cargo vehicles) to the MOBILE6 classifications.

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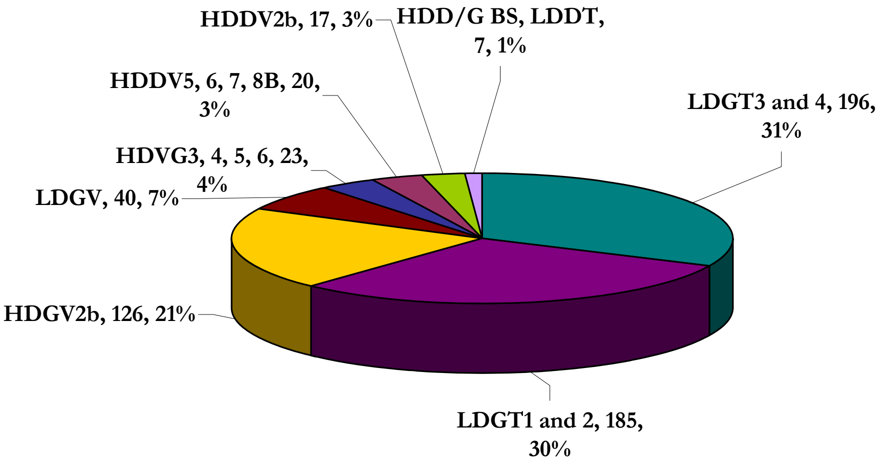
[138] Seaports Press Review, 30 October 2006. *Port of Everett Purchases 1st Electric Car*, 25 October 2006. See: *http://www.seaportspr.com.*

Table 8.3: Puget Sound 2005 On-Terminal Fleet Vehicle Classifications

Vehicle Classification	GVWR (lbs.)	Model Abbreviation	Count
Light-Duty Gasoline Trucks	6,001 to 8,500	LDGT3 and 4	196
Light-Duty Gasoline Trucks	0 – 6,000	LDGT1 and 2	185
Heavy-Duty Gasoline Vehicles	8,501 – 10,000	HDGV2b	126
Light-Duty Gasoline Vehicles	Passenger Cars	LDGV	40
Heavy-Duty Gasoline Vehicles	10,001 – 26,000	HDVG 3, 4, 5 and 6	23
Heavy-Duty Diesel Vehicles	16,001 – 33,000	HDDV5, 6, 7 and 8b	20
Heavy-Duty Diesel Vehicles	8,501 – 10,000	HDDV2b	17
Diesel Bus	NA	HDDBS	3
Gasoline Bus	NA	HDDGS	3
Light-Duty Diesel Trucks	6,001 to 8,500	LDDT	1

Figure 8.2: Puget Sound 2005 On-Terminal Fleet Vehicle Classifications



Almost one-third (31%) of the fleet vehicles are light-duty gasoline fueled trucks with a GVWR of 6,001 to 8,500 lbs. Almost another third (30%) are similar trucks with a GVWR of up to 6,000 lbs. One-fifth of the vehicles are heavy-duty gasoline fueled vehicles of a GVWR of 8,501 – 10,000 lbs. Seven percent of the vehicles are passenger cars, and the remainder of the fleet consists of heavy-duty vehicles, both gasoline and diesel-fueled.

The model years for eleven fleet vehicles were reassigned to the earliest year that MOBILE6 can accommodate, since the model includes only the previous 25 years; these vehicles had model years ranging from 1968 to 1980. For cruise terminal passenger-owned vehicles, MOBILE6 was used to compute a fleet average emissions rate (since vehicle model years were not available). This composite factor is a weighted average of the emissions factors associated with 25 model years. The model year distribution was based on the registration data sent by the Seattle Department of Transportation.

The emission factors for nitrous oxide and methane and are presented in Tables 8.4 (alternative fuels) and 8.5 (gasoline and diesel fuels).[139] To be consistent with the MOBILE6 model year constraints, for any vehicle with a model year prior to 1981, the 1981 model year factors were used.

Table 8.4: Alternative Fueled Light-Duty Vehicle Emissions Factors for N_2O and CH_4, g/mile

Vehicle Type	Fuel	N_2O	CH_4
Light-duty Vehicle	Propane (LPG)	0.008	0.038
Light-duty Vehicle	Ethanol	0.076	0.043
Heavy-duty Vehicle	Propane (LPG)	0.150	0.108

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[139] EPA 2006. See Annex 3, Tables A-91 - 96.

Table 8.5: Gasoline and Diesel Fueled LDV and HDV Emissions Factors for N_2O and CH_4, g/mile

	Light-Duty Vehicles								Heavy-Duty Vehicles			
	Gasoline				Diesel				Gasoline		Diesel	
Model Year	Passenger Car		Light Duty Truck		Passenger Car		Light Duty Truck		All		All	
	N_2O	CH_4	N_2O	CH_4	N_2O	CH_4	N_2O	CH_4	N_2O	CH_4	N_2O	CH_4
1981	0.06256	0.08017	0.06599	0.14790	0.0012	0.0006	0.0017	0.0011	0.04970	0.46040	0.0048	0.0051
1982	0.06270	0.07951	0.06807	0.14420	0.0012	0.0006	0.0017	0.0011	0.05380	0.44916	0.0048	0.0051
1983	0.06298	0.07821	0.07224	0.13680	0.0010	0.0005	0.0014	0.0009	0.05380	0.44916	0.0048	0.0051
1984	0.06470	0.07040	0.07641	0.12940	0.0010	0.0005	0.0014	0.0009	0.05380	0.44916	0.0048	0.0051
1985	0.06470	0.07040	0.08058	0.12200	0.0010	0.0005	0.0014	0.0009	0.05152	0.40898	0.0048	0.0051
1986	0.06470	0.07040	0.08475	0.11460	0.0010	0.0005	0.0014	0.0009	0.05152	0.40898	0.0048	0.0051
1987	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.08489	0.36746	0.0048	0.0051
1988	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.09333	0.34921	0.0048	0.0051
1989	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.09333	0.34921	0.0048	0.0051
1990	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.11417	0.32458	0.0048	0.0051
1991	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.11417	0.32458	0.0048	0.0051
1992	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.11417	0.32458	0.0048	0.0051
1993	0.06470	0.07040	0.10352	0.08130	0.0010	0.0005	0.0014	0.0009	0.11417	0.32458	0.0048	0.0051
1994	0.05598	0.05308	0.09820	0.06464	0.0010	0.0005	0.0014	0.0009	0.11417	0.32458	0.0048	0.0051
1995	0.04726	0.03576	0.09080	0.05168	0.0010	0.0005	0.0014	0.0009	0.11417	0.32458	0.0048	0.0051
1996	0.04270	0.02733	0.08710	0.04520	0.0010	0.0005	0.0015	0.0010	0.16803	0.12778	0.0048	0.0051
1997	0.04239	0.02701	0.08710	0.04520	0.0010	0.0005	0.0015	0.0010	0.17260	0.09239	0.0048	0.0051
1998	0.04021	0.02577	0.07260	0.04048	0.0010	0.0005	0.0015	0.0010	0.16916	0.06462	0.0048	0.0051
1999	0.03607	0.02373	0.05593	0.03505	0.0010	0.0005	0.0015	0.0010	0.14288	0.06064	0.0048	0.0051
2000	0.03131	0.02139	0.06173	0.03694	0.0010	0.0005	0.0015	0.0010	0.10784	0.05533	0.0048	0.0051
2001	0.02282	0.01721	0.01533	0.02184	0.0010	0.0005	0.0015	0.0010	0.12244	0.05754	0.0048	0.0051
2002	0.02241	0.01700	0.02185	0.02396	0.0010	0.0005	0.0015	0.0010	0.12974	0.05865	0.0048	0.0051
2003	0.02220	0.01690	0.01460	0.02160	0.0010	0.0005	0.0015	0.0010	0.12390	0.05777	0.0048	0.0051
2004	0.02220	0.01690	0.01460	0.02160	0.0010	0.0005	0.0015	0.0010	0.03630	0.04451	0.0048	0.0051
2005	0.02220	0.01690	0.01460	0.02160	0.0010	0.0005	0.0015	0.0010	0.03630	0.04451	0.0048	0.0051
2006	0.02220	0.01690	0.01460	0.02160	0.0010	0.0005	0.0015	0.0010	0.03630	0.04451	0.0048	0.0051

8.7 Emission Estimates

The 2005 on-terminal fleet vehicle and other vehicle emissions for Puget Sound are summarized in this section.

Relative to the criteria pollutant emissions values, the reader is advised that PM_{10}, $PM_{2.5}$, and DPM represent various fractions, sometimes overlapping, of the same pollutant and thus cannot be added together.

Table 8.6: Puget Sound 2005 On-Terminal Fleet Vehicle Criteria Pollutant Emissions by Terminal, tpy

Terminal	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
PSA010	0.06	0.06	0.48	0.000	0.000	0.000	0.000
PSE010	0.31	0.35	2.50	0.002	0.005	0.005	0.004
PSE030	0.42	0.06	0.62	0.003	0.005	0.005	0.005
PSS010	3.22	1.98	18.69	0.004	0.009	0.009	0.008
PSS050	0.61	0.52	5.57	0.000	0.000	0.000	0.000
PSS060	0.04	0.04	0.28	0.000	0.000	0.000	0.000
PSS070	0.41	0.52	5.33	0.000	0.000	0.000	0.000
PSS080	0.39	0.12	0.92	0.011	0.020	0.019	0.020
PSS090	0.02	0.01	0.09	0.000	0.000	0.000	0.000
PST010	0.67	0.40	3.78	0.001	0.002	0.002	0.002
PST020	0.92	0.30	3.38	0.009	0.021	0.021	0.020
PST050	1.11	0.65	6.00	0.000	0.000	0.000	0.000
PST060	1.33	0.10	0.52	0.007	0.018	0.017	0.018
PST070	0.24	0.23	1.52	0.001	0.002	0.002	0.002
PST100	0.01	0.02	0.10	0.000	0.000	0.000	0.000
Total	**9.78**	**5.36**	**49.78**	**0.039**	**0.083**	**0.080**	**0.079**

Table 8.7: Puget Sound 2005 On-Terminal Fleet Vehicle Greenhouse Gas Emissions by Terminal, tpy

				CO_2 Equivalents			
Terminal	**CO_2**	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**	**Total**
PSA010	18.2	0.002	0.004	18.2	0.70	0.09	19.0
PSE010	81.5	0.012	0.015	81.5	3.63	0.32	85.5
PSE030	40.6	0.001	0.001	40.6	0.19	0.03	40.8
PSS010	933.4	0.119	0.133	933.4	37.01	2.79	973.2
PSS050	173.7	0.020	0.026	173.7	6.29	0.54	180.5
PSS060	9.5	0.001	0.002	9.5	0.28	0.05	9.8
PSS070	134.7	0.017	0.012	134.7	5.35	0.26	140.3
PSS080	92.6	0.007	0.004	92.6	2.23	0.09	94.9
PSS090	4.4	0.001	0.001	4.4	0.19	0.02	4.6
PST010	232.5	0.028	0.022	232.5	8.64	0.45	241.6
PST020	758.2	0.031	0.034	758.2	9.62	0.72	768.5
PST050	410.0	0.062	0.032	410.0	19.27	0.68	429.9
PST060	177.9	0.001	0.001	177.9	0.26	0.02	178.2
PST070	64.9	0.007	0.009	64.9	2.08	0.19	67.2
PST100	3.0	0.001	0.000	3.0	0.16	0.01	3.2
Total	**3,135.1**	**0.309**	**0.299**	**3,135.1**	**95.89**	**6.27**	**3,237.3**

Tables 8.8 and 8.9 present the 2005 passenger-owned vehicle criteria pollutant and greenhouse gas emissions, respectively, for the Port of Seattle cruise terminals.

Table 8.8: Puget Sound 2005 Passenger-Owned Vehicle Criteria Pollutant Emissions, tpy

Terminal	**Vehicle Type**	**NOx**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**DPM**
Pier 66	Minivans	0.0001	0.0001	0.0014	8.3E-07	4.0E-07	3.7E-07	0.0000
Pier 66	Passenger Cars	0.0049	0.0083	0.0781	3.6E-05	2.3E-05	2.1E-05	0.0000
Terminal 30	Passenger Cars	0.0055	0.0092	0.0869	4.0E-05	2.6E-05	2.3E-05	0.0000
Total		0.0105	0.0176	0.1665	7.7E-05	4.9E-05	4.5E-05	0.0000

Table 8.9: Puget Sound 2005 Passenger-Owned Vehicle Greenhouse Gas Emissions, tpy

Terminal	Vehicle Type	CO_2	N_2O	CH_4	CO_2 Equivalents CO_2	N_2O	CH_4	Total
Pier 66	Minivans	0.041	0.000	0.000	0.041	0.004	0.000	0.045
Pier 66	Passenger Cars	1.770	0.002	0.002	1.770	0.700	0.036	2.506
Terminal 30	Passenger Cars	1.970	0.003	0.002	1.970	0.778	0.040	2.788
Total		3.781	0.005	0.004	3.781	1.482	0.076	5.339

Tables 8.10 and 8.11 present the 2005 new import/export vehicle criteria pollutant and greenhouse gas emissions, respectively, for the Port of Tacoma Marshall Avenue Auto Terminal.

Table 8.10: Puget Sound 2005 Import/Export Vehicle Criteria Pollutant Emissions, tpy

Class	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	DPM
LDGV	0.0176	0.0175	0.1749	0.0016	0.2100	0.2100	0.0000
LDGT2	0.0150	0.0089	0.0915	0.0009	0.1153	0.1153	0.0000
Totals	0.0325	0.0263	0.2664	0.0024	0.3253	0.3253	0.0000

Table 8.11: Puget Sound 2005 Import/Export Vehicle Greenhouse Gas Emissions, tpy

Class	CO_2	N_2O	CH_4	CO_2 Equivalents CO_2	N_2O	CH_4	Total
LDGV	77.6	0.005	0.004	77.6	1.45	0.07	79.1
LDGT2	43.3	0.001	0.002	43.3	0.41	0.04	43.8
Totals	120.9	0.006	0.006	120.9	1.859	0.116	122.8

8.8 Emission Control Measure Benefits

Less than three percent of the fleet vehicles are alternatively fueled. The emissions benefit is anticipated to be nominal and therefore were not calculated.

8.9 Strengths, Limitations, and Recommendations

A number of pieces of data, such as vehicle year, speed mileage or vehicle class (based on GVWR), were estimated or averaged from other fleet data; and no data on low emission vehicles was provided. To the extent that more complete data can be provided for fleet vehicles, emissions estimates can be refined. MOBILE6 accommodates vehicles with model years in the most recent 25 years; older vehicles are thus represented at a later model year, which may have an impact on emission estimates. However, given the nominal emissions, further study is not recommended.

SECTION 9 CONCLUSIONS AND RECOMMENDATIONS

The Puget Sound Maritime Air Forum proactively commissioned this air emissions inventory as a fundamental step in the process of reducing maritime-related emissions. As the understanding of maritime-related emissions sources improves, the maritime community will be better able to design and implement cost-effective, fact-based air pollution control strategies and deliver air quality benefits to the region. This report is not a policy document and does not include policy recommendations. The purpose of this emissions inventory is to provide scientifically valid data to aid in the planning and prioritization of pollution prevention investments in the region.

The Puget Sound Maritime Air Forum is a voluntary association of private and public maritime organizations, regional clean air agencies, and other parties with operational or regulatory responsibilities related to maritime industry air quality impacts. Forum participants are committed to accurately identifying and quantifying maritime-related sources of air pollution and seeking ways to voluntarily reduce air pollution impacts from this transportation sector.

This section presents the Puget Sound Maritime Air Emissions Inventory conclusions (Section 9.1), strengths (Section 9.2), limitations (Section 9.3), and recommendations for further study and continued efforts (Section 9.4).

9.1 Conclusions

The Puget Sound Maritime Air Emissions Inventory shows that in 2005 maritime-related sources within the regional clean air agency jurisdictions were responsible for the following percentages of emissions:

- Northwest Clean Air Agency –
    - 6% of fine particulate matter,
    - 40% of diesel particulate matter,
    - 16% of oxides of nitrogen,
    - 19% of sulfur dioxide,
    - 5% of carbon monoxide, and
    - 6% of volatile organic compounds.

- Olympic Region Clean Air Agency –
    - 13% of fine particulate matter,
    - 66% of diesel particulate matter,
    - 40% of oxides of nitrogen,
    - 83% of sulfur dioxide,
    - 2% of carbon monoxide and
    - 4% of volatile organic compounds.

- Puget Sound Clean Air Agency –
    - 4% of fine particulate matter,
    - 28% of diesel particulate matter,
    - 11% of oxides of nitrogen,
    - 33% of sulfur dioxide,
    - 1% of carbon monoxide and
    - 2% of volatile organic compounds.

On a geographical basis, the county with the highest maritime emissions of NO_x (27%), SO_2 (40%), and DPM (29%) is Clallam County, because its waters include the inbound lane of the Strait of Juan de Fuca and ocean-going vessels make up the largest percentage of maritime-related emissions by source category. These emissions are primarily transiting emissions, as opposed to hotelling emissions which occur near land. The emissions attributed to vessels in Clallam County include departing vessels that actually traveled on the Canadian side of the international border. Emissions from vessels bound for Canadian destinations were not included in this inventory, even though the emissions were released on the U.S. side of the border. Coordination of these cross-border emissions is discussed in Section 1.12.2 and Section 3.2.1.

King County is second in the emissions of NO_x (24%), SO_2 (14%), and DPM (24%), and has the highest emissions of VOCs (21%), CO (22%), and CO_2 (27%). This status reflects the fact that King County sees a large number of ocean-going vessels, including the vessels transiting through to destinations in Pierce and Thurston Counties, and also sees a relatively large amount of harbor vessel activity which results in relatively higher VOC and CO emissions because of the use of gasoline engines in many harbor vessels.

Because emissions from ocean-going vessels and harbor vessels drive the emission totals, it is reasonable to see the distribution described above, in which the highest emissions are seen in the county where almost all vessels entering the area pass through, and where the next highest county is the locations of one of the largest ports in the region.

9.2 Strengths

The Puget Sound Maritime Air Emissions Inventory benefits from a number of enhancements and expansions, relative to prior emissions inventory efforts conducted elsewhere, including:

- The unprecedented cooperation of maritime entities and regulatory authorities
- Emission reduction efforts identified during the inventory process
- The breadth and nature of the pollutants included
- Vessel-specific data collected during the OGV Vessel Boarding Program
- High level of completeness for OGV main engine data
- Coordination with Canadian entities on vessel counts, emission factors, and geographical areas (to avoid double counting)
- Detailed routing segments established for OGV travel in the complex greater Puget Sound

9.2.1 Unprecedented Cooperation of Maritime Entities and Regulatory Authorities

The Puget Sound Maritime Air Emissions Inventory is unprecedented in the cooperation of ports, other maritime entities, non-governmental organizations, and international, federal, state, and local regulatory authorities working together at a regional level to provide a comprehensive accounting of maritime-related emissions in the greater Puget Sound, an area that spans approximately 140 miles south to north and 160 miles west to east, at its extremities.

Historically, those major ports that have conducted emissions inventories have included only their own port's operations; this effort includes the operations of the six ports within the region that had equipment and vehicles, as well as ocean-going vessel, harbor vessel and locomotive emissions for the twelve-county area, which is under the jurisdiction of three regional clean air agencies (Northwest Clean Air Agency, Olympic Region Clean Air Agency, Puget Sound Clean Air Agency) and the Washington Department of Ecology.

Maritime entities included shipping lines and their agents, tugboat companies, terminal operators, maritime trade associations, the Puget Sound Pilots, rail lines, refineries and petroleum terminal operators, metropolitan planning organizations, and non-governmental organizations such as the American Lung Association of Washington.

The effort is also unprecedented in that it was done proactively, in advance of any regulatory directive; the area is in currently in attainment for with all federal, state, and local ambient air quality standards.

9.2.2 Emission Reduction Efforts Identified

Many emission reduction methods already being implemented (fuels and technologies), and initiatives were identified during the inventory process for the Ports of Seattle, Tacoma and Everett, and the Washington State Ferries. These efforts are summarized in Section 1.3 and detailed within each source category section under the subsections 'Emission Reduction Technologies Identified' and 'Emission Control Measure Benefits.'

9.2.3 Breadth and Nature of Pollutants Included

The emissions inventory includes not only the criteria pollutants, but also the CARB air toxic, DPM, and the greenhouse gases carbon dioxide, nitrous oxide and methane. In fact, this is the first maritime emissions in the U.S. to included greenhouse gases. The emission factors for the greenhouse gases are consistent with the latest EPA national greenhouse gas emissions inventory, earlier cited. Emission factors for all pollutants and source categories are based on the latest credible technical literature.

9.2.4 Starcrest Vessel Boarding Program

The Vessel Boarding Program made important contributions and refinements to the methodology used for the OGV portion of the Puget Sound Maritime Air Emissions Inventory. Data sharing between the Vessel Boarding Programs for the concurrent emissions inventories developed by the Port of Los Angeles, the Port of Long Beach and the Puget Sound Maritime Air Forum resulted in unprecedented sharing of detailed field-validated vessel data among West Coast ports. While the latest California port emissions inventories have not been finalized, Section 2.4.4 of the Port of Los Angeles Baseline Air Emissions Inventory – 2001,[140] details many of the insights obtained during the Vessel Boarding Program conducted there in 2003. Some of the 2003 OGV insights include:

- Validation of Lloyd's data by comparing it to actual on-board engine and vessel parameters, such as maximum vessel speed and engine power.
- Establishment of relationship between maximum and actual at-sea ship service speed.
- Evaluation of time-in-setting mode data and real time load readings for transit and in-port maneuvering modes.
- Significant improvements over Lloyd's data to the characterization of auxiliary engines.

Further refinements obtained from the 2005 - 2006 Puget Sound, Port of Los Angeles and Port of Long Beach Vessel Boarding Programs include:

- Refined vessel defaults by vessel type and subtype.
- Revised boiler emission methodology based on actual average boiler fuel consumption.

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[140] Starcrest 2005.

- Use of sister ships to maximize the application of collected data to specific ships. During vessel boarding, vessel captains were asked if there were any sister ships and if so, vessel names were noted to later see if they matched with vessels calling at the Puget Sound ports. In addition to the vessel data gathered through the Vessel Boarding Program, several companies provided main and auxiliary engine data on their fleet by submitting the information electronically.

Table 9.1 presents the source of the data for the 274 vessels included in the Vessel Boarding Programs conducted in the Puget Sound, and at the Ports of Los Angeles and Long Beach. Not all vessels from the survey data necessarily made a call to the Puget Sound ports in 2005 and therefore not all of data from the boardings listed below was used in this inventory.

Table 9.1: Vessel Boarding Programs

Number of Vessels	Program
32	Puget Sound Boarding Program (2006)
58	Ports of Long Beach and Los Angeles VBP (2005 – 2006)
79	Vessel Fleet Data Provided (2003-2006)
40	Sister Vessel Specifications Provided (2003-2006)
65	Port of Los Angeles Boarding Program (2001 - 2003)
274	**Total Vessels**

The following Vessel Boarding Program survey data was used specifically for emission estimation methodology in this study:

- Main engine power
- Auxiliary engine power
- Auxiliary engine load (at different vessel operating modes)
- Boiler fuel consumption
- Type of fuel used while in Puget Sound during transit and hotelling
- Emission reduction technologies such as slide valves
- Routing and speeds

9.2.5 Complete Main Engine Data

Lloyd's data on the worldwide fleet of OGVs was assembled in a common database and a query was completed to match with the MarEx vessel data. There were a high percentage of matches, over 95%, between the Lloyd's data and MarEx data. The remaining 5% were either matched to another dataset (see Section 3.3.3) or defaults were used from averages by vessel type from Lloyd's worldwide fleet data query. For main engine data, the match with Lloyd's and ABS data was greater than 98%, so defaults for main engine power were only used for 2% of the vessels, and if actual Vessel Boarding Program data was available, it was used for that vessel.

9.2.6 Coordination with the BCMVEI

The BCMVEI was coordinated with Environment Canada, the Greater Vancouver Regional District, the Vancouver-Fraser Port Authority, and others as well with the Puget Sound Maritime Air Forum to assure quality and consistency and avoid duplication and omissions between the two inventories. Analysis of the MarEx data (used in the Puget Sound Maritime Air Emissions Inventory) and analysis of AIS data (used in the BCMVEI) determined that the AIS data was not reliable with respect to origin and destination data. Using the MarEx data, it was determined that there were five general types of routing. In an effort to reduce double counting of ship activity and emissions, it was agreed between the two groups, which inventory would account for which emissions and where those emissions would be counted. Inbound and outbound vessels travel on specific travel lanes. Since the U.S./Canadian border divides the inbound and outbound vessel travel lanes (i.e., inbound lane lies on the U.S. side of the border, while the outbound lane lies on the Canadian border in the Strait of San Juan de Fuca), the agreement included discussion on inbound and outbound transit emissions.

9.2.7 Detailed Vessel Routing Segment Development

Vessel routing is the underlying geographic element upon which the OGV emissions estimates are based. Using the 2005 MarEx of Puget Sound data, distinct trip routes were derived, taking into account the routing complexity of the region and the multiple movements, including arrivals, departures and shifts. There were a total of 153 distinct ship routes in the MarEx data. Of these, 145 distinct routes were within the study area and scope, leaving eight distinct routes outside the scope of the inventory. The vessel routing was reviewed by the Puget Sound Pilots in order to assist in the validation effort. This detailed vessel routing allowed OGV emissions to be allocated by county, by port, and by mode (hotelling, maneuvering, and transiting), allowing for detailed analysis of this source category.

9.3 Limitations

Emissions inventories are inherently limited in scope. An emissions inventory provides only an average estimate of emissions by source category over a defined period of time. During the time period covered by an emissions inventory, the tenants and operators can change locations; equipment types, engines, and fuels can change; and operational modes of marine container terminals can change based on the availability of land (i.e., wheeled vs. grounded modes). In addition, emissions are estimated from hundreds of pieces of offroad and onroad equipment and marine vessels that operate using a vast variety of engine types, under a range of duty cycles, and that consume different fuel types. The equipment is also operated within variable spatial and temporal parameters.

9.3.1 Pollutants

It is not typical to include air toxics in maritime emissions inventories; however, this effort attempted to do so. Emission factors for specific toxic air contaminants were not available for all source categories, so emissions of air toxics were not estimated. Emissions for specific air toxics and source categories may be calculated based on the emission factors presented in Appendix D.

9.3.2 Ocean-Going Vessels

As explained earlier, the primary source of information on the physical parameters of ocean-going vessels (Lloyd's) that is usually used for emissions inventories provides only a limited amount of information on auxiliary engines. Such information is usually not provided to Lloyd's by vessel owners since it is not required by the IMO or the classification societies. Therefore, auxiliary engine data gathered from the Vessel Boarding Program and Lloyd's limited data on ships making local calls were used to generate profiles or defaults to assign to missing data. For the vessels that called on destinations in the Puget Sound area in 2005, only 22% of the vessels had actual data available from Vessel Boarding Program surveys, Lloyd's, ABS, or matching sister vessels. The profiles developed from the vessel-specific data were used to estimate the characteristics of the other 78% of vessels.

The IMO established OGV propulsion engine standards in MARPOL Annex VI and engine manufacturers have been in compliance with the NO_x Technical Code since 2000. The engine standards are baseline standards to prevent backsliding on emission levels from 2000 and newer engine models. In this study, the IMO standard of 17.0 g/kW-hr NO_x is used for slow speed vessels built after the year 2000.

Medium speed engine standards under the IMO program are based on design engine speed in revolutions per minute. For medium speed engines built after the year 2000, the 13.0 g/kW-hr NO_x emission standard is used. It should be qualified that the engine manufacturers design their engines to emit well below the standards, but it is difficult to establish an "in-use" average without the benefit of measurements. Therefore, the use of the IMO standards as emission factors probably overestimates actual vessel engine emissions.

In late February 2007, pilot billing data was obtained by the Pacific Merchant Shipping Association and checked against the MarEx data for inbound, outbound, and shifts. For inbound and outbound trips, the data seems to match very closely what was provided by MarEx. For shifts there was a difference that is most likely due to differences associated between billing (pilot's data) and activity (MarEx data). These differences include:

- Some jobs are cancelled but invoiced if the cancellation involved the dispatch of a pilot before cancellation
- Some jobs or moves include two pilots which would show up as two billing records and one activity record,
- Some yacht moves actually have a pilot onboard, which would show up as one billing record, one activity record, and would not included in the ocean-going vessel emissions (as it would have been included in recreational vessels), and
- Accounting of short shifts between berths vs. activity.

Currently the two data sets are being further evaluated to determine if there is an actual change in the number of shifts. At the time of publishing, this analysis has not been completed. Significant changes in emissions are not anticipated even if the number of shifts is increased as these movements represent a very minor fraction of the total ocean-going vessel emissions. For the next inventory update, it is recommended that these issues be understood and resolved. Also it is expected that for the next inventory update, that Coast Guard data will also be available to provide yet another quality assurance check with the MarEx and pilot data.

9.3.3 Harbor Vessels

Profiles were developed by vessel type for engine model year, horsepower, and activity hours and were used as defaults in the database input data file for those vessels for which specific data was unavailable. For vessel types that did not have an average value for a given parameter, the average for all harbor craft in the Puget Sound study area was used. For excursion vessels, the auxiliary engine model year was not available for 67% of the vessels. Since the model year average for most vessels in Puget Sound was earlier than the year 1999 (i.e., Tier 0 for pre-1999 model year), it was assumed that excursion vessels had Tier 0 engines. Auxiliary engine horsepower was not available for the majority (87%) of commercial fishing vessels. Information received from approximately 45 commercial fishing vessels was used to assign a default horsepower to the auxiliary engines for which specific data was not available.

In the absence of specific information, fuel correction factors for the use of biodiesel in harbor craft were based on data related to heavy-duty highway vehicles, and may not accurately reflect use in offroad engines. Testing of emissions from biodiesel use in harbor craft to determine emission reductions to improve the pollutant fuel correction factors is recommended.

Tank barge data was collected from the tugboat companies that were contacted for the harbor and ocean tugs data collection process (see Section 4.8). Tank barges belonging to companies not included in the inventory and/or those that may have a home base outside of Puget Sound are not included in the count. In addition, information to allow for spatial allocation by county was not obtained.

There are approximately 24,300 recreational vessels that use the public port-owned and privately owned marinas within the Puget Sound, and emissions for those vessels only are represented in the inventory.

9.3.4 Cargo Handling Equipment

Some cargo handling and related operations that result in emissions were not included within the scope of this emissions inventory. Some of these emissions are included in stationary source permits such as grain and petroleum terminals, but others are not. For example, activities in and around Lake Washington, Lake Union and the Duwamish River (beyond Port of Seattle facilities) were outside the scope of this effort.

Where actual data was unavailable, reasonable assumptions based on similar equipment in the inventory were used. Out of 1,145 pieces of cargo handling equipment, default values were assigned for horsepower for 162 pieces of equipment, operating hours for 46 pieces of equipment, and model years for 50 pieces of equipment. Actual equipment engine powers, model years, and operating hours for all covered equipment will provide more refined estimates.

9.3.5 Rail

The emission estimates presented in this section have been based on numerous assumptions made necessary because complete information was not available from all parties involved in the complex railroad operations in the Puget Sound area. While both of the major railroad companies provided some level of information, they were not able to provide the same types of data, or provide some of the data that would have been helpful in developing detailed emission estimates.

For example, emissions from line haul locomotives have been estimated using national average throttle notch frequencies published by the EPA. However, the activities of line haul locomotives as they arrive at and depart marine terminals and rail yards may not be well represented by the national average data because arrivals and departures involve slower speeds and potentially more idling than typical operations involving cross-country trips.

In addition, the amount of time locomotives spend in rail yards and marine terminals upon arrival and before departure affects the emissions from these locations. However, the railroads were not able to provide detailed information on these activities so order-of-magnitude estimates were used.

9.3.6 Heavy-Duty Vehicles

Limitations for on-terminal and off-terminal port-related HDV emissions are presented separately.

On-Terminal

In some cases, terminal operators track such parameters as the amount of time trucks spent on terminal, in other cases the times are estimates based on the operator's best knowledge of operations, so the uncertainty associated with the data is variable. Most of the parameters included in the estimates, such as speeds, distances, and idling times, are estimates that could be refined by closer measurement and/or recordkeeping.

The age distribution for Puget Sound area trucks engaged in maritime commerce was not available.

Off-Terminal

The off-terminal port-related HDV emission estimates are based on the best available data provided by a variety of agencies, the ports, and regional and metropolitan planning organizations within the study area. At the beginning of this analysis, it was assumed that the necessary data was available from state and local agencies. While data was available on heavy-duty truck activity and freight mobility in general within Washington State, very little data was available on off-terminal port-related HDV activity, which greatly limited the accuracy of the analysis.

9.3.7 Fleet Vehicles

In a number of cases, data for representative vehicles was averaged and applied to vehicles for which one or more parameters was unavailable. Data was assigned for 49 model years, 377 speeds, and 191 mileage values. Vehicle class was assigned based on vehicle description for all but 12 vehicles, for which GVWR was provided. For passenger-owned vehicles and mini-vans used at cruise terminals, vessel calls and passenger throughput were obtained, and activity data was estimated from that.

MOBILE6 accommodates vehicles with model years in the most recent 25 years; older vehicles are thus represented at a later model year, which may have an impact on emission estimates.

9.3.8 Fuel Sulfur Content

Fuel sulfur content for onroad diesel fuel used in cargo handling equipment and heavy-duty and light-duty vehicles was estimated to be 310 ppm sulfur for on-highway diesel fuel.[141] However, a representative of the Washington Department of Ecology recommended using a seasonally adjusted fuel sulfur content of 340 ppm for summer and 360 ppm for winter for Western Washington.[142]

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[141] WADOE 2006b.

[142] The data was made available through the Western Regional Air Partnership (WRAP) and was derived from a combination of AAM data, and data collected by TRW/Northrop-Grumman (formerly the National Institute

For offroad diesel, fuel sulfur content was estimated to be 2,284 ppm for cargo handling equipment, based on the NONROAD model default value. For harbor vessels, the offroad diesel fuel content was estimated to be 3,100 ppm, based on supplier information. Although different companies may provide fuel for the different source categories, a broader supplier/user survey could refine fuel sulfur content values used to calculate SO_2 emissions.

9.3.9 Other Equipment

Barge generators, discussed in Section 5.3, were identified during the cargo handling equipment data collection process. However, emission estimates were not included due to the lack of availability of data from a representative set of potential sources.

9.3.10 Regional Emissions Comparisons

The regional clean air agencies compiled emissions inventory updates for emission sources within their jurisdictions for 2005. The non-maritime emission sources include point sources (large industrial sources), onroad mobile sources (vehicles that are licensed for highway use), offroad mobile sources (vehicles that are not licensed for use on highways), locomotive mobile sources, and area sources (a broad category that includes everything else such as wood burning and small business operations).

The pollutants and specific source categories that were reported by each regional clean air agency varied so the emissions inventories from the three agencies could not be accurately summed across the entire study area for the Puget Sound Maritime Air Emissions Inventory. Therefore, comparisons of regional emissions with maritime-related emissions are made on the basis of regional clean air agency jurisdiction only. Refined regional inventories would allow the regional emissions to be combined into an area-wide total, and compared with area-wide maritime emissions.

9.4 Recommendations

Recommendations, based on the discussion presented in the Limitations subsection above, are presented by source category for further consideration. This report is not designed to provide policy recommendations; however, a follow-up emissions inventory will document continued and newly implemented reduction efforts.

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for Petroleum and Energy Research, NIPER). *References*: 1) Memo from Philip Heirigs and Joe Roeschen, Sierra Research to Alison Pollack, ENVIRON International Corporation. Subject: *Development of Calendar Year 2002 County-Level Fuel Specification Data for the WRAP Modeling Domain*. Dec. 14, 2004. 2) Spreadsheet of seasonal fuel Reid vapor pressure, sulfur and oxygen levels titled *WRAP_Fuel_2002_toEnviron_121404.xls. Sierra Research.*

9.4.1 Pollutants

As air toxic contaminant emission factors become available for all source categories, consider inclusion of these pollutants in future emissions inventories.

9.4.2 Ocean-Going Vessels

Recommendations for the ocean-going vessel source category are to:

- Engage the maritime community in additional discussions related to emission reduction methods, especially during hotelling and while in the greater Puget Sound area.
- Continue support of the Vessel Boarding Program to obtain data which is unavailable from Lloyd's, e.g., for auxiliary engines.
- Encourage OGV engine testing for NO_x in order to establish "in-use" averages of NO_x emissions, which should be below manufacturer design standards.
- Evaluate differences in activity data for Pacific Merchant Shipping Association and MarEx data.
- Continue current emission reduction efforts.

9.4.3 Harbor Vessels

Recommendations for the harbor vessels source category are to:

- Engage harbor craft fleet owners such that more complete data on their vessel engines can be obtained, in order to provide more refined emissions estimates.
- Test biodiesel use in harbor craft to determine emission reductions to improve the pollutant fuel correction factors.
- Consider a more comprehensive analysis of tank barges belonging to operations not otherwise included in the inventory and/or those that may have a home base outside of Puget Sound, and obtain sufficient data to allow for spatial allocation by county.
- Estimate recreational vessel emissions for the registered fleet, of which 24,300 are included in the inventory.
- Continue current emission reduction efforts.

9.4.4 Cargo Handling Equipment

Recommendations for the cargo handling equipment source category are to:

- With each inventory update, attempt to obtain even more complete data on equipment in order to provide more refined emissions estimates.
- Continue current emission reduction efforts.

9.4.5 Rail

Recommendations for the rail locomotive source category are to:

- Use on-site survey work to develop the types of information that the railroads are unable to provide because of their personnel, financial, or confidentiality concerns, ensuring that adequate lead time is provided for the data collection process.
- Continue current emission reduction efforts.

9.4.6 Heavy-Duty Vehicles

Recommendations for the heavy-duty vehicle source category are to:

- Refine, by closer measurement and/or recordkeeping, speeds, distances, and idling times, for on-terminal heavy-duty vehicles.
- Develop some means of estimating the age distribution of Puget Sound area trucks engaged in maritime commerce.
- Consider conducting a comprehensive analysis of off-terminal port-related HDV activity in the Puget Sound region in order to accurately understand and address emissions from this segment of the goods movement chain.
- Incorporate data from the TransNow "Freight Modeling of Containerized Cargo Shipments between Ocean Port, Handling Facility, and Final Market for Regional Policy and Planning" and the SFTA study, when complete, into the off-terminal port-related heavy-duty vehicle analysis.

9.4.7 Fleet Vehicles

Given the nominal emissions of on-terminal fleet and related vehicles relative to other source categories, further study is not recommended.

9.4.8 Fuel Sulfur Content

Fuel sulfur content in onroad and offroad diesel fuels supplied to cargo handling equipment, harbor vessels, and heavy- and light-duty vehicles is an area for further study.

9.4.9 Other Equipment

Further consideration for the inclusion of barge generators in the inventory process is recommended, including a determination of the appropriate source category designation, a reliable method for identifying a representative set of operators from which to collect data, and a reliable method for data collection.

9.4.10 Regional Emissions Comparisons

The Northwest Clean Air Agency, Olympic Region Clean Air Agency, Puget Sound Clean Air Agency and the Washington Department of Ecology are encouraged to coordinate systematic inventorying of non-maritime and maritime emission source categories and pollutants across the greater Puget Sound area.

Appendix A - Glossary

Air toxics – Toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious, chronic health effects, such as reproductive effects or birth defects, or adverse environmental effects.

Alternative fuel – Also known as "non-conventional fuels", is any material or substance that can be used as a fuel, other than fossil fuels, or conventional fuels of petroleum (oil), coal, propane, and natural gas. The term "alternative fuels" usually refers to a source of which energy is renewable (See "renewable fuel").

Area source – A general term for a source that is an aggregate of all emission sources within a defined spatial boundary. Though emissions from individual sources in an area are relatively small, collectively their emissions can be of concern - particularly where large numbers of sources are located in heavily populated areas.

Auxiliary engine – A small engine often used when a ship is in-transit, maneuvering, or hotelling.

Baseline Air Emissions Inventory – For a given air emission source category, a baseline inventory establishes a reference point with more detailed emission data than previously existed. An established baseline allows comparison with future inventories of similar precision to describe changes to the characteristics of the source category and intensity of the emissions.

Brake-Specific Fuel Consumption – A way to measure the efficiency of an engine by dividing rate of fuel consumption by the rate of power production.

Bunker Fuel – See *"Fuel Oil"*

Cargo Handling Equipment (CHE) – Equipment used to move cargo to and from marine vessels, railcars and trucks. This includes equipment such as cranes, rubber tired gantry cranes, terminal trucks, container handlers, bulk loaders, and forklifts.

Cold Ironing – Also called "Alternative Maritime Power" in application at the Port of Los Angeles and more generally referred to as "Shore Power." This specifically refers to an electrical connection made between the vessel and the terminal to provide full or partial operational power during hotelling periods. The primary motivation for cold ironing has been as a method to reduce emissions from the exhausts of auxiliary engines that would normally operate during hotelling. "Cold iron" is a reference to when ships mainly used boilers to produce steam for propulsion, heat, and power. When the steam production was shut down, the iron in the boiler housing would go cold.

Commercial vessel – Any vessel involved in commercial trade or business.

Criteria pollutants – A regulatory term that refers specifically to six outdoor air pollutants for which EPA is required to develop National Ambient Air Quality Standards (NAAQS), as codified in the federal Clean Air Act. These six are carbon monoxide (CO), lead, nitrogen dioxide (NO_2), particulate matter (PM_x), ozone, and sulfur oxides (SO_x).

Deadweight tonnage – Refers to the total amount of weight that a vessel is carrying, minus the actual weight of the vessel. Historically, tonnage was the tax on tuns (casks) of wine that held approximately 252 gallons of wine and weighed approximately 2,240 pounds. This suggests that the unit of weight measurement, long tons (also 2,240 lb) and tonnage both share the same etymology. The confusion between weight based terms (deadweight and displacement) stems from this common source and the eventual decision to assess dues based on a ship's deadweight rather than counting the tuns of wine.

Deterioration factor – For use in emission or performance calculation, this number accounts for the effect of gradual wear in the internal engine components in the course of normal operation.

Diesel – In standard use, this refers to a specific fractional distillate of fuel oil that is used as fuel in a combustion-ignition (CI) engine. Practically, diesel can refer generally to any hydrocarbon-dense oil with relatively low volatility that can be used as a combustion fuel. In common maritime use, diesel can refer to several varieties of distillate fuels including "Marine Diesel Oil" (MDO, aka DMB or DMC) and "Marine Gas Oil" (MGO, aka DMA or DMX) as specified by ISO 8217. Diesel can also be referred to by its sulfur content, such as the case of LSD (low sulfur diesel with less than 500 ppm sulfur) or ULSD (ultra low sulfur diesel with less than 15 ppm sulfur).

Diesel electric – Refers to equipment that uses electric motive systems that rely on electricity from diesel generators.

Diesel Oxidation Catalyst (DOC) – A flow-through canister, fit to an engine exhaust pipe, containing a honeycomb-like structure or substrate. The substrate has a large surface area that is coated with an active catalyst layer. This layer contains a small, well dispersed amount of precious metals such as platinum or palladium. As exhaust gases pass over the catalyst, carbon monoxide, gaseous hydrocarbons and liquid hydrocarbon particles (unburned fuel and oil) are oxidized, thereby reducing harmful emissions.

Diesel Particulate Matter (DPM) – Refers to particulate components of combustion products that are directly emitted from diesel engines. These include soot ("elemental" or "black" carbon) and other aerosols that are complex aggregates of hydrocarbons, metals, silicates, and other chemicals. In recent years, DPM has been singled out as posing a carcinogenic risk to people who regularly work in proximity to diesel equipment over the course of many years.

Diesel Particulate Filter (DPF) – A filter installed on the exhaust pipe of diesel engine to physically separate particulate matter from the exhaust stream. Some filters are single use (disposable), while others are designed to burn off the accumulated particulate, either through the use of a catalyst (passive), or through an active technology, such as a fuel burner which heats the filter to soot combustion temperatures

Economizer – A heat exchanger that transfers heat from the exhaust stream to a water circulation system to produce steam. Often used when a vessel is in transit, an economizer can allow the regular diesel powered boiler to be shut off.

Emission factor – A number specific to an engine or system that describes the amount of a pollutant that is generated per unit of activity, e.g. mg/mile or g/hr

Emulsified fuel – A homogenized blend of water into diesel fuel that changes the fuel combustion characteristics and resulting emissions. This strategy is mainly employed to reduce NO_x emissions but may also reduce PM and improve fuel economy.

EPA NONROAD model – NONROAD is a computer modeling program created and regularly updated by EPA that calculates past, present, and future emission inventories (i.e., tons of pollutant) for all offroad equipment categories except commercial marine, locomotives, and aircraft. For a specified geographic area, time period, and fuel type, the model estimates exhaust and evaporative hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM), sulfur dioxide (SO_2), and carbon dioxide (CO_2).

Exhaust gas recirculation (EGR) – A technique used in most gasoline and diesel powered engines to control emissions. Engine exhaust is mixed with engine intake air and recirculated through the combustion process. The result is a reduction in NO_x emissions due to lower combustion temperatures and reduction of excess oxygen.

Fine particulate matter – See *Particulate Matter*

Four-stroke engines – The most common type of engine for cars and trucks. This engine uses the 'Otto cycle' and consists of four strokes. 1. intake stroke, 2. compression stroke, 3. power (ignition) stroke, and 4. exhaust stroke.

Fuel correction factor (FCF) – A number used in emission inventory models to reflect the impact on emissions of commercially dispensed fuel compared to fuel used during the certification process. These factors are derived as the ratio of the impact of the dispensed fuel to the impact of the certification fuel.

***Fuel Oil* –** A general term for viscous liquid fuels used for powering engines. In the maritime industry the following classifications are used.

- ***MGO (Marine gas oil)* –** A purely distillate fuel (see "diesel")
- ***MDO (Marine diesel oil)* -** A blend of gas oil and heavy fuel oil
- ***IFO (Intermediate fuel oil)*** A blend of gas oil and heavy fuel oil, with less gas oil than marine diesel oil
- ***MFO (Medium fuel oil)* -** A blend of gas oil and heavy fuel oil, with less gas oil than intermediate fuel oil
- ***HFO (Heavy fuel oil)* -** Pure or nearly pure residual oil (bunker fuel)

Fugitive emissions – Emissions not created through a defined process or controlled by a dedicated system. These can be due to equipment leaks, evaporative processes, materials processing, and windblown disturbances

GHG equivalent – Similar to "carbon equivalent" this refers to a method by which air emissions are standardized for comparison based on their "global warming potential" (GWP) as greenhouse gases. Each greenhouse gas differs in its ability to absorb heat in the atmosphere so will be presented in units of carbon equivalents, which weighs each gas by its GWP relative to carbon dioxide. For example, methane traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule than carbon dioxide.

Greenhouse Gas – Substances in the atmosphere that absorb radiated heat form the earth's surface and also radiate heat back to the surface, causing a net retention of heat energy. Carbon dioxide, methane, and nitrous oxide are common examples.

Gross vehicle weight rating – The estimated total weight of a road vehicle that is loaded to capacity, including the weight of the vehicle, the passengers, fuel, cargo, and miscellaneous items. The rating allows the vehicle driver to know what routes are acceptable, depending on whether the roadways can accommodate a vehicle of the estimated weight.

Harbor craft – A term that generally refers to vessels that do not make regular ocean passage. These include fishing boats, tug boats, ferries, and other commercial workboats. For the purpose of this report, any craft that is not an ocean-going vessel, recreational vessel, or tank barge, has been categorized as a harbor craft.

Heavy-duty vehicle – A class 8 truck fueled by diesel and has a gross vehicle weight of 33,001 lbs or higher.

***Hotelling* –** The period during which a vessel is secured at berth

Hydrocarbon – A chemical term referring to compounds that consists of carbon and hydrogen in various structures. Most common liquid fuels are primarily comprised of some form of hydrocarbon.

Integrated tug/barge – Any tug and barge combination with a specially designed connection system joining the two together. The combination allows the vessel to have increased seakeeping capabilities when compared to a separated tug and barge.

Intermediate fuel oil (IFO) – See *Fuel Oil*

Intermodal Container Transfer Facility – A rail yard that is located close to a port facility and is where a cargo transition between two different transportation modes (e.g. trucks, trains, or ships) occurs.

Light duty vehicle (LDV) – Class 1 and 2 vehicles that can use gas or diesel fuel and have a gross vehicle weight of 6,000 lbs or less (class 1) or between 6,001 and 10,000 lbs (class 2).

Liquefied Natural Gas (LNG) – Natural gas that has been processed to remove impurities and heavy hydrocarbons and is then condensed into a liquid using extremely low temperature or high pressure.

Liquefied Petroleum Gas (LPG) – A mixture of hydrocarbon gases that are commonly used to fuel heating appliances and vehicles. The two most common forms of liquefied petroleum gas are propane and butane.

Load Factor (LF) – A ratio of an engine's average actual power used to its maximum power rating.

Low Sulfur Diesel (LSD) – See "Diesel"

Main line locomotives – Also called "line-haul," these are the largest class of locomotives and are designed for the heaviest loads, longest distances, and steepest grades.

Main propulsion engine – The engines on a vessel that are dedicated to movement of a ship over long distances.

Marine Diesel Oil (MDO) – See "Fuel Oil"

Maximum continuous rating – A value assigned to a piece of equipment by its manufacturer that sets a guideline for which the equipment can be operated for an unlimited period of time without damage.

National Ambient Air Quality Standards (NAAQS) – A term referring to a specific legal instrument under the federal Clean Air Act that creates enforceable limits to airborne concentrations of "criteria pollutants." NAAQS are currently required for six substances (See "criteria pollutants"). NAAQS can be of two types: "Primary NAAQS" are designed to protect human health, including sensitive populations such as children, the elderly, and individuals suffering from respiratory disease. "Secondary" NAAQS are designed to protect public welfare (e.g., building facades, visibility, crops, and domestic animals).

Non-Methane Organic Gas (NMOG) – Organic gases that exclude methane but account for all other organic pollutants that form a foundation for the formation of ozone.

Ocean-going vessel (OGV) – Vessels that operate in open oceanic waters.

Particulate Matter (PM) – A general term for any substance, except pure water, that exists as a liquid or solid in the atmosphere under normal conditions and is of microscopic or sub-microscopic size but larger than molecular dimensions. Airborne PM can result from direct emissions of particles (primary PM) or from condensation of certain gases that have themselves been directly emitted or chemically transformed in the atmosphere (secondary PM). PM is often classified by size:

- ***$PM_{2.5}$*** – Also known as "fine" particulate matter, $PM_{2.5}$ refers to the fraction of PM in a sample that is 2.5 microns in diameter or less. This size of PM is commonly associated with combustion and secondary PM.
- ***PM_{10}*** – Also known as "coarse" particulate matter, PM_{10} refers to the fraction of PM in a sample that is 10 microns in diameter or less.

Polycyclic Aromatic Hydrocarbon (PAH) – One of the first atmospheric species to be identified as carcinogenic. PAH's are formed during the incomplete combustion of organic matter, e.g. coal, oil, wood, and petroleum. PAH's consist of two or more fused benzene rings in various configurations that, by definition, contain only carbon and hydrogen.

Polycyclic organic material – Compounds containing polycyclic aromatic hydrocarbons and derivatives.

Renewable Fuels – Fuels derived from sources that are regenerative or for all practical purposes can not be depleted.

Residual oil – "Residual Fuel Oil" or "Bunker Fuel" – See 'Fuel Oil"***.***

Roll-on/Roll-off (RoRo) – A vessel featuring a built-in ramp for wheeled cargo to be 'rolled-on' and 'rolled-off' of the vessel.

Rubber Tired Gantry (RTG) Crane – A common piece of cargo handling equipment at marine terminals used to transfer containers from stacked storage to a vehicle.

Selective Catalytic Reduction (SCR) – A process where a gaseous or liquid reductant (most commonly ammonia or urea) is added to the flue or exhaust gas stream and absorbed onto a catalyst. The reductant reacts with NO_x in the exhaust gas to form H_2O (water vapor) and N_2 (nitrogen gas).

Sea water scrubbing – An exhaust treatment technique used on ships to reduce emissions by through physical and chemical interaction with sea water. When the exhaust comes in contact with the seawater, the SO_X reacts with calcium carbonate to form a solid calcium sulfate and CO_2. Scrubbers also function by physically scavenging particles and gases from the air.

Shaft generators – Provides electric power to a moving vessel by generating current from the rotation of the vessel's drive shaft.

Shore power **–** See "Cold Ironing"

Point source – A single, stationary point source of emissions that is immoveable for all practical purposes.

Switching locomotive **–** A locomotive that is used exclusively in a facility where rail cars are organized and assembled into trains.

Total organic gases **–** The sum of reactive and non-reactive organic gases in the air.

Twenty-foot Equivalent Unit (TEU) **–** A measure used for containerized cargo. One TEU is equivalent to one standard cargo container measured 20' x 8' x 8'6".

Two-stroke engines – A type of internal combustion engine that completes the same four processes as a four-stroke engine (intake, compression, power, and exhaust) in only two strokes of the piston rather than four. This is accomplished by using the space below the piston for air intake and compression, thus allowing the chamber above the piston to be used for just the power and exhaust strokes. This results in a power stroke with every revolution of the crank, instead of every second revolution as in a four-stroke engine. For this reason, two-stroke engines provide high specific power, so they are valued for use in portable, lightweight applications. Two stoke diesel engines are common in large marine vessels.

Ultra Low Sulfur Diesel (ULSD) **–** See "diesel."

Volatile Organic Compound (VOC) **–** A very board term used to describe the entire set of vapor-phase atmospheric organic chemicals except CO and CO_2.

Appendix B - Forum Participant Organization Descriptions

Appendix B - Forum Participant Organization Descriptions

Puget Sound Maritime Air Forum participants include:

- American Lung Association of Washington and Idaho
- American President Lines
- Apollo Alliance
- BNSF Railroad
- Campbell Marine
- Clean Energy
- Cleaner Production International
- Community Coalition for Environmental Justice
- Cummins Northwest
- Eagle Marine
- Environmental Coalition of South Seattle
- Holland America Line
- International Longshore and Warehouse Union
- Imperium Renewables
- Kitsap Transit
- Manson Construction Company
- Marine Terminals Corporation
- Northwest Clean Air Agency
- NorthWest CruiseShip Association
- Olympic Region Clean Air Agency
- Pacific Merchant Shipping Association
- People for Puget Sound
- Port of Anacortes
- Port of Bellingham
- Port of Everett
- Port of Olympia
- Port of Seattle
- Port of Tacoma
- Prometheus Energy
- Puget Sound Clean Air Agency
- Puget Sound Clean Cities
- Puget Sound Regional Council
- Starcrest Consulting Group, LLC
- Stevedoring Services of America (SSA) Marine
- Transportation Institute
- U.S. Coast Guard
- U.S. EPA
- U.S. Navy
- Victoria Clipper
- Washington Department of Ecology

- Washington Department of Transportation
- Washington Public Ports Association
- Washington State Ferries
- Western States Petroleum Association

Information provided by the organizations is presented below.

American Lung Association of Washington

The mission of the American Lung Association® of Washington is to assure lung health for the people of Washington state through research, education, community service and advocacy. The American Lung Association® of Washington was founded in 1906 as part of the first nationwide corps of volunteers organized to combat a single disease: tuberculosis. American Lung Association® of Washington goals include reducing tobacco use, especially among young people; preventing and controlling air pollution; and providing education and funding research to make life more comfortable for people with asthma or other lung disease. The Lung Association is a 501(c) 3 non-profit organization that relies on donations of time, talent, and treasure from individuals. See: *http://www.alaw.org/*

BNSF Railway

BNSF Railway and the railroad industry are increasing fuel efficiency and reducing emissions while handling more freight than any other mode of transportation. BNSF Railway strives to have its operations leave as little impact as possible on all the inhabitants of the environment. This includes the conservation of wildlife and wetlands in areas through which our tracks pass, and includes controlling noise, emissions and odors, as well as environmental remediation at former railroad facilities. BNSF Railway is committed to continuous improvement in their environmental stewardship. They are an active partner with the communities they serve and appreciate their input. See: *http://www.bnsf.com/*

Cummins Northwest

Cummins Northwest has supplied service and support to the Pacific Northwest and Alaska for over 60 years as the authorized distributor of Cummins products and services. Cummins Northwest offers the largest factory trained and certified staff in the Pacific Northwest. See: *http://www.cumminsnorthwest.com*

Environmental Coalition of South Seattle

Environmental Coalition of South Seattle is an independent environmental resource promoting economic development and a safer, healthier, cleaner environment in Puget Sound. Through education and outreach, Environmental Coalition of South Seattle helps businesses and individual residents - many of whom are not native English-speakers - prevent pollution, conserve energy, manage hazardous materials and clean up contaminated properties. Environmental Coalition of South Seattle helps the community be environmentally responsible, whether addressing contaminated property issues or translating hazardous material labels for those in multicultural communities. See: *http://www.ecoss.org*

North Pacific Fishing Vessel Owners' Association

The North Pacific Fishing Vessel Owners' Association is a non-profit organization located in Seattle, Washington that is totally dedicated to providing safety education and training for mariners. See: *http://www.npfvoa.org/*

Northwest Clean Air Agency

The Northwest Clean Air Agency is the regional agency responsible for enforcing air quality laws in Island, Skagit and Whatcom Counties. It is one of seven regional clean air agencies in Washington State. The Northwest Clean Air Agency regulates over 400 sources of air pollution ranging from large refineries, hospitals, dry cleaners, gas stations and auto body shops, to home fireplaces and wood stoves. The Northwest Clean Air Agency has representatives in Anchorage, Juneau, Honolulu and Ottawa. See: *http:// www.nwcleanair.org*

NorthWest CruiseShip Association

The NorthWest CruiseShip Association is a not-for-profit association representing the major cruise lines operating in the Pacific Northwest, Canada, Alaska and Hawaii. The Association was established in 1986, initially for the purpose of providing security services to the member lines. Its role was later expanded to include government relations on legal and regulatory issues. The NorthWest CruiseShip Association also works to develop strong partnerships with the communities where its member lines are based, and those they visit. The Association provides support for the work of local organizations to mitigate industry-related concerns, and to develop local opportunities. It supports economic and environmental studies related to the industry, and collaborates with government agencies to ensure a workable regulatory environment. The NorthWest CruiseShip Association office is located in Vancouver, BC, Canada. See: *http://www.nwcruiseship.org*

Olympic Region Clean Air Agency

The Olympic Region Clean Air Agency is a local government agency charged with regulatory and enforcement authority for air quality issues in Clallam, Grays Harbor, Jefferson, Mason, Pacific, and Thurston Counties. The Olympic Region Clean Air Agency is one of seven such regional air pollution control agencies in Washington State. Established in 1968 after passage of the Clean Air Washington Act (RCW 70.94), the agency is responsible for enforcing federal, state and local air pollution standards and governing air pollutant emissions from new and existing sources. See: *http://www.orcaa.org/*

Pacific Merchant Shipping Association

Pacific Merchant Shipping Association is an independent, not-for-profit shipping association based in San Francisco, Long Beach and Seattle. Pacific Merchant Shipping Association represents owners and operators of marine terminals and U.S. and foreign vessels operating in the Pacific Basin. See: *http://www.pmsaship.com*

Port of Anacortes

Located on Puget Sound in western Washington, the Port of Anacortes is midway between Seattle and Vancouver, British Columbia. Its location, natural deep-water berthing, excellent inland transportation access, and proximity to large population centers, ideally suits shipping to the Pacific Rim, Canada, and Alaska. The Port's primary operations include handling cargo (including petroleum coke and logs), operating a 1,100 boat marina on Fidalgo Bay, and managing the Anacortes Airport. See: *http://www.portofanacortes.com*

Port of Everett

The Port of Everett strives to bring jobs, business and tourism to its local and surrounding communities. The Port operates eight berths situated on approximately 100 acres of land, a bulk unloading facility, and a multi-purpose warehouse and is served by the BSNF Railway. Located one day closer to Asian Markets than California facilities, the Port of Everett handles a wide variety of cargoes including, but not limited to, aerospace parts for the local industry, heavy machinery, construction equipment, project cargo and containerized commodities. The Port's Riverside Business Park, a 78-acre master-planned development adjacent to an inter-modal rail facility, provides opportunities for an inter-modal facility, or a dynamic mix of manufacturing, assembly and warehouse uses. The Port also operates the Everett Marina, which is the largest on the West Coast, which is lined by dozens of waterfront businesses. The Port owns 3,000 acres of property on the Everett waterfront, most of which consists of Jetty Island. To enhance the Everett waterfront, the Port is partnering with a developer to construct a new 65-acre mixed-use waterfront redevelopment, which will be surrounded by the Port's existing marina, and its new marina that is under construction. See: *http://www.portofeverett.com*

Port of Olympia

Since its formation in 1922, the Port of Olympia has served as an economic catalyst for the Thurston County Port district. It is a municipal corporation, governed by three elected Commissioners who set policies and objectives. A community Port, it is committed to helping area residents enjoy a special quality of life by promoting a healthy economy and a healthy environment. See: *http://www.portolympia.com*

Port of Seattle

The Port of Seattle is a municipal corporation with unique authority operating in an international, market-driven environment. The Port gives careful consideration to the economic, social and environmental implications of its business decisions. The Port of Seattle's vision is to be the most effective and respected provider of transportation facilities and services to promote international trade and commerce and to be the best publicly-owned catalyst for sustained regional prosperity in the nation. Their services and facilities accommodate transportation of cargo and passengers by air, water and land; provide a home for the fishing industry; and foster regional economic vitality and a quality life for King County citizens. See: *http://www.portseattle.org/*

Port of Tacoma

The Port of Tacoma is an independent, municipal corporation that operates under state-enabling legislation. There are more than 70 public ports in the State of Washington. Created by Pierce County citizens in 1918, the Port has 2,400 acres (972 hectares) that are used for shipping terminal activity and warehouse, distributing, and manufacturing. See: *http://www.portoftacoma.com*

Puget Sound Clean Air Agency

The Puget Sound Clean Air Agency is a special-purpose, regional agency chartered by state law in 1967 (RCW 70.94). The agency's mission is to "protect our resources for the health of current and future generations by fostering individual responsibility and assuring regulatory accountability". Through its voluntary Diesel Solutions program ("cleaner air for tomorrow, today"), launched in 2001, the agency enables partners to reduce diesel emissions by retrofitting engines, using cleaner fuel and promoting reduced idling. The Puget Sound Clean Air Agency works in partnership with the EPA and the Washington State Department of Ecology, but is a separate organization. The Puget Sound Clean Air Agency jurisdiction covers King, Kitsap, Pierce and Snohomish Counties, spans 6,300 square miles and is home to more than 3.5 million people — almost half the state's population. See: *http://www.pscleanair.org*

Puget Sound Regional Council

The Puget Sound Regional Council is an association of cities, towns, counties, ports, and state agencies that serves as a forum for developing policies and making decisions about regional growth and transportation issues in the four-county central Puget Sound region. See: *http://www.psrc.org/*

Starcrest Consulting Group, LLC

Starcrest Consulting Group, LLC (Starcrest) is a uniquely designed small business dedicated to providing maritime and port clients with high quality technical, environmental, and business services support in the field of air quality issues evaluation, strategy, planning, and policy. Since its inception in 1997, Starcrest has placed working with Port Authorities and related maritime entities to solve air quality issues as a top priority. In addition to working with the Puget Sound Maritime Air Forum, Starcrest has provided support on air quality issues with the Port of Seattle, the Port of Los Angeles, the Port of Long Beach, the Port of Oakland, the Port of Houston Authority, and the Port Authority of New York & New Jersey, as well as several Pacific Rim ports.

Transportation Institute

The Transportation Institute was established in 1967 as a Washington-based, non-profit organization dedicated to maritime research education and promotion. The Institute companies participate in all phases of the nation's deep sea foreign and domestic shipping trades, and barge and tugboat operations on the Great Lakes and on the 25,000 mile network of America's inland waterways. These operations embrace deep-sea and river passenger vessels, and liquid, dry-bulk, container and special purpose ships. Many are contracted to the U.S. military services. All are of U.S. registry -- crewed by American citizens operating under the world's highest safety standards, and proudly flying the American flag. With offices on the east and west coasts, the Transportation Institute supports a wide range of programs that promote the strength of America's capability. See: *http://www.trans-inst.org/*

U.S. Coast Guard

The U.S. Coast Guard is a military, multi-mission, maritime service and one of the nation's five Armed Services. Its mission is to protect the public, the environment, and U.S. economic interests – in the nation's ports and waterways, along the coast, on international waters, or in any maritime region as required to support national security. See: *http://www.uscg.mil/uscg.shtm*

U.S. EPA

The EPA leads the nation's environmental science, research, education and assessment efforts. The EPA works to develop and enforce regulations that implement environmental laws enacted by Congress. EPA is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and tribes the responsibility for issuing permits and for monitoring and enforcing compliance. Where national standards are not met, the EPA can issue sanctions and take other steps to assist the states and tribes in reaching the desired levels of environmental quality. See: *http://www.epa.gov/*

U.S. Navy

The mission of the Navy is to maintain, train and equip combat-ready Naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas. See: *http://www.navy.mil/*

Washington Department of Ecology

The Washington Department of Ecology's mission is to protect, preserve and enhance Washington's environment and promote the wise management of our air, land and water. To fulfill the mission, Ecology has three goals: prevent pollution, clean up pollution, and support sustainable communities and natural resources. Since its creation in 1970, the agency has helped achieve far-reaching improvements for Washington's air, land, and water. Air quality is significantly better, toxic industrial discharges have been reduced, the generation of hazardous waste has been reduced by half in 20 years, landfills have been modernized, recycling has been widely embraced, large oil spills are much rarer, and thousands of contaminated sites have been cleaned up. See: *http://www.ecy.wa.*

Washington Department of Transportation

The Washington Department of Transportation acknowledges the state's vital interests in protecting and preserving natural resources and other environmental assets and its citizens' health and safety. These interests must be integrated with other vital interests committed to the Department, including the cost-effective delivery and operation of transportation systems and services that meet public needs.
See: *http://www.wsdot.wa.gov/*

Washington Public Ports Association

The Washington Public Ports Association serves as the hub through which the State's 76 public ports work cooperatively to share information and address issues on trade, transportation, and the environment. In turn, the Washington Public Ports Association provides leadership on legislative advocacy, research and education. See: *http://www.washingtonports.org/*

Washington State Ferries

Washington State Ferries is the largest ferry system in the U.S., serving eight counties within Washington and the Province of British Columbia in Canada. Counties served include Pierce, King, Snohomish, Kitsap, Skagit, Island, San Juan, and Jefferson. Washington State Ferries' existing system has ten routes and twenty terminals that are served by 28 vessels. In fiscal year 2005-06, Washington State Ferries carried nearly eleven million vehicles and twenty-four million people. See: *http://www.wsdot.wa.gov/ferries/*

Western States Petroleum Association

Western States Petroleum Association is a non-profit trade association that represents approximately 30 companies that account for the bulk of petroleum exploration, production, refining, transportation and marketing in the six western states of Arizona, California, Hawaii, Nevada, Oregon and Washington. Founded in 1907, Western States Petroleum Association is the oldest petroleum trade association in the U.S. See: *http://www.wspa.org/*

The Forum coordinates its efforts with:

British Columbia Chamber of Shipping

The British Columbia Chamber of Shipping speaks out for its members with all levels of government and the wider marine community on such topics as ship and port operations, navigation and pilotage, cruise ships, legislation, and even as a registration point for vessels under the Canadian oil spill regulations. See: *http://www.chamber-of-shipping.com*

Environment Canada

Environment Canada is the Canadian equivalent of the U.S. EPA. See: *http://www.ec.gc.ca/*

Greater Vancouver Regional District

The Greater Vancouver Regional District is a partnership of 21 municipalities and one electoral area that make up the metropolitan area of Greater Vancouver. See*: http://www.gvrd.bc.ca/index.html*

Vancouver-Fraser Port Authority

The Vancouver-Fraser Port Authority facilitates and expands the movement of cargo and passengers through the Port of Vancouver in the best interests of Canadians. See: *http://www.portvancouver.com/*

Appendix C - EPA Quality Assurance Project Plan

Puget Sound Maritime Air Emissions Inventory

U.S. EPA Regions 9 and 10 Collaborative Diesel Emissions
Reduction Grant XA-960107-01-0

Quality Assurance Project Plan

March 15, 2006

MARITIMEAIRFORUM.ORG
PUGET SOUND
MARITIME AIR
FORUM

A. Project Management

A1. Title and Approval Sheet

Title of Plan: Puget Sound Maritime Air Emissions Inventory Project

Organizations Implementing the Project: Port of Seattle, in collaboration with American Lung Association of Washington, Olympic Region Clean Air Agency, Pacific Merchant Shipping Association, Port of Everett, Port of Tacoma, Puget Sound Clean Air Agency, Washington State Ferries, and Western States Petroleum Association.

Effective Date of Plan: March 15, 2006

Approving Officials:

Organization's Project Manager (Port of Seattle)

______________________________ _______________
Signature Date

Barbara J. Cole
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EPA Project Manager

______________________________ _______________
Signature Date

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A2. Table of Contents

A3. Distribution List

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A4. Project/Task Organization

Project Background

The Puget Sound Maritime Air Forum is a voluntary, broad-based regional association of maritime organizations, air agencies, and other parties with operational or regulatory responsibilities related to maritime industry air quality impacts. Begun in 2004, the Forum is led by the Port of Seattle and includes members from throughout the greater Puget Sound region and Western Washington.* Forum members have a shared interest in enjoying the benefits of cleaner air, protecting the region's ambient air quality attainment status, participating in policy decision making regarding maritime operations, ensuring that policies are based on the best available information, minimizing regulatory mandates, enhancing the region's economic competitive advantages, and preserving positive relationships with communities. By improving understanding of maritime-related emissions sources, the maritime community will be better able to design and implement cost-effective, fact-based air pollution control strategies. These strategies, in turn, will help ensure the long-term success of maritime commerce in our region with its positive impact on the region's economic vitality.

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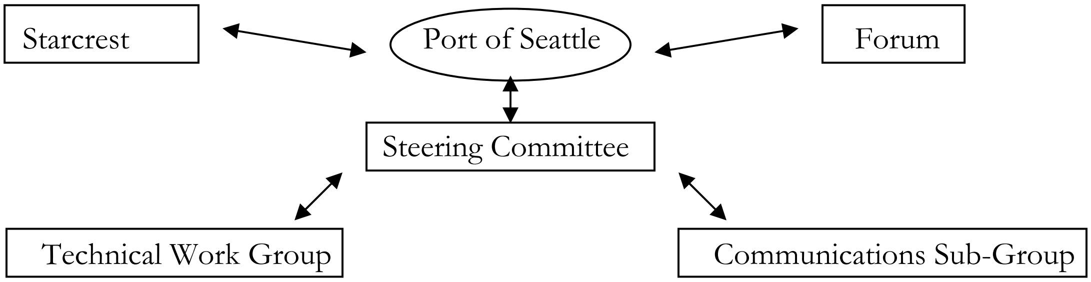
[*] Forum members are American Lung Association of Washington, Burlington Northern Santa Fe Railway, Cummins Northwest, Environmental Coalition of South Seattle, North Pacific Fishing Vessel Owner's Association, Northwest Cruise Ship Association, Olympic Region Clean Air Agency, Pacific Merchant Shipping Association, Port of Anacortes, Port of Bellingham, Port of Everett, Port of Olympia, Port of Seattle, Port of Tacoma, Puget Sound Clean Air Agency, Puget Sound Regional Council, Transportation Institute, U.S. Coast Guard, U.S. Environmental Protection Agency, U.S. Navy, UW/EPA NW PM Research Center, Washington Dept. of Ecology, Washington Dept. of Transportation, Washington Public Ports Association, Washington State Ferries, Western States Petroleum Association

Forum members have agreed to provide funding, data, in-kind assistance, technical expertise or a combination thereof and have agreed to work together to develop the 2005 baseline Puget Sound Maritime Air Emissions Inventory.

Project Management

The review and funding for the inventory is being provided by several different ports, maritime related entities, air agencies, and other parties. Those providing the funding are members of the Steering Committee, which is made up of the American Lung Association of Washington, Burlington Northern Santa Fe Railway, Pacific Merchant Shipping Association, Olympic Region Clean Air Agency, Port of Everett, Port of Tacoma, Port of Seattle, Puget Sound Clean Air Agency, Washington State Ferries, and Western States Petroleum Association. Members of the Steering Committee are parties to the Memorandum of Agreement. The Port of Seattle is the lead-contracting agency for the project and serves as the project manager on behalf of the Steering Committee. Members of the Steering Committee, and representatives of other organizations appointed by the Steering Committee, were selected to serve on the Technical Work Group (TWG). The purpose of the TWG is to review and make recommendations to the Steering Committee regarding the Technical Approach and the draft report(s). The TWG reports recommendations to the Steering Committee for final approval. The consultant hired by the Forum to assist in developing the EI, Starcrest Consulting Group, LLC (Starcrest), reports to the Port of Seattle and reports to and assists in the coordination of the TWG and Steering Committee as directed by the Port of Seattle. All work products developed under this effort first go to the Port of Seattle for approval. Further distribution to the Steering Committee and the TWG will be as directed by the Port of Seattle.

Project Organization Chart



Puget Sound Maritime Air Forum Steering Committee

Below are the organizations that compose the Steering Committee, which meets monthly. All Steering Committee members are parties to the Memorandum of Agreement and are contributing funding and in-kind support to the Puget Sound Maritime Air Emissions Inventory project. Decisions regarding the Technical Approach, reports, and other matters related to the emissions inventory project will be made by the Steering Committee in accordance with the provisions of the MOA. The Forum received comments regarding the methodology for the emissions inventory from the Technical Work Group, especially from the participating organizations and regulatory agencies.

- Public Agencies
    - Olympic Region Clean Air Agency
    - Port of Everett
    - Port of Tacoma
    - Port of Seattle
    - Puget Sound Clean Air Agency
    - Washington State Ferries
- Not for Profit Organizations
    - American Lung Association of Washington
    - Pacific Merchant Shipping Association
    - Western States Petroleum Association

Memorandum of Agreement

The members of the Puget Sound Maritime Air Forum Steering Committee signed a Memorandum of Agreement (MOA) on May 26th, 2005 (included as attachment). The MOA was signed by the following organizations:

- Public Agencies
    - Olympic Region Clean Air Agency
    - Port of Everett
    - Port of Tacoma
    - Port of Seattle
    - Puget Sound Clean Air Agency
    - Washington State Ferries
- Not for Profit Organizations
    - American Lung Association of Washington
    - Pacific Merchant Shipping Association
    - Western States Petroleum Association

This agreement lays out the framework for management of the Puget Sound Maritime Air Emissions Inventory project. Some formal aspects, such as selection and management of support consultants and final approval of draft documents, are established in the MOA (attached). Many decisions, such as provision of comments from the Forum in agency policy development processes, will be made by consensus with opportunity to document significant minority opinions. Details in the MOA include project, financial, consultant, and data management of the Puget Sound Maritime Air Emissions Inventory project, defines roles and responsibilities of the Steering Committee members, and establishes the monetary contributions of each member.

Puget Sound Maritime Air Forum Technical Work Group

The Puget Sound Maritime Air Forum Steering Committee, per the MOA, appointed a Technical Work Group (TWG) from organizations with technical expertise and/or from whom data regarding maritime activities are necessary for the success of the emissions inventory data. The purpose of TWG is to focus on the methodologies by which emissions will be estimated and review and comment on the technical approach (TA), which will include overview of the sources to be included and the geographical extent, the emissions factors document, and the draft reports.

- Public Agencies
    - Environment Canada
    - Greater Vancouver Regional District
    - Olympic Region Clean Air Agency
    - Port of Everett
    - Port of Tacoma
    - Port of Seattle
    - Puget Sound Clean Air Agency
    - U.S. Environmental Protection Agency
    - Washington Department of Ecology
    - Washington Department of Transportation
    - Puget Sound Regional Council
- Not for Profit Organizations
    - North Pacific Fishing Vessel Owner's Association
    - Pacific Merchant Shipping Association
    - Transportation Institute
    - Western States Petroleum Association

Establishment of the Communications Sub-Group

The Steering Committee established a Communications sub-group, composed of public affairs staff from the Steering Committee organizations, in July 2005 to work on the aspects of developing our mission statement and promote the efforts of the Forum and its members. A Forum communications plan was established, as well as a website (www.maritimeairforum.org) and a logo.

Consultant Selection Process

The Port of Seattle, on behalf of the Puget Sound Maritime Air Forum, issued a Request for Qualifications (RFQ) (included as attachment) to select a consultant to prepare the Puget Sound Maritime Air Emissions Inventory, in compliance with Washington State procurement requirements The RFQ was released on April 22, 2005, with submittals due to the Port of Seattle by 2:00 PM on May 6, 2005. The schedule for consultant selection was as follows:

- Advertise for Consultant – April 22, 2005
- Pre-bid Meeting – April 27, 2005 9:00 – 10:00 AM, Port of Seattle Pier 69 Headquarters, room 3CC05
- Statements of Qualification due – May 6, 2005
- Short-List Consultants – May 13, 2005
- Interviews – Week of May 16 through May 20, 2005
- Consultant Selection – Approximately May 23 – 27, 2005
- Execute Contract – Approximately June 1, 2005

This advertisement resulted in two consulting firms submitting Statements of Qualifications, Starcrest and the Geomatrix team (composed of Levelton, Genesis Engineering, Geomatrix, and Heffron Transportation consulting firms). The Steering Committee of the Puget Sound Maritime Air Forum, which served as the consultant selection team, selected Starcrest to prepare the emissions inventory (included as attachment). A Category C contract, not to exceed $500,000, was signed with Starcrest on June 7, 2005. Six Supplemental Agreements were written under this contract, which correspond to the six tasks listed in the project scope of work.

Project Members

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	Walter Williamson +1 (360) 371-1494 (phone) WILLIWO@bp.com
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Starcrest Project Team

Name	Project Responsibility	Source Category Sector Leader
Bruce Anderson	Principal, Project Director	Ocean-going Vessels, Western States Petroleum Association
Joe Ray	Principal, Technical Director	Rail, Heavy-duty Vehicles
Joyce Kristiansson	Project Manager	Washington State Ferries
Guiselle Aldrete		Harbor Craft, Cargo Handling Equipment
Mark Carlock	Quality Assurance Director	Database
Sam Wells	Modeler	
Archana Agrawal	Modeler	
Galen Giebler	Database Support	

A5. Problem Definition/Background

The study will estimate emissions associated with maritime-related mobile source operations associated with maritime-related activities in the greater Puget Sound region. Emissions from sources that are subject to air permits will not be included because those emissions have already been quantified. The EI will include the following source categories: ocean-going vessels, harbor craft, off-road cargo handling equipment, railroad locomotives, and on-road heavy-duty vehicles. The basic approach will be to develop activity-based "bottom up" emissions inventories based on interviews and conversations with the individuals who own, operate, maintain, and/or charter the equipment and vessels to be included. In general, this will include container terminals, liquid and dry bulk terminals, railroad operations, ferry services, and other sources of marine related activities. Data provided by agencies and associations such as the Western State

Petroleum Association and U.S. Coast Guard will also be incorporated. Forum members and Starcrest will work with regulatory agencies to project activity or emissions levels for those facilities not actually surveyed.

A6. Project/Task Description

HE GEOGRAPHICAL BOUNDARY OF THE PUGET SOUND MARITIME AIR EMISSIONS INVENTORY IS THE AREA OF THE PUGET SOUND/GEORGIA BASIN AIRSHED FROM THE U.S.-CANADA BORDER SOUTH AND FROM THE "J" BUOY AT THE MOUTH OF THE STRAIT OF JUAN DE FUCA EAST. BELOW IS A MAP OF THE STUDY AREA.

TASK 1: DEVELOP AND COORDINATE AN APPROVED TECHNICAL APPROACH

This task is key to understanding data sources and collection methods. Starcrest will develop a draft Technical Approach (TA) in conjunction with the TWG to describe how the activity-based emissions inventory will be prepared with an emphasis on accuracy and meticulous documentation of data and methodology to support additional analysis in the future. The TA will be as clear as possible regarding data collection methods up front. The draft TA document will be coordinated and approved by the Project Manager prior to submittal to the TWG for comments. The TA must be approved by Steering Committee prior to the start of detailed data collection and emission estimating begins. The TA will be built on estimating methodologies for maritime-related sources, including the recently completed marine inventories in California, New York, and as applicable, the Northwest. The TA will be standardized with other maritime emissions inventories to the extent practicable and as approved by the Steering Committee. The TA will include documentation of assumptions sufficient to allow technical use and comparison of this inventory with others cited in this paragraph. Since the inventory will include greenhouse gases, the latest available emissions factors and estimating methods will be evaluated and proposed in the TA document provided by Starcrest. Coordination, to the maximum extent practical, with Environment Canada and the Greater Vancouver Regional District (GVRD) will again be critical. The methodologies for each source category will be coordinated with the Project Manager prior to submittal to the TWG and the Steering Committee for their review, comments, and endorsements.

While each source category has a slightly different methodology for estimating air emissions, the general approach is basically the same. Emission estimates are developed as a function of engine power, activity, and an emission factor (where feasible). Review of the fuel sulfur content sampling of a statistically significant number of vessels, including fuels for both the main engines and on-board generators, will be conducted with the assistance of PMSA and other Members and participants. To the extent practicable, every vehicle or piece of equipment will be inventoried and entered into a database, with engine parameters (make and model, maximum rated power, etc.) and applicable activity/operational data (e.g., hours, miles, gross ton-miles, gallons, throttle notch, etc.) being recorded. For those activities associated with a marine terminal, a terminal source identification code will be developed. Off-terminal activities will be assigned geographic identifiers relating to specific areas, (such as a rail yard or roadway).

The TA document will include the following subject areas at a minimum:

- Emission estimating methodologies for the six source categories listed above
- Data collection approach and description of types of information to be collected for each source category (for example: engine manufacturer, make and model years, fuel type, and duty cycle data)
- Project schedule and milestones
- Coordination plan for incorporating resources provided by participants
- Quality Assurance/Quality Control (QA/QC)

It is important to note that the TA will not be considered a "final" description of the approach to developing the emissions inventory even after its approval by the Project Manager and the TWG. There is invariably a need for adjustment of some aspects of a planned approach to account for unforeseen circumstances. These adjustments will be communicated to and coordinated with the Project Manager and the TWG but will not be incorporated into a revision to the TA once a "final draft" TA has been approved to avoid the need for multiple iterations of document revision, review, and re-approval. The emissions inventory report itself will serve as the final description of the approach to developing the emissions inventory.

TASK 2: DEVELOP EMISSION ESTIMATES FOR THE SIX SOURCE CATEGORIES

Based on the methodologies suggested by the TWG and approved by the Steering Committee, Starcrest will collect the appropriate data and develop emission estimates for the six source categories under this task. The methodologies by source category are further discussed below.

Ocean-Going Vessels (OGVs)

OGVs are typically grouped by the cargo they carry as the cargo type strongly influences their physical parameters and operational activities. At a minimum the following OGV subcategories will be considered:

- Containerships
- Cruise ships
- Tankers (crude, chemical)
- Dry bulk carriers
- Auto carriers
- General cargo ships
- Large fishing vessels
- Refrigeration ships
- Roll-on/roll-off ships
- Military ships (USN, Coast Guard)
- Others (heavy-lift, research, integrated tug-barge, etc.)

OGV emissions will be estimated in three modes of activity: transiting, maneuvering, and hotelling. Transiting is the mode in which the ship approaches the coast, including picking up the pilot (arrivals), to the start of maneuvering (or vise-versa for departures) operations. Maneuvering is when a ship transitions from transiting to hotelling. Hotelling is typically when the ship is at berth dispensing or loading cargo, but can include maintenance time at berth for maintenance and repair. Emissions will be estimated by vessel type and mode for the study area. Starcrest will include a combination of existing data from other relevant studies; interviews with vessel owners, operators, and association representatives; and vessel rides to directly observe and document key activity data as specified in the TA and resources permit.

Harbor Vessels

Commercial marine vessels not listed above fall into the towboat or harbor vessel category. The harbor vessel source category includes any vessel that generally spends its time within the study area and includes:

- Assist tugboats
- Line-haul and shift towboats
- Ferries
- Excursion vessels (charter fishing vessels may be included here)
- Commercial fishing vessels
- Dredges and dredge support vessels
- Crewboats
- Recreational vessels
- Government vessels (pilot, patrol, fire boats, research, and enforcement)
- Others

Similar to OGVs, emissions will be estimated on an activity basis and cross-checked with fuel data if available.

The Puget Sound Clean Air Agency has developed a methodology for estimating emissions from the recreational vessel fleet that Starcrest will review and refine in coordination with the agency. This will be used as the baseline methodology for recreational vessels. The report will include a sensitivity analysis comparing the methodology with the activity based approach and a discussion of limitations for this approach.

For the Washington State Ferries, existing emissions estimates will be reviewed, and values for time-in-mode and engine power for the various routes will be reviewed and refined, and the WSF data will be compiled into the regional database. Washington State Ferries has monthly and annual fuel consumption data for each ferry, which may be used to estimate the ferry emissions by the power demand method as well. The deviation of the power demand estimates from the fuel method estimates can be a gauge of how reasonable the power setting assumptions are for the ferries and other categories for which fuel data is not available.

As with OGV, Starcrest will include a combination of existing data from other relevant studies; interviews with harbor craft vessel owners, operators, and association representatives; and vessel rides to directly observe and document key activity data as specified in the TA and resources permit.

Cargo Handling Equipment (CHE)

CHE is nonroad equipment that operates primarily on port terminals. CHE covers a broad range of equipment that typically includes:

- Yard tractors
- Top and side loaders
- Forklifts
- Rubber tired gantry cranes
- Rail mounted gantry cranes
- Wharf cranes (can be electric or diesel electric configured)
- Cranes
- Backhoes
- Others (such as container refrigeration units, landscape and maintenance equipment)

All equipment types will be assigned a source category code (SCC). The method to estimate emissions is to incorporate physical and activity parameters into the model as inputs. Starcrest will interview terminal operators to better understand terminal hours of operation, equipment characteristics and duty cycles, and other activity related parameters that are relevant to the project. Output will be in a by-model-year output format. It should be noted that there are some kinds of equipment used at marine ports which need to be reclassified because they do not naturally fit into the model's source categories, such as:

- Container lift, top-pick, side-pick (industrial forklift)
- Rubber-tired gantry crane (other industrial equipment)
- Landscaping and maintenance equipment

WSF gasoline-powered "Dock Bulls", used to move dead cars and trash on and off the ferries, are not included in current estimates, and may be excluded, as will the on-site emergency generator as their emissions are very small relative to the vessels.

Onroad Trucks

Diesel powered trucks, such as stake-bed, container, tanker, refrigerated, and bobtail (no-trailer) trucks are the main sources of highway mobile source emissions near maritime facilities, although buses, delivery, construction, and personal commuter vehicle activities can also be significant. Travel demand modeling is most appropriate for estimating emissions from maritime-related activity on public roadways beyond its terminal property limits, and to maintain consistency with previous regional travel planning activities. Therefore the emissions inventory will leverage existing maritime and regional government transportation studies, Metropolitan Planning Organization (e.g., the Puget Sound Regional Council [PSRC]) studies and information, and other environmental documentation associated with maritime related on-road sources. It should be noted that off-road trucks (for example, terminal tractors) are included in the non-road task.

On-terminal highway truck activity is typically developed from in-out gate transactions. Trucks either have a single loading event (loading or unloading) or a double event (unloading and loading). Operational measures that will be utilized to compile on-terminal and near terminal emission estimates include, but are not limited to:

- Entry queue time (idle or creep-ahead)
- Travel to the loading area
- Loading and unloading (engine idling or engine off)
- Travel to the exit gate
- Drayage trips to nearby rail yards
- Travel on roadways in the immediate vicinity of terminals

Light-Duty Vehicles

Emissions for on-terminal fleet vehicle and passenger vehicles parking at the cruise terminals will be calculated based on average speeds and vehicle miles traveled (VMT) provided by terminal operators. Employee personal vehicles will not be included. In addition to speeds and VMT, the make, model, year and fuel type for the terminal fleet vehicles will be collected. The EPA MOBILE6 model will be used to calculate LDV emissions.

Locomotives

Locomotives are grouped into switchyard and line haul engines. Switch engines generally stay within the local area moving rail cars to and from rail yards and terminals.
Line haul engines are used to transport rail cars or trains to locations well outside the local area. Locomotive lines in the area include:

- Union Pacific
- Burlington Northern Santa Fe
- Tacoma Beltlines
- Other locomotives related to maritime operations

Starcrest will interview locomotive operators and estimate both switch and line haul locomotive emissions associated with the movement of maritime cargoes. Starcrest will ask for locomotive recorder data from locomotive operators.

For both on-road trucks and locomotives the work will be coordinated with regulatory agencies through the TWG to avoid "double counting" maritime related emissions and to agree on methodology to estimate their emissions in the region. To avoid double counting these emissions the methodology may be discussed in the narrative, but not included in the inventory. If available and resources permit, truck and locomotive origin and destination data related to cargo will be included. The level of detail and approach for off-terminal emissions of on-road trucks and locomotives will also depend on availability of resources as the details of the work plan are prioritized.

Task 3: Coordination with Technical Working Group and Steering Committee

Starcrest will coordinate with the Project Manager on a regular basis and provide support as directed to the TWG and the Steering Committee. This coordination will be significant during the development of the approved TA document and then again upon development of the final report. During the time in between these two tasks, Starcrest will hold regular update meetings with both groups to provide a status update on the progress of the data collection, emission estimates, report section development, and other updates, as needed. Starcrest will also participate in development of the Communication Plan by the Steering Committee and support development of communication tools and events.

Task 4: Development of Draft and Final Reports

Starcrest will develop a draft table of contents and a list of what is to be included in the appendices that will be reviewed and approved by the Project Manager prior to submittal to the TWG and the Steering Committee for review and comment. Starcrest will then prepare a draft report that will include technical appendices for review and comment by both the TWG and the Steering Committee. Starcrest will incorporate comments and a final document with appendices will be provided. Starcrest will provide the report in Word, Excel, and Adobe PDF formats and provide a camera ready final report for printing by the Port of Seattle Print Shop.

Starcrest will prepare intermediate emissions estimates and reports as needed to support grant and other reporting needs related to the project.

TASK 5: INTEGRATION SUPPORT FOR DATABASE DEVELOPMENT & POPULATING

Each maritime Member will develop their own database with their data incorporated into their organization's system at their own cost as desired and appropriate. To maximize time and cost effectiveness, a single database structure will be developed by the Port of Seattle. Participating maritime organizations may also choose to keep and maintain their individual data. The database structure and output formats will be developed in the Database Work Plan and specified by the Port of Seattle. Appropriate training, documentation, and support will be provided by the developer. In addition, data to support a Geographical Information System (GIS) component will be included in the inventory. Emissions inventory data is inherently geographic. Data necessary to support a GIS system will be collected with the other data. The Port of Seattle developed a database business plan in cooperation with its Information Technology group. Port of Seattle staff will develop and manage the database. Data provided by Starcrest for inclusion in the database will be provided in the format specified by the Port of Seattle. Starcrest will support development of the Port of Seattle database and the integration of the inventory data into the database which will serve as the central repository for data for the Puget Sound Maritime Air Emissions Inventory.

TASK 6: COORDINATE PARTICIPANT COMMITTED RESOURCES

As part of the collaborative effort of the participants, resources such as interns, staff, and access to data sources will be provided at unprecedented levels. It will be the responsibility of Starcrest to work with the Project Manager and coordinate these resources so that they are effectively integrated into the project. The coordination plan will be incorporated into Task 1.

SCHEDULE

With a baseline year of 2005 for the inventory the following schedule should be met by Starcrest:

- Task 1: Develop and Coordinate an Approved Technical Approach
  - Draft Technical Approach document - 90 days after notice to proceed
  - Final Technical Approach document – 15 days after receipt of all comments
- Task 2: Develop Emission Estimates for the Six Source Categories
  - Data collection for all source categories completed within first 120 days of 2006
  - Draft emission estimates – 255th day of 2006
  - Spatial allocation of emissions – 270th day of 2006
- Task 3: Coordinate with Technical Working Group and Steering Committee
  - Coordination will be throughout the entire project
- Task 4: Develop Draft and Final Reports
  - Draft Table of Contents and Appendices – 120 days after Final Technical Approach document
  - Draft Report – 300th day of 2006
  - Final Report – 30 days after receipt of all comments
- Task 5: Integration Support for Database Development & Populating
  - Integration will be throughout the entire project
- Task 6: Coordinate Participant Committed Resources
  - Coordination efforts will be throughout the entire project

A7. Quality Objectives and Criteria

The objectives for quality, and the criteria for demonstrating that the objectives have been met, include:

1. Develop an emissions inventory that provides an accurate estimate of emissions from the subject source categories. This objective will be met by:
   - Meeting Objectives 2, 3, and 4, which together will ensure that the emission estimates are the best that the current state of knowledge can provide.
2. Obtain and maintain participation and support of members of the TWG and the Steering Committee with regard to methods of data collection, emission estimation, and report preparation. This objective will be met by:
   - Continuing to hold and participate in scheduled meetings of the TWG and the Steering Committee as the project progresses,
   - Appropriately addressing issues raised by members of these groups.

3. Use current and defensible emission factors and emission estimating models. This objective will be met by:
    - Reviewing the emission factors used for recent marine emissions inventories
    - Consulting the literature for recent emission factor related publications,
    - Ensuring that the most recent versions of EPA estimating models such as NONROAD and MOBILE6 are used,
    - Distribute the proposed emission factors to the TWG for review, discussion, and, if revised, be submitted to the Steering Committee for approval revision.
4. Collect data from source category operators to a high level of completeness, consistent with expectations discussed in Section B, Data Generation and Acquisition. This objective will be met by:
    - Developing a comprehensive list of facilities (ports, terminals, etc.) to be included in the emissions inventory,
    - For source types requiring a high level of data completion (see Section B), contacting each source operator individually to explain the data needs and request cooperation and participation,
    - Reviewing provided data for completeness and reasonableness (e.g., horsepower, hours of operation, etc. should be similar to data collected during previous emissions inventories conducted by Starcrest),
    - Providing feedback to data provider regarding perceived data gaps or inconsistencies and requesting clarification or additional data if needed.
5. Report the results in a clearly presented format that explains how the estimates were developed and presents the emission estimates in the context of area-wide emissions from other source types operating in the area (such as stationary sources including non-maritime mobile sources). This objective will be met by:
    - Discussing and agreeing on general format with the TWG early in the emission inventory process,
    - Starting work on the report early with an outline being the first stage of preparation (to be reviewed by the Project manager and the Steering Committee),
    - Reviewing early drafts of the report sections with the Project Manager and, at the Project Manager's discretion, with the Steering Committee and TWG.

A8. Special Training/Certification

The contract was awarded to Starcrest, an experienced port and maritime air quality consultant, based on a detailed Statement of Qualifications (attached) and documented in the Consultant Selection Justification prepared by the Port of Seattle (attached). In addition, selected port personnel will assist in harbor craft and heavy-duty vehicle data collection, and will receive on-the-job training through Starcrest team members.

In addition to explaining the nature of the source category and the data that is needed to estimate emissions, the Starcrest team members will provide data collection templates and lists of the questions that should be posed to potential data providers such as vessel owners and operators. The Starcrest team member will also maintain contact with the port data collector to address questions that may arise, and will review the collected data for completeness and reasonableness (as discussed in Section A7 above).

No additional special training, and no certifications, will be needed for the emissions inventory project

A9. Documents and Records

As a public agency, the Port of Seattle is subject to Washington State record retention requirements, as established in the Revised Code of Washington (RCW) 40.14 Preservation and Destruction of Public Records. Based on this RWC, the Port of Seattle established a Records Management Policy LE-1 (attached) to ensure that documents and records generated by the Port are maintained in compliance with these requirements. Records that will be generated during the Puget Sound Maritime Air Emissions Inventory project may include draft and final reports, meeting minutes, Puget Sound Maritime Air Emissions Inventory project database, technical approach, scope of work, and contract and accounting documents. The Port of Seattle utilizes the Hummingbird Document Management System to retain electronic documents, also is used for version control and updates. Documents will be distributed to Forum members via email. Reporting format for hard copy and electronic forms will be Microsoft Word, Adobe PDF, Microsoft Excel, and others as needed. In case where documents are prepared in Adobe PDF format, an electronic version in the source format will also be maintained. Reports generated from the database will be retained per the Records Management Policy LE-1. The database itself is not classified as a record but will be maintained for the foreseeable future. Original documents that are produced in hard copy will be retained at the Port of Seattle Headquarters at Pier 69, 2711 Alaskan Way, Seattle, WA 98121 for 2 years. Beyond 2 years, original documents will be moved to off site storage at Iron Mountain for the remainder of the retention schedule. Once the document has reached the end of the retention schedule it will be disposed of by Iron Mountain upon authorization by the Port of Seattle. Below is the record retention schedule for documents related to this project that the Port of Seattle is subject to.

Type of Document	Record Description	Length of Retention
Bid and Proposal Files – Successful	Case histories of requests for bids and proposals to provide the agency with goods and services. Including specifications, the chosen bid, or proposal, and statements of qualification.	6 years after completion of purchase or fulfillment of contract
Bid and Proposal Files – Unsuccessful	Unsuccessful bids and proposals, includes statement of qualification.	2 years
Contracts, Agreements, and Warranties		6 years after contract or agreement termination
Correspondence - General	Letters, memos, etc. and attached materials sent and received during the course of business (Includes post cards).	2 years
Grant Agreement	Official statement of the terms and conditions of the grant agreed upon and signed by the grantor and the grantee	3 years from the date of submission of the final expenditure report or retain for period required by grant or program.
Grant Applications – Approved	Includes narrative explanation of the nature and purpose of the proposed project, amount of funds requested, matching funds, in-kind contributions, and plan of work.	3 years from the date of submission of the final expenditure report or retain for period required by grant or program.
Grant Expenditure Report – Final	End of project report accounting for the expenditure of grant funds submitted for non-continuing grants	3 years from the date of submission of the final report or retain for period required by grant or program.
Grants: Financial Support Documents – Continuing Grants	Working papers, such as summaries, spread sheets and other data reflecting the expenditures of grant funds.	3 years or retain for period required by grant or program.
Grants: Financial Support Documents – Non-Continuing Grants	Working papers, such as summaries, spreadsheets, and other data reflecting the expenditure of grant funds.	3 years from the date of submission of the final expenditure report or retain for period required by grant or program.
Grant Project Reports	Statement on progress, problems, and success in the completion of the grant project, including periodic, annual, special, and final reports.	3 years from the date of submission of the final expenditure report or retain for period required by grant or program.

Grant Project Warrants, Checks, and Vouchers		6 years or until satisfaction of grant audit requirements, whichever is longer
Meeting Minutes and Reports	(Non-Commission) Meeting notes, agendas, attendance records and correspondence of various Port of Seattle committees	6 years
Pollution and Pollution Control Studies	Includes soil sampling and monitoring data and reports.	5 years
Project Files	Other then public works or construction projects.	Completion of project plus 6 years
Press Releases	Press releases issued by the Port of Seattle regarding Port policies, events, activities, etc.	Destroy when obsolete or superseded

B. Data Generation and Acquisition

B1. Sampling Process Design (Experimental Design)

Data collection for this emissions inventory will not involve any actual sampling; rather, information will be collected from personnel who own or operate the emitting equipment, and from databases or other published or publicly accessible information sources. The data collection methods are discussed in section B9, Non-Direct Measurements.

B2. Sampling Methods

Not applicable for this project.

B3. Sample Handling and Custody

Not applicable for this project.

B4. Analytical Methods

Not applicable for this project.

B5. Quality Control

Not applicable for this project.

B6. Instrument/Equipment Testing, Inspection, and Maintenance

Not applicable for this project.

B7. Instrument/Equipment Calibration and Frequency

Not applicable for this project.

B8. Inspection/Acceptance of Supplies and Consumables

Not applicable for this project.

B9. Non-direct Measurements

The Technical Approach document includes a detailed description of how data will be collected and used during the course of the project, and the reader of this QAPP is encouraged to review that document. Each source category has a separate section within the Technical Approach that describes the types of data specific to that sector (ocean-going vessels, harbor craft, cargo handling equipment, rail, heavy-duty vehicles, and light-duty vehicles). Since the Technical Approach is a working document, the approach will likely be revised during the emissions inventory process. For that reason, it is not excerpted here, but instead should be consulted directly.

Based upon the approved Technical Approach, Starcrest will initiate the detailed data collection process. Starcrest has found that the more interest the stakeholder has in the project, the more efficient the data collection process. Because of the intensive collaboration that has occurred in developing this scope of work, Starcrest believes that the stakeholders have expressed deep interest and thus the data collection process should be relatively efficient. Starcrest recognizes that the various entities will have their data and information in a variety of formats, and will likely draw from existing sources used for other purposes.

To facilitate data collection while not placing undue burden on the organization data is being collected from, Starcrest will compile clear and concise lists of data that are needed, based on the entity and source category, and then will request the data in any format convenient to that particular entity, including e-mail, verbal, or hard copy data, site visits to collect the data, and/or existing spreadsheets developed for other purposes. A Starcrest sector leader will be assigned to each source category and will be the point person for coordinating resources and gathering the data for that category, for example, ocean-going vessels, harbor vessels, cargo handling equipment, on-road trucks, and locomotives. Each Starcrest sector leader will be matched to a designated stakeholder participant, and they will work together to ensure that the correct data is gathered accurately and on time.

The data collection process will include the data necessary to perform the emissions calculations and data necessary to locate the sources through GIS so that the sources may be located spatially in the emissions inventory database. In addition, for critical source owners, operators, etc., the sector leader will personally interview the data provider to ensure that there is a clear understanding of how their sources operate, inter-relate with operations, and to determine if there are data or understanding gaps that can be better understood.

Once the data is collected, each sector leader will review it for completeness and reasonableness, as discussed previously. Any data gaps or apparently anomalous data will be identified, and the source of the data will be contacted for resolution. For example, if a piece of equipment is identified as having operated 10,000 hours per year (a year has 8,760 hours), the provider of the data will be contacted to determine what the correct value should be.

If gaps remain after the data provider has been consulted (i.e., if the data provider is not able to provide complete information on every piece of equipment), then the missing data will be filled with surrogate values based on averages for appropriately similar equipment that have been provided by data providers. These surrogate values will be reported to the original data source for concurrence that they are reasonable. Because the data will not be provided to the modeler until all gaps and anomalies have been resolved, the data collection process is usually more time consuming, both in terms of labor hours and calendar schedule, than the actual modeling.

After the data has been reviewed and gaps have been filled, the modeler will conduct further quality assurance relative to model inputs, and then the modeling will be fairly straightforward as it will be conducted in accordance with the methods and factors that have been detailed in the Technical Approach. The data review steps will vary with the specific data and with the emission source category represented by the data. For example, vessel call data will be reviewed to ensure that the listed ship calls are logical with respect to time and space (e.g., an arrival at a particular berth should be followed by a hotelling period and a departure from the same berth). For cargo handling equipment estimates prepared using the NONROAD model, data checks would include comparing the number of engines in the output file with the number in the original survey data.

The emission estimates will also be reviewed for reasonableness, relative to other emissions inventory results for the same source categories. For example, cargo handling equipment emissions from a container terminal in the Puget Sound emissions inventory should be similar to cargo handling equipment emissions from similarly sized container terminals in other similar emissions inventories (taking into account emission reduction initiatives that may have been implemented at one or more of the terminals). Developing precise acceptance criteria for "similar" or "reasonably close" would be problematic due to the numerous differences between terminals and terminal equipment. It would be difficult to determine whether the reasons for a difference were due to faulty data or to significantly different equipment emissions without reviewing the equipment data itself, something that cannot be done before the data is collected.

Detailed information collection such as described above will be the procedure for cargo handling equipment, on-terminal light-duty vehicles, and locally operated switch locomotives. Data on ocean-going vessels will also be collected to a high degree of completeness, being based on records of vessel arrivals and departures and on ship characteristic databases (such as Lloyd's Registry of Ships). Information on harbor craft, on-road trucks, and line haul locomotives will be based on fleet average characteristics obtained from owners, operators, and regional databases, as discussed in the Technical Approach.

B10. <u>Data Management</u>

The Port of Seattle plans to develop and maintain an emissions inventory database, and will support the integration of the emissions inventory information into the database. The database structure and output formats will be developed by the Port of Seattle in the Database Work Plan, and the training, documentation, and support will be provided by the Port of Seattle's Information and Communications Technology (ICT) group. During the process of gathering the data for development of the emissions inventories as described, Starcrest will also collect the data necessary to support a GIS application. Starcrest is developing the database in conjunction with Port of Seattle's ICT group to ensure the database architecture is compatible with Port system requirements.

C. Assessment and Oversight

C1. <u>Assessments and Response Actions</u>

Assessments to be used in the project include the following:

- The Technical Approach, and subsequent modifications, will be reviewed and approved by the Project Manager and the Steering Committee with comments from the Technical Working Group as needed.

- Conduct periodic status meetings among the consultant, the Project manager, and the Steering Committee, with TWG consultation as needed.
- Development, maintenance, and periodic review of the status of the data collection process and submittals (listing entities from whom data is required and status of that data, e.g., requested, provided/under review, additional data requested, complete) will be conducted as outlined below.
  - Data will be developed and maintained by designated personnel responsible for collecting the information.
  - Data will be reviewed monthly by the Starcrest Project Coordinator.
  - The Starcrest Project Coordinator reports to Project Manager if data collection difficulties appear to negatively affect completion of project milestones.

    - The Project Manager will work with stakeholders to encourage resolution of data difficulties as they arise.
- Development, maintenance, and review of the project schedule and timeline, which indicates tasks, milestones, and project progress.
    - The project schedule and timeline will be developed and maintained by the Starcrest Project Coordinator.
    - The project schedule and timeline will be reviewed monthly by the Project Manager.
    - If scheduled milestones are not being met, the Project Manager and Starcrest Project Coordinator will work together to resolve delays.
- Draft report sections, data, and emission calculations will be reviewed by the Project Manager and the Steering Committee, with comments from the TWG as needed, to ensure that the calculations are developed in accordance with the Technical Approach and that report meets the expectations and requirements of the Technical Working Group.

In general, the methodologies are pre-defined in the Technical Approach document, and the final work product will be compared to the Technical Approach, and any gaps or inconsistencies will be addressed.

The Port of Seattle, as project manager and contracting agency, has the right to stop work, require modifications, and approve any draft and final reports. Work orders are issued through supplemental agreements to a contract. Supplemental agreements authorize and define a scope of work, budget, deliverables, and timeline. The Port of Seattle reserves the right to make changes to the scope of work or to terminate the contract if there is a failure to perform work. Starcrest is authorized to act once a supplemental agreement is signed by both Starcrest and the Port of Seattle. If needed, the Port of Seattle will respond to assessment findings and take corrective actions, which will be verified and documented in accordance with the Port of Seattle Records Management Policy.

C2. Reports to Management

Reports to management are conducted through periodic teleconference meetings and written updates. The Port of Seattle Project Manager reports on the schedule, progress to date, and any problems or issues that arise to the Steering Committee on a generally monthly basis. The Steering Committee will review these reports and work with the Project Manager to resolve any problems that may arise according to the terms listed in the MOA.

D. Data Validation and Usability

D1. Data Review, Verification, and Validation

Each sector leader will review and validate data with regard to completeness, activity indicators, and possible out-of-range values. Each data file to be considered for inclusion in the master database will have a meta-file indicating the file properties, each column and what it means, when the file was created and modified, and any known issues. Activity metrics shall state the units of measurement and how the data were developed (e.g., from fuel usage, clock hours, speed and distance, estimated, etc.).

The sector leader will also be responsible for working with the database staff responsible for importing the information into the master database, such as consistency of data field names, numerical level of precision (significant figures and rounding issues), and terminal identification codes. After these two steps are followed, the meta-file will be updated with information as to when it was imported, what the file name is, and who performed the update operation.

Most activity data is collected from independent sources, such as terminal operators, and is used as provided without modification. In cases where information provided entities is not complete, efforts are made to obtain additional information to complete the data set, as discussed in section B9. If missing data must be filled in using averages or surrogates, then the data will be returned to the providing entity for their concurrence that the filled values are reasonable before the data is added to the project database.

D2. Verification and Validation Methods

As stated in Section D.1, meta-files will be used to accept the information into the database and this method addresses chain-of-custody issues. When aggregated, the database system administrator will develop another suite of meta-files for each sector (e.g., ships, harbor vessels, locomotives, cargo handling, and on-road vehicles). This will complete the circle so that the original data can be tracked on to a larger database system. After this point, data will be merged with locational parameters, emission factors, and other information relevant to estimating air emissions. Emissions will be output to a file and checked against the root activity information. The standard equation is:

$E = A * F$

Where
E = emissions
A = activity
F = emissions factor

Typical issues to be encountered are:

- Simple math mistakes associated with unit conversion, misused emission factor, or division by zero, and other obvious errors. These are usually checked independently by use of a spreadsheet or other means.
- Errors in replicating regulatory models: sometimes due to the manner in which data is processed by regulatory models (e.g., NONROAD2005, MOBILE6), or by calculations that are simulated to act like those models, errors can occur as a function of variables such as useful life, deterioration, and other factors. The method to resolve these issues is to run the data through the models, independently, and compare the output to the database.
- Effect of time: in some cases, a new engine replaces an old one but only the new engine activity (e.g., hours) was recorded. This phenomenon also occurs with mid-year fuel switching programs, which may require two or more passes to account for a full calendar year of activity. For this reason, an indicator or database "flag" is used to denote whether a new emission control technology (ECT) has been adopted during the year.
- "Phantom" engines: due to the manner in which data are sometimes merged, joined, and queried, one can end up with more (or fewer) engines than went into the root activity data. Repairs to the database must be done on a line-by-line basis unless there appears to be a systematic error (e.g., a full join instead of a left join). For this reason, emissions will be reported along with the number of units in that category.
- Errors in "gap filling": in some cases there simply are no data available, such as for a ship which is not recorded by Lloyds or other ship characteristic database. There is little option but to assign a surrogate based on fleet averages, regulatory defaults, or some other method. In some cases, such surrogates could lead to misleading results, so great care will be taken in the assignment of surrogate values.

Criteria pollutants and greenhouse gas emissions will be reported in terms of short tons per year (2,000 pounds per ton). The units will be clearly labeled where values are displayed to prevent confusion.

To conclude, data verification will be the process where input data is accurately reflected in the database when imported, whereas internal validation infers that the data is tracked through the processing to the resulting emission estimates. External validation will be the comparison of study findings to previous efforts done on a similar scope and scale.

D3. Reconciliation with User Requirements

The purpose of the Project is two-fold: to develop estimates of emissions from marine-related sources for calendar year 2005, and to provide a tool that can be used for (a) future years, as new activity information becomes available and (b) "what-if" scenarios so as to gauge the effectiveness of various emission control strategies. Final data clean-up can be accomplished by:

- Queries for nulls, missing values, zero, or emissions with negative numbers
- Checks on maxima to ensure that emissions are within an expected order of magnitude (standard deviation and other parametric statistics)
- Creation of monthly emission plots to ensure that unrealistic spikes and troughs are not present (time trend analysis)
- Mapping the data on a GIS to visualize that emissions are in the right place and not missing or out of bounds (spatial diffusion analysis)

All these procedures are conducted as post-processing steps after the database has been assembled and tested. Should any issues be discovered, corrective actions would be taken in consultation with the sector leaders and Project Manager. A final section in the Report will document the strengths and limitations of the Project.

User requirements are more a function of expressing the resulting emission estimates rather than input/output processes, since most methodology issues are addressed in the Technical Approach Document. Such issues will be developed in parallel with the development of the emissions database and geographic information system. Limitations on use of the data and the resulting emission estimates will be disclosed and discussed in the emissions inventory report.

The Project Manager will bring any discrepancies that arise with respect to requirements defined by the Technical Assumptions, consultant contract, and other project documents to the attention of the Steering Committee for resolution in accordance with the MOU and contracting documents.

APPENDIX D – AIR TOXICS EMISSIONS FACTORS

APPENDIX D – AIR TOXICS EMISSIONS FACTORS

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SECTION 1 INTRODUCTION

The EPA performs annual inventories of criteria pollutants and air toxics for stationary industrial sources; the toxics inventory is updated every three years for mobile and area sources. The lists of contaminants and emission factors presented in this appendix were selected from the most recent EPA guidance[143] and methods documents for offroad sources.[144] Some of the values listed in the following tables were rounded.

Table D-1 summarizes the air toxics emission factors that have been identified as potentially applicable to the emission source types included in the greater Puget Sound area emission inventory. The shaded areas indicate the source type categories that have no published toxic emission factor for the indicated compound.

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[143] EPA, 'Documentation for the draft 2002 Mobile National Emissions Inventory,' prepared by E.H. Pechan & Associates, Work Order 68-D-02-063, March 2005.

[144] EPA, 'Documentation for aircraft, commercial marine vessel, locomotive, and other nonroad components of the National Emissions Inventory,' prepared by E.H. Pechan, Work Order 68-D-02-063, February 2005.

Table D-1: Toxic Contaminants and Availability of Emission Factors

Contaminant	Onroad	Nonroad	Locomotive	Vessels
1.3-Butadiene	☑	☑	☑	☒
2,2,4-Trimethylpentane (TMP)	☑	☑	☑	☑
Acetaldehyde	☑	☑	☑	☑
Acrolein	☑	☑	☑	☑
Benzene	☑	☑	☑	☑
Beryllium	☒	☒	☑	☑
Cadmium	☒	☒	☑	☑
Chromium (hexavalent, Cr^{6+})	☑	☑	☑	☑
Chromium (trivalent, Cr^{3+})	☑	☑	☑	☑
Dioxin/Furan (TEQ)	☑	☑	☒	☒
Ethyl benzene	☑	☑	☑	☑
Formaldehyde	☑	☑	☑	☑
Lead	☑	☒	☑	☑
Manganese	☑	☑	☑	☑
MTBE	☑	☑	☒	☒
Naphthalene	☑	☒	☑	☒
n-Hexane	☑	☑	☑	☑
Nickel	☑	☑	☑	☑
PAH *	☑	☑	☑	☑
Propionaldehyde	☑	☑	☑	☑
Selenium	☒	☒	☒	☑
Styrene	☑	☑	☑	☑
Toluene	☑	☑	☑	☑
Xylenes	☑	☑	☑	☑

Polycyclic aromatic hydrocarbons (PAHs) consist of several compounds as listed below. Each is estimated separately and may be reported as "total PAH" if so desired. In general, PAHs are derived from particulate matter (PM) with the exception of naphthalene, which may have a hydrocarbon component.

- Benzo[a] anthracene
- Benzo[a] pyrene
- Benzo[b] fluoranthene
- Benzo[k] fluoranthene
- Chrysene
- Dibenzo[a,h]anthracene
- Indenol pyrene
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo perylene
- Fluoranthene
- Fluorene
- Naphthalene
- Phenanthrene
- Pyrene

Each source category is assigned toxics emission factors from the EPA documentation. Different metrics and units of measurement are used and are so noted. Given the changing science and internal quality assurance measures, these factors may be revised on a case-by-case basis.

SECTION 2 COMMERCIAL MARINE VESSELS

There are two sets of emission factors for commercial marine vessels that cover diesel motorships and steamships.

In practice, the factors should be applied differently to estimate the emissions due different metrics and units found in the EPA guidance for each toxic pollutant. As an example in the table below, tri-methyl pentane (TMP) would be calculated by applying a ratio factor to exhaust VOC; metals such as chromium would be estimated by applying a ratio to PM_{10}. Some constituents, such as lead, would be estimated from fuel consumption data (thousands of gallons or tonnes of fuel), as well.

The diesel motorships emission factors listed in Table D-2 would be appropriate for commercial marine vessels and commercial harbor craft that have diesel engines.

Table D-2: Air Toxics Emission Factors for Diesel Motorships

Contaminant	Method	Value
1.3-Butadiene		
2,2,4-Trimethylpentane (TMP)	VOC ratio	0.0004
Acetaldehyde	VOC ratio	0.075
Acrolein	VOC ratio	0.0035
Benzene	VOC ratio	0.020
Beryllium		
Cadmium		
Chromium (hexavalent, Cr^{6+})	PM$_{10}$ ratio	3.27E-06
Chromium (trivalent, Cr^{3+})		
Dioxin/furan (TEQ)		
Ethyl benzene	VOC ratio	0.002
Formaldehyde	VOC ratio	0.15
Lead	Fuel factor	1.30E-06 g/gal
Manganese	PM$_{10}$ ratio	2.04E-06
Methyl tertiary-butyl ether		
Naphthalene		
n-Hexane	VOC ratio	0.0055
Nickel	PM$_{10}$ ratio	6.55E-06
PAH	PM$_{2.5}$ ratio	See Below
Propionaldehyde	VOC ratio	0.0061
Selenium		
Styrene	VOC ratio	0.0021
Toluene	VOC ratio	0.0032
Xylenes	VOC ratio	0.0048

The PAH factors for diesel engines used by commercial marine vessels are listed in Table D-3:

Table D-3: Diesel PAH Factors

PAH	Ratio
Benzo[a] anthracene	0.000040
Benzo[a] pyrene	0.000013
Benzo[b] fluoranthene	0.000011
Benzo[k] fluoranthene	0.000011
Chrysene	0.000007
Dibenzo[a,h] anthracene	0.000000
Indenol pyrene	0.000001
Acenaphthene	0.000024
Acenaphthylene	0.000037
Anthracene	0.000037
Benzo perylene	0.000037
Fluoranthene	0.000009
Fluorene	0.000049
Naphthalene	0.000056
Phenanthrene	0.000056
Pyrene	0.000039

2.1 Commercial Marine Vessels - Steamships

The factors appropriate for steamships are listed in Table D-4. These factors may also be used for turbine-powered ships since there are no specific factors in the guidance for turbine-powered ships which may be few in number in the inventory. In the EPA guidance, there are no PAH factors for steamships.

Table D-4: Steamships

Contaminant	Method	Units	Value
1.3-Butadiene			
2,2,4-Trimethylpentane (TMP)			
Acetaldehyde	Fuel	Ton/1000 Gal	2.45E-06
Acrolein			
Benzene	Fuel	Ton/1000 Gal	1.05E-07
Beryllium	Fuel	Ton/1000 Gal	1.40E-08
Cadmium	Fuel	Ton/1000 Gal	1.96E-07
Chromium (hexavalent, Cr^{6+})	Fuel	Ton/1000 Gal	4.20E-07
Chromium (trivalent, Cr^{3+})			
Dioxin/furan (TEQ)			
Ethyl benzene			
Formaldehyde	Fuel	Ton/1000 Gal	0.15
Lead	Fuel	Ton/1000 Gal	7.70E-07
Manganese	Fuel	Ton/1000 Gal	1.42E-06
Methyl tertiary-butyl ether			
Naphthalene			
n-Hexane			
Nickel	Fuel	Ton/1000 Gal	4.20E-05
POM as PAH	Fuel	Ton/1000 Gal	5.88E-07
Propionaldehyde			
Selenium	Fuel	Ton/1000 Gal	3.43E-07
Styrene			
Toluene			
Xylenes			

SECTION 3 LOCOMOTIVES

Locomotive toxic factors are separated into two-stroke and four-stroke engines. If it is not known which factor should be used, industry knowledge can be used (e.g., older General Electric engines are of a certain stroke type). The fuel consumption method is the most widely used approach for locomotives, with the exception of PAH which uses the ratio approach. Locomotive factors are presented in Table D-5.

Table D-5: Locomotives, 2-Stroke

Contaminant	Method	Units	Value
1.3-Butadiene	Fuel	g/gallon	0.028
2,2,4-Trimethylpentane (TMP)	VOC	ton/VOC	0.0022
Acetaldehyde	Fuel	g/gallon	0.21
Acrolein	Fuel	g/gallon	0.037
Benzene	Fuel	g/gallon	0.019
Beryllium	Fuel	lb/gallon	4.20E-07
Cadmium	Fuel	lb/gallon	4.20E-07
Chromium (hexavalent, Cr^{6+})	Fuel	g/gallon	3.36E-05
Chromium (trivalent, Cr^{3+})			
Dioxin/furan (TEQ)			
Ethyl benzene	VOC	ton/VOC	0.002
Formaldehyde	Fuel	g/gallon	0.45
Lead	Fuel	lb/gallon	1.30E-06
Manganese	PM_{10}	ton/PM_{10}	2.04E-06
MTBE			
Naphthalene			
n-Hexane	VOC	ton/VOC	0.0055
Nickel	PM_{10}	ton/PM_{10}	6.55E-06
PAH	PM_{10}	ton/PM_{10}	See Below
Propionaldehyde	VOC	ton/VOC	0.0061
Selenium			
Styrene	VOC	ton/VOC	0.0021
Toluene	VOC	ton/VOC	0.0032
Xylenes	VOC	ton/VOC	0.0048

The factors for 4-stroke locomotive engines are presented in Table D-6:

Table D-6: Locomotives, 4-Stroke

Contaminant	Method	Units	Value
1.3-Butadiene	Fuel	g/gallon	0.041
2,2,4-Trimethylpentane (TMP)	VOC	ton/VOC	0.0022
Acetaldehyde	Fuel	g/gallon	0.15
Acrolein	Fuel	g/gallon	0.018
Benzene	Fuel	g/gallon	0.041
Beryllium	Fuel	lb/gallon	4.20E-07
Cadmium	Fuel	lb/gallon	4.20E-07
Chromium (hexavalent, Cr^{6+})	Fuel	g/gallon	5.86E-05
Chromium (trivalent, Cr^{3+})			
Dioxin/furan (TEQ)			
Ethyl benzene	VOC	ton/VOC	0.002
Formaldehyde	Fuel	g/gallon	0.38
Lead	Fuel	lb/gallon	1.30E-06
Manganese	PM$_{10}$	ton/PM$_{10}$	2.04E-06
Methyl tertiary-butyl ether			
Naphthalene			
n-Hexane	VOC	ton/VOC	0.0055
Nickel	PM$_{10}$	ton/PM$_{10}$	6.55E-06
PAH	PM$_{10}$	ton/PM$_{10}$	See Below
Propionaldehyde	VOC	ton/VOC	0.0061
Selenium			
Styrene	VOC	ton/VOC	0.0021
Toluene	VOC	ton/VOC	0.0032
Xylenes	VOC	ton/VOC	0.0048

The PAH factors for locomotive engines are presented in Table D-7:

Table D-7: Locomotives PAH Factors

PAH	Ton/PM_{10}
Benzo[a] anthracene	0.0000160
Benzo[a] pyrene	0.0000027
Benzo[b] fluoranthene	0.0000064
Benzo[k] fluoranthene	0.0000052
Chrysene	0.0000119
Dibenzo[a,h] anthracene	0.0000000
Indenol pyrene	0.0000027
Acenaphthene	0.0000306
Acenaphthylene	0.0004275
Anthracene	0.0001009
Benzo perylene	0.0000031
Fluoranthene	0.0000746
Fluorene	0.0001407
Naphthalene	0.0025756
Phenanthrene	0.0005671
Pyrene	0.0001054

SECTION 4 NONROAD ENGINES

Diesel toxic emission factors for cargo handling equipment are reported in this section, as they comprise the majority of port-related emissions. Including all the various gasoline, liquefied petroleum gas (LPG), and compressed natural gas (CNG) emission factors would become lengthy. The EPA guidance does not list toxic emission factors for specialty fuels such as biodiesel, diesel emulsion, and others. Diesel factors for offroad equipment are listed in Table D-8:

Table D-8: NONROAD Diesel Factors

Contaminant	Method	Units	Value
1.3-Butadiene	VOC	Ratio	0.0019
2,2,4-Trimethylpentane (TMP)	VOC	Ratio	0.00059
Acetaldehyde	VOC	Ratio	0.053
Acrolein	VOC	Ratio	0.0030
Benzene	VOC	Ratio	0.020
Beryllium			
Cadmium			
Chromium (hexavalent, Cr^{6+})	Fuel	g/gal	0.03
Chromium (trivalent, Cr^{3+})			
Dioxin/furan (TEQ)	Fuel	tons TEQ/gal	1.91E-14
Ethyl benzene	VOC	Ratio	0.0031
Formaldehyde	VOC	Ratio	0.12
Lead			
Manganese	Fuel	ug/HP-hr	1.37
Methyl tertiary-butyl ether	N/A	N/A	N/A
Naphthalene			
n-Hexane	VOC	Ratio	0.0016
Nickel	Fuel	ug/HP-hr	2.035
PAH	PM_{10}	Ratio	See Below
Propionaldehyde	VOC	Ratio	0.011
Selenium			
Styrene	VOC	Ratio	0.00059
Toluene	VOC	Ratio	0.015
Xylenes	VOC	Ratio	0.011

The PAH factors for cargo handling equipment are presented in Table D-9:

Table D-9: NONROAD PAH Factors

PAH	Ratio
Benzo[a] anthracene	0.00000710
Benzo[a] pyrene	0.00000035
Benzo[b] fluoranthene	0.00000049
Benzo[k] fluoranthene	0.00000035
Chrysene	0.00000190
Dibenzo[a,h] anthracene	0.00000003
Indenol pyrene	0.00000008
Acenaphthene	0.00010000
Acenaphthylene	0.00008400
Anthracene	0.00000004
Benzo perylene	0.00000019
Fluoranthene	0.00001700
Fluorene	0.00010000
Naphthalene	0.00046000
Phenanthrene	0.00026000
Pyrene	0.00000290

SECTION 5 ONROAD HEAVY-DUTY DIESEL VEHICLES

Some air toxics can be directly estimated from the MOBILE6 emission model available from the EPA. Others are more generic, usually expressed in milligrams per mile (mg/mi) or micrograms per mile (ug/mile). Note that because diesel does not contain any methyl tert-butyl ether (MTBE), its factor is reported as "N/A". HDV emission factors are presented in Table D-10.

Table D-10: Onroad HDV Factors

Contaminant	Method	Units	Value
1.3-Butadiene	MOBILE6	mg/mile	Varies
2,2,4-Trimethylpentane (TMP)	VOC ratio	mg/g	25.82
Acetaldehyde	MOBILE6	mg/mile	Varies
Acrolein	MOBILE6	mg/mile	Varies
Benzene	MOBILE6	mg/mile	Varies
Beryllium			
Cadmium			
Chromium (hexavalent, Cr^{6+})	Emissions per mile	ug/mile	0.53
Chromium (trivalent, Cr^{3+})	Emissions per mile	ug/mile	0.79
Dioxin/furan (TEQ)	Emissions per mile	tons TEQ/mile	8.87E-16
Ethyl benzene	VOC ratio	Ratio	0.002
Formaldehyde	MOBILE6	mg/mile	Varies
Lead			
Manganese	Emissions per mile	ug/mile	0.82
MTBE	MOBILE6	mg/mile	N/A
Naphthalene	PM/VOC ratio	N/A	N/A
n-Hexane	VOC ratio	Ratio	0.0055
Nickel	Emissions per mile	ug/mile	2.64
PAH	$PM_{2.5}$ ratio	Ratio	See Below
Propionaldehyde	VOC ratio	Ratio	0.0061
Selenium			
Styrene	VOC ratio	Ratio	0.0021
Toluene	VOC ratio	Ratio	0.0032
Xylenes	VOC ratio	Ratio	0.0048

The PAH factors for on-road trucks are presented in Table D-11:

Table D-11: Onroad PAH Factors

PAH	Ratio
Benzo[a] anthracene	0.000040
Benzo[a] pyrene	0.000013
Benzo[b] fluoranthene	0.000011
Benzo[k] fluoranthene	0.000011
Chrysene	0.000007
Dibenzo[a,h] anthracene	0.000000
Indenol pyrene	0.000001
Acenaphthene	0.000024
Acenaphthylene	0.000037
Anthracene	0.000037
Benzo perylene	0.000037
Fluoranthene	0.000009
Fluorene	0.000049
Naphthalene	0.000056
Phenanthrene	0.000056
Pyrene	0.000039

Appendix E - Supporting Data

APPENDIX E SUPPORTING DATA

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Puget Sound Emissions Inventory
Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
7407324	1976	9993	18	Auto Carrier	10082	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7608382	1977	8545	16	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7616250	1977	13446	19	Auto Carrier	14790	3523	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7620859	1977	18099	20	Auto Carrier	17255	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7628174	1977	13873	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7631391	1977	10535	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7701304	1978	10890	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7710408	1979	42424	15	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7710408	1979	42424	15	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7710410	1979	42424	15	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7724617	1978	18069	21	Auto Carrier	17255	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7727530	1978	10601	17	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7801609	1978	18426	18	Auto Carrier	11750	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7801659	1978	13833	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7804596	1978	17224	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7814981	1978	11311	18	Auto Carrier	8500	2850	321	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
7816903	1980	10803	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7825435	1980	14837	19	Auto Carrier	11750	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7902532	1980	10758	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7913115	1979	11080	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7917551	1981	28223	20	Auto Carrier	13496	186	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
7917563	1981	28210	20	Auto Carrier	13500	5283	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
7930242	1980	13023	17	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8004698	1980	10915	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8009583	1980	13950	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8010867	1980	17859	18	Auto Carrier	11750	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8014227	1980	10677	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8015142	1981	13834	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8015269	1980	11076	17	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8016548	1982	28100	18	Auto Carrier	13501	5310	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8016550	1982	28566	20	Auto Carrier	13501	5307	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8018168	1982	17863	20	Auto Carrier	13721	2670	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8021270	1981	17743	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

Puget Sound Emissions Inventory
Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
8100985	1982	9190	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8107103	1982	41666	15	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8110136	1981	10480	18	Auto Carrier	8504	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8117184	1982	15148	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8130966	1983	15500	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8200541	1983	9358	17	Auto Carrier	6895	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8202329	1982	14361	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8204274	1983	13656	17	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8223593	1983	11548	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8309579	1985	21900	19	Auto Carrier	11502	2850	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8313324	1984	18293	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8316455	1984	11907	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8400397	1985	9763	17	Auto Carrier	9540	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8401274	1984	11940	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8401391	1984	13687	18	Auto Carrier	11130	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8402369	1984	16349	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8402371	1985	15160	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8405282	1985	11824	17	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8412089	1985	12184	18	Auto Carrier	9540	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8412089	1985	12184	18	Auto Carrier	9540	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8418291	1985	16068	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8418930	1985	9234	17	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8507664	1987	7894	20	Auto Carrier	9001	1942	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8508711	1985	16169	18	Auto Carrier	11130	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8510001	1986	13418		Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8517279	1987	16493	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8519710	1988	9772	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8519722	1989	9772	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8600179	1987	11676	18	Auto Carrier	9310	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8602579	1987	15528	18	Auto Carrier	11502	2850	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8605167	1987	15577		Auto Carrier	11130	2850	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8608133	1987	9783	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8608145	1987	9675	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
8610124	1987	14189	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8612299	1987	14597	19	Auto Carrier	13300	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8705773	1988	14126	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8708907	1988	13162	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8709119	1987	9694	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8709121	1987	9694	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8709157	1987	12730	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8712324	1988	18777		Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8912663	1988	12763	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8912663	1988	12763	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8913514	1990	17914	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8919922	1991	29213	19	Auto Carrier	12510	3178	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9051818	1994	15194	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9051820	1993	17189	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9056296	1994	14930	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9070448	1994	15199	20	Auto Carrier	16358	3428	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9070450	1995	15199	20	Auto Carrier	16358	3428	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9070474	1994	13363	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9078830	1994	15553	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9122655	1997	14927	21	Auto Carrier	16358	3428	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9150341	1998	14348	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162394	1997	9518	14	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9175925	1998	14101	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9177428	1998	21523	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9177430	1999	21503	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9179725	1999	14863	21	Auto Carrier	16358	3428	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9181376	1999	15894	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9182356	2000	14283	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9185047	2000	14067	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9185463	2000	12473	20	Auto Carrier	11502	2850	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9188790	1999	10834	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9188805	1999	10817	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9188817	2000	10817	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9188829	2000	10419	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9190858	2000	12778	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9205964	1999	16827	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9207388	2000	20581	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9209934	1999	8531	18	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9228306	2000	16681	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231688	2001	10817	21	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9238521	2001	17232	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9240160	2003	22616	21	Auto Carrier	14700	3432	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9250232	2002	17232	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9252228	2003	19893		Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9267675	2003	19531		Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9267687	2003	19512	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9277838	2004	21300		Auto Carrier	15540	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9279812	2004	14900	19	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9284764	2005	18383		Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9293612	2004	14512		Auto Carrier	11502	2850	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9293624	2005	19628		Auto Carrier	11502	2850	321	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9293636	2004	19086	21	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9293650	2004	19106	21	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9294343	2005	15100	20	Auto Carrier	11502	2850	321	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7526601	1982	75594	15	Bulk	14790	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8110318	1984	35174	15	Bulk	9731	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8116661	1983	30750	15	Bulk	8375	1650	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8123901	1983	64897	12	Bulk	14790	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8307492	1984	33024	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8309141	1984	23904	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8314469	1985	36663	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8316326	1984	29111	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8317021	1985	43589	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8323111	1984	36241	14	Bulk	9540	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8405751	1985	38883	14	Bulk	9540	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8412106	1987	64201	14	Bulk	7900	1889	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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8412106	1987	64201	14	Bulk	7900	1889	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8412118	1987	64368	14	Bulk	7900	1890	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8419001	1987	67232	14	Bulk	6752	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8419594	1987	64377	14	Bulk	7900	1890	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8501684	1986	69561	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8517384	1986	26842	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8711112	1989	64282	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8715481	1989	68762	14	Bulk	7497	1497	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8800315	1990	68789	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8800327	1990	68789	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8807210	1990	62873	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8812679	1989	67782	13	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8813946	1991	73505	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8813958	1991	73470	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8901822	1989	43685	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902216	2002	65000	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902436	1990	42263		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902462	1991	42263		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8915976	1990	69306	14	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8919568	1991	47378	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8919611	1991	73505	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9001186	1990	69332	14	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9001186	1990	69332	14	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9003093	1990	69338	14	Bulk	8091	1012	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9038787	1992	43595	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9050266	1995	69286	15	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9050371	1993	74696	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9050383	1994	72338	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9050395	1994	72338	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9052604	1994	70029	14	Bulk	9021	1782	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9055979	1995	69967	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9057446	1998	69146	15	Bulk	13320	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9057575	1993	69634	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9065390	1994	70181	14	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9066760	1994	38858	13	Bulk	7980	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9074688	1994	71756	16	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9074810	1995	42529	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9077305	1995	44809	14	Bulk	7850	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9079157	1995	43706	16	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9081849	1995	75464	15	Bulk	10216	2103	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9082764	1994	45708	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9082958	1994	44875	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9086710	1995	71695	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9086980	1995	71252	14	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9087245	1995	43230	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9087740	1994	69073	15	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9088732	1994	45518	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9100085	1995	70135	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9100102	1995	73670	14	Bulk	8232	1622	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9101558	1995	71747	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9102162	1994	69043	15	Bulk	11400	2040	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9104122	1995	71550	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9104158	1994	26054	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9104548	1994	69659	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9107681	1995	64214	13	Bulk	8555	1643	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9108269	1996	72171		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9112325	1996	73080	14	Bulk	8680	1771	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9112911	2002	48640	15	Bulk	11100	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9112973	1997	49370	15	Bulk	10920	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9113898	1995	28730	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9115224	1994	69180	15	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9118446	1995	45665	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9118678	1997	72873	15	Bulk	11100	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9121924	1996	72072	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9121924	1996	72072	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9122588	1997	75229	16	Bulk	11100	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9123647	1996	70349	14	Bulk	9310	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9128922	1996	70252	14	Bulk	9310	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9129627	1996	27079	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9132973	1997	73981		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9134189	1996	69053	15	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9135676	1996	73565	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9135913	1998	44114	15	Bulk	7800	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9136060	1997	73427	14	Bulk	8945	1666	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9138082	1997	73606	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9138903	1997	32115	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9138927	1996	72394	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9140047	1996	28387	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9143726	1997	24280	16	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9145669	1997	72126	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9145786	1997	24396	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9147423	1998	73937	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9154012	1997	46670	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9155327	1998	47500	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9156278	1998	73018	15	Bulk	8673	1705	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9157349	1997	28437	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9159189	1996	69163		Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9159529	1997	72517	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9160281	1998	72769		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9161479	1997	69123	15	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9161687	1997	73762		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162019	1997	71372	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162045	1997	71349	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162590	1997	73000	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9163300	1998	74577	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9164639	1998	73056	15	Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9164653	1998	73207		Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9166900	1997	71298	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9168465	1998	72474	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9168491	1998	45713	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9169380	1999	72891	14	Bulk	8680	1808	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9171149	1999	75542	16	Bulk	9120	1697	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9171711	1998	23701	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9172105	1998	23468	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9172533	1997	68962	15	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9172545	1997	72272	14	Bulk	11400	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9175327	1999	75265	17	Bulk	11100	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9176747	1999	73035	14	Bulk	11100	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9176759	1999	73035	14	Bulk	11100	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9180011	1997	28545		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9180906	2000	75100	15	Bulk	10750	1491	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9187447	1998	72495	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9189081	1999	72844	15	Bulk	9936	1972	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193707	2000	45251	15	Bulk	8561	1654	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9194880	1999	31762	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200378	1999	73941	15	Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200380	1999	73941	15	Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200433	2000	48265	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9207417	1999	73807	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9207443	1999	73976	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9207742	2000	73992	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9207778	2001	75966	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9208514	2000	72917	15	Bulk	10412	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9209219	2000	47787	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9209491	2000	74000	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9209520	2000	74078	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9211602	2000	74228	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9212694	2001	75259	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9213363	2001	75172	14	Bulk	11160	2377	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9213820	2000	73454	15	Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9214082	2000	50777	15	Bulk	8730	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9214331	2001	74665	15	Bulk	8990	1962	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9216602	2001	24765	14	Bulk	6650	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9216676	2001	51008	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9216810	2001	52413	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9217216	2001	74293		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9217656	2001	75120	14	Bulk	10750	1491	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9217888	2000	31632	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218052	2000	32787	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218064	2001	28456	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218387	2000	73281	14	Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9219032	2001	74329		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9221621	2002	74133	15	Bulk	10371	1787	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9222625	2001	52224		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224702	2001	75080	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224714	2001	75257	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9227467	2001	50341	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9227675	2001	74107	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9227687	2001	73996		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9228203	2000	28407	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9229867	2002	20035		Bulk	9028	1365	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231030	2000	74381		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231315	2002	76662	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9233284	2001	76529	14	Bulk	9028	1418	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9233454	2001	46882	15	Bulk	9310	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9233985	2001	47314	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9234202	2001	33476	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235878	2001	73435	15	Bulk	9520	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9237395	2001	28378	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9238193	2002	52828	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9242508	2002	52479	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9242546	2001	28460	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9243497	2001	29756	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9244037	2003	27112	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9244893	2001	52416	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9246293	2002	91949	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9247285	2004	73305	15	Bulk	9028	1688	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9248198	2001	28494	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9248904	2001	74500		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9249271	2003	52500		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9251080	2002	32744	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9252412	2003	75932	15	Bulk	9028	2117	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9253806	2002	74222	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9254111	2003	74269		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9256353	2001	28470		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9256872	2004	76015	15	Bulk	9028	2117	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9257981	2002	29738	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9260122	2001	74500	16	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9263277	2003	53026	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9263772	2002	28484		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9264453	2002	50400	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9268930	2004	33000		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9273210	2003	73800	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9273612	2004	73601	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9273818	2004	76616		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9274458	2004	52483		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9274551	2004	32754	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9277656	2004	52800		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9277668	2004	52808		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9278739	2004	33773	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9279381	2004	73902	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9281437	2004	73880	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9283538	2004	27000		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9283643	2004	74364	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9284001	2004	32773	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9284506	2005	55500		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9286645	2004	73700		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9286865	2004	76602		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9286889	2003	76633	16	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9286968	14	76150		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9288332	2004	55426	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9288459	2005	76454		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290153	2005	75500	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290866	2004	55418		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9291212	2004	28449	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9291781	2004	76310	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9294109	2005	74364	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9294484	2004	76801		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9294501	2004	76600		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9296846	2005	87000	15	Bulk	11999	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9300556	2004	74195	15	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9305130	2005	73808		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9305142	2005	73901	14	Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9312341	2004	28436		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9316036	2005	76600		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9316684	2005	76500		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9316921	2005	34906		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9317262	2005	12100		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9322736	2005	28300		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9322762	2005	53350		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9325063	2005	76629		Bulk	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7354292	1974	26082	15	Bulk - Heavy Loa	14790	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7506572	1976	72399	15	Bulk - Heavy Loa	14790	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8130875	1983	40910	14	Bulk - Heavy Loa	13540	843	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9139294	1997	16069	16	Bulk - Heavy Loa	8775	1940	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7117278	1971	31364	16	Bulk Self-Dischar	9783	1590	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7925613	1981	37448		Bulk Self-Dischar	6620	3566	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8508709	1986	46036	14	Bulk Wood Chips	9540	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8611972	1987	42791		Bulk Wood Chips	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8711045	1988	42304	14	Bulk Wood Chips	7980	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8805212	1988	42921	14	Bulk Wood Chips	7980	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9078153	1994	46790	14	Bulk Wood Chips	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9145683	1996	49889		Bulk Wood Chips	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9167497	1997	43980	16	Bulk Wood Chips	9028	1776	109	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7218462	1973	22086	23	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7218462	1973	22086	23	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8419142	1987	21282	20	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8419154	1987	20668	20	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8419166	1987	20668	20	Container1000	16810	6400	500	HFO (2.5% S)	HFO (2.5% S)	HFO (1.5% S)
9014092	1991	22219	19	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9084035	1994	24444	19	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9123922	1995	24370	20	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9130133	1998	23380	20	Container1000	13320	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9130145	1998	23200	20	Container1000	13320	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9130145	1998	23200	20	Container1000	13320	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9130157	1998	23200	20	Container1000	13320	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9130157	1998	23200	20	Container1000	13320	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9134593	1998	29240	21	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9176682	1998	21008	21	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9176682	1998	21008	21	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9223772	2000	25723		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9265598	2003	13760	20	Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9299317	2005	18900		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9299317	2005	18900		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9299329	2005	19104		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9299329	2005	19104		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9301263	2005	18900		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9301275	2005	16500		Container1000	9642	2090	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7105471	1971	38656	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7326233	1973	31495	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7602338	1978	26665	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7617890	1979	31213	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7617905	1980	31423	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7729459	1980	46154	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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7729461	1980	45895	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7802718	1980	26350	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7819369	1980	46600	22	Container2000	29580	4493	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7820849	1980	36267	21	Container2000	22185	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7820851	1980	36417	21	Container2000	22185	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7820851	1980	36417	21	Container2000	22185	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7820904	1980	36616	21	Container2000	22185	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7820966	1980	36392	21	Container2000	22185	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8204509	1984	43310	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8204509	1984	43310	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8204509	1984	43310	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8204535	1984	43289	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8204535	1984	43289	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8208220	1984	43198	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8208244	1983	43198	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8217025	1984	43198	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8314512	1985	43401	21	Container2000	16800	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8417948	1986	37915	21	Container2000	23500	2600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8605662	1986	38438	22	Container2000	26480	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8616489	1987	39157	22	Container2000	14350	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8806096	1989	47625	19	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8818740	1990	47625	19	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9002037	1992	28555	23	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9005259	1991	44006	22	Container2000	23170	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9062984	1994	30621	20	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9062996	1995	30645	20	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9064334	1995	30743	20	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9080998	1996	32482	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9110951	1995	34625	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9124524	1997	34954	23	Container2000	24300	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9126479	1996	30201	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9127540	1997	30600	21	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9127540	1997	30600	21	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9128192	1997	34894	21	Container2000	24300	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9141778	1997	30252	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9141792	1997	30200	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9143518	1997	34809	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9146302	1998	30360	21	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9151527	1997	34705	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9152741	1998	30721	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9152741	1998	30721	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9153381	1997	33976	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162253	1998	30007	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162277	1999	30135	20	Container2000	22028	3840	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9188219	1998	30029	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9188219	1998	30029	20	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9217022	2000	33899	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9222467	2000	33694	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224049	2000	29841	20	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224051	2003	29894	21	Container2000	17940	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9225407	2000	39128	23	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9225419	2000	39128	23	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9226504	2001	33917	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9228540	2001	35600	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235593	2003	39429	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235593	2003	39429	22	Container2000	22028	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9236042	2002	35971	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9236652	2001	33900	21	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9241918	2004	35770		Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9246346	2003	33800	22	Container2000	21560	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9253014	2003	39422	23	Container2000	22028	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9253014	2003	39422	23	Container2000	22028	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9305001	2004	37978		Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9305879	2005	33594	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9308390	2005	37883	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9308405	2005	37800	22	Container2000	22028	4925	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9315850	2005	39382	23	Container2000	22028	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9315862	2005	39382	23	Container2000	22028	4925	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8300119	1983	53310		Container3000	34954	4020	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8300121	1984	48485	24	Container3000	34954	4020	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8417479	1985	53325	23	Container3000	34954	4020	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8420189	1987	45863	23	Container3000	24390	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8501440	1988	40845	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8511299	1986	43567	22	Container3000	23170	2600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8511304	1986	43567	23	Container3000	23170	2600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8511316	1986	43567	23	Container3000	23170	2600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8511328	1986	43567	22	Container3000	23170	2600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8517891	1987	43108	22	Container3000	23170	3434	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8616506	1988	59533	23	Container3000	27694	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8806785	1991	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8806797	1991	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8806802	1990	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8806802	1990	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8806814	1990	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8906731	1991	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8906743	1992	47230	21	Container3000	21680	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8910419	1990	59418	23	Container3000	36445	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8913136	1990	59089	23	Container3000	27694	5931	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
8918825	1991	38953	23	Container3000	36445	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8918837	1991	38997	23	Container3000	36445	4800	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9015498	1993	59560	23	Container3000	36670	4772	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9017020	1991	39398	23	Container3000	36445	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9017032	1992	39424	23	Container3000	36445	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9017032	1992	39424	23	Container3000	36445	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9017044	1992	39424	23	Container3000	36445	4500	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9021253	1991	40499	22	Container3000	27694	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9043627	1994	51981	25	Container3000	36445	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9043653	1993	47500	24	Container3000	27694	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9043768	1993	47359	24	Container3000	27694	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9113654	1996	45850	22	Container3000	28350	4206	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9113666	1996	45850	22	Container3000	28350	4206	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9113678	1996	45850	21	Container3000	28350	4206	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9113680	1997	45850	22	Container3000	28350	4206	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9113692	1997	45850	22	Container3000	28350	4206	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9134517	1997	42954		Container3000	22214	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9134517	1997	42954		Container3000	22214	5931	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9139036	1997	44911	21	Container3000	20595	5025	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9139050	1997	44772	21	Container3000	27694	5931	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9139907	1997	46350	22	Container3000	28350	4206	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9208875	2000	40301	22	Container3000	28832	7745	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902539	1991	67686	23	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902541	1991	67727	23	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902565	1991	67684	23	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8902577	1992	65815	23	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9006631	1992	58986	24	Container4000	36445	7121	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9015369	1992	61152	25	Container4000	39091	7327	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9015371	1992	61152	25	Container4000	39091	7327	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9035981	1992	61152	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9035993	1992	61152	26	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9036002	1992	61153	26	Container4000	39091	7327	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9036909	1993	67680	23	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9038907	1993	67680	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9065625	1994	61152	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9065625	1994	61152	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9134232	1997	55604	25	Container4000	37080	7121	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9134244	1997	55604	25	Container4000	37080	7121	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9141273	1997	63527	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9141297	1997	62200	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9142198	1998	55515	25	Container4000	37080	7121	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9143544	1997	66771	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9143556	1998	66525	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9143568	1998	66577	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9147095	1998	63515	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193226	1999	52267	23	Container4000	36445	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193252	2000	62228	24	Container4000	43070	6000	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193264	2000	51100	24	Container4000	43070	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193290	2000	67145	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193305	2000	66971	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193317	2000	66975	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200809	2000	66793	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200811	2000	66781		Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200823	2000	66818	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224300	2001	50500	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224300	2001	50500	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224312	2001	50488	25	Container4000	36515	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224312	2001	50488	25	Container4000	36515	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224336	2001	50953	25	Container4000	36515	7440	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9224348	2002	50863	25	Container4000	36515	7440	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235074	2000	52250	23	Container4000	36445	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235567	2003	61649	24	Container4000	43070	9120	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9251365	2003	63160	25	Container4000	36712	7600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9251377	2003	63160	26	Container4000	36712	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9251389	2003	50800	25	Container4000	36712	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9251391	2003	62800	26	Container4000	36712	7300	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9252254	2002	57900	25	Container4000	41130	5680	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9256212	2004	53610	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9261724	2003	61441	25	Container4000	36712	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9261736	2003	61441	26	Container4000	39091	8000	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9261748	2003	61441	26	Container4000	36712	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9262120	2004	50137		Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9280809	2004	55495	24	Container4000	36445	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290098	2005	50869	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290098	2005	50869	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290103	2005	50869	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290103	2005	50869	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9290115	2005	50500	25	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292175	2004	65038	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292230	2005	65002	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292242	2004	64990	24	Container4000	45680	8532	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292254	2004	65006	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292266	2005	65023	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9309930	2005	52000		Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9310020	2005	52000	24	Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9312561	2005	52000		Container4000	39091	7121	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9102291	1995	67741	25	Container5000	37080	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9102306	1996	67752	25	Container5000	37080	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9102318	1996	67958	25	Container5000	37080	6300	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9115731	1996	67115	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9115743	1997	67298	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9116577	1996	63388	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9116591	1996	63388	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9116606	1997	63388	25	Container5000	37080	7080	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9116618	1997	63388	25	Container5000	37080	7080	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9120786	1997	69285	25	Container5000	43100	10033	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9128128	1997	67266	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9143063	1997	67473	25	Container5000	37080	6300	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9143075	1997	67473	25	Container5000	37080	6300	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9161778	1998	68993	26	Container5000	54900	6000	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9168831	1999	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9168843	1999	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9168855	1999	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9168867	1999	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9168879	1999	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9169158	1999	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9169160	2000	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9188154	2000	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9189366	2000	67712	25	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9189495	2000	67712	25	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9196955	2000	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9196967	2000	63400	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9196967	2000	63400	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9196979	2000	63388	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9196981	2001	63216	25	Container5000	37080	11360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9198109	1999	67660	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9198111	1999	67584	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9199270	2000	67278	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200677	1999	68824	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200689	1999	68996	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200691	2000	68790	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9200718	2000	68834	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9211169	2000	67737	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9214226	2001	67591	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9215634	2000	68263	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9215646	2001	68263	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9216987	2000	68122	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218650	2001	67987		Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218662	2001	67500		Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218674	2001	67500	25	Container5000	55681	11600	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9218686	2002	67500		Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231236	2001	67500	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231262	2002	68024	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231755	2002	68086	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235098	2002	68045	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235103	2002	68063	26	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9238739	2001	67795	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9238739	2001	67795	25	Container5000	46574	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9248136	2003	68200	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9248150	2003	67979	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9248162	2003	68037	26	Container5000	54900	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290402	2005	67310	26	Container5000	45760	11360	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9304784	2004	69303	26	Container5000	58092	9280	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9085534	1996	84900	25	Container6000	54860	14081	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9085558	1996	84900	25	Container6000	54840	14081	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9085560	1997	84900	25	Container6000	54840	14111	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9107887	1997	90456	25	Container6000	54840	14111	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9153850	1998	88669	25	Container6000	65880	15725	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9241281	2002	75898	25	Container6000	37080	12000	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9241293	2003	75898	25	Container6000	37080	12000	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9241308	2002	75898	25	Container6000	37080	13501	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9241310	2001	75898	25	Container6000	37080	13501	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9241322	2002	75898	25	Container6000	37080	13501	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9307035	2005	72968	25	Container6000	68640	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9285691	2004	93728	25	Container7000	63898	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9295218	2005	92964		Container7000	63898	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9300398	2005	78693	26	Container7000	54900	12360	500	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
9290464	2005	92964		Container8000	63898	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290476	2005	93546		Container8000	63898	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290476	2005	93546		Container8000	63898	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9290488	2005	92964		Container8000	63898	13501	500	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8802868	1991	645	16	Cruise	42168	10542	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9000259	1995	8293	21	Cruise	36864	9216	1000	HFO (2.5% S)	Shore Power	HFO (2.5% S)
9008419	1992	6731	19	Cruise	42168	10542	1000	HFO (1.5% S)	HFO (1.5% S)	HFO (2.5% S)
9102992	1996	6604	20	Cruise	27139	6784.8	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9106302	1997	5700	22	Cruise	25200	6300	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9141065	1998	8530	24	Cruise	42168	10542	1000	HFO (1.5% S)	HFO (1.5% S)	HFO (2.5% S)
9156515	1999	6150	22	Cruise	34560	8640	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9156527	2000	6150	22	Cruise	34560	8640	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9160011	1998	4202	21	Cruise	42168	10542	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9188037	2000	7327	21	Cruise	44173	11043.2	1000	HFO (1.5% S)	HFO (1.5% S)	HFO (2.5% S)
9192387	2001	11788	24	Cruise	46400	11600	1000	MGO (0.5% S)	MGO (0.5% S)	MGO (0.5% S)
9195157	2001	7500	25	Cruise	42168	10542	1000	HFO (1.5% S)	HFO (1.5% S)	HFO (2.5% S)
9218131	2001	7100	20	Cruise	42168	10542	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9221281	2003	10965	22	Cruise	60112	15028	1000	HFO (1.5% S)	HFO (1.5% S)	HFO (2.5% S)
9228186	2004	7921	23	Cruise	42168	10542	1000	HFO (2.5% S)	Shore Power	HFO (2.5% S)

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Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9228198	2004	14274	23	Cruise	42168	10542	1000	HFO (2.5% S)	Shore Power	HFO (2.5% S)
9263538	2003	350		Cruise	5011	1252.8	1000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
6605022	1966	17782		General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7516565	1977	45065	15	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7516656	1977	44895	15	General Cargo	11750	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7722138	1979	22270	21	General Cargo	11033	2615	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8013027	1983	23024	17	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8220072	1984	44959	16	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8316704	1985	41619	13	General Cargo	5973	2385	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8406688	1985	19828	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8406690	1985	22845	18	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8406717	1986	19763	17	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8507200	1986	43131	16	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8507212	1986	43131	16	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8512944	1986	45252	15	General Cargo	11400	1776	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8512982	1987	45252	15	General Cargo	11400	600	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8512982	1987	45252	15	General Cargo	11400	600	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
8611128	1988	9656	14	General Cargo	3935	696	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8700981	1988	1742	12	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8801618	1989	9682	14	General Cargo	4413	696	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8913851	1991	4110	14	General Cargo	1980	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9008706	1992	46956		General Cargo	9310	1776	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9042271	1992	3300	14	General Cargo	2560	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9086253	1995	12754	15	General Cargo	5430	1335	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9100073	1995	44251		General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9114610	1995	28760	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9114921	1995	5408	14	General Cargo	3840	1032	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9131266	1999	44593	16	General Cargo	12000	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9136773	1996	27912	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9141730	1999	8943	16	General Cargo	6000	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9145061	1999	35230	17	General Cargo	11999	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9145798	1997	24406	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9147617	1996	29512	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9159347	1997	28646	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9169809	1997	8874	16	General Cargo	8201	2445	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9183491	1998	4979	16	General Cargo	4320	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9195236	1999	3490	12	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9201712	1999	10400	13	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9205562	1999	8976	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9210311	2000	7620	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9210347	2001	7612	14	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9213961	2000	7458	17	General Cargo	5400	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9220392	2000	11612	13	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9226035	2002	45000		General Cargo	8524	3780	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9226047	2002	45000	17	General Cargo	11500	3780	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9226059	2003	45851	17	General Cargo	12000	3780	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9226061	2004	45000	17	General Cargo	10000	3780	371	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9231107	2002	30000	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231119	2002	30396	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9231121	2002	30490	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235139	2001	9000	17	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9235983	2002	30586	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9238820	2003	30018	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9244544	2003	30095	20	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9266308	2002	7409	17	General Cargo	6300	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9266310	2003	7408	17	General Cargo	6300	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9267742	2005	10700	18	General Cargo	7200	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292010	2003	29822	19	General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9302061	2004	4310		General Cargo	2880	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9315472	2005	12004		General Cargo	8201	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7634331	1978			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7901928	1982			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7926540	1983			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8001189	1983	47247		ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8001206	1983			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9271119	2002			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9275438	2002			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9275878	2002	9787		ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9277369	2002			ITB	9959	600	0	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
	1985		16	MISC	47726	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
	1945		24	MISC	52200	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
	1944		20	MISC	52200	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
	1983		28	MISC	29828	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
	1965		21	MISC	17897	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7223314	1973	39026	20	MISC	10019	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7320411	1973	41363	23	MISC	10019	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8030130	1983	11434	13	MISC	10019	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8977704	1990	105		MISC	10019	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9105798	1997	1332		MISC	4296	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9255713	2003	49999		MISC	10019	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9282106	2004	53194		MISC	10019	1776	371	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8301682	1983	8298	17	Reefer	9878	3900	464	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8319093	2003	6310	17	Reefer	9878	3900	464	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8710352	1988	7190	17	Reefer	9878	3900	464	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8907199	1991	6809	18	Reefer	6650	3900	464	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9003756	1990	4900	16	Reefer	9878	3900	464	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390105	1976	20275	21	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390117	1976	19480		RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390131	1977	19480		RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7704930	1979	32441	21	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7704942	1979	31800	21	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7715290	1978	29218	19	RoRo	19720	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9112557	1995	11464	15	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9112569	1995	11511	15	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9116826	1997		24	RoRo	48606	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9141211	1996	11285		RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9157430	1997	13041	16	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9157442	1997	13046	16	RoRo	19856	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9178355	2000			RoRo	48606	2850	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

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9232278	2003	22437	24	RoRo	19856	3600	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9232280	2003	22437	24	RoRo	19856	3600	100	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
5137767	1957	39999	16	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
5137779	1958	40017	16	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7500889	1980	127003		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8002951	1982	7850	15	Tanker	4400	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8008931	1983	50860		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8220773	1985	29500	16	Tanker	13781	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8310097	1986	30127	16	Tanker	13781	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8310102	1986	29526		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8420505	1987	45655	15	Tanker	9500	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8517085	1989	17485		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9066174	1993	95628		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9084671	1994	10331	14	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9131371	1998	46103		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9132789	1997	26777	18	Tanker	9630	2680	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9145841	1996	45217		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9149213	1998	47431	15	Tanker	8310	3549	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9161895	1998	19365	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9162502	1998	46269	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9168477	1998	19386	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9214044	1999	16408	14	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9219264	2001	31265	15	Tanker	7860	2109	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9221669	2000	11921	14	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9222651	2000	19998	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9232591	2002	69697		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9240718	2003	37000		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9244984	2002	19997	16	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9248461	2002	24404	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9251535	2003	44404	15	Tanker	7570	3040	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9255933	2004	72637		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9256236	2003	72365		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9257498	2003	61000		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

Puget Sound Emissions Inventory
Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9258612	2004	47171		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9259317	2003	70156		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9263095	2003	19997	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9275737	2004	69636		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9275751	2004	70313		Tanker	6242	1800	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9278703	2004	19999	15	Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9279719	2004	45948		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9283722	2004	46921		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9285720	2004	46803	15	Tanker	6242	3330	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9288813	2005	46000		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9296585	2005	45800		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9304318	2004	8700		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9310680	2004	48000		Tanker	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8130095	1982	22553	14	Tanker - Chemica	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9157519	1997	15265	14	Tanker - Chemica	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9157521	1997	15247	14	Tanker - Chemica	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9157521	1997	15247	14	Tanker - Chemica	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9168611	2000	22460	15	Tanker - Chemica	6242	1985	346	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9304332	2005	19900	16	Tanker - Chemica	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9321861	2005	25000	15	Tanker - Chemica	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390492	1977	90638	16	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390507	1977	92017	17	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390519	1977	91843	17	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7390521	1978	91967	17	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8813570	1990	96127	14	Tanker - Crude - A	13300	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8916188	1990	100202	15	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9131125	1997	105575	15	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9167033	1998	105337	15	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9177820	1998	106120	15	Tanker - Crude - A	14875	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9187760	1999	105535	15	Tanker - Crude - A	11999	2184	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9199713	1999	99998	14	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9243033	2003	114600	14	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9247792	2003	106500	15	Tanker - Crude - A	13784	2180	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

Puget Sound Emissions Inventory
Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9251810	2002	106500	15	Tanker - Crude - A	12240	2180	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9266853	2004	105900	15	Tanker - Crude - A	12240	2450	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9273052	2003	106127	15	Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9282479	2004	114760		Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9292515	2005	114780		Tanker - Crude - A	13784	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9296822	2005	106433		Tanker - Crude - A	14875	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9304643	2004	105778	15	Tanker - Crude - A	11999	2544	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8109682	1984	58643	16	Tanker - Crude - H	14700	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8618891	1989	46538	15	Tanker - Crude - H	6242	3103	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9015357	1992	45696	14	Tanker - Crude - H	6550	1535	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9118630	1998	46094	15	Tanker - Crude - H	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9001605	1993	68623	14	Tanker - Crude - P	8996	2095	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9035137	1993	66895	15	Tanker - Crude - P	11109	2247	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9252187	2002	70392	15	Tanker - Crude - P	11109	2520	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9256626	2003	70296	15	Tanker - Crude - P	11109	2520	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9280366	2004	71024	17	Tanker - Crude - P	11109	2520	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9289178	2005	61369	15	Tanker - Crude - P	11109	2520	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7408081	1978	122805	17	Tanker - Crude -	16742	1250	3000	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
7408081	1978	122805	17	Tanker - Crude -	16742	1250	3000	HFO (2.5% S)	MGO (0.5% S)	HFO (2.5% S)
7408093	1979	125091	17	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7500877	1979	188440	15	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7506027	1978	188099	14	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7506039	1978	188101	14	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9000510	1991	154970	15	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9002207	1991	152680		Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9051612	1994	156380	16	Tanker - Crude -	15810	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9104885	1995	149745	15	Tanker - Crude -	15420	2749	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9118458	1996	148017	15	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9131137	1997	151459	15	Tanker - Crude -	15215	3043	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9180114	2000	159057	15	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9187227	2000	159999		Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9187239	2000	149999		Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9193551	2001	141740	17	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (1.5% S)	HFO (1.5% S)

Puget Sound Emissions Inventory
Table E-1, Ocean Going Vessel Data, 2005

Vessel ID	Model Year	DWT (tons)	Max Speed (Knots)	Vessel Type	Main Eng Power (kW)	Aux Eng Demand (kW)	Aux Boiler Energy (kW)	Main Eng Fuel Type	Aux Eng Fuel Type	Aux Boiler Fuel Type
9193563	2002	141737	17	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (1.5% S)	HFO (1.5% S)
9206114	2003	140320	17	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (1.5% S)	HFO (1.5% S)
9231509	2002	159417		Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9244063	2004	141739	17	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (1.5% S)	HFO (1.5% S)
9244659	2004	193049	15	Tanker - Crude -	16742	2865	346	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9244661	2005	193049	15	Tanker - Crude -	16742	2865	346	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9244673	2005	193048	15	Tanker - Crude -	16742	2865	346	HFO (1.5% S)	HFO (1.5% S)	HFO (1.5% S)
9249324	2001	150500	15	Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9259733	2004	159149		Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
9293131	2005	159200		Tanker - Crude -	16742	2865	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
8414532	1987	214862	16	Tanker - Crude - V	26480	5680	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7391226	1976	39795	15	Tanker - Oil Prod	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)
7395349	1975	125926	17	Tanker - Oil Prod	6242	1985	3000	HFO (2.5% S)	HFO (2.5% S)	HFO (2.5% S)

Legend

Modes

T - Transit Stable tranist speed above 11 knots
X - Transition between Transit & Maneuvering
M - Maneuvering < 11 knots

NPE - Near Port Emissions - Emissions assigned to the "port area"

Puget Sound Emissions Inventory

OGV-Routing: VICTORIA (NB1) to SEATTLE

Lat/Long in WGS84 Datum

													Speed by Link (knots)												
													Fast	Fast	Medium	Slow	Very Slow								
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**	**HAL-1 Speed knots**	**HAL-1 PL (MW)**	**HAL-1 SL (MW)**	**HAL-1 BL (MW)**	**HAL-2 Speed knots**	**HAL-2 PL (MW)**	**HAL-2 SL (MW)**	**HAL-2 BL (MW)**
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13´ 55´´ N	123° 30´ 34´´ W	VP_A_2	48° 12´ 05´´ N	123° 28´ 55´´ W	2.1	Calallam	18	0	0	0	0	19	18.3	7.0	0.0	16.6	15.2	10.1	0.0
NB1_PortAngeles	Arrival	X	N	L2a	VP_A_2	48° 12´ 05´´ N	123° 28´ 55´´ W	PS_A_5	48° 09´ 20´´ N	123° 23´ 28´´ W	4.5	Calallam	16	0	0	0	0	16	17.0	7.0	0.0	16	15.2	9.0	0.0
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N	123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	0.6	Calallam	8	0	0	0	0	8	6.0	6.9	0.0	10	8.0	10.1	0.0
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N	123° 06´ 35´´ W	11.4	Calallam	18	0	0	0	0	18	15.0	6.9	0.0	18	14.0	10.1	0.0
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N	123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N	122° 52´ 23´´ W	9.5	Calallam	SS	0	0	0	0	19	18.4	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N	122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N	122° 48´ 01´´ W	2.9	Jefferson	SS	0	0	0	0	19	18.4	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N	122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N	122° 40´ 10´´ W	6.8	Jefferson	SS	0	0	0	0	19	18.4	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N	122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N	122° 38´ 08´´ W	5.6	Jefferson	SS	0	0	0	0	18	16.1	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N	122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N	122° 35´ 10´´ W	4.0	Island	SS	0	0	0	0	18	16.1	6.9	0.0	16.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N	122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N	122° 32´ 57´´ W	1.8	Island	19	0	0	0	0	18	16.1	6.9	0.0	16.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N	122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N	122° 30´ 06´´ W	2.3	Kitsap	18	0	0	0	0	18	16.1	6.9	0.0	16.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N	122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N	122° 26´ 45´´ W	9.7	Kitsap	17	0	0	0	0	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45´ 54´´ N	122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N	122° 28´ 24´´ W	6.3	Kitsap	17	0	0	0	0	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0
ElliottB_PS	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N	122° 28´ 24´´ W	EB_A_2	47° 39´ 21´´ N	122° 28´ 02´´ W	0.4	Kitsap	16	0	0	0	0	16	7.2	6.9	0.0	16	12.0	10.1	0.0
ElliottB_PS	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N	122° 28´ 02´´ W	EB_A_3	47° 38´ 16´´ N	122° 26´ 36´´ W	1.5	King	15	0	0	0	0	15.5	7.2	6.9	0.0	15.5	12.0	10.1	0.0
ElliottB_PS	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N	122° 26´ 36´´ W	EB_A_4	47° 36´ 52´´ N	122° 23´ 21´´ W	2.6	King	15	0	0	0	0	15	7.2	6.9	0.0	15	12.0	10.1	0.0

Total Distance 72.1 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to VICTORIA (NB1)

Lat/Long in WGS84 Datum

													Speed by Link (knots)												
													Fast	Fast	Medium	Slow	Very Slow								
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**	**HAL-1 Speed knots**	**HAL-1 PL (MW)**	**HAL-1 SL (MW)**	**HAL-1 BL (MW)**	**HAL-2 Speed knots**	**HAL-2 PL (MW)**	**HAL-2 SL (MW)**	**HAL-2 BL (MW)**
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N	122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N	122° 26´ 27´´ W	2.6	King	14	0	0	0	0	13.5	13.2	7.0	0.0	13.5	12.1	10.1	0.0
ElliottB_PS	Departure	X	Y	L2	EB_D_2	47° 38´ 22´´ N	122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	1.5	King	18	0	0	0	0	17.5	19.2	7.0	0.0	16.5	16.1	9.0	0.0
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	2.3	King	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	4.0	Kitsap	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	0.8	King	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	1.5	Snohomisl	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	4.6	Kitsap	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	3.1	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	2.4	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	1.9	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	4.5	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	2.8	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	2.2	Jefferson	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	1.3	Jefferson	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N	122° 46´ 47´´ W	5.3	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N	122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	1.4	Island	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N	122° 52´ 19´´ W	2.4	Jefferson	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N	122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N	123° 06´ 35´´ W	9.5	Calallam	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N	123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N	123° 23´ 03´´ W	11.2	Calallam	17	0	0	0	0	18	19.0	7.0	0.0	18	19.5	10.1	0.0
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N	123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N	123° 23´ 02´´ W	0.8	Calallam	8	0	0	0	0	10	12.0	7.0	0.0	10	11.0	10.1	0.0
Tacoma_Sea	Departure	X	N	L28a	PS_D_28	48° 11´ 21´´ N	123° 23´ 02´´ W	VP_D_1	48° 13´ 18´´ N	123° 26´ 59´´ W	3.2	Calallam	18	0	0	0	0	18	19.0	7.0	0.0	18	19.5	10.1	0.0
PortAngeles_Victoria	Departure	T	N	L1	VP_D_1	48° 13´ 18´´ N	123° 26´ 59´´ W	VP_D_2	48° 14´ 41´´ N	123° 26´ 36´´ W	1.4	Calallam	SS	0	0	0	0	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0

Total Distance 70.7 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VICTORIA (NB1) to TACOMA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13´ 55´´ N 123° 30´ 34´´ W	VP_A_2	48° 12´ 05´´ N 123° 28´ 55´´ W	2.1	Calallam	18	0	0	0	0
NB1_PortAngeles	Arrival	X	N	L2a	VP_A_2	48° 12´ 05´´ N 123° 28´ 55´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	4.5	Calallam	16	0	0	0	0
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	10	0	0	0	0
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	17	0	0	0	0
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	18	0	0	0	0
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	17	0	0	0	0
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	16	0	0	0	0
Sea_Tacoma	Arrival	T	N	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	17	0	0	0	0
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	14	0	0	0	0
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	10	0	0	0	0
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	10	0	0	0	0
								Total Distance	91.8	nm		Note: SS - Service Speed			
												Note: Red numbers - engines off			

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to VICTORIA (NB1)

Lat/Long in WGS84 Datum

Speed by Link (knots)

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	10	0	0	0	0
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	12	0	0	0	0
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	16	0	0	0	0
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	17	0	0	0	0
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	16	0	0	0	0
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	17	0	0	0	0
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	20	0	0	0	0
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	22	0	0	0	0
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	SS	0	0	0	0
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	SS	0	0	0	0
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	18	0	0	0	0
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	10	0	0	0	0
Tacoma_Sea	Departure	X	N	L28a	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	VP_D_1	48° 13´ 18´´ N 123° 26´ 59´´ W	3.2	Calallam	14	0	0	0	0
PortAngeles_Victoria	Departure	T	N	L1	VP_D_1	48° 13´ 18´´ N 123° 26´ 59´´ W	VP_D_2	48° 14´ 41´´ N 123° 26´ 36´´ W	1.4	Calallam	16	0	0	0	0
								Total Distance	91.1	nm					

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VICTORIA (NB1) to EVERETT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13´ 55´´ N 123° 30´ 34´´ W	VP_A_2	48° 12´ 05´´ N 123° 28´ 55´´ W	2.1	Calallam	18	0	0	0	0
NB1_PortAngeles	Arrival	X	N	L2a	VP_A_2	48° 12´ 05´´ N 123° 28´ 55´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	4.5	Calallam	16	0	0	0	0
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	8	0	0	0	0
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	19	0	0	0	0
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	SS	0	0	0	0
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	SS	0	0	0	0
PS_Everett	Arrival	X	N	L1a	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	EV_A_2	47° 53´ 08´´ N 122° 29´ 06´´ W	2.3	Kitsap	18	0	0	0	0
PS_Everett	Arrival	X	N	L2	EV_A_2	47° 53´ 08´´ N 122° 29´ 06´´ W	EV_A_3	47° 51´ 05´´ N 122° 26´ 26´´ W	2.7	Kitsap	17	0	0	0	0
PS_Everett	Arrival	X	N	L3	EV_A_3	47° 51´ 05´´ N 122° 26´ 26´´ W	EV_A_4	47° 51´ 50´´ N 122° 23´ 43´´ W	2.0	Island	16	0	0	0	0
PS_Everett	Arrival	T	N	L4	EV_A_4	47° 51´ 50´´ N 122° 23´ 43´´ W	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	0.6	Snohomisl	15	0	0	0	0
PS_Everett	Arrival	T	Y	L5	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	2.4	Snohomisl	15	0	0	0	0
PS_Everett	Arrival	T	Y	L6	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	2.5	Snohomisl	15	0	0	0	0
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	1.1	Snohomisl	14	0	0	0	0
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	2.0	Snohomisl	10	0	0	0	0
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	1.3	Snohomisl	7	0	0	0	0
								Total Distance	68.5	nm					

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VICTORIA (NB1) to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB1_PortAngeles	Arrival	T	N	L1	VP_A_1	48° 13´ 55´´ N 123° 30´ 34´´ W	VP_A_2	48° 12´ 05´´ N 123° 28´ 55´´ W	2.1	Calallam	18	0	0	0	0
NB1_PortAngeles	Arrival	X	Y	L2a	VP_A_2	48° 12´ 05´´ N 123° 28´ 55´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	4.5	Calallam	16	0	0	0	0
Sea_PortAngeles	Arrival	M	Y	L1a	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.4	Calallam	10	0	0	0	0
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	8	0	0	0	0
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	6	0	0	0	0
								Total Distance	9.6 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: SEA to SEATTLE

Lat/Long in WGS84 Datum

													Speed by Link (knots)												
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Fast Cruise**	**Fast Container Auto**	**Medium Reefer RO/RO Fishing**	**Slow Bulkers Tankers Log Fishing**	**Very Slow Fishing**	**HAL-1 Speed knots**	**HAL-1 PL (MW)**	**HAL-1 SL (MW)**	**HAL-1 BL (MW)**	**HAL-2 Speed knots**	**HAL-2 PL (MW)**	**HAL-2 SL (MW)**	**HAL-2 BL (MW)**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N	125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N	124° 43´ 51´´ W	10.7	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N	124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N	123° 55´ 03´´ W	35.9	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N	123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N	123° 31´ 59´´ W	15.4	Calallam	20	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N	123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N	123° 23´ 28´´ W	6.9	Calallam	16	15	12	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N	123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8	10.0	6.0	6.9	0.0	10.0	8.0	10.1	0.0
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N	123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS	17.0	15.0	6.9	0.0	18.0	14.0	10.1	0.0
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N	123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N	122° 52´ 23´´ W	9.5	Calallam	SS	SS	SS	SS	SS	19.0	18.4	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N	122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N	122° 48´ 01´´ W	2.9	Jefferson	SS	SS	SS	SS	SS	19.0	18.4	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N	122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N	122° 40´ 10´´ W	6.8	Jefferson	SS	SS	SS	SS	SS	19.0	18.4	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N	122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N	122° 38´ 08´´ W	5.6	Jefferson	SS	SS	SS	SS	SS	18.0	16.1	6.9	0.0	19.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N	122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N	122° 35´ 10´´ W	4.0	Island	SS	SS	SS	SS	SS	18.0	16.1	6.9	0.0	16.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N	122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N	122° 32´ 57´´ W	1.8	Island	SS	SS	SS	SS	SS	18.0	16.1	6.9	0.0	16.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N	122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N	122° 30´ 06´´ W	2.3	Kitsap	20	20	SS	SS	SS	18.0	16.1	6.9	0.0	16.8	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N	122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N	122° 26´ 45´´ W	9.7	Kitsap	17	16	SS	SS	SS	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0
Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45´ 54´´ N	122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N	122° 28´ 24´´ W	6.3	Kitsap	16	16	13	SS	SS	16.5	16.1	6.9	0.0	16.6	15.2	10.1	0.0
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N	122° 28´ 24´´ W	EB_A_2	47° 39´ 21´´ N	122° 28´ 02´´ W	0.4	Kitsap	16	15	13	9	8	16.0	7.2	6.9	0.0	16.0	12.0	10.1	0.0
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N	122° 28´ 02´´ W	EB_A_3	47° 38´ 16´´ N	122° 26´ 36´´ W	1.5	King	15	14	12	8	7	15.5	7.2	6.9	0.0	15.5	12.0	10.1	0.0
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N	122° 26´ 36´´ W	EB_A_4	47° 36´ 52´´ N	122° 23´ 21´´ W	2.6	King	15	12	11	6	6	15.0	7.2	6.9	0.0	15.0	12.0	10.1	0.0
										Total Distance	134.3 nm		Note: SS - Service Speed											

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE HARBOR

Lat/Long in WGS84 Datum

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County
PS_ElliottB	SEATTLE		Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	Mode:	M		King
ElliottB_PS	SEATTLE		Departure		EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	NPE:	Y		King

ALL ROUTES IN AND OUT GO THROUGH EB_A_4 and EB_D_1 EXCEPT

SALMON BAY **NORTHLAKE** **LAKE UNION**

FOSS SHIPYARD **SHILSHOLE**

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County
PS_ElliottB	SEATTLE	15	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	15	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	0.56	King
PS_ElliottB	SEATTLE	15	Arrival		EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	EB_B_P15	47° 35´ 17´´ N 122° 21´ 12´´ W	0.10	King
ElliottB_PS	SEATTLE	15	Departure		EB_B_P15	47° 35´ 17´´ N 122° 21´ 12´´ W	EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	0.10	King
ElliottB_PS	SEATTLE	15	Departure		EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.56	King
ElliottB_PS	SEATTLE	15	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	SHELL	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	SHELL	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	0.56	King
PS_ElliottB	SEATTLE	SHELL	Arrival		EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	EB_SH_1	47° 35´ 20´´ N 122° 21´ 10´´ W	0.05	King
PS_ElliottB	SEATTLE	SHELL	Arrival		EB_SH_1	47° 35´ 20´´ N 122° 21´ 10´´ W	EB_B_SH	47° 35´ 17´´ N 122° 21´ 10´´ W	0.06	King
ElliottB_PS	SEATTLE	SHELL	Departure		EB_B_SH	47° 35´ 17´´ N 122° 21´ 10´´ W	EB_SH_1	47° 35´ 20´´ N 122° 21´ 10´´ W	0.06	King
ElliottB_PS	SEATTLE	SHELL	Departure		EB_SH_1	47° 35´ 20´´ N 122° 21´ 10´´ W	EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	0.05	King
ElliottB_PS	SEATTLE	SHELL	Departure		EB_TD_2	47° 35´ 23´´ N 122° 21´ 12´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.56	King
ElliottB_PS	SEATTLE	SHELL	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	BP	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	BP	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	BP	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_B_BP	47° 34´ 57´´ N 122° 21´ 31´´ W	0.11	King
ElliottB_PS	SEATTLE	BP	Departure		EB_B_BP	47° 34´ 57´´ N 122° 21´ 31´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.11	King
ElliottB_PS	SEATTLE	BP	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	BP	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	5-NORTH	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	5-NORTH	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	5-NORTH	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_B_T5N	47° 34´ 49´´ N 122° 21´ 40´´ W	0.22	King
ElliottB_PS	SEATTLE	5-NORTH	Departure		EB_B_T5N	47° 35´ 17´´ N 122° 21´ 12´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.22	King
ElliottB_PS	SEATTLE	5-NORTH	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	5-NORTH	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	5-CENTER	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	5-CENTER	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	5-CENTER	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_B_T5C	47° 34´ 42´´ N 122° 21´ 41´´ W	0.35	King
ElliottB_PS	SEATTLE	5-CENTER	Departure		EB_B_T5C	47° 34´ 42´´ N 122° 21´ 41´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.35	King
ElliottB_PS	SEATTLE	5-CENTER	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	5-CENTER	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	5-SOUTH	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	5-SOUTH	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	5-SOUTH	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_B_T5S	47° 34´ 32´´ N 122° 21´ 41´´ W	0.50	King
ElliottB_PS	SEATTLE	5-SOUTH	Departure		EB_B_T5S	47° 34´ 32´´ N 122° 21´ 41´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.50	King
ElliottB_PS	SEATTLE	5-SOUTH	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	5-SOUTH	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	KINDER MORGAN	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	KINDER MORGAN	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_KM	47° 35´ 23´´ N 122° 20´ 45´´ W	0.42	King
ElliottB_PS	SEATTLE	KINDER MORGAN	Departure		EB_B_KM	47° 35´ 23´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.42	King
ElliottB_PS	SEATTLE	KINDER MORGAN	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	18-1	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	18-1	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T181	47° 35´ 18´´ N 122° 20´ 45´´ W	0.51	King
ElliottB_PS	SEATTLE	18-1	Departure		EB_B_T181	47° 35´ 18´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.51	King
ElliottB_PS	SEATTLE	18-1	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	18-2	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	18-2	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T182	47° 35´ 06´´ N 122° 20´ 45´´ W	0.71	King
ElliottB_PS	SEATTLE	18-2	Departure		EB_B_T182	47° 35´ 06´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.71	King
ElliottB_PS	SEATTLE	18-2	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	18-3	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	18-3	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T183	47° 34´ 55´´ N 122° 20´ 45´´ W	0.89	King
ElliottB_PS	SEATTLE	18-3	Departure		EB_B_T183	47° 34´ 55´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.89	King
ElliottB_PS	SEATTLE	18-3	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King

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Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County
PS_ElliottB	SEATTLE	18-4	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	18-4	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T184	47° 34´ 44´´ N 122° 20´ 45´´ W	1.08	King
ElliottB_PS	SEATTLE	18-4	Departure		EB_B_T184	47° 34´ 44´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	1.08	King
ElliottB_PS	SEATTLE	18-4	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	18-5	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	18-5	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T185	47° 34´ 34´´ N 122° 20´ 45´´ W	1.24	King
ElliottB_PS	SEATTLE	18-5	Departure		EB_B_T185	47° 34´ 34´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	1.24	King
ElliottB_PS	SEATTLE	18-5	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	20-1	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	20-1	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T201	47° 34´ 55´´ N 122° 20´ 45´´ W	0.89	King
ElliottB_PS	SEATTLE	20-1	Departure		EB_B_T201	47° 34´ 55´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.89	King
ElliottB_PS	SEATTLE	20-1	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	20-2	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	20-2	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_B_T202	47° 34´ 55´´ N 122° 20´ 45´´ W	0.89	King
ElliottB_PS	SEATTLE	20-2	Departure		EB_B_T202	47° 34´ 55´´ N 122° 20´ 45´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.89	King
ElliottB_PS	SEATTLE	20-2	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King

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Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County
PS_ElliottB	SEATTLE	25-NORTH	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	25-NORTH	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	1.04	King
PS_ElliottB	SEATTLE	25-NORTH	Arrival		EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	EB_B_T25N	47° 34´ 37´´ N 122° 20´ 35´´ W	0.15	King
ElliottB_PS	SEATTLE	25-NORTH	Departure		EB_B_T25N	47° 34´ 37´´ N 122° 20´ 35´´ W	EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	0.15	King
ElliottB_PS	SEATTLE	25-NORTH	Departure		EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	1.04	King
ElliottB_PS	SEATTLE	25-NORTH	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	25-SOUTH	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	25-SOUTH	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	1.04	King
PS_ElliottB	SEATTLE	25-SOUTH	Arrival		EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	EB_B_T25S	47° 34´ 31´´ N 122° 20´ 35´´ W	0.25	King
ElliottB_PS	SEATTLE	25-SOUTH	Departure		EB_B_T25S	47° 34´ 31´´ N 122° 20´ 35´´ W	EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	0.25	King
ElliottB_PS	SEATTLE	25-SOUTH	Departure		EB_EC_2	47° 34´ 46´´ N 122° 20´ 39´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	1.04	King
ElliottB_PS	SEATTLE	25-SOUTH	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	30-NORTH	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	30-NORTH	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	0.61	King
PS_ElliottB	SEATTLE	30-NORTH	Arrival		EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	EB_B_T30N	47° 35´ 07´´ N 122° 20´ 35´´ W	0.09	King
ElliottB_PS	SEATTLE	30-NORTH	Departure		EB_B_T30N	47° 35´ 07´´ N 122° 20´ 35´´ W	EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	0.09	King
ElliottB_PS	SEATTLE	30-NORTH	Departure		EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.61	King
ElliottB_PS	SEATTLE	30-NORTH	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	30-SOUTH	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	2.08	King
PS_ElliottB	SEATTLE	30-SOUTH	Arrival		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	0.61	King
PS_ElliottB	SEATTLE	30-SOUTH	Arrival		EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	EB_B_T30S	47° 34´ 57´´ N 122° 20´ 35´´ W	0.25	King
ElliottB_PS	SEATTLE	30-SOUTH	Departure		EB_B_T30S	47° 34´ 57´´ N 122° 20´ 35´´ W	EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	0.25	King
ElliottB_PS	SEATTLE	30-SOUTH	Departure		EB_EC_3	47° 35´ 12´´ N 122° 20´ 39´´ W	EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	0.61	King
ElliottB_PS	SEATTLE	30-SOUTH	Departure		EB_EC_1	47° 35´ 48´´ N 122° 20´ 41´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	2.08	King
PS_ElliottB	SEATTLE	37	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	1.5	King
PS_ElliottB	SEATTLE	37	Arrival		EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_FS_2	47° 35´ 43´´ N 122° 20´ 32´´ W	0.84	King
PS_ElliottB	SEATTLE	37	Arrival		EB_FS_2	47° 35´ 43´´ N 122° 20´ 32´´ W	EB_B_T37	47° 35´ 35´´ N 122° 20´ 33´´ W	0.13	King
ElliottB_PS	SEATTLE	37	Departure		EB_B_T37	47° 35´ 35´´ N 122° 20´ 33´´ W	EB_FS_2	47° 35´ 43´´ N 122° 20´ 32´´ W	0.13	King
ElliottB_PS	SEATTLE	37	Departure		EB_FS_2	47° 35´ 43´´ N 122° 20´ 32´´ W	EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	0.84	King
ElliottB_PS	SEATTLE	37	Departure		EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.5	King
PS_ElliottB	SEATTLE	46	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	1.5	King
PS_ElliottB	SEATTLE	46	Arrival		EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_FN_1	47° 35´ 56´´ N 122° 20´ 30´´ W	0.7	King
PS_ElliottB	SEATTLE	46	Arrival		EB_FN_1	47° 35´ 56´´ N 122° 20´ 30´´ W	EB_B_T46	47° 35´ 50´´ N 122° 20´ 27´´ W	0.11	King
ElliottB_PS	SEATTLE	46	Departure		EB_B_T46	47° 35´ 50´´ N 122° 20´ 27´´ W	EB_FN_1	47° 35´ 56´´ N 122° 20´ 30´´ W	0.11	King
ElliottB_PS	SEATTLE	46	Departure		EB_FN_1	47° 35´ 56´´ N 122° 20´ 30´´ W	EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	0.7	King
ElliottB_PS	SEATTLE	46	Departure		EB_FS_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.5	King
PS_ElliottB	SEATTLE	66-1	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	1.66	King
PS_ElliottB	SEATTLE	66-1	Arrival		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_B_T661	47° 36´ 39´´ N 122° 21´ 00´´ W	0.13	King
ElliottB_PS	SEATTLE	66-1	Departure		EB_B_T661	47° 36´ 39´´ N 122° 21´ 00´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	0.13	King
ElliottB_PS	SEATTLE	66-1	Departure		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.66	King
PS_ElliottB	SEATTLE	66-2	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	1.66	King
PS_ElliottB	SEATTLE	66-2	Arrival		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_B_T662	47° 36´ 37´´ N 122° 20´ 57´´ W	0.1	King
ElliottB_PS	SEATTLE	66-2	Departure		EB_B_T662	47° 36´ 37´´ N 122° 20´ 57´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	0.1	King
ElliottB_PS	SEATTLE	66-2	Departure		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.66	King
PS_ElliottB	SEATTLE	66-3	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	1.66	King
PS_ElliottB	SEATTLE	66-3	Arrival		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_B_T663	47° 36´ 36´´ N 122° 20´ 54´´ W	0.08	King
ElliottB_PS	SEATTLE	66-3	Departure		EB_B_T663	47° 36´ 36´´ N 122° 20´ 54´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	0.08	King
ElliottB_PS	SEATTLE	66-3	Departure		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.66	King
PS_ElliottB	SEATTLE	66-4	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	1.66	King
PS_ElliottB	SEATTLE	66-4	Arrival		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_B_T664	47° 36´ 34´´ N 122° 20´ 52´´ W	0.07	King
ElliottB_PS	SEATTLE	66-4	Departure		EB_B_T664	47° 36´ 34´´ N 122° 20´ 52´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	0.07	King
ElliottB_PS	SEATTLE	66-4	Departure		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.66	King
PS_ElliottB	SEATTLE	66-N	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	1.66	King
PS_ElliottB	SEATTLE	66-N	Arrival		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_B_T66N	47° 36´ 41´´ N 122° 21´ 03´´ W	0.17	King
ElliottB_PS	SEATTLE	66-N	Departure		EB_B_T66N	47° 36´ 41´´ N 122° 21´ 03´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	0.17	King
ElliottB_PS	SEATTLE	66-N	Departure		EB_CT_1	47° 36´ 25´´ N 122° 21´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.66	King

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YACHTS ONLY										
PS_ElliottB	SEATTLE	EB MARINA	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	1.66	King
PS_ElliottB	SEATTLE	EB MARINA	Arrival		EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	EB_EM_1	47° 36´ 33´´ N 122° 20´ 44´´ W	0.14	King
PS_ElliottB	SEATTLE	EB MARINA	Arrival		EB_EM_1	47° 36´ 33´´ N 122° 20´ 44´´ W	EB_B_EM	47° 36´ 36´´ N 122° 20´ 50´´ W	0.09	King
ElliottB_PS	SEATTLE	EB MARINA	Departure		EB_B_EM	47° 36´ 36´´ N 122° 20´ 50´´ W	EB_EM_1	47° 36´ 33´´ N 122° 20´ 44´´ W	0.09	King
ElliottB_PS	SEATTLE	EB MARINA	Departure		EB_EM_1	47° 36´ 33´´ N 122° 20´ 44´´ W	EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	0.14	King
ElliottB_PS	SEATTLE	EB MARINA	Departure		EB_CT_1	47° 36´ 31´´ N 122° 20´ 57´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.66	King
PS_ElliottB	SEATTLE	86	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_GE_1	47° 37´ 22´´ N 122° 22´ 14´´ W	0.9	King
PS_ElliottB	SEATTLE	86	Arrival		EB_GE_1	47° 37´ 22´´ N 122° 22´ 14´´ W	EB_B_T86	47° 37´ 25´´ N 122° 22´ 14´´ W	0.04	King
ElliottB_PS	SEATTLE	86	Departure		EB_B_T86	47° 37´ 25´´ N 122° 22´ 14´´ W	EB_GE_1	47° 37´ 22´´ N 122° 22´ 14´´ W	0.04	King
ElliottB_PS	SEATTLE	86	Departure		EB_GE_1	47° 37´ 22´´ N 122° 22´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.9	King
PS_ElliottB	SEATTLE	90-3	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	0.69	King
PS_ElliottB	SEATTLE	90-3	Arrival		EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	EB_B_T903	47° 37´ 47´´ N 122° 22´ 46´´ W	0.35	King
ElliottB_PS	SEATTLE	90-3	Departure		EB_B_T903	47° 37´ 47´´ N 122° 22´ 46´´ W	EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	0.04	King
ElliottB_PS	SEATTLE	90-3	Departure		EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.9	King
PS_ElliottB	SEATTLE	90-3&7	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	0.69	King
PS_ElliottB	SEATTLE	90-3&7	Arrival		EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	EB_B_T9037	47° 37´ 39´´ N 122° 22´ 45´´ W	0.21	King
ElliottB_PS	SEATTLE	90-3&7	Departure		EB_B_T9037	47° 37´ 39´´ N 122° 22´ 45´´ W	EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	0.21	King
ElliottB_PS	SEATTLE	90-3&7	Departure		EB_FE_1	47° 37´ 26´´ N 122° 22´ 45´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.69	King
PS_ElliottB	SEATTLE	90-5	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.63	King
PS_ElliottB	SEATTLE	90-5	Arrival		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_B_T905	47° 37´ 47´´ N 122° 22´ 51´´ W	0.37	King
ElliottB_PS	SEATTLE	90-5	Departure		EB_B_T905	47° 37´ 39´´ N 122° 22´ 45´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.37	King
ElliottB_PS	SEATTLE	90-5	Departure		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.63	King
PS_ElliottB	SEATTLE	90-5&7	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.63	King
PS_ElliottB	SEATTLE	90-5&7	Arrival		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_B_T9057	47° 37´ 48´´ N 122° 22´ 55´´ W	0.38	King
ElliottB_PS	SEATTLE	90-5&7	Departure		EB_B_T9057	47° 37´ 48´´ N 122° 22´ 55´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.38	King
ElliottB_PS	SEATTLE	90-5&7	Departure		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.63	King
PS_ElliottB	SEATTLE	91-H&I	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.63	King
PS_ElliottB	SEATTLE	91-H&I	Arrival		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_B_T91HI	47° 37´ 48´´ N 122° 22´ 55´´ W	0.38	King
ElliottB_PS	SEATTLE	91-H&I	Departure		EB_B_T91HI	47° 37´ 48´´ N 122° 22´ 55´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.38	King
ElliottB_PS	SEATTLE	91-H&I	Departure		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.63	King
PS_ElliottB	SEATTLE	91-J&K	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.63	King
PS_ElliottB	SEATTLE	91-J&K	Arrival		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_B_T91JK	47° 37´ 40´´ N 122° 22´ 55´´ W	0.25	King
ElliottB_PS	SEATTLE	91-J&K	Departure		EB_B_T91JK	47° 37´ 40´´ N 122° 22´ 55´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.25	King
ElliottB_PS	SEATTLE	91-J&K	Departure		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.63	King
PS_ElliottB	SEATTLE	91-E&F	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_FW_1	47° 37´ 27´´ N 122° 23´ 03´´ W	0.62	King
PS_ElliottB	SEATTLE	91-E&F	Arrival		EB_FW_1	47° 37´ 27´´ N 122° 23´ 03´´ W	EB_B_T91EF	47° 37´ 42´´ N 122° 23´ 02´´ W	0.24	King
ElliottB_PS	SEATTLE	91-E&F	Departure		EB_B_T91EF	47° 37´ 40´´ N 122° 22´ 55´´ W	EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	0.25	King
ElliottB_PS	SEATTLE	91-E&F	Departure		EB_FM_1	47° 37´ 25´´ N 122° 22´ 53´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.63	King
PS_ElliottB	SEATTLE	ANCHOR-SCE	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_AN_SCE	47° 37´ 09´´ N 122° 22´ 18´´ W	0.75	King
ElliottB_PS	SEATTLE	ANCHOR-SCE	Departure		EB_AN_SCE	47° 37´ 09´´ N 122° 22´ 18´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.75	King
PS_ElliottB	SEATTLE	ANCHOR-SCW	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_AN_SCW	47° 37´ 34´´ N 122° 24´ 07´´ W	0.87	King
ElliottB_PS	SEATTLE	ANCHOR-SCW	Departure		EB_AN_SCW	47° 37´ 34´´ N 122° 24´ 07´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	0.87	King
PS_ElliottB	SEATTLE	ANCHOR-EBE	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_AN_EBE	47° 35´ 35´´ N 122° 22´ 14´´ W	1.49	King
ElliottB_PS	SEATTLE	ANCHOR-EBE	Departure		EB_AN_EBE	47° 35´ 35´´ N 122° 22´ 14´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.49	King
PS_ElliottB	SEATTLE	ANCHOR-EBW	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_AN_EBW	47° 35´ 42´´ N 122° 21´ 09´´ W	1.88	King
ElliottB_PS	SEATTLE	ANCHOR-EBW	Departure		EB_AN_EBW	47° 35´ 42´´ N 122° 21´ 09´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.88	King
PS_ElliottB	SEATTLE	TODD-4	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-4	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.47	King
PS_ElliottB	SEATTLE	TODD-4	Arrival		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_B_TD4	47° 35´ 17´´ N 122° 21´ 24´´ W	0.15	King

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ElliottB_PS	SEATTLE	TODD-4	Departure		EB_B_TD4	47° 35´ 17´´ N 122° 21´ 24´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-4	Departure		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.47	King
ElliottB_PS	SEATTLE	TODD-4	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-5	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-5	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.47	King
PS_ElliottB	SEATTLE	TODD-5	Arrival		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_B_TD5	47° 35´ 17´´ N 122° 21´ 24´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-5	Departure		EB_B_TD5	47° 35´ 17´´ N 122° 21´ 24´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-5	Departure		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.47	King
ElliottB_PS	SEATTLE	TODD-5	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-DD3	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-DD3	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.47	King
PS_ElliottB	SEATTLE	TODD-DD3	Arrival		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_B_TDD3	47° 35´ 17´´ N 122° 21´ 24´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-DD3	Departure		EB_B_TDD3	47° 35´ 17´´ N 122° 21´ 24´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-DD3	Departure		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.47	King
ElliottB_PS	SEATTLE	TODD-DD3	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-E	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-E	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.47	King
PS_ElliottB	SEATTLE	TODD-E	Arrival		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_B_TDE	47° 35´ 17´´ N 122° 21´ 24´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-E	Departure		EB_B_TDE	47° 35´ 17´´ N 122° 21´ 24´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-E	Departure		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.47	King
ElliottB_PS	SEATTLE	TODD-E	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-F	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-F	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.47	King
PS_ElliottB	SEATTLE	TODD-F	Arrival		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_B_TDF	47° 35´ 17´´ N 122° 21´ 24´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-F	Departure		EB_B_TDF	47° 35´ 17´´ N 122° 21´ 24´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-F	Departure		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.47	King
ElliottB_PS	SEATTLE	TODD-F	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-H	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	TODD-H	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.47	King
PS_ElliottB	SEATTLE	TODD-H	Arrival		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_B_TDH	47° 35´ 17´´ N 122° 21´ 24´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-H	Departure		EB_B_TDH	47° 35´ 17´´ N 122° 21´ 24´´ W	EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	0.15	King
ElliottB_PS	SEATTLE	TODD-H	Departure		EB_TD_3	47° 35´ 26´´ N 122° 21´ 23´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.47	King
ElliottB_PS	SEATTLE	TODD-H	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	0.49	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	0.61	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	0.26	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	0.44	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	0.14	King
PS_ElliottB	SEATTLE	LAFARGE	Arrival		EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	EB_B_LF	47° 33´ 14´´ N 122° 20´ 34´´ W	0.07	King

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ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_B_LF	47° 33´ 14´´ N 122° 20´ 34´´ W	EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	0.07	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	0.14	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	0.44	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	0.26	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	0.61	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.49	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	LAFARGE	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	0.49	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	0.61	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	0.26	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	0.44	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	0.14	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	0.07	King
PS_ElliottB	SEATTLE	GLACIER	Arrival		EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	EB_B_GL	47° 33´ 12´´ N 122° 20´ 27´´ W	0.06	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_B_GL	47° 33´ 12´´ N 122° 20´ 27´´ W	EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	0.06	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	0.07	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	0.14	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	0.44	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	0.26	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	0.61	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.49	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	GLACIER	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	1.54	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.84	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	0.49	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	0.61	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	0.26	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	0.44	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	0.14	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	0.07	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	EB_DU_6	47° 33´ 03´´ N 122° 20´ 25´´ W	0.2	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_6	47° 33´ 03´´ N 122° 20´ 25´´ W	EB_DU_7	47° 32´ 54´´ N 122° 20´ 21´´ W	0.15	King
PS_ElliottB	SEATTLE	BPB	Arrival		EB_DU_7	47° 32´ 54´´ N 122° 20´ 21´´ W	EB_B_BPB	47° 32´ 49´´ N 122° 20´ 15´´ W	0.11	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_B_BPB	47° 32´ 49´´ N 122° 20´ 15´´ W	EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	0.11	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_7	47° 32´ 54´´ N 122° 20´ 21´´ W	EB_DU_6	47° 33´ 03´´ N 122° 20´ 25´´ W	0.15	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_6	47° 33´ 03´´ N 122° 20´ 25´´ W	EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	0.2	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_5	47° 33´ 14´´ N 122° 20´ 31´´ W	EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	0.07	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_4	47° 33´ 18´´ N 122° 20´ 34´´ W	EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	0.14	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_3	47° 33´ 26´´ N 122° 20´ 38´´ W	EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	0.44	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_2	47° 33´ 52´´ N 122° 20´ 50´´ W	EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	0.26	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_DU_1	47° 34´ 06´´ N 122° 20´ 59´´ W	EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	0.61	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_WC_3	47° 34´ 33´´ N 122° 21´ 35´´ W	EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	0.49	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_WC_2	47° 35´ 02´´ N 122° 21´ 36´´ W	EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	0.84	King
ElliottB_PS	SEATTLE	BPB	Departure		EB_WC_1	47° 35´ 52´´ N 122° 21´ 37´´ W	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	1.54	King

Puget Sound I		Speed by Link (knots)											
OGV-Routing: SI	**Fast**	**Fast**	**Medium**	**Slow**	**Very Slow**								
Lat/Long in WGS8				**Bulkers**									
			Reefer	**Tankers**		**CR-1**	**CR-1**	**CR-1**	**CR-1**	**CR-2**	**CR-2**	**CR-2**	**CR-2**
		Container	**RO/RO**	**Log**		**Speed**	**PL**	**SL**	**BL**	**Speed**	**PL**	**SL**	**BL**
Route	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**	**knots**	**(MW)**	**(MW)**	**(MW)**	**knots**	**(MW)**	**(MW)**	**(MW)**
PS_ElliottB													
ElliottB_PS													
ALL ROUTES IN													
SALMON BAY													
FOSS SHIPYAR													
Route		**Container**	**RO/RO**	**Log**		**Speed**	**PL**	**SL**	**BL**	**Speed**	**PL**	**SL**	**BL**
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	6	0	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	4	0	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	2	0	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	1	0	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	1	0	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	2	0	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	4	0	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	7	0	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0

Puget Sound I

		Speed by Link (knots)											
OGV-Routing: SI	Fast	Fast	Medium	Slow	Very Slow								
Lat/Long in WGS8				Bulkers									
			Reefer	Tankers		CR-1	CR-1	CR-1	CR-1	CR-2	CR-2	CR-2	CR-2
		Container	RO/RO	Log		Speed	PL	SL	BL	Speed	PL	SL	BL
Route	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**	**knots**	**(MW)**	**(MW)**	**(MW)**	**knots**	**(MW)**	**(MW)**	**(MW)**
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0

Puget Sound I

OGV-Routing: SI

Lat/Long in WGS8

Speed by Link (knots)

	Fast	Fast	Medium	Slow	Very Slow								
Route	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**	**CR-1 Speed knots**	**CR-1 PL (MW)**	**CR-1 SL (MW)**	**CR-1 BL (MW)**	**CR-2 Speed knots**	**CR-2 PL (MW)**	**CR-2 SL (MW)**	**CR-2 BL (MW)**
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	4	2	7	0.0	**4**	2.6	10.5	0.0
PS_ElliottB	4	4	4	4	4	3	1	7	0.0	**3**	0.5	10.5	0.0
PS_ElliottB	2	2	2	2	2	2	1	7	0.0	**2**	0.4	10.5	0.0
ElliottB_PS	3	2	2	2	2	3	7	7	0.0	**3**	6.0	10.1	0.0
ElliottB_PS	5	4	4	4	4	5	7	7	0.0	**5**	6.0	10.1	0.0
ElliottB_PS	8	7	7	7	7	8	10	7	0.0	**8**	12.1	10.1	0.0
PS_ElliottB	8	6	6	6	6	4	2	7	0.0	**4**	2.6	10.5	0.0
PS_ElliottB	4	4	4	4	4	3	1	7	0.0	**3**	0.5	10.5	0.0
PS_ElliottB	2	2	2	2	2	2	1	7	0.0	**2**	0.4	10.5	0.0
ElliottB_PS	3	2	2	2	2	3	7	7	0.0	**3**	6.0	10.1	0.0
ElliottB_PS	5	4	4	4	4	5	7	7	0.0	**5**	6.0	10.1	0.0
ElliottB_PS	8	7	7	7	7	8	10	7	0.0	**8**	12.1	10.1	0.0
PS_ElliottB	0	5	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	5	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	0	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	0	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	0	6	6	6	4	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	0	2	2	2	2	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	0	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	0	6	6	6	4	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	0	2	2	2	2	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	0	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	0	6	6	6	4	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	0	2	2	2	2	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	0	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	0	6	6	6	4	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	0	2	2	2	2	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	0	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0

Puget Sound I

Speed by Link (knots)

OGV-Routing: SI	Fast	Fast	Medium	Slow	Very Slow								
Lat/Long in WGS8													
Route	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing	CR-1 Speed knots	CR-1 PL (MW)	CR-1 SL (MW)	CR-1 BL (MW)	CR-2 Speed knots	CR-2 PL (MW)	CR-2 SL (MW)	CR-2 BL (MW)
YACHTS ONLY					Yachts only								
PS_ElliottB	0	0	0	0	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	0	2	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	0	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	0	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	0	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	0	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	4	0	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	0	2	0	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	2	0	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	0	5	0	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	4	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	4	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	4	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	4	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	4	4	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	5	5	5	5	5	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	4.5	4.5	4.5	4.5	4.5	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0

Puget Sound I

Speed by Link (knots)

Lat/Long in WGS8

OGV-Routing: SI	**Fast**	**Fast**	**Medium**	**Slow**	**Very Slow**								
Route	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**	**CR-1 Speed knots**	**CR-1 PL (MW)**	**CR-1 SL (MW)**	**CR-1 BL (MW)**	**CR-2 Speed knots**	**CR-2 PL (MW)**	**CR-2 SL (MW)**	**CR-2 BL (MW)**
ElliottB_PS	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	6	6	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	2	2	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	3	3	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	7	7	7	7	7	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0

Puget Sound I Speed by Link (knots)

Lat/Long in WGS8

OGV-Routing: SI	**Fast**	**Fast**	**Medium**	**Slow**	**Very Slow**								
Route	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**	**CR-1 Speed knots**	**CR-1 PL (MW)**	**CR-1 SL (MW)**	**CR-1 BL (MW)**	**CR-2 Speed knots**	**CR-2 PL (MW)**	**CR-2 SL (MW)**	**CR-2 BL (MW)**
ElliottB_PS	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	6	6	6	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
PS_ElliottB	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	1	1	1	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	2	2	2	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	3	3	3	0	0	0	0.0	**0**	0.0	0.0	0.0
ElliottB_PS	0	0	4	4	4	0	0	0	0.0	**0**	0.0	0.0	0.0

▨ Engines off during departure due to constricted waterway: Duamish River

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to SEA

Lat/Long in WGS84 Datum

											Speed by Link (knots)												
											Fast	Fast	Medium	Slow	Very Slow								
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**	**HAL-1 Speed knots**	**HAL-1 PL (MW)**	**HAL-1 SL (MW)**	**HAL-1 BL (MW)**	**HAL-2 Speed knots**	**HAL-2 PL (MW)**	**HAL-2 SL (MW)**	**HAL-2 BL (MW)**
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	14	12	9	8	6	13.5	13.2	7.0	0.0	13.5	12.1	10.1	0.0
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	18	16	SS	SS	7	17.5	19.2	7.0	0.0	16.5	16.1	9.0	0.0
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	SS	SS	SS	SS	SS	19.5	21.2	7.0	0.0	19.8	22.2	10.1	0.0
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	17	17	16	12	SS	18.0	19.0	7.0	0.0	18.0	19.5	10.1	0.0
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	8	8	8	8	8	10.0	12.0	7.0	0.0	10.0	11.0	10.1	0.0
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	15	14	12	SS	SS	21.0	27.3	7.0	0.0	22.0	29.3	10.1	0.0
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	19	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	SS	SS	SS	SS	SS	22.0	27.3	7.0	0.0	22.7	31.4	10.1	0.0

Total Distance 134.4 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to EVERETT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	0	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	0	16	SS	SS	7
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12a	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	ET_A_1	47° 46´ 40´´ N 122° 25´ 37´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L1	ET_A_1	47° 46´ 40´´ N 122° 25´ 37´´ W	ET_A_2	47° 48´ 14´´ N 122° 25´ 10´´ W	1.6	Snohomish	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L2a	ET_A_2	47° 48´ 14´´ N 122° 25´ 10´´ W	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	4.1	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	2.4	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	2.5	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	1.1	Snohomish	0	14	12	SS	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	2.0	Snohomish	0	10	10	10	8
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	1.3	Snohomish	0	7	6	6	5
								Total Distance	26.1	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: EVERETT to SEATTLE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W		EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	1.7 Snohomish	0	4	4	4	3
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W		EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	2.3 Snohomish	0	10	10	10	5
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W		EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	3.8 Island	0	14	SS	SS	6
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W		EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	2.4 Island	0	17	SS	SS	SS
Everett_PS	Departure	T	N	L5a	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W		ET_D_1	47° 51´ 53´´ N 122° 23´ 38´´ W	0.3 Island	0	19	SS	SS	SS
Everett_Tacoma	Departure	T	N	L1	ET_D_1	47° 51´ 53´´ N 122° 23´ 38´´ W		ET_D_2	47° 46´ 44´´ N 122° 26´ 20´´ W	5.5 Snohomish	0	SS	SS	SS	SS
Everett_Tacoma	Departure	T	N	L2a	ET_D_2	47° 46´ 44´´ N 122° 26´ 20´´ W		PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	0.9 Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W		PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3 Kitsap	0	SS	SS	SS	SS
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W		EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	0.4 Kitsap	0	15	13	9	8
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W		EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	1.5 King	0	14	12	8	7
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W		EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	2.6 King	0	12	11	6	6

Total Distance 27.6 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to VANCOUVER (NB2)

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	14	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	18	16	SS	SS	7
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	17	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	8	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	18	18	12	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	2.5	Jefferson	SS	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AD_D_2	48° 13´ 19´´ N 122° 50´ 53´´ W	2.1	San Juan	18	18	17	16	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13´ 19´´ N 122° 50´ 53´´ W	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	8.1	San Juan	16	16	15	15	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	5.1	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	7.3	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	5.8	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	AD_D_7	48° 40´ 00´´ N 123° 14´ 28´´ W	5.4	San Juan	15	15	15	15	SS

Total Distance 123.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to SEATTLE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
NB2_AI	Arrival	T	N	L1	AD_A_1	48° 40´ 00´´ N 123° 15´ 30´´ W	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	5.2	San Juan	15	16	SS	SS	SS
NB2_AI	Arrival	T	N	L2	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	5.9	San Juan	15	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L3	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	2.4	San Juan	15	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L4	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	3.6	San Juan	15	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L5	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	3.3	San Juan	15	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L6	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	2.9	San Juan	15	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L7	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	8.8	San Juan	15	SS	SS	SS	SS
NB2_AI	Arrival	T	N	L8a	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	0.9	Jefferson	15	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	18	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	16	16	12	SS	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	8	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	18	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	Y	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	SS	SS	SS	SS	SS
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	0.4	Kitsap	18	16	SS	SS	8
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	1.5	King	14	12	10	9	7
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	2.6	King	12	10	6	6	6

Total Distance 119.3 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to NANIAMO (NB2)

Lat/Long in WGS84 Datum

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N	122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N	122° 26´ 27´´ W	2.6	King	14	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N	122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	1.5	King	18	16	SS	SS	7
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	2.3	King	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	4.0	Kitsap	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	0.8	King	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	1.5	Snohomish	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	4.6	Kitsap	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	3.1	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	2.4	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	1.9	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	4.5	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	2.8	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	2.2	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	1.3	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N	122° 46´ 47´´ W	5.3	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N	122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	1.4	Island	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N	122° 52´ 19´´ W	2.4	Jefferson	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N	122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N	123° 06´ 35´´ W	9.5	Calallam	SS	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N	123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N	123° 23´ 03´´ W	11.2	Calallam	17	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N	123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	0.8	Calallam	8	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N	123° 06´ 35´´ W	11.4	Calallam	21	18	15	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N	123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N	122° 52´ 23´´ W	9.5	Calallam	SS	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11´ 11´´ N	122° 52´ 23´´ W	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	2.5	Jefferson	SS	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	AD_D_2	48° 13´ 19´´ N	122° 50´ 53´´ W	2.1	San Juan	18	18	17	16	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13´ 19´´ N	122° 50´ 53´´ W	AD_D_3	48° 19´ 51´´ N	122° 58´ 00´´ W	8.1	San Juan	16	16	15	15	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19´ 51´´ N	122° 58´ 00´´ W	AD_D_4	48° 24´ 17´´ N	123° 01´ 52´´ W	5.1	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24´ 17´´ N	123° 01´ 52´´ W	AD_D_5	48° 29´ 18´´ N	123° 09´ 56´´ W	7.3	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29´ 18´´ N	123° 09´ 56´´ W	AD_D_6	48° 34´ 47´´ N	123° 12´ 43´´ W	5.8	San Juan	15	15	15	15	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34´ 47´´ N	123° 12´ 43´´ W	AD_D_7	48° 40´ 00´´ N	123° 14´ 28´´ W	5.4	San Juan	15	15	15	15	SS

Total Distance 123.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to PORT ANGELES

Lat/Long in WGS84 Datum

													Speed by Link (knots)				
													Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N	122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N	122° 26´ 27´´ W	2.6	King	0	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N	122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	1.5	King	0	16	SS	SS	7
Tacoma_Sea	Departure	T	Y	L10	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	Y	L11	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N	122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N	122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N	122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N	122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N	122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N	123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12´ 45´´ N	123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N	123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10´ 33´´ N	123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N	123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N	123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N	123° 22´ 25´´ W	1.6	Calallam	0	8	8	8	7
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N	123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N	123° 23´ 48´´ W	1.0	Calallam	0	6	6	6	6

Total Distance 68.5 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to EVERETT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPM	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.72	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.85	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.36	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.94	Calallam	0	16	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.49	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.92	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.82	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.62	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	3.97	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.82	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.33	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L1a	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	EV_A_2	47° 53´ 08´´ N 122° 29´ 06´´ W	2.26	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L2	EV_A_2	47° 53´ 08´´ N 122° 29´ 06´´ W	EV_A_3	47° 51´ 05´´ N 122° 26´ 26´´ W	2.72	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L3	EV_A_3	47° 51´ 05´´ N 122° 26´ 26´´ W	EV_A_4	47° 51´ 50´´ N 122° 23´ 43´´ W	1.97	Island	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L4	EV_A_4	47° 51´ 50´´ N 122° 23´ 43´´ W	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	0.62	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	2.42	Snohomish	0	20	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	2.49	Snohomish	0	18	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	1.07	Snohomish	0	14	14	12	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	1.95	Snohomish	0	10	10	10	9
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	1.32	Snohomish	0	7	7	6	6

Total Distance 130.68 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: EVERETT HARBOR

Lat/Long in WGS84 Datum

							Speed by Link (knots)				
							Fast	Fast	Medium	Slow	Very Slow
										Bulkers	
									Reefer	Tankers	
								Container	RO/RO	Log	
Route	**To_Port**	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
PS_Everett	EVERETT	Arrival	L9	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	Snohomish					
Everett_PS	EVERETT	Departure	L1	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	Snohomish					

NOTE: All ARRIVAL harbor transits branch from EV_A_10

NOTE: All DEPARTURE harbor transits goto EV_D_1

Route	To_Port	To_Pier	Arr/Dep	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Everett_1-North	EVERETT	1-NORTH	Arrival	L1a	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	0.40	Snohomish	0	4	4	4	4
Everett_1-North	EVERETT	1-NORTH	Arrival	L2	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	EV_H_2	47° 58´ 54´´ N 122° 13´ 26´´ W	0.23	Snohomish	0	2	2	2	2
Everett_1-North	EVERETT	1-NORTH	Arrival	L3	EV_H_2	47° 58´ 54´´ N 122° 13´ 26´´ W	EV_B_1	47° 58´ 52´´ N 122° 13´ 17´´ W	0.11	Snohomish	0	1	1	1	1
								Total Distance	0.74 nm						
1-North_Everett	EVERETT	1-NORTH	Departure	L3	EV_B_1	47° 58´ 52´´ N 122° 13´ 17´´ W	EV_H_2	47° 58´ 54´´ N 122° 13´ 26´´ W	0.11	Snohomish	0	1	1	1	1
1-North_Everett	EVERETT	1-NORTH	Departure	L2	EV_H_2	47° 58´ 54´´ N 122° 13´ 26´´ W	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	0.23	Snohomish	0	2	2	2	2
1-North_Everett	EVERETT	1-NORTH	Departure	L1a	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	0.40	Snohomish	0	5	5	5	5
								Total Distance	0.74 nm						
Everett_3-South	EVERETT	3-SOUTH	Arrival	L1a	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	0.40	Snohomish	0	4	4	4	4
Everett_3-South	EVERETT	3-SOUTH	Arrival	L2	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	EV_H_3	47° 58´ 52´´ N 122° 13´ 30´´ W	0.17	Snohomish	0	2	2	2	2
Everett_3-South	EVERETT	3-SOUTH	Arrival	L3	EV_H_3	47° 58´ 52´´ N 122° 13´ 30´´ W	EV_B_2	47° 58´ 50´´ N 122° 13´ 17´´ W	0.14	Snohomish	0	1	1	1	1
								Total Distance	0.71 nm						
3-South_Everett	EVERETT	3-SOUTH	Departure	L3	EV_B_2	47° 58´ 50´´ N 122° 13´ 17´´ W	EV_H_3	47° 58´ 52´´ N 122° 13´ 30´´ W	0.14	Snohomish	0	1	1	1	1
3-South_Everett	EVERETT	3-SOUTH	Departure	L2	EV_H_3	47° 58´ 52´´ N 122° 13´ 30´´ W	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	0.17	Snohomish	0	2	2	2	2
3-South_Everett	EVERETT	3-SOUTH	Departure	L1a	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	0.40	Snohomish	0	5	5	5	5
								Total Distance	0.71 nm						
Everett_Hewitt	EVERETT	HEWITT	Arrival	L1a	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	0.40	Snohomish	0	4	4	4	4
Everett_Hewitt	EVERETT	HEWITT	Arrival	L2	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	EV_H_4	47° 58´ 50´´ N 122° 13´ 32´´ W	0.13	Snohomish	0	2	2	2	2
Everett_Hewitt	EVERETT	HEWITT	Arrival	L3	EV_H_4	47° 58´ 50´´ N 122° 13´ 32´´ W	EV_B_3	47° 58´ 45´´ N 122° 13´ 22´´ W	0.13	Snohomish	0	1	1	1	1
								Total Distance	0.66 nm						
Hewitt_Everett	EVERETT	HEWITT	Departure	L3	EV_B_3	47° 58´ 45´´ N 122° 13´ 22´´ W	EV_H_4	47° 58´ 50´´ N 122° 13´ 32´´ W	0.13	Snohomish	0	1	1	1	1
Hewitt_Everett	EVERETT	HEWITT	Departure	L2	EV_H_4	47° 58´ 50´´ N 122° 13´ 32´´ W	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	0.13	Snohomish	0	2	2	2	2
Hewitt_Everett	EVERETT	HEWITT	Departure	L1a	EV_H_1	47° 58´ 44´´ N 122° 13´ 39´´ W	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	0.40	Snohomish	0	5	5	5	5
								Total Distance	0.66 nm						
PortAngeles_Tesoro	EVERETT	PACIFIC TERMINAL	Arrival	L1a	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_B_4	48° 58´ 40´´ N 122° 13´ 25´´ W	0.56	Snohomish	0	2	2	2	2
Tesoro_PortAngeles	EVERETT	PACIFIC TERMINAL	Departure	L1a	EV_B_4	48° 58´ 40´´ N 122° 13´ 25´´ W	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	0.56	Snohomish	0	3	3	3	3
PortAngeles_Tesoro	EVERETT	SOUTH TERMINAL	Arrival	L1a	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_B_5	47° 58´ 28´´ N 122° 13´ 45´´ W	0.39	Snohomish	0	2	2	2	2
Tesoro_PortAngeles	EVERETT	SOUTH TERMINAL	Departure	L1a	EV_B_5	47° 58´ 28´´ N 122° 13´ 45´´ W	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	0.39	Snohomish	0	3	3	3	3
PortAngeles_Tesoro	EVERETT	ANCHORAGE	Arrival	L1a	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_B_6	47° 58´ 54´´ N 122° 14´ 37´´ W	0.34	Snohomish	0	2	2	2	2
Tesoro_PortAngeles	EVERETT	ANCHORAGE	Departure	L1a	EV_B_6	47° 58´ 54´´ N 122° 14´ 37´´ W	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	0.34	Snohomish	0	3	3	3	3

Puget Sound Emissions Inventory

OGV-Routing: EVERETT to SEA

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	1.7	Snohomish	0	4	4	4	4
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	2.3	Snohomish	0	10	10	10	9
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	3.8	Island	0	16	14	SS	SS
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	2.4	Island	0	20	17	SS	SS
Everett_PS	Departure	T	N	L5	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	EV_D_6	47° 51´ 21´´ N 122° 26´ 29´´ W	2.2	Island	0	SS	SS	SS	SS
Everett_PS	Departure	T	N	L6a	EV_D_6	47° 51´ 21´´ N 122° 26´ 29´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	4.6	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	SS	SS	SS	SS
								Total Distance	131.0 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: EVERETT to VANCOUVER (NB2)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	1.7	Snohomish	0	4	4	4	4
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	2.3	Snohomish	0	10	10	10	9
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	3.8	Island	0	16	14	SS	SS
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	2.4	Island	0	20	17	SS	SS
Everett_PS	Departure	T	N	L5	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	EV_D_6	47° 51´ 21´´ N 122° 26´ 29´´ W	2.2	Island	0	SS	SS	SS	SS
Everett_PS	Departure	T	N	L6a	EV_D_6	47° 51´ 21´´ N 122° 26´ 29´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	4.6	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	15	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	2.5	Jefferson	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AD_D_2	48° 13´ 19´´ N 122° 50´ 53´´ W	2.1	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13´ 19´´ N 122° 50´ 53´´ W	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	8.1	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	5.1	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	7.3	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	5.8	San Juan	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	AD_D_7	48° 40´ 00´´ N 123° 14´ 28´´ W	5.4	San Juan	0	18	16	11	SS

Total Distance 119.8 nm

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to EVERETT

Lat/Long in WGS84 Datum

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
NBndry_AI	Arrival	T	N	L1	AD_A_1	48° 40´ 00´´ N 123° 15´ 30´´ W	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	5.2	San Juan	0	18	16	SS	SS
NBndry_AI	Arrival	T	N	L2	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	5.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L3	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	2.4	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L4	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	3.6	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L5	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	3.3	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L6	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	2.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L7	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	8.8	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L8a	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	0.9	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	16	12	SS	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L1a	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	EV_A_2	47° 53´ 08´´ N 122° 29´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L2	EV_A_2	47° 53´ 08´´ N 122° 29´ 06´´ W	EV_A_3	47° 51´ 05´´ N 122° 26´ 26´´ W	2.7	Kitsap	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L3	EV_A_3	47° 51´ 05´´ N 122° 26´ 26´´ W	EV_A_4	47° 51´ 50´´ N 122° 23´ 43´´ W	2.0	Island	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L4	EV_A_4	47° 51´ 50´´ N 122° 23´ 43´´ W	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	0.6	Snohomisl	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	2.4	Snohomisl	0	19	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	2.5	Snohomisl	0	18	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	1.1	Snohomisl	0	14	14	12	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	2.0	Snohomisl	0	10	10	10	10
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	1.3	Snohomisl	0	7	7	6	6

Total Distance 115.7 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to TACOMA

Lat/Long in WGS84 Datum

Route	Arr/Dep	Mode	NPM	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	Speed by Link (knots) Fast Container Auto	Speed by Link (knots) Medium Reefer RO/RO Fishing	Speed by Link (knots) Slow Bulkers Tankers Log Fishing	Speed by Link (knots) Very Slow Fishing
ElliottBay_Tacoma	Departure	X	Y	L1	E_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_S1	47° 36´ 19´´ N 122° 25´ 41´´ W	1.7	King	0	14	12	10	9
ElliottBay_Tacoma	Departure	X	Y	L2	EB_D_S1	47° 36´ 19´´ N 122° 25´ 41´´ W	EB_D_S2	47° 35´ 06´´ N 122° 26´ 57´´ W	1.5	King	0	18	16	SS	SS
ElliottBay_Tacoma	Departure	X	Y	L3a	EB_D_S2	47° 35´ 06´´ N 122° 26´ 57´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	0.7	Kitsap	0	20	SS	SS	SS
Sea_Tacoma	Arrival	T	Y	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	T	N	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	10	10	10	8
								Total Distance	22.9	nm					

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to SEATTLE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	Y	L7a	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	2.2	King	0	17	16	SS	SS
Tacoma_ElliottBay	Arrival	X	Y	L1	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	1.3	King	0	15	13	10	9
								Total Distance	22.6	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.6	Calallam	0	10	10	10	9
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	6	6	6	6
								Total Distance	88.8	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to TACOMA

Lat/Long in WGS84 Datum

												Speed by Link (knots)			
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	6	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	8	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	10	10	10	9
Sea_Tacoma	Arrival	X	Y	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	18	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	10	10	10	8
								Total Distance	87.7 nm						

Note: SS - Service Speed

Note: Red numbers - engines off

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to EVERETT

Lat/Long in WGS84 Datum

													Speed by Link (knots)		
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12a	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	ET_A_1	47° 46´ 40´´ N 122° 25´ 37´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L1	ET_A_1	47° 46´ 40´´ N 122° 25´ 37´´ W	ET_A_2	47° 48´ 14´´ N 122° 25´ 10´´ W	1.6	Snohomish	0	SS	SS	SS	SS
Tacoma_Everett	Departure	T	N	L2a	ET_A_2	47° 48´ 14´´ N 122° 25´ 10´´ W	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	4.1	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	2.4	Snohomish	0	19	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	2.5	Snohomish	0	18	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	1.1	Snohomish	0	14	14	12	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	2.0	Snohomish	0	10	10	10	9
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	1.3	Snohomish	0	7	7	6	6
								Total Distance	46.5	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: EVERETT to TACOMA

Lat/Long in WGS84 Datum

Speed by Link (knots)

Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Fast** **Cruise**	**Fast** **Container Auto**	**Medium** **Reefer RO/RO Fishing**	**Slow** **Bulkers Tankers Log Fishing**	**Very Slow** **Fishing**
Everett_PS	Departure	M	Y	L1	EV_D_1	47° 58´ 40´´ N 122° 14´ 15´´ W	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	1.7	Snohomish	0	4	4	4	4
Everett_PS	Departure	M	Y	L2	EV_D_2	47° 58´ 51´´ N 122° 16´ 44´´ W	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	2.3	Snohomish	0	10	10	10	9
Everett_PS	Departure	X	Y	L3	EV_D_3	47° 57´ 44´´ N 122° 19´ 42´´ W	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	3.8	Island	0	16	14	SS	SS
Everett_PS	Departure	X	Y	L4	EV_D_4	47° 54´ 11´´ N 122° 21´ 32´´ W	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	2.4	Island	0	20	17	SS	SS
Everett_PS	Departure	T	N	L5a	EV_D_5	47° 52´ 10´´ N 122° 23´ 30´´ W	ET_D_1	47° 51´ 53´´ N 122° 23´ 38´´ W	0.3	Island	0	SS	SS	SS	SS
Everett_Tacoma	Departure	T	N	L1	ET_D_1	47° 51´ 53´´ N 122° 23´ 38´´ W	ET_D_2	47° 46´ 44´´ N 122° 26´ 20´´ W	5.5	Snohomish	0	SS	SS	SS	SS
Everett_Tacoma	Departure	T	N	L2a	ET_D_2	47° 46´ 44´´ N 122° 26´ 20´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	0.9	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	18	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	10	10	10	8

Total Distance 47.3 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to TACOMA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPM**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	16	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	18	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	10	10	10	8

Total Distance 154.0 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

Route	To_Port	To_Pier	Arr/Dep Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
Sea_Tacoma	SEATTLE		Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	Mode:	M		King					
Tacoma_Sea	SEATTLE		Departure	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	NPE:	Y		King					

Route	To_Port	To_Pier	Arr/Dep Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Sea_Tacoma	TACOMA	4-A	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	4-A	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	4-A	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_B_4A	47° 16´ 23´´ N 122° 24´ 21´´ W	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A	Departure	TA_B_4A	47° 16´ 23´´ N 122° 24´ 21´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	4-A	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	4-A&B	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	4-A&B	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	4-A&B	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_B_4AB	47° 16´ 25´´ N 122° 24´ 28´´ W	0.29	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A&B	Departure	TA_B_4AB	47° 16´ 25´´ N 122° 24´ 28´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.29	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-A&B	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	4-A&B	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	4-B	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	4-B	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	4-B	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_B_4B	47° 16´ 29´´ N 122° 24´ 36´´ W	0.20	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-B	Departure	TA_B_4B	47° 16´ 29´´ N 122° 24´ 36´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.20	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	4-B	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	4-B	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	BLAIR-A	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	BLAIR-A	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	BLAIR-A	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	BLAIR-A	Arrival	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.40	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	BLAIR-A	Arrival	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_B_BLA	47° 15´ 34´´ N 122° 23´ 02´´ W	0.16	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-A	Departure	TA_B_BLA	47° 15´ 34´´ N 122° 23´ 02´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.16	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-A	Departure	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.40	Pierce	0	3	3	3	3
Tacoma_Sea	TACOMA	BLAIR-A	Departure	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-A	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-A	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	BLAIR-B	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	BLAIR-B	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	BLAIR-B	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	BLAIR-B	Arrival	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.40	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	BLAIR-B	Arrival	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	0.28	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	BLAIR-B	Arrival	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	TA_B_BLB	47° 15´ 20´´ N 122° 22´ 55´´ W	0.18	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-B	Departure	TA_B_BLB	47° 15´ 20´´ N 122° 22´ 55´´ W	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	0.18	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	BLAIR-B	Departure	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.28	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	BLAIR-B	Departure	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.40	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-B	Departure	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-B	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	BLAIR-B	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	WA UNITED 1	Arrival	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_B_WU1	47° 15´ 41´´ N 122° 23´ 14´´ W	0.38	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_B_WU1	47° 15´ 41´´ N 122° 23´ 14´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.38	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 1	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	WA UNITED 2	Arrival	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_B_WU2	47° 15´ 49´´ N 122° 23´ 26´´ W	0.19	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_B_WU2	47° 15´ 49´´ N 122° 23´ 26´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.19	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WA UNITED 2	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	PCT-A	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.40	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	0.28	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	PCT-A	Arrival	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	TA_B_PCTA	47° 15´ 17´´ N 122° 22´ 47´´ W	0.23	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_B_PCTA	47° 15´ 17´´ N 122° 22´ 47´´ W	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	0.23	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.28	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.40	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-A	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	PCT-B	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	PCT-B	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4

Puget Sound Emissions Inventory

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**To_Port**	**To_Pier**	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	TACOMA	PCT-B	Arrival		TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-B	Arrival		TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.40	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	PCT-B	Arrival		TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	0.28	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	PCT-B	Arrival		TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	TA_B_PCTB	47° 15´ 23´´ N 122° 22´ 32´´ W	0.26	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-B	Departure		TA_B_PCTB	47° 15´ 23´´ N 122° 22´ 32´´ W	TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	0.26	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	PCT-B	Departure		TA_BW_5	47° 15´ 30´´ N 122° 22´ 51´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.28	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	PCT-B	Departure		TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.40	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-B	Departure		TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-B	Departure		TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	PCT-B	Departure		TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival		PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival		TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival		TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	1.03	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival		TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.40	Pierce	0	2	2	2	2
Sea_Tacoma	TACOMA	WEYCO CHIP	Arrival		TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_B_WYCF	47° 15´ 43´´ N 122° 23´ 06´´ W	0.04	Pierce	0	1	1	1	1

Puget Sound Emissions Inventory

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

										Speed by Link (knots)				
										Fast	Fast	Medium	Slow	Very Slow
Route	To_Port	To_Pier	Arr/Dep Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_B_WYCF	47° 15´ 43´´ N 122° 23´ 06´´ W	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	0.04	Pierce	0	1	1	1	1
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_4	47° 15´ 42´´ N 122° 23´ 09´´ W	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	0.40	Pierce	0	3	3	3	3
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_3	47° 15´ 58´´ N 122° 23´ 35´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	1.03	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	WEYCO CHIP	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	TOTE	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	TOTE	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	3	3	3	3
Sea_Tacoma	TACOMA	TOTE	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_B_TO	47° 16´ 24´´ N 122° 24´ 12´´ W	0.45	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	TOTE	Departure	TA_B_TO	47° 16´ 24´´ N 122° 24´ 12´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.45	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	TOTE	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	TOTE	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	ANCHORAGE	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_AN_1	47° 17´ 25´´ N 122° 25´ 40´´ W	1.54	Pierce	0	3	3	3	3
Tacoma_Sea	TACOMA	ANCHORAGE	Departure	TA_AN_1	47° 17´ 25´´ N 122° 25´ 40´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.54	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-A	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-A	Arrival	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-A	Arrival	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	TA_B_7A	47° 16´ 02´´ N 122° 24´ 49´´ W	0.42	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-A	Departure	TA_B_7A	47° 16´ 02´´ N 122° 24´ 49´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.42	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-A	Departure	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-A	Departure	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	7-B	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-B	Arrival	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-B	Arrival	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	TA_B_7B	47° 16´ 07´´ N 122° 24´ 54´´ W	0.32	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-B	Departure	TA_B_7B	47° 16´ 07´´ N 122° 24´ 54´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.32	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-B	Departure	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-B	Departure	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	7-C	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-C	Arrival	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-C	Arrival	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	TA_B_7C	47° 16´ 12´´ N 122° 25´ 00´´ W	0.22	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-C	Departure	TA_B_7C	47° 16´ 12´´ N 122° 25´ 00´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.22	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-C	Departure	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-C	Departure	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	7-D	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	7-D	Arrival	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	7-D	Arrival	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	TA_B_7D	47° 16´ 16´´ N 122° 25´ 05´´ W	0.13	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-D	Departure	TA_B_7D	47° 16´ 16´´ N 122° 25´ 05´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.13	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	7-D	Departure	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	7-D	Departure	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	MAERSK	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	1.69	Pierce	0	5	5	5	5
Sea_Tacoma	TACOMA	MAERSK	Arrival	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.74	Pierce	0	4	4	4	4
Sea_Tacoma	TACOMA	MAERSK	Arrival	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	TA_B_MK	47° 16´ 02´´ N 122° 24´ 56´´ W	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	MAERSK	Departure	TA_B_MK	47° 16´ 02´´ N 122° 24´ 56´´ W	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	0.37	Pierce	0	2	2	2	2
Tacoma_Sea	TACOMA	MAERSK	Departure	TA_SI_1	47° 16´ 20´´ N 122° 25´ 16´´ W	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	0.74	Pierce	0	4	4	4	4
Tacoma_Sea	TACOMA	MAERSK	Departure	PS_A_24	47° 16´ 53´´ N 122° 25´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.69	Pierce	0	9	9	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.44	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	0.45	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	WEYCO LOG 1	Arrival	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	TA_B_WYL1	47° 15´ 47´´ N 122° 21´ 51´´ W	0.11	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_B_WYL1	47° 15´ 47´´ N 122° 21´ 51´´ W	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	0.11	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.45	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.44	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	WEYCO LOG 1	Departure	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.44	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	0.45	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	WEYCO LOG 2	Arrival	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	TA_B_WYL2	47° 15´ 51´´ N 122° 21´ 57´´ W	0.03	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_B_WYL2	47° 15´ 51´´ N 122° 21´ 57´´ W	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	0.03	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.45	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.44	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	WEYCO LOG 2	Departure	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.09	Pierce	0	0	9	6	6

Puget Sound Emissions Inventory

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

										Speed by Link (knots)				
										Fast	Fast	Medium	Slow	Very Slow
Route	**To_Port**	**To_Pier**	**Arr/Dep Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.44	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	SCHNITZER	Arrival	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_B_SHZ	47° 16´ 02´´ N 122° 22´ 09´´ W	0.23	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_B_SHZ	47° 16´ 02´´ N 122° 22´ 09´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.23	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.44	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	0.30	Pierce	0	0	4	4	4
Tacoma_Sea	TACOMA	SCHNITZER	Departure	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	PIONEER	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	2.09	Pierce	0	0	5	5	5
Sea_Tacoma	TACOMA	PIONEER	Arrival	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.30	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PIONEER	Arrival	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_B_PI	47° 16´ 58´´ N 122° 24´ 26´´ W	0.13	Pierce	0	0	1	1	1

Puget Sound Emissions Inventory

OGV-Routing: TACOMA HARBOR

Lat/Long in WGS84 Datum

										Speed by Link (knots)				
										Fast	Fast	Medium	Slow	Very Slow
Route	**To_Port**	**To_Pier**	**Arr/Dep Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Tacoma_Sea	TACOMA	PIONEER	Departure	TA_B_PI	47° 16´ 58´´ N 122° 24´ 26´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.13	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	PIONEER	Departure	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	0.30	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PIONEER	Departure	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	PNW	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	2.09	Pierce	0	0	6	6	6
Sea_Tacoma	TACOMA	PNW	Arrival	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.30	Pierce	0	0	4	4	4
Sea_Tacoma	TACOMA	PNW	Arrival	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.46	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PNW	Arrival	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.83	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PNW	Arrival	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.44	Pierce	0	0	3	3	3
Sea_Tacoma	TACOMA	PNW	Arrival	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	0.45	Pierce	0	0	2	2	2
Sea_Tacoma	TACOMA	PNW	Arrival	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	TA_B_PNW	47° 15´ 50´´ N 122° 21´ 38´´ W	0.21	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	PNW	Departure	TA_B_PNW	47° 15´ 50´´ N 122° 21´ 38´´ W	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	0.21	Pierce	0	0	1	1	1
Tacoma_Sea	TACOMA	PNW	Departure	TA_HY_6	47° 15´ 52´´ N 122° 21´ 57´´ W	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	0.45	Pierce	0	0	2	2	2
Tacoma_Sea	TACOMA	PNW	Departure	TA_HY_5	47° 16´ 10´´ N 122° 22´ 26´´ W	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	0.44	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PNW	Departure	TA_HY_4	47° 16´ 28´´ N 122° 22´ 54´´ W	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	0.83	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PNW	Departure	TA_HY_3	47° 16´ 46´´ N 122° 24´ 02´´ W	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	0.46	Pierce	0	0	3	3	3
Tacoma_Sea	TACOMA	PNW	Departure	TA_HY_2	47° 17´ 04´´ N 122° 24´ 33´´ W	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	0.30	Pierce	0	0	5	5	5
Tacoma_Sea	TACOMA	PNW	Departure	TA_HY_1	47° 17´ 16´´ N 122° 24´ 53´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.09	Pierce	0	0	9	6	6
Sea_Tacoma	TACOMA	US OIL	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	0	0	5	0
Sea_Tacoma	TACOMA	US OIL	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Arrival	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	TA_B_USO	47° 16´ 00´´ N 122° 23´ 49´´ W	0.20	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	US OIL	Departure	TA_B_USO	47° 16´ 00´´ N 122° 23´ 49´´ W	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	0.20	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	US OIL	Departure	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	US OIL	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	0	0	6	0
Sea_Tacoma	TACOMA	TEMCO	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_TC_1	47° 16´ 07´´ N 122° 26´ 40´´ W	2.12	Pierce	0	0	0	5	0
Sea_Tacoma	TACOMA	TEMCO	Arrival	TA_TC_1	47° 16´ 07´´ N 122° 26´ 40´´ W	TA_B_TEM	47° 15´ 59´´ N 122° 26´ 34´´ W	0.15	Pierce	0	0	0	2	0
Tacoma_Sea	TACOMA	TEMCO	Departure	TA_B_TEM	47° 15´ 59´´ N 122° 26´ 34´´ W	TA_TC_1	47° 16´ 07´´ N 122° 26´ 40´´ W	0.15	Pierce	0	0	0	2	0
Tacoma_Sea	TACOMA	TEMCO	Departure	TA_TC_1	47° 16´ 07´´ N 122° 26´ 40´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.12	Pierce	0	0	0	6	0
Sea_Tacoma	TACOMA	SPERRY	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_SP_1	47° 16´ 36´´ N 122° 27´ 26´´ W	1.54	Pierce	0	6	6	5	0
Sea_Tacoma	TACOMA	SPERRY	Arrival	TA_SP_1	47° 16´ 36´´ N 122° 27´ 26´´ W	TA_B_SPR	47° 16´ 26´´ N 122° 27´ 21´´ W	0.16	Pierce	0	2	2	2	0
Tacoma_Sea	TACOMA	SPERRY	Departure	TA_B_SPR	47° 16´ 26´´ N 122° 27´ 21´´ W	TA_SP_1	47° 16´ 36´´ N 122° 27´ 26´´ W	0.16	Pierce	0	2	2	2	0
Tacoma_Sea	TACOMA	SPERRY	Departure	TA_SP_1	47° 16´ 36´´ N 122° 27´ 26´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	1.53	Pierce	0	9	9	6	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	2.24	Pierce	0	0	0	5	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Arrival	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	TA_B_3S	47° 16´ 07´´ N 122° 23´ 46´´ W	0.13	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure	TA_B_3S	47° 16´ 07´´ N 122° 23´ 46´´ W	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	0.13	Pierce	0	0	0	1	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure	TA_UO_1	47° 16´ 11´´ N 122° 23´ 56´´ W	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	0.72	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure	TA_BW_2	47° 16´ 40´´ N 122° 24´ 43´´ W	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	0.25	Pierce	0	0	0	3	0
Sea_Tacoma	TACOMA	3-SOUTH	Departure	TA_BW_1	47° 16´ 50´´ N 122° 24´ 59´´ W	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	2.24	Pierce	0	0	0	6	0

🟧 Engines off in constricted channels:
Hylebos, Blair, & Sitcum Waterways
Ships pulled out by tugs

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to SEA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPM**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	SS	SS	SS	SS
								Total Distance	154.8	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to TACOMA

Lat/Long in WGS84 Datum

												Speed by Link (knots)			
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPM	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
NBndry_AI	Arrival	T	N	L1	AD_A_1	48° 40´ 00´´ N 123° 15´ 30´´ W	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	5.2	San Juan	0	18	16	SS	SS
NBndry_AI	Arrival	T	N	L2	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	5.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L3	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	2.4	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L4	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	3.6	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L5	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	3.3	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L6	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	2.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L7	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	8.8	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L8	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	0.9	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	16	12	SS	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	18	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	X	N	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	10	10	10	8

Total Distance 139.1 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to VANCOUVER (NB2)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
														Bulkers	
													Reefer	**Tankers**	
												Container	**RO/RO**	**Log**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
Tacoma_Sea	Departure	X	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	10	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	12	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	16	14	SS	SS
Tacoma_Sea	Departure	T	N	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	17	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	20	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	15	SS	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8a	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	2.5	Jefferson	0	SS	SS	SS	SS
AI_NB2	Departure	T	N	L1a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AD_D_2	48° 13´ 19´´ N 122° 50´ 53´´ W	2.1	San Juan	0	18	17	16	SS
AI_NB2	Departure	T	N	L2	AD_D_2	48° 13´ 19´´ N 122° 50´ 53´´ W	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	8.1	San Juan	0	16	15	15	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	5.1	San Juan	0	15	15	15	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	7.3	San Juan	0	15	15	15	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	5.8	San Juan	0	15	15	15	SS
AI_NB2	Departure	T	N	L6	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	AD_D_7	48° 40´ 00´´ N 123° 14´ 28´´ W	5.4	San Juan	0	15	15	15	SS
								Total Distance	143.6	nm					

Puget Sound Emissions Inventory

OGV-Routing: SEA to Point Wells

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	0	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L14a	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PW_A_1	47° 49´ 18´´ N 122° 27´ 45´´ W	6.2	Kitsap	0	0	12	9	SS
PS_PointWells	Arrival	M	Y	L1	PW_A_1	47° 49´ 18´´ N 122° 27´ 45´´ W	PW_A_2	47° 48´ 25´´ N 122° 26´ 21´´ W	1.3	Kitsap	0	0	8	6	6
PS_PointWells	Arrival	M	Y	L2	PW_A_2	47° 48´ 25´´ N 122° 26´ 21´´ W	PW_B_1	47° 46´ 52´´ N 122° 23´ 54´´ W	2.3	Snohomish	0	0	4	2	2
								Total Distance	123.6	nm					

Puget Sound Emissions Inventory

OGV-Routing: POINT WELLS to SEA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
PointWells_PS	Departure	M	Y	L1a	PW_B_1	47° 46´ 52´´ N 122° 23´ 54´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	2.1	Snohomish	0	0	9	6	5
Tacoma_Sea	Departure	X	Y	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	12	8	SS
Tacoma_Sea	Departure	X	Y	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	14	10	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	T	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	T	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS
								Total Distance	123.9	nm					

Puget Sound Emissions Inventory

OGV-Routing: POINT WELLS to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
PointWells_PS	Departure	M	Y	L1a	PW_B_1	47° 46´ 52´´ N 122° 23´ 54´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	2.1	Snohomish	0	0	9	6	5
Tacoma_Sea	Departure	X	Y	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	12	8	SS
Tacoma_Sea	Departure	X	Y	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	14	10	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19		48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20		48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	0	6	6	6
								Total Distance	58.0	nm					

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to POINT WELLS

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	0	10	10	9
Sea_Tacoma	Arrival	X	Y	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	0	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L14a	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PW_A_1	47° 49´ 18´´ N 122° 27´ 45´´ W	6.2	Kitsap	0	0	12	9	SS
PS_PointWells	Arrival	M	Y	L1	PW_A_1	47° 49´ 18´´ N 122° 27´ 45´´ W	PW_A_2	47° 48´ 25´´ N 122° 26´ 21´´ W	1.3	Kitsap	0	0	8	6	6
PS_PointWells	Arrival	M	Y	L2	PW_A_2	47° 48´ 25´´ N 122° 26´ 21´´ W	PW_B_1	47° 46´ 52´´ N 122° 23´ 54´´ W	2.3	Snohomisl	0	0	4	2	2

Total Distance 57.3 nm

Puget Sound Emissions Inventory

OGV-Routing: POINT WELLS to MARCH POINT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PointWells_PS	Departure	M	Y	L1a	PW_B_1	47° 46´ 52´´ N 122° 23´ 54´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	2.1	Snohomish	0	0	9	6	5
Tacoma_Sea	Departure	X	Y	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	12	8	SS
Tacoma_Sea	Departure	X	Y	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	14	10	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacorte	Arrival	T	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacorte	Arrival	T	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacorte	Arrival	T	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	11	11	SS
RS_MarchPT	Arrival	T	Y	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	11	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	11	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	10	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	11	9	6

Total Distance 57.6 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to POINT WELLS

Lat/Long in WGS84 Datum

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	10	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	13	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	T	N	L4a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	16	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L14a	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PW_A_1	47° 49´ 18´´ N 122° 27´ 45´´ W	6.2	Kitsap	0	0	12	9	SS
PS_PointWells	Arrival	M	N	L1	PW_A_1	47° 49´ 18´´ N 122° 27´ 45´´ W	PW_A_2	47° 48´ 25´´ N 122° 26´ 21´´ W	1.3	Kitsap	0	0	8	6	6
PS_PointWells	Arrival	M	N	L2	PW_A_2	47° 48´ 25´´ N 122° 26´ 21´´ W	PW_B_1	47° 46´ 52´´ N 122° 23´ 54´´ W	2.3	Snohomisl	0	0	4	2	2
								Total Distance	56.8 nm						

Puget Sound Emissions Inventory

OGV-Routing: SEA to OLYMPIA

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	16	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Clallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	20	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	18	17	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	VW_A_1	47° 33´ 05´´ N 122° 27´ 36´´ W	1.5	Kitsap	0	14	13	13	SS
Vash_Olympia	Arrival	T	N	L1	VW_A_1	47° 33´ 05´´ N 122° 27´ 36´´ W	VW_A_2	47° 31´ 17´´ N 122° 28´ 45´´ W	2.0	Kitsap	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L2	VW_A_2	47° 31´ 17´´ N 122° 28´ 45´´ W	VW_A_3	47° 30´ 38´´ N 122° 29´ 10´´ W	0.7	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L3	VW_A_3	47° 30´ 38´´ N 122° 29´ 10´´ W	VW_A_4	47° 28´ 56´´ N 122° 30´ 17´´ W	1.9	Kitsap	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L4	VW_A_4	47° 28´ 56´´ N 122° 30´ 17´´ W	VW_A_5	47° 27´ 35´´ N 122° 31´ 09´´ W	1.5	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L5	VW_A_5	47° 27´ 35´´ N 122° 31´ 09´´ W	VW_A_6	47° 25´ 48´´ N 122° 31´ 25´´ W	1.8	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L6	VW_A_6	47° 25´ 48´´ N 122° 31´ 25´´ W	VW_A_7	47° 24´ 32´´ N 122° 32´ 02´´ W	1.3	Kitsap	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L7	VW_A_7	47° 24´ 32´´ N 122° 32´ 02´´ W	VW_A_8	47° 23´ 43´´ N 122° 32´ 19´´ W	0.8	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L8	VW_A_8	47° 23´ 43´´ N 122° 32´ 19´´ W	VW_A_9	47° 23´ 00´´ N 122° 31´ 53´´ W	0.8	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L9	VW_A_9	47° 23´ 00´´ N 122° 31´ 53´´ W	VW_A_10	47° 22´ 29´´ N 122° 31´ 39´´ W	0.5	Pierce	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L10	VW_A_10	47° 22´ 29´´ N 122° 31´ 39´´ W	VW_A_11	47° 20´ 58´´ N 122° 32´ 29´´ W	1.6	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L11a	VW_A_11	47° 22´ 31´´ N 122° 31´ 42´´ W	OL_A_4	47° 19´ 36´´ N 122° 33´ 14´´ W	3.1	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L4	OL_A_4	47° 19´ 36´´ N 122° 33´ 14´´ W	OL_A_5	47° 18´ 34´´ N 122° 33´ 08´´ W	1.0	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L5	OL_A_5	47° 18´ 34´´ N 122° 33´ 08´´ W	OL_A_6	47° 17´ 23´´ N 122° 32´ 18´´ W	1.3	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L6	OL_A_6	47° 17´ 23´´ N 122° 32´ 18´´ W	OL_A_7	47° 16´ 51´´ N 122° 32´ 24´´ W	0.5	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L7	OL_A_7	47° 16´ 51´´ N 122° 32´ 24´´ W	OL_A_8	47° 14´ 52´´ N 122° 34´ 15´´ W	2.4	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L8	OL_A_8	47° 14´ 52´´ N 122° 34´ 15´´ W	OL_A_9	47° 11´ 45´´ N 122° 36´ 09´´ W	3.4	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L9	OL_A_9	47° 11´ 45´´ N 122° 36´ 09´´ W	OL_A_10	47° 10´ 52´´ N 122° 37´ 42´´ W	1.4	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L10	OL_A_10	47° 10´ 52´´ N 122° 37´ 42´´ W	OL_A_11	47° 07´ 47´´ N 122° 41´ 01´´ W	3.8	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L11	OL_A_11	47° 07´ 47´´ N 122° 41´ 01´´ W	OL_A_12	47° 07´ 07´´ N 122° 41´ 59´´ W	0.9	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L12	OL_A_12	47° 07´ 07´´ N 122° 41´ 59´´ W	OL_A_13	47° 07´ 23´´ N 122° 43´ 33´´ W	1.1	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L13	OL_A_13	47° 07´ 23´´ N 122° 43´ 33´´ W	OL_A_14	47° 07´ 34´´ N 122° 44´ 36´´ W	0.7	Thurston	0	13	13	13	9
PS_Olympia	Arrival	T	N	L14	OL_A_14	47° 07´ 34´´ N 122° 44´ 36´´ W	OL_A_15	47° 08´ 37´´ N 122° 45´ 45´´ W	1.3	Thurston	0	13	13	13	9
PS_Olympia	Arrival	T	N	L15	OL_A_15	47° 08´ 37´´ N 122° 45´ 45´´ W	OL_A_16	47° 09´ 16´´ N 122° 46´ 29´´ W	0.8	Thurston	0	13	13	13	9
PS_Olympia	Arrival	T	N	L16	OL_A_16	47° 09´ 16´´ N 122° 46´ 29´´ W	OL_A_17	47° 10´ 10´´ N 122° 47´ 23´´ W	1.1	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L17	OL_A_17	47° 10´ 10´´ N 122° 47´ 23´´ W	OL_A_18	47° 10´ 53´´ N 122° 48´ 17´´ W	0.9	Thurston	0	13	13	13	9
PS_Olympia	Arrival	T	N	L18	OL_A_18	47° 10´ 53´´ N 122° 48´ 17´´ W	OL_A_19	47° 11´ 21´´ N 122° 49´ 12´´ W	0.8	Thurston	0	13	13	13	9
PS_Olympia	Arrival	M	Y	L19	OL_A_19	47° 11´ 21´´ N 122° 49´ 12´´ W	OL_A_20	47° 10´ 53´´ N 122° 50´ 18´´ W	0.9	Thurston	0	9	9	9	9
PS_Olympia	Arrival	M	Y	L20	OL_A_20	47° 10´ 53´´ N 122° 50´ 18´´ W	OL_A_21	47° 10´ 24´´ N 122° 51´ 03´´ W	0.7	Thurston	0	9	9	9	9
PS_Olympia	Arrival	M	Y	L21	OL_A_21	47° 10´ 24´´ N 122° 51´ 03´´ W	OL_A_22	47° 09´ 35´´ N 122° 52´ 35´´ W	1.3	Mason	0	9	9	9	9
PS_Olympia	Arrival	M	Y	L22	OL_A_22	47° 09´ 35´´ N 122° 52´ 35´´ W	OL_A_23	47° 09´ 25´´ N 122° 53´ 15´´ W	0.5	Mason	0	9	9	9	9
PS_Olympia	Arrival	M	Y	L23	OL_A_23	47° 09´ 25´´ N 122° 53´ 15´´ W	OL_A_24	47° 08´ 44´´ N 122° 54´ 40´´ W	1.2	Thurston	0	8	8	8	8
PS_Olympia	Arrival	M	Y	L24	OL_A_24	47° 08´ 44´´ N 122° 54´ 40´´ W	OL_A_25	47° 06´ 33´´ N 122° 54´ 30´´ W	2.2	Thurston	0	7	7	7	7
PS_Olympia	Arrival	M	Y	L25	OL_A_25	47° 06´ 33´´ N 122° 54´ 30´´ W	OL_A_26	47° 05´ 13´´ N 122° 55´ 42´´ W	1.6	Thurston	0	6	6	6	6
PS_Olympia	Arrival	M	Y	L26	OL_A_26	47° 05´ 13´´ N 122° 55´ 42´´ W	OL_A_27	47° 04´ 20´´ N 122° 54´ 52´´ W	1.1	Thurston	0	4	4	4	4
PS_Olympia	Arrival	M	Y	L27	OL_A_27	47° 04´ 20´´ N 122° 54´ 52´´ W	OL_A_28	47° 04´ 04´´ N 122° 54´ 37´´ W	0.3	Thurston	0	4	4	4	4
PS_Olympia	Arrival	M	Y	L28	OL_A_28	47° 04´ 04´´ N 122° 54´ 37´´ W	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	0.2	Thurston	0	4	4	4	4
								Total Distance	183.9	nm					

Puget Sound Emissions Inventory

OGV-Routing: OLYMPIA HARBOR

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**To_Port**	**To_Pier**	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PS_Olympia	OLYMPIA		Arrival		OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	Mode:	M		Thurston					
Olympia_PS	OLYMPIA		Departure		OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	NPE:	Y		Thurston					
NOTE: All ARRIVAL harbor transits branch from OL_A_29															
NOTE: All DEPARTURE harbor transits goto OL_D_1															
Olympia_PortDock1	OLYMPIA	PORT DOCK 1	Arrival	L1a	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_B_1	47° 03´ 22´´ N 122° 54´ 23´´ W	0.49	Thurston	0	2	2	2	2
Olympia_PortDock1	OLYMPIA	PORT DOCK 1	Departure	L1a	OL_B_1	47° 03´ 22´´ N 122° 54´ 23´´ W	OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	0.49	Thurston	0	2	2	2	2
Olympia_PortDock2	OLYMPIA	PORT DOCK 2	Arrival	L1a	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_B_2	47° 03´ 16´´ N 122° 54´ 22´´ W	0.60	Thurston	0	2	2	2	2
Olympia_PortDock2	OLYMPIA	PORT DOCK 2	Departure	L1a	OL_B_2	47° 03´ 16´´ N 122° 54´ 22´´ W	OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	0.60	Thurston	0	3	3	3	3
Olympia_PortDock3	OLYMPIA	PORT DOCK 3	Arrival	L1a	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_B_3	47° 03´ 10´´ N 122° 54´ 21´´ W	0.71	Thurston	0	2	2	2	2
Olympia_PortDock3	OLYMPIA	PORT DOCK 3	Departure	L1a	OL_B_3	47° 03´ 10´´ N 122° 54´ 21´´ W	OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	0.71	Thurston	0	3	3	3	3
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Arrival	L1a	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_B_4	47° 05´ 07´´ N 122° 55´ 12´´ W	1.35	Thurston	0	3	3	3	3
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Arrival	L2	OL_B_4	47° 05´ 07´´ N 122° 55´ 12´´ W	OL_AN_1	47° 06´ 19´´ N 122° 54´ 33´´ W	2.62	Thurston	0	3	3	3	2
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Departure	L2	OL_AN_1	47° 06´ 19´´ N 122° 54´ 33´´ W	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	2.62	Thurston	0	3	3	3	3
Olympia_Anchorage	OLYMPIA	ANCHORAGE	Departure	L1a	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_B_4	47° 05´ 07´´ N 122° 55´ 12´´ W	1.35	Thurston	0	3	3	3	2

Puget Sound Emissions Inventory

OGV-Routing: OLYMPIA to SEA

Lat/Long in WGS84 Datum

Puget Sound Emissions Inventory

Speed by Link (knots)

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Fast	Fast	Medium	Slow	Very Slow
											Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Olympia_PS	Departure	M	Y	L1	OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_D_2	47° 04´ 04´´ N 122° 54´ 37´´ W	0.2	Thurston	0	4	4	4	4
Olympia_PS	Departure	M	Y	L2	OL_D_2	47° 04´ 04´´ N 122° 54´ 37´´ W	OL_D_3	47° 04´ 20´´ N 122° 54´ 52´´ W	0.3	Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L3	OL_D_3	47° 04´ 20´´ N 122° 54´ 52´´ W	OL_D_4	47° 05´ 13´´ N 122° 55´ 42´´ W	1.1	Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L4	OL_D_4	47° 05´ 13´´ N 122° 55´ 42´´ W	OL_D_5	47° 06´ 33´´ N 122° 54´ 30´´ W	1.57	Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L5	OL_D_5	47° 06´ 33´´ N 122° 54´ 30´´ W	OL_D_6	47° 08´ 44´´ N 122° 54´ 40´´ W	2.19	Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L6	OL_D_6	47° 08´ 44´´ N 122° 54´ 40´´ W	OL_D_7	47° 09´ 25´´ N 122° 53´ 15´´ W	1.18	Thurston	0	9	9	9	9
Olympia_PS	Departure	M	Y	L7	OL_D_7	47° 09´ 25´´ N 122° 53´ 15´´ W	OL_D_8	47° 09´ 35´´ N 122° 52´ 35´´ W	0.5	Mason	0	9	9	9	9
Olympia_PS	Departure	M	Y	L8	OL_D_8	47° 09´ 35´´ N 122° 52´ 35´´ W	OL_D_9	47° 10´ 24´´ N 122° 51´ 03´´ W	1.3	Mason	0	9	9	9	9
Olympia_PS	Departure	M	Y	L9	OL_D_9	47° 10´ 24´´ N 122° 51´ 03´´ W	OL_D_10	47° 10´ 53´´ N 122° 50´ 18´´ W	0.7	Thurston	0	9	9	9	9
Olympia_PS	Departure	M	Y	L10	OL_D_10	47° 10´ 53´´ N 122° 50´ 18´´ W	OL_D_11	47° 11´ 21´´ N 122° 49´ 12´´ W	0.9	Thurston	0	13	13	13	9
Olympia_PS	Departure	T	N	L11	OL_D_11	47° 11´ 21´´ N 122° 49´ 12´´ W	OL_D_12	47° 10´ 53´´ N 122° 48´ 17´´ W	0.8	Thurston	0	13	13	13	9
Olympia_PS	Departure	T	N	L12	OL_D_12	47° 10´ 53´´ N 122° 48´ 17´´ W	OL_D_13	47° 10´ 10´´ N 122° 47´ 23´´ W	0.9	Thurston	0	13	13	13	9
Olympia_PS	Departure	T	N	L13	OL_D_13	47° 10´ 10´´ N 122° 47´ 23´´ W	OL_D_14	47° 09´ 16´´ N 122° 46´ 29´´ W	1.1	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L14	OL_D_14	47° 09´ 16´´ N 122° 46´ 29´´ W	OL_D_15	47° 08´ 37´´ N 122° 45´ 45´´ W	0.8	Thurston	0	13	13	13	9
Olympia_PS	Departure	T	N	L15	OL_D_15	47° 08´ 37´´ N 122° 45´ 45´´ W	OL_D_16	47° 07´ 34´´ N 122° 44´ 36´´ W	1.3	Thurston	0	13	13	13	9
Olympia_PS	Departure	T	N	L16	OL_D_16	47° 07´ 34´´ N 122° 44´ 36´´ W	OL_D_17	47° 07´ 23´´ N 122° 43´ 33´´ W	0.7	Thurston	0	13	13	13	9
Olympia_PS	Departure	T	N	L17	OL_D_17	47° 07´ 23´´ N 122° 43´ 33´´ W	OL_D_18	47° 07´ 07´´ N 122° 41´ 59´´ W	1.1	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L18	OL_D_18	47° 07´ 07´´ N 122° 41´ 59´´ W	OL_D_19	47° 07´ 47´´ N 122° 41´ 01´´ W	0.9	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L19	OL_D_19	47° 07´ 47´´ N 122° 41´ 01´´ W	OL_D_20	47° 10´ 52´´ N 122° 37´ 42´´ W	3.8	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L20	OL_D_20	47° 10´ 52´´ N 122° 37´ 42´´ W	OL_D_21	47° 11´ 45´´ N 122° 36´ 09´´ W	1.4	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L21	OL_D_21	47° 11´ 45´´ N 122° 36´ 09´´ W	OL_D_22	47° 14´ 52´´ N 122° 34´ 15´´ W	3.4	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L22	OL_D_22	47° 14´ 52´´ N 122° 34´ 15´´ W	OL_D_23	47° 16´ 51´´ N 122° 32´ 24´´ W	2.4	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L23	OL_D_23	47° 16´ 51´´ N 122° 32´ 24´´ W	OL_D_24	47° 17´ 23´´ N 122° 32´ 18´´ W	0.5	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L24	OL_D_24	47° 17´ 23´´ N 122° 32´ 18´´ W	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	1.3	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	1.0	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L26a	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	VW_D_1	47° 20´ 58´´ N 122° 32´ 29´´ W	1.4	Pierce	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L1	VW_D_1	47° 20´ 58´´ N 122° 32´ 29´´ W	VW_D_2	47° 22´ 29´´ N 122° 31´ 39´´ W	1.6	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L2	VW_D_2	47° 22´ 29´´ N 122° 31´ 39´´ W	VW_D_3	47° 23´ 00´´ N 122° 31´ 53´´ W	0.5	Pierce	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L3	VW_D_3	47° 23´ 00´´ N 122° 31´ 53´´ W	VW_D_4	47° 23´ 43´´ N 122° 32´ 19´´ W	0.8	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L4	VW_D_4	47° 23´ 43´´ N 122° 32´ 19´´ W	VW_D_5	47° 24´ 32´´ N 122° 32´ 02´´ W	0.8	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L5	VW_D_5	47° 24´ 32´´ N 122° 32´ 02´´ W	VW_D_6	47° 25´ 48´´ N 122° 31´ 25´´ W	1.3	Kitsap	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L6	VW_D_6	47° 25´ 48´´ N 122° 31´ 25´´ W	VW_D_7	47° 27´ 35´´ N 122° 31´ 09´´ W	1.8	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L7	VW_D_7	47° 27´ 35´´ N 122° 31´ 09´´ W	VW_D_8	47° 28´ 56´´ N 122° 30´ 17´´ W	1.5	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L8	VW_D_8	47° 28´ 56´´ N 122° 30´ 17´´ W	VW_D_9	47° 30´ 38´´ N 122° 29´ 10´´ W	1.9	Kitsap	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L9	VW_D_9	47° 30´ 38´´ N 122° 29´ 10´´ W	VW_D_10	47° 31´ 17´´ N 122° 28´ 45´´ W	0.7	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L10	VW_D_10	47° 31´ 17´´ N 122° 28´ 45´´ W	VW_D_11	47° 33´ 05´´ N 122° 27´ 36´´ W	2.0	Kitsap	0	13	13	13	9
Tacoma_Sea	Departure	X	N	L11a	VW_D_11	47° 33´ 05´´ N 122° 27´ 36´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	1.5	King	0	13	13	13	9
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	18	17	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	20	19	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	SS	SS	SS	SS
								Total Distance	182.8	nm					

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to OLYMPIA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NBndry_AI	Arrival	T	N	L1	AD_A_1	48° 40´ 00´´ N 123° 15´ 30´´ W	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	5.2	San Juan	0	18	16	SS	SS
NBndry_AI	Arrival	T	N	L2	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	5.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L3	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	2.4	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L4	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	3.6	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L5	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	3.3	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L6	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	2.9	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L7	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	8.8	San Juan	0	SS	SS	SS	SS
NBndry_AI	Arrival	T	N	L8a	AD_A_8	48° 12´ 48´´ N 122° 51´ 54´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	0.9	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	16	12	SS	SS
Tacoma_Sea	Departure	M	N	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.8	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	20	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	18	17	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	VW_A_1	47° 33´ 05´´ N 122° 27´ 36´´ W	1.5	Kitsap	0	14	13	13	SS
Vash_Olympia	Arrival	T	N	L1	VW_A_1	47° 33´ 05´´ N 122° 27´ 36´´ W	VW_A_2	47° 31´ 17´´ N 122° 28´ 45´´ W	2.0	Kitsap	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L2	VW_A_2	47° 31´ 17´´ N 122° 28´ 45´´ W	VW_A_3	47° 30´ 38´´ N 122° 29´ 10´´ W	0.7	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L3	VW_A_3	47° 30´ 38´´ N 122° 29´ 10´´ W	VW_A_4	47° 28´ 56´´ N 122° 30´ 17´´ W	1.9	Kitsap	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L4	VW_A_4	47° 28´ 56´´ N 122° 30´ 17´´ W	VW_A_5	47° 27´ 35´´ N 122° 31´ 09´´ W	1.5	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L5	VW_A_5	47° 27´ 35´´ N 122° 31´ 09´´ W	VW_A_6	47° 25´ 48´´ N 122° 31´ 25´´ W	1.8	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L6	VW_A_6	47° 25´ 48´´ N 122° 31´ 25´´ W	VW_A_7	47° 24´ 32´´ N 122° 32´ 02´´ W	1.3	Kitsap	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L7	VW_A_7	47° 24´ 32´´ N 122° 32´ 02´´ W	VW_A_8	47° 23´ 43´´ N 122° 32´ 19´´ W	0.8	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L8	VW_A_8	47° 23´ 43´´ N 122° 32´ 19´´ W	VW_A_9	47° 23´ 00´´ N 122° 31´ 53´´ W	0.8	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L9	VW_A_9	47° 23´ 00´´ N 122° 31´ 53´´ W	VW_A_10	47° 22´ 29´´ N 122° 31´ 39´´ W	0.5	Pierce	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L10	VW_A_10	47° 22´ 29´´ N 122° 31´ 39´´ W	VW_A_11	47° 20´ 58´´ N 122° 32´ 29´´ W	1.6	King	0	13	13	13	9
Vash_Olympia	Arrival	T	N	L11a	VW_A_11	47° 22´ 31´´ N 122° 31´ 42´´ W	OL_A_4	47° 19´ 36´´ N 122° 33´ 14´´ W	3.1	Pierce	0	13	13	13	9
PS_Olympia	Arrival	T	N	L4	OL_A_4	47° 19´ 36´´ N 122° 33´ 14´´ W	OL_A_5	47° 18´ 34´´ N 122° 33´ 08´´ W	1.0	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L5	OL_A_5	47° 18´ 34´´ N 122° 33´ 08´´ W	OL_A_6	47° 17´ 23´´ N 122° 32´ 18´´ W	1.3	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L6	OL_A_6	47° 17´ 23´´ N 122° 32´ 18´´ W	OL_A_7	47° 16´ 51´´ N 122° 32´ 24´´ W	0.5	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L7	OL_A_7	47° 16´ 51´´ N 122° 32´ 24´´ W	OL_A_8	47° 14´ 52´´ N 122° 34´ 15´´ W	2.4	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L8	OL_A_8	47° 14´ 52´´ N 122° 34´ 15´´ W	OL_A_9	47° 11´ 45´´ N 122° 36´ 09´´ W	3.4	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L9	OL_A_9	47° 11´ 45´´ N 122° 36´ 09´´ W	OL_A_10	47° 10´ 52´´ N 122° 37´ 42´´ W	1.4	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L10	OL_A_10	47° 10´ 52´´ N 122° 37´ 42´´ W	OL_A_11	47° 07´ 47´´ N 122° 41´ 01´´ W	3.8	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L11	OL_A_11	47° 07´ 47´´ N 122° 41´ 01´´ W	OL_A_12	47° 07´ 07´´ N 122° 41´ 59´´ W	0.9	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L12	OL_A_12	47° 07´ 07´´ N 122° 41´ 59´´ W	OL_A_13	47° 07´ 23´´ N 122° 43´ 33´´ W	1.1	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L13	OL_A_13	47° 07´ 23´´ N 122° 43´ 33´´ W	OL_A_14	47° 07´ 34´´ N 122° 44´ 36´´ W	0.7	Thurston	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L14	OL_A_14	47° 07´ 34´´ N 122° 44´ 36´´ W	OL_A_15	47° 08´ 37´´ N 122° 45´ 45´´ W	1.3	Thurston	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L15	OL_A_15	47° 08´ 37´´ N 122° 45´ 45´´ W	OL_A_16	47° 09´ 16´´ N 122° 46´ 29´´ W	0.8	Thurston	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L16	OL_A_16	47° 09´ 16´´ N 122° 46´ 29´´ W	OL_A_17	47° 10´ 10´´ N 122° 47´ 23´´ W	1.1	Pierce	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L17	OL_A_17	47° 10´ 10´´ N 122° 47´ 23´´ W	OL_A_18	47° 10´ 53´´ N 122° 48´ 17´´ W	0.9	Thurston	0	13	13	13	SS
PS_Olympia	Arrival	T	N	L18	OL_A_18	47° 10´ 53´´ N 122° 48´ 17´´ W	OL_A_19	47° 11´ 21´´ N 122° 49´ 12´´ W	0.8	Thurston	0	13	13	13	SS
PS_Olympia	Arrival	M	Y	L19	OL_A_19	47° 11´ 21´´ N 122° 49´ 12´´ W	OL_A_20	47° 10´ 53´´ N 122° 50´ 18´´ W	0.9	Thurston	0	9	9	9	8
PS_Olympia	Arrival	M	Y	L20	OL_A_20	47° 10´ 53´´ N 122° 50´ 18´´ W	OL_A_21	47° 10´ 24´´ N 122° 51´ 03´´ W	0.7	Thurston	0	9	9	9	8
PS_Olympia	Arrival	M	Y	L21	OL_A_21	47° 10´ 24´´ N 122° 51´ 03´´ W	OL_A_22	47° 09´ 35´´ N 122° 52´ 35´´ W	1.3	Mason	0	9	9	9	8
PS_Olympia	Arrival	M	Y	L22	OL_A_22	47° 09´ 35´´ N 122° 52´ 35´´ W	OL_A_23	47° 09´ 25´´ N 122° 53´ 15´´ W	0.5	Mason	0	9	9	9	8
PS_Olympia	Arrival	M	Y	L23	OL_A_23	47° 09´ 25´´ N 122° 53´ 15´´ W	OL_A_24	47° 08´ 44´´ N 122° 54´ 40´´ W	1.2	Thurston	0	8	8	8	8
PS_Olympia	Arrival	M	Y	L24	OL_A_24	47° 08´ 44´´ N 122° 54´ 40´´ W	OL_A_25	47° 06´ 33´´ N 122° 54´ 30´´ W	2.2	Thurston	0	7	7	7	7
PS_Olympia	Arrival	M	Y	L25	OL_A_25	47° 06´ 33´´ N 122° 54´ 30´´ W	OL_A_26	47° 05´ 13´´ N 122° 55´ 42´´ W	1.6	Thurston	0	6	6	6	6
PS_Olympia	Arrival	M	Y	L26	OL_A_26	47° 05´ 13´´ N 122° 55´ 42´´ W	OL_A_27	47° 04´ 20´´ N 122° 54´ 52´´ W	1.1	Thurston	0	4	4	4	4
PS_Olympia	Arrival	M	Y	L27	OL_A_27	47° 04´ 20´´ N 122° 54´ 52´´ W	OL_A_28	47° 04´ 04´´ N 122° 54´ 37´´ W	0.3	Thurston	0	4	4	4	4
PS_Olympia	Arrival	M	Y	L28	OL_A_28	47° 04´ 04´´ N 122° 54´ 37´´ W	OL_A_29	47° 03´ 51´´ N 122° 54´ 29´´ W	0.2	Thurston	0	4	4	4	4

Total Distance 169.0 nm

Puget Sound Emissions Inventory

OGV-Routing: OLYMPIA to SEATTLE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Olympia_PS	Departure	M	Y	L1	OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_D_2	47° 04´ 04´´ N 122° 54´ 37´´ W	0.2	Thurston	0	4	4	4	4
Olympia_PS	Departure	M	Y	L2	OL_D_2	47° 04´ 04´´ N 122° 54´ 37´´ W	OL_D_3	47° 04´ 20´´ N 122° 54´ 52´´ W	0.3	Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L3	OL_D_3	47° 04´ 20´´ N 122° 54´ 52´´ W	OL_D_4	47° 05´ 13´´ N 122° 55´ 42´´ W	1.1	Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L4	OL_D_4	47° 05´ 13´´ N 122° 55´ 42´´ W	OL_D_5	47° 06´ 33´´ N 122° 54´ 30´´ W	1.57	Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L5	OL_D_5	47° 06´ 33´´ N 122° 54´ 30´´ W	OL_D_6	47° 08´ 44´´ N 122° 54´ 40´´ W	2.19	Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L6	OL_D_6	47° 08´ 44´´ N 122° 54´ 40´´ W	OL_D_7	47° 09´ 25´´ N 122° 53´ 15´´ W	1.18	Thurston	0	9	9	9	9
Olympia_PS	Departure	M	Y	L7	OL_D_7	47° 09´ 25´´ N 122° 53´ 15´´ W	OL_D_8	47° 09´ 35´´ N 122° 52´ 35´´ W	0.5	Mason	0	9	9	9	9
Olympia_PS	Departure	M	Y	L8	OL_D_8	47° 09´ 35´´ N 122° 52´ 35´´ W	OL_D_9	47° 10´ 24´´ N 122° 51´ 03´´ W	1.3	Mason	0	9	9	9	8
Olympia_PS	Departure	M	Y	L9	OL_D_9	47° 10´ 24´´ N 122° 51´ 03´´ W	OL_D_10	47° 10´ 53´´ N 122° 50´ 18´´ W	0.7	Thurston	0	9	9	9	8
Olympia_PS	Departure	M	Y	L10	OL_D_10	47° 10´ 53´´ N 122° 50´ 18´´ W	OL_D_11	47° 11´ 21´´ N 122° 49´ 12´´ W	0.9	Thurston	0	9	9	9	8
Olympia_PS	Departure	T	N	L11	OL_D_11	47° 11´ 21´´ N 122° 49´ 12´´ W	OL_D_12	47° 10´ 53´´ N 122° 48´ 17´´ W	0.8	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L12	OL_D_12	47° 10´ 53´´ N 122° 48´ 17´´ W	OL_D_13	47° 10´ 10´´ N 122° 47´ 23´´ W	0.9	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L13	OL_D_13	47° 10´ 10´´ N 122° 47´ 23´´ W	OL_D_14	47° 09´ 16´´ N 122° 46´ 29´´ W	1.1	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L14	OL_D_14	47° 09´ 16´´ N 122° 46´ 29´´ W	OL_D_15	47° 08´ 37´´ N 122° 45´ 45´´ W	0.8	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L15	OL_D_15	47° 08´ 37´´ N 122° 45´ 45´´ W	OL_D_16	47° 07´ 34´´ N 122° 44´ 36´´ W	1.3	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L16	OL_D_16	47° 07´ 34´´ N 122° 44´ 36´´ W	OL_D_17	47° 07´ 23´´ N 122° 43´ 33´´ W	0.7	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L17	OL_D_17	47° 07´ 23´´ N 122° 43´ 33´´ W	OL_D_18	47° 07´ 07´´ N 122° 41´ 59´´ W	1.1	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L18	OL_D_18	47° 07´ 07´´ N 122° 41´ 59´´ W	OL_D_19	47° 07´ 47´´ N 122° 41´ 01´´ W	0.9	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L19	OL_D_19	47° 07´ 47´´ N 122° 41´ 01´´ W	OL_D_20	47° 10´ 52´´ N 122° 37´ 42´´ W	3.8	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L20	OL_D_20	47° 10´ 52´´ N 122° 37´ 42´´ W	OL_D_21	47° 11´ 45´´ N 122° 36´ 09´´ W	1.4	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L21	OL_D_21	47° 11´ 45´´ N 122° 36´ 09´´ W	OL_D_22	47° 14´ 52´´ N 122° 34´ 15´´ W	3.4	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L22	OL_D_22	47° 14´ 52´´ N 122° 34´ 15´´ W	OL_D_23	47° 16´ 51´´ N 122° 32´ 24´´ W	2.4	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L23	OL_D_23	47° 16´ 51´´ N 122° 32´ 24´´ W	OL_D_24	47° 17´ 23´´ N 122° 32´ 18´´ W	0.5	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L24	OL_D_24	47° 17´ 23´´ N 122° 32´ 18´´ W	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	1.3	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	1.0	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L26a	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	VW_D_1	47° 20´ 58´´ N 122° 32´ 29´´ W	1.4	Pierce	0	13	13	13	9
Olympia_Vash	Departure	T	N	L1	VW_D_1	47° 20´ 58´´ N 122° 32´ 29´´ W	VW_D_2	47° 22´ 29´´ N 122° 31´ 39´´ W	1.6	King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L2	VW_D_2	47° 22´ 29´´ N 122° 31´ 39´´ W	VW_D_3	47° 23´ 00´´ N 122° 31´ 53´´ W	0.5	Pierce	0	13	13	13	9
Olympia_Vash	Departure	T	N	L3	VW_D_3	47° 23´ 00´´ N 122° 31´ 53´´ W	VW_D_4	47° 23´ 43´´ N 122° 32´ 19´´ W	0.8	King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L4	VW_D_4	47° 23´ 43´´ N 122° 32´ 19´´ W	VW_D_5	47° 24´ 32´´ N 122° 32´ 02´´ W	0.8	King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L5	VW_D_5	47° 24´ 32´´ N 122° 32´ 02´´ W	VW_D_6	47° 25´ 48´´ N 122° 31´ 25´´ W	1.3	Kitsap	0	13	13	13	9
Olympia_Vash	Departure	T	N	L6	VW_D_6	47° 25´ 48´´ N 122° 31´ 25´´ W	VW_D_7	47° 27´ 35´´ N 122° 31´ 09´´ W	1.8	King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L7	VW_D_7	47° 27´ 35´´ N 122° 31´ 09´´ W	VW_D_8	47° 28´ 56´´ N 122° 30´ 17´´ W	1.5	King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L8	VW_D_8	47° 28´ 56´´ N 122° 30´ 17´´ W	VW_D_9	47° 30´ 38´´ N 122° 29´ 10´´ W	1.9	Kitsap	0	13	13	13	9
Olympia_Vash	Departure	T	N	L9	VW_D_9	47° 30´ 38´´ N 122° 29´ 10´´ W	VW_D_10	47° 31´ 17´´ N 122° 28´ 45´´ W	0.7	King	0	13	13	13	9
Olympia_Vash	Departure	T	N	L10	VW_D_10	47° 31´ 17´´ N 122° 28´ 45´´ W	VW_D_11	47° 33´ 05´´ N 122° 27´ 36´´ W	2.0	Kitsap	0	13	13	13	9
Tacoma_Sea	Departure	X	N	L11a	VW_D_11	47° 33´ 05´´ N 122° 27´ 36´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	1.5	King	0	13	13	13	9
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	20	17	SS	SS
Tacoma_Sea	Departure	T	Y	L7a	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	2.2	King	0	20	17	SS	SS
Tacoma_Elliot	Arrival	X	Y	L1	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	1.3	King	0	15	13	10	10

Total Distance 58.5 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: OLYMPIA to EVERETT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Olympia_PS	Departure	M	Y	L1	OL_D_1	47° 03´ 51´´ N 122° 54´ 29´´ W	OL_D_2	47° 04´ 04´´ N 122° 54´ 37´´ W	0.2	Thurston	0	4	4	4	4
Olympia_PS	Departure	M	Y	L2	OL_D_2	47° 04´ 04´´ N 122° 54´ 37´´ W	OL_D_3	47° 04´ 20´´ N 122° 54´ 52´´ W	0.3	Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L3	OL_D_3	47° 04´ 20´´ N 122° 54´ 52´´ W	OL_D_4	47° 05´ 13´´ N 122° 55´ 42´´ W	1.1	Thurston	0	5	5	5	5
Olympia_PS	Departure	M	Y	L4	OL_D_4	47° 05´ 13´´ N 122° 55´ 42´´ W	OL_D_5	47° 06´ 33´´ N 122° 54´ 30´´ W	1.57	Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L5	OL_D_5	47° 06´ 33´´ N 122° 54´ 30´´ W	OL_D_6	47° 08´ 44´´ N 122° 54´ 40´´ W	2.19	Thurston	0	7	7	7	7
Olympia_PS	Departure	M	Y	L6	OL_D_6	47° 08´ 44´´ N 122° 54´ 40´´ W	OL_D_7	47° 09´ 25´´ N 122° 53´ 15´´ W	1.18	Thurston	0	9	9	9	9
Olympia_PS	Departure	M	Y	L7	OL_D_7	47° 09´ 25´´ N 122° 53´ 15´´ W	OL_D_8	47° 09´ 35´´ N 122° 52´ 35´´ W	0.5	Mason	0	9	9	9	9
Olympia_PS	Departure	M	Y	L8	OL_D_8	47° 09´ 35´´ N 122° 52´ 35´´ W	OL_D_9	47° 10´ 24´´ N 122° 51´ 03´´ W	1.3	Mason	0	9	9	9	8
Olympia_PS	Departure	M	Y	L9	OL_D_9	47° 10´ 24´´ N 122° 51´ 03´´ W	OL_D_10	47° 10´ 53´´ N 122° 50´ 18´´ W	0.7	Thurston	0	9	9	9	8
Olympia_PS	Departure	M	Y	L10	OL_D_10	47° 10´ 53´´ N 122° 50´ 18´´ W	OL_D_11	47° 11´ 21´´ N 122° 49´ 12´´ W	0.9	Thurston	0	9	9	9	8
Olympia_PS	Departure	T	N	L11	OL_D_11	47° 11´ 21´´ N 122° 49´ 12´´ W	OL_D_12	47° 10´ 53´´ N 122° 48´ 17´´ W	0.8	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L12	OL_D_12	47° 10´ 53´´ N 122° 48´ 17´´ W	OL_D_13	47° 10´ 10´´ N 122° 47´ 23´´ W	0.9	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L13	OL_D_13	47° 10´ 10´´ N 122° 47´ 23´´ W	OL_D_14	47° 09´ 16´´ N 122° 46´ 29´´ W	1.1	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L14	OL_D_14	47° 09´ 16´´ N 122° 46´ 29´´ W	OL_D_15	47° 08´ 37´´ N 122° 45´ 45´´ W	0.8	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L15	OL_D_15	47° 08´ 37´´ N 122° 45´ 45´´ W	OL_D_16	47° 07´ 34´´ N 122° 44´ 36´´ W	1.3	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L16	OL_D_16	47° 07´ 34´´ N 122° 44´ 36´´ W	OL_D_17	47° 07´ 23´´ N 122° 43´ 33´´ W	0.7	Thurston	0	13	13	13	SS
Olympia_PS	Departure	T	N	L17	OL_D_17	47° 07´ 23´´ N 122° 43´ 33´´ W	OL_D_18	47° 07´ 07´´ N 122° 41´ 59´´ W	1.1	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L18	OL_D_18	47° 07´ 07´´ N 122° 41´ 59´´ W	OL_D_19	47° 07´ 47´´ N 122° 41´ 01´´ W	0.9	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L19	OL_D_19	47° 07´ 47´´ N 122° 41´ 01´´ W	OL_D_20	47° 10´ 52´´ N 122° 37´ 42´´ W	3.8	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L20	OL_D_20	47° 10´ 52´´ N 122° 37´ 42´´ W	OL_D_21	47° 11´ 45´´ N 122° 36´ 09´´ W	1.4	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L21	OL_D_21	47° 11´ 45´´ N 122° 36´ 09´´ W	OL_D_22	47° 14´ 52´´ N 122° 34´ 15´´ W	3.4	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L22	OL_D_22	47° 14´ 52´´ N 122° 34´ 15´´ W	OL_D_23	47° 16´ 51´´ N 122° 32´ 24´´ W	2.4	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L23	OL_D_23	47° 16´ 51´´ N 122° 32´ 24´´ W	OL_D_24	47° 17´ 23´´ N 122° 32´ 18´´ W	0.5	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L24	OL_D_24	47° 17´ 23´´ N 122° 32´ 18´´ W	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	1.3	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	1.0	Pierce	0	13	13	13	SS
Olympia_PS	Departure	T	N	L25	OL_D_25	47° 18´ 34´´ N 122° 33´ 08´´ W	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	1.0	Pierce	0	13	13	13	9
Olympia_PS	Departure	T	N	L26a	OL_D_26	47° 19´ 36´´ N 122° 33´ 14´´ W	VW_D_1	47° 20´ 58´´ N 122° 32´ 29´´ W	1.4	Pierce	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L1	VW_D_1	47° 20´ 58´´ N 122° 32´ 29´´ W	VW_D_2	47° 22´ 29´´ N 122° 31´ 39´´ W	1.6	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L2	VW_D_2	47° 22´ 29´´ N 122° 31´ 39´´ W	VW_D_3	47° 23´ 00´´ N 122° 31´ 53´´ W	0.5	Pierce	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L3	VW_D_3	47° 23´ 00´´ N 122° 31´ 53´´ W	VW_D_4	47° 23´ 43´´ N 122° 32´ 19´´ W	0.8	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L4	VW_D_4	47° 23´ 43´´ N 122° 32´ 19´´ W	VW_D_5	47° 24´ 32´´ N 122° 32´ 02´´ W	0.8	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L5	VW_D_5	47° 24´ 32´´ N 122° 32´ 02´´ W	VW_D_6	47° 25´ 48´´ N 122° 31´ 25´´ W	1.3	Kitsap	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L6	VW_D_6	47° 25´ 48´´ N 122° 31´ 25´´ W	VW_D_7	47° 27´ 35´´ N 122° 31´ 09´´ W	1.8	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L7	VW_D_7	47° 27´ 35´´ N 122° 31´ 09´´ W	VW_D_8	47° 28´ 56´´ N 122° 30´ 17´´ W	1.5	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L8	VW_D_8	47° 28´ 56´´ N 122° 30´ 17´´ W	VW_D_9	47° 30´ 38´´ N 122° 29´ 10´´ W	1.9	Kitsap	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L9	VW_D_9	47° 30´ 38´´ N 122° 29´ 10´´ W	VW_D_10	47° 31´ 17´´ N 122° 28´ 45´´ W	0.7	King	0	13	13	13	9
Olympia_Vasl	Departure	T	N	L10	VW_D_10	47° 31´ 17´´ N 122° 28´ 45´´ W	VW_D_11	47° 33´ 05´´ N 122° 27´ 36´´ W	2.0	Kitsap	0	13	13	13	9
Tacoma_Sea	Departure	X	N	L11a	VW_D_11	47° 33´ 05´´ N 122° 27´ 36´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	1.5	King	0	13	13	13	9
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	16	15	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	18	17	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	20	19	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	22	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12a	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	ET_A_1	47° 46´ 40´´ N 122° 25´ 37´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Ever	Departure	T	N	L1	ET_A_1	47° 46´ 40´´ N 122° 25´ 37´´ W	ET_A_2	47° 48´ 14´´ N 122° 25´ 10´´ W	1.6	Snohomish	0	SS	SS	SS	SS
Tacoma_Ever	Departure	T	N	L2a	ET_A_2	47° 48´ 14´´ N 122° 25´ 10´´ W	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	4.1	Snohomish	0	SS	SS	SS	SS
PS_Everett	Arrival	T	N	L5	EV_A_5	47° 52´ 03´´ N 122° 22´ 51´´ W	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	2.4	Snohomish	0	19	SS	SS	SS
PS_Everett	Arrival	X	Y	L6	EV_A_6	47° 54´ 06´´ N 122° 20´ 54´´ W	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	2.5	Snohomish	0	18	SS	SS	SS
PS_Everett	Arrival	X	Y	L7	EV_A_7	47° 56´ 25´´ N 122° 19´ 35´´ W	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	1.1	Snohomish	0	14	14	12	SS
PS_Everett	Arrival	M	Y	L8	EV_A_8	47° 57´ 28´´ N 122° 19´ 10´´ W	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	2.0	Snohomish	0	10	10	10	10
PS_Everett	Arrival	M	Y	L9	EV_A_9	47° 58´ 31´´ N 122° 16´ 42´´ W	EV_A_10	47° 58´ 40´´ N 122° 14´ 15´´ W	1.3	Snohomish	0	7	7	6	6

Total Distance 75.5 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	16	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L1a	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PT_A_1	48° 08´ 40´´ N 122° 43´ 55´´ W	3.6	Jefferson	0	16	14	10	SS
SJ_PortTownsend	Arrival	X	N	L2	PT_A_1	48° 08´ 40´´ N 122° 43´ 55´´ W	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	1.7	Jefferson	0	10	8	6	6
								Total Distance	98.6	nm					

Puget Sound Emissions Inventory

OGV-Routing: PORT TOWNSEND/INDIAN ISLAND HARBOR

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**To_Port**	**To_Pier**	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
SJ_PortTownsend	PORT TOWNSEND		Arrival	L2	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	Mode:	M							
PortTownsend_SJ	PORT TOWNSEND		Departure	L1	PT_D_1	48° 07´ 00´´ N 122° 44´ 13´´ W	NPE:	Y							
NOTE: All ARRIVAL harbor transits branch from PT_A_2															
NOTE: All DEPARTURE harbor transits goto PT_D_1															
PortTownsend_Anchorage	PORT TOWNSEND	ANCHORAGE	Arrival	L1a	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	PT_B_1	48° 07´ 57´´ N 123° 27´ 37´´ W	1.3	Jefferson	0	3	3	3	3
Anchorage_PortTownsend	PORT TOWNSEND	ANCHORAGE	Departure	L1a	PT_B_1	48° 07´ 57´´ N 123° 27´ 37´´ W	PT_D_1	48° 07´ 00´´ N 122° 44´ 13´´ W	1.3	Jefferson	0	3	3	3	3
IndianIsland_Ammo	INDIAN ISLAND	AMMO	Arrival	L1a	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	II_A_1	48° 04´ 54´´ N 122° 45´ 29´´ W	2.28	Jefferson	0	4	4	4	4
IndianIsland_Ammo	INDIAN ISLAND	AMMO	Arrival	L2	II_A_1	48° 04´ 54´´ N 122° 45´ 29´´ W	II_B_1	48° 04´ 31´´ N 122° 44´ 56´´ W	0.52	Jefferson	0	2	2	2	2
								Total Distance	5.4 nm						
Ammo_IndianIsland	INDIAN ISLAND	AMMO	Departure	L1	II_B_1	48° 04´ 31´´ N 122° 44´ 56´´ W	II_D_1	48° 04´ 54´´ N 122° 45´ 29´´ W	0.52	Jefferson	0	2	2	2	2
Ammo_IndianIsland	INDIAN ISLAND	AMMO	Departure	L2a	II_D_1	48° 04´ 54´´ N 122° 45´ 29´´ W	PT_D_1	48° 07´ 00´´ N 122° 44´ 13´´ W	2.28	Jefferson	0	5	5	5	5
								Total Distance	13.6 nm						
PORT TOWNSEND TO INDIAN ISLAND															
PortTownsend_IndianIsland	PORT TOWNSEND	ANCHORAGE	Arrival	L1	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	II_A_1	48° 04´ 54´´ N 122° 45´ 29´´ W	1.88	Jefferson	0	4	4	4	4
IndianIsland_Ammo	INDIAN ISLAND	AMMO	Arrival	L2	II_A_1	48° 04´ 54´´ N 122° 45´ 29´´ W	II_B_1	48° 04´ 31´´ N 122° 44´ 56´´ W	0.52	Jefferson	0	2	2	2	2
								Total Distance	2.4 nm						
INDIAN ISLAND TO PORT TOWNSEND															
IndianIsland_PortTownsend	INDIAN ISLAND	AMMO	Departure	L1	II_B_1	48° 04´ 31´´ N 122° 44´ 56´´ W	II_A_1	48° 04´ 54´´ N 122° 45´ 29´´ W	1.88	Jefferson	0	2	2	2	2
IndianIsland_PortTownsend	PORT TOWNSEND	ANCHORAGE	Departure	L2	II_A_1	48° 04´ 54´´ N 122° 45´ 29´´ W	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	0.52	Jefferson	0	5	5	5	5
								Total Distance	2.4 nm						

Puget Sound Emissions Inventory

OGV-Routing: PORT TOWNSEND/INDIAN ISLAND to SEA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortTownsend_SJ	Arrival	X	Y	L1	PT_D_1	48° 07´ 00´´ N 122° 44´ 13´´ W	PT_D_2	48° 08´ 40´´ N 122° 43´ 55´´ W	1.7	Jefferson	0	12	10	8	6
PortTownsend_SJ	Arrival	X	Y	L2	PT_D_2	48° 08´ 40´´ N 122° 43´ 55´´ W	PT_D_3	48° 09´ 03´´ N 122° 43´ 38´´ W	2.1	Jefferson	0	15	13	10	8
PortTownsend_SJ	Arrival	X	Y	L3	PT_D_3	48° 09´ 03´´ N 122° 43´ 38´´ W	PT_D_4	48° 09´ 40´´ N 122° 43´ 53´´ W	0.7	Island	0	17	15	SS	SS
PortTownsend_SJ	Arrival	X	Y	L4a	PT_D_4	48° 09´ 40´´ N 122° 43´ 53´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	2.6	Island	0	20	18	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	SS	SS	SS	SS

Total Distance 100.6 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	6	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	8	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	X	Y	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	19	17	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L1a	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PT_A_1	48° 08´ 40´´ N 122° 43´ 55´´ W	3.6	Jefferson	0	16	14	10	SS
SJ_PortTownsend	Arrival	M	Y	L2	PT_A_1	48° 08´ 40´´ N 122° 43´ 55´´ W	PT_A_2	48° 07´ 00´´ N 122° 44´ 13´´ W	1.7	Jefferson	0	10	8	6	6
								Total Distance	32.2 nm						

Puget Sound Emissions Inventory

OGV-Routing: PORT TOWNSEND/INDIAN ISLAND to BREMERTON

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
PTII_Bremerton	Departure	X	Y	L1	PI_D_1	48° 07´ 00´´ N 122° 44´ 13´´ W	PI_D_2	48° 07´ 41´´ N 122° 44´ 05´´ W	0.7	Jefferson	0	12	10	8	6
PTII_Bremerton	Departure	X	Y	L2	PI_D_2	48° 07´ 41´´ N 122° 44´ 05´´ W	PI_D_3	48° 07´ 47´´ N 122° 43´ 08´´ W	0.6	Jefferson	0	14	12	9	7
PTII_Bremerton	Departure	X	Y	L3a	PI_D_3	48° 07´ 47´´ N 122° 43´ 08´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	2.3	Jefferson	0	18	16	10	9
Sea_Tacoma	Arrival	X	Y	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	20	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	2.1	Kitsap	0	SS	SS	SS	SS
PS_Bremerton	Arrival	X	Y	L1	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	BR_A_2	47° 34´ 04´´ N 122° 31´ 22´´ W	0.6	Kitsap	0	20	18	SS	SS
PS_Bremerton	Arrival	X	Y	L2	BR_A_2	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_A_3	47° 34´ 24´´ N 122° 32´ 12´´ W	0.7	Kitsap	0	18	16	11	SS
PS_Bremerton	Arrival	X	Y	L3	BR_A_3	47° 34´ 24´´ N 122° 32´ 12´´ W	BR_A_4	47° 35´ 34´´ N 122° 32´ 46´´ W	1.2	Kitsap	0	14	12	10	8
PS_Bremerton	Arrival	X	Y	L4	BR_A_4	47° 35´ 34´´ N 122° 32´ 46´´ W	BR_A_5	47° 35´ 39´´ N 122° 33´ 16´´ W	0.4	Kitsap	0	13	11	9	8
PS_Bremerton	Arrival	X	Y	L5	BR_A_5	47° 35´ 39´´ N 122° 33´ 16´´ W	BR_A_6	47° 35´ 10´´ N 122° 34´ 23´´ W	0.9	Kitsap	0	12	10	9	8
PS_Bremerton	Arrival	M	Y	L6	BR_A_6	47° 35´ 10´´ N 122° 34´ 23´´ W	BR_A_7	47° 33´ 45´´ N 122° 36´ 22´´ W	2.0	Kitsap	0	10	10	9	9
PS_Bremerton	Arrival	M	Y	L7	BR_A_7	47° 33´ 45´´ N 122° 36´ 22´´ W	BR_A_8	47° 33´ 09´´ N 122° 38´ 06´´ W	1.3	Kitsap	0	10	10	9	9
PS_Bremerton	Arrival	M	Y	L8	BR_A_8	47° 33´ 09´´ N 122° 38´ 06´´ W	BR_B_1	47° 33´ 21´´ N 122° 38´ 32´´ W	0.4	Kitsap	0	10	10	9	9

Total Distance 48 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: BREMERTON to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

													Speed by Link (knots)				
													Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Bremerton_PS	Departure	M	Y	L1	BR_B_1	47° 33´ 21´´ N	122° 38´ 32´´ W	BR_D_1	47° 33´ 09´´ N	122° 38´ 06´´ W	0.4	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L2	BR_D_1	47° 33´ 09´´ N	122° 38´ 06´´ W	BR_D_2	47° 33´ 45´´ N	122° 36´ 22´´ W	1.3	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L3	BR_D_2	47° 33´ 45´´ N	122° 36´ 22´´ W	BR_D_3	47° 35´ 10´´ N	122° 34´ 23´´ W	2.0	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	X	Y	L4	BR_D_3	47° 35´ 10´´ N	122° 34´ 23´´ W	BR_D_4	47° 35´ 39´´ N	122° 33´ 16´´ W	0.9	Kitsap	0	12	10	9	8
Bremerton_PS	Departure	X	Y	L5	BR_D_4	47° 35´ 39´´ N	122° 33´ 16´´ W	BR_D_5	47° 35´ 34´´ N	122° 32´ 46´´ W	0.4	Kitsap	0	13	11	9	8
Bremerton_PS	Departure	X	Y	L6	BR_D_5	47° 35´ 34´´ N	122° 32´ 46´´ W	BR_D_6	47° 34´ 24´´ N	122° 32´ 12´´ W	1.2	Kitsap	0	14	12	10	8
Bremerton_PS	Departure	X	Y	L7	BR_D_6	47° 34´ 24´´ N	122° 32´ 12´´ W	BR_D_7	47° 34´ 04´´ N	122° 31´ 22´´ W	0.7	Kitsap	0	18	16	11	SS
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N	122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N	122° 30´ 31´´ W	0.6	Kitsap	0	19	17	SS	SS
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N	122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N	122° 27´ 32´´ W	2.1	Kitsap	0	20	SS	SS	SS
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34´ 32´´ N	122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N	122° 26´ 45´´ W	1.5	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N	122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N	122° 26´ 56´´ W	1.1	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N	122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	2.7	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N	122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N	122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N	122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N	122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N	122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N	122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N	122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N	122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N	122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N	122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N	122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L21	PS_D_21	48° 06´ 58´´ N	122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	1.3	Jefferson	0	20	18	SS	SS
Tacoma_Sea	Departure	X	Y	L22a	PS_D_22	48° 07´ 51´´ N	122° 40´ 43´´ W	PI_A_1	48° 08´ 08´´ N	122° 41´ 34´´ W	0.6	Island	0	19	17	10	SS
Bremerton_PTII	Arrival	X	Y	L1	PI_A_1	48° 08´ 08´´ N	122° 41´ 34´´ W	PI_A_2	48° 08´ 03´´ N	122° 42´ 10´´ W	0.4	Island	0	18	16	10	SS
Bremerton_PTII	Arrival	X	Y	L2	PI_A_2	48° 08´ 03´´ N	122° 42´ 10´´ W	PI_A_3	48° 07´ 48´´ N	122° 44´ 03´´ W	1.3	Jefferson	0	14	12	8	8
Bremerton_PTII	Arrival	X	Y	L3	PI_A_3	48° 07´ 48´´ N	122° 44´ 03´´ W	PI_A_4	48° 07´ 00´´ N	122° 44´ 13´´ W	0.8	Jefferson	0	12	10	8	8
										Total Distance	49.2	nm					

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	0	12	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	0	16	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	20	18	SS	SS
Tacoma_Sea	Departure	X	Y	L22a	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PI_A_1	48° 08´ 08´´ N 122° 41´ 34´´ W	0.6	Island	0	19	17	10	SS
Bremerton_PTII	Arrival	X	Y	L1	PI_A_1	48° 08´ 08´´ N 122° 41´ 34´´ W	PI_A_2	48° 08´ 03´´ N 122° 42´ 10´´ W	0.4	Island	0	18	16	10	SS
Bremerton_PTII	Arrival	X	Y	L2	PI_A_2	48° 08´ 03´´ N 122° 42´ 10´´ W	PI_A_3	48° 07´ 48´´ N 122° 44´ 03´´ W	1.3	Jefferson	0	14	12	8	8
Bremerton_PTII	Arrival	X	Y	L3	PI_A_3	48° 07´ 48´´ N 122° 44´ 03´´ W	PI_A_4	48° 07´ 00´´ N 122° 44´ 13´´ W	0.8	Jefferson	0	12	10	8	8
								Total Distance	38.6 nm						

Puget Sound Emissions Inventory

OGV-Routing: SEA to BREMERTON

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	16	15	12	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	8	8	8	8
Sea_Tacoma	Arrival	T	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	18	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	2.1	Kitsap	0	SS	SS	SS	SS
PS_Bremerton	Arrival	X	Y	L1	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	BR_A_2	47° 34´ 04´´ N 122° 31´ 22´´ W	0.6	Kitsap	0	20	18	SS	SS
PS_Bremerton	Arrival	X	Y	L2	BR_A_2	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_A_3	47° 34´ 24´´ N 122° 32´ 12´´ W	0.7	Kitsap	0	18	16	11	SS
PS_Bremerton	Arrival	X	Y	L3	BR_A_3	47° 34´ 24´´ N 122° 32´ 12´´ W	BR_A_4	47° 35´ 34´´ N 122° 32´ 46´´ W	1.2	Kitsap	0	14	12	10	8
PS_Bremerton	Arrival	X	Y	L4	BR_A_4	47° 35´ 34´´ N 122° 32´ 46´´ W	BR_A_5	47° 35´ 39´´ N 122° 33´ 16´´ W	0.4	Kitsap	0	13	11	9	8
PS_Bremerton	Arrival	X	Y	L5	BR_A_5	47° 35´ 39´´ N 122° 33´ 16´´ W	BR_A_6	47° 35´ 10´´ N 122° 34´ 23´´ W	0.9	Kitsap	0	12	10	9	8
PS_Bremerton	Arrival	M	Y	L6	BR_A_6	47° 35´ 10´´ N 122° 34´ 23´´ W	BR_A_7	47° 33´ 45´´ N 122° 36´ 22´´ W	2.0	Kitsap	0	10	10	9	9
PS_Bremerton	Arrival	M	Y	L7	BR_A_7	47° 33´ 45´´ N 122° 36´ 22´´ W	BR_A_8	47° 33´ 09´´ N 122° 38´ 06´´ W	1.3	Kitsap	0	10	10	9	9
PS_Bremerton	Arrival	M	Y	L8	BR_A_8	47° 33´ 09´´ N 122° 38´ 06´´ W	BR_B_1	47° 33´ 21´´ N 122° 38´ 32´´ W	0.4	Kitsap	0	10	10	9	9
								Total Distance	144.4 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: BREMERTON to SEA

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Bremerton_PS	Departure	M	Y	L1	BR_B_1	47° 33´ 21´´ N 122° 38´ 32´´ W	BR_D_1	47° 33´ 09´´ N 122° 38´ 06´´ W	0.4	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L2	BR_D_1	47° 33´ 09´´ N 122° 38´ 06´´ W	BR_D_2	47° 33´ 45´´ N 122° 36´ 22´´ W	1.3	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L3	BR_D_2	47° 33´ 45´´ N 122° 36´ 22´´ W	BR_D_3	47° 35´ 10´´ N 122° 34´ 23´´ W	2.0	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	X	Y	L4	BR_D_3	47° 35´ 10´´ N 122° 34´ 23´´ W	BR_D_4	47° 35´ 39´´ N 122° 33´ 16´´ W	0.9	Kitsap	0	12	10	9	8
Bremerton_PS	Departure	X	Y	L5	BR_D_4	47° 35´ 39´´ N 122° 33´ 16´´ W	BR_D_5	47° 35´ 34´´ N 122° 32´ 46´´ W	0.4	Kitsap	0	13	11	9	8
Bremerton_PS	Departure	X	Y	L6	BR_D_5	47° 35´ 34´´ N 122° 32´ 46´´ W	BR_D_6	47° 34´ 24´´ N 122° 32´ 12´´ W	1.2	Kitsap	0	14	12	10	8
Bremerton_PS	Departure	X	Y	L7	BR_D_6	47° 34´ 24´´ N 122° 32´ 12´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	0.7	Kitsap	0	18	16	11	SS
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	19	17	SS	SS
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	20	SS	SS	SS
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	17	16	12	SS
Tacoma_Sea	Departure	X	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	X	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	SS	SS	SS	SS

Total Distance 145.0 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: BREMERTON to SEATTLE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Bremerton_PS	Departure	M	Y	L1	BR_B_1	47° 33´ 21´´ N 122° 38´ 32´´ W	BR_D_1	47° 33´ 09´´ N 122° 38´ 06´´ W	0.4	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L2	BR_D_1	47° 33´ 09´´ N 122° 38´ 06´´ W	BR_D_2	47° 33´ 45´´ N 122° 36´ 22´´ W	1.3	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	M	Y	L3	BR_D_2	47° 33´ 45´´ N 122° 36´ 22´´ W	BR_D_3	47° 35´ 10´´ N 122° 34´ 23´´ W	2.0	Kitsap	0	10	10	9	9
Bremerton_PS	Departure	X	Y	L4	BR_D_3	47° 35´ 10´´ N 122° 34´ 23´´ W	BR_D_4	47° 35´ 39´´ N 122° 33´ 16´´ W	0.9	Kitsap	0	12	10	9	8
Bremerton_PS	Departure	X	Y	L5	BR_D_4	47° 35´ 39´´ N 122° 33´ 16´´ W	BR_D_5	47° 35´ 34´´ N 122° 32´ 46´´ W	0.4	Kitsap	0	13	11	9	8
Bremerton_PS	Departure	X	Y	L6	BR_D_5	47° 35´ 34´´ N 122° 32´ 46´´ W	BR_D_6	47° 34´ 24´´ N 122° 32´ 12´´ W	1.2	Kitsap	0	14	12	10	8
Bremerton_PS	Departure	T	N	L7	BR_D_6	47° 34´ 24´´ N 122° 32´ 12´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	0.7	Kitsap	0	18	16	11	SS
Bremerton_PS	Departure	T	N	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	19	17	SS	SS
Bremerton_PS	Departure	T	N	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	20	SS	SS	SS
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_X_8	47° 34´ 55´´ N 122° 26´ 58´´ W	0.5	Kitsap	0	SS	SS	SS	SS
BremCross_ElliottBay	Arrival	X	Y	L8a	PS_X_8	47° 34´ 55´´ N 122° 26´ 58´´ W	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	2.0	Kitsap	0	17	SS	SS	SS
Tacoma_ElliottBay	Arrival	X	Y	L1	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	1.3	King	0	15	13	10	10

Total Distance 13.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to MANCHESTER

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Fast** **Cruise**	**Fast** **Container** **Auto**	**Medium** **Reefer** **RO/RO** **Fishing**	**Slow** **Bulkers** **Tankers** **Log** **Fishing**	**Very Slow** **Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
Sea_Tacoma	Arrival	X	N	L6	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	11.4	Calallam	0	0	16	12	SS
Sea_Tacoma	Arrival	T	N	L7	PS_A_7	48° 11´ 56´´ N 123° 06´ 35´´ W	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	9.5	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L8	PS_A_8	48° 11´ 11´´ N 122° 52´ 23´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	2.9	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	2.1	Kitsap	0	0	16	10	SS
PS_Bremerton	Arrival	X	Y	L1a	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	MU_A_1	47° 33´ 39´´ N 122° 31´ 51´´ W	1.0	Kitsap	0	0	12	9	8
Brem_Manchester	Arrival	X	Y	L2a	MU_A_1	47° 33´ 39´´ N 122° 31´ 51´´ W	MU_B_1	47° 33´ 42´´ N 122° 32´ 10´´ W	0.2	Kitsap	0	0	11	8	8

Total Distance 138.3 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to SEA

Lat/Long in WGS84 Datum

DRAFT

Speed by Link (knots)

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33´ 42´´ N 122° 32´ 10´´ W	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	0.2	Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	X	N	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	X	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS
								Total Distance	139 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
													Reefer	**Bulkers Tankers**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**RO/RO Fishing**	**Log Fishing**	**Fishing**
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33´ 42´´ N 122° 32´ 10´´ W	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	0.2	Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	12	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	11	SS

Total Distance 82.9 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to MANCHESTER

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	2.1	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	16	12	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	11	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	11	SS
Anacortes_Admr	Departure	X	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	12	SS
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	2.1	Kitsap	0	0	16	10	SS
PS_Bremerton	Arrival	X	Y	L1a	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	MU_A_1	47° 33´ 39´´ N 122° 31´ 51´´ W	1.0	Kitsap	0	0	12	9	8
Brem_Manchester	Arrival	X	Y	L2a	MU_A_1	47° 33´ 39´´ N 122° 31´ 51´´ W	MU_B_1	47° 33´ 42´´ N 122° 32´ 10´´ W	0.2	Kitsap	0	0	11	8	8

Total Distance 80.8 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to SEATTLE

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**	**Dist.** **County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33´ 42´´ N	122° 32´ 10´´ W	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	0.2 Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33´ 39´´ N	122° 31´ 51´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	1.0 Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N	122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6 Kitsap	0	0	13	9	8
Bremerton_PS	Departure	T	N	L9a	BR_D_8	47° 33´ 58´´ N	122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1 Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	T	N	L10a	PS_A_17	47° 34´ 32´´ N	122° 27´ 32´´ W	PS_X_8	47° 34´ 55´´ N 122° 26´ 58´´ W	0.5 Kitsap	0	0	17	SS	SS
BremCross_ElliottBa	Arrival	X	Y	L8a	PS_X_8	47° 34´ 55´´ N	122° 26´ 58´´ W	EB_A_S1	47° 36´ 28´´ N 122° 25´ 05´´ W	2.0 Kitsap	0	0	17	SS	SS
Tacoma_ElliottBay	Arrival	X	Y	L1	EB_A_S1	47° 36´ 28´´ N	122° 25´ 05´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	1.3 King	0	0	13	10	10
									Total Distance	7.6 nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to MANCHESTER

Lat/Long in WGS84 Datum

													Speed by Link (knots)				
													Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
																Bulkers	
															Reefer	**Tankers**	
														Container	**RO/RO**	**Log**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
ElliotBay_Manchester	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N	122° 23´ 21´´ W	EB_D_B1	47° 36´ 19´´ N	122° 25´ 41´´ W	1.7	King	0	0	8	6	7
ElliotBay_Manchester	Departure	M	Y	L2	EB_D_B1	47° 36´ 19´´ N	122° 25´ 41´´ W	EB_D_B2	47° 35´ 06´´ N	122° 26´ 57´´ W	1.5	King	0	0	8	8	8
ElliotBay_Manchester	Departure	M	Y	L3a	EB_D_B2	47° 35´ 06´´ N	122° 26´ 57´´ W	PS_A_17	47° 34´ 32´´ N	122° 27´ 32´´ W	0.7	Kitsap	0	0	9	9	9
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34´ 32´´ N	122° 27´ 32´´ W	BR_A_1	47° 33´ 58´´ N	122° 30´ 31´´ W	2.1	Kitsap	0	0	16	10	SS
PS_Bremerton	Arrival	X	Y	L1a	BR_A_1	47° 33´ 58´´ N	122° 30´ 31´´ W	MU_A_1	47° 33´ 39´´ N	122° 31´ 51´´ W	1.0	Kitsap	0	0	12	9	8
Brem_Manchester	Arrival	X	Y	L2a	MU_A_1	47° 33´ 39´´ N	122° 31´ 51´´ W	MU_B_1	47° 33´ 42´´ N	122° 32´ 10´´ W	0.2	Kitsap	0	0	11	8	8
										Total Distance	7.1	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to BLAKE ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliotBay_Manchester	Departure	M	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_B1	47° 36´ 19´´ N 122° 25´ 41´´ W	1.7	King	0	0	8	6	7
ElliotBay_Manchester	Departure	M	Y	L2	EB_D_B1	47° 36´ 19´´ N 122° 25´ 41´´ W	EB_D_B2	47° 35´ 06´´ N 122° 26´ 57´´ W	1.5	King	0	0	8	8	8
ElliotBay_Manchester	Departure	M	Y	L3a	EB_D_B2	47° 35´ 06´´ N 122° 26´ 57´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	0.7	Kitsap	0	0	9	9	9
Sea_Tacoma	Arrival	T	N	L17a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	2.1	Kitsap	0	0	9	8	SS
PS_BlakeIsland	Arrival	M	Y	L1a	BR_A_1	47° 33´ 58´´ N 122° 30´ 31´´ W	BI_AN_1	47° 33´ 42´´ N 122° 32´ 10´´ W	0.7	Kitsap	0	0	4	4	4

Total Distance 6.6 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to PORT TOWNSEND/INDIAN ISLAND

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33´ 42´´ N 122° 32´ 10´´ W	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	0.2	Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	X	Y		PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	18	SS	SS
Tacoma_Sea	Departure	X	Y	L22a	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PI_A_1	48° 08´ 08´´ N 122° 41´ 34´´ W	0.6	Island	0	0	17	10	SS
Bremerton_PTII	Arrival	X	Y	L1	PI_A_1	48° 08´ 08´´ N 122° 41´ 34´´ W	PI_A_2	48° 08´ 03´´ N 122° 42´ 10´´ W	0.4	Island	0	0	16	10	SS
Bremerton_PTII	Arrival	X	Y	L2	PI_A_2	48° 08´ 03´´ N 122° 42´ 10´´ W	PI_A_3	48° 07´ 48´´ N 122° 44´ 03´´ W	1.3	Jefferson	0	0	12	8	8
Bremerton_PTII	Arrival	M	Y	L3	PI_A_3	48° 07´ 48´´ N 122° 44´ 03´´ W	PI_A_4	48° 07´ 00´´ N 122° 44´ 13´´ W	0.8	Jefferson	0	0	10	8	8
								Total Distance	43.7	nm					

Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to MARCH POINT

Lat/Long in WGS84 Datum

												Speed by Link (knots)		
										Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Manchester_Bren	Departure	M	Y	L1	MU_D_1	47° 33´ 42´´ N 122° 32´ 10´´ W	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	0.2	Kitsap	0	0	11	8	8
Manchester_Bren	Departure	X	Y	L2a	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	T	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6

Total Distance 73.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: BLAKE ISLAND (ANCHORAGE) to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
BlakeIsland_PS	Departure	M	Y	L1a	BI_AN_1	47° 33´ 42´´ N 122° 32´ 10´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.7	Kitsap	0	0	6	3	3
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	0	15	9	SS
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	0	6	6	6
								Total Distance	72.5 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: MANCHESTER to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Manchester_Brem	Departure	M	Y	L1	MU_D_1	47° 33´ 42´´ N 122° 32´ 10´´ W	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	0.2	Kitsap	0	0	11	8	8
Manchester_Brem	Departure	X	Y	L2a	MU_D_2	47° 33´ 39´´ N 122° 31´ 51´´ W	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	1.0	Kitsap	0	0	12	9	8
Bremerton_PS	Departure	X	Y	L8	BR_D_7	47° 34´ 04´´ N 122° 31´ 22´´ W	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	0.6	Kitsap	0	0	13	9	8
Bremerton_PS	Departure	X	Y	L9a	BR_D_8	47° 33´ 58´´ N 122° 30´ 31´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	2.1	Kitsap	0	0	15	SS	SS
PSCross_Brem	Departure	X	Y	L10a	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.5	Kitsap	0	0	17	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	2.4	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L25	PS_D_25	48° 11´ 57´´ N 122° 52´ 19´´ W	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	9.5	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	X	Y	L26	PS_D_26	48° 12´ 45´´ N 123° 06´ 35´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	11.2	Calallam	0	0	16	12	SS
Tacoma_Sea	Departure	M	Y	L27a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	0	6	6	6

Total Distance 73.5 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	M	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	13	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.0	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	11	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	11	11	SS

Total Distance 120.3 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE HARBOR

Lat/Long in WGS84 Datum

									Speed by Link (knots)				
									Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PA_CherryPT	Arrival				RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W		Whatcom					
CherryPT_PT	Departure		RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W				Whatcom					
NOTE: All ARRIVAL harbor transits branch from RS_A_13													
NOTE: All DEPARTURE harbor transits goto RS_D_1													
Ferndale Route to Ferndale_Intalco													
Ferndale_Intalco	Arrival	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	FI_B_1	48° 50´ 25´´ N 122° 43´ 20´´ W	5.38	Whatcom	0	0	4	4	4
Ferndale_Intalco	Departure	L1a	FI_B_1	48° 50´ 25´´ N 122° 43´ 20´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	5.76	Whatcom	0	0	6	6	6
Ferndale_Intalco to SandyPoint Anchorage													
Ferndale_Intalco_SandyPoint	Arrival	L1a	FI_B_1	48° 50´ 25´´ N 122° 43´ 20´´ W	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	2.59	Whatcom	0	0	4	4	4
SandyPoint_Ferndale_Intalco	Departure	L1a	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	FI_B_1	48° 50´ 25´´ N 122° 43´ 20´´ W	2.59	Whatcom	0	0	6	6	6
Ferndale_Phillips	Arrival	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	FP_B_2	48° 49´ 35´´ N 122° 43´ 14´´ W	4.61	Whatcom	0	0	4	4	4
Ferndale_Phillips	Departure	L1a	FP_B_2	48° 49´ 35´´ N 122° 43´ 14´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	5.04	Whatcom	0	0	6	6	6
Ferndale_Phillips to SandyPoint Anchorage													
Ferndale_Phillips_SandyPoint	Arrival	L1a	FP_B_2	48° 49´ 35´´ N 122° 43´ 14´´ W	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	2.19	Whatcom	0	0	4	4	4
SandyPoint_Ferndale_Phillips	Departure	L1a	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	FP_B_2	48° 49´ 35´´ N 122° 43´ 14´´ W	2.19	Whatcom	0	0	6	6	6
CherryPT_BP	Arrival	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	FC_A_1	48° 48´ 29´´ N 122° 44´ 34´´ W	3.28	Whatcom	0	0	4	4	4
CherryPT_BP	Arrival	L2	FC_A_1	48° 48´ 29´´ N 122° 44´ 34´´ W	FC_B_3	48° 51´ 39´´ N 122° 45´ 31´´ W	3.23	Whatcom	0	0	6	6	6
						Total Distance	6.51	nm					
CherryPT_BP	Departure	L1	FC_B_3	48° 51´ 39´´ N 122° 45´ 31´´ W	FC_D_2	48° 48´ 40´´ N 122° 47´ 26´´ W	3.23	Whatcom	0	0	4	4	4
CherryPT_BP	Departure	L2a	FC_D_2	48° 48´ 40´´ N 122° 47´ 26´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	3.39	Whatcom	0	0	6	6	6
						Total Distance	6.62	nm					
CherryPT_BP to SandyPoint Anchorage													
CherryPT_BP_SandyPoint	Departure	L1a	FC_B_3	48° 51´ 39´´ N 122° 45´ 31´´ W	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	3.14	Whatcom	0	0	4	4	4
SandyPoint_CherryPT_BP	Arrival	L1a	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	FC_B_3	48° 51´ 39´´ N 122° 45´ 31´´ W	3.14	Whatcom	0	0	6	6	6
PA_CherryPT_SandyPoint Anchorage													
PA_CherryPT_SandyPoint	Arrival	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	3.24	Whatcom	0	0	4	4	4
SandyPT_CherryPT_PA	Departure	L1a	FA_AN_3	48° 48´ 32´´ N 122° 46´ 03´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	3.24	Whatcom	0	0	6	6	6

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to SEA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	2.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L14a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS
								Total Distance	118.6	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	Y	L2a	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	SG_A_1	48° 39´ 27´´ N 122° 41´ 37´´ W	1.7	San Juan	0	0	13	9	SS
GStght_Vendovi	Arrival	X	Y	L1	SG_A_1	48° 39´ 27´´ N 122° 41´ 37´´ W	SG_A_2	48° 38´ 43´´ N 122° 40´ 24´´ W	1.1	Whatcom	0	0	12	8	SS
GStght_Vendovi	Arrival	M	Y	L2	SG_A_2	48° 38´ 43´´ N 122° 40´ 24´´ W	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	2.2	Skagit	0	0	6	4	SS
								Total Distance	10.2 nm						

Puget Sound Emissions Inventory

OGV-Routing: VENDOVI ISLAND (ANCHORAGE) to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Vendovi_GStght	Departure	M	Y	L1	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	LI_D_2	48° 38´ 43´´ N 122° 39´ 49´´ W	1.9	Skagit	0	0	10	8	SS
Vendovi_GStght	Departure	X	Y	L2a	LI_D_2	48° 38´ 43´´ N 122° 39´ 49´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	2.4	Whatcom	0	0	12	10	SS
PA_CherryPT	Arrival	X	Y	L12a	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	11	SS
								Total Distance	9.6	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	Y	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	Y	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	Y	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	X	Y	L1a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	2.2	Skagit	0	0	14	11	SS
RS_Bellingham	Arrival	X	Y	L2	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	3.7	Skagit	0	0	12	10	SS
RS_Bellingham	Arrival	M	Y	L3	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	2.9	Skagit	0	0	8	6	6
RS_Bellingham	Arrival	M	Y	L4	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	1.5	Skagit	0	0	4	3	3
								Total Distance	69.9 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to SEATTLE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
														Bulkers	
													Reefer	**Tankers**	
												Container	**RO/RO**	**Log**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	2.1	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	16	12	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	11	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	11	SS
Anacortes_Admr	Departure	X	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	12	SS
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	13	SS	SS
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	0.4	Kitsap	0	0	13	9	8
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	1.5	King	0	0	12	8	7
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	2.6	King	0	0	11	6	6

Total Distance 76.8 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

													Speed by Link (knots)		
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	11	SS

Total Distance 77.9 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to TACOMA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	2.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	0	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	0	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	0	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	0	10	10	8

Total Distance 96.5 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
Tacoma_Sea	Departure	M	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	0	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	0	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	0	14	SS	SS
Tacoma_Sea	Departure	X	Y	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	X	Y	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	0	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	11	SS

Total Distance 98.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to MARCH POINT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6

Total Distance 21.3 nm

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	M	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
March PT_CPFrn	Departure	T	N	L1a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.3	Skagit	0	0	14	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	11	SS
								Total Distance	21.6 nm						

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L8	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	2.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	N	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	X	N	L10	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	X	N	L11	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	Y	L14a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
CPFern_PA	Arrival	M	Y	L1a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.8	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	0	6	6	6

Total Distance 52.8 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N	123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N	123° 22´ 00´´ W	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N	123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N	123° 23´ 01´´ W	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N	123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	0.5	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	Y	L1a	PS_A_6	48° 09´ 58´´ N	123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N	123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N	123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N	122° 57´ 50´´ W	6.6	San Juan	0	0	13	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19´ 40´´ N	122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N	122° 47´ 16´´ W	8.3	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N	122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N	122° 44´ 47´´ W	2.7	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N	122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N	122° 43´ 53´´ W	1.9	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N	122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N	122° 44´ 12´´ W	2.0	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30´ 01´´ N	122° 44´ 12´´ W	RS_A_8	48° 31´ 00´´ N	122° 44´ 21´´ W	1.0	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N	122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N	122° 45´ 07´´ W	5.1	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N	122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N	122° 43´ 52´´ W	2.1	Skagit	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N	122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N	122° 42´ 24´´ W	2.5	San Juan	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N	122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N	122° 42´ 10´´ W	0.4	Whatcom	0	0	13	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N	122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N	122° 45´ 50´´ W	5.3	Whatcom	0	0	13	11	SS

Total Distance 54.0 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to VANCOUVER (NB3)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	X	Y	L1a	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	SG_D_1	48° 47´ 27´´ N 122° 51´ 18´´ W	3.45	San Juan	0	0	15	13	SS
BuoyYCA_NB3	Departure	T	N	L2	SG_D_1	48° 47´ 27´´ N 122° 51´ 18´´ W	SG_D_2	49° 00´ 09´´ N 123° 14´ 09´´ W	19.67	Whatcom	0	0	SS	SS	SS

Total Distance 23.12 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

													Speed by Link (knots)		
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
														Bulkers	
													Reefer	**Tankers**	
												Container	**RO/RO**	**Log**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**		**End WP**	**Ending Waypoint Lat/Lon**		**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49° 00´ 09´´ N	123° 18´ 15´´ W	NB3_A_2	48° 49´ 10´´ N	122° 58´ 12´´ W	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48° 49´ 10´´ N	122° 58´ 12´´ W	NB3_A_3	48° 45´ 54´´ N	122° 50´ 09´´ W	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	X	Y	L3a	NB3_A_3	48° 45´ 54´´ N	122° 50´ 09´´ W	RS_D_2	48° 45´ 16´´ N	122° 47´ 14´´ W	2.0	San Juan	0	0	17	13	SS
CherryPT_Cross	Arrival	X	Y	L1a	RS_D_2	48° 45´ 16´´ N	122° 47´ 14´´ W	RS_A_13	48° 45´ 17´´ N	122° 45´ 50´´ W	1.0	Whatcom	0	0	15	11	SS

Total Distance 26.4 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49° 00´ 09´´ N 123° 18´ 15´´ W	NB3_A_2	48° 49´ 10´´ N 122° 58´ 12´´ W	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48° 49´ 10´´ N 122° 58´ 12´´ W	NB3_A_3	48° 45´ 54´´ N 122° 50´ 09´´ W	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	X	Y	L3a	NB3_A_3	48° 45´ 54´´ N 122° 50´ 09´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	2.0	San Juan	0	0	17	13	SS
CherryPT_Cross	Arrival	X	Y	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	X	Y	L2a	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	SG_A_1	48° 39´ 27´´ N 122° 41´ 37´´ W	1.7	San Juan	0	0	13	9	SS
GStght_Vendovi	Arrival	X	Y	L1	SG_A_1	48° 39´ 27´´ N 122° 41´ 37´´ W	SG_A_2	48° 38´ 43´´ N 122° 40´ 24´´ W	1.1	Whatcom	0	0	12	8	SS
GStght_Vendovi	Arrival	M	Y	L2	SG_A_2	48° 38´ 43´´ N 122° 40´ 24´´ W	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	2.2	Skagit	0	0	6	4	SS

Total Distance 35.6 nm

Puget Sound Emissions Inventory

OGV-Routing: SEA to MARCH POINT

Lat/Long in WGS84 Datum

Speed by Link (knots)

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Other Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	T	N	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	13	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	13	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6
								Total Distance	110.5 nm						

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT HARBOR

Lat/Long in WGS84 Datum

									Speed by Link (knots)				
									Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
RS_MarchPT	Arrival	L4	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	Mode:	M		Skagit					
MarchPT_RS	Departure	L5	MP_D_5	48° 30´ 33´´ N 122° 34´ 27´´ W	NPE:	Y		Skagit					
NOTE: All ARRIVAL harbor transits branch from MP_A_5													
NOTE: All DEPARTURE harbor transits goto MP_D_5													
MP_Shell	Arrival	L1a	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_B_1	48° 30´ 23´´ N 122° 35´ 00´´ W	0.81	Skagit	0	0	3	3	3
MP_Shell	Departure	L1a	MP_B_1	48° 30´ 23´´ N 122° 35´ 00´´ W	MP_D_5	48° 30´ 33´´ N 122° 34´ 27´´ W	0.81	Skagit	0	0	4	4	4
MP_Tosoro	Arrival	L1a	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_B_2	48° 30´ 32´´ N 122° 34´ 10´´ W	1.02	Skagit	0	0	3	3	3
MP_Tosoro	Departure	L1a	MP_B_2	48° 30´ 32´´ N 122° 34´ 10´´ W	MP_D_5	48° 30´ 33´´ N 122° 34´ 27´´ W	1.02	Skagit	0	0	4	4	4
MP_Anchorage	Arrival	L1a	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_AN_1	48° 31´ 26´´ N 122° 33´ 58´´ W	0.69	Skagit	0	0	2	2	2
MP_Anchroage	Departure	L1a	MP_AN_1	48° 31´ 26´´ N 122° 33´ 58´´ W	MP_D_5	48° 30´ 33´´ N 122° 34´ 27´´ W	0.69	Skagit	0	0	3	3	3

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to SEA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	T	N	L4a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	T	N	L5a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L15a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS

Total Distance 109.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to VANCOUVER (NB3)

Lat/Long in WGS84 Datum

Speed by Link (knots)

											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
March PT_CPFrn	Departure	T	N	L1a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.3	Skagit	0	0	14	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	13	SS
BuoyYCA_NB3	Departure	T	N	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	SG_D_1	48° 47´ 27´´ N 122° 51´ 18´´ W	4.2	Whatcom	0	0	17	13	SS
BuoyYCA_NB3	Departure	T	N	L2	SG_D_1	48° 47´ 27´´ N 122° 51´ 18´´ W	SG_D_2	49° 00´ 09´´ N 123° 14´ 09´´ W	19.7	Whatcom	0	0	SS	SS	SS

Total Distance 45.4 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to MARCH POINT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49° 00´ 09´´ N 123° 18´ 15´´ W	NB3_A_2	48° 49´ 10´´ N 122° 58´ 12´´ W	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48° 49´ 10´´ N 122° 58´ 12´´ W	NB3_A_3	48° 45´ 54´´ N 122° 50´ 09´´ W	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	X	N	L3a	NB3_A_3	48° 45´ 54´´ N 122° 50´ 09´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	2.0	San Juan	0	0	17	13	SS
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0		11	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	11	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	11	SS
CherryPT_MP	Arrival	T	N	L1a	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6
								Total Distance	46.6 nm						

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
MarchPT_Vendovi	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	VI_D_1	48° 31´ 33´´ N 122° 33´ 29´´ W	1.0	Skagit	0	0	9	7	SS
MarchPT_Vendovi	Departure	M	Y	L2	VI_D_1	48° 31´ 33´´ N 122° 33´ 29´´ W	VI_D_2	48° 34´ 57´´ N 122° 35´ 04´´ W	3.6	Skagit	0	0	10	8	SS
MarchPT_Vendovi	Departure	M	Y	L3	VI_D_2	48° 34´ 57´´ N 122° 35´ 04´´ W	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	3.0	Skagit	0	0	6	5	4
								Total Distance	7.6	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: VENDOVI ISLAND (ANCHORAGE) to MARCH POINT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Vendovi_MarchPT	Arrival	M	Y	L1	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	VI_A_2	48° 34´ 57´´ N 122° 35´ 04´´ W	3.0	Skagit	0	0	6	5	4
Vendovi_MarchPT	Arrival	X	Y	L2	VI_A_2	48° 34´ 57´´ N 122° 35´ 04´´ W	VI_A_1	48° 31´ 33´´ N 122° 33´ 29´´ W	3.6	Skagit	0	0	12	9	SS
Vendovi_MarchPT	Arrival	M	Y	L3	VI_A_1	48° 31´ 33´´ N 122° 33´ 29´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.0	Skagit	0	0	9	7	SS
								Total Distance	7.6	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: VENDOVI ISLAND (ANCHORAGE) to ANACORTES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Vendovi_MarchPT	Arrival	M	Y	L1	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	VI_A_2	48° 34´ 57´´ N 122° 35´ 04´´ W	3.0	Skagit	0	0	6	5	4
Vendovi_MarchPT	Arrival	X	Y	L2	VI_A_2	48° 34´ 57´´ N 122° 35´ 04´´ W	VI_A_1	48° 31´ 33´´ N 122° 33´ 29´´ W	3.6	Skagit	0	0	12	9	SS
Vendovi_MarchPT	Arrival	M	Y	L3	VI_A_1	48° 31´ 33´´ N 122° 33´ 29´´ W	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	1.0	Skagit	0	0	9	7	SS
MarchPT_RS	Departure	X	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	12	9	SS
								Total Distance	8.7 nm						

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VENDOVI ISLAND to TACOMA

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Vendovi_RS	Departure	M	Y	L1a	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	1.5	Skagit	0	0	6	4	SS
Bellingham_RS	Departure	X	Y	L3	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	2.9	Skagit	0	0	12	10	SS
Bellingham_RS	Departure	X	Y	L2	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	3.7	Skagit	0	0	12	10	SS
Bellingham_RS	Departure	X	Y	L1a	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	2.2	Skagit	0	0	14	11	SS
Bellingham_RS	Departure	X	Y	L0a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	11	SS
Anacortes_Admr	Departure	X	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	12	SS
Anacortes_Admr	Departure	X	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	18	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	17	16	13	SS
Sea_Tacoma	Arrival	X	Y	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	16	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	17	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	14	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	10	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	10	10	10	8

Total Distance 86.8 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Fast** **Cruise**	**Fast** **Container Auto**	**Medium** **Reefer RO/RO Fishing**	**Slow** **Bulkers Tankers Log Fishing**	**Very Slow** **Fishing**
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	X	Y	L4a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	X	Y	L5a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	Y	L10	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L14a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	13
CPFern_PA	Arrival	X	Y	L1a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.8	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	0	6	6	6
								Total Distance	41.7	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	Y	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	T	N	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6
								Total Distance	44.2 nm						

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to SEATTLE

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	X	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	X	Y	L4a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	X	Y	L5a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	Y	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	13	SS	SS
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	0.4	Kitsap	0	0	13	9	8
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	1.5	King	0	0	12	8	7
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	2.6	King	0	0	11	6	6

Total Distance 67.5 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

Speed by Link (knots)

											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	T	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	T	N	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6
								Total Distance	68.1	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to TACOMA

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
MarchPT_RS	Departure	M	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	9	8	6
MarchPT_RS	Departure	M	Y	L2	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	3.1	Skagit	0	0	12	10	SS
MarchPT_RS	Departure	M	Y	L3	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	M	Y	L4a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	M	Y	L5a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	X	Y	L9	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	0	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	0	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	0	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	0	10	10	8

Total Distance 93.5 nm

Note: SS - Service Speed

Note: Red numbers - engines off

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to MARCH POINT

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Tacoma_Sea	Departure	M	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	0	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	0	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	0	14	SS	SS
Tacoma_Sea	Departure	X	Y	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	0	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacorte	Arrival	X	Y	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacorte	Arrival	X	Y	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacorte	Arrival	X	Y	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L3	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	3.1	Skagit	0	0	11	8	SS
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	9	7	6

Total Distance 88.4 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to ANACORTES

Lat/Long in WGS84 Datum

Speed by Link (knots)

DRAFT											**Fast**	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	Y	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	13	11	SS
RS_MarchPT	Arrival	M	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	11	8	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	2.6	Skagit	0	0	9	7	6

Total Distance 108.9 nm

Puget Sound Emissions Inventory

OGV-Routing: ANACORTES HARBOR

Lat/Long in WGS84 Datum

DRAFT

									Speed by Link (knots)				
									Fast	Fast	Medium	Slow	Very Slow
												Bulkers	
											Reefer	Tankers	
										Container	RO/RO	Log	
Route	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
RS_Anacortes	Arrival	L1	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	Mode:	M		Skagit					
Anacortes_RS	Departure	L1	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	NPE:	Y		Skagit					

NOTE: All ARRIVAL harbor transits branch from AC_A_2

NOTE: All DEPARTURE harbor transits goto AC_D_2

Anacortes_PortDock1	Arrival	L1a	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	AC_B_1	48° 31´ 20´´ N 122° 36´ 29´´ W	0.63	Skagit	0	3	3	3	3
Anacortes_PortDock1	Departure	L1a	AC_B_1	48° 31´ 20´´ N 122° 36´ 29´´ W	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	0.63	Skagit	0	3	3	3	3
Anacortes_PortDock2	Arrival	L1a	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	AC_B_2	48° 31´ 20´´ N 122° 36´ 42´´ W	0.49	Skagit	0	3	3	3	3
Anacortes_PortDock2	Departure	L1a	AC_B_2	48° 31´ 20´´ N 122° 36´ 42´´ W	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	0.49	Skagit	0	3	3	3	3
Anacortes_CurtisWharf	Arrival	L1a	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	AC_B_3	48° 31´ 19´´ N 122° 36´ 54´´ W	0.36	Skagit	0	3	3	3	3
Anacortes_CurtisWharf	Departure	L1a	AC_B_3	48° 31´ 19´´ N 122° 36´ 54´´ W	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	0.36	Skagit	0	3	3	3	3

Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to SEA

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Anacortes_RS	Departure	M	Y	L1	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	2.6	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L2	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	12	11	SS
MarchPT_RS	Departure	X	Y	L3	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	14	10	SS
MarchPT_RS	Departure	X	Y	L4a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	14	11	SS
CherryPT_PA	Departure	T	N	L10	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L15	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	8	8	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS
								Total Distance	107.6 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB3) to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB3_CherryPT	Arrival	T	N	L1	NB3_A_1	49° 00´ 09´´ N 123° 18´ 15´´ W	NB3_A_2	48° 49´ 10´´ N 122° 58´ 12´´ W	17.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L2	NB3_A_2	48° 49´ 10´´ N 122° 58´ 12´´ W	NB3_A_3	48° 45´ 54´´ N 122° 50´ 09´´ W	6.2	Whatcom	0	0	SS	SS	SS
NB3_CherryPT	Arrival	T	N	L3a	NB3_A_3	48° 45´ 54´´ N 122° 50´ 09´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	2.0	San Juan	0	0	17	13	SS
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	M	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	11	8	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	2.6	Skagit	0	0	9	7	6
								Total Distance	46.1	nm					

Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to MARCH POINT

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
DRAFT												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
RS_MarchPT	Arrival	M	Y	L4	MP_A_4	48° 31´ 34´´ N 122° 36´ 40´´ W	MP_A_5	48° 31´ 23´´ N 122° 35´ 00´´ W	1.1	Skagit	0	0	11	9	SS

Total Distance 1.1 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: MARCH POINT to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
														Bulkers	
													Reefer	**Tankers**	
												Container	**RO/RO**	**Log**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
MarchPT_RS	Departure	X	Y	L1	MP_D_1	48° 31´ 23´´ N 122° 35´ 00´´ W	MP_D_2	48° 31´ 34´´ N 122° 36´ 40´´ W	1.1	Skagit	0	0	12	9	SS
								Total Distance	1.1 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Anacortes_RS	Departure	M	Y	L1a	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	2.6	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L2	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	14	11	SS
MarchPT_RS	Departure	T	N	L1	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	15	13	SS
MarchPT_RS	Departure	T	N	L0a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L10	RS_D_10	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_11	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	T	N	L14a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
CPFern_PA	Arrival	X	Y	L1a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.8	Calallam	0	0	10	10	10
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	0	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	0	6	6	6
								Total Distance	40.1	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to SEATTLE

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Anacortes_RS	Departure	M	Y	L1a	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	2.6	Skagit	0	0	10	7	7
MarchPT_RS	Departure	M	Y	L5	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L4	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	1.6	Skagit	0	0	13	10	SS
MarchPT_RS	Departure	X	Y	L3a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_D_15	48° 29´ 33´´ N 122° 44´ 36´´ W	0.8	San Juan	0	0	14	11	SS
CherryPT_PA	Departure	X	Y	L10	RS_D_15	48° 29´ 33´´ N 122° 44´ 36´´ W	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L11a	RS_D_14	48° 28´ 53´´ N 122° 44´ 31´´ W	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	2.8	Skagit	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L1	AA_D_1	48° 26´ 04´´ N 122° 44´ 43´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
PS_ElliottB	Arrival	X	Y	L1a	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	0.4	Kitsap	0	0	13	9	8
PS_ElliottB	Arrival	X	Y	L2	EB_A_2	47° 39´ 21´´ N 122° 28´ 02´´ W	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	1.5	King	0	0	12	8	7
PS_ElliottB	Arrival	M	Y	L3	EB_A_3	47° 38´ 16´´ N 122° 26´ 36´´ W	EB_A_4	47° 36´ 52´´ N 122° 23´ 21´´ W	2.6	King	0	0	11	6	6

Total Distance 65.8 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEATTLE to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Fast Cruise**	**Fast Container Auto**	**Medium Reefer RO/RO Fishing**	**Slow Bulkers Tankers Log Fishing**	**Very Slow Fishing**
ElliottB_PS	Departure	X	Y	L1	EB_D_1	47° 36´ 52´´ N 122° 23´ 21´´ W	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	2.6	King	0	0	9	8	6
ElliottB_PS	Departure	X	Y	L2a	EB_D_2	47° 38´ 22´´ N 122° 26´ 27´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	1.5	King	0	0	SS	SS	7
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	T	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	X	Y	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	X	Y	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	13	10	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	2.6	Skagit	0	0	11	9	SS
								Total Distance	66.4 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	0	10	10	10
PA_CherryPT	Arrival	T	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	X	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
RS_MarchPT	Arrival	X	Y	L1a	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.6	Skagit	0	0	13	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	13	11	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	2.6	Skagit	0	0	10	8	8
								Total Distance	42.5 nm						

Puget Sound Emissions Inventory

OGV-Routing: ANACORTES to CHERRY POINT/FERNDALE

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Anacortes_RS	Departure	M	Y	L1a	AC_D_2	48° 31´ 24´´ N 122° 37´ 26´´ W	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	2.6	Skagit	0	0	11	9	8
MarchPT_RS	Departure	X	Y	L5	MP_D_3	48° 31´ 04´´ N 122° 41´ 17´´ W	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	0.7	Skagit	0	0	12	9	8
Anacortes_CPFrn	Departure	X	Y	L1a	MP_D_4	48° 31´ 00´´ N 122° 42´ 20´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.3	Skagit	0	0	13	10	8
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	11	SS
								Total Distance	19.9 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: CHERRY POINT/FERNDALE to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
CherryPT_PA	Departure	T	N	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	2.6	Skagit	0	0	10	8	8
								Total Distance	19.6 nm						

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to ORCAS ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

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Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	0	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	0	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	0	10	10	10
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L6	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	2.0	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L7	RS_A_7	48° 30´ 01´´ N 122° 44´ 12´´ W	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	1.0	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L8	RS_A_8	48° 31´ 00´´ N 122° 44´ 21´´ W	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	5.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L9	RS_A_9	48° 36´ 04´´ N 122° 45´ 07´´ W	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	2.1	Skagit	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L10	RS_A_10	48° 37´ 59´´ N 122° 43´ 52´´ W	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	2.5	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L11	RS_A_11	48° 40´ 15´´ N 122° 42´ 24´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	0.4	Whatcom	0	0	15	11	SS
PA_CherryPT	Arrival	X	Y	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	12	9	SS
OrcasIS_BuoyYC	Departure	M	Y	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	OC_A_1	48° 44´ 53´´ N 122° 46´ 26´´ W	0.6	Whatcom	0	0	8	6	5
OrcasIS_BuoyYC	Departure	M	Y	L2	OC_A_1	48° 44´ 53´´ N 122° 46´ 26´´ W	OC_AN_1	48° 43´ 02´´ N 122° 48´ 43´´ W	2.4	San Juan	0	0	6	4	4

Total Distance 56.9 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: ORCAS ISLAND to ANACORTES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
														Bulkers	
													Reefer	**Tankers**	
												Container	**RO/RO**	**Log**	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
OrcasIS_BuoyYCA	Departure	M	Y	L1a	OC_AN_1	48° 43´ 02´´ N 122° 48´ 43´´ W	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	2.4	San Juan	0	0	8	6	6
CherryPT_PA	Departure	X	Y	L1	RS_D_2	48° 45´ 16´´ N 122° 47´ 14´´ W	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	5.3	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L2	RS_D_3	48° 40´ 34´´ N 122° 43´ 28´´ W	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L3	RS_D_4	48° 38´ 22´´ N 122° 43´ 58´´ W	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	0.7	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L4	RS_D_5	48° 37´ 43´´ N 122° 44´ 25´´ W	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	1.8	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L5	RS_D_6	48° 36´ 06´´ N 122° 45´ 32´´ W	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	2.2	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L6	RS_D_7	48° 33´ 58´´ N 122° 45´ 14´´ W	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	1.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L7	RS_D_8	48° 32´ 48´´ N 122° 45´ 04´´ W	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	1.1	Skagit	0	0	15	13	SS
CherryPT_MP	Arrival	X	Y	L1a	RS_D_9	48° 31´ 41´´ N 122° 44´ 54´´ W	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	1.8	Skagit	0	0	14	11	SS
RS_MarchPT	Arrival	X	Y	L2	MP_A_2	48° 31´ 00´´ N 122° 42´ 20´´ W	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	0.7	Skagit	0	0	14	11	SS
RS_Anacortes	Arrival	M	Y	L1a	MP_A_3	48° 31´ 04´´ N 122° 41´ 17´´ W	AC_A_2	48° 31´ 24´´ N 122° 37´ 26´´ W	2.6	Skagit	0	0	10	8	8
								Total Distance	22.0	nm					

Puget Sound Emissions Inventory

OGV-Routing: SEA to VENDOVI ISLAND (ANCHORAGE)

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	Fast Container Auto	Medium Reefer RO/RO Fishing	Slow Bulkers Tankers Log Fishing	Very Slow Fishing
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	X	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	T	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	X	Y	L1a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	2.2	Skagit	0	0	12	11	SS
RS_Bellingham	Arrival	X	Y	L2	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	3.7	Skagit	0	0	10	10	SS
RS_Bellingham	Arrival	M	Y	L3	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	2.9	Skagit	0	0	8	6	6
RS_Bellingham	Arrival	M	Y	L4	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	1.5	Skagit	0	0	4	3	3

Total Distance 112.4 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: VENDOVI (ANCHORAGE) to SEA

Lat/Long in WGS84 Datum

DRAFT

Speed by Link (knots)

											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Vendovi_RS	Departure	M	Y	L1a	VI_AN_3	48° 37´ 16´´ N 122° 37´ 59´´ W	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	1.5	Skagit	0	0	6	4	SS
Bellingham_RS	Departure	M	Y	L3	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	2.9	Skagit	0	0	10	9	SS
Bellingham_RS	Departure	X	Y	L2	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	3.7	Skagit	0	0	12	10	SS
Bellingham_RS	Departure	X	Y	L1	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	2.2	Skagit	0	0	14	11	SS
Bellingham_RS	Departure	T	N	L0a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	1.3	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	Y	L13	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L15a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS

Total Distance 111.1 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to BELLINGHAM

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	0	SS	SS	SS
Sea_Tacoma	Arrival	X	N	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	0	15	12	SS
Sea_Tacoma	Arrival	M	N	L5	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.6	Calallam	0	0	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	0	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	0	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	8.3	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L4	RS_A_4	48° 24´ 06´´ N 122° 47´ 16´´ W	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	2.7	San Juan	0	0	15	11	SS
PA_CherryPT	Arrival	T	N	L5	RS_A_5	48° 26´ 13´´ N 122° 44´ 47´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	1.9	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	T	N	L1a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	2.2	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	T	N	L2	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	3.7	Skagit	0	0	15	10	SS
RS_Bellingham	Arrival	T	N	L3	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	2.9	Skagit	0	0	15	10	SS
RS_Bellingham	Arrival	T	N	L4	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	BH_A_5	48° 38´ 22´´ N 122° 34´ 18´´ W	4.1	Skagit	0	0	13	10	SS
RS_Bellingham	Arrival	X	Y	L5	BH_A_5	48° 38´ 22´´ N 122° 34´ 18´´ W	BH_A_6	48° 38´ 43´´ N 122° 34´ 10´´ W	0.4	Skagit	0	0	13	10	SS
RS_Bellingham	Arrival	M	Y	L6	BH_A_6	48° 38´ 43´´ N 122° 34´ 10´´ W	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	4.2	Whatcom	0	0	10	8	6
								Total Distance	119.5	nm	Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: BELLINGHAM HARBOR

Lat/Long in WGS84 Datum

DRAFT

									Speed by Link (knots)				
									Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
RS_Bellingham	Arrival		BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	Mode:	M		Whatcom					
Bellingham_RS	Departure		BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	NPE:	Y		Whatcom					
NOTE: All ARRIVAL harbor transits branch from BH_A_7													
NOTE: All DEPARTURE harbor transits goto BH_D_7													
Bellingham_PortDock1	Arrival	L1a	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BP_B_1	48° 42´ 46´´ N 122° 32´ 44´´ W	2.88	Whatcom	0	3	3	3	3
Bellingham_PortDock1	Departure	L1a	BP_B_1	48° 42´ 46´´ N 122° 32´ 44´´ W	BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	2.88	Whatcom	0	5	5	5	5
Bellingham_PortDock2	Arrival	L1a	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BP_B_2	48° 42´ 46´´ N 122° 32´ 43´´ W	3.24	Whatcom	0	3.5	3.5	3.5	3.5
Bellingham_PortDock2	Departure	L1a	BP_B_2	48° 42´ 46´´ N 122° 32´ 43´´ W	BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	3.24	Whatcom	0	6	6	6	6
Bellingham_ColdStorage	Arrival	L1a	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BH_A_8	48° 44´ 45´´ N 122° 31´ 16´´ W	2.21	Whatcom	0	4	4	4	4
Bellingham_ColdStorage	Arrival	L2	BH_A_8	48° 44´ 45´´ N 122° 31´ 16´´ W	BH_B_3	48° 45´ 32´´ N 122° 30´ 42´´ W	0.86	Whatcom	0	3	3	3	3
Bellingham_ColdStorage	Departure	L2	BH_B_3	48° 45´ 32´´ N 122° 30´ 42´´ W	BH_A_8	48° 44´ 45´´ N 122° 31´ 16´´ W	0.86	Whatcom	0	3	3	3	3
Bellingham_ColdStorage	Departure	L1a	BH_A_8	48° 44´ 45´´ N 122° 31´ 16´´ W	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	2.21	Whatcom	0	6	6	6	6
Bellingham_Anchorage	Arrival	L1a	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BP_B_4	48° 44´ 18´´ N 122° 32´ 27´´ W	1.53	Whatcom	0	3	3	3	3
Bellingham_Anchorage	Departure	L1a	BP_B_4	48° 44´ 18´´ N 122° 32´ 27´´ W	BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	1.53	Whatcom	0	4	4	4	4

Puget Sound Emissions Inventory

OGV-Routing: BELLINGHAM to SEA

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Bellingham_RS	Departure	M	Y	L6	BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BH_D_6	48° 38´ 43´´ N 122° 34´ 10´´ W	4.2	Whatcom	0	0	10	8	6
Bellingham_RS	Departure	X	Y	L5	BH_D_6	48° 38´ 43´´ N 122° 34´ 10´´ W	BH_D_5	48° 38´ 22´´ N 122° 34´ 18´´ W	0.4	Skagit	0	0	11	9	SS
Bellingham_RS	Departure	X	Y	L4	BH_D_5	48° 38´ 22´´ N 122° 34´ 18´´ W	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	4.1	Skagit	0	0	14	12	SS
Bellingham_RS	Departure	T	N	L3	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	2.9	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L2	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	3.7	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L1a	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	2.2	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L0a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	1.3	Skagit	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L12	RS_D_12	48° 27´ 12´´ N 122° 45´ 18´´ W	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	1.1	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L13	RS_D_13	48° 26´ 10´´ N 122° 45´ 48´´ W	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	2.2	San Juan	0	0	15	13	SS
CherryPT_PA	Departure	T	N	L14	RS_D_14	48° 24´ 37´´ N 122° 48´ 09´´ W	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	8.1	San Juan	0	0	SS	SS	SS
CherryPT_PA	Departure	X	N	L15a	RS_D_15	48° 20´ 13´´ N 122° 58´ 21´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	M	N	L27	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	0.8	Calallam	0	0	8	8	8
Tacoma_Sea	Departure	X	N	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	0	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	0	SS	SS	SS

Total Distance 118.2 nm

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: BELLINGHAM to VANCOUVER (NB3)

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Bellingham_RS	Departure	M	Y	L6	BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BH_D_6	48° 38´ 43´´ N 122° 34´ 10´´ W	4.2	Whatcom	0	0	10	8	6
Bellingham_RS	Departure	M	Y	L5	BH_D_6	48° 38´ 43´´ N 122° 34´ 10´´ W	BH_D_5	48° 38´ 22´´ N 122° 34´ 18´´ W	0.4	Skagit	0	0	11	9	SS
Bellingham_RS	Departure	X	Y	L4a	BH_D_5	48° 38´ 22´´ N 122° 34´ 18´´ W	LI_D_1	48° 37´ 15´´ N 122° 38´ 00´´ W	2.7	Skagit	0	0	14	12	SS
Vendovi_GStght	Departure	T	N	L1	LI_D_1	48° 37´ 15´´ N 122° 38´ 00´´ W	LI_D_2	48° 38´ 43´´ N 122° 39´ 49´´ W	1.9	Skagit	0	0	10	12	SS
Vendovi_GStght	Departure	T	N	L2a	LI_D_2	48° 38´ 43´´ N 122° 39´ 49´´ W	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	2.4	Whatcom	0	0	12	12	SS
PA_CherryPT	Arrival	T	N	L12	RS_A_12	48° 40´ 35´´ N 122° 42´ 10´´ W	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	5.3	Whatcom	0	0	15	12	SS
BuoyYCA_NB3	Departure	T	N	L1a	RS_A_13	48° 45´ 17´´ N 122° 45´ 50´´ W	SG_D_1	48° 47´ 27´´ N 122° 51´ 18´´ W	4.2	Whatcom	0	0	17	13	SS
BuoyYCA_NB3	Departure	T	N	L2	SG_D_1	48° 47´ 27´´ N 122° 51´ 18´´ W	SG_D_2	49° 00´ 09´´ N 123° 14´ 09´´ W	19.7	Whatcom	0	0	SS	SS	SS
								Total Distance	40.7 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: BELLINGHAM to TACOMA

Lat/Long in WGS84 Datum

DRAFT

Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots) Fast Cruise	 Fast Container Auto	 Medium Reefer RO/RO Fishing	 Slow Bulkers Tankers Log Fishing	 Very Slow Fishing
Bellingham_RS	Departure	M	Y	L6	BH_D_7	48° 42´ 46´´ N 122° 32´ 43´´ W	BH_D_6	48° 38´ 43´´ N 122° 34´ 10´´ W	4.2	Whatcom	0	0	10	8	6
Bellingham_RS	Departure	X	Y	L5	BH_D_6	48° 38´ 43´´ N 122° 34´ 10´´ W	BH_D_5	48° 38´ 22´´ N 122° 34´ 18´´ W	0.4	Skagit	0	0	11	9	SS
Bellingham_RS	Departure	X	Y	L4	BH_D_5	48° 38´ 22´´ N 122° 34´ 18´´ W	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	4.1	Skagit	0	0	14	12	SS
Bellingham_RS	Departure	T	N	L3	BH_D_4	48° 36´ 07´´ N 122° 39´ 29´´ W	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	2.9	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L2	BH_D_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	3.7	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L1	BH_D_2	48° 30´ 09´´ N 122° 43´ 05´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	2.2	Skagit	0	0	15	13	SS
Bellingham_RS	Departure	T	N	L0a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	1.9	San Juan	0	0	15	13	SS
Anacortes_Admr	Departure	T	N	L2	AA_D_2	48° 24´ 08´´ N 122° 44´ 50´´ W	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	1.8	San Juan	0	0	16	13	SS
Anacortes_Admr	Departure	T	N	L3	AA_D_3	48° 22´ 25´´ N 122° 45´ 34´´ W	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	9.3	Island	0	0	17	13	SS
Anacortes_Admr	Departure	T	N	L4	AA_D_4	48° 13´ 29´´ N 122° 49´ 22´´ W	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	2.1	Island	0	0	SS	SS	SS
Anacortes_Admr	Departure	T	N	L5a	AA_D_5	48° 11´ 32´´ N 122° 48´ 21´´ W	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	0.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L9	PS_A_9	48° 10´ 57´´ N 122° 48´ 01´´ W	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	6.8	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L10	PS_A_10	48° 06´ 35´´ N 122° 40´ 10´´ W	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	5.6	Jefferson	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L11	PS_A_11	48° 01´ 08´´ N 122° 38´ 08´´ W	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	4.0	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L12	PS_A_12	47° 57´ 41´´ N 122° 35´ 10´´ W	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	1.8	Island	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L13	PS_A_13	47° 56´ 38´´ N 122° 32´ 57´´ W	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	2.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L14	PS_A_14	47° 55´ 17´´ N 122° 30´ 06´´ W	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	9.7	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L15	PS_A_15	47° 45´ 54´´ N 122° 26´ 45´´ W	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	6.3	Kitsap	0	0	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L16	PS_A_16	47° 39´ 42´´ N 122° 28´ 24´´ W	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	5.2	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L17	PS_A_17	47° 34´ 32´´ N 122° 27´ 32´´ W	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	2.8	Kitsap	0	0	16	13	SS
Sea_Tacoma	Arrival	T	N	L18	PS_A_18	47° 31´ 51´´ N 122° 26´ 34´´ W	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	5.3	King	0	0	16	13	SS
Sea_Tacoma	Arrival	X	Y	L19	PS_A_19	47° 26´ 44´´ N 122° 24´ 45´´ W	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	4.1	King	0	0	17	13	SS
Sea_Tacoma	Arrival	X	Y	L20	PS_A_20	47° 23´ 09´´ N 122° 21´ 56´´ W	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	5.3	King	0	0	13	12	SS
Sea_Tacoma	Arrival	M	Y	L21	PS_A_21	47° 19´ 39´´ N 122° 27´ 52´´ W	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	0.5	King	0	0	10	10	9
Sea_Tacoma	Arrival	M	Y	L22	PS_A_22	47° 19´ 10´´ N 122° 28´ 05´´ W	PS_A_23	47° 18´ 07´´ N 122° 27´ 41´´ W	1.1	Pierce	0	0	10	10	8

Total Distance 93.9 nm

Note: SS - Service Speed

Note: Red numbers - engines off

Puget Sound Emissions Inventory

OGV-Routing: TACOMA to BELLINGHAM

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
														Bulkers	
													Reefer	Tankers	
												Container	RO/RO	Log	
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
Tacoma_Sea	Departure	M	Y	L2	PS_D_2	47° 18´ 07´´ N 122° 27´ 41´´ W	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	1.3	Pierce	0	0	10	10	9
Tacoma_Sea	Departure	X	Y	L3	PS_D_3	47° 19´ 20´´ N 122° 27´ 02´´ W	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	0.9	Pierce	0	0	12	12	SS
Tacoma_Sea	Departure	X	Y	L4	PS_D_4	47° 19´ 54´´ N 122° 26´ 03´´ W	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	4.8	King	0	0	14	SS	SS
Tacoma_Sea	Departure	X	Y	L5	PS_D_5	47° 23´ 04´´ N 122° 20´ 40´´ W	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	4.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L6	PS_D_6	47° 26´ 56´´ N 122° 23´ 43´´ W	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	7.8	King	0	0	15	SS	SS
Tacoma_Sea	Departure	T	N	L7	PS_D_7	47° 34´ 32´´ N 122° 26´ 30´´ W	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	1.4	King	0	0	16	SS	SS
Tacoma_Sea	Departure	T	N	L8	PS_D_8	47° 35´ 55´´ N 122° 26´ 45´´ W	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	1.1	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L9	PS_D_9	47° 37´ 02´´ N 122° 26´ 56´´ W	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	2.7	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L10	PS_D_10	47° 39´ 42´´ N 122° 27´ 25´´ W	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	2.3	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L11	PS_D_11	47° 41´ 54´´ N 122° 26´ 47´´ W	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	4.0	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L12	PS_D_12	47° 45´ 52´´ N 122° 25´ 49´´ W	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	0.8	King	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L13	PS_D_13	47° 46´ 40´´ N 122° 26´ 04´´ W	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	1.5	Snohomish	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L14	PS_D_14	47° 48´ 06´´ N 122° 26´ 29´´ W	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	4.6	Kitsap	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L15	PS_D_15	47° 52´ 36´´ N 122° 28´ 08´´ W	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	3.1	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L16	PS_D_16	47° 55´ 34´´ N 122° 29´ 11´´ W	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	2.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L17	PS_D_17	47° 57´ 01´´ N 122° 32´ 03´´ W	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	1.9	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L18	PS_D_18	47° 58´ 07´´ N 122° 34´ 19´´ W	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	4.5	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L19	PS_D_19	48° 02´ 01´´ N 122° 37´ 40´´ W	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	2.8	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L20	PS_D_20	48° 04´ 48´´ N 122° 38´ 31´´ W	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	2.2	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L21	PS_D_21	48° 06´ 58´´ N 122° 39´ 13´´ W	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	1.3	Jefferson	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L22	PS_D_22	48° 07´ 51´´ N 122° 40´ 43´´ W	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	5.3	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L23	PS_D_23	48° 11´ 20´´ N 122° 46´ 47´´ W	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	1.4	Island	0	0	SS	SS	SS
Tacoma_Sea	Departure	T	N	L24a	PS_D_24	48° 11´ 44´´ N 122° 48´ 45´´ W	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	2.2	Island	0	0	SS	SS	SS
Admr_Anacortes	Arrival	X	N	L1	AA_A_1	48° 13´ 14´´ N 122° 48´ 23´´ W	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	11.3	Island	0	0	18	SS	SS
Admr_Anacortes	Arrival	T	N	L2	AA_A_2	48° 24´ 06´´ N 122° 43´ 42´´ W	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	0.7	Island	0	0	16	12	SS
Admr_Anacortes	Arrival	T	N	L3a	AA_A_3	48° 24´ 50´´ N 122° 43´ 44´´ W	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	3.2	Skagit	0	0	15	11	SS
RS_Bellingham	Arrival	T	N	L1a	RS_A_6	48° 28´ 00´´ N 122° 43´ 53´´ W	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	2.2	Skagit	0	0	14	11	SS
RS_Bellingham	Arrival	T	N	L2	BH_A_2	48° 30´ 09´´ N 122° 43´ 05´´ W	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	3.7	Skagit	0	0	14	10	SS
RS_Bellingham	Arrival	T	N	L3	BH_A_3	48° 33´ 12´´ N 122° 39´ 48´´ W	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	2.9	Skagit	0	0	14	10	SS
RS_Bellingham	Arrival	T	N	L4	BH_A_4	48° 36´ 07´´ N 122° 39´ 29´´ W	BH_A_5	48° 38´ 22´´ N 122° 34´ 18´´ W	4.1	Skagit	0	0	14	10	SS
RS_Bellingham	Arrival	X	Y	L5	BH_A_5	48° 38´ 22´´ N 122° 34´ 18´´ W	BH_A_6	48° 38´ 43´´ N 122° 34´ 10´´ W	0.4	Skagit	0	0	12	10	SS
RS_Bellingham	Arrival	M	Y	L6	BH_A_6	48° 38´ 43´´ N 122° 34´ 10´´ W	BH_A_7	48° 42´ 46´´ N 122° 32´ 43´´ W	4.2	Whatcom	0	0	10	8	6
								Total Distance	97.4 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES to VANCOUVER (NB2)

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	6	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	8	8	8	8
PortAngeles_Sea	Departure	M	Y	L3a	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	0.5	Calallam	0	8	8	8	8
PA_CherryPT	Arrival	X	N	L1a	PS_A_6	48° 09´ 58´´ N 123° 23´ 25´´ W	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	13.1	Calallam	0	20	15	13.5	SS
PA_CherryPT	Arrival	T	N	L2	RS_A_2	48° 16´ 08´´ N 123° 06´ 08´´ W	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	6.6	San Juan	0	21	15	13	SS
PA_CherryPT	Arrival	T	N	L3	RS_A_3	48° 19´ 40´´ N 122° 57´ 50´´ W	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	8.3	San Juan	0	20	15	13	SS
AI_NB2	Departure	T	N	L3	AD_D_3	48° 19´ 51´´ N 122° 58´ 00´´ W	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	5.1	San Juan	0	22	SS	SS	SS
AI_NB2	Departure	T	N	L4	AD_D_4	48° 24´ 17´´ N 123° 01´ 52´´ W	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	7.3	San Juan	0	22	SS	SS	SS
AI_NB2	Departure	T	N	L5	AD_D_5	48° 29´ 18´´ N 123° 09´ 56´´ W	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	5.8	San Juan	0	22	SS	SS	SS
AI_NB2	Departure	X	N	L6	AD_D_6	48° 34´ 47´´ N 123° 12´ 43´´ W	AD_D_7	48° 40´ 00´´ N 123° 14´ 28´´ W	5.4	San Juan	0	18	16	11	SS
								Total Distance	54.7	nm					

Puget Sound Emissions Inventory

OGV-Routing: VANCOUVER (NB2) to PORT ANGELES

Lat/Long in WGS84 Datum

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
NB2_AI	Arrival	T	N	L1	AD_A_1	48° 40´ 00´´ N 123° 15´ 30´´ W	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	5.2	San Juan	0	18	16	SS	SS
NB2_AI	Arrival	T	N	L2	AD_A_2	48° 34´ 56´´ N 123° 13´ 51´´ W	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	5.9	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L3	AD_A_3	48° 29´ 20´´ N 123° 10´ 55´´ W	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	2.4	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L4	AD_A_4	48° 27´ 27´´ N 123° 08´ 35´´ W	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	3.6	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L5	AD_A_5	48° 25´ 07´´ N 123° 04´ 29´´ W	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	3.3	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	T	N	L6	AD_A_6	48° 22´ 36´´ N 123° 01´ 23´´ W	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	2.9	San Juan	0	22	SS	SS	SS
NB2_AI	Arrival	X	N	L7a	AD_A_7	48° 20´ 00´´ N 122° 59´ 29´´ W	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	19.0	Calallam	0	16	14	13	11
CPFern_PA	Arrival	X	Y	L1a	PS_D_27	48° 10´ 33´´ N 123° 23´ 03´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.8	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	6	6	6	6
								Total Distance	45.7	nm					

Note: SS - Service Speed

Puget Sound Emissions Inventory

OGV-Routing: SEA to PORT ANGELES

Lat/Long in WGS84 Datum

DRAFT

											Speed by Link (knots)				
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
Route	**Arr/Dep**	**Mode**	**NPE**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Container Auto**	**Reefer RO/RO Fishing**	**Bulkers Tankers Log Fishing**	**Fishing**
Sea_Tacoma	Arrival	T	N	L1	PS_A_1	48° 28´ 30´´ N 125° 00´ 02´´ W	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	10.7	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L2	PS_A_2	48° 28´ 38´´ N 124° 43´ 51´´ W	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	35.9	Calallam	0	SS	SS	SS	SS
Sea_Tacoma	Arrival	T	N	L3	PS_A_3	48° 13´ 22´´ N 123° 55´ 03´´ W	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	15.4	Calallam	0	20	SS	SS	SS
Sea_Tacoma	Arrival	X	Y	L4	PS_A_4	48° 13´ 20´´ N 123° 31´ 59´´ W	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	6.9	Calallam	0	16	15	12	SS
Sea_PortAngeles	Arrival	M	Y	L1a	PS_A_5	48° 09´ 20´´ N 123° 23´ 28´´ W	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	0.4	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L1	PA_A_2	48° 09´ 45´´ N 123° 23´ 25´´ W	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	1.6	Calallam	0	8	8	8	8
Sea_PortAngeles	Arrival	M	Y	L2	PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	1.0	Calallam	0	6	6	6	6
								Total Distance	71.8 nm		Note: SS - Service Speed				

Puget Sound Emissions Inventory

OGV-Routing: PORT ANGELES HARBOR

Lat/Long in WGS84 Datum

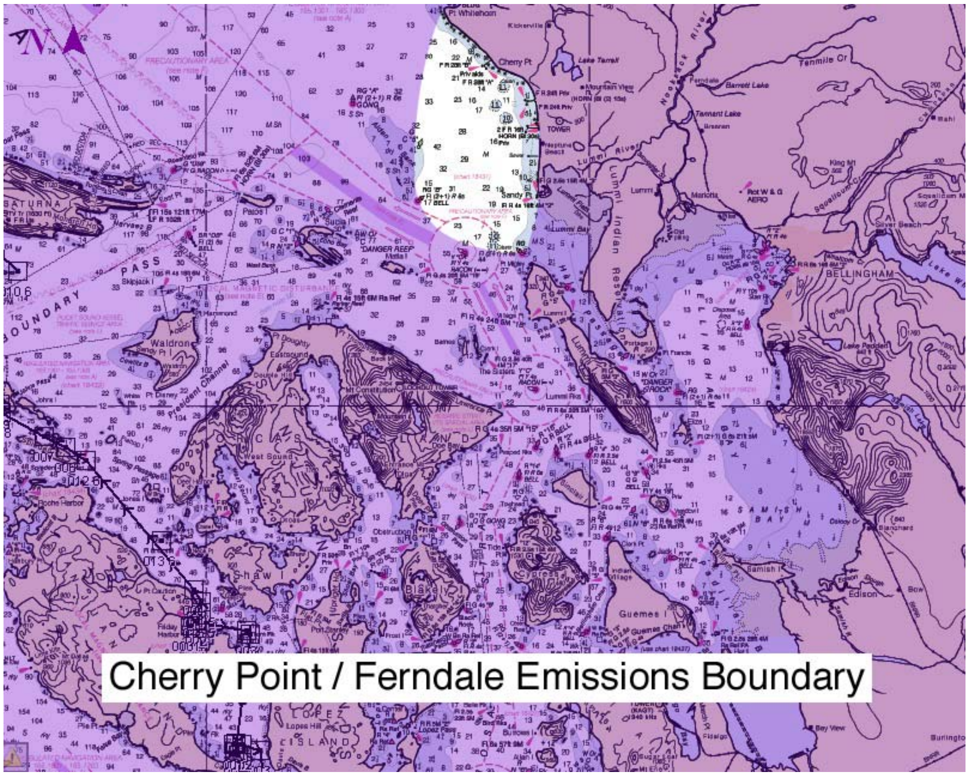
													Speed by Link (knots)		
											Fast	**Fast**	**Medium**	**Slow**	**Very Slow**
														Bulkers	
													Reefer	**Tankers**	
												Container	**RO/RO**	**Log**	
Route	**To_Port**	**To_Pier**	**Arr/Dep**	**Link ID**	**Start WP**	**Starting WP Lat/Lon**	**End WP**	**Ending Waypoint Lat/Lon**	**Dist.**	**County**	**Cruise**	**Auto**	**Fishing**	**Fishing**	**Fishing**
Sea_PortAngeles	PORT ANGELES		Arrival		PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	Mode:	M		Calallam					
PortAngeles_Sea	PORT ANGELES		Departure		PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	NPE:	Y		Calallam					
NOTE: All ARRIVAL harbor transits branch from PA_A_4															
NOTE: All DEPARTURE harbor transits goto PA_D_1															
PortAngeles_1-North	PORT ANGELES	1-NORTH	Arrival	L1a	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_B_1	48° 07´ 57´´ N 123° 27´ 37´´ W	2.55	Calallam	3	3	3	3	3
1-North_PortAngeles	PORT ANGELES	1-NORTH	Departure	L1a	PA_B_1	48° 07´ 57´´ N 123° 27´ 37´´ W	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	2.55	Calallam	4	4	4	4	4
PortAngeles_Tesoro	PORT ANGELES	TESORO	Arrival	L1a	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_B_2	48° 07´ 45´´ N 123° 27´ 24´´ W	2.41	Calallam	3	3	3	3	3
Tesoro_PortAngeles	PORT ANGELES	TESORO	Departure	L1a	PA_B_2	48° 07´ 45´´ N 123° 27´ 24´´ W	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	2.41	Calallam	4	4	4	4	4
PortAngeles_Tesoro	PORT ANGELES	CITY DOCK	Arrival	L1a	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_B_3	48° 07´ 31´´ N 123° 26´ 37´´ W	1.93	Calallam	3	3	3	3	3
Tesoro_PortAngeles	PORT ANGELES	CITY DOCK	Departure	L1a	PA_B_3	48° 07´ 45´´ N 122° 27´ 24´´ W	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	1.93	Calallam	4	4	4	4	4
PortAngeles_Tesoro	PORT ANGELES	T PIER	Arrival	L1a	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_B_4	48° 07´ 31´´ N 123° 26´ 27´´ W	1.83	Calallam	3	3	3	3	3
Tesoro_PortAngeles	PORT ANGELES	T PIER	Departure	L1a	PA_B_4	48° 07´ 31´´ N 123° 26´ 27´´ W	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	1.83	Calallam	4	4	4	4	4
Sea_PortAngeles	PORT ANGELES		Arrival		PA_A_3	48° 08´ 21´´ N 123° 22´ 25´´ W	Mode:	M		Calallam					
PortAngeles_Sea	PORT ANGELES		Departure		PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	NPE:	Y		Calallam					
NOTE: All ANCHORAGE ARRIVAL harbor transits branch from PA_A_3															
NOTE: All ANCHORAGE DEPARTURE harbor transits goto PA_D_2															
PortAngeles_Tesoro	PORT ANGELES	ANCHORAGE	Arrival	L1a	PA_A_4	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_B_5	48° 08´ 21´´ N 123° 22´ 25´´ W	0.79	Calallam	2	2	2	2	2
Tesoro_PortAngeles	PORT ANGELES	ANCHORAGE	Departure	L1a	PA_B_5	48° 08´ 21´´ N 123° 22´ 25´´ W	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	0.53	Calallam	4	4	4	4	4

Puget Sound Emissions Inventory

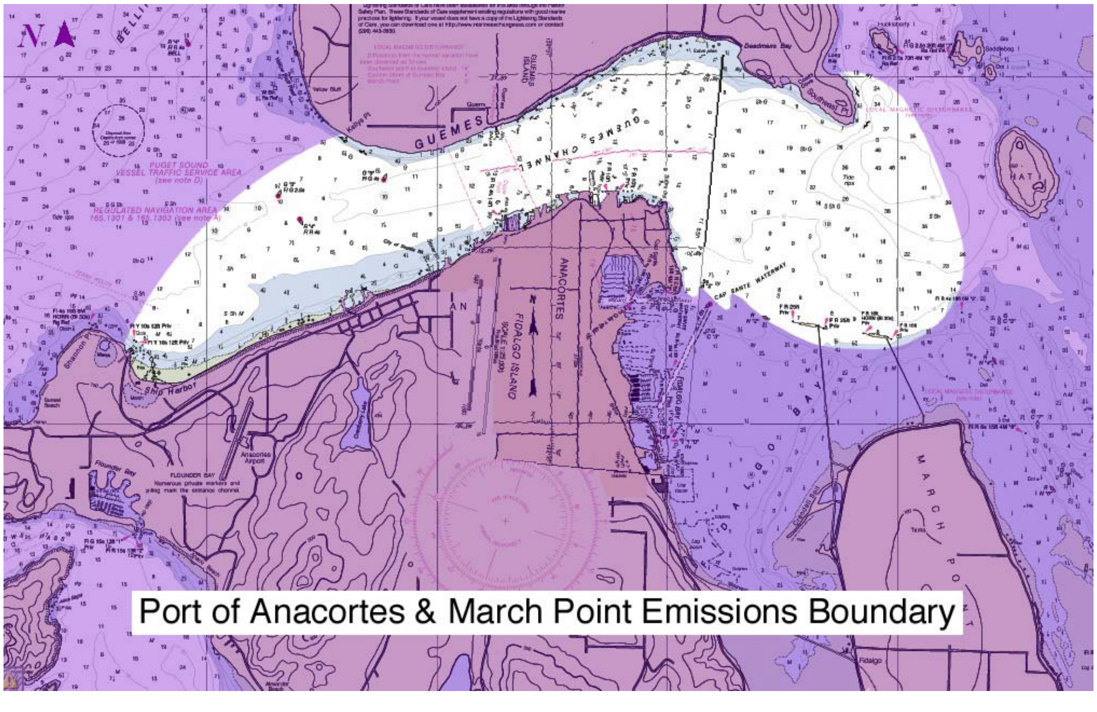
OGV-Routing: PORT ANGELES to SEA

Lat/Long in WGS84 Datum

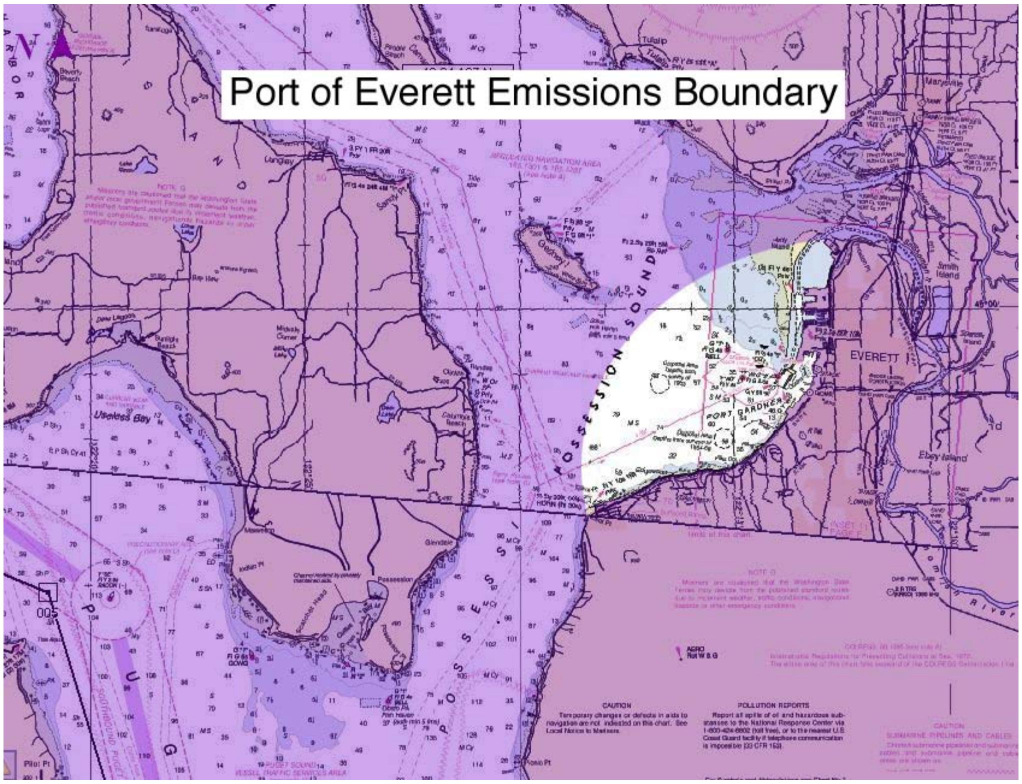
Route	Arr/Dep	Mode	NPE	Link ID	Start WP	Starting WP Lat/Lon	End WP	Ending Waypoint Lat/Lon	Dist.	County	Speed by Link (knots)				
											Fast	Fast	Medium	Slow	Very Slow
											Cruise	Container Auto	Reefer RO/RO Fishing	Bulkers Tankers Log Fishing	Fishing
PortAngeles_Sea	Departure	M	Y	L1	PA_D_1	48° 08´ 00´´ N 123° 23´ 48´´ W	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	1.2	Calallam	0	6	6	6	6
PortAngeles_Sea	Departure	M	Y	L2	PA_D_2	48° 08´ 18´´ N 123° 22´ 00´´ W	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	1.5	Calallam	0	8	8	8	8
PortAngeles_Sea	Departure	M	Y	L3	PA_D_3	48° 09´ 36´´ N 123° 23´ 01´´ W	PA_D_4	48° 11´ 21´´ N 123° 23´ 02´´ W	1.8	Calallam	0	8	8	8	8
Tacoma_Sea	Departure	X	Y	L28	PS_D_28	48° 11´ 21´´ N 123° 23´ 02´´ W	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	4.9	Calallam	0	15	14	12	SS
Tacoma_Sea	Departure	T	N	L29	PS_D_29	48° 14´ 13´´ N 123° 28´ 57´´ W	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	3.1	Calallam	0	19	SS	SS	SS
Tacoma_Sea	Departure	T	N	L30	PS_D_30	48° 15´ 21´´ N 123° 33´ 17´´ W	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	15.4	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L31	PS_D_31	48° 17´ 36´´ N 123° 56´ 06´´ W	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	34.1	Calallam	0	SS	SS	SS	SS
Tacoma_Sea	Departure	T	N	L32	PS_D_32	48° 30´ 38´´ N 124° 43´ 36´´ W	PS_D_33	48° 30´ 43´´ N 125° 00´ 00´´ W	10.9	Calallam	0	SS	SS	SS	SS
								Total Distance	72.8 nm		Note: SS - Service Speed				

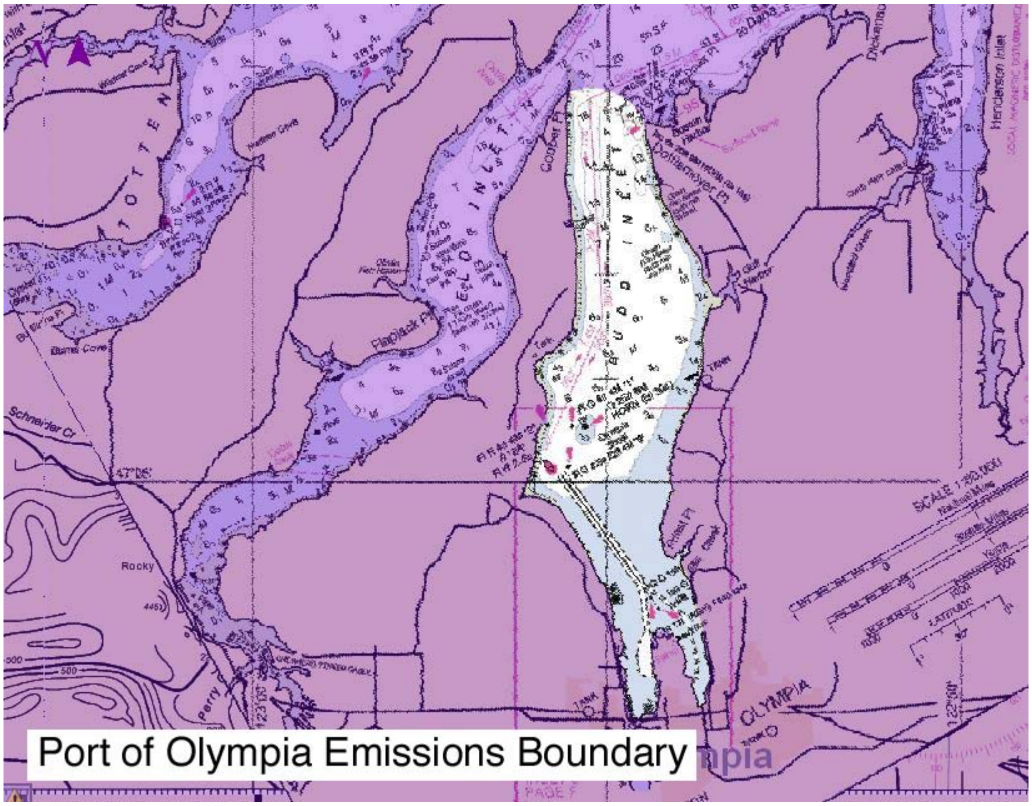


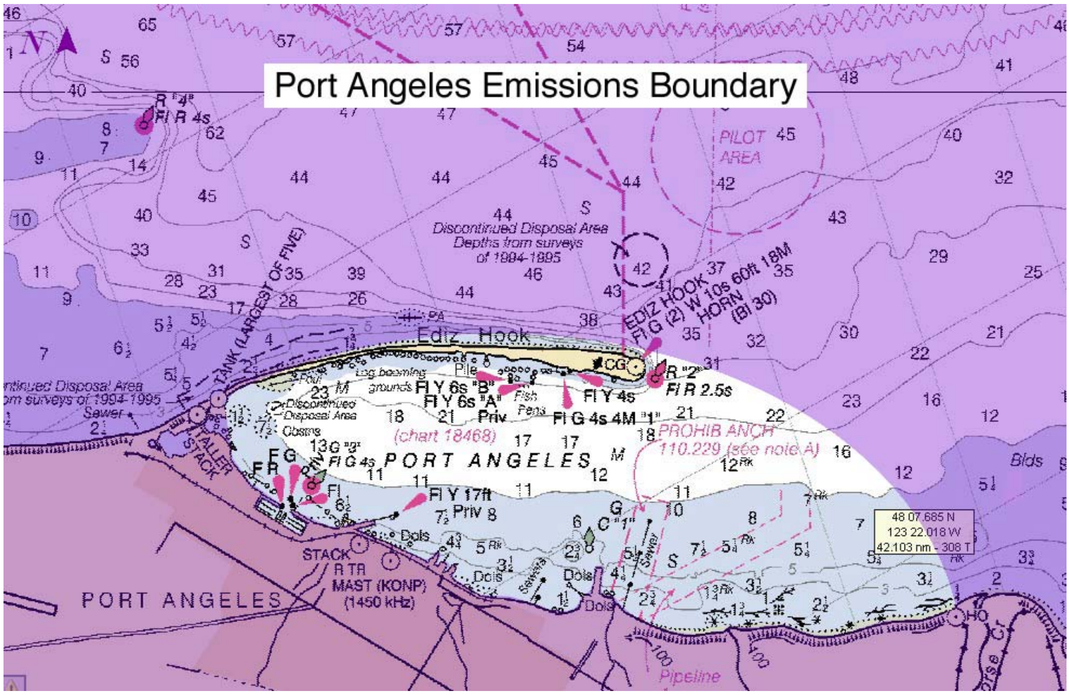
Cherry Point / Ferndale Emissions Boundary

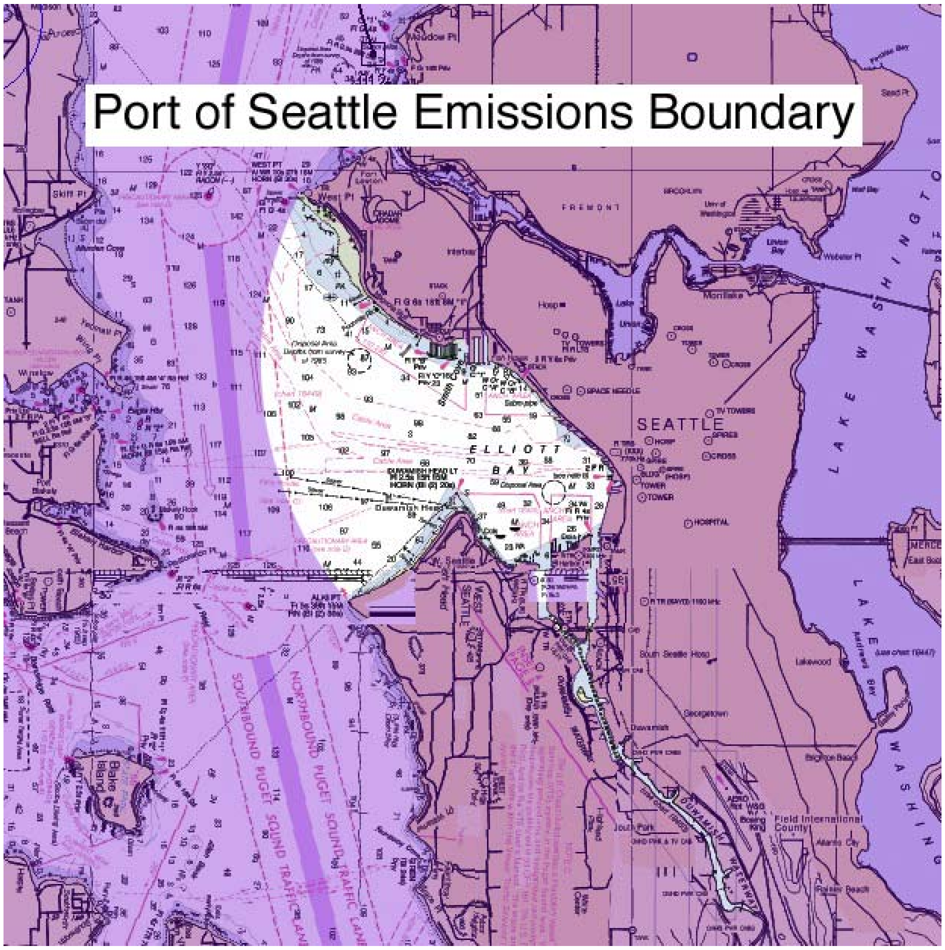


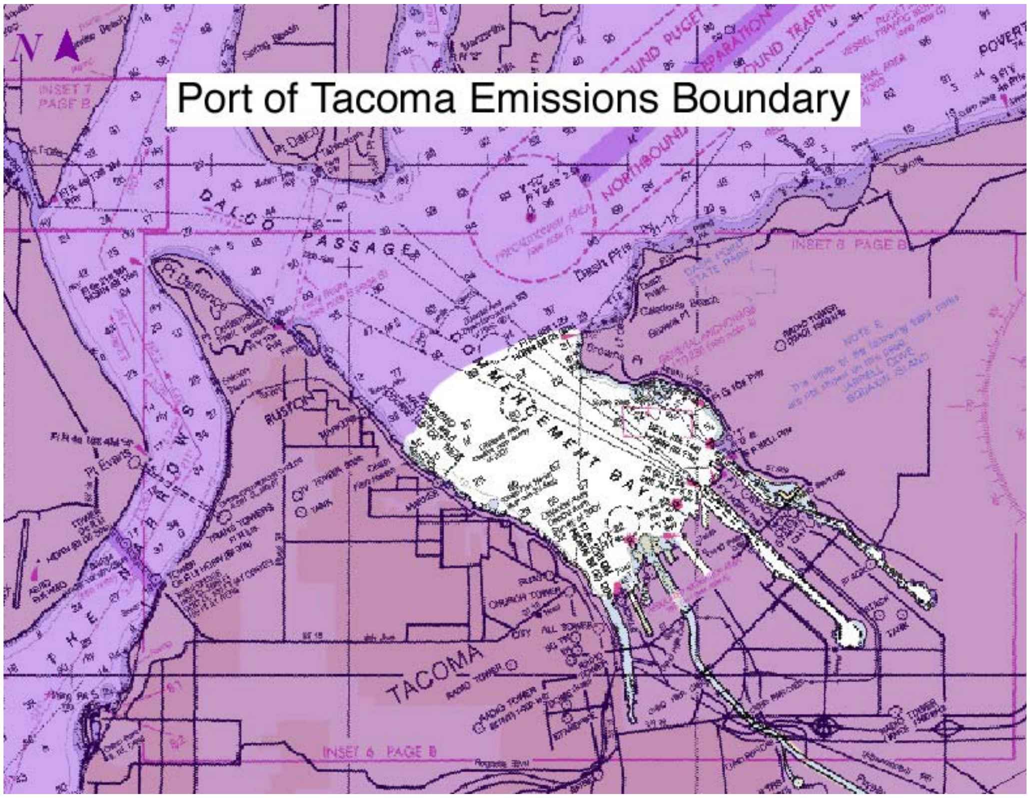
Port of Anacortes & March Point Emissions Boundary


Port of Everett Emissions Boundary


Port of Olympia Emissions Boundary


Port Angeles Emissions Boundary
N
R "4"
Fl R 4s
PILOT AREA
Discontinued Disposal Area
Depths from surveys
of 1994-1995
TANK (LARGEST OF FIVE)
Ediz Hook
EDIZ HOOK
Fl G (2) W 10s 60ft 18M
HORN
(Bl 30)
CG
R "2"
Fl R 2.5s
Log booming grounds
Fl Y 6s "B"
Fl Y 6s "A"
Priv
Fish Pens
Fl Y 4s
Fl G 4s 4M "1"
Discontinued Disposal Area
Obstns
(chart 18468)
PROHIB ANCH
110.229 (see note A)
G "3"
Fl G 4s
PORT ANGELES
F G
F R
Fl
Fl Y 17ft
Priv
TALLER STACK
STACK
R TR
MAST (KONP)
(1450 kHz)
Dols
Sewer
G
C "1"
PORT ANGELES
48 07.685 N
123 22.018 W
42.103 nm - 308 T
Bldg
Pipeline


Port of Seattle Emissions Boundary
WEST PT
West Pt
FREMONT
Univ of Washington
Union Bay
Montlake
Hosp
Lake Union
SPACE NEEDLE
SEATTLE
ELLIOTT
BAY
DUWAMISH HEAD LT
Duwamish Head
Disposal Area
Cable Area
ALKI PT
Blake Island
SOUTHBOUND PUGET SOUND TRAFFIC LANE
NORTHBOUND PUGET SOUND TRAFFIC LANE
WEST SEATTLE
South Seattle
Georgetown
Duwamish
South Park
Boeing Field International County
LAKE WASHINGTON
Lakewood
Seward Park


Port of Tacoma Emissions Boundary
N
INSET 7 PAGE B
Pt Dalco
DALCO PASSAGE
Pt Defiance
RUSTON
COMMENCEMENT BAY
Browns Pt
Dash Pt
INSET 6 PAGE B
TACOMA

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
503101	Assist & Escort	1	Propulsion	CAT	D-379	1966	Offroad Diesel (EPA)	650	485	Tier 0-Cat 1	822
503101	Assist & Escort	2	Propulsion	CAT	D-379	1966	Offroad Diesel (EPA)	650	485	Tier 0-Cat 1	822
503101	Assist & Escort	3	Auxiliary	CAT	D-311	1966	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	1469
503101	Assist & Escort	4	Auxiliary	CAT	D-311	1966	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	342
524820	Assist & Escort	1	Propulsion	CAT	3516	1970	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	3131
524820	Assist & Escort	2	Propulsion	CAT	3516	1970	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	3131
524820	Assist & Escort	3	Auxiliary	GM Detroit	671	1970	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	2569
524820	Assist & Escort	4	Auxiliary	GM Detroit	671	1970	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	3669
527806	Assist & Escort	1	Propulsion	CAT	D-399	1970	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	4053
527806	Assist & Escort	2	Propulsion	CAT	D-399	1970	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	4053
527806	Assist & Escort	3	Auxiliary	CAT	D-3304	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	4138
527806	Assist & Escort	4	Auxiliary	CAT	D-3304	1970	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	4146
573848	Assist & Escort	1	Propulsion	GM EMD	12-645-E6	1976	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 2	2985
573848	Assist & Escort	2	Propulsion	GM EMD	12-645-E6	1976	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 2	2985
573848	Assist & Escort	3	Auxiliary	GM Detroit	671	1976	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	3817
573848	Assist & Escort	4	Auxiliary	GM Detroit	671	1976	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	4448
578655	Assist & Escort	1	Propulsion	EMD	20-645-E5	1977	Offroad Diesel (EPA)	3600	2686	Tier 0-Cat 2	2600
578655	Assist & Escort	2	Propulsion	EMD	20-645-E5	1977	Offroad Diesel (EPA)	3600	2686	Tier 0-Cat 2	2600
578655	Assist & Escort	3	Auxiliary	CAT	3304	1977	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
578655	Assist & Escort	4	Auxiliary	CAT	3304	1977	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
623866	Assist & Escort	1	Propulsion	CAT	D-398	1980	Offroad Diesel (EPA)	1150	858	Tier 0-Cat 1	4113
623866	Assist & Escort	2	Propulsion	CAT	D-398	1980	Offroad Diesel (EPA)	1150	858	Tier 0-Cat 1	4113
623866	Assist & Escort	3	Auxiliary	GM Detroit	471	1980	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	1942
623866	Assist & Escort	4	Auxiliary	GM Detroit	471	1980	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	6059
624422	Assist & Escort	1	Propulsion	CAT	D-398	1980	Offroad Diesel (EPA)	1150	858	Tier 0-Cat 1	1678
624422	Assist & Escort	2	Propulsion	CAT	D-398	1980	Offroad Diesel (EPA)	1150	858	Tier 0-Cat 1	1678
624422	Assist & Escort	3	Auxiliary	GM Detroit	471	1980	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	2136
624422	Assist & Escort	4	Auxiliary	GM Detroit	471	1980	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	2213
649840	Assist & Escort	1	Propulsion	GM EMD	12-645-E6	1982	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	2569
649840	Assist & Escort	2	Propulsion	GM EMD	12-645-E6	1982	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	2569
649840	Assist & Escort	3	Propulsion	Cummins	KTA-50-M2	2005	Offroad Diesel (EPA)	1700	1268	Tier 2-Cat 1	2810
649840	Assist & Escort	4	Auxiliary	GM Detroit	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	6081

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
649840	Assist & Escort	5	Auxiliary	GM Detroit	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	1626
650272	Assist & Escort	1	Propulsion	GM EMD	12-645-E6	1982	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	2195
650272	Assist & Escort	2	Propulsion	GM EMD	12-645-E6	1982	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	2195
650272	Assist & Escort	3	Auxiliary	GM Detroit	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	1231
650272	Assist & Escort	4	Auxiliary	GM Detroit	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	4049
650273	Assist & Escort	1	Propulsion	GM EMD	16-645-E6	1982	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	3489
650273	Assist & Escort	2	Propulsion	GM EMD	16-645-E6	1982	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	3489
650273	Assist & Escort	3	Auxiliary	GM Detroit	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	4475
650273	Assist & Escort	4	Auxiliary	GM Detroit	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	4236
961349	Assist & Escort	1	Propulsion	GM	671	1981	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	110
961349	Assist & Escort	2	Propulsion	GM	671	1981	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	110
997792	Assist & Escort	1	Propulsion	GM EMD	16-710-G7A	1994	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	3300
997792	Assist & Escort	2	Propulsion	GM EMD	16-710-G7A	1994	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	3300
997792	Assist & Escort	3	Auxiliary	GM Detroit	6V-92TA	1994	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	4233
997792	Assist & Escort	4	Auxiliary	GM Detroit	6V-92TA	1994	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	4316
997794	Assist & Escort	1	Propulsion	GM EMD	16-710-G7A	1993	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	3160
997794	Assist & Escort	2	Propulsion	GM EMD	16-710-G7A	1993	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	3160
997794	Assist & Escort	3	Auxiliary	GM Detroit	6V-92TA	1993	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	4441
997794	Assist & Escort	4	Auxiliary	GM Detroit	6V-92TA	1993	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	4247
1045212	Assist & Escort	1	Propulsion	CAT	3606	1996	Offroad Diesel (EPA)	2550	1902	Tier 0-Cat 2	2600
1045212	Assist & Escort	2	Propulsion	CAT	3606	1996	Offroad Diesel (EPA)	2550	1902	Tier 0-Cat 2	2600
1045212	Assist & Escort	3	Auxiliary	CAT	3304	1996	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1045212	Assist & Escort	4	Auxiliary	CAT	3304	1996	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1045213	Assist & Escort	1	Propulsion	CAT	3606	1996	Offroad Diesel (EPA)	2550	1902	Tier 0-Cat 2	2600
1045213	Assist & Escort	2	Propulsion	CAT	3606	1996	Offroad Diesel (EPA)	2550	1902	Tier 0-Cat 2	2600
1045213	Assist & Escort	3	Auxiliary	CAT	3304	1996	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1045213	Assist & Escort	4	Auxiliary	CAT	3304	1996	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1063012	Assist & Escort	1	Propulsion	CAT	3516D	1998	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 1	3510
1063012	Assist & Escort	2	Propulsion	CAT	3516D	1998	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 1	3510
1063755	Assist & Escort	1	Propulsion	CAT	3516	1998	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	2600
1063755	Assist & Escort	2	Propulsion	CAT	3516	1998	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	2600
1063755	Assist & Escort	3	Auxiliary	CAT	3304	1998	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
1063755	Assist & Escort	4	Auxiliary	CAT	3304	1998	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1063763	Assist & Escort	1	Propulsion	CAT	3516	1998	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	2600
1063763	Assist & Escort	2	Propulsion	CAT	3516	1998	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	2600
1063763	Assist & Escort	3	Auxiliary	CAT	3304	1998	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1063763	Assist & Escort	4	Auxiliary	CAT	3304	1998	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	4000
1129936	Assist & Escort	1	Propulsion	CAT	3308	2002	Offroad Diesel (EPA)	3600	2686	Tier 1-Cat 1	2600
1129936	Assist & Escort	2	Propulsion	CAT	3308	2002	Offroad Diesel (EPA)	3600	2686	Tier 1-Cat 1	2600
1129936	Assist & Escort	3	Auxiliary	CAT	3306	2002	Offroad Diesel (EPA)	250	187	Tier 1-Cat 1	4000
1129936	Assist & Escort	4	Auxiliary	CAT	3306	2002	Offroad Diesel (EPA)	250	187	Tier 1-Cat 1	4000
4982	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
4982	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
4982	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
18085	Commercial Fishing	1	Propulsion			1972	Offroad Diesel (EPA)	110	82	Tier 0-Cat 1	48
18085	Commercial Fishing	2	Auxiliary			1972	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
20881	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
20881	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
20881	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
23277	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
23277	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
28831	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
28831	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
28831	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
29842	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
29842	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
29842	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
189617	Commercial Fishing	1	Propulsion			1957	Offroad Diesel (EPA)	213	159	Tier 0-Cat 1	48
189617	Commercial Fishing	2	Propulsion			1957	Offroad Diesel (EPA)	213	159	Tier 0-Cat 1	48
189617	Commercial Fishing	3	Auxiliary			1957	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
198650	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
198650	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
198650	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
210906	Commercial Fishing	1	Propulsion			1913	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
210906	Commercial Fishing	2	Auxiliary			1913	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
223931	Commercial Fishing	1	Propulsion			1924	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
223931	Commercial Fishing	2	Propulsion			1924	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
223931	Commercial Fishing	3	Auxiliary			1924	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
224779	Commercial Fishing	1	Propulsion			1925	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
224779	Commercial Fishing	2	Propulsion			1925	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
224779	Commercial Fishing	3	Auxiliary			1925	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
228446	Commercial Fishing	1	Propulsion			1929	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
228446	Commercial Fishing	2	Propulsion			1929	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
236505	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
236505	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
236505	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
237743	Commercial Fishing	1	Propulsion			1938	Offroad Diesel (EPA)	1100	821	Tier 0-Cat 1	48
237743	Commercial Fishing	2	Propulsion			1938	Offroad Diesel (EPA)	1100	821	Tier 0-Cat 1	48
237743	Commercial Fishing	3	Auxiliary			1938	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
246619	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	143	106	Tier 0-Cat 1	48
246619	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	143	106	Tier 0-Cat 1	48
246619	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
248169	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
248169	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
248169	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
248959	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	1250	933	Tier 0-Cat 1	48
248959	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	1250	933	Tier 0-Cat 1	48
248959	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
249301	Commercial Fishing	1	Propulsion			1946	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
249301	Commercial Fishing	2	Propulsion			1946	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
249301	Commercial Fishing	3	Auxiliary			1946	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
249559	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	110	82	Tier 0-Cat 1	48
249559	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	110	82	Tier 0-Cat 1	48
249559	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
250464	Commercial Fishing	1	Propulsion			1946	Offroad Diesel (EPA)	375	280	Tier 0-Cat 1	48
250464	Commercial Fishing	2	Propulsion			1946	Offroad Diesel (EPA)	375	280	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
250464	Commercial Fishing	3	Auxiliary			1946	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
250971	Commercial Fishing	1	Propulsion			1942	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
250971	Commercial Fishing	2	Propulsion			1942	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
250971	Commercial Fishing	3	Auxiliary			1942	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
251138	Commercial Fishing	1	Propulsion			1946	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
251138	Commercial Fishing	2	Propulsion			1946	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
251138	Commercial Fishing	3	Auxiliary			1946	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
251424	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
251424	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
251424	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
251810	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	48
253631	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
253631	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
253631	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
258139	Commercial Fishing	1	Propulsion			1989	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	48
258139	Commercial Fishing	2	Auxiliary			1989	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
259472	Commercial Fishing	1	Propulsion			1943	Offroad Diesel (EPA)	115	86	Tier 0-Cat 1	48
259472	Commercial Fishing	2	Propulsion			1943	Offroad Diesel (EPA)	115	86	Tier 0-Cat 1	48
259472	Commercial Fishing	3	Auxiliary			1943	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
259779	Commercial Fishing	1	Propulsion			1949	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
259779	Commercial Fishing	2	Propulsion			1949	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
259779	Commercial Fishing	3	Auxiliary			1949	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
260614	Commercial Fishing	1	Propulsion			1950	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
260614	Commercial Fishing	2	Propulsion			1950	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
260614	Commercial Fishing	3	Auxiliary			1950	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
261269	Commercial Fishing	1	Propulsion			1951	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
261269	Commercial Fishing	2	Propulsion			1951	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
261269	Commercial Fishing	3	Auxiliary			1951	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
261389	Commercial Fishing	1	Propulsion			1942	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
261389	Commercial Fishing	2	Propulsion			1942	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
261389	Commercial Fishing	3	Auxiliary			1942	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
269440	Commercial Fishing	1	Propulsion			1955	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
271507	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
271507	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
272744	Commercial Fishing	1	Propulsion			1956	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
272744	Commercial Fishing	2	Propulsion			1956	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
272744	Commercial Fishing	3	Auxiliary			1956	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
280541	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
280541	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
280541	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
290638	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
290638	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
290638	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
291085	Commercial Fishing	1	Propulsion			1932	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
291085	Commercial Fishing	2	Propulsion			1932	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
291085	Commercial Fishing	3	Auxiliary			1932	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
291728	Commercial Fishing	1	Propulsion			1963	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
291728	Commercial Fishing	2	Propulsion			1963	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
291728	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
291815	Commercial Fishing	1	Propulsion			1963	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
291815	Commercial Fishing	2	Propulsion			1963	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
291815	Commercial Fishing	3	Auxiliary			1963	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
293151	Commercial Fishing	1	Propulsion			1954	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
293151	Commercial Fishing	2	Propulsion			1954	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
293151	Commercial Fishing	3	Auxiliary			1954	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
296512	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
296512	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
296512	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
296779	Commercial Fishing	1	Propulsion			1964	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
296779	Commercial Fishing	2	Propulsion			1964	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
296779	Commercial Fishing	3	Auxiliary			1964	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
297530	Commercial Fishing	1	Propulsion			1965	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
297530	Commercial Fishing	2	Propulsion			1965	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
297530	Commercial Fishing	3	Auxiliary			1965	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
313111	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
313111	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
313111	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
319724	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
319724	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
319724	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
325683	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
325683	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
325683	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
383485	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
383485	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
383485	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
391861	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
391861	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
391861	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
393520	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
393520	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
393520	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
394168	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
394168	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
394168	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
500072	Commercial Fishing	1	Propulsion			1965	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
500072	Commercial Fishing	2	Propulsion			1965	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
500072	Commercial Fishing	3	Auxiliary			1965	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
506694	Commercial Fishing	1	Propulsion	Bergen Diesel	BRM 8	1988	Offroad Diesel (EPA)	3600	2686	Tier 0-Cat 2	48
506694	Commercial Fishing	2	Propulsion	Bergen Diesel	BRM 8	1988	Offroad Diesel (EPA)	3600	2686	Tier 0-Cat 2	48
507891	Commercial Fishing	1	Propulsion			1941	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
507891	Commercial Fishing	2	Propulsion			1941	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
507891	Commercial Fishing	3	Auxiliary			1941	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
508212	Commercial Fishing	1	Propulsion			1967	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
508212	Commercial Fishing	2	Propulsion			1967	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
508212	Commercial Fishing	3	Auxiliary			1967	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
511315	Commercial Fishing	1	Propulsion			1967	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	48
511315	Commercial Fishing	2	Propulsion			1967	Offroad Diesel (EPA)	364	272	Tier 0-Cat 1	48
511315	Commercial Fishing	3	Auxiliary			1967	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
511698	Commercial Fishing	1	Propulsion			1967	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
511698	Commercial Fishing	2	Propulsion			1967	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
511698	Commercial Fishing	3	Auxiliary			1967	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
513354	Commercial Fishing	1	Propulsion			1968	Offroad Diesel (EPA)	245	183	Tier 0-Cat 1	48
513354	Commercial Fishing	2	Propulsion			1968	Offroad Diesel (EPA)	245	183	Tier 0-Cat 1	48
513354	Commercial Fishing	3	Auxiliary			1968	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
515274	Commercial Fishing	1	Propulsion			1968	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
515274	Commercial Fishing	2	Propulsion			1968	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
515274	Commercial Fishing	3	Auxiliary			1968	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
516256	Commercial Fishing	1	Propulsion			1968	Offroad Diesel (EPA)	725	541	Tier 0-Cat 1	48
516256	Commercial Fishing	2	Propulsion			1968	Offroad Diesel (EPA)	725	541	Tier 0-Cat 1	48
516256	Commercial Fishing	3	Auxiliary			1968	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
516627	Commercial Fishing	1	Propulsion			1968	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
516627	Commercial Fishing	2	Propulsion			1968	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
516627	Commercial Fishing	3	Auxiliary			1968	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
517242	Commercial Fishing	1	Propulsion			1968	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
517242	Commercial Fishing	2	Propulsion			1968	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
517242	Commercial Fishing	3	Auxiliary			1968	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
517481	Commercial Fishing	1	Propulsion			1968	Offroad Diesel (EPA)	280	209	Tier 0-Cat 1	48
517481	Commercial Fishing	2	Propulsion			1968	Offroad Diesel (EPA)	280	209	Tier 0-Cat 1	48
517481	Commercial Fishing	3	Auxiliary			1968	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
518545	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
518545	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
518545	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
518937	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
518937	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
518937	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
520494	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
520494	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48

Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
520494	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
521069	Commercial Fishing	1	Propulsion	MAK	453 C	1989	Offroad Diesel (EPA)	3680	2745	Tier 0-Cat 2	48
521069	Commercial Fishing	2	Propulsion	MAK	453 C	1989	Offroad Diesel (EPA)	3680	2745	Tier 0-Cat 2	48
521637	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	48
521637	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	48
521637	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
521927	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	360	269	Tier 0-Cat 1	48
521927	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	360	269	Tier 0-Cat 1	48
521927	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
522411	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	565	421	Tier 0-Cat 1	48
522411	Commercial Fishing	2	Auxiliary			1969	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
522574	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	480	358	Tier 0-Cat 1	48
522574	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	480	358	Tier 0-Cat 1	48
522574	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
522643	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
522643	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
522643	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
522870	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	290	216	Tier 0-Cat 1	48
522870	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	290	216	Tier 0-Cat 1	48
522870	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
523613	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
523613	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
523613	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
524422	Commercial Fishing	1	Propulsion			1969	Offroad Diesel (EPA)	360	269	Tier 0-Cat 1	48
524422	Commercial Fishing	2	Propulsion			1969	Offroad Diesel (EPA)	360	269	Tier 0-Cat 1	48
524422	Commercial Fishing	3	Auxiliary			1969	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
524423	Commercial Fishing	1	Propulsion			1970	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
524423	Commercial Fishing	2	Propulsion			1970	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
524423	Commercial Fishing	3	Auxiliary			1970	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
525572	Commercial Fishing	1	Propulsion			1970	Offroad Diesel (EPA)	675	504	Tier 0-Cat 1	48
525572	Commercial Fishing	2	Auxiliary			1970	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
525608	Commercial Fishing	1	Propulsion			1970	Offroad Diesel (EPA)	590	440	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
525608	Commercial Fishing	2	Propulsion			1970	Offroad Diesel (EPA)	590	440	Tier 0-Cat 1	48
525608	Commercial Fishing	3	Auxiliary			1970	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
529154	Commercial Fishing	1	Propulsion			1970	Offroad Diesel (EPA)	650	485	Tier 0-Cat 1	48
529154	Commercial Fishing	2	Propulsion			1970	Offroad Diesel (EPA)	650	485	Tier 0-Cat 1	48
529154	Commercial Fishing	3	Auxiliary			1970	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
529872	Commercial Fishing	1	Propulsion			1970	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
529872	Commercial Fishing	2	Propulsion			1970	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
529872	Commercial Fishing	3	Auxiliary			1970	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
532762	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
532762	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
532762	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
536161	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
536161	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
536823	Commercial Fishing	1	Propulsion			1972	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	48
536823	Commercial Fishing	2	Propulsion			1972	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	48
536823	Commercial Fishing	3	Auxiliary			1972	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
538431	Commercial Fishing	1	Propulsion			1972	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
538431	Commercial Fishing	2	Propulsion			1972	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
538431	Commercial Fishing	3	Auxiliary			1972	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
542375	Commercial Fishing	1	Propulsion		D398	1972	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
542375	Commercial Fishing	2	Auxiliary	CAT	3406	1972	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
542375	Commercial Fishing	3	Auxiliary	CAT	3406	1972	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
542651	Commercial Fishing	1	Propulsion			1972	Offroad Diesel (EPA)	575	429	Tier 0-Cat 1	48
542651	Commercial Fishing	2	Propulsion			1972	Offroad Diesel (EPA)	575	429	Tier 0-Cat 1	48
542651	Commercial Fishing	3	Auxiliary			1972	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
546234	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
546234	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
546234	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
546728	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	48
546728	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
547726	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
547726	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
547726	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
548543	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	48
548543	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	48
548543	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
548612	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
548612	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
549649	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
549649	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
549649	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
550139	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
550139	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
550139	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
550190	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	565	421	Tier 0-Cat 1	48
550190	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	565	421	Tier 0-Cat 1	48
550190	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
550931	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	2800	2089	Tier 0-Cat 1	48
550931	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	2800	2089	Tier 0-Cat 1	48
550931	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
551913	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
551913	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
551913	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
552364	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
552364	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
552364	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
552893	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
552893	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
552893	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
553713	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
553713	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
553713	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
554030	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	3300	2462	Tier 0-Cat 1	48
554030	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	3300	2462	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
554030	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
554126	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
554126	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
554126	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
555058	Commercial Fishing	1	Propulsion	CAT	3512	1988	Offroad Diesel (EPA)	1300	970	Tier 0-Cat 1	48
555058	Commercial Fishing	2	Auxiliary	CAT	3406	1992	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
555058	Commercial Fishing	3	Auxiliary	CAT	3406	1992	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
555403	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
555403	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
555403	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
557441	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
557441	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
557441	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
557854	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	188	140	Tier 0-Cat 1	48
557854	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	188	140	Tier 0-Cat 1	48
557854	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
558605	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	880	656	Tier 0-Cat 1	48
558605	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	880	656	Tier 0-Cat 1	48
558605	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
559271	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
559271	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
559849	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
559849	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
559849	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
559907	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
559907	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
559907	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
560237	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
560237	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
560237	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
560501	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
560501	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
560501	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
561651	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	510	380	Tier 0-Cat 1	48
561651	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	510	380	Tier 0-Cat 1	48
561651	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
561934	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
561934	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
561934	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
562772	Commercial Fishing	1	Propulsion			1975	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
562772	Commercial Fishing	2	Propulsion			1975	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
562772	Commercial Fishing	3	Auxiliary			1975	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
563829	Commercial Fishing	1	Propulsion			1975	Offroad Diesel (EPA)	470	351	Tier 0-Cat 1	48
563829	Commercial Fishing	2	Propulsion			1975	Offroad Diesel (EPA)	470	351	Tier 0-Cat 1	48
563829	Commercial Fishing	3	Auxiliary			1975	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
565017	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	884	659	Tier 0-Cat 1	48
565017	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	884	659	Tier 0-Cat 1	48
565017	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
566067	Commercial Fishing	1	Propulsion			1975	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
566067	Commercial Fishing	2	Propulsion			1975	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
566067	Commercial Fishing	3	Auxiliary			1975	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
569927	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	624	466	Tier 0-Cat 1	48
569927	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	624	466	Tier 0-Cat 1	48
569927	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
571879	Commercial Fishing	1	Propulsion			1976	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
571879	Commercial Fishing	2	Propulsion			1976	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
571879	Commercial Fishing	3	Auxiliary			1976	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
572337	Commercial Fishing	1	Propulsion			1976	Offroad Diesel (EPA)	190	142	Tier 0-Cat 1	48
572337	Commercial Fishing	2	Auxiliary			1976	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
576029	Commercial Fishing	1	Propulsion			1976	Offroad Diesel (EPA)	280	209	Tier 0-Cat 1	48
576029	Commercial Fishing	2	Propulsion			1976	Offroad Diesel (EPA)	280	209	Tier 0-Cat 1	48
576029	Commercial Fishing	3	Auxiliary			1976	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
577044	Commercial Fishing	1	Propulsion			1976	Offroad Diesel (EPA)	2900	2163	Tier 0-Cat 1	96
577044	Commercial Fishing	2	Propulsion			1976	Offroad Diesel (EPA)	2900	2163	Tier 0-Cat 1	96

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
577044	Commercial Fishing	3	Auxiliary			1976	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	96
578178	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
578178	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
578178	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
579450	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	3000	2238	Tier 0-Cat 1	48
579450	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	3000	2238	Tier 0-Cat 1	48
579450	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
583100	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	48
583100	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	48
583100	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
583974	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
583974	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
583974	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
585926	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
585926	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
585926	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
586179	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
586179	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
586179	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
586183	Commercial Fishing	1	Propulsion			1941	Offroad Diesel (EPA)	548	409	Tier 0-Cat 1	48
586183	Commercial Fishing	2	Propulsion			1941	Offroad Diesel (EPA)	548	409	Tier 0-Cat 1	48
586183	Commercial Fishing	3	Auxiliary			1941	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
586415	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	588	438	Tier 0-Cat 1	48
586415	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	588	438	Tier 0-Cat 1	48
586415	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
586441	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
586441	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
586441	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
586918	Commercial Fishing	1	Propulsion			1942	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
586918	Commercial Fishing	2	Propulsion			1942	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
586918	Commercial Fishing	3	Auxiliary			1942	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
587551	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
587551	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
587551	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
587816	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
587816	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
587816	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
589317	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
589317	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
589317	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
589854	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	375	280	Tier 0-Cat 1	48
589854	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	375	280	Tier 0-Cat 1	48
589854	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
589883	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	930	694	Tier 0-Cat 1	48
589883	Commercial Fishing	2	Propulsion			1977	Offroad Diesel (EPA)	930	694	Tier 0-Cat 1	48
589883	Commercial Fishing	3	Auxiliary			1977	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
591603	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
591603	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
591603	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
591632	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	380	283	Tier 0-Cat 1	48
591632	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	380	283	Tier 0-Cat 1	48
591632	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
592291	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	225	168	Tier 0-Cat 1	48
592291	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	225	168	Tier 0-Cat 1	48
592291	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
592441	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
592441	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
592441	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
593310	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
593310	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
593310	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
593404	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
593404	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
593404	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
593623	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	183	136	Tier 0-Cat 1	48
593623	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	183	136	Tier 0-Cat 1	48
593623	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
594154	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	475	354	Tier 0-Cat 1	48
594154	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	475	354	Tier 0-Cat 1	48
594154	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
594399	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
594399	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
594399	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
594470	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
594470	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
594470	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
596137	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	705	526	Tier 0-Cat 1	48
596137	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	705	526	Tier 0-Cat 1	48
596137	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
597532	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	660	492	Tier 0-Cat 1	48
597532	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	660	492	Tier 0-Cat 1	48
597532	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
597611	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
597611	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
597611	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
598484	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
598484	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
598484	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
598508	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
598508	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
598508	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
598975	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
598975	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
598975	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
600072	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	48
600072	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
600072	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
600325	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
600325	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
600325	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
600856	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	48
600856	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	48
600856	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
601068	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
601068	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
601068	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
602279	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	905	675	Tier 0-Cat 1	48
602279	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	905	675	Tier 0-Cat 1	48
602279	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
602309	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
602309	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
602309	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
602386	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	338	252	Tier 0-Cat 1	48
602386	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	338	252	Tier 0-Cat 1	48
602386	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
603126	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	460	343	Tier 0-Cat 1	48
603126	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	460	343	Tier 0-Cat 1	48
604315	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
604315	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
604315	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
604439	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 1	48
604439	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 1	48
604439	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
604676	Commercial Fishing	1	Propulsion			1945	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
604676	Commercial Fishing	2	Propulsion			1945	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
604676	Commercial Fishing	3	Auxiliary			1945	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
604998	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
604998	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
604998	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
605228	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
605228	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
605228	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
606565	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	705	526	Tier 0-Cat 1	48
606565	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	705	526	Tier 0-Cat 1	48
606565	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
608216	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
608216	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
608216	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
608397	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
608397	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
608397	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
608438	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
608438	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
608438	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
609823	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	855	638	Tier 0-Cat 1	48
609823	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	855	638	Tier 0-Cat 1	48
609823	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
609940	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
609940	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
609940	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
610290	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	48
610290	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	48
610290	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
610436	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
610436	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
610436	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
611225	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	725	541	Tier 0-Cat 1	48
611225	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	725	541	Tier 0-Cat 1	48
611225	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
611519	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	520	388	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
611519	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	520	388	Tier 0-Cat 1	48
611519	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
611520	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
611520	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	48
611520	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
611524	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
611524	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
611524	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
611642	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
611642	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
611642	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
611985	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
611985	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
611985	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
612616	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
612616	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
612616	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
615165	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
615165	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
615165	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
615387	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	375	280	Tier 0-Cat 1	48
615387	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	375	280	Tier 0-Cat 1	48
615387	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
615563	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
615563	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
615563	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
615796	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
615796	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
615796	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
617019	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	563	420	Tier 0-Cat 1	48
617019	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	563	420	Tier 0-Cat 1	48
617019	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
617540	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	320	239	Tier 0-Cat 1	48
617540	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	320	239	Tier 0-Cat 1	48
617540	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
617807	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	563	420	Tier 0-Cat 1	48
617807	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	563	420	Tier 0-Cat 1	48
617807	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
618374	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	72
618374	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
618374	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
619109	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
619109	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
620538	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	270	201	Tier 0-Cat 1	48
620538	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
620769	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	905	675	Tier 0-Cat 1	48
620769	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	905	675	Tier 0-Cat 1	48
620769	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
622324	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
622324	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
622324	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
623210	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	475	354	Tier 0-Cat 1	48
623210	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	475	354	Tier 0-Cat 1	48
623210	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
624371	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	630	470	Tier 0-Cat 1	48
624371	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	630	470	Tier 0-Cat 1	48
624371	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
624429	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	520	388	Tier 0-Cat 1	48
624429	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	520	388	Tier 0-Cat 1	48
624429	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
625095	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	485	362	Tier 0-Cat 1	48
625095	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	485	362	Tier 0-Cat 1	48
625095	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
625927	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
625927	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	48
625927	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
627433	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
627433	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
627433	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
628313	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
628313	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
628313	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
628555	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
628555	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
628555	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
628959	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	875	653	Tier 0-Cat 1	48
628959	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	875	653	Tier 0-Cat 1	48
628959	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
629675	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
629675	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
629675	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
630401	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
630401	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
631084	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
631084	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
631084	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
632751	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
632751	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
632751	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
633219	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	144
633219	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	144
633219	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	144
635397	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
635397	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
635397	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
637693	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
637693	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
637744	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
637744	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
637744	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
637856	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	3125	2331	Tier 0-Cat 1	48
637856	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	3125	2331	Tier 0-Cat 1	48
637856	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
638851	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
638851	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
638851	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
639547	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	2300	1716	Tier 0-Cat 1	48
639547	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	2300	1716	Tier 0-Cat 1	48
639547	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
640128	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
640128	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
640128	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
640130	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 1	48
640130	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 1	48
640130	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
640956	Commercial Fishing	1	Propulsion			1988	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
640956	Commercial Fishing	2	Auxiliary			1988	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
642161	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
642161	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
642161	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
642436	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
642436	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
642436	Commercial Fishing	3	Auxiliary			1980	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
642653	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
642653	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
642653	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
643771	Commercial Fishing	1	Propulsion	Bergen Diesel	BRM 8	1989	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	48
643771	Commercial Fishing	2	Propulsion	Bergen Diesel	BRM 8	1989	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
643920	Commercial Fishing	1	Propulsion			1981	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
643920	Commercial Fishing	2	Propulsion			1981	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
643920	Commercial Fishing	3	Auxiliary			1981	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
646834	Commercial Fishing	1	Propulsion			1982	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
646834	Commercial Fishing	2	Propulsion			1982	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
646834	Commercial Fishing	3	Auxiliary			1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
647314	Commercial Fishing	1	Propulsion			1983	Offroad Diesel (EPA)	285	213	Tier 0-Cat 1	48
647314	Commercial Fishing	2	Propulsion			1983	Offroad Diesel (EPA)	285	213	Tier 0-Cat 1	48
647314	Commercial Fishing	3	Auxiliary			1983	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
649350	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
649350	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
649350	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
651041	Commercial Fishing	1	Propulsion			1972	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	48
651041	Commercial Fishing	2	Propulsion			1972	Offroad Diesel (EPA)	2400	1790	Tier 0-Cat 1	48
651041	Commercial Fishing	3	Auxiliary			1972	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
651455	Commercial Fishing	1	Propulsion			1982	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
651455	Commercial Fishing	2	Propulsion			1982	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
651455	Commercial Fishing	3	Auxiliary			1982	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
651752	Commercial Fishing	1	Propulsion			1982	Offroad Diesel (EPA)	1100	821	Tier 0-Cat 1	48
651752	Commercial Fishing	2	Propulsion			1982	Offroad Diesel (EPA)	1100	821	Tier 0-Cat 1	48
651752	Commercial Fishing	3	Auxiliary			1982	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
653806	Commercial Fishing	1	Propulsion			1982	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
653806	Commercial Fishing	2	Propulsion			1982	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
653806	Commercial Fishing	3	Auxiliary			1982	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
654362	Commercial Fishing	1	Propulsion			1983	Offroad Diesel (EPA)	270	201	Tier 0-Cat 1	48
654362	Commercial Fishing	2	Auxiliary			1983	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
654947	Commercial Fishing	1	Propulsion			1944	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
654947	Commercial Fishing	2	Propulsion			1944	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
654947	Commercial Fishing	3	Auxiliary			1944	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
655328	Commercial Fishing	1	Propulsion			1983	Offroad Diesel (EPA)	770	574	Tier 0-Cat 1	48
655328	Commercial Fishing	2	Propulsion			1983	Offroad Diesel (EPA)	770	574	Tier 0-Cat 1	48
655328	Commercial Fishing	3	Auxiliary			1983	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
657383	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
657383	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
657383	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
663457	Commercial Fishing	1	Propulsion			1983	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
663457	Commercial Fishing	2	Propulsion			1983	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	48
663457	Commercial Fishing	3	Auxiliary			1983	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
664175	Commercial Fishing	1	Propulsion			1983	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
664175	Commercial Fishing	2	Propulsion			1983	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
664175	Commercial Fishing	3	Auxiliary			1983	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
668040	Commercial Fishing	1	Propulsion			1984	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	48
668040	Commercial Fishing	2	Propulsion			1984	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	48
668040	Commercial Fishing	3	Auxiliary			1984	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
677399	Commercial Fishing	1	Propulsion			1984	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
677399	Commercial Fishing	2	Propulsion			1984	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
677399	Commercial Fishing	3	Auxiliary			1984	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
677905	Commercial Fishing	1	Propulsion			1985	Offroad Diesel (EPA)	460	343	Tier 0-Cat 1	48
677905	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
678236	Commercial Fishing	1	Propulsion			1984	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
678236	Commercial Fishing	2	Propulsion			1984	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
678236	Commercial Fishing	3	Auxiliary			1984	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
678237	Commercial Fishing	1	Propulsion			1984	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
678237	Commercial Fishing	2	Propulsion			1984	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
678237	Commercial Fishing	3	Auxiliary			1984	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
679774	Commercial Fishing	1	Propulsion			1955	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
679774	Commercial Fishing	2	Auxiliary			1955	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
697280	Commercial Fishing	1	Propulsion			1986	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
697280	Commercial Fishing	2	Propulsion			1986	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
697280	Commercial Fishing	3	Auxiliary			1986	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
697637	Commercial Fishing	1	Propulsion			1986	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
697637	Commercial Fishing	2	Propulsion			1986	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
697637	Commercial Fishing	3	Auxiliary			1986	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
697907	Commercial Fishing	1	Propulsion			1985	Offroad Diesel (EPA)	435	325	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
697907	Commercial Fishing	2	Propulsion			1985	Offroad Diesel (EPA)	435	325	Tier 0-Cat 1	48
697907	Commercial Fishing	3	Auxiliary			1985	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
807768	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
807768	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
810483	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
810483	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
810483	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
814404	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
814404	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
814404	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
817566	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
817566	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
817566	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
819946	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	48
819946	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	48
819946	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
903511	Commercial Fishing	1	Propulsion			1941	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 1	72
903511	Commercial Fishing	2	Propulsion			1941	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 1	72
903511	Commercial Fishing	3	Auxiliary			1941	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	72
904767	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	1950	1455	Tier 0-Cat 1	48
904767	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	1950	1455	Tier 0-Cat 1	48
904767	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
914214	Commercial Fishing	1	Propulsion			1987	Offroad Diesel (EPA)	855	638	Tier 0-Cat 1	48
914214	Commercial Fishing	2	Propulsion			1987	Offroad Diesel (EPA)	855	638	Tier 0-Cat 1	48
914214	Commercial Fishing	3	Auxiliary			1987	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
914477	Commercial Fishing	1	Propulsion			1987	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	48
914477	Commercial Fishing	2	Propulsion			1987	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	48
914477	Commercial Fishing	3	Auxiliary			1987	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
918779	Commercial Fishing	1	Propulsion			1987	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
918779	Commercial Fishing	2	Propulsion			1987	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	48
918779	Commercial Fishing	3	Auxiliary			1987	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
919309	Commercial Fishing	1	Propulsion			1990	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
919309	Commercial Fishing	2	Propulsion			1990	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
919309	Commercial Fishing	3	Auxiliary			1990	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
925863	Commercial Fishing	1	Propulsion			1988	Offroad Diesel (EPA)	738	550	Tier 0-Cat 1	48
925863	Commercial Fishing	2	Propulsion			1988	Offroad Diesel (EPA)	738	550	Tier 0-Cat 1	48
925863	Commercial Fishing	3	Auxiliary			1988	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
926647	Commercial Fishing	1	Propulsion			1988	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
926647	Commercial Fishing	2	Propulsion			1988	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
926647	Commercial Fishing	3	Auxiliary			1988	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
933627	Commercial Fishing	1	Propulsion			1988	Offroad Diesel (EPA)	3300	2462	Tier 0-Cat 1	96
933627	Commercial Fishing	2	Propulsion			1988	Offroad Diesel (EPA)	3300	2462	Tier 0-Cat 1	96
933627	Commercial Fishing	3	Auxiliary			1988	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	96
939078	Commercial Fishing	1	Propulsion			1988	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
939078	Commercial Fishing	2	Propulsion			1988	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
939078	Commercial Fishing	3	Auxiliary			1988	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
940866	Commercial Fishing	1	Propulsion			1974	Offroad Diesel (EPA)	3030	2260	Tier 0-Cat 1	72
940866	Commercial Fishing	2	Propulsion			1974	Offroad Diesel (EPA)	3030	2260	Tier 0-Cat 1	72
940866	Commercial Fishing	3	Auxiliary			1974	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	72
944290	Commercial Fishing	1	Propulsion			1988	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
944290	Commercial Fishing	2	Propulsion			1988	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
944290	Commercial Fishing	3	Auxiliary			1988	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
944658	Commercial Fishing	1	Propulsion			1989	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 1	48
944658	Commercial Fishing	2	Propulsion			1989	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 1	48
944658	Commercial Fishing	3	Auxiliary			1989	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
950038	Commercial Fishing	1	Propulsion			1989	Offroad Diesel (EPA)	460	343	Tier 0-Cat 1	48
950038	Commercial Fishing	2	Propulsion			1989	Offroad Diesel (EPA)	460	343	Tier 0-Cat 1	48
950038	Commercial Fishing	3	Auxiliary			1989	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
951440	Commercial Fishing	1	Propulsion			1989	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
951440	Commercial Fishing	2	Propulsion			1989	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
951440	Commercial Fishing	3	Auxiliary			1989	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
951441	Commercial Fishing	1	Propulsion			1989	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
951441	Commercial Fishing	2	Propulsion			1989	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
951441	Commercial Fishing	3	Auxiliary			1989	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
959086	Commercial Fishing	1	Propulsion			1990	Offroad Diesel (EPA)	624	466	Tier 0-Cat 1	48
959086	Commercial Fishing	2	Propulsion			1990	Offroad Diesel (EPA)	624	466	Tier 0-Cat 1	48
959086	Commercial Fishing	3	Auxiliary			1990	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
960836	Commercial Fishing	1	Propulsion			1990	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
960836	Commercial Fishing	2	Propulsion			1990	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
960836	Commercial Fishing	3	Auxiliary			1990	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
966130	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	410	306	Tier 0-Cat 1	48
966130	Commercial Fishing	2	Propulsion			1991	Offroad Diesel (EPA)	410	306	Tier 0-Cat 1	48
966130	Commercial Fishing	3	Auxiliary			1991	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
966996	Commercial Fishing	1	Propulsion			1990	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
966996	Commercial Fishing	2	Propulsion			1990	Offroad Diesel (EPA)	640	477	Tier 0-Cat 1	48
966996	Commercial Fishing	3	Auxiliary			1990	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
967106	Commercial Fishing	1	Propulsion			1990	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
967106	Commercial Fishing	2	Propulsion			1990	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	48
967106	Commercial Fishing	3	Auxiliary			1990	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
967502	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 1	48
967502	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 1	48
967502	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
969494	Commercial Fishing	1	Propulsion			1990	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
969494	Commercial Fishing	2	Propulsion			1990	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
969494	Commercial Fishing	3	Auxiliary			1990	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
970937	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	625	466	Tier 0-Cat 1	48
970937	Commercial Fishing	2	Propulsion			1991	Offroad Diesel (EPA)	625	466	Tier 0-Cat 1	48
970937	Commercial Fishing	3	Auxiliary			1991	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
973006	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	675	504	Tier 0-Cat 1	48
973006	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
973478	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	625	466	Tier 0-Cat 1	48
973478	Commercial Fishing	2	Propulsion			1991	Offroad Diesel (EPA)	625	466	Tier 0-Cat 1	48
973478	Commercial Fishing	3	Auxiliary			1991	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
975015	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
975015	Commercial Fishing	2	Propulsion			1991	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
975015	Commercial Fishing	3	Auxiliary			1991	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
975597	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	270	201	Tier 0-Cat 1	48
975597	Commercial Fishing	2	Propulsion			1991	Offroad Diesel (EPA)	270	201	Tier 0-Cat 1	48
975597	Commercial Fishing	3	Auxiliary			1991	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
976538	Commercial Fishing	1	Propulsion			1991	Offroad Diesel (EPA)	585	436	Tier 0-Cat 1	48
976538	Commercial Fishing	2	Propulsion			1991	Offroad Diesel (EPA)	585	436	Tier 0-Cat 1	48
976538	Commercial Fishing	3	Auxiliary			1991	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
982610	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
982610	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
982610	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
996920	Commercial Fishing	1	Propulsion			1993	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
996920	Commercial Fishing	2	Propulsion			1993	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
996920	Commercial Fishing	3	Auxiliary			1993	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
996921	Commercial Fishing	1	Propulsion			1993	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
996921	Commercial Fishing	2	Propulsion			1993	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
996921	Commercial Fishing	3	Auxiliary			1993	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
1021269	Commercial Fishing	1	Propulsion			1995	Offroad Diesel (EPA)	125	93	Tier 0-Cat 1	48
1021269	Commercial Fishing	2	Propulsion			1995	Offroad Diesel (EPA)	125	93	Tier 0-Cat 1	48
1021269	Commercial Fishing	3	Auxiliary			1995	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
1038382	Commercial Fishing	1	Propulsion			1966	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
1038382	Commercial Fishing	2	Propulsion			1966	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
1038382	Commercial Fishing	3	Auxiliary			1966	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
1060513	Commercial Fishing	1	Propulsion			1998	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
1060513	Commercial Fishing	2	Propulsion			1998	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
1060513	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
1075512	Commercial Fishing	1	Propulsion			1998	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
1075512	Commercial Fishing	2	Propulsion			1998	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	48
1075512	Commercial Fishing	3	Auxiliary			1998	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
5042986	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	48
5042986	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
5268231	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5268231	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5268231	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
5268308	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5268308	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5268308	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
5280667	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5280667	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5280667	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
5372654	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5372654	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
5372654	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
5410418	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	235	175	Tier 0-Cat 1	48
5410535	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
5410535	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
6409301	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6409301	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6409301	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
6420513	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6420513	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6420513	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
6506953	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6506953	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6506953	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
6617075	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6617075	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6617075	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
6621648	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	340	254	Tier 0-Cat 1	48
6621648	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	340	254	Tier 0-Cat 1	48
6621648	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
6714691	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6714691	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6714691	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
6810184	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
6810184	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
6810184	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
6920240	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
6920240	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	48
6920240	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
6931055	Commercial Fishing	1	Propulsion	Bergen Diesel	KVM 18	1983	Offroad Diesel (EPA)	4200	3133	Tier 0-Cat 2	48
7048271	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7048271	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7114874	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7114874	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7114874	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7223845	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7223845	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7223845	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7303968	Commercial Fishing	1	Propulsion	Wartsila	Vasa 12V32	1990	Offroad Diesel (EPA)	6200	4625	Tier 0-Cat 2	48
7307184	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
7307184	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
7307184	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7337165	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
7337165	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	48
7337165	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7390416	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7390428	Commercial Fishing	1	Propulsion	Bergen Diesel	BRM 8	1990	Offroad Diesel (EPA)	4400	3282	Tier 0-Cat 2	48
7390428	Commercial Fishing	2	Propulsion	Bergen Diesel	BRM 8	1990	Offroad Diesel (EPA)	4400	3282	Tier 0-Cat 2	48
7437630	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	1150	858	Tier 0-Cat 1	48
7437630	Commercial Fishing	2	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
7513006	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7513006	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7513006	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7513331	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
7513331	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	48
7513331	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7521089	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48

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Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
7521089	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7521089	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7611391	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
7611391	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
7611391	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7628473	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
7628473	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
7628473	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7641712	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7641712	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7641712	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7643124	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7643124	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7643124	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7644269	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7644269	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7644269	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7728091	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7728091	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7728091	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7738412	Commercial Fishing	1	Propulsion	Wartsila	8R32	1989	Offroad Diesel (EPA)	4400	3282	Tier 0-Cat 2	48
7738412	Commercial Fishing	2	Propulsion	Wartsila	8R32	1989	Offroad Diesel (EPA)	4400	3282	Tier 0-Cat 2	48
7739193	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
7739193	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	48
7739193	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7742358	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7742358	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7742358	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7743467	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	650	485	Tier 0-Cat 1	48
7743467	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	650	485	Tier 0-Cat 1	48
7743467	Commercial Fishing	3	Auxiliary			1978	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7803152	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
7803152	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	48
7803152	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7829041	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
7829041	Commercial Fishing	2	Propulsion			1978	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
7829041	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7902001	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
7902001	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	48
7902001	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
7902219	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7902219	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7902219	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7908079	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7908079	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7908079	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7919858	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7919858	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
7919858	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7932381	Commercial Fishing	1	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
7932381	Commercial Fishing	2	Propulsion			1979	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	48
7932381	Commercial Fishing	3	Auxiliary			1979	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
7939523	Commercial Fishing	1	Propulsion			1978	Offroad Diesel (EPA)	460	343	Tier 0-Cat 1	48
7939523	Commercial Fishing	2	Auxiliary			1978	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
7947398	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
7947398	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	48
7947398	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8010087	Commercial Fishing	1	Propulsion			1980	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
8010087	Commercial Fishing	2	Propulsion			1980	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	48
8010087	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8016524	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8016524	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8016524	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8023682	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
8023682	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8023682	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8101678	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	3000	2238	Tier 0-Cat 1	48
8101678	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	3000	2238	Tier 0-Cat 1	48
8101678	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
8124230	Commercial Fishing	1	Propulsion			1977	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	48
8124230	Commercial Fishing	2	Auxiliary			1977	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
8133059	Commercial Fishing	1	Propulsion			1949	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
8133059	Commercial Fishing	2	Propulsion			1949	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	48
8133059	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8717415	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8717415	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8717415	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8802390	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8802390	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8802390	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8836273	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8836273	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8836273	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8851615	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8851615	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
8851615	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
8853374	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
8853374	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	450	336	Tier 0-Cat 1	48
8853374	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	48
CA0040	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CA0040	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CA0040	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
CY8121	Commercial Fishing	1	Propulsion			1993	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CY8121	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CY8121	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
CYJY	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
CYJY	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CYJY	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
CZ4548	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CZ4548	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
CZ4548	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
VDGT	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
VDGT	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
VDGT	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
WBB5945	Commercial Fishing	1	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
WBB5945	Commercial Fishing	2	Propulsion			1973	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	48
WBB5945	Commercial Fishing	3	Auxiliary			1973	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	48
222170	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	500
222170	Excursion	2	Auxiliary			1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	500
222170	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	500
234281	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	800
253102	Excursion	1	Propulsion	Detroit		1992	Offroad Diesel (EPA)	320	239	Tier 0-Cat 1	300
253102	Excursion	2	Propulsion	Detroit		1992	Offroad Diesel (EPA)	320	239	Tier 0-Cat 1	300
253102	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	300
282387	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	335	250	Tier 0-Cat 1	1387
282387	Excursion	2	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	500
504847	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	215	160	Tier 0-Cat 1	300
514506	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	300
520222	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	155	116	Tier 0-Cat 1	270
520222	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	155	116	Tier 0-Cat 1	270
520222	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	13	10	Tier 0-Cat 1	60
525654	Excursion	1	Propulsion			1970	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	100
525654	Excursion	2	Auxiliary			1991	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	100
525654	Excursion	3	Auxiliary			1991	Offroad Diesel (EPA)	54	40	Tier 0-Cat 1	100
537794	Excursion	1	Propulsion			1996	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	384
537794	Excursion	2	Propulsion			1998	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	384
539994	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	316	236	Tier 0-Cat 1	900
539994	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	316	236	Tier 0-Cat 1	900

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
543871	Excursion	1	Propulsion			1999	Offroad Diesel (EPA)	236	176	Tier 0-Cat 1	1184
543871	Excursion	2	Propulsion			1999	Offroad Diesel (EPA)	236	176	Tier 0-Cat 1	1184
543871	Excursion	3	Auxiliary			1999	Offroad Diesel (EPA)	20	15	Tier 0-Cat 1	1184
543871	Excursion	4	Auxiliary			1999	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	1184
553780	Excursion	1	Propulsion			2005	Biodiesel (B99)	150	112	Tier 2-Cat 1	1095
553780	Excursion	2	Propulsion			2005	Biodiesel (B99)	150	112	Tier 2-Cat 1	1095
559548	Excursion	1	Propulsion			1992	Biodiesel (B99)	725	541	Tier 0-Cat 1	500
559548	Excursion	2	Propulsion			1992	Biodiesel (B99)	725	541	Tier 0-Cat 1	500
559548	Excursion	3	Propulsion			1992	Biodiesel (B99)	725	541	Tier 0-Cat 1	500
571306	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	335	250	Tier 0-Cat 1	725
571306	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	335	250	Tier 0-Cat 1	725
571306	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	300
571306	Excursion	4	Auxiliary			1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	300
572980	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	2000
572980	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	2000
572980	Excursion	3	Propulsion			1992	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	2000
572980	Excursion	4	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	2000
578880	Excursion	1	Propulsion			1976	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	600
578880	Excursion	2	Propulsion			1976	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	600
579981	Excursion	1	Propulsion			2003	Offroad Diesel (EPA)	235	175	Tier 1-Cat 1	1000
579981	Excursion	2	Propulsion			2003	Offroad Diesel (EPA)	235	175	Tier 1-Cat 1	1000
593090	Excursion	1	Propulsion			1976	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	700
593090	Excursion	2	Propulsion			1976	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	700
593090	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	34	25	Tier 0-Cat 1	350
594261	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	950
594261	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	950
594261	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	300
594261	Excursion	4	Auxiliary			1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	300
594991	Excursion	1	Propulsion			2005	Offroad Diesel (EPA)	425	317	Tier 2-Cat 1	400
594991	Excursion	2	Propulsion			2005	Offroad Diesel (EPA)	425	317	Tier 2-Cat 1	400
600818	Excursion	1	Propulsion			1978	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	255
601283	Excursion	1	Propulsion			2002	Offroad Diesel (EPA)	370	276	Tier 1-Cat 1	20

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
601283	Excursion	2	Propulsion			2002	Offroad Diesel (EPA)	370	276	Tier 1-Cat 1	20
603440	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	1500
603440	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	1500
603440	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	20	15	Tier 0-Cat 1	1500
605959	Excursion	1	Propulsion			1986	Offroad Diesel (EPA)	510	380	Tier 0-Cat 1	500
605959	Excursion	2	Propulsion			1986	Offroad Diesel (EPA)	510	380	Tier 0-Cat 1	500
605959	Excursion	3	Propulsion			1986	Offroad Diesel (EPA)	510	380	Tier 0-Cat 1	500
605959	Excursion	4	Propulsion			1986	Offroad Diesel (EPA)	510	380	Tier 0-Cat 1	500
605959	Excursion	5	Auxiliary			1986	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	500
633786	Excursion	1	Propulsion			1986	Offroad Diesel (EPA)	485	362	Tier 0-Cat 1	500
633786	Excursion	2	Propulsion			1986	Offroad Diesel (EPA)	485	362	Tier 0-Cat 1	500
633786	Excursion	3	Propulsion			1986	Offroad Diesel (EPA)	485	362	Tier 0-Cat 1	500
633786	Excursion	4	Auxiliary			1986	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	500
685462	Excursion	1	Propulsion			1985	Offroad Diesel (EPA)	133	99	Tier 0-Cat 1	400
698903	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	495	369	Tier 0-Cat 1	800
908725	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	320	239	Tier 0-Cat 1	1000
908725	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	320	239	Tier 0-Cat 1	1000
908725	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	24	18	Tier 0-Cat 1	1000
916587	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	442	330	Tier 0-Cat 1	968
916587	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	442	330	Tier 0-Cat 1	968
916587	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	450
916587	Excursion	4	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	450
921107	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	2000
944434	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	210	157	Tier 0-Cat 1	1072
944434	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	210	157	Tier 0-Cat 1	1072
944434	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	1072
956275	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	3000
956275	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	3000
976735	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	85	63	Tier 0-Cat 1	150
1000079	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	1650	1231	Tier 0-Cat 1	800
1025644	Excursion	1	Propulsion			1996	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	800
1025644	Excursion	2	Propulsion			1996	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	800

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
1033607	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	264	197	Tier 0-Cat 1	500
1033659	Excursion	1	Propulsion			1994	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	264
1033659	Excursion	2	Propulsion			1994	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	264
1051053	Excursion	1	Propulsion			2002	Offroad Diesel (EPA)	318	237	Tier 1-Cat 1	2800
1051053	Excursion	2	Propulsion			2002	Offroad Diesel (EPA)	318	237	Tier 1-Cat 1	2800
1055060	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	270
1055060	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	230	172	Tier 0-Cat 1	270
1055060	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	60
1060642	Excursion	1	Propulsion			1992	Gasoline	450	336	Gasoline-4 stroke	10
1064771	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	210	157	Tier 0-Cat 1	1200
1079075	Excursion	1	Propulsion			2001	Offroad Diesel (EPA)	480	358	Tier 1-Cat 1	600
1081068	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	500
1093282	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	1157
1093282	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	1157
1093282	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	1157
1093282	Excursion	4	Auxiliary			1985	Offroad Diesel (EPA)	54	40	Tier 0-Cat 1	1157
1109391	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	270
1109391	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	750	560	Tier 0-Cat 1	270
1109391	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	56	42	Tier 0-Cat 1	60
D231868	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	2990	2231	Tier 0-Cat 1	2500
PSECL	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	210	157	Tier 0-Cat 1	1071
PSECL	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	210	157	Tier 0-Cat 1	1071
PSECL	Excursion	3	Auxiliary			1985	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	1071
PSEH	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	115	86	Tier 0-Cat 1	2000
PSEH	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	115	86	Tier 0-Cat 1	2000
PSEIE	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	315	235	Tier 0-Cat 1	1000
PSEIE	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	315	235	Tier 0-Cat 1	1000
PSEIEII	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	315	235	Tier 0-Cat 1	1000
PSEIEII	Excursion	2	Propulsion			1992	Offroad Diesel (EPA)	315	235	Tier 0-Cat 1	1000
PSEIN	Excursion	1	Propulsion			1992	Gasoline	450	336	Gasoline-4 stroke	10
PSEIS	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	2200	1641	Tier 0-Cat 1	1000
PSEK	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	1000

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
PSEOQ	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	300
PSEPL	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	600
PSEPO	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	350	261	Tier 0-Cat 1	500
PSES	Excursion	1	Propulsion			1976	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	300
PSES	Excursion	2	Propulsion			1976	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	300
PSES	Excursion	3	Auxiliary			1976	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	30
PSESH	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	1000
PSETI	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	500
PSEVS	Excursion	1	Propulsion			1992	Offroad Diesel (EPA)	760	567	Tier 0-Cat 1	1500
214872	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	4000
226567	Ferry	1	Propulsion	Wartsilla	824 TS	1981	Onroad Diesel (EPA)	1200	895	Tier 0-Cat 1	4680
226567	Ferry	2	Propulsion	Wartsilla	824 TS	1981	Onroad Diesel (EPA)	1200	895	Tier 0-Cat 1	4678
226567	Ferry	5	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	355	265	Tier 0-Cat 1	34
226567	Ferry	6	Boiler	Weil McLain	PL486SF	1986	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	2400
226567	Ferry	3	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	190
226567	Ferry	4	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	4633
226588	Ferry	1	Propulsion	Wartsilla	824 TS	1986	Onroad Diesel (EPA)	1448	1080	Tier 0-Cat 1	5129
226588	Ferry	2	Propulsion	Wartsilla	824 TS	1986	Onroad Diesel (EPA)	1448	1080	Tier 0-Cat 1	5129
226588	Ferry	3	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	0
226588	Ferry	4	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	355	265	Tier 0-Cat 1	24
226588	Ferry	5	Boiler	Weil McLain	PL486SF	1986	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	0
226712	Ferry	1	Propulsion	Wartsilla	824 TS	1981	Onroad Diesel (EPA)	1448	1080	Tier 0-Cat 1	0
226712	Ferry	2	Propulsion	Wartsilla	824 TS	1981	Onroad Diesel (EPA)	1448	1080	Tier 0-Cat 1	0
226712	Ferry	3	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	0
226712	Ferry	4	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	355	265	Tier 0-Cat 1	0
226712	Ferry	5	Boiler	Weil McLain	PL486SF	1986	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	0
226738	Ferry	1	Propulsion	EMD	645 7B	1985	Onroad Diesel (EPA)	1448	1080	Tier 0-Cat 2	3283
226738	Ferry	2	Propulsion	EMD	645 7B	1985	Onroad Diesel (EPA)	1448	1080	Tier 0-Cat 2	3150
226738	Ferry	3	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	0
226738	Ferry	4	Auxiliary	Cummins	NTA 855	1986	Onroad Diesel (EPA)	355	265	Tier 0-Cat 1	24
226738	Ferry	5	Boiler	Weil McLain	PL486SF	1986	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	0
251646	Ferry	1	Propulsion	Wartsilla	624 TS	1990	Onroad Diesel (EPA)	1086	810	Tier 0-Cat 1	5548

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
251646	Ferry	2	Propulsion	Wartsilla	624 TS	1990	Onroad Diesel (EPA)	1086	810	Tier 0-Cat 1	5550
251646	Ferry	5	Auxiliary	Cummins	6BT5.9	1990	Onroad Diesel (EPA)	166	124	Tier 0-Cat 1	25
251646	Ferry	6	Boiler	Weil McLain	H1088WS	1990	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	2500
251646	Ferry	3	Auxiliary	Cummins	6CTA8.3-G	1990	Onroad Diesel (EPA)	277	207	Tier 0-Cat 1	5088
251646	Ferry	4	Auxiliary	Cummins	6CTA8.3-G	1990	Onroad Diesel (EPA)	277	207	Tier 0-Cat 1	847
268732	Ferry	1	Propulsion	tork Werkspo	9FHD 240	1988	Onroad Diesel (EPA)	1250	933	Tier 0-Cat 2	1112
268732	Ferry	2	Propulsion	tork Werkspo	9FHD 240	1988	Onroad Diesel (EPA)	1250	933	Tier 0-Cat 2	1112
268732	Ferry	4	Auxiliary	Cummins	NTA 855	1988	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	28
268732	Ferry	5	Boiler	Weil McLain	BL-1088-SF	1988	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	24
268732	Ferry	3	Auxiliary	Cummins	NTA 855	1988	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	48
277872	Ferry	1	Propulsion	EMD	645 7B	2000	Onroad Diesel (EPA)	1250	933	Tier 1-Cat 2	4710
277872	Ferry	2	Propulsion	EMD	645 7B	2000	Onroad Diesel (EPA)	1250	933	Tier 1-Cat 2	4726
277872	Ferry	4	Auxiliary	Cummins	NTA 855	1995	Onroad Diesel (EPA)	325	242	Tier 0-Cat 1	31
277872	Ferry	5	Boiler	Weil McLain		1995	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	0
277872	Ferry	3	Auxiliary	Cummins	NTA 855	1995	Onroad Diesel (EPA)	325	242	Tier 0-Cat 1	61
278437	Ferry	1	Propulsion	EMD	645 7B	2000	Onroad Diesel (EPA)	1250	933	Tier 1-Cat 2	5835
278437	Ferry	2	Propulsion	EMD	645 7B	2000	Onroad Diesel (EPA)	1250	933	Tier 1-Cat 2	5836
278437	Ferry	4	Auxiliary	Cummins	NTA 855	1959	Onroad Diesel (EPA)	325	242	Tier 0-Cat 1	33
278437	Ferry	5	Boiler	Weil McLain	H1088WS	1959	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	100
278437	Ferry	3	Auxiliary	Cummins	NTA 855	1959	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	249
288249	Ferry	1	Propulsion	Cat		2004	Offroad Diesel (EPA)	360	269	Tier 2-Cat 1	6000
288249	Ferry	2	Propulsion	Cat		2004	Offroad Diesel (EPA)	360	269	Tier 2-Cat 1	6000
288249	Ferry	3	Auxiliary			2004	Offroad Diesel (EPA)	20	15	Tier 2-Cat 1	3250
288249	Ferry	4	Auxiliary			2004	Offroad Diesel (EPA)	13	10	Tier 2-Cat 1	3250
508159	Ferry	1	Propulsion	CAT	D 379	1967	Onroad Diesel (EPA)	430	321	Tier 0-Cat 1	0
508159	Ferry	2	Propulsion	CAT	D379	1967	Onroad Diesel (EPA)	430	321	Tier 0-Cat 1	0
508159	Ferry	5	Auxiliary	Cummins	4BT 3.9	1967	Onroad Diesel (EPA)	82	61	Tier 0-Cat 1	0
508159	Ferry	6	Boiler	Way Wolf	2128 8-C	1967	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	0
508159	Ferry	3	Auxiliary	Cummins	4BT 3.9G2	1967	Onroad Diesel (EPA)	102	76	Tier 0-Cat 1	0
508159	Ferry	4	Auxiliary	Cummins	4BT 3.9G2	1967	Onroad Diesel (EPA)	102	76	Tier 0-Cat 1	0
508160	Ferry	1	Propulsion	EMD	645F7B	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4478
508160	Ferry	2	Propulsion	EMD	645F7B	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4476

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
508160	Ferry	3	Propulsion	EMD	645F7B	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4650
508160	Ferry	4	Propulsion	EMD	645F7B	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4492
508160	Ferry	8	Auxiliary	Detroit	6V92	1999	Onroad Diesel (EPA)	355	265	Tier 0-Cat 1	24
508160	Ferry	9	Boiler	Weil McLain		1999	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	750
508160	Ferry	10	Boiler	Weil McLain		1999	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	750
508160	Ferry	5	Auxiliary	Detroit	Series 50 DDEC	1999	Onroad Diesel (EPA)	134	100	Tier 0-Cat 1	4651
508160	Ferry	6	Auxiliary	Cat	3412	1999	Onroad Diesel (EPA)	451	336	Tier 0-Cat 1	3620
508160	Ferry	7	Auxiliary	Cat	3412	1999	Onroad Diesel (EPA)	451	336	Tier 0-Cat 1	2457
508604	Ferry	1	Propulsion	EMD	645 E5	2002	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	5515
508604	Ferry	2	Propulsion	EMD	645 E5	2002	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	5376
508604	Ferry	3	Propulsion	EMD	645 E5	2002	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	5530
508604	Ferry	4	Propulsion	EMD	645 E5	2002	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	5574
508604	Ferry	8	Auxiliary	Detroit	6V92	2002	Onroad Diesel (EPA)	355	265	Tier 1-Cat 1	44
508604	Ferry	9	Boiler	Weil McLain	94	2002	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1500
508604	Ferry	10	Boiler	Weil McLain	94	2002	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1500
508604	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	5821
508604	Ferry	6	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3045
508604	Ferry	7	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3035
510289	Ferry	1	Propulsion	Cat	D343	1994	Offroad Diesel (EPA)	335	250	Tier 0-Cat 1	2600
510289	Ferry	2	Propulsion	Cat	D343	1994	Offroad Diesel (EPA)	335	250	Tier 0-Cat 1	2600
510289	Ferry	3	Auxiliary	Kato		1985	Offroad Diesel (EPA)	27	20	Tier 0-Cat 1	2600
510289	Ferry	4	Auxiliary	Yanmar		1985	Offroad Diesel (EPA)	30	22	Tier 0-Cat 1	2600
511823	Ferry	1	Propulsion	EMD	645 E5	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4354
511823	Ferry	2	Propulsion	EMD	645 E5	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4354
511823	Ferry	3	Propulsion	EMD	645 E5	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4354
511823	Ferry	4	Propulsion	EMD	645 E5	2000	Onroad Diesel (EPA)	2000	1492	Tier 1-Cat 2	4354
511823	Ferry	8	Auxiliary	Detroit	Series 6V71	2004	Onroad Diesel (EPA)	355	265	Tier 1-Cat 1	23
511823	Ferry	9	Boiler	Weil McLain	94	2004	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1000
511823	Ferry	10	Boiler	Weil McLain	94	2004	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1000
511823	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2004	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3954
511823	Ferry	6	Auxiliary	Detroit	Series 60 DDEC	2004	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	2272
511823	Ferry	7	Auxiliary	Detroit	Series 60 DDEC	2004	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3099

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
512324	Ferry	1	Propulsion	EMD	645F7B	2000	ULSD	2550	1902	Tier 1-Cat 2	2579
512324	Ferry	2	Propulsion	EMD	645F7B	2000	ULSD	2550	1902	Tier 1-Cat 2	4745
512324	Ferry	3	Propulsion	EMD	645F7B	2000	ULSD	2550	1902	Tier 1-Cat 2	5200
512324	Ferry	4	Propulsion	EMD	645F7B	2000	ULSD	2550	1902	Tier 1-Cat 2	4271
512324	Ferry	6	Auxiliary	Cat	3406	1991	ULSD	451	336	Tier 0-Cat 1	24
512324	Ferry	7	Boiler	Weil McLain	94	1991	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	2000
512324	Ferry	8	Boiler	Weil McLain	94	1991	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	2000
512324	Ferry	5	Auxiliary	Cat	3412	1991	ULSD	451	336	Tier 0-Cat 1	185
544785	Ferry	1	Propulsion	EMD	645 F7B	2000	Onroad Diesel (EPA)	2875	2145	Tier 1-Cat 2	6232
544785	Ferry	2	Propulsion	EMD	645 F7B	2000	Onroad Diesel (EPA)	2875	2145	Tier 1-Cat 2	6224
544785	Ferry	3	Propulsion	EMD	645 F7B	2000	Onroad Diesel (EPA)	2875	2145	Tier 1-Cat 2	6237
544785	Ferry	4	Propulsion	EMD	645 F7B	2000	Onroad Diesel (EPA)	2875	2145	Tier 1-Cat 2	6240
544785	Ferry	8	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	24
544785	Ferry	9	Boiler	Weil McLain	PL-1194S/F	2002	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	3000
544785	Ferry	10	Boiler	Weil McLain	PL-1194S/F	2002	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	3000
544785	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	6393
544785	Ferry	6	Auxiliary	Cummins	KTA38	2002	Onroad Diesel (EPA)	1210	903	Tier 1-Cat 1	3427
544785	Ferry	7	Auxiliary	Cummins	KTA38	2002	Onroad Diesel (EPA)	1210	903	Tier 1-Cat 1	3087
546382	Ferry	1	Propulsion	EMD	645 F7B	2005	Onroad Diesel (EPA)	2875	2145	Tier 2-Cat 2	2830
546382	Ferry	2	Propulsion	EMD	645 F7B	2005	Onroad Diesel (EPA)	2875	2145	Tier 2-Cat 2	2721
546382	Ferry	3	Propulsion	EMD	645 F7B	2005	Onroad Diesel (EPA)	2875	2145	Tier 2-Cat 2	2727
546382	Ferry	4	Propulsion	EMD	645 F7B	2005	Onroad Diesel (EPA)	2875	2145	Tier 2-Cat 2	2782
546382	Ferry	8	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	24
546382	Ferry	9	Boiler	Weil McLain	PL-1194S/F	2002	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1000
546382	Ferry	10	Boiler	Weil McLain	PL-1194S/F	2002	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1000
546382	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2002	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3103
546382	Ferry	6	Auxiliary	Cummins	KTA38	2002	Onroad Diesel (EPA)	1210	903	Tier 1-Cat 1	529
546382	Ferry	7	Auxiliary	Cummins	KTA38	2002	Onroad Diesel (EPA)	1210	903	Tier 1-Cat 1	2731
574608	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	2000
574608	Ferry	2	Propulsion			1994	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	2000
601686	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	540	403	Tier 0-Cat 1	4000
601686	Ferry	2	Propulsion			1994	Offroad Diesel (EPA)	540	403	Tier 0-Cat 1	4000

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
601686	Ferry	3	Auxiliary			1985	Offroad Diesel (EPA)	54	40	Tier 0-Cat 1	3000
624022	Ferry	1	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6586
624022	Ferry	2	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6584
624022	Ferry	6	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	168	125	Tier 1-Cat 1	24
624022	Ferry	7	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1700
624022	Ferry	8	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1700
624022	Ferry	3	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	6842
624022	Ferry	4	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3562
624022	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3484
627507	Ferry	1	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6572
627507	Ferry	2	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6516
627507	Ferry	7	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1500
627507	Ferry	8	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1500
627507	Ferry	6	Auxiliary	Detroit	Series 6V71	2003	Onroad Diesel (EPA)	168	125	Tier 1-Cat 1	36
627507	Ferry	3	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	6587
627507	Ferry	4	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3391
627507	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3142
630023	Ferry	1	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6131
630023	Ferry	2	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6145
630023	Ferry	6	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	168	125	Tier 1-Cat 1	24
630023	Ferry	7	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	3000
630023	Ferry	8	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	3000
630023	Ferry	3	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	6551
630023	Ferry	4	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	1168
630023	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	5588
636551	Ferry	1	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6993
636551	Ferry	2	Propulsion	GE	7FDM12EFI	2003	Onroad Diesel (EPA)	2500	1865	Tier 1-Cat 2	6993
636551	Ferry	6	Auxiliary	Detroit	6V71	2003	Onroad Diesel (EPA)	168	125	Tier 1-Cat 1	24
636551	Ferry	7	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1500
636551	Ferry	8	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1500
636551	Ferry	3	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	7015
636551	Ferry	4	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	5851

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
636551	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	1089
662478	Ferry	1	Propulsion	GE	7FDM12EFI	2004	Onroad Diesel (EPA)	2500	1865	Tier 2-Cat 2	5592
662478	Ferry	2	Propulsion	GE	7FDM12EFI	2004	Onroad Diesel (EPA)	2500	1865	Tier 2-Cat 2	5589
662478	Ferry	6	Auxiliary	Detroit	Series 6V71	2004	Onroad Diesel (EPA)	168	125	Tier 1-Cat 1	24
662478	Ferry	7	Boiler	Seattle Boiler	SDW50M	2004	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1200
662478	Ferry	8	Boiler	Seattle Boiler	SDW50M	2004	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1200
662478	Ferry	3	Auxiliary	Detroit	Series 60 DDEC	2004	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	5628
662478	Ferry	4	Auxiliary	Detroit	Series 60 DDEC	2004	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	796
662478	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2004	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	4821
678705	Ferry	1	Propulsion	Detroit	8V71	1994	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	2900
678705	Ferry	2	Propulsion	Detroit	8V71	1994	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	2900
678705	Ferry	3	Auxiliary	Lugger		1985	Offroad Diesel (EPA)	16	12	Tier 0-Cat 1	2900
949139	Ferry	1	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	710	530	Tier 0-Cat 1	1074
949139	Ferry	2	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	710	530	Tier 0-Cat 1	853
949139	Ferry	3	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	710	530	Tier 0-Cat 1	1009
949139	Ferry	4	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	710	530	Tier 0-Cat 1	1082
949139	Ferry	5	Auxiliary	Detroit	471	1989	Onroad Diesel (EPA)	80	60	Tier 0-Cat 1	1001
949139	Ferry	6	Auxiliary	Detroit	471	1989	Onroad Diesel (EPA)	80	60	Tier 0-Cat 1	444
949140	Ferry	1	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	960	716	Tier 0-Cat 1	1403
949140	Ferry	2	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	960	716	Tier 0-Cat 1	1461
949140	Ferry	3	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	960	716	Tier 0-Cat 1	1473
949140	Ferry	4	Propulsion	Detroit	16V92 TA	1989	Onroad Diesel (EPA)	960	716	Tier 0-Cat 1	1510
949140	Ferry	5	Auxiliary	Detroit	471	1989	Onroad Diesel (EPA)	80	60	Tier 0-Cat 1	1059
949140	Ferry	6	Auxiliary	Detroit	471	1989	Onroad Diesel (EPA)	80	60	Tier 0-Cat 1	736
965831	Ferry	1	Propulsion	Detroit	16V149TI	1989	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 1	4000
965831	Ferry	2	Propulsion	Detroit	16V149TI	1989	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 1	4000
991479	Ferry	1	Propulsion	Allied Signal	TF40	1993	Offroad Diesel (EPA)	4400	3282	Tier 0-Cat 2	4000
991479	Ferry	2	Propulsion	Allied Signal	TF40	1993	Offroad Diesel (EPA)	4000	2984	Tier 0-Cat 2	4000
999032	Ferry	1	Propulsion	GE	7FDM12EFI	2005	Onroad Diesel (EPA)	2500	1865	Tier 2-Cat 2	3908
999032	Ferry	2	Propulsion	GE	7FDM12EFI	2005	Onroad Diesel (EPA)	2500	1865	Tier 2-Cat 2	3908
999032	Ferry	6	Auxiliary	Detroit	6V71	2003	Onroad Diesel (EPA)	168	125	Tier 1-Cat 1	24
999032	Ferry	8	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1000

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
999032	Ferry	7	Boiler	Seattle Boiler	SDW50M	2003	Onroad Diesel (EPA)	60	45	Tier 1-Cat 1	1000
999032	Ferry	3	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	3968
999032	Ferry	4	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	2012
999032	Ferry	5	Auxiliary	Detroit	Series 60 DDEC	2003	Onroad Diesel (EPA)	400	298	Tier 1-Cat 1	2035
1023545	Ferry	1	Propulsion			1996	Offroad Diesel (EPA)	960	716	Tier 0-Cat 1	5150
1023545	Ferry	2	Propulsion			1996	Offroad Diesel (EPA)	960	716	Tier 0-Cat 1	5150
1023545	Ferry	3	Auxiliary			1985	Offroad Diesel (EPA)	99	74	Tier 0-Cat 1	2760
1023545	Ferry	4	Auxiliary			1985	Offroad Diesel (EPA)	99	74	Tier 0-Cat 1	2760
1052576	Ferry	1	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	4072
1052576	Ferry	2	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	3812
1052576	Ferry	3	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	6974
1052576	Ferry	4	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	6535
1052576	Ferry	5	Auxiliary	Cat	3412	1997	Onroad Diesel (EPA)	719	536	Tier 0-Cat 1	1314
1052576	Ferry	6	Auxiliary	Cat	3412	1997	Onroad Diesel (EPA)	831	620	Tier 0-Cat 1	46
1052576	Ferry	7	Boiler	Weil McLain	888	1997	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	300
1052576	Ferry	8	Boiler	Weil McLain	888	1997	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	300
1061309	Ferry	1	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	3978
1061309	Ferry	2	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	3813
1061309	Ferry	3	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	6890
1061309	Ferry	4	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	6882
1061309	Ferry	5	Auxiliary	Cat	3412	1998	Onroad Diesel (EPA)	719	536	Tier 0-Cat 1	1314
1061309	Ferry	6	Auxiliary	Cat	3412	1998	Onroad Diesel (EPA)	831	620	Tier 0-Cat 1	131
1061309	Ferry	7	Boiler			1998	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	300
1061309	Ferry	8	Boiler			1998	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	300
1061310	Ferry	1	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	3772
1061310	Ferry	2	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	3857
1061310	Ferry	3	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	6286
1061310	Ferry	4	Propulsion	EMD	710 G7B	2000	Onroad Diesel (EPA)	3300	2462	Tier 1-Cat 2	6123
1061310	Ferry	5	Auxiliary	Cat	3412	1999	Onroad Diesel (EPA)	719	536	Tier 0-Cat 1	1691
1061310	Ferry	6	Auxiliary	Cat	3412	1999	Onroad Diesel (EPA)	831	620	Tier 0-Cat 1	202
1061310	Ferry	7	Boiler	Weil McLain	888	1999	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	600
1061310	Ferry	8	Boiler	Weil McLain	888	1999	Onroad Diesel (EPA)	60	45	Tier 0-Cat 1	600

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
1063252	Ferry	1	Propulsion	Detroit	16V149TI	1998	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1063252	Ferry	2	Propulsion	Detroit	16V149TI	1998	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1063252	Ferry	3	Propulsion	Detroit	16V149TI	1998	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1063252	Ferry	4	Propulsion	Detroit	16V149TI	1998	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1063252	Ferry	5	Auxiliary	Northern Light	P-4039T	1998	Onroad Diesel (EPA)	168	125	Tier 0-Cat 1	0
1063252	Ferry	6	Auxiliary	Northern Light	P-4039T	1998	Onroad Diesel (EPA)	168	125	Tier 0-Cat 1	0
1084026	Ferry	1	Propulsion	Detroit	16V149TI	1999	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1084026	Ferry	2	Propulsion	Detroit	16V149TI	1999	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1084026	Ferry	3	Propulsion	Detroit	16V149TI	1999	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1084026	Ferry	4	Propulsion	Detroit	16V149TI	1999	Onroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	0
1084026	Ferry	5	Auxiliary	Northern Light	P-4039T	1999	Onroad Diesel (EPA)	168	125	Tier 0-Cat 1	0
1084026	Ferry	6	Auxiliary	Northern Light	P-4039T	1999	Onroad Diesel (EPA)	168	125	Tier 0-Cat 1	0
8520757	Ferry	1	Propulsion		MTU396TE74L	1994	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 1	4000
8520757	Ferry	2	Propulsion		MTU396TE74L	1994	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 1	4000
PSFC	Ferry	1	Propulsion	Detroit	8V71	1994	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	2600
PSFC	Ferry	2	Propulsion	Detroit	8V71	1994	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	2600
PSFC	Ferry	3	Auxiliary	Lugger		1985	Offroad Diesel (EPA)	16	12	Tier 0-Cat 1	2600
PSFCa	Ferry	1	Propulsion	EMD	12V	1994	Offroad Diesel (EPA)	2600	1940	Tier 0-Cat 1	1350
PSFCa	Ferry	2	Propulsion			1994	Offroad Diesel (EPA)	2600	1940	Tier 0-Cat 1	1350
PSFE	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	4000
PSFGS	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	1300	970	Tier 0-Cat 1	800
PSFML	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	4000
PSFRH	Ferry	1	Propulsion			1994	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	800
PSFS	Ferry	1	Propulsion	Cummins	6 Cyl.	1983	Offroad Diesel (EPA)	250	187	Tier 0-Cat 1	500
PSFS	Ferry	2	Auxiliary			1985	Offroad Diesel (EPA)	20	15	Tier 0-Cat 1	500
231095	Government	1	Propulsion			1940	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	143
231095	Government	2	Propulsion			1940	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	143
231095	Government	3	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	7
231095	Government	4	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	7
231095	Government	5	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	10
231095	Government	6	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	15
231095	Government	7	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	57

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
231095	Government	8	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	57
231095	Government	9	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	193
231095	Government	10	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	8
231095	Government	11	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	45
231095	Government	12	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	45
231095	Government	13	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	45
231095	Government	14	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	45
231095	Government	15	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	45
231095	Government	16	Auxiliary			1940	Offroad Diesel (EPA)	160	119	Tier 0-Cat 1	45
508932	Government	1	Propulsion	GM		1988	Offroad Diesel (EPA)	2200	1641	Tier 0-Cat 1	50
605216	Government	1	Propulsion	Detroit	8V71	1988	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	2500
605216	Government	2	Propulsion	Detroit	8V71	1988	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	2500
605216	Government	3	Propulsion	Detroit	8V71	1988	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	2500
605216	Government	4	Auxiliary	Detroit	271	1978	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	2500
605216	Government	5	Auxiliary	Detroit	271	1978	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	2500
674678	Government	1	Propulsion			1984	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	339
674678	Government	2	Propulsion			1984	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	339
674678	Government	3	Propulsion			1984	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	339
674678	Government	4	Auxiliary			1984	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	255
674678	Government	5	Auxiliary			1984	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	226
7333195	Government	1	Propulsion	White Superior		1984	Offroad Diesel (EPA)	534	398	Tier 0-Cat 1	50
7333195	Government	2	Propulsion	White Superior		1966	Offroad Diesel (EPA)	534	398	Tier 0-Cat 1	50
CG004637	Government	1	Propulsion	F-M	12 cyl	1988	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	40
CG004637	Government	2	Propulsion	F-M	12 cyl	1988	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	40
CG044855	Government	1	Propulsion	F-M	12 cyl	1988	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	40
CG044855	Government	2	Propulsion	F-M	12 cyl	1988	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	40
CG044937	Government	1	Propulsion	Paxman	V16	1988	Offroad Diesel (EPA)	2880	2148	Tier 0-Cat 2	1200
CG044937	Government	2	Propulsion	Paxman	V16	1988	Offroad Diesel (EPA)	2880	2148	Tier 0-Cat 2	1200
CG06036	Government	1	Propulsion			1988	Offroad Diesel (EPA)	2880	2148	Tier 0-Cat 2	1200
CG06036	Government	2	Propulsion			1988	Offroad Diesel (EPA)	2880	2148	Tier 0-Cat 2	1200
CG325332	Government	1	Propulsion	GE		1985	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	50
CG325332	Government	2	Propulsion	GE		1985	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	50

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
CG608131	Government	1	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 2	1800
CG608131	Government	2	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 2	1800
CG830693	Government	1	Propulsion	FM		1988	Offroad Diesel (EPA)	325	242	Tier 0-Cat 1	50
PSGAD	Government	1	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	2000
PSGAD	Government	2	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	2000
PSGDB	Government	1	Propulsion			2004	Offroad Diesel (EPA)	175	131	Tier 2-Cat 1	200
PSGDB	Government	2	Propulsion			2004	Offroad Diesel (EPA)	175	131	Tier 2-Cat 1	200
PSGDM1	Government	1	Propulsion	Chevy	350	1988	Gasoline	300	224	Gasoline-4 stroke	150
PSGDP2	Government	1	Propulsion	Mercruiser	350	1988	Gasoline	300	224	Gasoline-4 stroke	250
PSGDP3	Government	1	Propulsion	Mercruiser	350	1988	Gasoline	300	224	Gasoline-4 stroke	250
PSGDP5	Government	1	Propulsion	Chevy	350	1988	Gasoline	300	224	Gasoline-4 stroke	250
PSGK	Government	1	Propulsion	GM	V12-71	1988	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	2700
PSGK	Government	2	Propulsion	GM	V12-71	1988	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	2700
PSGK	Government	3	Auxiliary	GM	361S	1978	Offroad Diesel (EPA)	43	32	Tier 0-Cat 1	2700
PSGM	Government	1	Propulsion	Detroit	V12	1988	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	2200
PSGM	Government	2	Propulsion	Detroit	V12	1988	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	2200
PSGM	Government	3	Auxiliary	GM	271	1978	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	2200
PSGM	Government	4	Auxiliary	GM	271	1978	Offroad Diesel (EPA)	40	30	Tier 0-Cat 1	2200
PSGMR	Government	1	Propulsion	EMD		1968	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	50
PSGMR	Government	2	Propulsion	EMD		1968	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	50
PSGSL	Government	1	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	1800
PSGSL	Government	2	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	1800
PSGW	Government	1	Propulsion	MTU	8 cyl	1988	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	1800
SPP1	Government	1	Propulsion			1988	Onroad Diesel (EPA)	375	280	Tier 0-Cat 1	1083
SPP1	Government	2	Propulsion			1988	Onroad Diesel (EPA)	375	280	Tier 0-Cat 1	1083
SPP16	Government	1	Propulsion			1988	Gasoline	90	67	Gasoline-2 stroke	50
SPP2	Government	1	Propulsion			2000	Onroad Diesel (EPA)	587	438	Tier 1-Cat 1	100
SPP2	Government	2	Propulsion			2000	Onroad Diesel (EPA)	587	438	Tier 1-Cat 1	100
SPP3	Government	1	Propulsion			1988	Onroad Diesel (EPA)	260	194	Tier 0-Cat 1	729
SPP3	Government	2	Propulsion			1988	Onroad Diesel (EPA)	260	194	Tier 0-Cat 1	729
SPP4	Government	1	Propulsion			1988	Onroad Diesel (EPA)	660	492	Tier 0-Cat 1	1400
SPP4	Government	2	Propulsion			1988	Onroad Diesel (EPA)	660	492	Tier 0-Cat 1	1400

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
SPP4	Government	3	Auxiliary			1978	Onroad Diesel (EPA)	425	317	Tier 0-Cat 1	1400
SPP5	Government	1	Propulsion			1988	Gasoline	300	224	Gasoline-4 stroke	192
SPP6	Government	1	Propulsion			2000	Gasoline	250	187	Gasoline-4 stroke	50
SPP6	Government	2	Propulsion			2000	Gasoline	250	187	Gasoline-4 stroke	50
SPP6	Government	3	Propulsion			2000	Gasoline	250	187	Gasoline-4 stroke	50
SPP7	Government	1	Propulsion			2000	Gasoline	140	104	Gasoline-4 stroke	636
SPP8	Government	1	Propulsion			2000	Gasoline	140	104	Gasoline-4 stroke	286
SPPX1	Government	1	Propulsion			1988	Gasoline	10	7	Gasoline-2 stroke	40
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WADNRI	Government	1	Propulsion		4-Stroke	2001	Gasoline	250	187	Gasoline-4 stroke	200
WMEC 61	Government	1	Propulsion	Alco	251CE	1988	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	40
WMEC 61	Government	2	Propulsion	Alco	251CE	1988	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	40
247040	Harbor Tug	1	Propulsion			1977	Biodiesel (B99)	500	373	Tier 0-Cat 1	1000
247040	Harbor Tug	2	Propulsion			1977	Biodiesel (B99)	500	373	Tier 0-Cat 1	1000
249861	Harbor Tug	1	Propulsion	CAT	D348	1945	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	0
249861	Harbor Tug	2	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	0
249861	Harbor Tug	3	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	0

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
256601	Harbor Tug	1	Propulsion	GM	8v92	1977	Offroad Diesel (EPA)	380	283	Tier 0-Cat 1	1000
263365	Harbor Tug	1	Propulsion	Cummins		1951	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	1000
275287	Harbor Tug	1	Propulsion	Detroit Diesel	12v71	1976	Offroad Diesel (EPA)	340	254	Tier 0-Cat 1	2080
275287	Harbor Tug	2	Propulsion	Detroit Diesel	12v71	1976	Offroad Diesel (EPA)	340	254	Tier 0-Cat 1	2080
276766	Harbor Tug	1	Propulsion	EMD	12-645-E6	1957	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 2	200
290759	Harbor Tug	1	Propulsion	CAT	398	1963	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	1200
290759	Harbor Tug	2	Propulsion	CAT	398	1963	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	1200
290759	Harbor Tug	3	Auxiliary	GM	671	1963	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
290759	Harbor Tug	4	Auxiliary	GM	671	1963	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
294666	Harbor Tug	1	Propulsion	CAT	3412	1964	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	1200
294666	Harbor Tug	2	Propulsion	CAT	3412	1964	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	1200
294666	Harbor Tug	3	Auxiliary	GM	671	1964	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
294666	Harbor Tug	4	Auxiliary	GM	671	1964	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
299614	Harbor Tug	1	Propulsion	CAT	3606	1996	Offroad Diesel (EPA)	2800	2089	Tier 0-Cat 2	1200
299614	Harbor Tug	2	Auxiliary	GM	671	1996	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
299614	Harbor Tug	3	Auxiliary	GM	671	1996	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
299737	Harbor Tug	1	Propulsion	Cummins		1999	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	1200
299737	Harbor Tug	2	Propulsion	Cummins		1999	Offroad Diesel (EPA)	550	410	Tier 0-Cat 1	1200
299737	Harbor Tug	3	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
299737	Harbor Tug	4	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
347892	Harbor Tug	1	Propulsion	Detroit Diesel	16V149	1944	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	1200
347892	Harbor Tug	2	Propulsion	Detroit Diesel	16V149	1944	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	1200
347892	Harbor Tug	3	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
347892	Harbor Tug	4	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
501267	Harbor Tug	1	Propulsion	Detroit	12V92T	1965	Offroad Diesel (EPA)	675	504	Tier 0-Cat 1	1400
501267	Harbor Tug	2	Propulsion	Detroit	12V92T	1965	Offroad Diesel (EPA)	675	504	Tier 0-Cat 1	1400
501267	Harbor Tug	3	Auxiliary	GM	3-71	1970	Offroad Diesel (EPA)	87	65	Tier 0-Cat 1	1728
501267	Harbor Tug	4	Auxiliary	GM	3-71	1970	Offroad Diesel (EPA)	87	65	Tier 0-Cat 1	1728
501938	Harbor Tug	1	Propulsion	Detroit Diesel	12V71	1965	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	1200
501938	Harbor Tug	2	Propulsion	Detroit Diesel	12V71	1965	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	1200
501938	Harbor Tug	3	Propulsion	Detroit Diesel	12V71	1965	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	1200
501938	Harbor Tug	4	Auxiliary	GM	671	1965	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
501938	Harbor Tug	5	Auxiliary	GM	671	1965	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
502662	Harbor Tug	1	Propulsion	EMD		1978	Offroad Diesel (EPA)	1050	783	Tier 0-Cat 2	1500
502662	Harbor Tug	2	Propulsion	EMD		1978	Offroad Diesel (EPA)	1050	783	Tier 0-Cat 2	1500
502662	Harbor Tug	3	Auxiliary			1978	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
502662	Harbor Tug	4	Auxiliary			1978	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
503426	Harbor Tug	1	Propulsion	CAT	D398	1966	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	1200
503426	Harbor Tug	2	Auxiliary	GM	671	1966	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
503426	Harbor Tug	3	Auxiliary	GM	671	1966	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
506094	Harbor Tug	1	Propulsion	CAT	343	1966	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	400
507257	Harbor Tug	1	Propulsion	EMD		1967	Offroad Diesel (EPA)	1975	1473	Tier 0-Cat 2	1500
507257	Harbor Tug	2	Propulsion	EMD		1967	Offroad Diesel (EPA)	1975	1473	Tier 0-Cat 2	1500
507257	Harbor Tug	3	Auxiliary			1967	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
507257	Harbor Tug	4	Auxiliary			1967	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
507755	Harbor Tug	1	Propulsion	CAT	D-343	1969	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	1779
510653	Harbor Tug	1	Propulsion	CAT	3512B	1999	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	1200
510653	Harbor Tug	2	Propulsion	CAT	3512B	1999	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	1200
510653	Harbor Tug	3	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
510653	Harbor Tug	4	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
512190	Harbor Tug	1	Propulsion	Caterpillar		1968	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	1000
514329	Harbor Tug	1	Propulsion	CAT	3408	1968	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	2500
514329	Harbor Tug	2	Propulsion	CAT	3408	1968	Offroad Diesel (EPA)	800	597	Tier 0-Cat 1	2500
514329	Harbor Tug	3	Auxiliary	John Deere		1968	Offroad Diesel (EPA)	55	40	Tier 0-Cat 1	1250
514329	Harbor Tug	4	Auxiliary	John Deere		1968	Offroad Diesel (EPA)	55	40	Tier 0-Cat 1	1250
521490	Harbor Tug	1	Propulsion	CAT	D-343	1969	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	919
521907	Harbor Tug	1	Propulsion	EMD		1969	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	1500
521907	Harbor Tug	2	Propulsion	EMD		1969	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	1500
521907	Harbor Tug	3	Auxiliary			1969	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
521907	Harbor Tug	4	Auxiliary			1969	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
522088	Harbor Tug	1	Propulsion	CAT	3508	1969	Offroad Diesel (EPA)	775	578	Tier 0-Cat 1	3500
522088	Harbor Tug	2	Propulsion	CAT	3508	1969	Offroad Diesel (EPA)	775	578	Tier 0-Cat 1	3500
522088	Harbor Tug	3	Auxiliary	GM	4 71	1969	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1750
522088	Harbor Tug	4	Auxiliary	GM	4 71	1969	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1750

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
526883	Harbor Tug	1	Propulsion	John Deere	8L	1999	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	1200
526883	Harbor Tug	2	Propulsion	John Deere	8L	1999	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	1200
526883	Harbor Tug	3	Propulsion	John Deere	8L	1999	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	1200
526883	Harbor Tug	4	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
526883	Harbor Tug	5	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
527549	Harbor Tug	1	Propulsion	Detroit		1970	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	1500
527549	Harbor Tug	2	Propulsion	Detroit		1970	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	1500
527549	Harbor Tug	3	Auxiliary			1970	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
527549	Harbor Tug	4	Auxiliary			1970	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
529534	Harbor Tug	1	Propulsion	CAT	343	1976	Offroad Diesel (EPA)	340	254	Tier 0-Cat 1	2150
530828	Harbor Tug	1	Propulsion	CAT	3306DITA	1985	Offroad Diesel (EPA)	220	164	Tier 0-Cat 1	1248
542679	Harbor Tug	1	Propulsion	CAT	D-353	1972	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	840
542679	Harbor Tug	2	Propulsion	CAT	D-353	1972	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	840
542679	Harbor Tug	3	Auxiliary	CAT	3304	1972	Offroad Diesel (EPA)	75	56	Tier 0-Cat 1	840
564341	Harbor Tug	1	Propulsion	CAT	3508B	2000	Offroad Diesel (EPA)	500	373	Tier 1-Cat 1	270
564341	Harbor Tug	2	Propulsion	CAT	3508B	2000	Offroad Diesel (EPA)	500	373	Tier 1-Cat 1	270
564341	Harbor Tug	3	Auxiliary	Detroit Diesel	6V71	1975	Offroad Diesel (EPA)	65	48	Tier 0-Cat 1	270
564341	Harbor Tug	4	Auxiliary	Detroit Diesel	6V71	1975	Offroad Diesel (EPA)	65	48	Tier 0-Cat 1	270
571411	Harbor Tug	1	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	115
571411	Harbor Tug	2	Auxiliary	Detroit Diesel	471	1975	Offroad Diesel (EPA)	60	45	Tier 0-Cat 1	1289
571411	Harbor Tug	3	Auxiliary	Detroit Diesel	471	1975	Offroad Diesel (EPA)	60	45	Tier 0-Cat 1	546
571411	Harbor Tug	4	Propulsion	CAT	399	1975	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	1392
571411	Harbor Tug	5	Propulsion	CAT	399	1975	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	1392
572463	Harbor Tug	1	Propulsion	Detroit Diesel	8v71	1972	Offroad Diesel (EPA)	220	164	Tier 0-Cat 1	600
578032	Harbor Tug	1	Propulsion	CAT	3508	1977	Offroad Diesel (EPA)	855	638	Tier 0-Cat 1	4000
578032	Harbor Tug	2	Propulsion	CAT	3508	1977	Offroad Diesel (EPA)	855	638	Tier 0-Cat 1	4000
578032	Harbor Tug	3	Auxiliary	CAT	3304NA	1977	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	2500
578032	Harbor Tug	4	Auxiliary	Perkins	6-354	1976	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
583332	Harbor Tug	1	Propulsion	Detroit		1977	Offroad Diesel (EPA)	675	504	Tier 0-Cat 1	1500
583332	Harbor Tug	2	Propulsion	Detroit		1977	Offroad Diesel (EPA)	675	504	Tier 0-Cat 1	1500
583332	Harbor Tug	3	Auxiliary			1977	Offroad Diesel (EPA)	50	37	Tier 0-Cat 1	1500
583332	Harbor Tug	4	Auxiliary			1977	Offroad Diesel (EPA)	50	37	Tier 0-Cat 1	1500

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
583851	Harbor Tug	1	Propulsion	CAT	D 399	1980	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	1500
583851	Harbor Tug	2	Propulsion	CAT	D 399	1980	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	1500
583851	Harbor Tug	3	Auxiliary	Isuzu	6BG1-A	2001	Offroad Diesel (EPA)	105	78	Tier 1-Cat 1	1800
583851	Harbor Tug	4	Auxiliary	John Deere	404ST	2001	Offroad Diesel (EPA)	75	56	Tier 1-Cat 1	1800
585319	Harbor Tug	1	Propulsion	Cummins	KTA38	2002	Offroad Diesel (EPA)	850	634	Tier 1-Cat 1	2560
585319	Harbor Tug	2	Propulsion	Cummins	KTA38	2002	Offroad Diesel (EPA)	850	634	Tier 1-Cat 1	2560
585319	Harbor Tug	3	Auxiliary	Perkins	6354	1980	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1855
585319	Harbor Tug	4	Auxiliary	Detroit Diesel	371	1980	Offroad Diesel (EPA)	52	39	Tier 0-Cat 1	705
588535	Harbor Tug	1	Propulsion	Caterpillar		1978	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	1500
588535	Harbor Tug	2	Propulsion	Caterpillar		1978	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	1500
588535	Harbor Tug	3	Auxiliary			1978	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
588535	Harbor Tug	4	Auxiliary			1978	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
623521	Harbor Tug	1	Propulsion	Detroit		1980	Offroad Diesel (EPA)	625	466	Tier 0-Cat 1	1500
623521	Harbor Tug	2	Propulsion	Detroit		1980	Offroad Diesel (EPA)	625	466	Tier 0-Cat 1	1500
623521	Harbor Tug	3	Auxiliary			1980	Offroad Diesel (EPA)	50	37	Tier 0-Cat 1	1500
623521	Harbor Tug	4	Auxiliary			1980	Offroad Diesel (EPA)	50	37	Tier 0-Cat 1	1500
636305	Harbor Tug	1	Propulsion	Detroit Diesel	S-60 Tier II	2004	Offroad Diesel (EPA)	500	373	Tier 2-Cat 1	960
636305	Harbor Tug	2	Propulsion	Detroit Diesel	S-60 Tier II	2004	Offroad Diesel (EPA)	500	373	Tier 2-Cat 1	960
636305	Harbor Tug	3	Propulsion	Detroit Diesel	16V71	1981	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	960
636305	Harbor Tug	4	Auxiliary	Detroit Diesel	371	1981	Offroad Diesel (EPA)	65	48	Tier 0-Cat 1	960
636305	Harbor Tug	5	Auxiliary	Detroit Diesel	371	1981	Offroad Diesel (EPA)	65	48	Tier 0-Cat 1	960
636305	Harbor Tug	6	Auxiliary	Detroit Diesel	471	1981	Offroad Diesel (EPA)	65	48	Tier 0-Cat 1	960
636922	Harbor Tug	1	Propulsion	Cummins	1150	1981	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	1200
639797	Harbor Tug	1	Propulsion	CAT	3508B	2004	Offroad Diesel (EPA)	900	671	Tier 2-Cat 1	90
639797	Harbor Tug	2	Propulsion	CAT	3508B	2004	Offroad Diesel (EPA)	900	671	Tier 2-Cat 1	90
639797	Harbor Tug	3	Auxiliary	Toyota		2004	Offroad Diesel (EPA)	65	48	Tier 2-Cat 1	90
639797	Harbor Tug	4	Auxiliary	Toyota		2004	Offroad Diesel (EPA)	65	48	Tier 2-Cat 1	90
639797	Harbor Tug	5	Auxiliary	CAT	3054	2003	Offroad Diesel (EPA)	30	22	Tier 1-Cat 1	90
640554	Harbor Tug	1	Propulsion	CAT	3512B	1981	Offroad Diesel (EPA)	1250	933	Tier 0-Cat 1	1200
640554	Harbor Tug	2	Propulsion	CAT	3512B	1981	Offroad Diesel (EPA)	1250	933	Tier 0-Cat 1	1200
640554	Harbor Tug	3	Auxiliary	GM	671	1981	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
640554	Harbor Tug	4	Auxiliary	GM	671	1981	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
645701	Harbor Tug	1	Propulsion	Caterpillar		1981	Offroad Diesel (EPA)	765	571	Tier 0-Cat 1	1500
645701	Harbor Tug	2	Propulsion	Caterpillar		1981	Offroad Diesel (EPA)	765	571	Tier 0-Cat 1	1500
645701	Harbor Tug	3	Auxiliary			1981	Offroad Diesel (EPA)	50	37	Tier 0-Cat 1	1500
645701	Harbor Tug	4	Auxiliary			1981	Offroad Diesel (EPA)	50	37	Tier 0-Cat 1	1500
646126	Harbor Tug	1	Propulsion	GE		1945	Offroad Diesel (EPA)	3600	2686	Tier 0-Cat 1	1200
646126	Harbor Tug	2	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
646126	Harbor Tug	3	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
648423	Harbor Tug	1	Propulsion	Detroit Diesel	12V71	1982	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	1200
648423	Harbor Tug	2	Propulsion	Detroit Diesel	12V71	1982	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	1200
648423	Harbor Tug	3	Auxiliary	GM	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
648423	Harbor Tug	4	Auxiliary	GM	671	1982	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
917105	Harbor Tug	1	Propulsion	CAT	D398	1945	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	1200
917105	Harbor Tug	2	Propulsion	CAT	D398	1945	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	1200
917105	Harbor Tug	3	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
917105	Harbor Tug	4	Auxiliary	GM	671	1945	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
918736	Harbor Tug	1	Propulsion	CAT	3512	1987	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	2500
918736	Harbor Tug	2	Propulsion	CAT	3512	1987	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	2500
918736	Harbor Tug	3	Auxiliary	CAT	3304	1987	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1250
918736	Harbor Tug	4	Auxiliary	Duetz		1987	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1250
928453	Harbor Tug	1	Propulsion	CAT	3408 DITA	1984	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	2496
984759	Harbor Tug	1	Propulsion	CAT	3412	1992	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	2000
984759	Harbor Tug	2	Propulsion	CAT	3412	1992	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	2000
984759	Harbor Tug	3	Auxiliary	CAT	3304	1992	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1000
984759	Harbor Tug	4	Auxiliary	CAT	3304	1992	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1000
1033438	Harbor Tug	1	Propulsion	CAT	3512	1995	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	2500
1033438	Harbor Tug	2	Propulsion	CAT	3512	1995	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	2500
1033438	Harbor Tug	3	Auxiliary	CAT	3304	1995	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1250
1033438	Harbor Tug	4	Auxiliary	CAT	3304	1995	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	1250
1187285	Harbor Tug	1	Propulsion			1945	Biodiesel (B99)	450	336	Tier 0-Cat 1	1000
1187285	Harbor Tug	2	Propulsion			1945	Biodiesel (B99)	450	336	Tier 0-Cat 1	1000
5072905	Harbor Tug	1	Propulsion	CAT	3512	1999	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	1200
5072905	Harbor Tug	2	Propulsion	CAT	3512	1999	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	1200

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
5072905	Harbor Tug	3	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
5072905	Harbor Tug	4	Auxiliary	GM	671	1999	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	600
7514236	Harbor Tug	1	Propulsion	Caterpillar		1975	Offroad Diesel (EPA)	2200	1641	Tier 0-Cat 1	1500
7514236	Harbor Tug	2	Propulsion	Caterpillar		1975	Offroad Diesel (EPA)	2200	1641	Tier 0-Cat 1	1500
7514236	Harbor Tug	3	Auxiliary	GM		1975	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
7514236	Harbor Tug	4	Auxiliary	GM		1975	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
CG058217	Harbor Tug	1	Propulsion	CAT	3306DITA	1984	Offroad Diesel (EPA)	220	164	Tier 0-Cat 1	832
PSHTB	Harbor Tug	1	Propulsion	GM	671	1977	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	1000
PSHTB	Harbor Tug	2	Propulsion	GM	671	1977	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	1000
PSHTF	Harbor Tug	1	Propulsion	CAT	3406	1998	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	4368
PSHTF	Harbor Tug	2	Propulsion	Cat	3406	1998	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	4368
PSHTJ	Harbor Tug	1	Propulsion	Ford		1977	Offroad Diesel (EPA)	135	101	Tier 0-Cat 1	1000
PSHTV	Harbor Tug	1	Propulsion	CAT	3508	1977	Offroad Diesel (EPA)	705	526	Tier 0-Cat 1	5000
PSHTV	Harbor Tug	2	Propulsion	CAT	3508	1977	Offroad Diesel (EPA)	705	526	Tier 0-Cat 1	5000
PSHTV	Harbor Tug	3	Auxiliary	CAT	3304NA	1998	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	3500
PSHTV	Harbor Tug	4	Auxiliary	Perkins	6-354	1977	Offroad Diesel (EPA)	95	71	Tier 0-Cat 1	1500
PSHTW	Harbor Tug	1	Propulsion	Detroit Diesel	8V71	1980	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	1020
PSHTW	Harbor Tug	2	Propulsion	Detroit Diesel	8V71	1980	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	1020
PSHTW	Harbor Tug	3	Auxiliary	Detroit Diesel	471	1980	Offroad Diesel (EPA)	190	142	Tier 0-Cat 1	1020
WN8626R	Harbor Tug	1	Propulsion	GM	8V71	1977	Offroad Diesel (EPA)	300	224	Tier 0-Cat 1	1000
256829	Ocean Tug	1	Propulsion	CAT	D398	1974	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	5000
256829	Ocean Tug	2	Propulsion	CAT	D398	1974	Offroad Diesel (EPA)	850	634	Tier 0-Cat 1	5000
256829	Ocean Tug	3	Auxiliary	CAT	3304B	1974	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	2500
256829	Ocean Tug	4	Auxiliary	CAT	3304B	1974	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	2500
293323	Ocean Tug	1	Propulsion	EMD	16-645 E6	1971	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	225
293323	Ocean Tug	2	Propulsion	EMD	16-645 E6	1982	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	225
293323	Ocean Tug	3	Auxiliary	Detroit	8-71	1987	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	408
293323	Ocean Tug	4	Auxiliary	Detroit	8-71	1987	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	408
500126	Ocean Tug	1	Propulsion	CAT	D 398	1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	3325
500126	Ocean Tug	2	Propulsion	CAT	D 398	1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	3325
500126	Ocean Tug	3	Auxiliary	Detroit	6-71	1981	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	6840
500126	Ocean Tug	4	Auxiliary	Detroit	6-71	1977	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	6840

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
506243	Ocean Tug	1	Propulsion	EMD	16-645	1966	Offroad Diesel (EPA)	1950	1455	Tier 0-Cat 2	490
506243	Ocean Tug	2	Propulsion	EMD	16-645	1966	Offroad Diesel (EPA)	1950	1455	Tier 0-Cat 2	490
506243	Ocean Tug	3	Auxiliary	Detroit Diesel	671	1966	Offroad Diesel (EPA)	80	60	Tier 0-Cat 1	250
506243	Ocean Tug	4	Auxiliary	Detroit Diesel	671	1966	Offroad Diesel (EPA)	80	60	Tier 0-Cat 1	250
507964	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
507964	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
507964	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
507964	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
516870	Ocean Tug	1	Propulsion	EMD	16-645-E5	1968	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 2	12
516870	Ocean Tug	2	Propulsion	EMD	16-645-E5	1968	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 2	12
516870	Ocean Tug	3	Auxiliary	CAT	3304	1968	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	12
516870	Ocean Tug	4	Auxiliary	CAT	3304	1968	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	12
516924	Ocean Tug	1	Propulsion	CAT	3516B	1968	Offroad Diesel (EPA)	1700	1268	Tier 0-Cat 1	832
516924	Ocean Tug	2	Propulsion	CAT	3516B	1968	Offroad Diesel (EPA)	1700	1268	Tier 0-Cat 1	832
516924	Ocean Tug	3	Auxiliary	CAT	3306	1968	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	416
516924	Ocean Tug	4	Auxiliary	CAT	3306	1968	Offroad Diesel (EPA)	100	75	Tier 0-Cat 1	416
521494	Ocean Tug	1	Propulsion	EMD	12-645 E7	1973	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 2	0
521494	Ocean Tug	2	Propulsion	EMD	12-645 E7	1968	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 2	0
521494	Ocean Tug	3	Auxiliary	CAT	3304 B	1999	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	0
521494	Ocean Tug	4	Auxiliary	CAT	3304 B	1999	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	0
525855	Ocean Tug	1	Propulsion	EMD	16-645-E5	1970	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 2	36
525855	Ocean Tug	2	Propulsion	EMD	16-645-E5	1970	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 2	36
525855	Ocean Tug	3	Auxiliary	CAT	3304	1970	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	36
525855	Ocean Tug	4	Auxiliary	CAT	3304	1970	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	36
526607	Ocean Tug	1	Propulsion	EMD	16-645-E5	1970	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 2	84
526607	Ocean Tug	2	Propulsion	EMD	16-645-E5	1970	Offroad Diesel (EPA)	2850	2126	Tier 0-Cat 2	84
526607	Ocean Tug	3	Auxiliary	CAT	3304	1970	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	84
526607	Ocean Tug	4	Auxiliary	CAT	3304	1970	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	84
526717	Ocean Tug	1	Propulsion	EMD	8-645-E5	1970	Offroad Diesel (EPA)	1450	1082	Tier 0-Cat 2	700
526717	Ocean Tug	2	Propulsion	EMD	8-645-E5	1970	Offroad Diesel (EPA)	1450	1082	Tier 0-Cat 2	700
526717	Ocean Tug	3	Auxiliary	Detroit	671	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	700
526717	Ocean Tug	4	Auxiliary	Detroit	671	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	700

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
526844	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
526844	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
526844	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
526844	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
527071	Ocean Tug	1	Propulsion	CAT	343	1978	Offroad Diesel (EPA)	365	272	Tier 0-Cat 1	2080
527280	Ocean Tug	1	Propulsion	CAT	D399	1980	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	48
527280	Ocean Tug	2	Propulsion	CAT	D399	1980	Offroad Diesel (EPA)	1200	895	Tier 0-Cat 1	48
527280	Ocean Tug	3	Auxiliary	CAT	3406	1980	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	48
527280	Ocean Tug	4	Auxiliary	CAT	3406	1980	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	48
527409	Ocean Tug	1	Propulsion	EMD	8-645-E5	1970	Offroad Diesel (EPA)	1450	1082	Tier 0-Cat 2	12
527409	Ocean Tug	2	Propulsion	EMD	8-645-E5	1970	Offroad Diesel (EPA)	1450	1082	Tier 0-Cat 2	12
527409	Ocean Tug	3	Auxiliary	Detroit	671	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	12
527409	Ocean Tug	4	Auxiliary	Detroit	671	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	12
529686	Ocean Tug	1	Propulsion	EMD	12-645 E6	1970	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	330
529686	Ocean Tug	2	Propulsion	EMD	12-645 E6	1970	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	330
529686	Ocean Tug	3	Auxiliary	John Deere	6068T	1992	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	408
529686	Ocean Tug	4	Auxiliary	John Deere	6068T	1992	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	408
538858	Ocean Tug	1	Propulsion	Detroit	12V149NA	1974	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	0
538858	Ocean Tug	2	Propulsion	Detroit	12V149NA	1974	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	0
538858	Ocean Tug	3	Auxiliary			1974	Offroad Diesel (EPA)	51	38	Tier 0-Cat 1	0
538858	Ocean Tug	4	Auxiliary			1974	Offroad Diesel (EPA)	51	38	Tier 0-Cat 1	0
540227	Ocean Tug	1	Propulsion	CAT	3516	1994	Offroad Diesel (EPA)	1710	1276	Tier 0-Cat 1	472
540227	Ocean Tug	2	Propulsion	CAT	3516	1994	Offroad Diesel (EPA)	1710	1276	Tier 0-Cat 1	472
540227	Ocean Tug	3	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	80	60	Tier 0-Cat 1	253
540227	Ocean Tug	4	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	80	60	Tier 0-Cat 1	260
540227	Ocean Tug	5	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	23
540290	Ocean Tug	1	Propulsion	CAT	3516	1994	Offroad Diesel (EPA)	1710	1276	Tier 0-Cat 1	532
540290	Ocean Tug	2	Propulsion	CAT	3516	1994	Offroad Diesel (EPA)	1710	1276	Tier 0-Cat 1	532
540290	Ocean Tug	3	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	80	60	Tier 0-Cat 1	312
540290	Ocean Tug	4	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	80	60	Tier 0-Cat 1	212
540290	Ocean Tug	5	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	16
555271	Ocean Tug	1	Propulsion	CAT	3606	1974	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	24

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
555271	Ocean Tug	2	Propulsion	CAT	3606	1974	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	24
555271	Ocean Tug	3	Auxiliary	Detroit	671	1974	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	24
555271	Ocean Tug	4	Auxiliary	Detroit	671	1974	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	24
559404	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	1500
559404	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	1500
559404	Ocean Tug	3	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	1500
559404	Ocean Tug	4	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	1500
561652	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	60
561652	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	60
561652	Ocean Tug	3	Auxiliary	Detroit	8V71	1976	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	60
561652	Ocean Tug	4	Auxiliary	Detroit	8V71	1976	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	60
562688	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	36
562688	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	36
562688	Ocean Tug	3	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	36
562688	Ocean Tug	4	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	36
565291	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	400
565291	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	400
565291	Ocean Tug	3	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	400
565291	Ocean Tug	4	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	400
566082	Ocean Tug	1	Propulsion	CAT	D399	1975	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	1331
566082	Ocean Tug	2	Propulsion	CAT	D399	1975	Offroad Diesel (EPA)	1125	839	Tier 0-Cat 1	1331
566082	Ocean Tug	3	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	623
566082	Ocean Tug	4	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	70	52	Tier 0-Cat 1	919
566082	Ocean Tug	5	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	116
566429	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	480
566429	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	480
566429	Ocean Tug	3	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	480
566429	Ocean Tug	4	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	480
567630	Ocean Tug	1	Propulsion	ALCO	251C12MR	1975	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 2	1620
567630	Ocean Tug	2	Propulsion	ALCO	251C12MR	1975	Offroad Diesel (EPA)	2150	1604	Tier 0-Cat 2	1620
567630	Ocean Tug	3	Auxiliary	Detroit	8-71	1974	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	2448
567630	Ocean Tug	4	Auxiliary	Detroit	8-71	1979	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	2448

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
568498	Ocean Tug	1	Propulsion	EMD	20-645-E5	1975	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	36
568498	Ocean Tug	2	Propulsion	EMD	20-645-E5	1975	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	36
568498	Ocean Tug	3	Auxiliary	Detroit	8V71	1975	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	36
568498	Ocean Tug	4	Auxiliary	Detroit	8V71	1975	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	36
568790	Ocean Tug	1	Propulsion	CAT	3606	1975	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	216
568790	Ocean Tug	2	Propulsion	CAT	3606	1975	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	216
568790	Ocean Tug	3	Auxiliary	Detroit	671	1975	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	216
568790	Ocean Tug	4	Auxiliary	Detroit	671	1975	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	216
569517	Ocean Tug	1	Propulsion	Cat	3516	1986	Offroad Diesel (EPA)	1710	1276	Tier 0-Cat 1	1041
569517	Ocean Tug	2	Propulsion	CAT	3516	1986	Offroad Diesel (EPA)	1710	1276	Tier 0-Cat 1	1041
569517	Ocean Tug	3	Auxiliary	CAT	3304NA	1995	Offroad Diesel (EPA)	85	63	Tier 0-Cat 1	605
569517	Ocean Tug	4	Auxiliary	CAT	3304NA	1995	Offroad Diesel (EPA)	85	63	Tier 0-Cat 1	564
569517	Ocean Tug	5	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	105	78	Tier 0-Cat 1	84
569925	Ocean Tug	1	Propulsion	CAT	3606	1975	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	60
569925	Ocean Tug	2	Propulsion	CAT	3606	1975	Offroad Diesel (EPA)	2500	1865	Tier 0-Cat 2	60
569925	Ocean Tug	3	Auxiliary	Detroit	671	1975	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	60
569925	Ocean Tug	4	Auxiliary	Detroit	671	1975	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	60
571631	Ocean Tug	1	Propulsion	EMD	12-645 E6	1975	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	0
571631	Ocean Tug	2	Propulsion	EMD	12-645 E6	1975	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	0
571631	Ocean Tug	3	Auxiliary	Detroit	6-71	1979	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
571631	Ocean Tug	4	Auxiliary	Detroit	6-71	1970	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
571854	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
571854	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
571854	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
571854	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
571855	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
571855	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
571855	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
571855	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
571909	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	60
571909	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	60
571909	Ocean Tug	3	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	60

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
571909	Ocean Tug	4	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	60
572647	Ocean Tug	1	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	720
572647	Ocean Tug	2	Propulsion	EMD	20-645-E5	1976	Offroad Diesel (EPA)	3500	2611	Tier 0-Cat 2	720
572647	Ocean Tug	3	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	720
572647	Ocean Tug	4	Auxiliary	CAT	3304	1976	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	720
575361	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
575361	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
575361	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
575361	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
579789	Ocean Tug	1	Propulsion			1977	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
579789	Ocean Tug	2	Propulsion			1977	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
579789	Ocean Tug	3	Auxiliary			1977	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
579789	Ocean Tug	4	Auxiliary			1977	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
584331	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
584331	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
584331	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
584331	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
586202	Ocean Tug	1	Propulsion	EMD	16-645 E6	1976	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	270
586202	Ocean Tug	2	Propulsion	EMD	16-645 E6	1976	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	270
586202	Ocean Tug	3	Auxiliary	Detroit	8-71	1976	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	408
586202	Ocean Tug	4	Auxiliary	Detroit	8-71	1976	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	408
596518	Ocean Tug	1	Propulsion	EMD	12-645 E6	1974	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	270
596518	Ocean Tug	2	Propulsion	EMD	12-645 E6	1974	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 2	270
596518	Ocean Tug	3	Auxiliary	Detroit	6-71	1974	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	408
596518	Ocean Tug	4	Auxiliary	Detroit	6-71	1970	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	408
626592	Ocean Tug	1	Propulsion	CAT	D 398	1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	0
626592	Ocean Tug	2	Propulsion	CAT	D 398	1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	0
626592	Ocean Tug	3	Auxiliary	Detroit	4-71	1979	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	0
626592	Ocean Tug	4	Auxiliary	Detroit	4-71	1978	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	0
627416	Ocean Tug	1	Propulsion	CAT	D 398 B	1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	600
627416	Ocean Tug	2	Propulsion	CAT	D 398 B	1980	Offroad Diesel (EPA)	900	671	Tier 0-Cat 1	600
627416	Ocean Tug	3	Auxiliary	Detroit	4-71	1971	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	876

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
627416	Ocean Tug	4	Auxiliary	Detroit	4-71	1980	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	876
648710	Ocean Tug	1	Propulsion	CAT	3512	1982	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	12
648710	Ocean Tug	2	Propulsion	CAT	3512	1982	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	12
648710	Ocean Tug	3	Auxiliary	CAT	3304	1982	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	12
648710	Ocean Tug	4	Auxiliary	CAT	3304	1982	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	12
648865	Ocean Tug	1	Propulsion	CAT	3512	1982	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	96
648865	Ocean Tug	2	Propulsion	CAT	3512	1982	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	96
648865	Ocean Tug	3	Auxiliary	CAT	3304	1982	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	96
648865	Ocean Tug	4	Auxiliary	CAT	3304	1982	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	96
648866	Ocean Tug	1	Propulsion	CAT	3512	1982	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	12
648866	Ocean Tug	2	Propulsion	CAT	3512	1982	Offroad Diesel (EPA)	1000	746	Tier 0-Cat 1	12
648866	Ocean Tug	3	Auxiliary	CAT	3304	1982	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	12
648866	Ocean Tug	4	Auxiliary	CAT	3304	1982	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	12
656807	Ocean Tug	1	Propulsion	CAT	3516B	1983	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	24
656807	Ocean Tug	2	Propulsion	CAT	3516B	1983	Offroad Diesel (EPA)	1500	1119	Tier 0-Cat 1	24
656807	Ocean Tug	3	Auxiliary	GM	4 71	1983	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	12
656807	Ocean Tug	4	Auxiliary	GM	6 71	1983	Offroad Diesel (EPA)	67	50	Tier 0-Cat 1	12
662872	Ocean Tug	1	Propulsion	CAT	3516B	1984	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 1	832
662872	Ocean Tug	2	Propulsion	CAT	3516B	1984	Offroad Diesel (EPA)	1600	1194	Tier 0-Cat 1	832
662872	Ocean Tug	3	Auxiliary	GM	4 71	1984	Offroad Diesel (EPA)	75	50	Tier 0-Cat 1	416
662872	Ocean Tug	4	Auxiliary	GM	6 71	1984	Offroad Diesel (EPA)	75	50	Tier 0-Cat 1	416
681479	Ocean Tug	1	Propulsion	CAT	3516	1985	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 1	576
681479	Ocean Tug	2	Propulsion	CAT	3516	1985	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 1	576
681479	Ocean Tug	3	Auxiliary	CAT	3304	1985	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	288
681479	Ocean Tug	4	Auxiliary	CAT	3304	1985	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	288
693814	Ocean Tug	1	Propulsion	CAT	3516B	1986	Offroad Diesel (EPA)	1550	1156	Tier 0-Cat 1	576
693814	Ocean Tug	2	Propulsion	CAT	3516B	1986	Offroad Diesel (EPA)	1550	1156	Tier 0-Cat 1	576
693814	Ocean Tug	3	Auxiliary	CAT	3306	1986	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	288
693814	Ocean Tug	4	Auxiliary	CAT	3306	1986	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	288
961922	Ocean Tug	1	Propulsion	CAT	3516B	1990	Offroad Diesel (EPA)	2100	1567	Tier 0-Cat 1	832
961922	Ocean Tug	2	Propulsion	CAT	3516B	1990	Offroad Diesel (EPA)	2100	1567	Tier 0-Cat 1	832
961922	Ocean Tug	3	Auxiliary	CAT	3306	1990	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	416

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
961922	Ocean Tug	4	Auxiliary	CAT	3306	1990	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	416
973968	Ocean Tug	1	Propulsion	CAT	3516B	1991	Offroad Diesel (EPA)	1550	1156	Tier 0-Cat 1	576
973968	Ocean Tug	2	Propulsion	CAT	3516B	1991	Offroad Diesel (EPA)	1550	1156	Tier 0-Cat 1	576
973968	Ocean Tug	3	Auxiliary	CAT	3304	1991	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	288
973968	Ocean Tug	4	Auxiliary	CAT	3304	1991	Offroad Diesel (EPA)	74	55	Tier 0-Cat 1	288
1029298	Ocean Tug	1	Propulsion	EMD	8-645-E5	1970	Offroad Diesel (EPA)	1450	1082	Tier 0-Cat 2	110
1029298	Ocean Tug	2	Propulsion	EMD	8-645-E5	1970	Offroad Diesel (EPA)	1450	1082	Tier 0-Cat 2	110
1029298	Ocean Tug	3	Auxiliary	Detroit	671	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	110
1029298	Ocean Tug	4	Auxiliary	Detroit	671	1970	Offroad Diesel (EPA)	150	112	Tier 0-Cat 1	110
1037412	Ocean Tug	1	Propulsion	EMD	16-645E2	1995	Offroad Diesel (EPA)	1950	1455	Tier 0-Cat 2	0
1037412	Ocean Tug	2	Propulsion	EMD	16-645E2	1995	Offroad Diesel (EPA)	1950	1455	Tier 0-Cat 2	0
1037412	Ocean Tug	3	Auxiliary	CAT	3304B	1995	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	0
1037412	Ocean Tug	4	Auxiliary	CAT	3304B	1995	Offroad Diesel (EPA)	140	104	Tier 0-Cat 1	0
1052805	Ocean Tug	1	Propulsion	CAT	3516B	1997	Offroad Diesel (EPA)	2250	1679	Tier 0-Cat 1	624
1052805	Ocean Tug	2	Propulsion	CAT	3516B	1997	Offroad Diesel (EPA)	2250	1679	Tier 0-Cat 1	624
1052805	Ocean Tug	3	Auxiliary	CAT	3306	1997	Offroad Diesel (EPA)	180	135	Tier 0-Cat 1	312
1052805	Ocean Tug	4	Auxiliary	CAT	3306	1997	Offroad Diesel (EPA)	180	135	Tier 0-Cat 1	312
1090636	Ocean Tug	1	Propulsion	CAT	3612B	2000	Offroad Diesel (EPA)	5000	3730	Tier 1-Cat 2	24
1090636	Ocean Tug	2	Propulsion	CAT	3612B	2000	Offroad Diesel (EPA)	5000	3730	Tier 1-Cat 2	24
1090636	Ocean Tug	3	Auxiliary	CAT		2000	Offroad Diesel (EPA)	150	112	Tier 1-Cat 1	24
1090636	Ocean Tug	4	Auxiliary	CAT		2000	Offroad Diesel (EPA)	150	112	Tier 1-Cat 1	24
1090637	Ocean Tug	1	Propulsion	CAT	3612B	2000	Offroad Diesel (EPA)	5000	3730	Tier 1-Cat 2	24
1090637	Ocean Tug	2	Propulsion	CAT	3612B	2000	Offroad Diesel (EPA)	5000	3730	Tier 1-Cat 2	24
1090637	Ocean Tug	3	Auxiliary	CAT		2000	Offroad Diesel (EPA)	150	112	Tier 1-Cat 1	24
1090637	Ocean Tug	4	Auxiliary	CAT		2000	Offroad Diesel (EPA)	150	112	Tier 1-Cat 1	24
1090638	Ocean Tug	1	Propulsion	CAT	3612B	2000	Offroad Diesel (EPA)	5000	3730	Tier 1-Cat 2	24
1090638	Ocean Tug	2	Propulsion	CAT	3612B	2000	Offroad Diesel (EPA)	5000	3730	Tier 1-Cat 2	24
1090638	Ocean Tug	3	Auxiliary	CAT		2000	Offroad Diesel (EPA)	150	112	Tier 1-Cat 1	24
1090638	Ocean Tug	4	Auxiliary	CAT		2000	Offroad Diesel (EPA)	150	112	Tier 1-Cat 1	24
1092436	Ocean Tug	1	Propulsion	CAT	3516B	2000	Offroad Diesel (EPA)	2250	1679	Tier 1-Cat 1	624
1092436	Ocean Tug	2	Propulsion	CAT	3516B	2000	Offroad Diesel (EPA)	2250	1679	Tier 1-Cat 1	624
1092436	Ocean Tug	3	Auxiliary	CAT	3306	2000	Offroad Diesel (EPA)	180	135	Tier 1-Cat 1	312

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
1092436	Ocean Tug	4	Auxiliary	CAT	3306	2000	Offroad Diesel (EPA)	180	135	Tier 1-Cat 1	312
1115109	Ocean Tug	1	Propulsion	CAT	3516B	2001	Offroad Diesel (EPA)	2500	1865	Tier 1-Cat 1	576
1115109	Ocean Tug	2	Propulsion	CAT	3516B	2001	Offroad Diesel (EPA)	2500	1865	Tier 1-Cat 1	576
1115109	Ocean Tug	3	Auxiliary	CAT	3306	2001	Offroad Diesel (EPA)	180	135	Tier 1-Cat 1	288
1115109	Ocean Tug	4	Auxiliary	CAT	3306	2001	Offroad Diesel (EPA)	180	135	Tier 1-Cat 1	288
1117884	Ocean Tug	1	Propulsion	CAT	3606	2001	Offroad Diesel (EPA)	5100	3805	Tier 1-Cat 1	324
1117884	Ocean Tug	2	Propulsion	CAT	3606	2001	Offroad Diesel (EPA)	5100	3805	Tier 1-Cat 1	324
1117884	Ocean Tug	3	Auxiliary	CAT	3304T	2001	Offroad Diesel (EPA)	140	104	Tier 1-Cat 1	180
1117884	Ocean Tug	4	Auxiliary	CAT	3304T	2001	Offroad Diesel (EPA)	140	104	Tier 1-Cat 1	177
1117884	Ocean Tug	5	Auxiliary	CAT	3306DITA	2001	Offroad Diesel (EPA)	185	138	Tier 1-Cat 1	6
1134122	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
1134122	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
1134122	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
1134122	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
1139986	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
1139986	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
1139986	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
1139986	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
1160544	Ocean Tug	1	Propulsion	CAT	3516B	2004	Offroad Diesel (EPA)	2500	1865	Tier 2-Cat 1	832
1160544	Ocean Tug	2	Propulsion	CAT	3516B	2004	Offroad Diesel (EPA)	2500	1865	Tier 2-Cat 1	832
1160544	Ocean Tug	3	Auxiliary	CAT	3306	2004	Offroad Diesel (EPA)	190	135	Tier 2-Cat 1	416
1160544	Ocean Tug	4	Auxiliary	CAT	3306	2004	Offroad Diesel (EPA)	190	135	Tier 2-Cat 1	416
4210399	Ocean Tug	1	Propulsion	Detroit	16V92	1980	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	0
4210399	Ocean Tug	2	Propulsion	Detroit	16V92	1980	Offroad Diesel (EPA)	700	522	Tier 0-Cat 1	0
4210399	Ocean Tug	3	Auxiliary	Detroit	3-71	1970	Offroad Diesel (EPA)	87	65	Tier 0-Cat 1	0
4210399	Ocean Tug	4	Auxiliary	Detroit	3-71	1970	Offroad Diesel (EPA)	87	65	Tier 0-Cat 1	0
7729526	Ocean Tug	1	Propulsion	EMD	16-645 E6	1970	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	2160
7729526	Ocean Tug	2	Propulsion	EMD	16-645 E6	1966	Offroad Diesel (EPA)	2000	1492	Tier 0-Cat 2	2160
7729526	Ocean Tug	3	Auxiliary	CAT	C4.4	2006	Offroad Diesel (EPA)	140	104	Tier 2-Cat 1	3264
7729526	Ocean Tug	4	Auxiliary	CAT	C4.4	2006	Offroad Diesel (EPA)	140	104	Tier 2-Cat 1	3264
CG63965	Ocean Tug	1	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144
CG63965	Ocean Tug	2	Propulsion			1981	Offroad Diesel (EPA)	1800	1343	Tier 0-Cat 1	144

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
CG63965	Ocean Tug	3	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
CG63965	Ocean Tug	4	Auxiliary			1982	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	144
PSOTS	Ocean Tug	1	Propulsion	EMD	16-645	1981	Offroad Diesel (EPA)	3070	2290	Tier 0-Cat 2	1423
PSOTS	Ocean Tug	2	Propulsion	EMD	16-645	1981	Offroad Diesel (EPA)	3070	2290	Tier 0-Cat 2	1423
PSOTS	Ocean Tug	3	Auxiliary	Detroit Diesel	671	1981	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	485
PSOTS	Ocean Tug	4	Auxiliary	Detroit Diesel	671	1981	Offroad Diesel (EPA)	130	97	Tier 0-Cat 1	1265
1088139	Pilot Boat	1	Propulsion			1999	Onroad Diesel (EPA)	1100	821	Tier 0-Cat 1	2353
1088139	Pilot Boat	2	Propulsion			1999	Onroad Diesel (EPA)	1100	821	Tier 0-Cat 1	2710
1088139	Pilot Boat	3	Auxiliary	orthern Ligh	984	1999	Onroad Diesel (EPA)	50	32	Tier 0-Cat 1	1000
1088139	Pilot Boat	4	Auxiliary	orthern Ligh	984	1999	Onroad Diesel (EPA)	50	32	Tier 0-Cat 1	1000
1120139	Pilot Boat	1	Propulsion			2001	Onroad Diesel (EPA)	1100	821	Tier 1-Cat 1	2819
1120139	Pilot Boat	2	Propulsion			2001	Onroad Diesel (EPA)	1100	821	Tier 1-Cat 1	2819
1120139	Pilot Boat	3	Auxiliary	orthern Ligh	984	2001	Onroad Diesel (EPA)	43	32	Tier 1-Cat 1	1000
1120139	Pilot Boat	4	Auxiliary	orthern Ligh	984	2001	Onroad Diesel (EPA)	43	32	Tier 1-Cat 1	1000
525609	Tank Barge	2	Auxiliary	Detroit	3-71	1987	Offroad Diesel (EPA)	87	65	Tier 0-Cat 1	700
525609	Tank Barge	1	Auxiliary	Detroit	3-71	1975	Offroad Diesel (EPA)	87	65	Tier 0-Cat 1	700
569653	Tank Barge	3	Auxiliary	Detroit	4-71	1987	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	0
569653	Tank Barge	1	Auxiliary	Detroit	12-71	1987	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	0
569653	Tank Barge	2	Auxiliary	Detroit	12-71	1987	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	0
569653	Tank Barge	4	Auxiliary	Detroit	12-71	1987	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	0
611099	Tank Barge	1	Auxiliary	Deutz	4 cylinder	1991	Offroad Diesel (EPA)	90	67	Tier 0-Cat 1	0
619729	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
619729	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
619729	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
628604	Tank Barge	1	Auxiliary			1980	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
644434	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
644434	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
644434	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
645121	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
645121	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
645121	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
648823	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
648823	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
648823	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
651631	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
651631	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
651631	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
981972	Tank Barge	1	Auxiliary	Detroit	8-71	1991	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	3000
981972	Tank Barge	2	Auxiliary	Detroit	8-71	1991	Offroad Diesel (EPA)	240	179	Tier 0-Cat 1	3000
981972	Tank Barge	3	Auxiliary	Detroit	4-71	1992	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	3000
990194	Tank Barge	3	Auxiliary	CAT	3304B	1993	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	675
990194	Tank Barge	1	Auxiliary	CAT	3406B	1993	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	675
990194	Tank Barge	2	Auxiliary	CAT	3406B	1993	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	675
990194	Tank Barge	4	Auxiliary	Detroit	Series 40	2002	Offroad Diesel (EPA)	100	75	Tier 1-Cat 1	675
996165	Tank Barge	3	Auxiliary	Detroit	4-71	1992	Offroad Diesel (EPA)	120	90	Tier 0-Cat 1	225
996165	Tank Barge	1	Auxiliary	Detroit	12-71	1992	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
996165	Tank Barge	2	Auxiliary	Detroit	12-71	1992	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
1026330	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1026330	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1026330	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1101122	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1101122	Tank Barge	2	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1101122	Tank Barge	3	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1109007	Tank Barge	1	Auxiliary			2001	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1109007	Tank Barge	2	Auxiliary			2001	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1109007	Tank Barge	3	Auxiliary			2001	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
1110781	Tank Barge	1	Auxiliary	CAT	3406	2001	Offroad Diesel (EPA)	200	149	Tier 1-Cat 1	225
1110781	Tank Barge	2	Auxiliary	CAT	3406	2001	Offroad Diesel (EPA)	200	149	Tier 1-Cat 1	225
1110781	Tank Barge	3	Auxiliary	Yanmar	4TNU88-GGE	2004	Offroad Diesel (EPA)	50	37	Tier 1-Cat 1	225
PM 230	Tank Barge	3	Auxiliary	CAT	3304B	1983	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	300
PM 230	Tank Barge	1	Auxiliary	CAT	3306	1983	Offroad Diesel (EPA)	170	127	Tier 0-Cat 1	300
PM 230	Tank Barge	2	Auxiliary	CAT	3306	1983	Offroad Diesel (EPA)	170	127	Tier 0-Cat 1	300
SCT 180	Tank Barge	1	Auxiliary	CAT	3304	1997	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	0
SCT 180	Tank Barge	2	Auxiliary	CAT	3304	1997	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	0

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
SCT 180	Tank Barge	3	Auxiliary	Lugger	NL843N-12L	2003	Offroad Diesel (EPA)	40	30	Tier 1-Cat 1	0
SCT 280	Tank Barge	3	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	500
SCT 280	Tank Barge	4	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	500
SCT 280	Tank Barge	5	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	500
SCT 280	Tank Barge	6	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	500
SCT 280	Tank Barge	7	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	500
SCT 280	Tank Barge	1	Auxiliary	John Deere	4 CYL	2001	Offroad Diesel (EPA)	50	37	Tier 1-Cat 1	500
SCT 280	Tank Barge	2	Auxiliary	John Deere	4 CYL	2001	Offroad Diesel (EPA)	50	37	Tier 1-Cat 1	500
SCT 282	Tank Barge	1	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
SCT 282	Tank Barge	2	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
SCT 282	Tank Barge	3	Auxiliary	Detroit	6-71	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
SCT 282	Tank Barge	4	Auxiliary	Detroit	6-71	1972	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
SCT 282	Tank Barge	5	Auxiliary	Detroit	6-71	1972	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	0
SCT 282	Tank Barge	6	Auxiliary	John Deere	4239DF001	2002	Offroad Diesel (EPA)	50	37	Tier 1-Cat 1	0
SCT 282	Tank Barge	7	Auxiliary	John Deere	4239DF001	2002	Offroad Diesel (EPA)	50	37	Tier 1-Cat 1	0
SCT 340	Tank Barge	3	Auxiliary	Detroit	12-71	1974	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
SCT 340	Tank Barge	1	Auxiliary	Detroit	12-71	1978	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
SCT 340	Tank Barge	2	Auxiliary	Detroit	12-71	1978	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
SCT 340	Tank Barge	4	Auxiliary	Daewoo	O728	2003	Offroad Diesel (EPA)	40	30	Tier 1-Cat 1	225
SCT 344	Tank Barge	1	Auxiliary	Detroit	2-71	1970	Offroad Diesel (EPA)	51	38	Tier 0-Cat 1	225
SCT 344	Tank Barge	3	Auxiliary	Detroit	12-71	1981	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
SCT 344	Tank Barge	4	Auxiliary	Detroit	12-71	1981	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
SCT 344	Tank Barge	2	Auxiliary	Detroit	12-71	1982	Offroad Diesel (EPA)	353	263	Tier 0-Cat 1	225
SEA 76	Tank Barge	1	Auxiliary	Detroit	6-71	1987	Offroad Diesel (EPA)	170	127	Tier 0-Cat 1	0
SEA 76	Tank Barge	2	Auxiliary	Detroit	6-71	1975	Offroad Diesel (EPA)	170	127	Tier 0-Cat 1	0
SEA 76	Tank Barge	3	Auxiliary	Lister-Petter	2000 series	1991	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	0
TB185	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
TB248	Tank Barge	1	Auxiliary			1987	Offroad Diesel (EPA)	185	138	Tier 0-Cat 1	500
TBKP	Tank Barge	3	Auxiliary	CAT	3304	1999	Offroad Diesel (EPA)	165	123	Tier 0-Cat 1	900
TBKP	Tank Barge	1	Auxiliary	CAT	3406C	1999	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	900
TBKP	Tank Barge	2	Auxiliary	CAT	3406C	1999	Offroad Diesel (EPA)	200	149	Tier 0-Cat 1	900
270038	Workboat	1	Propulsion	CAT	3512B	1983	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	210

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Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
270038	Workboat	2	Propulsion	Detroit Diesel	S-60	1983	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	210
274237	Workboat	1	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	392	292	Tier 0-Cat 1	350
507942	Workboat	1	Propulsion	Detroit Diesel	8V71	1993	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	60
507942	Workboat	2	Propulsion	Detroit Diesel	8V71	1993	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	60
507942	Workboat	3	Propulsion	Detroit Diesel	471	1993	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	60
527467	Workboat	1	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	370	276	Tier 0-Cat 1	1000
527467	Workboat	2	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	370	276	Tier 0-Cat 1	1000
537094	Workboat	1	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	1000
537094	Workboat	2	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	600	448	Tier 0-Cat 1	1000
657491	Workboat	1	Propulsion	Detroit Diesel	12V71	1976	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	180
657491	Workboat	2	Propulsion	CAT	3412	1983	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	180
657491	Workboat	3	Propulsion		JD-4045TF150	2004	Offroad Diesel (EPA)	500	373	Tier 2-Cat 1	180
657491	Workboat	4	Auxiliary	Detroit Diesel	471	1969	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	180
657491	Workboat	5	Auxiliary	Detroit Diesel	471	1969	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	180
1177801	Workboat	1	Propulsion	CAT	3512	2001	Offroad Diesel (EPA)	500	373	Tier 1-Cat 1	390
1177801	Workboat	2	Propulsion	CAT	3406	2000	Offroad Diesel (EPA)	500	373	Tier 1-Cat 1	390
1177801	Workboat	3	Auxiliary	CAT	C-9	2005	Offroad Diesel (EPA)	180	134	Tier 2-Cat 1	390
1177801	Workboat	4	Auxiliary	Detroit Diesel	8V71	1976	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	390
1177801	Workboat	5	Auxiliary	Detroit Diesel	8V71	1976	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	390
CG001716	Workboat	1	Propulsion	Detroit Diesel	16V71	1979	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	960
CG001716	Workboat	2	Propulsion	Detroit Diesel	S-60	2004	Offroad Diesel (EPA)	500	373	Tier 2-Cat 1	960
CG001919	Workboat	1	Propulsion	EMD	12-567	1955	Offroad Diesel (EPA)	500	373	Tier 0-Cat 2	540
CG001919	Workboat	2	Propulsion	EMD	12-567	1955	Offroad Diesel (EPA)	500	373	Tier 0-Cat 2	540
CG001919	Workboat	3	Propulsion	EMD	12-567	1955	Offroad Diesel (EPA)	500	373	Tier 0-Cat 2	540
CG001919	Workboat	4	Auxiliary	CAT	3512	1976	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	540
CG059573	Workboat	1	Propulsion	Detroit Diesel	6V71	1988	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	990
CG747195	Workboat	1	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	75
CG747195	Workboat	2	Propulsion	Detroit	8V71	1971	Offroad Diesel (EPA)	330	246	Tier 0-Cat 1	75
D650645	Workboat	1	Propulsion	Detroit Diesel	S-60 Tier II	2004	Offroad Diesel (EPA)	500	373	Tier 2-Cat 1	720
D650645	Workboat	2	Propulsion	Detroit Diesel	671	1971	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	720
D650645	Workboat	3	Auxiliary	Detroit Diesel	671	1964	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	720
D691320	Workboat	1	Propulsion	CAT	3406	1985	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	600

Puget Sound Emissions Inventory
Table E-2 Harbor Craft Input Data, 2005

Vessel ID	Type	Eng ID No.	Engine Type	Engine Make	Engine Model	Engine Year	Fuel	HP	kW	Emission Certification Category	2005 Hours
D691320	Workboat	2	Propulsion	CAT	3306	1985	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	600
D691320	Workboat	3	Auxiliary	Detroit Diesel	471	1979	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	600
D691320	Workboat	4	Auxiliary	Detroit Diesel	471	1979	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	600
D691320	Workboat	5	Auxiliary	CAT	3208	1987	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	600
DB3	Workboat	1	Propulsion	Detroit Diesel	12V71	1974	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	930
DB3	Workboat	2	Propulsion	Detroit Diesel	8V71	1969	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	930
DB6	Workboat	1	Propulsion	Detroit Diesel	8V71	1965	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	900
DB6	Workboat	2	Propulsion	Detroit Diesel	8V71	1963	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	900
DB6	Workboat	3	Auxiliary	Detroit Diesel	671	1975	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	900
DB6	Workboat	4	Auxiliary	Detroit Diesel	671	1971	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	900
DB6	Workboat	5	Auxiliary	Detroit Diesel	471	1967	Offroad Diesel (EPA)	180	134	Tier 0-Cat 1	900
DB8	Workboat	1	Propulsion	Detroit Diesel	12V71	1965	Offroad Diesel (EPA)	500	373	Tier 0-Cat 1	660
DB8	Workboat	2	Propulsion	Detroit Diesel	S-60	2003	Offroad Diesel (EPA)	500	373	Tier 1-Cat 1	660
PB10	Workboat	1	Propulsion			1987	Gasoline	100	75	Gasoline-2 stroke	500
PSWM	Workboat	1	Propulsion	Detroit Diesel	6V71	1983	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	330
PSWR	Workboat	1	Propulsion	Detroit Diesel	6V71	1975	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	750
PSWR	Workboat	2	Auxiliary	Detroit Diesel	6V71	1975	Offroad Diesel (EPA)	90	67	Tier 0-Cat 1	750
PSWR	Workboat	3	Propulsion	Detroit Diesel	271	1975	Offroad Diesel (EPA)	400	298	Tier 0-Cat 1	750
SB97	Workboat	1	Propulsion			1979	Gasoline	50	37	Gasoline-2 stroke	500
W1	Workboat	1	Propulsion			1980	Gasoline	50	37	Gasoline-2 stroke	500
W100	Workboat	1	Propulsion			1983	Gasoline	50	37	Gasoline-2 stroke	500
W1251	Workboat	1	Propulsion			2001	Gasoline	50	37	Gasoline-2 stroke	500
W1260	Workboat	1	Propulsion	Honda		1985	Gasoline	45	34	Gasoline-2 stroke	500
W2	Workboat	1	Propulsion			1983	Gasoline	50	37	Gasoline-2 stroke	500
W3	Workboat	1	Propulsion			1983	Gasoline	50	37	Gasoline-2 stroke	500
ZB12	Workboat	1	Propulsion	Honda		1995	Gasoline	50	37	Gasoline-2 stroke	500

Table E-2.1 Biodiesel Emission Reduction Calculation Spreadsheet, 2005

Biodiesel Emission Reduction Calculation Spreadsheet

Reductions must be calculated for each different biodiesel fuel.
The default biodiesel fuel is soybean modified, average (vs. "clean") base fuel.
Biodiesel fuels that are not the default will be addressed through the calculations.
The base fuel to which the biologically derived oils have been added is a "clean" fuel ONLY IF:
It is equal to Calif. highway fuel, or if it meets all of following
Cetane number > 52, and
Aromatics < 25 vol%, and
Specific gravity < 0.84
If the base fuel is clean, place a 1 in the Clean field below, otherwise enter 0.

If the biological oil source is soybean oil, place a 0 in both the Rapeseed and the Animal fields below.
If the biological oil source is rapeseed or canola oil, place a 1 in the Rapeseed field below, and 0 in the Animal field.
If the biological oil source is animal based (grease, lard), place a 1 in the Animal field below, and 0 in the the Rapeseed field.

In the % Biodiesel field enter volume percent of biologically derived oils (e.g., B20, enter 20)

Enter the k1, k2, k3, and k4 factors for the year of interest from the Yr_Factors table (next worksheet).
Reductions will be rounded down to the next whole number, i.e., X.01 to X.99 becomes X.
Increases will be rounded up to the next whole number.
Notes: Fuel economy will be reduced when using biodiesel.
The calculation is 4.6% to 10.6% times biodiesel vol%.
Animal based biodiesel is slightly worse than plant based.
The fuel economy decreas is calculated to the right.

BASIS: 2005 Animal Based B99	
Factors	Arguments to Enter
% Biodiesel	99
k1	0.1
k2	0.07
k3	0.08
k4	0.23
Clean	1
Rapeseed	0
Animal	1

	Percent (%)				
	PM	**CO**	**NOx**	**HC**	**Fuel Economy Decrease**
Calculated Reductions	-32	-35	17	-50	4.6 to 10.5

Note: A positive number, above, is an increase in the pollutant.

Reference for calculator:
www.epa.gov/otaq/retrofit/techlist-biodiesel.htm

Example

To calculate the benefits of a 20% canola oil modified biodiesel fuel, for calendar year 2003, working with a clean base fuel the arguments to be entered are shown below.
The resulting reductions are also shown in green.

	Percent (%)				
	PM	**CO**	**NOx**	**HC**	**Fuel Economy Decrease**
Calculated Reductions	-7	-5	4	-13	0.9 to 2.1

Factors	Arguments to Enter
% Biodiesel	20
k1	0.12
k2	0.09
k3	0.09
k4	0.07
Clean	1
Rapeseed	1
Animal	0

Note: A positive number, above, is an increase in the pollutant.

Puget Sound Maritime Air Emissions Inventory

Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSA010	Forklift	8	Clark		Continental	4 cyl	1970	50	31	Propane	Propane	Propane
PSA010	Forklift	9	Komatsu	5 ton	Nissan	6 cyl	1995	100	62	Propane	Propane	Propane
PSA010	Forklift	10	Clark	2.5 ton		4 cyl	1963	50	54	Propane	Propane	Propane
PSA010	Forklift	12	Caterpillar	9 ton	Caterpillar	3206	1982	200	63	Diesel, Offroad	NA	NA
PSA010	Forklift	11		9 ton	Ford	351	1977	200	94	Propane	NA	Propane
PSA010	Loader		Bobcat		Kubota	4 cyl	1991	150	56	Diesel, Offroad	NA	NA
PSA010	Log handler		Wagner	L90	Cummins	350	1972	200	21	Diesel, Offroad	NA	NA
PSE010	Air compressor	75	Ingersoll Rand	100	White	G1600X118	1978	50	250	Gasoline	150	NA
PSE010	Backhoe	57	Ford	455C KF2P1Z	Ford	201 C.I. 3Cyl	1988	63	300	Diesel, Onroad	300	NA
PSE010	Crane	71	Grove	RT59S	Detroit	4-71 NA	1968	160	150	Diesel, Onroad	200	NA
PSE010	Crane, container		Manitowoc	Crane	Cummins	N14	1992	330	150	Diesel, Onroad	300	NA
PSE010	Forklift, diesel, onroad	7	Towmotor	V160	Caterpillar	3208 NA, 8 ton	1974	175	250	Diesel, Onroad	250	NA
PSE010	Forklift, diesel, onroad	9	Towmotor	V160	Caterpillar	3208, 8 ton	1974	175	250	Diesel, Onroad	250	NA
PSE010	Forklift, diesel, onroad	12	Hyster	H130F	Perkins	4.236 NA, 6 ton	1976	85	300	Diesel, Onroad	300	NA
PSE010	Forklift, diesel, onroad	18	Hyster	H130F	Perkins	4.236 NA, 6 ton	1976	85	300	Diesel, Onroad	300	NA
PSE010	Forklift, electric	60	Nissan	CYMO2L253		2 ton	1994	NA	0	Electric	NA	Electric
PSE010	Forklift, electric	61	Nissan	CYMO2L253		2 ton	1994	NA	0	Electric	NA	Electric
PSE010	Forklift, electric	62	Nissan	CYMO2L253		2 ton	1994	NA	0	Electric	NA	Electric
PSE010	Forklift, electric	63	Nissan	CYMO2L253		2 ton	1994	NA	0	Electric	NA	Electric
PSE010	Forklift, electric	64	Nissan	CYMO2L253		2 ton	1994	NA	0	Electric	NA	Electric
PSE010	Forklift, electric	65	Nissan	CYMO2L253		2 ton	1994	NA	0	Electric	NA	Electric
PSE010	Forklift, gasoline	27	Hyster	H120C	Continental	F245, 6 ton	1968	76	200	Gasoline	200	NA
PSE010	Forklift, gasoline	28	Hyster	H120C	Continental	F245, 6 ton	1969	76	200	Gasoline	200	NA
PSE010	Forklift, gasoline	4	Towmotor	V160	Caterpillar	3208 NA, 8 ton	1974	175	250	Gasoline	250	NA
PSE010	Forklift, propane	45	Mitsubishi	FGC20	Mitsubishi	2.0 Litre 4Cyl, 2 ton	1982	93	300	Propane	300	NA
PSE010	Forklift, propane	46	Mitsubishi	FGC20	Mitsubishi	2.0 Litre 4Cyl, 2 ton	1982	93	300	Propane	300	NA
PSE010	Forklift, propane	47	Mitsubishi	FGC20	Mitsubishi	2.0 Litre 4Cyl, 2 ton	1982	93	300	Propane	300	NA
PSE010	Forklift, propane	48	Mitsubishi	FGC20	Mitsubishi	2.0 Litre 4Cyl, 2 ton	1982	93	300	Propane	300	NA
PSE010	Forklift, propane	49	Mitsubishi	FGC25	Mitsubishi	2.0 Litre 4Cyl, 2 ton	1982	93	300	Propane	300	NA
PSE010	Generator		DMT	Generator	John Deere	4039	1992	71	150	Diesel, Onroad	150	NA
PSE010	Generator	85	Onan	85 KW	Cummins	6CT 8.3	2000	210	50	Diesel, Onroad	50	NA
PSE010	Light tower	76	Winco	LSC4	Kubota	D 850	1991	25	300	Diesel, Onroad	150	NA
PSE010	Loader	29	Bobcat	600LP	Wisconsin	VF4D	1968	25	100	Propane	75	NA
PSE010	Loader	32	Caterpillar	930	Caterpillar	41K1189	1970	101	200	Diesel, Onroad	200	NA
PSE010	Loader	11	Caterpillar	930	Caterpillar	3304	1974	101	200	Diesel, Onroad	200	NA
PSE010	Manlift, 65 ft.	72	Genie	S-65-2WD	Ford	2.5 Litre 4Cyl	1998	82	300	Gasoline/Propane	300	NA
PSE010	Sweeper	73	Power Boss	SW90HD	Kubota	V-1702B	1987	36	300	Diesel, Onroad	150	NA
PSE010	Truck, 14 Ton Boom & Basket	56	Ford	F800 Boom Ttuck	Ford	MFMO 7.8	1992	210	350	Diesel, Onroad	350	NA
PSE010	Welder, 400 amp portable	77	Lincoln	F245	Continental	F 245	1968	76	250	Gasoline	200	NA
PSE020	Log shovel	580	Caterpillar	330ll	Caterpillar	3306	1994	177	1,000	Diesel, Offroad	3,000	NA
PSE020	Log shovel	593	Caterpillar	330b-l	Caterpillar	3306	2001	177	1,500	Diesel, Offroad	4,500	NA
PSE020	Wheelloader	515	Caterpillar	966	Caterpillar	3306	1973	177	100	Diesel, Offroad	300	NA
PSE020	Wheelloader	531	Caterpillar	966	Caterpillar	3306	1973	177	1,200	Diesel, Offroad	4,500	NA
PSE020	Wheelloader	527	Dart	kw80	Cummins	335	1976	335	200	Diesel, Offroad	1,000	NA
PSE020	Wheelloader	578	Caterpillar	988b	Caterpillar	3408	1985	400	500	Diesel, Offroad	3,000	NA
PSE020	Wheelloader	545	Caterpillar	980c	Caterpillar	3306	1986	177	100	Diesel, Offroad	300	NA
PSE020	Wheelloader	549	Caterpillar	988b	Caterpillar	3408	1987	400	1,500	Diesel, Offroad	9,000	NA

Puget Sound Maritime Air Emissions Inventory
Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSE020	Wheelloader	524	Wagner	L80	Cummins	335	1989	335	200	Diesel, Offroad	1,000	NA
PSE020	Wheelloader	570	Caterpillar	988b	Caterpillar	3408	1991	400	2,000	Diesel, Offroad	12,000	NA
PSE030	Forklift, diesel, offroad	151	Clark	C500Y155D	Detroit	7 ton	1984	75	92	Diesel, Offroad	NA	NA
PSE030	Forklift, diesel, offroad	157	Clark	C500Y155GM	Detroit	7 ton	1984	75	168	Diesel, Offroad	NA	NA
PSE030	Forklift, diesel, offroad	193	Taylor	TE300S	Detroit	15 ton	1984	150	354	Diesel, Offroad	NA	NA
PSE030	Forklift, diesel, offroad	195	Taylor	TE300M	Detroit	15 ton	1984	150	189	Diesel, Offroad	NA	NA
PSE030	Forklift, diesel, offroad	160	Clark	C500Y155GM	Detroit	7 ton	1990	75	32	Diesel, Offroad	NA	NA
PSE030	Top pick	T29	Caterpillar	V925	Caterpillar		1993	200	104	Diesel, Offroad	NA	NA
PSE030	Top pick	TP107	Hyster	H1050E-16CH			1993	200	600	Diesel, Offroad	NA	NA
PSE030	Yard tractor	T46	Ottawa	YT50	Caterpillar		1986	175	266	Diesel, Offroad	NA	NA
PSE030	Yard tractor	T55	Ottawa	YT50	Caterpillar		1993	175	94	Diesel, Offroad	NA	NA
PSE040	Crane		Gottwald	350	Cummins	12 cyl	2000	250	280	Diesel-Electric	NA	NA
PSE040	Forklift, diesel, offroad					7 ton	1990	75	200	Diesel, Offroad	NA	NA
PSE040	Forklift, diesel, offroad		Caterpillar			15 ton	1995	150	200	Diesel, Offroad	NA	NA
PSE040	Forklift, diesel, offroad		Mitsubishi			15 ton	1995	150	200	Diesel, Offroad	NA	NA
PSE040	Forklift, diesel, offroad		Mitsubishi			15 ton	1995	150	200	Diesel, Offroad	NA	NA
PSE040	Reach stacker		Hyster				1995	200	400	Diesel, Offroad	NA	NA
PSE040	Reach stacker		Taylor				1995	200	400	Diesel, Offroad	NA	NA
PSE040	Yard tractor						1995	175	200	Diesel, Offroad	NA	NA
PSE040	Yard tractor						1995	175	200	Diesel, Offroad	NA	NA
PSE040	Yard tractor						1995	175	200	Diesel, Offroad	NA	NA
PSE040	Yard tractor						1995	175	200	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Caterpillar		Perkins	4 cyl	1995	85	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Hyster		GMC	6 cyl	1986	116	400	Propane	NA	Propane
PSO010	Forklift		Hyster		Hercules	6 cyl	1958	82	400	Propane	NA	Propane
PSO010	Forklift		Hyster		Perkins	6 cyl	1975	95	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Hyster		Perkins	6 cyl	1975	95	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Kalmar		Volvo	6 cyl	2001	159	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Komatsu		Komatsu	6 cyl	2001	104	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Komatsu		Komatsu	6 cyl	2001	104	400	Diesel, Offroad	NA	NA
PSO010	Forklift		Nissan			4 cyl	2003	61	400	Propane	NA	Propane
PSO010	Forklift		Nissan			4 cyl	2003	61	400	Propane	NA	Propane
PSO010	Forklift		Nissan			4 cyl	2003	61	400	Propane	NA	Propane
PSO010	Forklift		Pettibone		Continental	6 cyl	1984	49	400	Propane	NA	Propane
PSO010	Log handler		Wagner		Cummins	6 cyl	1968	310	400	Diesel, Offroad	NA	NA
PSO010	Log handler		Wagner		Detroit	6 cyl	1970	318	400	Diesel, Offroad	NA	NA
PSO010	Log handler		Wagner		Cummins	6 cyl	1976	360	400	Diesel, Offroad	NA	NA
PSO010	Log handler		Komatsu		Komatsu	6 cyl	1990	415	400	Diesel, Offroad	NA	NA
PSO010	Log handler		Komatsu		Komatsu	6 cyl	1990	415	400	Diesel, Offroad	NA	NA
PSO010	Log handler		Komatsu		Komatsu	6 cyl	1990	415	400	Diesel, Offroad	NA	NA

Puget Sound Maritime Air Emissions Inventory
Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSO010	Wheelloader		Wagner		Cummins	6 cyl	1963	175	400	Diesel, Offroad	NA	NA
PSO010	Wheelloader		Wagner		International	6 cyl	1985	160	400	Diesel, Offroad	NA	NA
PSO010	Wheelloader		Komatsu		Komatsu	6 cyl	1987	197	400	Diesel, Offroad	NA	NA
PSO020	Log handler		Wagner		Cummins	6 cyl	1968	310	1,500	Diesel, Offroad	NA	NA
PSO020	Log handler		Wagner		Detroit	6 cyl	1970	318	1,500	Diesel, Offroad	NA	NA
PSO020	Log handler		Wagner		Cummins	6 cyl	1976	360	1,500	Diesel, Offroad	NA	NA
PSO020	Log handler		Komatsu		Komatsu	6 cyl	1990	415	1,500	Diesel, Offroad	NA	NA
PSO020	Log handler		Komatsu		Komatsu	6 cyl	1990	415	1,500	Diesel, Offroad	NA	NA
PSP010	Forklift	NA					1995	75	360	Propane	Propane	Propane
PSP010	Forklift	NA					1995	75	360	Propane	Propane	Propane
PSP010	Forklift	NA					1995	75	360	Propane	Propane	Propane
PSP010	Forklift	NA					1995	100	360	Diesel, Offroad	NA	NA
PSP010	Forklift	NA					1995	100	360	Diesel, Offroad	NA	NA
PSP010	Forklift	NA					1995	100	360	Diesel, Offroad	NA	NA
PSP010	Log handler	NA					1995	400	480	Diesel, Offroad	NA	NA
PSP010	Log handler	NA					1995	400	480	Diesel, Offroad	NA	NA
PSP010	Log handler	NA					1995	400	480	Diesel, Offroad	NA	NA
PSP010	Log handler	NA					1995	400	480	Diesel, Offroad	NA	NA
PSP010	Log handler	NA					1995	400	480	Diesel, Offroad	NA	NA
PSS010	Car loader	91					1969	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	308					1981	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	310					1981	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	317					1981	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	323					1988	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	329					1989	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	332					1989	150	500	Gasoline	NA	Gasoline
PSS010	Car loader	1253					2001	150	500	Gasoline	NA	Gasoline
PSS010	Forklift	124					1974	NA	NA	Electric	NA	Electric
PSS010	Forklift	151	Crown				1975	NA	NA	Electric	NA	Electric
PSS010	Forklift	169	Clark				1978	NA	NA	Electric	NA	Electric
PSS010	Forklift	175					1979	NA	NA	Electric	NA	Electric
PSS010	Forklift	177					1979	NA	NA	Electric	NA	Electric
PSS010	Forklift	195	Clark				1995	NA	NA	Electric	NA	Electric
PSS010	Forklift	1253		4T			2001	85	1,000	Gasoline	NA	Gasoline
PSS010	Forklift	268					1975	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	270					1975	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	273					1976	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	272					1976	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	201					1988	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	203					1988	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	205					1989	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	208					1989	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	213					1989	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	216					1989	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	217					1990	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	218					1990	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	220					1990	100	2,000	Gasoline	NA	Gasoline

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Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSS010	Forklift	221					1990	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	222					1990	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	275					1993	100	2,000	Gasoline	NA	Gasoline
PSS010	Forklift	17			Detroit	6V53	1961	200	3,078	ULSD	NA	ULSD
PSS010	Forklift	25			AH 60	453	1969	200	1,239	ULSD	NA	ULSD
PSS010	Forklift	18			Detroit	453	1973	200	2,102	ULSD	NA	ULSD
PSS010	Forklift	16			Detroit	453	1974	200	4,053	ULSD	NA	ULSD
PSS010	Forklift	1					1975	200	2,000	ULSD	NA	ULSD
PSS010	Forklift	12			Detroit	453	1975	200	1,910	ULSD	NA	ULSD
PSS010	Forklift	13			Detroit	453	1975	200	2,468	ULSD	NA	ULSD
PSS010	Forklift	14			Detroit	453	1975	200	1,160	ULSD	NA	ULSD
PSS010	Forklift	33			Detroit	453	1977	200	2,145	ULSD	NA	ULSD
PSS010	Forklift	34			Detroit	453	1977	200	1,617	ULSD	NA	ULSD
PSS010	Forklift	276					1994	100	2,000	Propane	NA	Propane
PSS010	Generator sets, terminal	158	Honda	3,000 watt			2005	5	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	159	Honda	3,000 watt			2005	5	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	160	Honda	3,000 watt			2005	5	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	1					1962	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	2					1964	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	3					1964	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	4					1964	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	5					1964	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	6					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	7					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	8					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	9					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	10					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	11					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	12					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	13					1979	110	1,000	Gasoline	NA	Gasoline
PSS010	Generator sets, terminal	149		40 plug Reefer Gen			1996	110	1,000	ULSD	NA	ULSD
PSS010	Generator sets, terminal	150		40 plug Reefer Gen			1996	110	1,000	ULSD	NA	ULSD
PSS010	Generator sets, terminal	151		50 plug Reefer Gen			1996	110	1,000	ULSD	NA	ULSD
PSS010	Generator sets, terminal	152		145 KW	Volvo	TAD 720GE	2001	195	2,183	ULSD	NA	ULSD
PSS010	Generator sets, terminal	153		145 KW	Volvo	TAD 720GE	2001	195	708	ULSD	NA	ULSD
PSS010	Generator sets, terminal	155		250 KW	Volvo	TAD 1031GE	2001	335	198	ULSD	NA	ULSD
PSS010	Generator sets, terminal	156		350 KW	Volvo	TAD 1241GE	2001	470	1,706	ULSD	NA	ULSD
PSS020	Forklift							NA	NA	Electric	NA	Electric
PSS020	Forklift	POS						NA	NA	Electric	NA	Electric
PSS020	Forklift							NA	NA	Electric	NA	Electric
PSS020	Forklift							NA	NA	Electric	NA	Electric
PSS020	Forklift							NA	NA	Electric	NA	Electric
PSS020	Forklift					5 T	1991	85	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					5 T	1991	85	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					5 T	1991	85	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift	POS				5 T	1991	85	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					5 T	1991	85	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)

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Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSS020	Forklift					10-15 T	1995	150	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					10-15 T	1995	150	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					10-15 T	1995	150	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					10-15 T	1995	150	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					10-15 T	1995	150	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					10-15 T	1995	150	530	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS020	Forklift					5 T	1987	85	530	Propane	NA	Propane
PSS020	Forklift					5 T	1987	85	530	Propane	NA	Propane
PSS020	Forklift					5 T	1987	85	530	Propane	NA	Propane
PSS020	Forklift					5 T	1987	85	530	Propane	NA	Propane
PSS020	Forklift					5 T	1987	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1989	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1993	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1993	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1993	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1993	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1993	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1993	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	1996	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	2005	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	2005	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	2005	85	530	Propane	NA	Propane
PSS020	Forklift					4 T	2005	85	530	Propane	NA	Propane
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS020	Pallet jacks							NA	NA	Electric	NA	Electric
PSS030	Forklift	361	Hyster	360XL	Perkins	PDX4021	1995	120	1,450	Diesel, Offroad	NA	NA
PSS030	Forklift	362	Hyster	360XL	Perkins	PDX4021	1995	120	1,450	Diesel, Offroad	NA	NA
PSS030	Forklift	301	Caterpillar	15T	Caterpillar	3208	1995	125	1,350	Diesel, Offroad	NA	NA

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PSS030	Forklift	302	Caterpillar	15T	Caterpillar	3208	1995	125	1,350	Diesel, Offroad	NA	NA
PSS030	Forklift	6210	Hyster	H620B	Detroit	6V53	1995	210	1,550	Diesel, Offroad	NA	NA
PSS030	Forklift	702	Hyster	700F	Cummins	8.3	1995	215	1,570	Diesel, Offroad	NA	NA
PSS030	Forklift	1001	Hyster	H100XM	Perkins	2158-2100	1995	215	0	Diesel, Offroad	NA	NA
PSS030	Forklift	1002	Hyster	H100XM	Perkins	2158-2100	1995	215	0	Diesel, Offroad	NA	NA
PSS030	Forklift	1004	Hyster	H100XM	Perkins	2158-2100	1995	215	0	Diesel, Offroad	NA	NA
PSS030	Forklift	6215	Hyster	H650C	Cummins	8.3	1995	215	1,550	Diesel, Offroad	NA	NA
PSS030	Forklift	6219	Taylor	TE620	Cummins	8.3	1995	215	1,550	Diesel, Offroad	NA	NA
PSS030	Forklift	V9001	Caterpillar	V900H	Caterpillar	3208	1995	235	1,750	Diesel, Offroad	NA	NA
PSS030	Forklift	8006	Taylor	TE800S	Cummins	L10	1995	250	1,700	Diesel, Offroad	NA	NA
PSS030	Forklift	RS-01	Hyster	25/45HR	Cummins	M11	2002	330	1,925	Diesel, Offroad	NA	NA
PSS030	Forklift	8008	Taylor	TE800S	Cummins	M11	1995	350	1,700	Diesel, Offroad	NA	NA
PSS030	Forklift	9202	Taylor	TE925SX	Cummins	M11	2000	350	1,850	Diesel, Offroad	NA	NA
PSS030	Forklift	9206	Taylor	TE925SX	Cummins	M11	2003	350	1,850	Diesel, Offroad	NA	NA
PSS030	Forklift	9207	Taylor	TE925SX	Cummins	M11	2004	350	1,850	Diesel, Offroad	NA	NA
PSS030	Forklift	9208	Taylor	TE925SX	Cummins	M11	2005	350	0	Diesel, Offroad	NA	NA
PSS040	Forklift					4 T	1995	100	1,000	Diesel, Offroad	NA	NA
PSS050	Crane, container	971679	Mitsubishi	50 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	971678	Mitsubishi	50 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	971677	Mitsubishi	50 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	8	ZPMC	65 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	7	Paceco	65 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	6	Paceco	65 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	5	Paceco	65 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	9980	IHI	40 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	9981	IHI	40 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	10000	IHI	40 TN				NA	NA	Electric	NA	Electric
PSS050	Crane, container	4128	Star	40 TN				NA	NA	Electric	NA	Electric
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Hyster	X10	Perkins	7 T	2001	100	1,800	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Clark			15 T	1982	150	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Mitsubishi			15 T	1984	150	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Taylor			15 T	1987	150	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Hyster			15 T	1995	150	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Hyster			15 T	1996	150	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Forklift		Taylor			15 T	1997	150	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	RTG crane		ZPMC		Caterpillar	3412	2005	900	1,100	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	RTG crane		ZPMC		Caterpillar	3412	2005	900	1,100	Diesel, Offroad	NA	Diesel, Onroad (2 months)

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PSS050	RTG crane		ZPMC		Caterpillar	3412	2005	900	0	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	RTG crane		ZPMC		Caterpillar	3412	2005	900	0	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS050	Side handler	15902	Taylor	TECSP 157/8	Cummins	B5.9 C	2001	205	2,112	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS050	Side handler	15903	Taylor	TECSP 157/8	Cummins	QSB5.9	2005	205	1,244	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS050	Side handler	15904	Taylor	TECSP 157/8	Cummins	QSB5.9	2005	205	1,075	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS050	Side handler	15905	Taylor	TECSP 157/8	Cummins	QSB5.9	2005	205	780	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS050	Side handler	15997	Taylor	TECSP 157/8	Cummins	QSB5.9	2005	205	0	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80913	Taylor	TEC 950L	Cummins	LT10-C	1992	260	1,553	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80914	Taylor	TEC 950L	Cummins	LT10-C	1992	260	2,500	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80007	Taylor	TEC 950L	Cummins	LT10-C	1993	260	1,772	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80212	Taylor	TEC 950L	Cummins	LT10-C	1993	260	1,523	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80906	Taylor	TEC 950L	Cummins	LT10-C	1993	260	1,699	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80954	Taylor	TEC 950L	Cummins	LT10-C	1993	260	2,451	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80907	Taylor	TEC 950L	Cummins	LT10-C	1994	260	2,566	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80955	Taylor	TEC 950L	Cummins	LT10-C	1994	260	1,648	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80010	Taylor	TEC 950L	Cummins	LT10-C	1995	260	1,893	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80902	Taylor	TEC 950L	Cummins	LT10-C	1995	260	1,788	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80903	Taylor	TEC 950L	Cummins	LT10-C	1995	260	2,068	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80908	Taylor	TEC 950L	Cummins	LT10-C	1995	260	2,517	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80912	Taylor	TEC 950L	Cummins	LT10-C	1995	260	2,455	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80956	Taylor	TEC 950L	Cummins	LT10-C	1995	260	2,124	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80909	Taylor	TEC 950L	Cummins	LT10-C	1996	260	3,063	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80910	Taylor	TEC 950L	Cummins	LT10-C	1996	260	2,733	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80911	Taylor	TEC 950L	Cummins	LT10-C	1996	260	3,064	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80915	Taylor	TEC 950L	Cummins	LT10-C	1997	260	2,062	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80916	Taylor	TEC 950L	Cummins	M11-C	1997	330	2,731	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80957	Taylor	TEC 950L	Cummins	M11-C	1997	330	2,911	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80924	Taylor	THDC 955	Cummins	QSM11-C	2004	335	3,525	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80926	Taylor	THDC 955	Cummins	QSM11-C	2004	335	3,543	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80927	Taylor	THDC 955	Cummins	QSM11-C	2005	335	2,253	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80928	Taylor	THDC 955	Cummins	QSM11-C	2005	335	979	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80929	Taylor	THDC 955	Cummins	QSM11-C	2005	335	1,757	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80930	Taylor	THDC 955	Cummins	QSM11-C	2005	335	1,665	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80931	Taylor	THDC 955	Cummins	QSM11-C	2005	335	1,583	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80932	Taylor	THDC 955	Cummins	M11-C	2005	335	1,016	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80933	Taylor	THDC 955	Cummins	QSM11-C	2005	335	1,595	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80934	Taylor	THDC 955	Cummins	QSM11-C	2005	335	1,068	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Top handler	80935	Taylor	THDC 955	Cummins	QSM11-C	2005	335	833	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 956	Ottawa	YT-50	Cummins	6CT	1996	177	1,923	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 957	Ottawa	YT-50	Cummins	6CT	1996	177	2,712	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 958	Ottawa	YT-50	Cummins	6CT	1996	177	1,789	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 959	Ottawa	YT-50	Cummins	6CT	1996	177	2,932	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 960	Ottawa	YT-50	Cummins	6CT	1996	177	3,244	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 962	Ottawa	YT-50	Cummins	6CT	1996	177	2,947	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 963	Ottawa	YT-50	Cummins	6CT	1996	177	1,429	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 964	Ottawa	YT-50	Cummins	6CT	1996	177	3,514	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 965	Ottawa	YT-50	Cummins	6CT	1996	177	2,695	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)

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PSS050	Yard tractor	H 967	Ottawa	YT-50	Cummins	6CT	1997	177	2,789	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 968	Ottawa	YT-50	Cummins	6CT	1997	177	3,334	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 969	Ottawa	YT-50	Cummins	6CT	1997	177	3,190	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 971	Ottawa	YT-50	Cummins	6CT	1997	177	2,772	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 972	Ottawa	YT-50	Cummins	6CT	1997	177	2,956	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 973	Ottawa	YT-50	Cummins	6CT	1997	177	3,293	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 975	Ottawa	YT-50	Cummins	6CT	1997	177	3,304	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 976	Ottawa	YT-50	Cummins	6CT	1997	177	396	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 977	Ottawa	YT-50	Cummins	6CT	1997	177	2,659	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 978	Ottawa	YT-50	Cummins	6CT	1997	177	3,364	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 979	Ottawa	YT-50	Cummins	6CT	1997	177	3,596	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 980	Ottawa	YT-50	Cummins	6CT	1997	177	3,951	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 981	Ottawa	YT-50	Cummins	6CT	1997	177	2,428	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 983	Ottawa	YT-50	Cummins	6CT	1997	177	1,847	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 984	Ottawa	YT-50	Cummins	6CT	1997	177	2,306	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 985	Ottawa	YT-50	Cummins	6CT	1997	177	2,961	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 986	Ottawa	YT-50	Cummins	6CT	1997	177	3,118	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 988	Ottawa	YT-50	Cummins	6CT	1998	177	3,203	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 989	Ottawa	YT-50	Cummins	6CT	1998	177	2,606	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 990	Ottawa	YT-50	Cummins	6CT	1998	177	2,615	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 992	Ottawa	YT-50	Cummins	6CT	1998	177	3,414	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 993	Ottawa	YT-50	Cummins	6CT	1999	177	3,205	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 994	Ottawa	YT-50	Cummins	6CT	1999	177	2,669	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 922	Capacity	TJ7000	Cummins	6BT	2004	177	1,903	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 923	Capacity	TJ7000	Cummins	6BT	2004	177	2,159	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 924	Capacity	TJ7000	Cummins	6BT	2004	177	2,737	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 925	Capacity	TJ7000	Cummins	6BT	2004	177	1,912	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 926	Capacity	TJ7000	Cummins	6BT	2005	177	1,096	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 927	Capacity	TJ7000	Cummins	6BT	2005	177	1,219	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 928	Capacity	TJ7000	Cummins	6BT	2005	177	1,144	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 929	Capacity	TJ7000	Cummins	6BT	2005	177	1,185	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 930	Capacity	TJ7000	Cummins	6BT	2005	177	1,128	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 931	Capacity	TJ7000	Cummins	6BT	2005	177	865	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 932	Capacity	TJ7000	Cummins	6BT	2005	177	1,401	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 933	Capacity	TJ7000	Cummins	6BT	2005	177	1,220	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 934	Capacity	TJ7000	Cummins	6BT	2005	177	899	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 935	Capacity	TJ7000	Cummins	6BT	2005	177	845	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 936	Capacity	TJ7000	Cummins	6BT	2005	177	1,321	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 937	Capacity	TJ7000	Cummins	6BT	2005	177	1,153	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 938	Capacity	TJ7000	Cummins	6BT	2005	177	1,416	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 939	Capacity	TJ7000	Cummins	6BT	2005	177	1,169	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 940	Capacity	TJ7000	Cummins	6BT	2005	177	1,586	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 941	Capacity	TJ7000	Cummins	6BT	2005	177	1,427	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 942	Capacity	TJ7000	Cummins	6BT	2005	177	1,107	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 943	Capacity	TJ7000	Cummins	6BT	2005	177	1,061	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 944	Capacity	TJ7000	Cummins	6BT	2005	177	986	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 945	Capacity	TJ7000	Cummins	6BT	2005	177	1,169	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)

Puget Sound Maritime Air Emissions Inventory
Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSS050	Yard tractor	H 946	Capacity	TJ7000	Cummins	6BT	2005	177	572	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 947	Capacity	TJ7000	Cummins	6BT	2005	177	79	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 948	Capacity	TJ7000	Cummins	6BT	2005	177	602	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 949	Capacity	TJ7000	Cummins	6BT	2005	177	607	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 950	Capacity	TJ7000	Cummins	6BT	2005	177	550	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 951	Capacity	TJ7000	Cummins	6BT	2005	177	601	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 952	Capacity	TJ7000	Cummins	6BT	2005	177	532	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 953	Capacity	TJ7000	Cummins	6BT	2005	177	587	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 954	Capacity	TJ7000	Cummins	6BT	2005	177	496	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 955	Capacity	TJ7000	Cummins	6BT	2005	177	657	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 956	Capacity	TJ7000	Cummins	6BT	2005	177	539	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 957	Capacity	TJ7000	Cummins	6BT	2005	177	54	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS050	Yard tractor	H 958	Capacity	TJ7000	Cummins	6BT	2005	177	729	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Crane, container	1261	Paceco	40 TN				NA	NA	Electric	NA	Electric
PSS060	Crane, container	1260	Paceco	40 TN				NA	NA	Electric	NA	Electric
PSS060	Crane, container	961	Paceco	40 TN				NA	NA	Electric	NA	Electric
PSS060	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS060	Forklift		Mitsubishi	FD40		4 T	2004	85	250	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS060	Forklift		Hyster	H360		18 T	2005	190	1,800	Diesel, Offroad	NA	Diesel, Onroad (2 months)
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Generator sets, terminal						2001	130	500	Diesel, Offroad	NA	NA
PSS060	Side handler	30019	Taylor	TECE 156H	Cummins	8 ton	1998	205	98	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS060	Side handler	30020	Taylor	TECE 156H	Cummins	8 ton	1998	205	155	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS060	Side handler	15900	Taylor	TECSP 157/8	Cummins	B5.9 C	2001	205	1,523	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS060	Side handler	15901	Taylor	TECSP 157/8	Cummins	B5.9 C	2001	205	1,279	Diesel, Offroad	2.8 gals/hr	Diesel, Onroad (2 months)
PSS060	Top handler	80014	Taylor	TEC 950L	Cummins	M11-C	1997	330	2,422	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS060	Top handler	80920	Taylor	THDC 955	Cummins	QSM11-C	2003	335	3,087	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS060	Top handler	80921	Taylor	THDC 955	Cummins	QSM11-C	2004	335	3,330	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS060	Top handler	80922	Taylor	THDC 955	Cummins	QSM11-C	2004	335	3,388	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS060	Top handler	80923	Taylor	THDC 955	Cummins	QSM11-C	2004	335	3,745	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS060	Top handler	80925	Taylor	THDC 955	Cummins	QSM11-C	2004	335	3,129	Diesel, Offroad	3.4 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 900	Capacity	TJ7000	Cummins	6BT	2002	177	1,676	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 901	Capacity	TJ7000	Cummins	6BT	2002	177	1,116	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 902	Capacity	TJ7000	Cummins	6BT	2002	177	1,500	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 903	Capacity	TJ7000	Cummins	6BT	2002	177	1,791	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 904	Capacity	TJ7000	Cummins	6BT	2002	177	1,030	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 905	Capacity	TJ7000	Cummins	6BT	2002	177	1,304	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 906	Capacity	TJ7000	Cummins	6BT	2002	177	1,692	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 907	Capacity	TJ7000	Cummins	6BT	2002	177	1,483	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)

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Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PSS060	Yard tractor	H 908	Capacity	TJ7000	Cummins	6BT	2002	177	1,467	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 909	Capacity	TJ7000	Cummins	6BT	2002	177	1,325	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 910	Capacity	TJ7000	Cummins	6BT	2002	177	1,710	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 911	Capacity	TJ7000	Cummins	6BT	2003	177	1,934	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 912	Capacity	TJ7000	Cummins	6BT	2003	177	1,946	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 913	Capacity	TJ7000	Cummins	6BT	2003	177	2,110	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 914	Capacity	TJ7000	Cummins	6BT	2003	177	2,143	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 915	Capacity	TJ7000	Cummins	6BT	2003	177	2,322	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 916	Capacity	TJ7000	Cummins	6BT	2003	177	2,013	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 917	Capacity	TJ7000	Cummins	6BT	2003	177	1,760	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 918	Capacity	TJ7000	Cummins	6BT	2003	177	2,068	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 920	Capacity	TJ7000	Cummins	6BT	2004	177	2,285	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS060	Yard tractor	H 921	Capacity	TJ7000	Cummins	6BT	2004	177	2,493	Diesel, Offroad	2.6 gals/hr	Diesel, Onroad (2 months)
PSS070	Crane, container	1354	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS070	Crane, container	1472	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS070	Crane, container	10001	IHI	40 TN				NA	NA	Electric	NA	Electric
PSS070	Crane, container	1	ZPMC	65 TN				NA	NA	Electric	NA	Electric
PSS070	Crane, container	2	ZPMC	65 TN				NA	NA	Electric	NA	Electric
PSS070	Crane, container	3	ZPMC	65 TN				NA	NA	Electric	NA	Electric
PSS070	Forklift	1701	Caterpillar	5 T	Caterpillar	DP40K	2004	100	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	1702	Caterpillar	5 T	Caterpillar	DP40K	2004	100	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	1703	Caterpillar	5 T	Caterpillar	DP40K	2004	100	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	1704	Caterpillar	5 T	Caterpillar	DP40K	2004	100	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	1705	Caterpillar	5 T	Caterpillar	DP40K	2004	100	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	2404	Taylor	TE360L	Cummins	5.9	1994	150	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	2795	Taylor	TH305L	Cummins	5.9	2005	165	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Forklift	3733	Taylor	Y-52	Detroit	453	1970	175	225	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Side handler	7212	Taylor		Cummins	5.9	1995	152	40	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6000	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6001	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6002	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6109	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6110	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6111	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6112	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6113	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6114	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6119	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6120	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6121	Taylor		Cummins	L-10	1995	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6136	Taylor		Cummins	M-11	1997	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6130	Taylor		Cummins	M-11	1998	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6137	Taylor		Cummins	M-11	1998	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6176	Taylor	THDC-955	Cummins	QSM-11	2005	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6177	Taylor	THDC-955	Cummins	QSM-11	2005	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Top handler	6178	Taylor	THDC-955	Cummins	QSM-11	2005	250	1,600	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5204	Ottawa	YT-50	Caterpillar	3208	1984	174	1,270	Diesel, Onroad	NA	ULSD (2 months)

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PSS070	Yard tractor	5205	Ottawa	YT-50	Caterpillar	3208	1984	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5206	Ottawa	YT-50	Caterpillar	3208	1984	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5207	Ottawa	YT-50	Caterpillar	3208	1984	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5208	Ottawa	YT-50	Caterpillar	3208	1984	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5100	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5101	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5102	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5103	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5104	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5105	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5106	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5107	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5108	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5109	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5110	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5111	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5112	Magnum		Cummins	5.9	1995	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5176	Magnum	Sisu TT-120	Cummins	5.9	1999	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5177	Magnum	Sisu TT-120	Cummins	5.9	1999	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5178	Magnum	Sisu TT-120	Cummins	5.9	1999	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5179	Magnum	Sisu TT-120	Cummins	5.9	1999	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5180	Magnum	Sisu TT-120	Cummins	5.9	1999	174	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5224	Capacity	TJ7000	Caterpillar	C-7	2005	240	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5225	Capacity	TJ7000	Caterpillar	C-7	2005	240	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5226	Capacity	TJ7000	Caterpillar	C-7	2005	240	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5227	Capacity	TJ7000	Caterpillar	C-7	2005	240	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS070	Yard tractor	5228	Capacity	TJ7000	Caterpillar	C-7	2005	240	1,270	Diesel, Onroad	NA	ULSD (2 months)
PSS080	Crane, container	1473	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS080	Crane, container	1261	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS080	Crane, container	1264	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS080	Crane, container	1262	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS080	Crane, container	1263	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS080	Crane, container	1355	Paceco	50 TN				NA	NA	Electric	NA	Electric
PSS080	Forklift	EMSF 648	Mitsubishi	2.5 T			1998	NA	72	Electric	NA	Electric
PSS080	Forklift	EMSF 649	Mitsubishi	2.5 T			1998	NA	108	Electric	NA	Electric
PSS080	Forklift	EMSF 622	Hyster	6 T	Chevrolet	4.3 L	1996	100	72	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 577	Taylor	7.5 T	Mitsubishi	4 cyl	1988	125	173	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 623	Hyster	7.5 T	Perkins	4 cyl	1997	125	108	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 624	Hyster	7.5 T	Perkins	4 cyl	1997	125	463	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 625	Hyster	7.5 T	Perkins	4 cyl	1997	125	478	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 626	Hyster	7.5 T	Perkins	4 cyl	1997	125	162	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 627	Hyster	7.5 T	Perkins	4 cyl	1997	125	219	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 628	Hyster	7.5 T	Chevrolet	4.3 L	1997	125	141	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 587	Hyster	18 T	Perkins	6CT	1992	215	305	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 586	Hyster	22 T	Cummins	6CT	1992	215	707	Diesel, Offroad	NA	NA
PSS080	Forklift	EMRF 101	Taylor	25 T	Detroit	471	2001	215	64	Diesel, Offroad	NA	NA
PSS080	Forklift	EMSF 548	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1982	85	7	Propane	NA	Propane

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PSS080	Forklift	EMSF 568	Taylor	2.5 T	Detroit	453	1986	85	178	Propane	NA	Propane
PSS080	Forklift	EMSF 571	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1986	85	3	Propane	NA	Propane
PSS080	Forklift	EMSF 573	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1986	85	54	Propane	NA	Propane
PSS080	Forklift	EMSF 563	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1987	85	777	Propane	NA	Propane
PSS080	Forklift	EMSF 564	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1987	85	725	Propane	NA	Propane
PSS080	Forklift	EMSF 565	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1987	85	31	Propane	NA	Propane
PSS080	Forklift	EMSF 569	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1988	85	653	Propane	NA	Propane
PSS080	Forklift	EMSF 570	Mitsubishi	2.5 T	Mitsubishi	4 cyl	1988	85	663	Propane	NA	Propane
PSS080	Forklift	EMSF 579	Clark	4 T	Perkins	4 cyl	1991	85	25	Propane	NA	Propane
PSS080	Forklift	EMSF 581	Hyster	4 T	Chevrolet	4.3 L	1992	85	321	Propane	NA	Propane
PSS080	Forklift	EMSF 583	Hyster	4 T	Chevrolet	4.3 L	1992	85	845	Propane	NA	Propane
PSS080	Forklift	EMSF 584	Hyster	4 T	Chevrolet	4.3 L	1992	85	547	Propane	NA	Propane
PSS080	Forklift	EMSF 588	Hyster	4 T	Chevrolet	4.3 L	1993	85	821	Propane	NA	Propane
PSS080	Forklift	EMSF 589	Hyster	4 T	Chevrolet	4.3 L	1993	85	352	Propane	NA	Propane
PSS080	Forklift	EMSF 616	Clark	2.5 T	Clark	4 cyl	1995	85	326	Propane	NA	Propane
PSS080	Forklift	EMSF 617	Clark	2.5 T	Clark	4 cyl	1995	85	473	Propane	NA	Propane
PSS080	Forklift	EMSF 618	Clark	2.5 T	Clark	4 cyl	1995	85	108	Propane	NA	Propane
PSS080	Forklift	EMSF 619	Clark	2.5 T	Clark	4 cyl	1995	85	705	Propane	NA	Propane
PSS080	Forklift	EMSF 578	Clark	5 T	Perkins	4 cyl	1991	100	75	Propane	NA	Propane
PSS080	Forklift	EMSF 621	Hyster	6 T	Chevrolet	4.3 L	1996	100	32	Propane	NA	Propane
PSS080	Forklift	EMSF 574	Clark	7.5 T	Mitsubishi	4 cyl	1990	125	245	Propane	NA	Propane
PSS080	Forklift	EMSF 575	Clark	7.5 T	Mitsubishi	4 cyl	1990	125	126	Propane	NA	Propane
PSS080	Forklift	EMSF 576	Clark	7.5 T	Mitsubishi	4 cyl	1990	125	403	Propane	NA	Propane
PSS080	Manlift	EMSU 178	Grove	MZ150	Wisconsin	4 cyl	1986	60	113	Propane	NA	Propane
PSS080	Side handler	EMRZ 036	Taylor		Cummins	6BT	1993	152	176	Diesel, Offroad	NA	NA
PSS080	Sweeper	EMSU 339	Tennant	800	Perkins	4 cyl	1997	50	20	Diesel, Offroad	NA	NA
PSS080	Sweeper	EMSU 373	Tennant	830	Perkins	4 cyl	1998	50	862	Diesel, Offroad	NA	NA
PSS080	Top handler	EMSZ 037	Taylor		Cummins	L10	1994	225	2,481	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 010	Kalmar		Detroit	6-71	1985	250	148	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 021	Taylor		Cummins	M11-C	1991	250	88	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 034	Taylor		Cummins	M11-C	1991	250	8,404	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 026	Taylor		Cummins	L10	1992	250	2,495	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 001	Taylor		Cummins	LT10-C	2001	250	1,815	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 007	Taylor		Cummins	LT10-C	2001	250	1,349	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 008	Taylor		Cummins	LT10-C	2001	250	1,798	Diesel, Offroad	NA	NA
PSS080	Top handler	EMRZ 002	Hyster		Cummins	M11-C	2001	325	1,361	Diesel, Offroad	NA	NA
PSS080	Top handler	EMSZ 047	Fantuzzi		Cummins	M11-C	1997	330	2,141	Diesel, Offroad	NA	NA
PSS080	Top handler	EMSZ 049	Fantuzzi		Cummins	M11-C	1997	330	2,755	Diesel, Offroad	NA	NA
PSS080	Top handler	EMSZ 050	Fantuzzi		Cummins	M11-C	1997	330	2,402	Diesel, Offroad	NA	NA
PSS080	Top handler	EMSZ 051	Fantuzzi		Cummins	M11-C	1997	330	2,393	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 462	Capacity		Cummins	B5.9C	1999	174	2,598	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 463	Capacity		Cummins	B5.9C	1999	174	2,813	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 464	Capacity		Cummins	B5.9C	1999	174	3,000	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 465	Capacity		Cummins	B5.9C	1999	174	2,898	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 466	Capacity		Cummins	B5.9C	1999	174	2,907	Diesel, Offroad	NA	NA
PSS080	Yard tractor	APST 183	Capacity		Cummins	6BTA	2000	174	2,319	Diesel, Offroad	NA	NA
PSS080	Yard tractor	APST 184	Capacity		Cummins	B5.9C	2000	174	2,744	Diesel, Offroad	NA	NA

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PSS080	Yard tractor	APST 185	Capacity		Cummins	6BTA	2000	174	3,244	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 044	Ottawa		Caterpillar	3208	2001	175	706	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 049	Ottawa		Caterpillar	3208	2001	175	727	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 051	Ottawa		Caterpillar	3208	2001	175	1,349	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 053	Ottawa		Caterpillar	3208	2001	175	759	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 055	Ottawa		Caterpillar	3208	2001	175	689	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 056	Sisu		Cummins	6CT	2001	175	1,726	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMRT 057	Sisu		Cummins	6CT	2001	175	923	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 232	Ottawa		Caterpillar	3208	1991	210	1,382	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 234	Ottawa		Caterpillar	3208	1991	210	1,420	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 247	Ottawa		Cummins	6CT	1992	210	466	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 248	Ottawa		Cummins	6CT	1992	210	1,876	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 249	Ottawa		Cummins	6CT	1992	210	2,341	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 250	Ottawa		Cummins	6CT	1992	210	2,541	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 252	Ottawa		Cummins	6CT	1992	210	1,658	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 253	Ottawa		Cummins	6CT	1992	210	871	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 269	Ottawa		Cummins	6CT	1993	210	323	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 270	Ottawa		Cummins	6CT	1993	210	258	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 271	Ottawa		Cummins	6CT	1993	210	3,017	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 272	Ottawa		Cummins	6CT	1993	210	1,048	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 273	Ottawa		Cummins	6CT	1993	210	2,747	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 274	Ottawa		Cummins	6CT	1993	210	2,625	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 286	Ottawa		Cummins	6CT	1995	210	2,636	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 287	Ottawa		Cummins	6CT	1995	210	3,195	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 288	Ottawa		Cummins	6CT	1995	210	2,507	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 289	Ottawa		Cummins	6CT	1995	210	2,407	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 290	Ottawa		Cummins	6CT	1995	210	2,495	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 291	Ottawa		Cummins	6CT	1995	210	354	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 301	Capacity		Cummins	6CT	1996	210	2,897	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 302	Capacity		Cummins	6CT	1996	210	2,856	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 303	Capacity		Cummins	6CT	1996	210	2,902	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 304	Capacity		Cummins	6CT	1996	210	2,538	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 305	Capacity		Cummins	6CT	1996	210	3,189	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 684	Capacity		Caterpillar	C7	2004	210	2,974	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 685	Capacity		Caterpillar	C7	2004	210	1,950	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 686	Capacity		Caterpillar	C7	2004	210	2,669	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 687	Capacity		Caterpillar	C7	2004	210	3,101	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 688	Capacity		Caterpillar	C7	2004	210	3,067	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 689	Capacity		Caterpillar	C7	2004	210	2,910	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 690	Capacity		Caterpillar	C7	2004	210	2,960	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 691	Capacity		Caterpillar	C7	2004	210	2,198	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 692	Capacity		Caterpillar	C7	2004	210	2,597	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 693	Capacity		Caterpillar	C7	2004	210	2,963	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 694	Capacity		Caterpillar	C7	2004	210	2,845	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 695	Capacity		Caterpillar	C7	2004	210	1,597	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 696	Capacity		Caterpillar	C7	2004	210	2,674	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 697	Capacity		Caterpillar	C7	2004	210	2,741	Diesel, Offroad	NA	NA

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PSS080	Yard tractor	EMST 716	Capacity		Caterpillar	C7	2005	210	2,005	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 717	Capacity		Caterpillar	C7	2005	210	2,181	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 718	Capacity		Caterpillar	C7	2005	210	1,978	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 719	Capacity		Caterpillar	C7	2005	210	1,954	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 720	Capacity		Caterpillar	C7	2005	210	1,963	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 397	Ottawa		Cummins	6CT	1997	215	4,056	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 398	Ottawa		Cummins	6CT	1997	215	3,349	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 399	Ottawa		Cummins	6CT	1997	215	3,632	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 400	Ottawa		Cummins	6CT	1997	215	3,787	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 401	Ottawa		Cummins	6CT	1997	215	3,768	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 402	Ottawa		Cummins	6CT	1997	215	3,588	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 403	Ottawa		Cummins	6CT	1997	215	3,510	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 404	Ottawa		Cummins	6CT	1997	215	4,011	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 406	Ottawa		Cummins	6CT	1997	215	2,927	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 407	Ottawa		Cummins	6CT	1997	215	3,861	Diesel, Offroad	NA	NA
PSS080	Yard tractor	EMST 408	Ottawa		Cummins	6CT	1997	215	3,364	Diesel, Offroad	NA	NA
PST010	Backhoe	4535	Case	580E		12",18",24"	1985	350	7	ULSD	5	ULSD
PST010	Backhoe	5491	John Deere	310SE LOADER		17940 LBS	1998	350	195	ULSD	394	ULSD
PST010	Compressor	4263	Saylor B	703-COMPRESSOR			1974	NA	NA	Electric	NA	Electric
PST010	Compressor	5407	Speedair	324206		165 PSI	1992	NA	NA	Electric	NA	Electric
PST010	Compressor	10097	Thomas	T2820ST			2003	NA	NA	Electric	NA	Electric
PST010	Compressor	5313	Ingersoll Rand	10FGT3215577			1989	10	0	Gasoline	1	Gasoline
PST010	Compressor	5449	Ingersoll Rand	T-30 2420FIIG		SPEC#1626	1996	10	0	Gasoline	13	Gasoline
PST010	Compressor	5461	Ingersoll Rand	T-30			1996	10	0	Gasoline	37	Gasoline
PST010	Compressor	5488	Speedair	5F219B			1998	10	0	Gasoline	62	Gasoline
PST010	Compressor	5511	Speedair	57219C		8 HP/8 GAL@175 PSI	1999	10	0	Gasoline	3	Gasoline
PST010	Compressor	5543	Ingersoll Rand	2475F11GHED			2001	10	0	Gasoline	5	Gasoline
PST010	Compressor	10574	Emglo	R5B120			1977	10	0	ULSD	NA	ULSD
PST010	Compressor	4387	Ingersoll Rand	P185WJD		185CF	1981	10	111	ULSD	114	ULSD
PST010	Compressor	4464	Ingersoll Rand	P185WJD		185CF	1982	10	71	ULSD	77	ULSD
PST010	Compressor	4528	Ingersoll Rand	P185WJD		185CF	1984	10	40	ULSD	20	ULSD
PST010	Compressor	10339	Ingersoll Rand	P185WIR			2004	10	0	ULSD	0	ULSD
PST010	Compressor	10340	Ingersoll Rand	P185WIR			2004	10	0	ULSD	0	ULSD
PST010	Crane	4445	Budget	309828-52		1 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4435	Niles			10 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4425	American			15 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4426	American			15 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4446	American			2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	5504	American	4K CHAIN FALL		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	5505	Coffing	EC4		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4447	Monck	221-5426		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4436	Robbins	1-ER-46		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4438	Robbins	1-ER-46		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4440	Robbins	1-ER-46		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4441	Robbins	1-ER-46		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4442	Robbins	1-ER-46		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4444	Robbins	1-ER-46		2 TN	1974	NA	NA	Electric	NA	Electric

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PST010	Crane	4467	Yale Hoi	PD-2C18P36		2 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	5506	Coffing	CHAIN FALL		3 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4433	American			7.5 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4431	Edder			7.5 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4432	Edder			7.5 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4443	Robbins			7.5 TN	1974	NA	NA	Electric	NA	Electric
PST010	Crane	4349	Demag			20 Ton Stradbay	1976	NA	NA	Electric	NA	Electric
PST010	Crane	5367	Demag	EZD520H20KN2		7.5 TN	1990	NA	NA	Electric	NA	Electric
PST010	Crane	5415	Abelhowe	J-904-140-12FS		2 TN	1993	NA	NA	Electric	NA	Electric
PST010	Crane	5434	Yale Hoi	TRTB-20-79D		10 TN	1995	NA	NA	Electric	NA	Electric
PST010	Crane	5513	F.T. Crow			5 TN	1995	NA	NA	Electric	NA	Electric
PST010	Crane	5435	Yale Hoi	TRTB-20-79D		5 TN	1995	NA	NA	Electric	NA	Electric
PST010	Crane	5433	Kone	XL400		7.5 TN	1995	NA	NA	Electric	NA	Electric
PST010	Crane	5531	Davit Crane	5124M2		2000 lbs	2000	NA	NA	Electric	NA	Electric
PST010	Crane	2241	Washington	28KN		40 TN	1941	NA	27	Electric	NA	Electric
PST010	Crane	2512	Klyde	3337		27.5 TN	1974	NA	88	Electric	NA	Electric
PST010	Crane, container	2078	IHI	6021-989		50 TN	1979	NA	3	Electric	NA	Electric
PST010	Crane, container	2077	Sumitomo	RN26		55 TN	1986	NA	50	Electric	NA	Electric
PST010	Crane, container	2403	Sumitomo	RN26		55 TN	1986	NA	38	Electric	NA	Electric
PST010	Crane, container	2404	Sumitomo	RN26		55 TN	1986	NA	47	Electric	NA	Electric
PST010	Crane, container	2301	Kone			66 TN	1989	NA	63	Electric	NA	Electric
PST010	Crane, container	2302	Kone			66 TN	1989	NA	126	Electric	NA	Electric
PST010	Crane, container	2405	ZPMC	Quayside CC		60 LT	1996	NA	160	Electric	NA	Electric
PST010	Crane, container	2406	ZPMC			50 LT spreader	2001	NA	149	Electric	NA	Electric
PST010	Forklift	1105	Hyster	S50C		5,000 cap	1971	60	110	Propane	134	Propane
PST010	Forklift	1168	Hyster	H60HP		6,000 cap	1977	60	491	Propane	539	Propane
PST010	Forklift	1172	Hyster	H60HP		6,000 cap	1977	60	122	Propane	199	Propane
PST010	Forklift	1173	Hyster	H60HP		6,000 cap	1977	60	3	Propane	6	Propane
PST010	Forklift	1174	Hyster	H60HP		6,000 cap	1977	60	15	Propane	20	Propane
PST010	Forklift	1175	Hyster	H60HP		6,000 cap	1977	60	91	Propane	88	Propane
PST010	Forklift	1176	Hyster	H60HP		6,000 cap	1977	60	55	Propane	74	Propane
PST010	Forklift	1177	Hyster	H60HP		6,000 cap	1977	60	53	Propane	113	Propane
PST010	Forklift	1178	Hyster	H60HP		6,000 cap	1977	60	294	Propane	319	Propane
PST010	Forklift	1180	Hyster	H60HP		6,000 cap	1977	60	27	Propane	49	Propane
PST010	Forklift	1190	Hyster	H60HP		6,000 cap	1977	60	6	Propane	9	Propane
PST010	Forklift	1211	Hyster	S30A		3,000 cap	1979	60	83	Propane	108	Propane
PST010	Forklift	1215	Caterpillar	V60B		6,000 cap	1980	60	21	Propane	13	Propane
PST010	Forklift	1216	Caterpillar	V60B		6,000 cap	1980	60	13	Propane	10	Propane
PST010	Forklift	1217	Caterpillar	V60B		6,000 cap	1980	60	23	Propane	11	Propane
PST010	Forklift	1218	Caterpillar	V60B		6,000 cap	1980	60	26	Propane	17	Propane
PST010	Forklift	1220	Caterpillar	V60B		6,000 cap	1980	60	41	Propane	44	Propane
PST010	Forklift	1221	Caterpillar	V60B		6,000 cap	1980	60	127	Propane	110	Propane
PST010	Forklift	1223	Caterpillar	V60B		6,000 cap	1980	60	32	Propane	23	Propane
PST010	Forklift	1224	Caterpillar	V60B		6,000 cap	1980	60	10	Propane	25	Propane
PST010	Forklift	1226	Caterpillar	V60B		6,000 cap	1980	60	0	Propane	0	Propane
PST010	Forklift	1227	Caterpillar	V60B		6,000 cap	1980	60	49	Propane	63	Propane
PST010	Forklift	1228	Caterpillar	V60B		6,000 cap	1980	60	4	Propane	8	Propane

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PST010	Forklift	1230	Caterpillar	V60B/cont eng		6,000 cap	1980	60	69	Propane	66	Propane
PST010	Forklift	1231	Caterpillar	V60B		6,000 cap	1980	60	0	Propane	0	Propane
PST010	Forklift	1238	Hyster	H80C		8,000 cap	1982	80	22	Propane	24	Propane
PST010	Forklift	1242	Hyster	X80XLBCS		8,000 cap	1989	80	264	Propane	438	Propane
PST010	Forklift	1243	Hyster	X80XLBCS		8,000 cap	1989	80	191	Propane	246	Propane
PST010	Forklift	1244	Hyster	X80XLBCS/boxcar		8,000 cap	1989	80	537	Propane	793	Propane
PST010	Forklift	1245	Hyster	X80XLBCS		8,000 cap	1989	80	194	Propane	307	Propane
PST010	Forklift	1246	Hyster	X80XLBCS		8,000 cap	1989	80	538	Propane	828	Propane
PST010	Forklift	1247	Hyster	X80XLBCS		8,000 cap	1989	80	185	Propane	272	Propane
PST010	Forklift	1066	Hyster	GH250E		25,000 cap	1968	200	0	ULSD	0	ULSD
PST010	Forklift	1108	Taylor	Y45WO		45,000 cap	1972	200	156	ULSD	364	ULSD
PST010	Forklift	1107	Taylor	Y62WO		62,000 cap	1972	200	297	ULSD	154	ULSD
PST010	Forklift	1117	Taylor	Y30WO		30,000 cap	1973	200	199	ULSD	164	ULSD
PST010	Forklift	1118	Taylor	Y52WO/471 eng		52,000 cap	1973	200	564	ULSD	125	ULSD
PST010	Forklift	1119	Taylor	Y52WO		52,000 cap	1973	200	78	ULSD	60	ULSD
PST010	Forklift	1163	Hyster	H150		15,000 cap	1977	200	30	ULSD	26	ULSD
PST010	Forklift	1183	Hyster	H150		15,000 cap	1977	200	289	ULSD	31	ULSD
PST010	Forklift	1193	Taylor	Y52WOM		52,000 cap	1978	200	39	ULSD	39	ULSD
PST010	Forklift	1194	Caterpillar	V140		14,000 cap	1979	200	54	ULSD	23	ULSD
PST010	Forklift	1195	Caterpillar	V140		14,000 cap	1979	200	11	ULSD	13	ULSD
PST010	Forklift	1212	Taylor	TY620L		62,000 cap	1979	200	18	ULSD	65	ULSD
PST010	Forklift	1204	Caterpillar	V80D		8,000 cap	1979	200	113	ULSD	13	ULSD
PST010	Forklift	1206	Caterpillar	V80D		8,000 cap	1979	200	80	ULSD	38	ULSD
PST010	Forklift	1207	Caterpillar	V80D		8,000 cap	1979	200	131	ULSD	50	ULSD
PST010	Forklift	1208	Caterpillar	V80D		8,000 cap	1979	200	0	ULSD	0	ULSD
PST010	Forklift	1233	Caterpillar	V150		15,000 cap	1981	200	3,757	ULSD	2,591	ULSD
PST010	Forklift	1234	Caterpillar	V150		15,000 cap	1981	200	465	ULSD	16	ULSD
PST010	Forklift	1235	Caterpillar	V150		15,000 cap	1981	200	0	ULSD	0	ULSD
PST010	Forklift	1236	Caterpillar	V150		15,000 cap	1981	200	96	ULSD	10	ULSD
PST010	Forklift	1239	Liftall	MT80D		6,000 cap	1985	200	29	ULSD	17	ULSD
PST010	Forklift	1248	Hyster	H190XL		19,000 cap	1989	200	161	ULSD	195	ULSD
PST010	Forklift	1249	Hyster	H190XL		19,000 cap	1989	200	82	ULSD	136	ULSD
PST010	Forklift	1250	Hyster	H190XL		19,000 cap	1989	200	283	ULSD	436	ULSD
PST010	Forklift	1251	Hyster	H190XL		19,000 cap	1989	200	52	ULSD	41	ULSD
PST010	Forklift	1252	Hyster	H190XL		19,000 cap	1989	200	209	ULSD	282	ULSD
PST010	Forklift	1240	Valmet	4212		92,000 cap	1997	200	214	ULSD	805	ULSD
PST010	Forklift	1241	TCM	FD70Z7		15,000 cap	1998	200	181	ULSD	225	ULSD
PST010	Forklift	1255	Caterpillar	V925		95,000 cap	2001	200	0	ULSD	0	ULSD
PST010	Forklift	10055	Caterpillar	V925		95,000 cap	2001	200	141	ULSD	112	ULSD
PST010	Forklift	10196	Wiggins	W360YXL		30,000 cap	2004	200	491	ULSD	1,215	ULSD
PST010	Generator	4506	Sears	580.328260		7.5 KW	1982	50	0	Gasoline	0	Gasoline
PST010	Generator	5486	Honda	EM3500SXKI		3546972	1998	50	0	Gasoline	2	Gasoline
PST010	Generator	10460	Onan	150DGFA-148		150 KW	1999	100	4	Gasoline	138	Gasoline
PST010	Generator	5549	Honda	EM3000C			2001	50	0	Gasoline	3	Gasoline
PST010	Generator	5552	Honda	3000			2002	50	0	Gasoline	2	Gasoline
PST010	Generator	4501	Onan	600DYA15R14J		60 KW	1982	50	26	ULSD	47	ULSD
PST010	Manlift	10341	Genie	GS2632		500/250 LBS	2005	NA	NA	Electric	NA	Electric

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PST010	Manlift	4583	Simon	MP60		500 LB	1984	60	22	Gasoline	35	Gasoline
PST010	Manlift	5418	Genie	Z601342WD		500 LB	1993	60	158	Gasoline	256	Gasoline
PST010	Manlift	5458	Genie	S65		500 LB	1996	60	14	Gasoline	20	Gasoline
PST010	Manlift	5530	GMC	7C7H042ECH50		600 LB	2000	60	224	Propane	456	Propane
PST010	Straddle carrier	1540	Valmet	401093678T		88,200 lbs	1986	320	71	ULSD	210	ULSD
PST010	Straddle carrier	1535	Valmet	401093678T		88,200 lbs	1987	320	28	ULSD	122	ULSD
PST010	Straddle carrier	1536	Valmet	401093678T		88,200 lbs	1987	320	29	ULSD	137	ULSD
PST010	Straddle carrier	1537	Valmet	401093678T		88,200 lbs	1987	320	72	ULSD	213	ULSD
PST010	Straddle carrier	1539	Valmet	401093678T		88,200 lbs	1987	320	89	ULSD	371	ULSD
PST010	Straddle carrier	1541	Valmet	401093678T		88,200 lbs	1991	320	639	ULSD	369	ULSD
PST010	Straddle carrier	1542	Valmet	401093678T		88,200 lbs	1991	320	631	ULSD	934	ULSD
PST010	Straddle carrier	1543	Valmet	401093678T		88,200 lbs	1991	320	607	ULSD	522	ULSD
PST010	Straddle carrier	1544	Valmet	401093678T		88,200 lbs	1991	320	243	ULSD	932	ULSD
PST010	Straddle carrier	1545	Valmet	401093678T		88,200 lbs	1991	320	579	ULSD	1,109	ULSD
PST010	Straddle carrier	1546	Valmet	401093678T		88,200 lbs	1991	320	784	ULSD	1,825	ULSD
PST010	Straddle carrier	1547	Valmet	401093678T		88,200 lbs	1992	320	720	ULSD	3,153	ULSD
PST010	Straddle carrier	1548	Valmet	401093678T		88,200 lbs	1992	320	948	ULSD	2,432	ULSD
PST010	Straddle carrier	1549	Noell	PPH434HWS		40MT	1995	320	12	ULSD	39	ULSD
PST010	Straddle carrier	1550	Noell	PPH434HWS		40MT	1995	320	3	ULSD	17	ULSD
PST010	Straddle carrier	1551	Noell	PPH434HWS		40MT	1995	320	0	ULSD	0	ULSD
PST010	Straddle carrier	1552	Noell	PPH434HWS		40MT	1995	320	14	ULSD	77	ULSD
PST010	Straddle carrier	1553	Kalmar	CSC340		40 LT	2002	320	1,375	ULSD	6,967	ULSD
PST010	Straddle carrier	1554	Kalmar	CSC340		40 LT	2002	320	1,326	ULSD	6,998	ULSD
PST010	Straddle carrier	1555	Kalmar	CSC340		40 LT	2002	320	1,456	ULSD	7,856	ULSD
PST010	Straddle carrier	1556	Kalmar	CSC340		40 LT	2002	320	1,378	ULSD	6,692	ULSD
PST010	Straddle carrier	1557	Kalmar	CSC340		40 LT	2002	320	1,249	ULSD	6,941	ULSD
PST010	Straddle carrier	1558	Kalmar	CSC340		40 LT	2002	320	1,644	ULSD	9,949	ULSD
PST010	Straddle carrier	1559	Kalmar	CSC340		40 LT	2002	320	1,504	ULSD	7,596	ULSD
PST010	Straddle carrier	1560	Kalmar	CSC340		40 LT	2002	320	1,661	ULSD	10,630	ULSD
PST010	Straddle carrier	1561	Kalmar	CSC340		40 LT	2004	320	1,442	ULSD	13,265	ULSD
PST010	Straddle carrier	1562	Kalmar	CSC340		40 LT	2004	320	1,806	ULSD	17,730	ULSD
PST010	Straddle carrier	1563	Kalmar	CSC340		40 LT	2004	320	1,471	ULSD	14,331	ULSD
PST010	Straddle carrier	1564	Kalmar	CSC340		40 LT	2004	320	1,592	ULSD	15,862	ULSD
PST010	Straddle carrier	1565	Kalmar	CSC340		40 LT	2004	320	1,614	ULSD	14,922	ULSD
PST010	Sweeper	10040	Ford	F550 V/10 ENG		19500 GVW	2003	130	7,670	Gasoline	1,484	Gasoline
PST010	Sweeper	4599	Power Boss	SW90HD			1989	50	84	Propane	85	Propane
PST010	Sweeper	5428	Elgin	SERIES P (PELICAN)		3 Cubic Yards	1994	175	111	ULSD	282	ULSD
PST010	Sweeper	10259	Tennant	Power Sweeper/Rider		20,000 lb	2004	50	321	ULSD	782	ULSD
PST010	Yard tractor	10066	Ottawa	Commando 50		170,000 pull	2003	110	579	Gasoline	1,549	Gasoline
PST010	Yard tractor	3303	Ottawa	YTD50TANDEM AX		30000	1987	110	93	ULSD	94	ULSD
PST010	Yard tractor	3348	Capacity	TJ5500			1991	110	97	ULSD	89	ULSD
PST020	Crane, container	CC-1	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric
PST020	Crane, container	CC-2	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric
PST020	Crane, container	CC-3	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric
PST020	Crane, container	CC-4	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric
PST020	Crane, container	CC-5	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric
PST020	Crane, container	CC-6	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric

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PST020	Crane, container	CC-7	ZPMC	50-60LT			2005	NA	3,800	Electric	NA	Electric
PST020	Forklift	F-01	Mitsubishi	3EM7B	Mitsubishi	3200	2005	155	800	ULSD	NA	ULSD
PST020	Forklift	F-02	Mitsubishi	3EM7B	Mitsubishi	3200	2005	155	800	ULSD	NA	ULSD
PST020	Forklift	F-03	Mitsubishi	3EM7B	Mitsubishi	3200	2005	155	800	ULSD	NA	ULSD
PST020	Forklift	F-04	Mitsubishi	3EM7B	Mitsubishi	3200	2005	155	800	ULSD	NA	ULSD
PST020	Forklift	F-05	Mitsubishi	3EM7B	Mitsubishi	3200	2005	155	800	ULSD	NA	ULSD
PST020	Forklift	F-06	Mitsubishi	3EM7B	Mitsubishi	3200	2005	155	800	ULSD	NA	ULSD
PST020	Forklift	L-01	Fantuzzi	18 TON 7B	Cummins	6BT	2005	180	900	ULSD	NA	ULSD
PST020	Forklift	L-02	Fantuzzi	18 TON 7B	Cummins	6BT	2005	180	900	ULSD	NA	ULSD
PST020	Side pick	S-01	Fantuzzi	FDC25K8	Cummins	6CT	2005	210	1,850	ULSD	NA	ULSD
PST020	Side pick	S-02	Fantuzzi	FDC25K8	Cummins	6CT	2005	210	1,850	ULSD	NA	ULSD
PST020	Side pick	S-03	Fantuzzi	FDC25K8	Cummins	6CT	2005	210	1,850	ULSD	NA	ULSD
PST020	Side pick	S-04	Fantuzzi	FDC25K8	Cummins	6CT	2005	210	1,850	ULSD	NA	ULSD
PST020	Side pick	S-05	Fantuzzi	FDC25K8	Cummins	6CT	2005	210	1,850	ULSD	NA	ULSD
PST020	Straddle carrier	SC-01	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-02	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-03	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-04	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-05	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-06	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-07	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-08	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-09	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-10	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-11	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-12	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-13	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-14	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-15	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-16	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-17	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-18	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-19	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-20	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-21	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-22	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-23	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-24	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-25	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-26	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-27	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-28	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-29	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-30	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-31	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-32	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-34	Noell	534ESW	Caterpillar	C-12	2004	455	4,200	ULSD	NA	ULSD

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PST020	Straddle carrier	SC-35	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-36	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-37	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-38	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-39	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-40	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-41	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-42	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-43	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-44	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-45	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-46	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-47	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-48	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-49	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Straddle carrier	SC-50	Noell	534ESW	Caterpillar	C-12	2005	455	4,200	ULSD	NA	ULSD
PST020	Yard tractor	H-01	Capacity	Y-50R	Cummins	6BT	2005	180	1,500	ULSD	NA	ULSD
PST020	Yard tractor	H-02	Capacity	Y-50R	Cummins	6BT	2005	180	1,500	ULSD	NA	ULSD
PST020	Yard tractor	H-03	Capacity	Y-50R	Cummins	6BT	2005	180	1,500	ULSD	NA	ULSD
PST030	Forklift	FL11	Taylor	TY300S			1982	100	200	Diesel, Onroad	NA	NA
PST030	Forklift	FL26	Mitsubishi	FD30B			1991	100	200	Diesel, Onroad	NA	NA
PST030	Forklift	FL27	Kalmar	DCE120-12			2004	100	200	Diesel, Onroad	NA	NA
PST030	Forklift	FL28	Kalmar	DCE120-12			2004	100	200	Diesel, Onroad	NA	NA
PST030	RTG crane	TT3	Paceco				1984	300	18	Diesel, Onroad	NA	NA
PST030	RTG crane	TT1	Nitsui Paceco				1988	300	609	Diesel, Onroad	NA	NA
PST030	RTG crane	TT2	Nitsui Paceco				1988	300	792	Diesel, Onroad	NA	NA
PST030	RTG crane	TT4	Paceco				1989	300	441	Diesel, Onroad	NA	NA
PST030	RTG crane	TT5	Nitsui Paceco				2005	300	1,169	Diesel, Onroad	NA	NA
PST030	RTG crane	TT6	Nitsui Paceco				2005	300	1,121	Diesel, Onroad	NA	NA
PST030	Top loader	TP20	Taylor	TYC800L			1984	300	250	Diesel, Onroad	NA	NA
PST030	Top loader	TP22	Taylor	TYCR800L			1986	300	1,385	Diesel, Onroad	NA	NA
PST030	Top loader	TP23	Taylor	TEC950L			1996	300	1,939	Diesel, Onroad	NA	NA
PST030	Top loader	TP24	Taylor	TEC950L			1997	300	2,042	Diesel, Onroad	NA	NA
PST030	Top loader	TP25	Taylor	THDC955			2002	300	2,821	Diesel, Onroad	NA	NA
PST030	Top loader	TP26	Taylor	THDC955			2002	300	2,821	Diesel, Onroad	NA	NA
PST030	Top loader	TP27	Kalmar	DCD450			2004	300	2,668	Diesel, Onroad	NA	NA
PST030	Top loader	TP28	Kalmar	DCD450			2004	300	2,712	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT6	Capacity	TJ4000E			1985	174	132	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT18	Capacity	TJ4000E			1986	174	46	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT20	Capacity	TJ4000E			1986	174	144	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT21	Capacity	TJ4134E			1986	174	272	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT22	Capacity	TJ4134E			1986	174	189	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT23	Ottawa	Commando 50			1996	174	1,583	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT24	Ottawa	Commando 50			1996	174	1,217	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT25	Ottawa	Commando 50			1996	174	1,575	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT26	Ottawa	Commando 50			1996	174	1,572	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT27	Ottawa	Commando 50			1996	174	1,332	Diesel, Onroad	NA	NA

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PST030	Yard tractor	YT28	Ottawa	Commando 50			2000	174	2,225	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT29	Ottawa	Commando 50			2000	174	2,146	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT30	Ottawa	Commando 50			2000	174	2,189	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT31	Ottawa	Commando 50			2000	174	2,167	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT32	Ottawa	Commando 50			2000	174	1,976	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT33	Capacity	TJ7000			2001	174	1,870	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT34	Capacity	TJ7000			2001	174	1,461	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT35	Capacity	TJ7000			2001	174	1,612	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT36	Capacity	TJ7000			2001	174	1,649	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT37	Capacity	TJ7000			2001	174	1,617	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT38	Capacity	TJ7000			2001	174	1,750	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT39	Ottawa	Commando 50			2004	174	1,958	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT40	Ottawa	Commando 50			2004	174	2,189	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT41	Ottawa	Commando 50			2004	174	2,083	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT42	Ottawa	Commando 50			2004	174	2,250	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT43	Ottawa	Commando 50			2004	174	2,088	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT44	Ottawa	Commando 50			2005	174	853	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT45	Ottawa	Commando 50			2005	174	741	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT46	Ottawa	Commando 50			2005	174	731	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT47	Ottawa	Commando 50			2005	174	814	Diesel, Onroad	NA	NA
PST030	Yard tractor	YT48	Ottawa	Commando 50			2005	174	818	Diesel, Onroad	NA	NA
PST040	Yard tractor	19	Ottawa	Commando 50			1983	174	2,017	Diesel, Onroad	NA	NA
PST040	Yard tractor	1	Ottawa	Commando 50			1998	174	1,435	Diesel, Onroad	NA	NA
PST040	Yard tractor	2	Ottawa	Commando 50			1998	174	1,963	Diesel, Onroad	NA	NA
PST040	Yard tractor	3	Ottawa	Commando 50			1998	174	1,577	Diesel, Onroad	NA	NA
PST040	Yard tractor	4	Ottawa	Commando 50			1998	174	1,540	Diesel, Onroad	NA	NA
PST040	Yard tractor	5	Ottawa	Commando 50			1998	174	1,736	Diesel, Onroad	NA	NA
PST040	Yard tractor	6	Ottawa	Commando 50			1998	174	1,811	Diesel, Onroad	NA	NA
PST040	Yard tractor	7	Ottawa	Commando 50			1998	174	1,017	Diesel, Onroad	NA	NA
PST040	Yard tractor	8	Ottawa	Commando 50			1998	174	1,599	Diesel, Onroad	NA	NA
PST040	Yard tractor	9	Ottawa	Commando 50			1998	174	1,761	Diesel, Onroad	NA	NA
PST040	Yard tractor	10	Ottawa	Commando 50			1998	174	1,629	Diesel, Onroad	NA	NA
PST040	Yard tractor	11	Ottawa	Commando 50			1998	174	1,440	Diesel, Onroad	NA	NA
PST040	Yard tractor	12	Ottawa	Commando 50			1998	174	1,540	Diesel, Onroad	NA	NA
PST040	Yard tractor	13	Ottawa	Commando 50			1998	174	1,608	Diesel, Onroad	NA	NA
PST040	Yard tractor	14	Ottawa	Commando 50			1998	174	1,671	Diesel, Onroad	NA	NA
PST040	Yard tractor	15	Ottawa	Commando 50			1998	174	2,040	Diesel, Onroad	NA	NA
PST040	Yard tractor	16	Ottawa	Commando 50			1998	174	1,695	Diesel, Onroad	NA	NA
PST040	Yard tractor	17	Ottawa	Commando 50			1998	174	240	Diesel, Onroad	NA	NA
PST040	Yard tractor	18	Ottawa	Commando 50			1998	174	1,425	Diesel, Onroad	NA	NA
PST040	Yard tractor	20	Ottawa	Commando 50			2000	174	2,048	Diesel, Onroad	NA	NA
PST040	Yard tractor	21	Ottawa	Commando 50			2000	174	1,963	Diesel, Onroad	NA	NA
PST040	Yard tractor	22	Ottawa	Commando 50			2000	174	1,552	Diesel, Onroad	NA	NA
PST040	Yard tractor	23	Ottawa	Commando 50			2000	174	2,056	Diesel, Onroad	NA	NA
PST040	Yard tractor	24	Ottawa	Commando 50			2000	174	2,148	Diesel, Onroad	NA	NA
PST040	Yard tractor	25	Ottawa	Commando 50			2000	174	1,907	Diesel, Onroad	NA	NA
PST040	Yard tractor	26	Ottawa	Commando 50			2000	174	1,777	Diesel, Onroad	NA	NA

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PST040	Yard tractor	27	Ottawa	Commando 50			2000	174	2,015	Diesel, Onroad	NA	NA
PST040	Yard tractor	28	Ottawa	Commando 50			2000	174	1,729	Diesel, Onroad	NA	NA
PST040	Yard tractor	29	Ottawa	Commando 50			2000	174	1,551	Diesel, Onroad	NA	NA
PST040	Yard tractor	30	Ottawa	Commando 50			2000	174	1,467	Diesel, Onroad	NA	NA
PST040	Yard tractor	31	Ottawa	Commando 50			2000	174	1,853	Diesel, Onroad	NA	NA
PST040	Yard tractor	32	Ottawa	Commando 50			2000	174	1,624	Diesel, Onroad	NA	NA
PST040	Yard tractor	33	Ottawa	Commando 50			2000	174	1,475	Diesel, Onroad	NA	NA
PST050	Forklift	7055	Caterpillar	AH52			1975	120	147	Diesel, Onroad	NA	NA
PST050	Forklift	2238	Clark	C500Y100			1983	120	44	Diesel, Onroad	NA	NA
PST050	Forklift	2247	Nissan	PHO2A25V			1988	120	53	Diesel, Onroad	NA	NA
PST050	Forklift	2333	Caterpillar	DP40KL			2003	120	524	Diesel, Onroad	NA	NA
PST050	Forklift	2334	Caterpillar	DP40KL			2003	120	488	Diesel, Onroad	NA	NA
PST050	Forklift	7078	Kalmar	DCE160-6			2003	215	272	Diesel, Onroad	NA	NA
PST050	Forklift	L7001	Kalmar	DCD160-12			2004	215	200	Diesel, Onroad	NA	NA
PST050	Forklift	2349	Caterpillar	DP40KL			2005	120	311	Diesel, Onroad	NA	NA
PST050	Forklift	2350	Caterpillar	DP40KL			2005	120	363	Diesel, Onroad	NA	NA
PST050	Manlift	1097	Genie	S125			2005	120	231	Diesel, Onroad	NA	NA
PST050	Reach stacker	6149	Sisu	RSD45315TL			1998	200	860	Diesel, Onroad	NA	NA
PST050	Reach stacker	6143	Kalmar	DRS4531-S5			2000	200	2,007	Diesel, Onroad	NA	NA
PST050	Reach stacker	6144	Kalmar	DRS4531-S5			2000	200	2,008	Diesel, Onroad	NA	NA
PST050	Reach stacker	6145	Kalmar	C			2000	200	2,141	Diesel, Onroad	NA	NA
PST050	Reach stacker	6247	Kalmar	DRS4531-S5			2003	200	1,625	Diesel, Onroad	NA	NA
PST050	Sweeper	1056	Elgin	Crosswind J			2000	150	1,332	Diesel, Onroad	NA	NA
PST050	Top loader	6146	Kalmar	DCD450.12CSG			2000	300	427	Diesel, Onroad	NA	NA
PST050	Top loader	6147	Kalmar	DCD450.12CSG			2000	300	920	Diesel, Onroad	NA	NA
PST050	Top loader	6198	Kalmar	DCD450.12CSG			2001	300	665	Diesel, Onroad	NA	NA
PST050	Top loader	6270	Kalmar	DCD450.12CSG			2004	300	1,069	Diesel, Onroad	NA	NA
PST050	Top loader	6271	Kalmar	DCD450.12CSG			2004	300	2,268	Diesel, Onroad	NA	NA
PST050	Yard tractor	4895	Ottawa	Commando 50	Cummins	ISB	2005	245	0	Diesel, Onroad	NA	NA
PST050	Yard tractor	4896	Ottawa	Commando 50	Cummins	ISB	2005	245	1,896	Diesel, Onroad	NA	NA
PST050	Yard tractor	4897	Ottawa	Commando 50	Cummins	ISB	2005	245	1,594	Diesel, Onroad	NA	NA
PST050	Yard tractor	4898	Ottawa	Commando 50	Cummins	ISB	2005	245	2,042	Diesel, Onroad	NA	NA
PST050	Yard tractor	4899	Ottawa	Commando 50	Cummins	ISB	2005	245	2,374	Diesel, Onroad	NA	NA
PST050	Yard tractor	4900	Ottawa	Commando 50	Cummins	ISB	2005	245	2,604	Diesel, Onroad	NA	NA
PST050	Yard tractor	4901	Ottawa	Commando 50	Cummins	ISB	2005	245	2,523	Diesel, Onroad	NA	NA
PST050	Yard tractor	4902	Ottawa	Commando 50	Cummins	ISB	2005	245	2,301	Diesel, Onroad	NA	NA
PST050	Yard tractor	4903	Ottawa	Commando 50	Cummins	ISB	2005	245	2,622	Diesel, Onroad	NA	NA
PST050	Yard tractor	4904	Ottawa	Commando 50	Cummins	ISB	2005	245	1,894	Diesel, Onroad	NA	NA
PST050	Yard tractor	4905	Ottawa	Commando 50	Cummins	ISB	2005	245	2,443	Diesel, Onroad	NA	NA
PST050	Yard tractor	4906	Ottawa	Commando 50	Cummins	ISB	2005	245	2,307	Diesel, Onroad	NA	NA
PST050	Yard tractor	4921	Ottawa	Commando 50	Cummins	ISB	2005	245	2,826	Diesel, Onroad	NA	NA
PST050	Yard tractor	4922	Ottawa	Commando 50	Cummins	ISB	2005	245	2,241	Diesel, Onroad	NA	NA
PST050	Yard tractor	4923	Ottawa	Commando 50	Cummins	ISB	2005	245	2,205	Diesel, Onroad	NA	NA
PST050	Yard tractor	4924	Ottawa	Commando 50	Cummins	ISB	2005	245	2,442	Diesel, Onroad	NA	NA
PST050	Yard tractor	4925	Ottawa	Commando 50	Cummins	ISB	2005	245	1,914	Diesel, Onroad	NA	NA
PST050	Yard tractor	4926	Ottawa	Commando 50	Cummins	ISB	2005	245	2,346	Diesel, Onroad	NA	NA
PST050	Yard tractor	4927	Ottawa	Commando 50	Cummins	ISB	2005	245	2,265	Diesel, Onroad	NA	NA

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PST050	Yard tractor	4928	Ottawa	Commando 50	Cummins	ISB	2005	245	1,935	Diesel, Onroad	NA	NA
PST050	Yard tractor	4929	Ottawa	Commando 50	Cummins	ISB	2005	245	2,130	Diesel, Onroad	NA	NA
PST050	Yard tractor	4930	Ottawa	Commando 50	Cummins	ISB	2005	245	2,010	Diesel, Onroad	NA	NA
PST050	Yard tractor	4931	Ottawa	Commando 50	Cummins	ISB	2005	245	1,668	Diesel, Onroad	NA	NA
PST050	Yard tractor	4932	Ottawa	Commando 50	Cummins	ISB	2005	245	0	Diesel, Onroad	NA	NA
PST050	Yard tractor	4955	Ottawa	Commando 50	Cummins	ISB	2005	245	0	Diesel, Onroad	NA	NA
PST050	Yard tractor	4577	Ottawa	Commando 50			1983	174	2,017	Diesel, Onroad	NA	NA
PST050	Yard tractor	4559	Ottawa	Commando 50			1998	174	1,435	Diesel, Onroad	NA	NA
PST050	Yard tractor	4560	Ottawa	Commando 50			1998	174	1,963	Diesel, Onroad	NA	NA
PST050	Yard tractor	4561	Ottawa	Commando 50			1998	174	1,577	Diesel, Onroad	NA	NA
PST050	Yard tractor	4562	Ottawa	Commando 50			1998	174	1,540	Diesel, Onroad	NA	NA
PST050	Yard tractor	4563	Ottawa	Commando 50			1998	174	1,736	Diesel, Onroad	NA	NA
PST050	Yard tractor	4564	Ottawa	Commando 50			1998	174	1,811	Diesel, Onroad	NA	NA
PST050	Yard tractor	4565	Ottawa	Commando 50			1998	174	1,017	Diesel, Onroad	NA	NA
PST050	Yard tractor	4566	Ottawa	Commando 50			1998	174	1,599	Diesel, Onroad	NA	NA
PST050	Yard tractor	4567	Ottawa	Commando 50			1998	174	1,761	Diesel, Onroad	NA	NA
PST050	Yard tractor	4568	Ottawa	Commando 50			1998	174	1,629	Diesel, Onroad	NA	NA
PST050	Yard tractor	4569	Ottawa	Commando 50			1998	174	1,440	Diesel, Onroad	NA	NA
PST050	Yard tractor	4570	Ottawa	Commando 50			1998	174	1,540	Diesel, Onroad	NA	NA
PST050	Yard tractor	4571	Ottawa	Commando 50			1998	174	1,608	Diesel, Onroad	NA	NA
PST050	Yard tractor	4572	Ottawa	Commando 50			1998	174	1,671	Diesel, Onroad	NA	NA
PST050	Yard tractor	4573	Ottawa	Commando 50			1998	174	2,040	Diesel, Onroad	NA	NA
PST050	Yard tractor	4574	Ottawa	Commando 50			1998	174	1,695	Diesel, Onroad	NA	NA
PST050	Yard tractor	4575	Ottawa	Commando 50			1998	174	240	Diesel, Onroad	NA	NA
PST050	Yard tractor	4576	Ottawa	Commando 50			1998	174	1,425	Diesel, Onroad	NA	NA
PST050	Yard tractor	4578	Ottawa	Commando 50	Cummins	6BTA	2000	174	2,048	Diesel, Onroad	NA	NA
PST050	Yard tractor	4579	Ottawa	Commando 50	Cummins	6BTA	2000	174	1,963	Diesel, Onroad	NA	NA
PST050	Yard tractor	4580	Ottawa	Commando 50	Cummins	6BTA	2000	174	1,552	Diesel, Onroad	NA	NA
PST050	Yard tractor	4581	Ottawa	Commando 50	Cummins	6BTA	2000	174	2,056	Diesel, Onroad	NA	NA
PST050	Yard tractor	4582	Ottawa	Commando 50	Cummins	6BTA	2000	174	2,148	Diesel, Onroad	NA	NA
PST050	Yard tractor	4583	Ottawa	Commando 50	Cummins	6BTA	2000	174	1,907	Diesel, Onroad	NA	NA
PST050	Yard tractor	4584	Ottawa	Commando 50	Cummins	6BTA	2000	174	1,777	Diesel, Onroad	NA	NA
PST050	Yard tractor	4585	Ottawa	Commando 50	Cummins	6BTA	2000	174	2,015	Diesel, Onroad	NA	NA
PST050	Yard tractor	4586	Ottawa	Commando 50	Cummins	6BTA	2000	174	1,729	Diesel, Onroad	NA	NA
PST050	Yard tractor	4587	Ottawa	Commando 50	Cummins	6BTA	2000	174	1,551	Diesel, Onroad	NA	NA
PST050	Yard tractor	4751	Ottawa	Commando 50	Cummins	6CT	2003	215	1,467	Diesel, Onroad	NA	NA
PST050	Yard tractor	4752	Ottawa	Commando 50	Cummins	6CT	2003	215	1,853	Diesel, Onroad	NA	NA
PST050	Yard tractor	4753	Ottawa	Commando 50	Cummins	6CT	2003	215	1,624	Diesel, Onroad	NA	NA
PST050	Yard tractor	4754	Ottawa	Commando 50	Cummins	6CT	2003	215	1,475	Diesel, Onroad	NA	NA
PST050	Yard tractor	4755	Ottawa	Commando 50	Cummins	6CT	2003	215	1,993	Diesel, Onroad	NA	NA
PST050	Yard tractor	4756	Ottawa	Commando 50	Cummins	6CT	2003	215	1,584	Diesel, Onroad	NA	NA
PST055	Forklift	8515	Nissan	CUM01L-15S			1988	NA	500	Electric	NA	Electric
PST055	Forklift	8516	Nissan	CUM01L-15S			1988	NA	500	Electric	NA	Electric
PST055	Forklift	8517	Nissan	CUM01L-15S			1988	NA	500	Electric	NA	Electric
PST055	Forklift	8518	Nissan	CUM01L-15S			1988	NA	500	Electric	NA	Electric
PST055	Forklift	8519	Nissan	CUM01L-15S			1988	NA	500	Electric	NA	Electric
PST055	Forklift	9056	Caterpillar	CPH01A-18V	Cummins		1975	50	250	Diesel, Onroad	NA	NA

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PST055	Forklift	8394	Clark	C500-Y90	Cummins		1983	100	2,000	Diesel, Onroad	NA	NA
PST055	Forklift	8510	Caterpillar	V-150	Cummins		1988	100	1,500	Diesel, Onroad	NA	NA
PST055	Forklift	8511	Caterpillar	V-150	Cummins		1988	100	1,500	Diesel, Onroad	NA	NA
PST055	Forklift	8513	Caterpillar	V-80E	Cummins		1988	100	2,000	Diesel, Onroad	NA	NA
PST055	Forklift	8249	Caterpillar	T-30B	Cummins		1976	50	500	Propane	NA	Propane
PST055	Forklift	8498	Nissan	PH-50			1987	50	1,500	Propane	NA	Propane
PST055	Forklift	8508	Nissan	50-P			1987	50	250	Propane	NA	Propane
PST055	Forklift	8521	Nissan	PH02A-25V			1988	50	1,500	Propane	NA	Propane
PST055	Forklift	8522	Nissan	PH02A-25V			1988	50	2,000	Propane	NA	Propane
PST055	Forklift	8586	Nissan	PH02A-25V			1990	50	500	Propane	NA	Propane
PST055	Forklift	8590	Nissan	CPH01A-18V			1990	50	500	Propane	NA	Propane
PST055	Forklift	8591	Nissan	CPH01A-18V			1990	50	500	Propane	NA	Propane
PST055	Forklift	8593	Nissan	CPH01A-18V			1990	50	500	Propane	NA	Propane
PST055	Reach stacker	9704	Fantuzzi	CS 45KM	Cummins		2000	200	2,000	Diesel, Onroad	NA	NA
PST055	Yard tractor	3320	Ottawa	YT-60	Detroit	8.2L	1968	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3321	Ottawa	YT-60	Detroit	8.2L	1968	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3323	Ottawa	YT-60	Detroit	8.2L	1968	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3358	Ottawa	YT-60	Detroit	8.2L	1968	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3359	Ottawa	YT-60	Detroit	8.2L	1968	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3361	Ottawa	YT-60	Detroit	8.2L	1968	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3727	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3728	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3729	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3730	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3731	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3732	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3733	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	3734	Ottawa	COMMANDO	Cummins	5.9L	1998	174	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5100	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5101	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5102	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5103	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5104	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5105	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5106	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5107	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5108	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5109	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5110	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5111	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5112	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5113	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5114	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5115	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5116	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5117	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5118	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA

Puget Sound Maritime Air Emissions Inventory
Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PST055	Yard tractor	5119	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5120	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5121	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5122	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5123	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST055	Yard tractor	5124	Kenworth	T800B	Cummins	C-12	2000	380	2,500	Diesel, Onroad	NA	NA
PST060	Empty handler	301	Kalmar		Volvo		1995	190	1,877	Diesel, Onroad	3.7 gals/hr	NA
PST060	Empty handler	T71	Sisu		Volvo		1995	190	2,038	Diesel, Onroad	3.7 gals/hr	NA
PST060	Forklift	721	Mitsubishi		Mitsubishi		1995	130	124	Diesel, Onroad	3.0 gals/hr	NA
PST060	Forklift	722	Hyster		Perkins		1995	130	69	Diesel, Onroad	3.0 gals/hr	NA
PST060	Reach stacker	201	Kalmar		Volvo		1995	190	3,410	Diesel, Onroad	4.6 gals/hr	NA
PST060	Reach stacker	202	Kalmar		Volvo		1995	190	3,016	Diesel, Onroad	4.6 gals/hr	NA
PST060	Reach stacker	203	Kalmar		Volvo		1995	190	2,743	Diesel, Onroad	4.6 gals/hr	NA
PST060	Reach stacker	204	Sisu		Cummins		1995	190	3,199	Diesel, Onroad	4.6 gals/hr	NA
PST060	Reach stacker	205	Kalmar		Cummins		1995	190	2,840	Diesel, Onroad	4.6 gals/hr	NA
PST060	Yard tractor	501	Ottawa		Cummins		1995	190	3,029	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	502	Ottawa		Cummins		1995	190	3,362	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	503	Ottawa		Cummins		1995	190	2,909	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	504	Ottawa		Cummins		1995	190	2,902	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	505	Ottawa		Cummins		1995	190	3,005	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	506	Ottawa		Cummins		1995	190	3,721	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	507	Ottawa		Cummins		1995	190	3,018	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	508	Ottawa		Cummins		1995	190	2,881	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	509	Ottawa		Cummins		1995	190	2,858	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	510	Ottawa		Cummins		1995	190	3,115	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	511	Ottawa		Cummins		1995	190	3,484	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	512	Ottawa		Cummins		1995	190	1,830	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	513	Ottawa		Cummins		1995	190	3,242	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	514	Ottawa		Cummins		1995	190	3,149	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	515	Ottawa		Cummins		1995	190	3,343	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	516	Ottawa		Cummins		1995	190	3,143	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	517	Ottawa		Cummins		1995	190	3,291	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	518	Ottawa		Cummins		1995	190	1,801	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	519	Ottawa		Cummins		1995	190	2,775	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	520	Ottawa		Cummins		1995	190	3,201	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	521	Ottawa		Cummins		1995	190	1,786	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	522	Ottawa		Cummins		1995	190	2,960	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	523	Ottawa		Cummins		1995	190	3,248	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	524	Ottawa		Cummins		1995	190	3,400	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	525	Ottawa		Cummins		1995	190	3,375	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	526	Ottawa		Cummins		1995	190	2,749	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	527	Ottawa		Cummins		1995	190	3,604	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	528	Ottawa		Cummins		1995	190	2,571	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	529	Ottawa		Cummins		1995	190	921	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	530	Ottawa		Cummins		1995	190	4,353	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	T56	Ottawa		Cummins		1995	190	613	Diesel, Onroad	3.7 gals/hr	NA
PST060	Yard tractor	T57	Ottawa		Cummins		1995	190	424	Diesel, Onroad	3.7 gals/hr	NA

Puget Sound Maritime Air Emissions Inventory
Table E-3 Cargo Handling Equipment Data, 2005

Terminal ID	Equip Type	Equip ID	Equipment Manufacturer	Equipment Model	Engine Manufacturer	Engine Model	Engine Year	HP	Annual Hours of Operation	Fuel Type	Total Fuel Consumed (gallons)	Alternate Fuel Used
PST070	Forklift	MTC01446	Hyster	H70C		5 T	1966	100	43	Gasoline	NA	Gasoline
PST070	Forklift	MTC01061	Hyster	H70C		3.5 T	1969	100	52	Gasoline	NA	Gasoline
PST070	Forklift	MTC02783	Taylor			18 T	1982	180	48	Gasoline	NA	Gasoline
PST070	Forklift	MTC02784	Taylor	TY300M			1982	100	73	Gasoline	NA	Gasoline
PST070	Forklift	MTC01056	Hyster	H70C		5 T	1967	100	218	Diesel, Onroad	NA	NA
PST070	Forklift	MTC01014	Hyster	H80XL		5 T	1992	100	83	Diesel, Onroad	NA	NA
PST070	Forklift	MTC02106	Hyster	H360		18 T	1998	180	700	Diesel, Onroad	NA	NA
PST070	Manlift	MTC26099	Snorkelift				1995	60	11	Propane	NA	Propane
PST070	Rail pusher	MTC05001	Magnum				1999	120	25	Diesel, Onroad	NA	NA
PST070	Side pick	MTC07011	Hyster	H-400			2000	210	492	Diesel, Onroad	NA	NA
PST070	Side pick	MTC07012	Hyster	H-400			2000	210	72	Diesel, Onroad	NA	NA
PST070	Side pick	MTC07013	Hyster	H-400			2000	210	341	Diesel, Onroad	NA	NA
PST070	Top loader	MTC06120	Taylor	TEC-950L			1995	300	1,575	Diesel, Onroad	NA	NA
PST070	Yard tractor	MTC05211	Ottawa	YT-50			1984	174	535	Diesel, Onroad	NA	NA
PST070	Yard tractor	MTC05212	Ottawa	YT-50			1984	174	297	Diesel, Onroad	NA	NA
PST070	Yard tractor	MTC05213	Ottawa	YT-50			1984	174	488	Diesel, Onroad	NA	NA
PST080	Forklift					5,000 lb	2002	100	660	Propane	NA	Propane

Puget Sound Maritime Air Emissions Inventory
Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	#Trucks	idlin gate in	idling terminal	idling gate out
PST020	141,000	0.08	0.25	0.03
PST030	39,863	0.17	0.25	0.08
PST040	95,153	0.00	0.23	0.00
PST050	247,000	0.08	0.00	0.08
PST060	100,000	0.17	0.25	0.08
PST070	11,472	0.02	0.02	0.02
PSS030	62,000	0.13	0.21	0.07
PSS050	912,500	0.33	0.50	0.17
PSS060	62,400	0.17	0.37	0.08
PSS070	200,000	0.17	0.13	0.05
PSS080	220,480	0.07	0.30	0.03
PSA010	3,600	0.13	0.21	0.07
PSEALL	28,158	0.13	0.21	0.07
PSP010	6,500	0.13	0.21	0.07
PSOALL	32,760	0.13	0.21	0.07
PSS020B	2,903	0.00	0.17	0.00
PSS020B	353	0.00	0.17	0.00
PSS020A	5,702	0.00	0.17	0.00
PSS020A	559	0.00	0.17	0.00
PST090	3,398	0.10	0.21	0.05

Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	speed mph	distance	terminal driving/trip	terminal idling/trip
PST020	15	1.06	0.07	0.28
PST030	15	0.95	0.06	0.33
PST040	15	0.8	0.05	0.23
PST050	15	1	0.07	0.08
PST060	15	1.6	0.11	0.33
PST070	15	0.3	0.02	0.03
PSS030	15	1.0	0.07	0.28
PSS050	15	1.75	0.12	0.67
PSS060	15	0.5	0.03	0.45
PSS070	15	1.0	0.07	0.18
PSS080	15	1.0	0.07	0.33
PSA010	15	1.0	0.07	0.28
PSEALL	15	0.75	0.05	0.28
PSP010	15	1.0	0.07	0.28
PSOALL	15	1.0	0.07	0.28
PSS020B	40	12.0	0.30	0.17
PSS020B	30	2.0	0.07	0.17
PSS020A	40	12.0	0.30	0.17
PSS020A	30	2.0	0.07	0.17
PST090	15	0.5	0.03	0.26

Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	overall idling/trip	total idling	total miles	driving NOx	driving CO
PST020	0.37	51,700	149,460	2.2104	1.0766
PST030	0.50	19,932	37,870	0.5601	0.2728
PST040	0.23	21,568	76,122	1.1258	0.5483
PST050	0.17	41,167	247,000	3.6530	1.7792
PST060	0.50	50,000	160,000	2.3663	1.1525
PST070	0.05	574	3,442	0.0509	0.0248
PSS030	0.41	25,420	62,000	0.9169	0.4466
PSS050	1.00	912,500	1,596,875	23.6169	11.5025
PSS060	0.62	38,480	31,200	0.4614	0.2247
PSS070	0.35	70,000	200,000	2.9579	1.4406
PSS080	0.40	88,192	220,480	3.2608	1.5882
PSA010	0.41	1,476	3,600	0.0532	0.0259
PSEALL	0.41	11,545	21,119	0.3123	0.1521
PSP010	0.41	2,665	6,500	0.0961	0.0468
PSOALL	0.41	13,432	32,760	0.4845	0.2360
PSS020B	0.17	484	34,832	0.5992	0.2439
PSS020B	0.17	59	706	0.0121	0.0049
PSS020A	0.17	950	68,428	1.1771	0.4791
PSS020A	0.17	93	1,118	0.0192	0.0078
PST090	0.36	1,233	1,699	0.0292	0.0119
				43.9636	21.2653

Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	driving VOC	driving PM:	driving SO2	driving CO2
PST020	0.1698	0.0608	0.0539	263.0098
PST030	0.0430	0.0154	0.0137	66.6408
PST040	0.0865	0.0309	0.0275	133.9551
PST050	0.2807	0.1004	0.0891	434.6542
PST060	0.1818	0.0650	0.0577	281.5574
PST070	0.0039	0.0014	0.0012	6.0563
PSS030	0.0704	0.0252	0.0224	109.1035
PSS050	1.8145	0.6492	0.5760	2,810.0746
PSS060	0.0355	0.0127	0.0113	54.9037
PSS070	0.2273	0.0813	0.0721	351.9467
PSS080	0.2505	0.0896	0.0795	387.9861
PSA010	0.0041	0.0015	0.0013	6.3350
PSEALL	0.0240	0.0086	0.0076	37.1629
PSP010	0.0074	0.0026	0.0023	11.4383
PSOALL	0.0372	0.0133	0.0118	57.6489
PSS020B	0.0205	0.0110	0.0185	90.0202
PSS020B	0.0004	0.0002	0.0004	1.8246
PSS020A	0.0404	0.0217	0.0363	176.8486
PSS020A	0.0007	0.0004	0.0006	2.8894
PST090	0.0010	0.0005	0.0009	4.3910
	3.2995	1.1918	1.0841	5,288.4472

Puget Sound Maritime Air Emissions Inventory
Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	driving CH4	driving N2O	idling NOx	idling CO
PST020	0.0008	0.0008	8.3234	6.6263
PST030	0.0002	0.0002	2.1090	1.6789
PST040	0.0004	0.0004	4.2393	3.3749
PST050	0.0014	0.0013	13.7554	10.9507
PST060	0.0009	0.0008	8.9104	7.0935
PST070	0.0000	0.0000	0.1917	0.1526
PSS030	0.0003	0.0003	3.4528	2.7487
PSS050	0.0090	0.0084	88.9298	70.7969
PSS060	0.0002	0.0002	1.7375	1.3832
PSS070	0.0011	0.0011	11.1380	8.8669
PSS080	0.0012	0.0012	12.2785	9.7749
PSA010	0.0000	0.0000	0.2005	0.1596
PSEALL	0.0001	0.0001	1.1761	0.9363
PSP010	0.0000	0.0000	0.3620	0.2882
PSOALL	0.0002	0.0002	1.8244	1.4524
PSS020B	0.0002	0.0002	0.0131	0.0083
PSS020B	0.0000	0.0000	0.0016	0.0010
PSS020A	0.0004	0.0004	0.0258	0.0164
PSS020A	0.0000	0.0000	0.0025	0.0016
PST090	0.0000	0.0000	0.0334	0.0212
	0.0166	0.0156	158.7051	126.3326

Puget Sound Maritime Air Emissions Inventory
Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	idling VOC	idling PM:	idling SO2	idling CO2
PST020	0.7669	0.1519	0.1348	657.5245
PST030	0.1943	0.0385	0.0342	166.6021
PST040	0.3906	0.0774	0.0686	334.8879
PST050	1.2673	0.2510	0.2227	1,086.6355
PST060	0.8209	0.1626	0.1443	703.8934
PST070	0.0177	0.0035	0.0031	15.1407
PSS030	0.3181	0.0630	0.0559	272.7587
PSS050	8.1933	1.6229	1.4401	7,025.1866
PSS060	0.1601	0.0317	0.0281	137.2592
PSS070	1.0262	0.2033	0.1804	879.8668
PSS080	1.1312	0.2241	0.1988	969.9652
PSA010	0.0185	0.0037	0.0032	15.8376
PSEALL	0.1084	0.0215	0.0190	92.9073
PSP010	0.0334	0.0066	0.0059	28.5957
PSOALL	0.1681	0.0333	0.0295	144.1222
PSS020B	0.0005	0.0002	0.0003	1.2503
PSS020B	0.0001	0.0000	0.0000	0.1521
PSS020A	0.0010	0.0003	0.0005	2.4562
PSS020A	0.0001	0.0000	0.0000	0.2408
PST090	0.0013	0.0004	0.0007	3.1861
	14.6177	2.8957	2.5702	12,538.4689

Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	idling CH4	idling N2O	total NOx	total CO
PST020	0.0021	0.0020	10.5338	7.7028
PST030	0.0005	0.0005	2.6690	1.9517
PST040	0.0011	0.0010	5.3651	3.9232
PST050	0.0035	0.0033	17.4084	12.7298
PST060	0.0022	0.0021	11.2767	8.2460
PST070	0.0000	0.0000	0.2426	0.1774
PSS030	0.0009	0.0008	4.3697	3.1953
PSS050	0.0224	0.0211	112.5468	82.2994
PSS060	0.0004	0.0004	2.1990	1.6080
PSS070	0.0028	0.0026	14.0959	10.3076
PSS080	0.0031	0.0029	15.5393	11.3631
PSA010	0.0001	0.0000	0.2537	0.1855
PSEALL	0.0003	0.0003	1.4884	1.0884
PSP010	0.0001	0.0001	0.4581	0.3350
PSOALL	0.0005	0.0004	2.3089	1.6884
PSS020B	0.0000	0.0000	0.6123	0.2522
PSS020B	0.0000	0.0000	0.0137	0.0060
PSS020A	0.0000	0.0000	1.2029	0.4955
PSS020A	0.0000	0.0000	0.0218	0.0094
PST090	0.0000	0.0000	0.0626	0.0331
	0.0401	0.0377	202.6688	147.5979

Puget Sound Maritime Air Emissions Inventory
Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	total VOC	total PM:	total SO2	total CO2
PST020	0.9367	0.2127	0.1887	920.5343
PST030	0.2373	0.0539	0.0478	233.2430
PST040	0.4771	0.1083	0.0961	468.8430
PST050	1.5480	0.3514	0.3118	1,521.2897
PST060	1.0027	0.2276	0.2020	985.4508
PST070	0.0216	0.0049	0.0043	21.1970
PSS030	0.3886	0.0882	0.0783	381.8622
PSS050	10.0077	2.2720	2.0161	9,835.2612
PSS060	0.1955	0.0444	0.0394	192.1629
PSS070	1.2534	0.2846	0.2525	1,231.8135
PSS080	1.3818	0.3137	0.2784	1,357.9512
PSA010	0.0226	0.0051	0.0045	22.1726
PSEALL	0.1324	0.0300	0.0267	130.0703
PSP010	0.0407	0.0092	0.0082	40.0339
PSOALL	0.2053	0.0466	0.0414	201.7711
PSS020B	0.0211	0.0112	0.0187	91.2705
PSS020B	0.0005	0.0002	0.0004	1.9767
PSS020A	0.0414	0.0220	0.0368	179.3048
PSS020A	0.0008	0.0004	0.0006	3.1302
PST090	0.0023	0.0009	0.0016	7.5771
	17.9173	4.0875	3.6543	17,826.9161

Puget Sound Maritime Air Emissions Inventory
Table E-4 Heavy-Duty Vehicle Input Data, 2005

Terminal ID	total CH4	total N2O
PST020	0.0029	0.0028
PST030	0.0007	0.0007
PST040	0.0015	0.0014
PST050	0.0049	0.0046
PST060	0.0031	0.0030
PST070	0.0001	0.0001
PSS030	0.0012	0.0011
PSS050	0.0314	0.0296
PSS060	0.0006	0.0006
PSS070	0.0039	0.0037
PSS080	0.0043	0.0041
PSA010	0.0001	0.0001
PSEALL	0.0004	0.0004
PSP010	0.0001	0.0001
PSOALL	0.0006	0.0006
PSS020B	0.0002	0.0002
PSS020B	0.0000	0.0000
PSS020A	0.0004	0.0004
PSS020A	0.0000	0.0000
PST090	0.0000	0.0000
	0.0567	0.0534

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSA001		1991	LDGT2	Gasoline	15	29	
PSA001		1970	HDGV6	Gasoline	15	148	
PSA001		1968	LDGT4	Gasoline	15	350	
PSA001		2006	LDGT3	Gasoline	15	474	
PSA001		1972	LDGT4	Gasoline	15	1,033	
PSA001		1994	LDGT3	Gasoline	15	1,395	
PSA001		1990	LDGT4	Gasoline	15	1,587	
PSA001		1995	LDGV	Gasoline	15	1,947	
PSA001		1995	HDGV2b	Gasoline	15	3,429	
PSA001		1995	HDGV2b	Gasoline	15	5,159	
PSA001		1998	LDGV	Gasoline	15	5,808	
PSA001		1999	LDGT2	Gasoline	15	6,065	
PSS010	5	1986	LDGV	Gasoline	30	4,450	
PSS010	51	1992	LDGT2	Gasoline	30	3,470	
PSS010	87	1979	HDGV2b	Gasoline	30	5,300	
PSS010	88	1988	LDGV	Gasoline	30	4,450	
PSS010	115	1988	HDGV2b	Gasoline	30	5,300	
PSS010	181	1989	LDGT2	Gasoline	30	11,350	
PSS010	183	1989	HDDV2b	Diesel	30	5,225	
PSS010	191	1989	LDGT3	Gasoline	30	11,350	
PSS010	256	1990	LDGT3	Gasoline	30	11,350	
PSS010	257	1990	HDGV2b	Gasoline	30	12,500	
PSS010	259	1990	HDGV2b	Gasoline	30	12,500	
PSS010	275	1990	LDGT3	Gasoline	30	11,350	
PSS010	289	1990	HDGV2b	Gasoline	30	12,500	
PSS010	346	1991	LDGT2	Gasoline	30	11,350	
PSS010	358	1992	HDGV2b	Gasoline	30	5,225	
PSS010	359	1992	LDGT4	Gasoline	30	5,225	
PSS010	494	1978	HDDV2b	Diesel	30	5,225	
PSS010	581	1995	HDDV7	Diesel	30	1,975	
PSS010	612	1992	LDGT2	Gasoline	30	5,350	
PSS010	747	1985	LDGT4	Diesel	30	2,599	
PSS010	763	1985	HDGV2b	Gasoline	30	5,300	
PSS010	783	1991	LDGV	Gasoline	30	4,450	
PSS010	787	1991	HDGV2b	Gasoline	30	5,225	
PSS010	788	1991	HDGV2b	Gasoline	30	5,225	
PSS010	789	1991	HDGV2b	Gasoline	30	5,225	
PSS010	791	1991	LDGT4	Gasoline	30	5,225	
PSS010	792	1991	LDGT4	Gasoline	30	5,225	
PSS010	811	1992	HDGV2b	Gasoline	30	5,300	
PSS010	817	1992	LDGT2	Gasoline	30	3,470	
PSS010	819	1992	HDGV2b	Gasoline	30	12,500	
PSS010	834	1993	LDGT2	Gasoline	30	3,470	
PSS010	852	1993	LDGT2	Gasoline	30	5,350	
PSS010	853	1994	HDGV2b	Gasoline	30	12,500	
PSS010	855	1994	HDDV2b	Diesel	30	5,225	
PSS010	857	1994	LDGV	Gasoline	30	4,450	
PSS010	861	1994	HDGV2b	Gasoline	30	12,500	
PSS010	862	1994	HDGV2b	Gasoline	30	12,500	
PSS010	864	1994	HDGV2b	Gasoline	30	12,500	
PSS010	865	1994	HDGV2b	Gasoline	30	12,500	
PSS010	866	1994	HDGV2b	Gasoline	30	5,300	
PSS010	870	1994	LDGT2	Gasoline	30	3,470	
PSS010	872	1994	LDGT2	Gasoline	30	3,470	

Puget Sound Maritime Air Emissions Inventory
Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSA001	Van, smalll		Chevrolet	minivan
PSA001	Truck, heavy		Ford	F800
PSA001	Truck, Pick-up, large		Chevrolet	3/4 ton
PSA001	Truck, Pick-up, small		Ford	truck
PSA001	Truck, Pick-up, large		Ford	3/4 ton
PSA001	Truck, Pick-up, small		Chevrolet	1/2 ton
PSA001	Truck, Pick-up, large		Chevrolet	3/4 ton
PSA001	Passenger car		Taurus	V6
PSA001	Truck, Pick-up, large		Chevrolet	1 ton
PSA001	Truck, Pick-up, large		Chevrolet	1 ton
PSA001	Passenger car		Taurus	V6
PSA001	SUV, small		Jeep	
PSS010	Passenger car		Nissan	MAXIMA, 4-DR GL SDN
PSS010	Van, smalll		Dodge	CARAVAN
PSS010	Van, utility/passenger		GMC	BOX VAN/TRUCK
PSS010	Passenger car		Chevrolet	CELEBRITY, STA WAGON
PSS010	Van, utility/passenger		Dodge	B350-MAXI-VAN
PSS010	Truck, Pick-up, small		GMC	S15 pickup truck
PSS010	Truck, Pick-up, large		Dodge	D350 1-TON FLATBED TRUCK
PSS010	Truck, Pick-up, small		Chevrolet	1/2 TON FLEETSIDE PICKUP
PSS010	Truck, Pick-up, small		Dodge	D150 PICKUP 4X2
PSS010	Truck, utility		Dodge	D350-UTILITY TRUCK 1-TON
PSS010	Truck, utility		Dodge	D350-FLATBED TRUCK
PSS010	Truck, Pick-up, small		Dodge	D150-PICKUP
PSS010	Truck, utility		Chevrolet	1-TON UTILITY TRUCK
PSS010	Truck, Pick-up, small		Chevrolet	S-10 PICKUP
PSS010	Truck, Pick-up, large		GMC	SIERRA UTILITY TRUCK
PSS010	Truck, Pick-up, large		Chevrolet	3/4-TON PICKUP
PSS010	Truck, Pick-up, large		GMC	FLATBED
PSS010	Truck, Heavy		IHI	4900 DUMP TRUCK
PSS010	SUV, smalll		Ford	EXPLORER
PSS010	Truck, Pick-up, large		Ford	PICKUP W/EXTENDED CAB
PSS010	Van, utility/passenger		Chevrolet	CARGO VAN - G10
PSS010	Passenger car		Dodge	SPIRIT 4DR SDN
PSS010	Truck, Pick-up, large		GMC	SIERRA 1-TON PICKUP
PSS010	Truck, Pick-up, large		GMC	SIERRA 1-TON PICKUP
PSS010	Truck, Pick-up, large		GMC	SIERRA 1-TON PICKUP
PSS010	Truck, Pick-up, large		Dodge	D250 3/4-TON PICKUP
PSS010	Truck, Pick-up, large		Dodge	D250 3/4-TON PICKUP
PSS010	Van, utility/passenger		Ford	12-PASS, CLUB WAGON
PSS010	Van, smalll		Ford	AEROSTAR VAN
PSS010	Truck, utility		GMC	1-TON H/D 3500 FLATBED
PSS010	Van, smalll		Ford	AEROSTAR VAN
PSS010	SUV, smalll		GMC	SONOMA TRUCK
PSS010	Truck, utility		GMC	1-TON H/D 3500 FLATBED
PSS010	Truck, Pick-up, large		Chevrolet	FLATBED PICKUP
PSS010	Passenger car		Nissan	ALTIMA 4/DR SDN
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Van, utility/passenger		Ford	ECONO VAN
PSS010	Van, smalll		Ford	AEROSTAR VAN
PSS010	Van, smalll		Ford	AEROSTAR VAN

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSS010	878	1994	LDGT2	Gasoline	30	5,350	
PSS010	883	1994	LDGT2	Gasoline	30	5,350	
PSS010	891	1995	HDGV6	Gasoline	30	1,975	
PSS010	892	1994	HDGV2b	Gasoline	30	12,500	
PSS010	894	1995	LDGT2	Gasoline	30	11,350	
PSS010	907	1995	HDGV2b	Gasoline	30	5,300	
PSS010	917	1995	HDGV2b	Gasoline	30	12,500	
PSS010	922	1995	HDGV2b	Gasoline	30	12,500	
PSS010	924	1996	LDGT2	Gasoline	30	11,350	
PSS010	933	1996	HDGV2b	Gasoline	30	5,225	
PSS010	935	1996	HDGV2b	Gasoline	30	12,500	
PSS010	936	1996	HDGV2b	Gasoline	30	12,500	
PSS010	938	1996	HDGV2b	Gasoline	30	12,500	
PSS010	954	1996	HDGV2b	Gasoline	30	5,300	
PSS010	955	1996	HDGV2b	Gasoline	30	5,300	
PSS010	965	1996	LDGV	Gasoline	30	4,450	
PSS010	966	1996	LDGV	Gasoline	30	4,450	
PSS010	967	1996	LDGV	Gasoline	30	4,450	
PSS010	968	1997	HDGV2b	Gasoline	30	5,300	
PSS010	971	1997	HDGV2b	Gasoline	30	5,300	
PSS010	972	1997	HDGV2b	Gasoline	30	5,300	
PSS010	978	1997	LDGT2	Gasoline	30	5,350	
PSS010	985	1996	LDGV	Gasoline	30	4,450	
PSS010	986	1997	LDGV	Gasoline	30	4,450	
PSS010	1005	1998	LDGT2	Gasoline	30	3,470	
PSS010	1006	1998	LDGT2	Gasoline	30	3,470	
PSS010	1007	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1008	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1009	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1010	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1011	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1012	1998	LDGT4	Gasoline	30	5,225	
PSS010	1013	1998	LDGT4	Gasoline	30	5,225	
PSS010	1014	1999	LDGT3	Gasoline	30	11,350	
PSS010	1015	1998	HDGV2b	Gasoline	30	5,300	
PSS010	1016	1998	LDGT3	Gasoline	30	11,350	
PSS010	1017	1998	LDGT3	Gasoline	30	11,350	
PSS010	1018	1998	LDGT3	Gasoline	30	11,350	
PSS010	1027	1998	LDGT2	Gasoline	30	3,470	
PSS010	1028	1997	LDGT2	Gasoline	30	11,350	
PSS010	1060	1999	LDGT2	Gasoline	30	5,350	
PSS010	1062	1999	LDGT4	Gasoline	30	5,225	
PSS010	1067	1999	LDGT2	Gasoline	30	5,350	
PSS010	1068	1999	LDGT3	Gasoline	30	11,350	
PSS010	1069	2000	LDGT4	Gasoline	30	5,225	
PSS010	1070	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1071	1999	HDGV2b	Gasoline	30	12,500	
PSS010	1072	1999	HDGV2b	Gasoline	30	5,300	
PSS010	1073	1999	HDGV2b	Gasoline	30	5,300	
PSS010	1092	1999	LDGT2	Gasoline	30	5,350	
PSS010	1099	1999	LDGT2	Gasoline	30	3,470	
PSS010	1117	1996	LDGT4	Gasoline	30	5,225	
PSS010	1119	1999	LDGV	Gasoline	30	4,450	
PSS010	1122	2000	LDGT4	Gasoline	30	5,225	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSS010	SUV, smalll		Jeep	CHEROKEE 4/DR
PSS010	SUV, smalll		Jeep	CHEROKEE
PSS010	Truck, heavy		IHI	ROLLBACK DUAL TANDM FLATBED
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, Pick-up, small		Chevrolet	S-10 CHEVROLET PICKUP
PSS010	Van, utility/passenger		Ford	CLUB WAGON
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, Pick-up, small		Ford	RANGER PICKUP
PSS010	Truck, Pick-up, large		Chevrolet	1 TON UTILITY
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Van, utility/passenger		Dodge	CARGO VAN
PSS010	Van, utility/passenger		Dodge	CARGO VAN
PSS010	Passenger car		Ford	CONTOUR 4 DR SDN
PSS010	Passenger car		Ford	CONTOUR 4 DR SDN
PSS010	Passenger car		Ford	CONTOUR 4 DR SDN
PSS010	Van, utility/passenger		Ford	H/D E-250 CARGO VAN
PSS010	Van, utility/passenger		Ford	H/D E-250 CARGO VAN
PSS010	Van, utility/passenger		Ford	H/D E-250 CARGO VAN
PSS010	SUV, smalll		Chevrolet	BLAZER S-10 4 DOOR
PSS010	Passenger car		Ford	CONTOUR 4 DR SDN
PSS010	Passenger car		Ford	CONTOUR 4 DR SDN
PSS010	Van, smalll		Ford	WINSTAR VAN
PSS010	Van, smalll		Ford	WINSTAR VAN
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 FLATBED
PSS010	Truck, utility		Chevrolet	1-TON H/D 3500 TRUCK
PSS010	Truck, Pick-up, large		Dodge	2500-PICKUP TRUCK
PSS010	Truck, Pick-up, large		Dodge	2500-PICKUP TRUCK
PSS010	Truck, Pick-up, small		Chevrolet	1500-PICKUP TRUCK
PSS010	Van, utility/passenger		Chevrolet	3500-CARGO VAN
PSS010	Truck, Pick-up, small		Ford	F-150 PICKUP TRUCK
PSS010	Truck, Pick-up, small		Ford	F-150 PICKUP TRUCK
PSS010	Truck, Pick-up, small		Chevrolet	1500-PICKUP TRUCK
PSS010	Van, smalll		Dodge	CARAVAN VAN
PSS010	Truck, Pick-up, small		Nissan	PICKUP TRUCK
PSS010	SUV, smalll		Chevrolet	BLAZER 4 X 4
PSS010	Truck, Pick-up, large		Ford	F-250 SUPER DUTY 4X4
PSS010	SUV, smalll		Jeep	CHEROKEE 4 DR
PSS010	Truck, Pick-up, small		Chevrolet	1500 PICKUP
PSS010	Truck, Pick-up, large		Ford	F-250 PICKUP TRUCK
PSS010	Truck, utility		Chevrolet	3500 FLAT BED TRUCK
PSS010	Truck, utility		Chevrolet	3500 1 TON UTILITY TRUCK
PSS010	Van, utility/passenger		Chevrolet	CARGO VAN
PSS010	Van, utility/passenger		GMC	CARGO VAN
PSS010	SUV, smalll		Jeep	CHEROKEE 4 DR
PSS010	Van, smalll		Ford	WINDSTAR
PSS010	Truck, Pick-up, large		Ford	3/4-TON CARGO VAN
PSS010	Passenger car		Chevrolet	MAILIBU 4 DR SDN
PSS010	Truck, Pick-up, large		Ford	F-250 PICKUP SUPER DUTY

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSS010	1131	1996	HDGV2b	Gasoline	30	5,300	
PSS010	1132	1999	LDGT2	Gasoline	30	5,350	
PSS010	1136	2000	LDGV	Gasoline	30	4,450	
PSS010	1137	2000	LDGV	Gasoline	30	4,450	
PSS010	1138	2000	LDGT4	Gasoline	30	5,225	
PSS010	1139	2000	HDGV2b	Gasoline	30	12,500	
PSS010	1140	2000	HDGV2b	Gasoline	30	12,500	
PSS010	1141	2000	HDGV2b	Gasoline	30	12,500	
PSS010	1142	2000	HDGV2b	Gasoline	30	12,500	
PSS010	1143	2000	HDGV2b	Gasoline	30	12,500	
PSS010	1144	2000	HDGV2b	Gasoline	30	5,300	
PSS010	1145	2000	LDGT4	Gasoline	30	5,225	
PSS010	1146	2000	LDGT4	Gasoline	30	5,225	
PSS010	1147	2000	LDGT3	Gasoline	30	11,350	
PSS010	1151	2000	LDGT2	Gasoline	30	5,350	
PSS010	1157	2000	LDGT3	Gasoline	30	11,350	
PSS010	1158	2001	LDGT3	Gasoline	30	11,350	
PSS010	1165	2000	LDGT2	Gasoline	30	5,350	
PSS010	1183	2001	LDGV	Gasoline	30	4,450	
PSS010	1184	2001	LDGV	Gasoline	30	4,450	
PSS010	1185	2001	LDGV	Gasoline	30	4,450	
PSS010	1186	2001	LDGV	Gasoline	30	4,450	
PSS010	1187	2001	LDGV	Gasoline	30	4,450	
PSS010	1188	2001	LDGV	Gasoline	30	4,450	
PSS010	1189	2001	LDGV	Gasoline	30	4,450	
PSS010	1190	2001	LDGV	Gasoline	30	4,450	
PSS010	1191	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1192	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1193	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1194	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1195	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1196	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1197	2001	HDGV2b	Gasoline	30	12,500	
PSS010	1198	2001	HDGV2b	Gasoline	30	5,300	
PSS010	1199	2001	LDGT4	Gasoline	30	5,225	
PSS010	1200	2001	LDGT4	Gasoline	30	5,225	
PSS010	1243	2001	LDGT2	Gasoline	30	5,350	
PSS010	1244	2001	LDGV	Gasoline	30	4,450	
PSS010	1245	2001	LDGV	Gasoline	30	4,450	
PSS010	1246	2001	LDGV	Gasoline	30	4,450	
PSS010	1247	2001	LDGT2	Gasoline	30	5,350	
PSS010	1249	2001	LDGT3	Gasoline	30	11,350	
PSS010	1250	2001	LDGT3	Gasoline	30	11,350	
PSS010	1262	2003	LDGT2	Gasoline	30	5,350	
PSS010	1263	2003	LDGV	Gasoline	30	4,450	
PSS010	1265	2004	LDGT4	Gasoline	30	5,225	
PSS010	1266	2005	LDGT4	Gasoline	30	5,225	
PSS010	1267	2006	LDGT4	Gasoline	30	5,225	
PSS010	1268	2004	HDGV2b	Gasoline	30	5,300	
PSS010	1269	2004	HDGV2b	Gasoline	30	5,300	
PSS010	1289	2006	LDGT1	Gasoline	30	5,350	
PSS010	1290	2006	LDGT4	Gasoline	30	5,225	
PSS010	1291	2006	LDGT4	Gasoline	30	5,225	
PSS010	1292	2006	LDGT3	Gasoline	30	5,350	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSS010	Van, utility/passenger		Ford	CARGO VAN E 250
PSS010	SUV, smalll		Chevrolet	BLAZER 4 X 4 4 DR
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Truck, Pick-up, large		Dodge	3/4 TON PICKUP TRUCK
PSS010	Truck, utility		Ford	F-450 SUPER DUTY UTILITY
PSS010	Truck, utility		Ford	F-450 SUPER DUTY UTILITY
PSS010	Truck, utility		Ford	F-450 SUPER DUTY UTILITY
PSS010	Truck, utility		Ford	F-450 SUPER DUTY UTILITY
PSS010	Truck, utility		Ford	F-450 SUPER DUTY UTILITY
PSS010	Van, utility/passenger		Chevrolet	WORK HORSE, (RR) VAN
PSS010	Truck, Pick-up, large		Dodge	3/4 TON PICKUP TRUCK
PSS010	Truck, Pick-up, large		Dodge	3/4 TON PICKUP TRUCK
PSS010	Truck, Pick-up, small		Chevrolet	1/2 TON PICKUP TRUCK
PSS010	SUV, smalll		Jeep	CHEROKEE 4 DR
PSS010	Truck, Pick-up, small		Chevrolet	1/2 TON PICKUP TRUCK
PSS010	Truck, Pick-up, small		Ford	1/2 TON CC PICKUP TRUCK
PSS010	SUV, smalll		Chevrolet	BLAZER 4 DR
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Truck, utility		Ford	F-550 FORD UTILITY TRUCK
PSS010	Truck, utility		Ford	F-450 FORD UTILITY TRUCK
PSS010	Truck, utility		Ford	F-450 FORD UTILITY TRUCK
PSS010	Truck, utility		Ford	F-450 FORD UTILITY TRUCK
PSS010	Truck, utility		Ford	F-450 FORD UTILITY TRUCK
PSS010	Truck, utility		Ford	F-450 FORD UTILITY TRUCK
PSS010	Truck, utility		Ford	F-450 FORD UTILITY TRUCK
PSS010	Van, utility/passenger		Chevrolet	PASSENGER VAN
PSS010	Truck, Pick-up, large		Dodge	2500-PICKUP TRUCK
PSS010	Truck, Pick-up, large		Dodge	2500-PICKUP TRUCK
PSS010	SUV, smalll		Chevrolet	BLAZER 4X4 4 DOOR
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	Passenger car		Ford	TAURUS 4 DR STATION WAGON
PSS010	SUV, smalll		Chevrolet	BLAZER 4x4 4 DOOR
PSS010	Truck, Pick-up, small		GMC	PICKUP 1500 WHITE
PSS010	Truck, Pick-up, small		GMC	PICKUP 1500 PEWTER
PSS010	SUV, smalll		Chevrolet	BLAZER 4X4 4 DOOR
PSS010	Passenger car		Honda	CIVIC HYBRID 4 DOOR
PSS010	Truck, Pick-up, large		Chevrolet	SILVERADO EXT CAB 2500 HD
PSS010	Truck, Pick-up, large		Chevrolet	SILVERADO EXT CAB 2500 HD
PSS010	Truck, Pick-up, large		Chevrolet	SILVERADO EXT CAB 2500 HD
PSS010	Van, utility/passenger		Dodge	SPRINTER 140 VAN 3500
PSS010	Van, utility/passenger		Dodge	SPRINTER 140 VAN 3500
PSS010	SUV, smalll		Ford	ESCAPE, HYBRID SUV
PSS010	Truck, Pick-up, large		Ford	F250XL PICKUP
PSS010	Truck, Pick-up, large		Ford	F250XL PICKUP
PSS010	SUV, smalll		Jeep	GRAND CHEROKEE SUV

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSS010	1293	2006	LDGT3	Gasoline	30	5,350	
PSS010	1295	2006	LDGT4	Gasoline	30	5,225	
PSS010	1296	2006	HDGV2b	Gasoline	30	5,300	
PSS010	1297	2006	HDGV2b	Gasoline	30	5,300	
PSS010	5007	1997	LDGT2	Gasoline	30	5,350	
PSS010	5011	1997	LDGT2	Gasoline	30	5,350	
PSS010	5017	1999	LDGT2	Gasoline	30	5,350	
PSS010	5025	2000	LDGT2	Gasoline	30	5,350	
PSS010	5040	1999	LDGV	Gasoline	30	4,450	
PSS010	5064	2000	LDGT2	Gasoline	30	5,350	
PSS010	5090	2003	HDGV2b	Gasoline	30	12,500	
PSS010	908L	2003	LDGV	Gasoline	30	4,450	
PSS010	918L	1995	HDGV2b	Gasoline	30	5,300	
PSS010	948L	1996	LDGT2	Gasoline	30	11,350	
PSS010	949L	1996	LDGT2	Gasoline	30	11,350	
PSS010	998L	1997	LDGT2	Gasoline	30	11,350	
PSS050	454294	2000	LDGT2	Gasoline	15	2,700	
PSS050	311017 NL	1988	LDGT2	Gasoline	15	2,700	
PSS050	311020 NL	1991	LDGT2	Gasoline	15	2,700	
PSS050	311025 NL	1995	LDGT2	Gasoline	15	2,700	
PSS050	452433 L	1989	HDGV2b	Gasoline	15	2,700	
PSS050	452446 NL	1992	LDGT3	Gasoline	15	2,700	
PSS050	452453 NL	1988	LDGT2	Gasoline	15	2,700	
PSS050	452458 L	1988	HDGV5	Gasoline	15	2,700	
PSS050	452460 L	1984	HDGV3	Gasoline	15	2,700	
PSS050	452467 NL	1994	LDGT2	Gasoline	15	2,700	
PSS050	452468 NL	1994	LDGT2	Gasoline	15	2,700	
PSS050	452470 NL	1995	LDGT2	Gasoline	15	2,700	
PSS050	452473 NL	1996	LDGT2	Gasoline	15	2,700	
PSS050	452474 NL	1996	LDGT2	Gasoline	15	2,700	
PSS050	452475 L	1996	LDGT2	Gasoline	15	2,700	
PSS050	452476 NL	1990	HDGV2b	Gasoline	15	2,700	
PSS050	452477 NL	1990	HDGV2b	Gasoline	15	2,700	
PSS050	452478 NL	1997	LDGT2	Gasoline	15	2,700	
PSS050	452480 NL	1997	LDGT2	Gasoline	15	2,700	
PSS050	452484 NL	1997	LDGT2	Gasoline	15	2,700	
PSS050	452485 NL	1997	LDGT2	Gasoline	15	2,700	
PSS050	452486 NL	1999	LDGT2	Gasoline	15	2,700	
PSS050	452687 NL	1989	LDGT2	Gasoline	15	2,700	
PSS050	452693 NL	1985	HDGV3	Gasoline	15	2,700	
PSS050	452874 NL	2001	LDGT2	Gasoline	15	2,700	
PSS050	452875 L	2001	LDGT2	Gasoline	15	2,700	
PSS050	452931 NL	2001	LDGT2	Gasoline	15	2,700	
PSS050	452946 L	1996	HDGV2b	Gasoline	15	2,700	
PSS050	452978 L	1989	HDGV2b	Gasoline	15	2,700	
PSS050	452979 L	1992	LDGT2	Gasoline	15	2,700	
PSS050	453018 L	1997	HDGV2b	Gasoline	15	2,700	
PSS050	453025 L	1979	HDGV2b	Gasoline	15	2,700	
PSS050	453026 L	2002	LDGT3	Gasoline	15	2,700	
PSS050	453027 L	2002	LDGT3	Gasoline	15	2,700	
PSS050	453044 N	1995	LDGT2	Gasoline	15	2,700	
PSS050	453236 L	2002	LDGT3	Gasoline	15	2,700	
PSS050	453266 NL	1989	LDGT2	Gasoline	15	2,700	
PSS050	453298 L	1996	LDGT2	Gasoline	15	2,700	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSS010	SUV, smalll		Jeep	GRAND CHEROKEE SUV
PSS010	Truck, Pick-up, large		Chevrolet	SILVERADO FLATBED
PSS010	Van, utility/passenger		Dodge	SPRINTER VAN 3500
PSS010	Van, utility/passenger		Dodge	SPRINTER VAN 3500
PSS010	SUV, smalll		GMC	JIMMY
PSS010	SUV, smalll		Chevrolet	BLAZER 4 DR.
PSS010	SUV, smalll		Chevrolet	BLAZER
PSS010	SUV, smalll		Chevrolet	4DOOR BLAZER
PSS010	Passenger car		Ford	TAURUS 4 DR. SE SEDAN
PSS010	SUV, smalll		Chevrolet	BLAZER 4 X4 4 DOOR
PSS010	Truck, utility		Chevrolet	TRAILBLAZER 4X4
PSS010	Passenger car		Lexus	INFINTI QX-4
PSS010	Van, utility/passenger		Ford	E-350 XL CLUB WAGON
PSS010	Truck, Pick-up, small		Ford	RANGER PICKUP TRUCK
PSS010	Truck, Pick-up, small		Ford	RANGER PICKUP TRUCK
PSS010	Truck, Pick-up, small		Ford	RANGER PICKUP TRUCK
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Nissan S	
PSS050	Truck, Pick-up, small		Nissan	
PSS050	Van, utility/passenger		Step Van	
PSS050	Truck, Pick-up, small		Chev1500	
PSS050	Truck, Pick-up, small		Nissan	
PSS050	Truck, Fuel		Ford Fuel	
PSS050	Truck, utility		Chev Fuel	
PSS050	Truck, Pick-up, small		Nissan	
PSS050	Truck, Pick-up, small		Nissan	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, utility		GMC V-2	
PSS050	Truck, utility		GMC V-2	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Nissan	
PSS050	Truck, Pick-up, large		Ford E350	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Van, utility/passenger		Step Van	
PSS050	Truck, utility		Ford LTN	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, large		Chev 1Ton	
PSS050	Van, utility/passenger		Step Van	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, Pick-up, small		Chev S-10	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, Pick-up, small		Nissan	
PSS050	Truck, Pick-up, small		S-10 Blaz	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSS050	453310 NL	1997	LDGT2	Gasoline	15	2,700	
PSS050	453311 NL	1997	LDGT2	Gasoline	15	2,700	
PSS050	453312 NL	1998	LDGT2	Gasoline	15	2,700	
PSS050	453332 NL	1995	LDGT3	Gasoline	15	2,700	
PSS050	453400 L	1986	HDGV2b	Gasoline	15	2,700	
PSS050	453430 NL	1992	LDGT3	Gasoline	15	2,700	
PSS050	453774 L	2001	LDGT2	Gasoline	15	2,700	
PSS050	453849 NL	1999	LDGT2	Gasoline	15	2,700	
PSS050	453880 NL	2004	LDGT2	Gasoline	15	2,700	
PSS050	453897 NL	2004	LDGT2	Gasoline	15	2,700	
PSS050	453981 NL	1997	HDGBS	Gasoline	15	2,700	
PSS050	454064 L	1997	LDGT3	Gasoline	15	2,700	
PSS050	454327 L	1991	HDGV2b	Gasoline	15	2,700	
PSS050	454359 L	2003	LDGT4	Gasoline	15	2,700	
PSS050	492743 L	1985	HDGV2b	Gasoline	15	2,700	
PSS050	495590 NL	1985	HDGV2b	Gasoline	15	2,700	
PSS050	L	1999	HDGV6	Gasoline	15	2,700	
PSS050	L	1999	HDGV6	Gasoline	15	2,700	
PSS050	L	1999	HDGV6	Gasoline	15	2,700	
PSS050	L	1999	HDGV6	Gasoline	15	2,700	
PSS050	L	1999	HDGV6	Gasoline	15	2,700	
PSS050	L	1994	HDGV3	Gasoline	15	2,700	
PSS050	L	2001	LDGT4	Gasoline	15	2,700	
PSS050	L	2006	LDGT3	Gasoline	15	2,700	
PSS050	L	2000	HDGV2b	Gasoline	15	2,700	
PSS050	L	2002	HDGV2b	Gasoline	15	2,700	
PSS050	NL	1997	LDGT4	Gasoline	15	2,700	
PSS050	NL	1998	LDGT4	Gasoline	15	2,700	
PSS050	NL	1999	LDGT4	Gasoline	15	2,700	
PSS050	NL	2000	LDGT4	Gasoline	15	2,700	
PSS050	NL	2001	LDGT4	Gasoline	15	2,700	
PSS050	NL	2001	LDGT3	Gasoline	15	2,700	
PSS050	Pending	1996	HDGBS	Gasoline	15	2,700	
PSS050	Pending	1998	HDGBS	Gasoline	15	2,700	
PSS050	Pending	1996	LDGT2	Gasoline	15	2,700	
PSS050	Pending	1997	LDGT2	Gasoline	15	2,700	
PSS050	Pending	1997	LDGT2	Gasoline	15	2,700	
PSS050	Pending	1997	LDGT2	Gasoline	15	2,700	
PSS050	Pending	1997	LDGT2	Gasoline	15	2,700	
PSS050		2001	LDGT4	Gasoline	15	2,700	
PSS050		1995	LDGT3	Gasoline	15	2,700	
PSS050		2002	LDGT3	Gasoline	15	2,700	
PSS050		2005	LDGT3	Gasoline	15	2,700	
PSS050		2005	LDGT3	Gasoline	15	2,700	
PSS050		2006	LDGT3	Gasoline	15	2,700	
PSS050		1998	HDGV2b	Gasoline	15	2,700	
PSS050		1989	HDGV2b	Gasoline	15	2,700	
PSS060	451238 L	1989	HDGV6	Gasoline	15	2,700	
PSS060	452576 NL	1986	LDGT2	Gasoline	15	2,700	
PSS060	452579 NL	1991	HDGV2b	Gasoline	15	2,700	
PSS060	454356 L	2005	LDGT3	Gasoline	15	2,700	
PSS070	Terminal 46	1991	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1991	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1996	LDGT2	Gasoline	15	11,350	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Truck, Pick-up, small		Dodge	
PSS050	Truck, utility		GMC Maint	
PSS050	Truck, Pick-up, small		Chev 1500	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R.	
PSS050	Bus		Ford V/Bus	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, utility		Ford F700	
PSS050	Truck, Pick-up, large		Ford F 250	
PSS050	Truck, utility		Inter. Snow	
PSS050	Truck, utility		Ford Sweep	
PSS050	Truck, Heavy		Frtliner	
PSS050	Truck, Heavy		Frtliner	
PSS050	Truck, Heavy		Frtliner	
PSS050	Truck, Heavy		Frtliner	
PSS050	Truck, Heavy		Frtliner	
PSS050	Truck, Pick-up, large		Ford E350	
PSS050	Truck, Pick-up, large		Ford F 250	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, utility		Iszusu NPR	
PSS050	Truck, utility		WORK	
PSS050	Truck, Pick-up, large		Chev 2500	
PSS050	Truck, Pick-up, large		Chev 2500	
PSS050	Truck, Pick-up, large		Ford F 250	
PSS050	Truck, Pick-up, large		Ford F 250	
PSS050	Truck, Pick-up, large		Ford F 250	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Bus		Ford V/Bus	
PSS050	Bus		Ford V/Bus	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, small		Ford R	
PSS050	Truck, Pick-up, large		Ford F 250	
PSS050	Truck, Pick-up, small		Dodge	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, Pick-up, small		Ford F 150	
PSS050	Truck, utility		International	
PSS050	Van, utility/passenger		Step Van	
PSS060	Truck, Heavy		Inter. Semi	
PSS060	Truck, Pick-up, small		Chev S-10	
PSS060	Van, utility/passenger		Ford Van	
PSS060	Truck, Pick-up, small		Ford F 150	
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.4L

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSS070	Terminal 46	1997	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1998	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1998	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1999	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	2000	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1987	LDGT1	Propane	15	11,350	
PSS070	Terminal 46	1998	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1998	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1998	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1999	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1999	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1999	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	2000	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	1985	LDGT1	Propane	15	11,350	
PSS070	Terminal 46	1988	LDGT1	Propane	15	11,350	
PSS070	Terminal 46	1989	LDGT1	Propane	15	11,350	
PSS070	Terminal 46	1976	HDGV2b	Propane	15	5,300	
PSS070	Terminal 46	1984	HDGV2b	Propane	15	5,300	
PSS070	Terminal 46	1999	LDGT2	Gasoline	15	11,350	
PSS070	Terminal 46	2000	LDGT2	Gasoline	15	11,350	
PSS080	EMSU 155	1992	LDGT4	Gasoline	15	280	
PSS080	EMSU 158	1992	LDGT4	Gasoline	15	1,259	
PSS080	EMSU 175	1992	LDGT4	Gasoline	15	1,212	
PSS080	EMSU 176	1992	HDDBS	Diesel	15	6,729	
PSS080	EMSU 177	1989	HDDV7	Diesel	15	466	
PSS080	EMSU 209	1995	LDGT2	Gasoline	15	1,186	
PSS080	EMSU 211	1995	LDGT2	Gasoline	15	1,693	
PSS080	EMSU 212	1995	LDGT2	Gasoline	15	1,928	
PSS080	EMSU 227	1996	LDGT3	Gasoline	15	537	
PSS080	EMSU 228	1996	LDGT3	Gasoline	15	2,851	
PSS080	EMSU 229	1996	LDGT3	Gasoline	15	3,044	
PSS080	EMSU 230	1996	LDGT3	Gasoline	15	3,073	
PSS080	EMSU 231	1996	LDGT3	Gasoline	15	3,076	
PSS080	EMSU 234	1996	LDGT3	Gasoline	15	1,047	
PSS080	EMSU 235	1996	LDGT3	Gasoline	15	1,183	
PSS080	EMSU 236	1996	LDGT3	Gasoline	15	2,619	
PSS080	EMSU 239	1989	LDGT4	Gasoline	15	89	
PSS080	EMSU 241	1993	LDGT3	Gasoline	15	488	
PSS080	EMSU 242	1993	LDGT3	Gasoline	15	1,519	
PSS080	EMSU 243	1993	LDGT3	Gasoline	15	1,061	
PSS080	EMSU 244	1993	HDDBS	Diesel	15	1,501	
PSS080	EMSU 246	1995	LDGT3	Gasoline	15	1,417	
PSS080	EMSU 248	1996	HDGV2b	Gasoline	15	687	
PSS080	EMSU 266	1996	HDDBS	Diesel	15	3,153	
PSS080	EMSU 306	1997	HDDV2b	Diesel	15	294	
PSS080	EMSU 309	1997	HDDV7	Diesel	15	929	
PSS080	EMSU 310	1997	HDDV2b	Diesel	15	116	
PSS080	EMSU 323	1997	HDDV2b	Diesel	15	1,244	
PSS080	EMSU 328	1998	LDGT3	Gasoline	15	4,002	
PSS080	EMSU 329	1998	LDGT3	Gasoline	15	2,205	
PSS080	EMSU 330	1998	LDGT3	Gasoline	15	4,211	
PSS080	EMSU 332	1998	LDGT3	Gasoline	15	2,069	
PSS080	EMSU 333	1998	LDGT3	Gasoline	15	2,734	
PSS080	EMSU 334	1998	LDGT3	Gasoline	15	5,586	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.4L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small		Ranger	2.5L
PSS070	Truck, Pick-up, small			S-10
PSS070	Truck, Pick-up, small			S-15
PSS070	Truck, Pick-up, small			S-15
PSS070	Van, utility/passenger		AM G	Van
PSS070	Van, utility/passenger		Ford	Van v-8
PSS070	Truck, Pick-up, small		Frontier	
PSS070	Truck, Pick-up, small		Frontier	
PSS080	Truck, Pick-up, large		Dodge	92 DODGE RAM 250
PSS080	Truck, Pick-up, large		Ford	92 FORD F-SUPER
PSS080	Truck, Pick-up, large		Ford	92 FORD F350
PSS080	Bus		Chevrolet	CHEVROLET/CARPENTER
PSS080	Truck, Heavy		International	INTERNATIONAL
PSS080	Truck, Pick-up, small		Ford	95 FORD RANGER XL
PSS080	Truck, Pick-up, small		Ford	95 FORD RANGER XL
PSS080	Truck, Pick-up, small		Ford	95 FORD RANGER XL
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, small		Ford	96 FORD F150
PSS080	Truck, Pick-up, large		Ford	89 FORD F-SUPER
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Bus		Chevrolet	CHEVROLET/CARPENTER
PSS080	Unknown		Ford	
PSS080	Van, utility/passenger		Chevrolet	96 CHEVROLET/GRUMMAN
PSS080	Bus		Chevrolet	CHEVROLET/CARPENTER
PSS080	Unknown		Precision Engineering	PRECISION ENG. CV-100
PSS080	Truck, Heavy		Mac	MACK MS300P
PSS080	Van, utility/passenger		Ford	FORD E40/ELDORADO
PSS080	Unknown		Precision Engineering	PRECISION ENG. CV-100
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PSS080	EMSU 335	1998	LDGT3	Gasoline	15	5,178	
PSS080	EMSU 336	1998	LDGT3	Gasoline	15	4,210	
PSS080	EMSU 337	1998	LDGT3	Gasoline	15	377	
PSS080	EMSU 346	1998	HDDV2b	Diesel	15	2,210	
PSS080	EMSU 367	1998	LDGT3	Gasoline	15	188	
PSS080	EMSU 369	1998	LDGT3	Gasoline	15	3,091	
PSS080	EMSU 370	1998	LDGT3	Gasoline	15	570	
PSS080	EMSU 374	1998	HDDV2b	Diesel	15	911	
PSS080	EMSU 395	2000	LDGT3	Gasoline	15	4,265	
PSS080	EMSU 396	2000	LDGT3	Gasoline	15	1,697	
PSS080	EMSU 397	2000	LDGT3	Gasoline	15	6,397	
PSS080	EMSU 398	2000	LDGT3	Gasoline	15	2,613	
PSS080	EMSU 399	2000	LDGT3	Gasoline	15	745	
PSS080	EMSU 433	2001	LDGT2	Gasoline	15	357	
PSS080	EMSU 437	1995	HDDV2b	Diesel	15	2,554	
PSS080	EMSU 438	2003	HDGV3	Diesel	15	3,371	
PSS080	EMSU 476	2005	LDGT3	Gasoline	15	5,345	
PSS080	EMSU 477	2005	LDGT3	Gasoline	15	381	
PSS080	EMSU 478	2005	LDGT3	Gasoline	15	349	
PSS080	EMSU 479	2005	LDGT3	Gasoline	15	263	
PSS080	EMSU 480	2005	LDGT3	Gasoline	15	269	
PSS080	EMSU 528	2006	LDGT4	Gasoline	15	20	
PSS080	EMSU 529	2006	LDGT4	Gasoline	15	26	
PSS080	EMSU 530	2006	LDGT4	Gasoline	15	574	
PSS080	EMSU 531	2006	LDGT4	Gasoline	15	487	
PSS080	EMSU 532	2006	LDGT4	Gasoline	15	278	
PSS080	EMSU 533	2006	LDGT4	Gasoline	15	75	
PSS080	EMSU 534	2006	LDGT4	Gasoline	15	146	
PSS080	EMSU 535	2006	LDGT4	Gasoline	15	470	
PSS080	EMSU 536	2006	LDGT4	Gasoline	15	99	
PSS080	EMSU 537	2006	LDGT4	Gasoline	15	146	
PSS080	EMSU 538	2006	LDGT4	Gasoline	15	436	
PSS080	EMSU 539	2006	LDGT4	Gasoline	15	30	
PSS090	450836 L	1990	HDGV4	Gasoline	15	2,700	
PSS090	451898 L	1996	LDGT2	Gasoline	15	2,700	
PST010	3293	1985	HDDV7	Diesel	15	871	
PST010	3331	1977	HDDV5	Diesel - ULS	15	0	
PST010	3373	1996	HDDV5	Diesel - ULS	15	169	
PST010	3408	1999	HDGV5	Gasoline	15	1,243	
PST010	03237	1979	HDGV2b	Gasoline	15	267	
PST010	03239	1980	HDGV4	Propane	15	717	
PST010	03284	1984	HDDV5	Diesel	15	227	
PST010	03306	1988	HDGV2b	Gasoline	15	298	
PST010	03317	1988	LDGT2	Gasoline	15	176	
PST010	03322	1989	LDGT4	Gasoline	15	3,929	7,200
PST010	03325	1990	HDGV2b	Gasoline	15	140	
PST010	03333	1998	LDGT3	Gasoline	15	1,673	
PST010	03346	1991	LDGT2	Gasoline	15	1,216	
PST010	03350	1991	LDGT2	Gasoline	15	927	
PST010	03352	1992	LDGT2	Gasoline	15	560	
PST010	03353	1992	LDGT2	Gasoline	15	812	
PST010	03355	1993	LDGT2	Gasoline	15	7,413	
PST010	03356	1993	LDGT2	Gasoline	15	461	
PST010	03357	1994	LDGT2	Gasoline	15	1,426	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Van, utility/passenger		Chevrolet	CHEVEROLET/GRUMMAN
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Ford	
PSS080	Unknown		Precision Engineering	PRECISION ENG. CV-100
PSS080	Truck, Pick-up, small		Ford	F150
PSS080	Truck, Pick-up, small		Ford	F150
PSS080	Truck, Pick-up, small		Ford	F150
PSS080	Truck, Pick-up, small		Ford	F150
PSS080	Truck, Pick-up, small		Ford	F150
PSS080	Van, smalll		Ford	01 FORD WINDSTAR LX
PSS080	Truck, Pick-up, large		Chevrolet	CHEVROLET 3500
PSS080	Truck, Pick-up, large		Ford	FORD F350
PSS080	Unknown		Chevrolet	
PSS080	Unknown		Chevrolet	
PSS080	Unknown		Chevrolet	
PSS080	Unknown		Chevrolet	
PSS080	Unknown		Chevrolet	
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS080	Truck, Pick-up, large		Chevrolet	Silverado
PSS090	Truck, Pick-up, large		Ford F450	
PSS090	Truck, Pick-up, small		Chev S-10	
PST010	Truck, Dump	9 TON	Chevrolet	70
PST010	Truck, Fuel		Peterbilt	Fuel Truck
PST010	Truck, Fuel		Freightliner	Fuel Truck
PST010	Truck, Fuel		Chevrolet	Fuel Truck
PST010	Truck, Flatbed	1 1/2 TON	Chevrolet	C60
PST010	Truck, Flatbed	2 1/2 TON	International	1824
PST010	Truck, Water	9 TON	Chevrolet	CC7D042 8.2L DIESEL
PST010	Truck, Flatbed	1 TON	Chevrolet	R30
PST010	Truck, Pick-up, small	2 WD	Isuzu	S14 2.6L
PST010	Truck, Pick-up, large	3/4 TON	Chevrolet	C2500 WB 131
PST010	Truck, Flatbed	1 TON 360 5.9L	Dodge	POWER RAM 8 CYL.
PST010	Van, smalll	3/4 TON V/8 5.0L	Chevrolet	305 ENG
PST010	Truck, Pick-up, small		Isuzu	S14 2.6L
PST010	Truck, Pick-up, small	1/2 TON 2.6L	Isuzu	2WD LONG BED, 4 CYL
PST010	Truck, Pick-up, small	1/2 TON	Isuzu	S14
PST010	Truck, Pick-up, small	1/2 TON	Isuzu	S14
PST010	Van, smalll	2WD 3.0L V/6	Ford	AEROSTAR WAGON
PST010	Truck, Pick-up, small		Ford	RANGER 136514
PST010	Truck, Pick-up, small	1/2 Ton	Ford	RANGER139166

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PST010	03361	1993	LDGT2	Gasoline	15	493	
PST010	03362	1994	LDGT4	Gasoline	15	2,743	
PST010	03364	1995	LDGT4	Gasoline	15	1,582	
PST010	03365	1995	LDGT4	Gasoline	15	3,765	
PST010	03366	1995	LDGT4	Gasoline	15	3,689	
PST010	03369	1995	LDGT4	Gasoline	15	4,232	
PST010	03370	1995	LDGT2	Gasoline	15	5,721	
PST010	03371	1995	HDGV2b	Gasoline	15	768	
PST010	03372	1995	HDGV2b	Gasoline	15	5,467	8,600
PST010	03374	1996	LDGT4	Gasoline	15	6,575	
PST010	03375	1996	LDGT4	Gasoline	15	3,357	
PST010	03376	1996	LDGT4	Gasoline	15	3,467	
PST010	03377	1996	HDGV4	Gasoline	15	2,555	15,000
PST010	03378	1996	HDGV2b	Gasoline	15	6,251	8,510
PST010	03379	1996	LDGV	Gasoline	15	1,446	
PST010	03380	1996	LDGT4	Gasoline	15	3,005	
PST010	03381	1996	HDGV2b	Gasoline	15	1,060	9,100
PST010	03382	1997	LDGT4	Gasoline	15	2,915	8,600
PST010	03383	1997	LDGT4	Gasoline	15	4,441	8,600
PST010	03384	1997	HDGV2b	Gasoline	15	6,703	
PST010	03385	1997	HDGV2b	Gasoline	15	5,401	
PST010	03386	1997	LDGT4	Gasoline	15	3,087	
PST010	03387	1997	LDGT2	Gasoline	15	1,239	
PST010	03388	1997	HDGV3	Gasoline	15	5,315	11,000
PST010	03393	1998	LDGV	Gasoline	15	13,411	
PST010	03394	1998	LDGT4	Gasoline	15	7,800	
PST010	03395	1998	LDGT4	Gasoline	15	2,099	
PST010	03396	1998	LDGT4	Gasoline	15	2,732	
PST010	03397	1998	LDGT3	Gasoline	15	6,227	
PST010	03398	1998	LDGT4	Gasoline	15	5,126	
PST010	03399	1998	LDGT4	Gasoline	15	5,752	
PST010	03400	1998	LDGT4	Gasoline	15	1,109	
PST010	03401	1998	LDGT4	Gasoline	15	3,000	
PST010	03402	1998	HDGV2b	Gasoline	15	1,477	
PST010	03404	1999	HDGV2b	Gasoline	15	3,189	
PST010	03405	1999	LDGT4	Gasoline	15	1,960	
PST010	03406	1999	LDGT4	Gasoline	15	2,569	
PST010	03409	1999	HDGV4	Gasoline	15	3,907	
PST010	03410	1999	HDGV4	Gasoline	15	6,745	15,000
PST010	03411	2000	HDGV5	Gasoline	15	1,799	19,000
PST010	03412	2000	LDGT2	Gasoline	15	7,857	
PST010	03413	2000	HDGV2b	Gasoline	15	1,135	
PST010	03414	2000	HDGV2b	Gasoline	15	3,966	
PST010	03416	2001	LDGV	Gasoline	15	0	
PST010	03418	2000	LDGV	Gasoline	15	3,844	
PST010	03419	1994	LDGT3	Gasoline	15	3,439	
PST010	03420	2001	LDGV	Ethanol	15	0	
PST010	03421	2001	LDGT4	Gasoline	15	4,400	
PST010	03422	1994	LDGT2	Gasoline	15	3,429	
PST010	03423	1994	LDGT4	Gasoline	15	1,723	
PST010	03424	2002	LDGT3	Gasoline	15	2,521	
PST010	03425	2002	LDGT3	Gasoline	15	2,634	
PST010	03426	2002	LDGT2	Gasoline	15	1,445	
PST010	03427	2002	LDGT2	Gasoline	15	1,811	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PST010	Truck, Pick-up, small	2 WD	Isuzu	
PST010	Truck, Pick-up, large	3/4 TON	Chevrolet	CC20903
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250 5.0L ENG.
PST010	Truck, Pick-up, large	3/4 TON 5.0L	Ford	F250
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250HD4X2
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250XL
PST010	Van, smalll		Ford	AEROSTAR
PST010	Truck, Flatbed	1 TON 5.8L	Ford	F350XL FLATBED
PST010	Van, utility/passenger		GMC	TG31605
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250HD
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250HD
PST010	Truck, Pick-up, large	3/4 TON C6 5.8L	Ford	F250HD R/C 4X2
PST010	Truck, Pick-up, large		Ford	F SUPERDUTYCHC
PST010	Van, utility/passenger		Dodge	3500 MAXI VAN
PST010	Passenger car	Compact 4 door	Dodge	NEON HIGHLINE
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250
PST010	Van, utility/passenger		Ford	Club Wagon
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250
PST010	Truck, Pick-up, large	3/4 TON	Ford	F250
PST010	Truck, Pick-up, large	1 TON	Chevrolet	CC30943 3500 SERIES
PST010	Truck, Pick-up, large	1 TON	Chevrolet	CC30943 DBL CAB
PST010	Truck, Pick-up, large		Ford	F250HD4X2
PST010	Van, smalll		Chevrolet	CM11006 ASTRO
PST010	Truck, Pick-up, large		Ford	F350
PST010	Passenger car	STOCK#181611	Ford	Crown Victoria
PST010	Truck, Pick-up, large	3/4 TON V/8 5.9L	Dodge	RAM PU BR2L62
PST010	Truck, Pick-up, large	3/4 TON V/8 5.9L	Dodge	RAM PU BR2L62
PST010	Truck, Pick-up, large	3/4 TON	Dodge	RAM PU
PST010	Truck, Pick-up, small	1/2 TON	GMC	C15 FULL EXT CAB 4x4
PST010	Truck, Pick-up, large	3/4 TON	Dodge	RAM PU
PST010	Truck, Pick-up, large	3/4 TON	Dodge	RAM PU
PST010	Truck, Pick-up, large	3/4 TON 5.9L	Dodge	RAM
PST010	Truck, Pick-up, large	3/4 TON 5.9L	Dodge	RAM
PST010	Van, utility/passenger	WALK-IN VAN	Chevrolet	CP30842
PST010	Van, utility/passenger		Chevrolet	CG31503
PST010	Truck, Pick-up, large	3/4 T V/8 250	Dodge	RAM BR2L62 5.9L ENG
PST010	Truck, Pick-up, large	3/4 TON	Dodge	RAM BR2L62
PST010	Truck, Flatbed		Chevrolet	CC31403
PST010	Truck, Flatbed		Chevrolet	CC31403
PST010	Van, utility/passenger		Ford	F56 SERVICEBDY
PST010	Van, smalll		Chevrolet	Astrovan
PST010	Van, utility/passenger		Chevrolet	CL11006 VAN
PST010	Van, utility/passenger		Chevrolet	CG31405 CARGO
PST010	Passenger car		Buick	Century
PST010	Passenger car	V-6 3.8L	Chevrolet	IMPALA
PST010	Truck, Pick-up, small	1/2 TON V/8	Chevrolet	K1PU (USED) 1500S
PST010	Truck, Flatbed		EZGO	875E
PST010	Truck, Pick-up, large	3/4 TON	Dodge	RAM 2500 BR2L62
PST010	SUV, smalll	4.0L 6 CYL AC	Jeep	Cherokee
PST010	Truck, Pick-up, large	3/4 TON	Chevrolet	C2500 350 2WD
PST010	Truck, Pick-up, small		GMC	SONOMA TS10653
PST010	Truck, Pick-up, small		GMC	SONOMA TS10653
PST010	SUV, smalll		Kia	Sedona
PST010	SUV, smalll		Ford	Explorer

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PST010	03428	2002	LDGT2	Gasoline	15	26,539	
PST010	03430	1994	LDGT3	Gasoline	15	781	
PST010	03431	1994	LDGT3	Gasoline	15	1,273	
PST010	03432	1995	HDGV2b	Gasoline	15	848	
PST010	03433	2003	LDGT2	Gasoline	15	3,007	
PST010	03434	2003	LDGT2	Gasoline	15	3,122	
PST010	03435	2003	LDGT4	Gasoline	15	23,410	
PST010	10093	2003	LDGT2	Gasoline	15	1,218	
PST010	10094	2003	LDGT2	Gasoline	15	2,552	
PST010	10101	1998	LDGT2	Gasoline	15	131	
PST010	10102	1999	LDGT2	Gasoline	15	5,197	
PST010	10103	1996	LDGT3	Gasoline	15	1,889	
PST010	10168	1996	HDGV2b	Gasoline	15	5,230	
PST010	10169	1998	LDGT4	Gasoline	15	1,583	
PST010	10179	1992	HDGV2b	Gasoline	15	4,353	
PST010	10180	1996	LDGT4	Gasoline	15	1,042	8,600
PST010	10181	1991	LDGV	Gasoline	15	3,741	
PST010	10245	1996	HDGV2b	Gasoline	15	5,291	
PST010	10260	2005	LDGV	Gasoline	15	1,668	
PST010	10331	2005	LDGT1	Gasoline	15	2,783	
PST010	10333	2005	LDGT1	Gasoline	15	1,593	
PST010	10337	2005	LDGT2	Gasoline	15	19,062	5,984
PST010	10394	2005	LDGT1	Gasoline	15	1,330	
PST010	10429	2005	LDGV	Gasoline	15	7,934	
PST010	10434	1998	LDGT2	Gasoline	15	413	
PST010	10435	2005	LDGT1	Gasoline	15	1,021	
PST010	10436	1998	LDGT3	Gasoline	15	705	
PST010	10437	2000	LDGT2	Gasoline	15	240	
PST010	10497	2001	LDGT3	Propane	15	0	
PST010	10516	2002	LDGT2	Gasoline	15	0	
PST010	10529	1992	HDGV2b	Gasoline	15	0	
PST010	10555	2006	LDGT1	Gasoline	15	0	
PST020	14008	1990	HDDV2b	Diesel	15	3,480	
PST020	14012	1983	HDDV2b	Diesel	15	1,740	
PST020	14042	1988	HDDV2b	Diesel	15	3,495	
PST020	14043	1988	HDDV2b	Diesel	15	3,000	
PST020	14044	1991	HDDV2b	Diesel	15	3,435	
PST020	14081	1996	HDGV2b	Gasoline	15	7,155	
PST020	14082	1999	HDGV2b	Gasoline	15	7,935	
PST020	14083	1997	HDGV2b	Gasoline	15	6,345	
PST020	14084	1997	HDGV2b	Gasoline	15	7,560	
PST020	14085	1996	HDGV2b	Gasoline	15	6,555	
PST020	15112	1986	HDDV2b	Diesel	15	5,580	
PST020	15576	1995	LDGT3	Gasoline	15	6,480	
PST020	15811	1998	LDGT2	Gasoline	15	5,940	
PST020	15812	1998	LDGT2	Gasoline	15	6,195	
PST020	15813	2000	LDGT2	Gasoline	15	6,990	
PST020	15893	1999	LDGT2	Gasoline	15	7,350	
PST020	J-01	2005	HDGV3	Gasoline	15	21,750	
PST020	J-11	2005	LDGT4	Gasoline	15	39,750	
PST020	J-12	2005	LDGT4	Gasoline	15	39,750	
PST020	J-13	2005	LDGT4	Gasoline	15	39,750	
PST020	J-51	2005	LDGT2	Gasoline	15	42,000	
PST020	J-52	2005	LDGT2	Gasoline	15	42,000	

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PST010	SUV, smalll	V8 4.0 L	Ford	Explorer
PST010	Truck, Pick-up, small	1/2 T 4.3Z AC	Chevrolet	1500C Cheyenne 1994
PST010	Truck, Pick-up, small	V/6 4.3L	Chevrolet	1500C CHEYENNE
PST010	Truck, Pick-up, large	1 TON	Chevrolet	C3500 350 CID
PST010	SUV, smalll	V6 4.0 L	Ford	Explorer
PST010	SUV, smalll	V6 4.0 L	Ford	Explorer SUV
PST010	Truck, Pick-up, large	1/2 T 4X4 4.8 L V8	Chevrolet	K15 EXT CAB PICKUP
PST010	SUV, smalll	SUV	Ford	Explorer SUV
PST010	SUV, smalll	SUV	Ford	Explorer SUV
PST010	Truck, Pick-up, small	1/2 TON	Ford	Ranger 98 XCab
PST010	Truck, Pick-up, small	B3000	Mazda	X Cab AIR/AUTO TRAN
PST010	Truck, Pick-up, small	1/2 TON	Dodge	DODGE 1500
PST010	Van, utility/passenger		Chevrolet	G3500 P SERIES
PST010	Truck, Pick-up, large	3/4 TON	Chevrolet	USED, meter 68417
PST010	Truck, Pick-up, large	1 TON	Chevrolet	USED, meter 100,868
PST010	Truck, Pick-up, large	3/4 TON 4.9L	Ford	F250
PST010	Passenger car		Ford	Taurus
PST010	Van, utility/passenger	WALK-IN VAN	Chevrolet	G3500 Multistop
PST010	Passenger car	4 DR Hybrid	Toyota	Prius
PST010	SUV, smalll	4x4	Ford	103 Escape Hybrid
PST010	SUV, smalll	2 DR Hybrid	Ford	ESCAPE 4x2 U95
PST010	SUV, smalll		Ford	Explorer
PST010	SUV, smalll	2 DR Hybrid	Ford	ESCAPE 4x2 U95
PST010	Passenger car	2 cy/4 dr	Ford	Interceptor
PST010	SUV, smalll	4 DR	Jeep	Cherokee
PST010	SUV, smalll	4 DR Hybrid	Ford	Escape Hybrid 2WD
PST010	Truck, Pick-up, small	1/2 TON	Dodge	Ram 1500 4WD
PST010	SUV, smalll	4 DR	Jeep	Cherokee
PST010	Truck, Pick-up, small	1/2 TON	Ford	F/150/7700 HD
PST010	Truck, Pick-up, small	1/2 TON	Mitsubishi	Sport XLS
PST010	Truck, Flatbed		GMC	3500
PST010	SUV, smalll		Ford	Escape
PST020	Van, utility/passenger		Dodge	Ram 250 Van
PST020	Van, utility/passenger		GMC	3500 Van
PST020	Van, utility/passenger		Dodge	Ram 250 Van
PST020	Van, utility/passenger		Dodge	Ram 350 Van
PST020	Van, utility/passenger		Dodge	Ram 150 Van
PST020	Van, utility/passenger		Ford	Club Wagon van
PST020	Van, utility/passenger		Ford	Econoline Van
PST020	Van, utility/passenger		Ford	Club Wagon van
PST020	Van, utility/passenger		Ford	Club Wagon van
PST020	Van, utility/passenger		Ford	Club Wagon van
PST020	Truck, Pick-up, small		Toyota	Pick Up
PST020	Truck, Pick-up, small		Ford	F150 Pick Up
PST020	Truck, Pick-up, small		Chevrolet	S-10 Pick Up
PST020	Truck, Pick-up, small		Chevrolet	S-10 Pick Up
PST020	Truck, Pick-up, small		Chevrolet	S-10 Pick Up
PST020	Truck, Pick-up, small		Chevrolet	S-10 Pick Up
PST020	Truck, Pick-up, large	5.4L	Ford	F350
PST020	Truck, Pick-up, large	5.4L	Ford	F250
PST020	Truck, Pick-up, large	5.4L	Ford	F250
PST020	Truck, Pick-up, large	5.4L	Ford	F250
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER

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Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PST020	J-53	2005	LDGT2	Gasoline	15	42,000	
PST020	J-54	2005	LDGT2	Gasoline	15	42,000	
PST020	J-55	2005	LDGT2	Gasoline	15	42,000	
PST020	J-56	2005	LDGT2	Gasoline	15	42,000	
PST020	J-57	2005	LDGT2	Gasoline	15	42,000	
PST020	J-58	2005	LDGT2	Gasoline	15	42,000	
PST020	J-59	2005	LDGT2	Gasoline	15	42,000	
PST020	J-60	2005	LDGT2	Gasoline	15	42,000	
PST020	J-61	2005	LDGT2	Gasoline	15	42,000	
PST020	J-62	2005	LDGT2	Gasoline	15	42,000	
PST020	J-63	2005	LDGT2	Gasoline	15	42,000	
PST020	J-64	2005	LDGT2	Gasoline	15	42,000	
PST020	J-65	2005	LDGT2	Gasoline	15	42,000	
PST020	J-66	2005	LDGT2	Gasoline	15	42,000	
PST020	J-67	2005	LDGT2	Gasoline	15	42,000	
PST020	J-68	2005	LDGT2	Gasoline	15	42,000	
PST020	J-69	2005	LDGT2	Gasoline	15	42,000	
PST020	J-70	2003	LDGT2	Gasoline	15	42,000	
PST020	J-71	2002	LDGT2	Gasoline	15	42,000	
PST020	J-72	2002	LDGT2	Gasoline	15	39,750	
PST020	J-73	2003	LDGT2	Gasoline	15	42,000	
PST020	J-74	2000	LDGT2	Gasoline	15	39,750	
PST020	U-01	2005	HDDV2b	Diesel - ULS	15	27,000	
PST020	U-02	2005	HDDV2b	Diesel - ULS	15	27,000	
PST020		1985	HDDV5	Diesel	15	3,600	
PST050	5730	1997	HDGV5	Gasoline	15	10,160	
PST050	5853	1997	LDGT4	Gasoline	15	20,180	
PST050	5855	1997	LDGT3	Gasoline	15	23,540	
PST050	5856	1997	LDGT4	Gasoline	15	36,940	
PST050	5858	1997	LDGT4	Gasoline	15	4,860	
PST050	5859	1997	LDGT4	Gasoline	15	520	
PST050	5860	1997	LDGT4	Gasoline	15	3,980	
PST050	5861	1997	LDGT4	Gasoline	15	5,440	
PST050	5862	1997	LDGT4	Gasoline	15	12,460	
PST050	5866	1997	HDGV2b	Gasoline	15	0	
PST050	5867	1997	HDGV2b	Gasoline	15	6,480	
PST050	5874	1997	LDGT3	Gasoline	15	8,420	
PST050	5875	1997	LDGT3	Gasoline	15	29,980	
PST050	5876	1997	LDGT3	Gasoline	15	24,240	
PST050	5880	1997	LDGT2	Gasoline	15	14,720	
PST050	5907	1997	LDGT2	Gasoline	15	7,840	
PST050	5908	1997	LDGT2	Gasoline	15	11,680	
PST050	5909	1997	LDGT2	Gasoline	15	36,080	
PST050	5910	1997	LDGT2	Gasoline	15	3,400	
PST050	5911	1997	LDGT3	Gasoline	15	3,120	
PST050	5947	1997	LDGT3	Gasoline	15	9,600	
PST050	59213	1997	HDGV2b	Gasoline	15	2,460	
PST050	59238	1997	LDGT2	Gasoline	15	34,940	
PST050	59437	1997	LDGT3	Gasoline	15	1,360	
PST050	59438	1997	LDGT3	Gasoline	15	18,860	
PST050	59441	1997	LDGT3	Gasoline	15	30,240	
PST050	59442	1997	LDGT3	Gasoline	15	40,460	
PST050	59443	1997	LDGT3	Gasoline	15	41,480	
PST050	59444	1997	LDGT3	Gasoline	15	14,180	

Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	4.3L	Chevrolet	S-10
PST020	Truck, Pick-up, small	2.3L	Ford	RANGER
PST020	Truck, Pick-up, small	4.3L	Chevrolet	S-10
PST020	Van, utility/passenger	7.3L	Ford	F350
PST020	Van, utility/passenger	7.3L	Ford	F450
PST020	Truck, Fuel		International	S1900 Fuel Truck
PST050	Truck, Fuel		Chevrolet	Kodiak
PST050	Truck, Pick-up, large		Ford	F250
PST050	Truck, Pick-up, small		Ford	F150
PST050	Truck, Pick-up, large		Chevrolet	Silverado
PST050	Truck, Pick-up, large		Chevrolet	Silverado
PST050	Truck, Pick-up, large		Chevrolet	Silverado
PST050	Truck, Pick-up, large		Chevrolet	Silverado
PST050	Truck, Pick-up, large		Chevrolet	Silverado
PST050	Truck, Pick-up, large		Chevrolet	Silverado
PST050	Truck, Pick-up, large		Chevrolet	One Ton
PST050	Truck, Pick-up, large		Chevrolet	One Ton
PST050	Truck, Pick-up, small		Ford	F150
PST050	Truck, Pick-up, small		Ford	F150
PST050	Truck, Pick-up, small		Ford	F150
PST050	SUV, smalll		Chevrolet	Blazer
PST050	Truck, Pick-up, small		Chevrolet	S10
PST050	Truck, Pick-up, small		Chevrolet	S10
PST050	Truck, Pick-up, small		Chevrolet	S10
PST050	Truck, Pick-up, small		Chevrolet	S10
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, large		Chevrolet	K-30 PU (1-ton)
PST050	Truck, Pick-up, small		Chevrolet	S10
PST050	Truck, Pick-up, small		Chevrolet	K-10 PU
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500

Puget Sound Maritime Air Emissions Inventory
Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	ID No.	YEAR	Class	FUEL	SPEED (mph)	2005 miles	GVWR
PST050	59445	1997	LDGT3	Gasoline	15	0	
PST050	59540	1997	LDGT3	Gasoline	15	2,040	
PST050	59541	1997	LDGT3	Gasoline	15	16,440	
PST050	59542	1997	LDGT3	Gasoline	15	19,200	
PST050	59543	1997	LDGT3	Gasoline	15	32,160	
PST050	59544	1997	LDGT3	Gasoline	15	14,460	
PST050	59545	1997	LDGT3	Gasoline	15	420	
PST050	59546	1997	LDGT3	Gasoline	15	18,420	
PST050	59547	1997	LDGT3	Gasoline	15	35,100	
PST050	59548	1997	LDGT3	Gasoline	15	2,040	
PST050	59549	1997	LDGT3	Gasoline	15	1,260	
PST050	59550	1997	HDGV2b	Gasoline	15	15,200	
PST060	825	1996	HDDV5	Diesel	10	3,600	
PST060	827	1996	HDDV5	Diesel	10	74,640	
PST060	828	1996	HDDV5	Diesel	10	9,315	
PST060	830	1996	HDDV5	Diesel	10	33,825	
PST060	831	1996	HDDV5	Diesel	10	35,340	
PST070	14094	1998	HDGV2b	Gasoline	10	5,190	
PST070	15096	2000	LDGT2	Gasoline	10	6,225	
PST070	15172	2000	LDGT2	Gasoline	10	1,590	
PST070	15175	2000	LDGT2	Gasoline	10	1,185	
PST070	15548	1989	LDGT3	Propane	10	6,180	
PST070	15550	1990	LDGT3	Propane	10	13,785	
PST070	15551	1990	LDGT3	Propane	10	6,015	
PST070	15553	1989	LDGT3	Gasoline	10	1,785	
PST070	15555	1989	LDGT3	Gasoline	10	3,900	
PST070	15565	1990	LDGT3	Gasoline	10	6,690	
PST070	15566	1989	LDGT3	Gasoline	10	5,130	
PST070	17046	2002	HDGV2b	Gasoline	10	7,995	
PST070	18011	1991	HDGV2b	Gasoline	10	13,950	
PST070		1990	HDDV5	Diesel	10	3,600	
PST100		1987	LDGV	Gasoline	10	2,413	
PST100		1989	LDGV	Gasoline	10	2,145	
PST100		1992	LDGT3	Gasoline	10	1,263	
PST100		1995	LDGT2	Gasoline	10	534	

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Table E-5 Fleet Vehicle Input Data, 2005

Terminal ID	Vehicle Type	Type info	MAKE	MODEL
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, Pick-up, small		Chevrolet	C1500
PST050	Truck, utility		Chevrolet	C3000 Flatbed
PST060	Truck, Fuel		Fuel truck	Mack
PST060	Truck, utility		GMC	Service Truck
PST060	Truck, utility		GMC	Service Truck
PST060	Truck, utility		GMC	Service Truck
PST060	Truck, utility		GMC	Service Truck
PST070	Van, utility/passenger		Ford	ELDORADO SHUTTLE BUS
PST070	Truck, Pick-up, small		Ford	RANGER PICK-UP
PST070	Truck, Pick-up, small		Ford	RANGER PICK-UP
PST070	Truck, Pick-up, small		Ford	RANGER PICK-UP
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - REEFER S/V
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - GEARMEN
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - YARD F/M
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - SUPERINTENDENT
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - CHIEF S/V
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - MARINE DEPT
PST070	Truck, Pick-up, small		Dodge	DAKOTA PICK-UP - RAIL S/V
PST070	Van, utility/passenger		Chevrolet	3500 CUBE VAN - 14'
PST070	Truck, utility		Ford	F-350 FLATBED TRUCK
PST070	Truck, Fuel		Fuel truck	Volvo
PST100	Passenger car		Chevrolet	car
PST100	Passenger car		Chevrolet	car
PST100	Truck, Pick-up, small		Chevrolet	truck
PST100	Truck, Pick-up, small		Chevrolet	S-10

Appendix F – Agency Supporting Data

Summary For this area:	Data Source This data source used:	
PSCAA	PSCAA	Point Source
	PSCAA	Area
	PSCAA	Nonroad
	PSCAA	Onroad
	PSCAA	Locomotive
	PSCAA	Evaporative
ORCAA	ORCAA	Point Source
	WADOE	Area
	WADOE	Locomotive
	WADOE	Nonroad
	WADOE	Onroad
NWCAA	NWCAA	Point Source
	WADOE	Area
	WADOE	Locomotive
	WADOE	Nonroad
	WADOE	Onroad
San Juan	WADOE	Point Source
	WADOE	Area
	WADOE	Locomotive
	WADOE	Nonroad
	WADOE	Onroad

Summary Data Source

For this area:	This data source used:	
PSCAA	PSCAA	Point Source
	PSCAA	Area
	PSCAA	Nonroad
	PSCAA	Onroad
	PSCAA	Locomotive
	PSCAA	Evaporative
ORCAA	ORCAA	Point Source
	WADOE	Area
	WADOE	Locomotive
	WADOE	Nonroad
	WADOE	Onroad
NWCAA	NWCAA	Point Source
	WADOE	Area
	WADOE	Locomotive
	WADOE	Nonroad
	WADOE	Onroad
San Juan	WADOE	Point Source
	WADOE	Area
	WADOE	Locomotive
	WADOE	Nonroad
	WADOE	Onroad

Puget Sound Emissions Inventory
Regional Clean Air Agency 2005 Data Supplied by NWCAA, Point Source

TITLE V & SYNTHETIC MINOR & MISC. LARGER SOURCES BY COUNTY	2005 PM_{10}	2004 PM_{10}	CHANGE IN PM_{10}	2005 SO_2	2004 SO_2	CHANGE IN SO_2	2005 NO_X	2004 NO_X	CHANGE IN NO_X	2005 VOC	2004 VOC	CHANGE IN VOC	2005 CO	2004 CO	CHANGE IN CO
ISLAND COUNTY	**Tons Per Year**			**Tons Per Year**			**Tons Per Year**			**Tons Per Year**			**Tons Per Year**		
Naval Air Station-Whidbey Island	**26**	31	-5	**0**	1	-1	**16**	22	-6	**15**	24	-9		27	-27
2004-2005 Island County Totals	**26**	31		**0**	1		**16**	22		**15**	24		**0**	27	
SKAGIT COUNTY															
Fribrex Corporation	**0**	0	0	**0**	0	0	**0**	0	0	**7**	5	2	**0**	0	0
General Chemical Corporation	**0**	0	0	**128**	178	-50	**12**	13	-1	**0**	0	0	**0**	3	-3
March Point Cogeneration Company	**6**	6	0	**19**	18	1	**242**	228	14	**18**	19	-1	**49**	36	13
Nordic Tugs	**0**	0	0	**0**	0	0	**0**	0	0	**11**	11	0	**0**	0	0
Northwest Pipeline - Mt. Vernon Station	**2**	4	-2	**1**	1	0	**60**	137	-77	**3**	10	-7	**32**	55	-23
Pacific Mariner	**0**	0	0	**0**	0	0	**0**	0	0	**5**	5	0	**0**	0	0
Pacific Woodtech	**4**	-		**0**	-		**3**	-		**26**	-		**1**	-	
Puget Sound Energy - Fredonia Station	**0**	1	-1	**1**	1	0	**6**	11	-5	**0**	0	0	**0**	2	-2
Puget Sound Refining - Shell Oil Company	**211**	259	-48	**4,052**	3,629	423	**1,297**	1,008	289	**578**	594	-16	**599**	740	-141
Tesoro Northwest Company	**652**	785	-133	**5,575**	6,033	-458	**2,257**	2,468	-211	**1,457**	1,508	-51	**677**	798	-121
2004-2005 Skagit County Totals	**875**	1,055		**9,776**	9,860		**3,877**	3,865		**2,105**	2,152		**1,358**	1,634	
WHATCOM COUNTY															
Alcoa Primary Metals - Intalco	**132**	167	-35	**1,736**	1,963	-227	**102**	86	16	**39**	29	10	**11,295**	15,131	-3,836
BP West Coast Products	**131**	129	2	**1,397**	1,532	-135	**2,179**	2,215	-36	**413**	434	-21	**888**	933	-45
Canfor USA	**0**	0	0	**0**	0	0	**0**	0	0	**17**	16	1	**0**	0	0
ConocoPhillips Company	**100**	106	-6	**494**	691	-197	**1,139**	1,146	-7	**776**	607	169	**279**	262	17
Darigold (West Farm Foods)	**48**	38	10	**25**	25	0	**30**	30	0	**1**	1	0	**21**	21	0
Encogen Northwest Cogeneration Plant	**6**	6	0	**5**	4	1	**51**	51	0	**0**	1	-1	**14**	13	1
Ershigs, Inc.	**0**	0	0	**0**	0	0	**0**	0	0	**33**	26	7	**0**	0	0
Fairhaven Shipyard	**0**	0	0	**0**	0	0	**0**	0	0	**15**	12	3	**0**	0	0
Heath Tecna, Inc.	**0**	0	0	**0**	0	0	**1**	0	1	**12**	5	7	**1**	0	1
Maax Hydroswirl	**0**	0	0	**0**	0	0	**0**	0	0	**19**	25	-6	**0**	0	0
Northwest Pipeline Corp. - Sumas Station	**2**	1	1	**3**	2	1	**163**	168	-5	**10**	10	0	**48**	48	0
Oceanus Plastics	**0**	0	0	**0**	0	0	**0**	0	0	**4**	3	1	**0**	0	0
Puget Sound Energy - Whitehorn Station	**0**	0	0	**0**	8	-8	**2**	14	-12	**0**	0	0	**0**	0	0
Sea Sport Boats, Inc.	**0**	0	0	**0**	0	0	**0**	0	0	**7**	7	0	**0**	0	0
Sumas Cogeneration Company, L.P./Calpine	**17**	17	0	**9**	9	0	**69**	71	-2	**0**	0	0	**1**	1	0
Tenaska Washington Partners, L.P.	**12**	13	-1	**6**	7	-1	**52**	51	1	**5**	1	4	**6**	6	0
Western Washinton University	**1**	1	0	**1**	1	0	**4**	3	1	**1**	1	0	**9**	9	0
Whatcom Builders	**1**	2	-1	**0**	0	0	**1**	1	0	**7**	3	4	**24**	18	6
2004-2005 Whatcom County Totals	**450**	480		**3,676**	4,242		**3,793**	3,836		**1,359**	1,181		**12,586**	16,442	
2004-2005 NWCAA TRI-COUNTY TOTAL	**1,351**	1,566		**13,452**	14,103		**7,686**	7,723		**3,479**	3,357		**13,944**	18,103	
TRI-COUNTY EMISSION INCREASE/DECREASE		**-215**	-13.73%		**-651**	-4.62%		**-37**	-0.48%		**122**	3.63%		**-4,159**	-22.97%

Puget Sound Emissions Inventory
Regional Clean Air Agency 2005 Data Supplied by ORCAA, Point Source

2005 Emission Inventory Summary - Olympic Region Clean Air Agency - Updated Emissions - 11/29/2006

Point Source - Actual Emissions by County - Criteria Pollutants and Green House Gases Ton/Yr

			-CRITERIA-							-GHG-		
County No	County Na	YEAR	PM	PM-10	PM 2.5	SO2	NOX	VOC	CO	CO2	CH4	N2O
9	**Clallam**	**2005**	**314**	**203**	**197**	**337**	**329**	**146**	**1061**	**239498**	**26**	**16**
27	**Grays Har**	**2005**	**854**	**715**	**658**	**336**	**929**	**377**	**1634**	**593006**	**61**	**180**
31	**Jefferson**	**2005**	**532**	**346**	**288**	**412**	**602**	**103**	**1845**	**18231**	**2**	**1**
45	**Mason**	**2005**	**431**	**214**	**186**	**6**	**80**	**249**	**273**	**144953**	**14**	**0**
49	**Pacific**	**2005**	**46**	**27**	**24**	**10**	**86**	**18**	**85**	**63777**	**7**	**1**
67	**Thurston**	**2005**	**28**	**13**	**11**	**1**	**41**	**516**	**31**	**3538**	**0**	**0**

Note: 1 **Updated Emissions,11/29/2006, are highlighted in "Yellow"**
2 Includes All Major Point Sources
3 Includes most Minor Point Sources > than around 1 Ton/Yr Criteria Pollutant
4 PM 2.5 data is included (PM 2.5 dataset incomplete, nulls were set = to PM10)
5 N2O Mason Cnty: The main combustion source in Mason County used a different emission factor for N2O than other combustion sources. The source used an emission factor specific to a Boiler with an ESP - N2O was non detect.
6 The Greenhouse gases are presented as native gases, equivalents are not used.

Puget Sound Emissions Inventory
Regional Clean Air Agency 2005 Data Supplied by PSCAA, Point, Nonroad, Onroad, Area Sources

Actual Emissions by County, tons/year

	Source Type	County	NOx	VOC	CO	SOx	PM	PM-10	PM2.5	DPM
Agency										
PSCAA	Onroad Gasoline	King	25,736	28,883	361,297	430			377	
PSCAA	Onroad Diesel	King	19,375	943	5,088	483			**562**	**562**
PSCAA	Onroad CNG	King	94	6	40	1			8	
PSCAA	Onroad LPG	King	9	0	1	1			0	
PSCAA	Aircraft	King	1,765	1,433	3,463	174			32	
PSCAA	Aircraft Grnd Support	King	436	302	7,934	43			**12**	**12**
PSCAA	Railroads & Port Rail	King	2,126	106	277	162			**52**	**52**
PSCAA	Gasoline Rec Boats	King	424	2,376	12,515	15			116	
PSCAA	Diesel Recreation Boats	King	30	3	10	4			**2**	**2**
PSCAA	Ferries, Tugs, Other Ve	King	2,954	130	502	113			**146**	**146**
PSCAA	Ocean-Going Vessels	King	1,641	61	138	1,556			**100**	**100**
PSCAA	Misc Gasoline Nrd	King	1,416	7,782	139,993	59			216	
PSCAA	Misc Diesel Nonroad	King	6,581	755	3,435	190			**554**	**554**
PSCAA	Misc LPG Nonroad	King	1,847	503	8,603	2			11	
PSCAA	Misc CNG Nonroad	King	169	3	946	0			1	
PSCAA	Point Sources	King	5,551	2,017	3,072	700			239	
PSCAA	Natural Gas Burning	King	2,982	158	1,778	17			218	
PSCAA	Propane Burning	King	202	4	30	20			6	
PSCAA	Distillate Oil Burning	King	873	16	205	1,749			113	
PSCAA	Wood Fireplaces	King	74	6,480	7,148	11			843	
PSCAA	Fireplace Inserts	King	32	294	1,995	6			278	
PSCAA	Wood Stoves	King	73	684	4,638	14			641	
PSCAA	Firelogs	King	25	471	1,118	3			207	
PSCAA	Pellet Stoves	King	77	67	219	2			20	
PSCAA	Land Clearing	King	45	262	3,190	7			403	

Puget Sound Emissions Inventory

Regional Clean Air Agency 2005 Data Supplied by PSCAA, Point, Nonroad, Onroad, Area Sources

Actual Emissions by County, tons/year

Agency	Source Type	County	NOx	VOC	CO	SOx	PM	PM-10	PM2.5	DPM
PSCAA	Household Garbage	King	48	69	684	8			280	
PSCAA	Yard Waste Burning	King	95	442	1,768	16			600	
PSCAA	Agric Burning	King	1	8	50	0			9	
PSCAA	Forest Burning	King	0	1	15	0			1	
PSCAA	Structure Burning	King	3	26	144	2			26	
PSCAA	Onroad Gasoline	Kitsap	2,689	3,101	39,915	42			37	
PSCAA	Onroad Diesel	Kitsap	1,884	92	495	47			**55**	**55**
PSCAA	Onroad CNG	Kitsap	9	1	4	0			1	
PSCAA	Onroad LPG	Kitsap	1	0	0	0			0	
PSCAA	Aircraft	Kitsap	1	13	323	0			0	
PSCAA	Aircraft Grnd Support	Kitsap	1	0	6	0			**0**	**0**
PSCAA	Railroads & Port Rail	Kitsap	0	0	0	0			**0**	**0**
PSCAA	Gasoline Rec Boats	Kitsap	95	522	2,778	3			25	
PSCAA	Diesel Recreation Boats	Kitsap	7	1	2	1			**0**	**0**
PSCAA	Ferries, Tugs, Other Ve	Kitsap	985	44	167	38			**49**	**49**
PSCAA	Ocean-Going Vessels	Kitsap	1,166	40	95	787			**57**	**57**
PSCAA	Misc Gasoline Nrd	Kitsap	115	784	11,916	5			23	
PSCAA	Misc Diesel Nonroad	Kitsap	774	86	404	22			**64**	**64**
PSCAA	Misc LPG Nonroad	Kitsap	45	12	207	0			0	
PSCAA	Misc CNG Nonroad	Kitsap	5	0	29	0			0	
PSCAA	Point Sources	Kitsap	91	152	42	0			85	
PSCAA	Natural Gas Burning	Kitsap	234	11	135	1			16	
PSCAA	Propane Burning	Kitsap	38	1	5	4			1	
PSCAA	Distillate Oil Burning	Kitsap	52	2	14	116			6	
PSCAA	Wood Fireplaces	Kitsap	10	904	997	2			118	

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Actual Emissions by County, tons/year

Agency	Source Type	County	NOx	VOC	CO	SOx	PM	PM-10	PM2.5	DPM
PSCAA	Fireplace Inserts	Kitsap	4	35	242	1			36	
PSCAA	Wood Stoves	Kitsap	21	183	1,252	4			181	
PSCAA	Firelogs	Kitsap	4	82	195	1			36	
PSCAA	Pellet Stoves	Kitsap	12	10	33	0			3	
PSCAA	Land Clearing	Kitsap	235	1,375	16,772	36			2,117	
PSCAA	Household Garbage	Kitsap	18	26	260	3			107	
PSCAA	Yard Waste Burning	Kitsap	39	181	725	6			246	
PSCAA	Agric Burning	Kitsap	3	21	139	1			25	
PSCAA	Forest Burning	Kitsap	0	0	4	0			0	
PSCAA	Structure Burning	Kitsap	0	4	19	0			3	
PSCAA	Total Pollutants	Kitsap	8,537	7,683	77,174	1,120			3,291	
PSCAA	Onroad Gasoline	Pierce	9,519	10,658	133,542	158			138	
PSCAA	Onroad Diesel	Pierce	7,116	346	1,869	177			**207**	**207**
PSCAA	Onroad CNG	Pierce	33	2	14	0			3	
PSCAA	Onroad LPG	Pierce	3	0	0	0			0	
PSCAA	Aircraft	Pierce	129	392	1,049	9			2	
PSCAA	Aircraft Grnd Support	Pierce	39	9	153	4			**3**	**3**
PSCAA	Railroads & Port Rail	Pierce	1,694	97	226	126			**43**	**43**
PSCAA	Gasoline Rec Boats	Pierce	162	1,034	5,029	6			51	
PSCAA	Diesel Recreational Boa	Pierce	12	1	4	1			**1**	**1**
PSCAA	Ferries, Tugs, Other Ve	Pierce	884	27	160	86			**35**	**35**
PSCAA	Ocean-Going Vessels	Pierce	793	27	67	975			**54**	**54**
PSCAA	Misc Gasoline Nrd	Pierce	422	2,669	42,899	18			80	
PSCAA	Misc Diesel Nonroad	Pierce	3,424	378	1,769	99			**280**	**280**
PSCAA	Misc LPG Nonroad	Pierce	332	90	1,546	0			2	

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Actual Emissions by County, tons/year

Agency	Source Type	County	NOx	VOC	CO	SOx	PM	PM-10	PM2.5	DPM
PSCAA	Misc CNG Nonroad	Pierce	30	1	165	0			0	
PSCAA	Point Sources	Pierce	1,076	671	1,693	438			181	
PSCAA	Natural Gas Burning	Pierce	1,066	55	635	6			76	
PSCAA	Propane Burning	Pierce	67	1	10	7			2	
PSCAA	Distillate Oil Burning	Pierce	169	3	40	340			22	
PSCAA	Wood Fireplaces	Pierce	14	1,267	1,398	2			165	
PSCAA	Fireplace Inserts	Pierce	13	139	825	2			116	
PSCAA	Wood Stoves	Pierce	36	384	2,281	7			315	
PSCAA	Firelogs	Pierce	10	178	423	1			78	
PSCAA	Pellet Stoves	Pierce	22	19	64	1			6	
PSCAA	Land Clearing	Pierce	90	525	6,406	14			809	
PSCAA	Household Garbage	Pierce	69	100	984	12			403	
PSCAA	Yard Waste Burning	Pierce	72	335	1,342	12			455	
PSCAA	Agric Burning	Pierce	28	192	1,250	4			224	
PSCAA	Forest Burning	Pierce	23	132	1,930	4			163	
PSCAA	Structure Burning	Pierce	1	11	60	1			11	
PSCAA	Onroad Gasoline	Snohomish	8,314	9,356	117,573	137			120	
PSCAA	Onroad Diesel	Snohomish	6,184	301	1,624	154			**180**	**180**
PSCAA	Onroad CNG	Snohomish	33	2	14	0			3	
PSCAA	Onroad LPG	Snohomish	3	0	0	0			0	
PSCAA	Aircraft	Snohomish	55	91	1,468	4			1	
PSCAA	Aircraft Grnd Support	Snohomish	12	5	134	2			**0**	**0**
PSCAA	Railroads & Port Rail	Snohomish	1,132	53	145	82			**27**	**27**
PSCAA	Gasoline Rec Boats	Snohomish	147	969	4,619	6			49	
PSCAA	Diesel Recreational Boa	Snohomish	11	1	4	1			**1**	**1**
PSCAA	Ferries, Tugs, Other Ve	Snohomish	2,463	99	395	101			**119**	**119**

Puget Sound Emissions Inventory

Regional Clean Air Agency 2005 Data Supplied by PSCAA, Point, Nonroad, Onroad, Area Sources

Actual Emissions by County, tons/year

Agency	Source Type	County	NOx	VOC	CO	SOx	PM	PM-10	PM2.5	DPM
PSCAA	Ocean-Going Vessels	Snohomish	97	3	8	105			**6**	**6**
PSCAA	Misc Gasoline Nrd	Snohomish	418	2,538	40,251	17			74	
PSCAA	Misc Diesel Nonroad	Snohomish	2,138	231	1,058	60			**171**	**171**
PSCAA	Misc LPG Nonroad	Snohomish	855	236	4,044	1			5	
PSCAA	Misc CNG Nonroad	Snohomish	67	1	344	0			0	
PSCAA	Point Sources	Snohomish	876	1,363	937	430			36	
PSCAA	Natural Gas Burning	Snohomish	823	42	476	5			59	
PSCAA	Propane Burning	Snohomish	104	2	15	10			3	
PSCAA	Distillate Oil Burning	Snohomish	259	3	57	485			35	
PSCAA	Wood Fireplaces	Snohomish	16	1,379	1,521	2			179	
PSCAA	Fireplace Inserts	Snohomish	15	141	912	3			134	
PSCAA	Wood Stoves	Snohomish	35	326	2,116	7			304	
PSCAA	Firelogs	Snohomish	10	192	456	1			84	
PSCAA	Pellet Stoves	Snohomish	52	45	149	2			14	
PSCAA	Land Clearing	Snohomish	129	755	9,207	20			1,162	
PSCAA	Household Garbage	Snohomish	48	69	683	8			280	
PSCAA	Yard Waste Burning	Snohomish	82	384	1,534	14			521	
PSCAA	Agric Burning	Snohomish	1	3	22	0			4	
PSCAA	Forest Burning	Snohomish	0	2	33	0			3	
PSCAA	Structure Burning	Snohomish	1	10	52	1			9	
			143,485	107,997	1,122,327	12,197	0	0	20,159	2,780

DPM = PM2.5 in bold (diesel sources)

	NOx	VOC	CO	SOx	PM	PM-10	PM2.5	DPM
King	74,684	54,283	570,297	5,788	0	0	6,072	1,428
Kitsap	17,074	15,367	154,348	2,239	0	0	6,581	225
Pierce	27,347	19,744	207,832	2,512	0	0	3,924	623
Snohomis	24,380	18,603	189,849	1,658	0	0	3,582	504
Region	143,485	107,997	1,122,327	12,197	0	0	20,159	2,780

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diesel?	category abbr	category descr	cnty	County Name	NOX	VOC	CO	SO2	PM10_e	PM2_5_	DPM
N	AGRIC	Agricultural Equipment	009	Clallam	0	0	7	0	0	0	0
N	AIRSRV	Airport Service Equipment	009	Clallam	0	0	2	0	0	0	0
N	COMM	Commercial Equipment	009	Clallam	8	26	764	0	0	0	0
N	CNSTR	Construction Equipment	009	Clallam	1	7	123	0	0	0	0
N	IND	Industrial Equipment	009	Clallam	24	7	142	0	0	0	0
N	LAWN	Lawn and Garden Equipment	009	Clallam	14	148	2,406	0	4	4	0
N	LOG	Logging Equipment	009	Clallam	2	40	349	0	3	2	0
N	REC	Recreational Equipment	009	Clallam	9	440	1,423	0	14	13	0
Y	AGRIC	Agricultural Equipment	009	Clallam	13	1	7	1	1	1	1
Y	AIRSRV	Airport Service Equipment	009	Clallam	3	0	1	0	0	0	0
Y	COMM	Commercial Equipment	009	Clallam	11	2	7	1	1	1	1
Y	CNSTR	Construction Equipment	009	Clallam	119	13	62	16	11	11	11
Y	IND	Industrial Equipment	009	Clallam	17	2	8	2	2	2	2
Y	LAWN	Lawn and Garden Equipment	009	Clallam	4	1	2	1	0	0	0
Y	LOG	Logging Equipment	009	Clallam	71	5	22	11	5	5	5
Y	REC	Recreational Equipment	009	Clallam	2	1	2	0	0	0	0
				Clallam	298	692	5,327	33	43	40	21
N	AGRIC	Agricultural Equipment	029	Island	0	0	6	0	0	0	0
N	COMM	Commercial Equipment	029	Island	6	20	594	0	0	0	0
N	CNSTR	Construction Equipment	029	Island	2	11	187	0	1	1	0
N	IND	Industrial Equipment	029	Island	9	3	54	0	0	0	0
N	LAWN	Lawn and Garden Equipment	029	Island	19	189	3,148	0	5	5	0
N	LOG	Logging Equipment	029	Island	0	0	0	0	0	0	0
N	REC	Recreational Equipment	029	Island	3	75	674	0	2	2	0
Y	AGRIC	Agricultural Equipment	029	Island	11	1	6	1	1	1	1
Y	COMM	Commercial Equipment	029	Island	9	1	5	1	1	1	1
Y	CNSTR	Construction Equipment	029	Island	181	20	94	24	17	16	16
Y	IND	Industrial Equipment	029	Island	13	1	6	2	1	1	1
Y	LAWN	Lawn and Garden Equipment	029	Island	7	1	3	1	1	1	1
Y	LOG	Logging Equipment	029	Island	0	0	0	0	0	0	0
Y	REC	Recreational Equipment	029	Island	0	0	0	0	0	0	0
				Island	260	322	4,778	29	29	28	20
N	AGRIC	Agricultural Equipment	031	Jefferson	0	0	3	0	0	0	0
N	COMM	Commercial Equipment	031	Jefferson	3	10	291	0	0	0	0
N	CNSTR	Construction Equipment	031	Jefferson	2	11	203	0	1	1	0
N	IND	Industrial Equipment	031	Jefferson	14	4	87	0	0	0	0
N	LAWN	Lawn and Garden Equipment	031	Jefferson	7	73	1,230	0	2	2	0
N	LOG	Logging Equipment	031	Jefferson	1	14	118	0	1	1	0
N	OIL	Oil Field Equipment	031	Jefferson	0	0	14	0	0	0	0
N	REC	Recreational Equipment	031	Jefferson	4	312	957	0	8	7	0
Y	AGRIC	Agricultural Equipment	031	Jefferson	6	1	3	1	1	1	1
Y	COMM	Commercial Equipment	031	Jefferson	4	1	3	1	0	0	0
Y	CNSTR	Construction Equipment	031	Jefferson	196	21	102	26	18	17	17
Y	IND	Industrial Equipment	031	Jefferson	8	1	4	1	1	1	1
Y	LAWN	Lawn and Garden Equipment	031	Jefferson	2	0	1	0	0	0	0
Y	LOG	Logging Equipment	031	Jefferson	24	2	8	4	2	2	2
Y	OIL	Oil Field Equipment	031	Jefferson	1	0	0	0	0	0	0
Y	REC	Recreational Equipment	031	Jefferson	0	0	0	0	0	0	0
				Jefferson	274	451	3,023	33	33	32	21
N	AGRIC	Agricultural Equipment	033	King	0	0	9	0	0	0	0
N	AIRSRV	Airport Service Equipment	033	King	7	5	133	0	0	0	0
N	COMM	Commercial Equipment	033	King	557	1,821	54,113	5	26	24	0
N	CNSTR	Construction Equipment	033	King	52	270	4,788	0	14	13	0
N	IND	Industrial Equipment	033	King	1,848	562	11,118	3	11	11	0
N	LAWN	Lawn and Garden Equipment	033	King	619	6,008	103,190	10	188	173	0
N	LOG	Logging Equipment	033	King	1	12	105	0	1	1	0
N	OIL	Oil Field Equipment	033	King	0	0	17	0	0	0	0
N	RRMAINT	Railroad Maintenance Equipment	033	King	0	0	11	0	0	0	0
N	REC	Recreational Equipment	033	King	21	639	3,969	0	20	18	0
Y	AGRIC	Agricultural Equipment	033	King	17	2	9	2	2	2	2
Y	AIRSRV	Airport Service Equipment	033	King	175	14	77	23	13	13	13
Y	COMM	Commercial Equipment	033	King	790	126	480	98	91	89	89
Y	CNSTR	Construction Equipment	033	King	4,637	504	2,419	606	425	412	412

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Y	IND	Industrial Equipment	033	King	841	83	382	123		78	75	75
Y	LAWN	Lawn and Garden Equipment	033	King	272	36	133	33		27	26	26
Y	LOG	Logging Equipment	033	King	21	2	7	3		2	1	1
Y	OIL	Oil Field Equipment	033	King	1	0	0	0		0	0	0
Y	RRMAINT	Railroad Maintenance Equipment	033	King	4	1	3	0		1	1	1
Y	REC	Recreational Equipment	033	King	2	1	3	0		0	0	0
				King	9,865	10,087	180,966	908		899	860	619
N	AGRIC	Agricultural Equipment	035	Kitsap	0	0	4	0		0	0	0
N	AIRSRV	Airport Service Equipment	035	Kitsap	0	0	1	0		0	0	0
N	COMM	Commercial Equipment	035	Kitsap	24	77	2,303	0		1	1	0
N	CNSTR	Construction Equipment	035	Kitsap	7	39	682	0		2	2	0
N	IND	Industrial Equipment	035	Kitsap	39	12	234	0		0	0	0
N	LAWN	Lawn and Garden Equipment	035	Kitsap	64	631	10,688	1		19	17	0
N	LOG	Logging Equipment	035	Kitsap	0	0	0	0		0	0	0
N	OIL	Oil Field Equipment	035	Kitsap	0	0	14	0		0	0	0
N	REC	Recreational Equipment	035	Kitsap	4	139	670	0		4	4	0
Y	AGRIC	Agricultural Equipment	035	Kitsap	7	1	4	1		1	1	1
Y	AIRSRV	Airport Service Equipment	035	Kitsap	1	0	0	0		0	0	0
Y	COMM	Commercial Equipment	035	Kitsap	34	5	20	4		4	4	4
Y	CNSTR	Construction Equipment	035	Kitsap	661	72	345	86		61	59	59
Y	IND	Industrial Equipment	035	Kitsap	46	5	21	7		4	4	4
Y	LAWN	Lawn and Garden Equipment	035	Kitsap	26	3	13	3		3	2	2
Y	LOG	Logging Equipment	035	Kitsap	0	0	0	0		0	0	0
Y	OIL	Oil Field Equipment	035	Kitsap	1	0	0	0		0	0	0
Y	REC	Recreational Equipment	035	Kitsap	1	0	1	0		0	0	0
				Kitsap	913	984	15,001	103		99	95	70
N	AGRIC	Agricultural Equipment	045	Mason	0	0	5	0		0	0	0
N	AIRSRV	Airport Service Equipment	045	Mason	0	0	0	0		0	0	0
N	COMM	Commercial Equipment	045	Mason	4	14	410	0		0	0	0
N	CNSTR	Construction Equipment	045	Mason	1	6	103	0		0	0	0
N	IND	Industrial Equipment	045	Mason	26	8	155	0		0	0	0
N	LAWN	Lawn and Garden Equipment	045	Mason	10	103	1,675	0		3	2	0
N	LOG	Logging Equipment	045	Mason	0	9	80	0		1	1	0
N	REC	Recreational Equipment	045	Mason	6	270	965	0		9	8	0
Y	AGRIC	Agricultural Equipment	045	Mason	8	1	4	1		1	1	1
Y	AIRSRV	Airport Service Equipment	045	Mason	0	0	0	0		0	0	0
Y	COMM	Commercial Equipment	045	Mason	6	1	4	1		1	1	1
Y	CNSTR	Construction Equipment	045	Mason	100	11	52	13		9	9	9
Y	IND	Industrial Equipment	045	Mason	16	2	7	2		1	1	1
Y	LAWN	Lawn and Garden Equipment	045	Mason	2	0	1	0		0	0	0
Y	LOG	Logging Equipment	045	Mason	16	1	5	2		1	1	1
Y	REC	Recreational Equipment	045	Mason	1	0	1	0		0	0	0
				Mason	198	426	3,469	20		26	25	13
N	AGRIC	Agricultural Equipment	053	Pierce	0	1	13	0		0	0	0
N	AIRSRV	Airport Service Equipment	053	Pierce	0	0	0	0		0	0	0
N	COMM	Commercial Equipment	053	Pierce	98	319	9,467	1		5	4	0
N	CNSTR	Construction Equipment	053	Pierce	32	168	2,980	0		9	8	0
N	IND	Industrial Equipment	053	Pierce	321	98	1,937	0		2	2	0
N	LAWN	Lawn and Garden Equipment	053	Pierce	217	2,120	36,220	3		65	60	0
N	LOG	Logging Equipment	053	Pierce	2	43	374	0		3	3	0
N	RRMAINT	Railroad Maintenance Equipment	053	Pierce	0	0	6	0		0	0	0
N	REC	Recreational Equipment	053	Pierce	12	357	2,321	0		11	10	0
Y	AGRIC	Agricultural Equipment	053	Pierce	23	3	13	3		3	2	2
Y	AIRSRV	Airport Service Equipment	053	Pierce	0	0	0	0		0	0	0
Y	COMM	Commercial Equipment	053	Pierce	138	22	84	17		16	16	16
Y	CNSTR	Construction Equipment	053	Pierce	2,886	314	1,506	377		264	256	256
Y	IND	Industrial Equipment	053	Pierce	206	21	95	30		20	19	19
Y	LAWN	Lawn and Garden Equipment	053	Pierce	93	12	45	11		9	9	9
Y	LOG	Logging Equipment	053	Pierce	76	5	24	11		5	5	5
Y	RRMAINT	Railroad Maintenance Equipment	053	Pierce	2	0	2	0		0	0	0
Y	REC	Recreational Equipment	053	Pierce	1	0	2	0		0	0	0
				Pierce	4,108	3,482	55,088	456		412	395	308
N	AGRIC	Agricultural Equipment	055	San Juan	0	0	4	0		0	0	0

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N	AIRSRV	Airport Service Equipment	055	San Juan	0	0	0	0	0	0	0
N	COMM	Commercial Equipment	055	San Juan	2	7	218	0	0	0	0
N	CNSTR	Construction Equipment	055	San Juan	1	4	71	0	0	0	0
N	IND	Industrial Equipment	055	San Juan	3	1	17	0	0	0	0
N	LAWN	Lawn and Garden Equipment	055	San Juan	9	90	1,553	0	3	3	0
N	LOG	Logging Equipment	055	San Juan	0	0	0	0	0	0	0
N	REC	Recreational Equipment	055	San Juan	3	138	608	0	4	4	0
Y	AGRIC	Agricultural Equipment	055	San Juan	8	1	4	1	1	1	1
Y	AIRSRV	Airport Service Equipment	055	San Juan	0	0	0	0	0	0	0
Y	COMM	Commercial Equipment	055	San Juan	3	1	2	0	0	0	0
Y	CNSTR	Construction Equipment	055	San Juan	68	7	36	9	6	6	6
Y	IND	Industrial Equipment	055	San Juan	3	0	1	0	0	0	0
Y	LAWN	Lawn and Garden Equipment	055	San Juan	4	1	2	1	0	0	0
Y	LOG	Logging Equipment	055	San Juan	0	0	0	0	0	0	0
Y	REC	Recreational Equipment	055	San Juan	1	0	1	0	0	0	0
				San Juan	106	251	2,517	12	16	15	8
N	AGRIC	Agricultural Equipment	057	Skagit	1	2	57	0	0	0	0
N	AIRSRV	Airport Service Equipment	057	Skagit	0	0	0	0	0	0	0
N	COMM	Commercial Equipment	057	Skagit	18	59	1,746	0	1	1	0
N	CNSTR	Construction Equipment	057	Skagit	3	17	295	0	1	1	0
N	IND	Industrial Equipment	057	Skagit	87	26	521	0	1	1	0
N	LAWN	Lawn and Garden Equipment	057	Skagit	20	210	3,407	0	6	5	0
N	LOG	Logging Equipment	057	Skagit	0	4	33	0	0	0	0
N	OIL	Oil Field Equipment	057	Skagit	0	0	17	0	0	0	0
N	RRMAINT	Railroad Maintenance Equipment	057	Skagit	0	0	1	0	0	0	0
N	REC	Recreational Equipment	057	Skagit	13	637	2,113	0	20	18	0
Y	AGRIC	Agricultural Equipment	057	Skagit	102	11	56	12	11	11	11
Y	AIRSRV	Airport Service Equipment	057	Skagit	0	0	0	0	0	0	0
Y	COMM	Commercial Equipment	057	Skagit	25	4	15	3	3	3	3
Y	CNSTR	Construction Equipment	057	Skagit	286	31	149	37	26	25	25
Y	IND	Industrial Equipment	057	Skagit	43	4	20	6	4	4	4
Y	LAWN	Lawn and Garden Equipment	057	Skagit	6	1	3	1	1	1	1
Y	LOG	Logging Equipment	057	Skagit	7	0	2	1	0	0	0
Y	OIL	Oil Field Equipment	057	Skagit	1	0	0	0	0	0	0
Y	RRMAINT	Railroad Maintenance Equipment	057	Skagit	1	0	0	0	0	0	0
Y	REC	Recreational Equipment	057	Skagit	2	1	3	0	0	0	0
				Skagit	615	1,008	8,440	62	74	70	45
N	AGRIC	Agricultural Equipment	061	Snohomish	0	1	23	0	0	0	0
N	AIRSRV	Airport Service Equipment	061	Snohomish	0	0	2	0	0	0	0
N	COMM	Commercial Equipment	061	Snohomish	97	317	9,431	1	5	4	0
N	CNSTR	Construction Equipment	061	Snohomish	15	80	1,423	0	4	4	0
N	IND	Industrial Equipment	061	Snohomish	909	277	5,470	1	5	5	0
N	LAWN	Lawn and Garden Equipment	061	Snohomish	204	1,981	34,062	3	62	57	0
N	LOG	Logging Equipment	061	Snohomish	1	21	187	0	1	1	0
N	OIL	Oil Field Equipment	061	Snohomish	0	0	17	0	0	0	0
N	RRMAINT	Railroad Maintenance Equipment	061	Snohomish	0	0	7	0	0	0	0
N	REC	Recreational Equipment	061	Snohomish	12	419	2,194	0	13	12	0
Y	AGRIC	Agricultural Equipment	061	Snohomish	41	5	22	5	5	4	4
Y	AIRSRV	Airport Service Equipment	061	Snohomish	2	0	1	0	0	0	0
Y	COMM	Commercial Equipment	061	Snohomish	138	22	84	17	16	15	15
Y	CNSTR	Construction Equipment	061	Snohomish	1,378	150	719	180	126	122	122
Y	IND	Industrial Equipment	061	Snohomish	381	37	172	56	35	34	34
Y	LAWN	Lawn and Garden Equipment	061	Snohomish	90	12	44	11	9	9	9
Y	LOG	Logging Equipment	061	Snohomish	38	3	12	6	3	3	3
Y	OIL	Oil Field Equipment	061	Snohomish	1	0	0	0	0	0	0
Y	RRMAINT	Railroad Maintenance Equipment	061	Snohomish	3	1	2	0	0	0	0
Y	REC	Recreational Equipment	061	Snohomish	2	0	2	0	0	0	0
				Snohomish	3,314	3,328	53,875	281	285	272	188
N	AGRIC	Agricultural Equipment	067	Thurston	0	1	16	0	0	0	0
N	AIRSRV	Airport Service Equipment	067	Thurston	0	0	0	0	0	0	0
N	COMM	Commercial Equipment	067	Thurston	25	82	2,434	0	1	1	0
N	CNSTR	Construction Equipment	067	Thurston	8	41	731	0	2	2	0
N	IND	Industrial Equipment	067	Thurston	53	16	318	0	0	0	0
N	LAWN	Lawn and Garden Equipment	067	Thurston	50	470	8,299	1	14	13	0

2005 Air Emissions Inventory, Dept. of Ecology (Sept. 12, 2006)
Noroad Mobile Sources from EPA's NONROAD2005 model

N	LOG	Logging Equipment	067	Thurston	1	11	92	0		1	1	0
N	RRMAINT	Railroad Maintenance Equipment	067	Thurston	0	0	2	0		0	0	0
N	REC	Recreational Equipment	067	Thurston	5	207	912	0		6	6	0
Y	AGRIC	Agricultural Equipment	067	Thurston	29	3	16	3		3	3	3
Y	AIRSRV	Airport Service Equipment	067	Thurston	0	0	0	0		0	0	0
Y	COMM	Commercial Equipment	067	Thurston	36	6	22	4		4	4	4
Y	CNSTR	Construction Equipment	067	Thurston	709	77	370	93		65	63	63
Y	IND	Industrial Equipment	067	Thurston	47	5	22	7		5	4	4
Y	LAWN	Lawn and Garden Equipment	067	Thurston	19	2	9	2		2	2	2
Y	LOG	Logging Equipment	067	Thurston	19	1	6	3		1	1	1
Y	RRMAINT	Railroad Maintenance Equipment	067	Thurston	1	0	1	0		0	0	0
Y	REC	Recreational Equipment	067	Thurston	1	0	1	0		0	0	0
				Thurston	1,002	924	13,250	114		105	100	78
N	AGRIC	Agricultural Equipment	073	Whatcom	1	3	65	0		0	0	0
N	AIRSRV	Airport Service Equipment	073	Whatcom	0	0	0	0		0	0	0
N	COMM	Commercial Equipment	073	Whatcom	42	137	4,061	0		2	2	0
N	CNSTR	Construction Equipment	073	Whatcom	5	28	492	0		1	1	0
N	IND	Industrial Equipment	073	Whatcom	126	38	760	0		1	1	0
N	LAWN	Lawn and Garden Equipment	073	Whatcom	44	440	7,315	1		13	12	0
N	LOG	Logging Equipment	073	Whatcom	0	1	9	0		0	0	0
N	OIL	Oil Field Equipment	073	Whatcom	0	0	14	0		0	0	0
N	RRMAINT	Railroad Maintenance Equipment	073	Whatcom	0	0	2	0		0	0	0
N	REC	Recreational Equipment	073	Whatcom	9	385	1,617	0		12	11	0
Y	AGRIC	Agricultural Equipment	073	Whatcom	115	13	63	13		13	12	12
Y	AIRSRV	Airport Service Equipment	073	Whatcom	0	0	0	0		0	0	0
Y	COMM	Commercial Equipment	073	Whatcom	59	9	36	7		7	7	7
Y	CNSTR	Construction Equipment	073	Whatcom	477	52	249	62		44	42	42
Y	IND	Industrial Equipment	073	Whatcom	65	7	30	10		6	6	6
Y	LAWN	Lawn and Garden Equipment	073	Whatcom	16	2	8	2		2	2	2
Y	LOG	Logging Equipment	073	Whatcom	2	0	1	0		0	0	0
Y	OIL	Oil Field Equipment	073	Whatcom	1	0	0	0		0	0	0
Y	RRMAINT	Railroad Maintenance Equipment	073	Whatcom	1	0	1	0		0	0	0
Y	REC	Recreational Equipment	073	Whatcom	1	0	2	0		0	0	0
				Whatcom	965	1,116	14,723	97		100	96	69
					21,919	23,070	360,457	2,148	0	2,120	2,027	1,462
N	BOAT	Recreational Boats	009	Clallam	23	398	1,101	0		6	6	6
Y	BOAT	Recreational Boats	009	Clallam	18	1	3	2		1	0	0
N	BOAT	Recreational Boats	029	Island	25	431	1,192	0		7	6	6
Y	BOAT	Recreational Boats	029	Island	20	1	3	3		1	1	1
N	BOAT	Recreational Boats	031	Jefferson	14	233	645	0		4	3	3
Y	BOAT	Recreational Boats	031	Jefferson	11	0	2	1		0	0	0
N	BOAT	Recreational Boats	033	King	297	5,073	14,038	4		83	76	76
Y	BOAT	Recreational Boats	033	King	234	9	37	30		7	6	6
N	BOAT	Recreational Boats	035	Kitsap	62	1,052	2,910	1		17	16	16
Y	BOAT	Recreational Boats	035	Kitsap	49	2	8	6		1	1	1
N	BOAT	Recreational Boats	045	Mason	27	447	1,261	0		7	7	7
Y	BOAT	Recreational Boats	045	Mason	21	1	3	3		1	1	1
N	BOAT	Recreational Boats	053	Pierce	141	2,403	6,649	2		39	36	36
Y	BOAT	Recreational Boats	053	Pierce	111	4	18	14		3	3	3
N	BOAT	Recreational Boats	055	San Juan	14	249	685	0		4	4	4
Y	BOAT	Recreational Boats	055	San Juan	11	0	2	1		0	0	0
N	BOAT	Recreational Boats	057	Skagit	48	818	2,253	1		13	12	12
Y	BOAT	Recreational Boats	057	Skagit	38	1	6	5		1	1	1
N	BOAT	Recreational Boats	061	Snohomish	140	2,400	6,640	2		39	36	36
Y	BOAT	Recreational Boats	061	Snohomish	111	4	18	14		3	3	3
N	BOAT	Recreational Boats	067	Thurston	49	837	2,309	1		14	13	13
Y	BOAT	Recreational Boats	067	Thurston	39	1	6	5		1	1	1
N	BOAT	Recreational Boats	073	Whatcom	46	788	2,170	1		13	12	12
Y	BOAT	Recreational Boats	073	Whatcom	36	1	6	5		1	1	1

Puget Sound Emissions Inventory

Regional Clean Air Agency 2005 Data Supplied by WADOE, Onroad Sources

2005 Air Emissions Inventory, Dept. of Ecology (Aug. 29, 2006)

Onroad Mobile Sources

*category	county code	county name	VOC	SO2	NOX	CO	CO2	PM2_5_	PM10_	DPM	PM2_5_brake&tire	PM10_brake&tire
HDD	009	Clallam	24	13	524	135	59,390	14	17	14	0	2
HDG	009	Clallam	28	1	89	386	18,938	1	2		0	0
LDD	009	Clallam	2	0	3	4	895	0	0	0	0	0
LDG	009	Clallam	840	11	664	10,791	189,028	6	11		3	9
			894	25	1,280	11,316	268,251	22	30	15		
HDD	029	Island	21	12	473	122	53,593	13	15	13	0	1
HDG	029	Island	25	1	81	349	17,089	1	2		0	0
LDD	029	Island	2	0	3	3	808	0	0	0	0	0
LDG	029	Island	758	10	599	9,739	170,578	5	10		3	8
			807	22	1,155	10,213	242,068	20	27	13		
HDD	031	Jefferson	17	9	371	95	42,047	10	12	10	0	1
HDG	031	Jefferson	20	1	63	274	13,408	1	1		0	0
LDD	031	Jefferson	1	0	2	3	634	0	0	0	0	0
LDG	031	Jefferson	595	8	470	7,639	133,827	4	8		2	6
			633	18	906	8,011	189,916	15	22	10		
HDD	033	King	874	476	19,253	4,953	2,181,513	531	613	531	18	59
HDG	033	King	1,005	39	3,266	13,286	695,622	51	68		6	16
LDD	033	King	69	7	122	135	32,881	13	15	13	1	1
LDG	033	King	27,878	391	22,470	348,012	6,943,365	206	421		114	321
			29,826	913	45,111	366,385	9,853,382	801	1,118	544		
HDD	035	Kitsap	85	46	1,872	482	212,090	52	60	52	2	6
HDG	035	Kitsap	101	4	319	1,380	67,629	5	7		1	2
LDD	035	Kitsap	7	1	12	13	3,197	1	1	1	0	0
LDG	035	Kitsap	3,000	38	2,370	38,535	675,041	20	41		11	31
			3,192	89	4,572	40,409	957,957	78	109	53		
HDD	045	Mason	23	13	506	130	57,355	14	16	14	0	2
HDG	045	Mason	27	1	87	376	18,289	1	2		0	0
LDD	045	Mason	2	0	3	4	864	0	0	0	0	0
LDG	045	Mason	812	10	653	10,846	182,546	5	11		3	8
			863	24	1,249	11,355	259,054	21	29	14		
HDD	053	Pierce	321	175	7,071	1,819	801,211	195	225	195	7	22
HDG	053	Pierce	370	14	1,200	4,891	255,485	19	25		2	6
LDD	053	Pierce	25	3	45	50	12,077	5	5	5	0	1
LDG	053	Pierce	10,288	144	8,318	128,651	2,550,138	76	155		42	118
			11,004	335	16,635	135,411	3,618,911	294	411	200		
HDD	055	San Juan	2	1	39	10	4,362	1	1	1	0	0
HDG	055	San Juan	2	0	7	27	1,391	0	0		0	0
LDD	055	San Juan	0	0	0	0	66	0	0	0	0	0
LDG	055	San Juan	62	1	49	784	13,885	0	1		0	1
			66	2	94	822	19,705	2	2	1		
HDD	057	Skagit	65	35	1,425	367	161,435	39	45	39	1	4
HDG	057	Skagit	77	3	242	1,017	51,477	4	5		0	1
LDD	057	Skagit	5	1	9	10	2,433	1	1	1	0	0
LDG	057	Skagit	2,288	29	1,805	28,960	513,814	15	31		8	24
			2,435	68	3,481	30,353	729,159	59	83	40		
HDD	061	Snohomish	279	152	6,146	1,581	696,338	169	196	169	6	19
HDG	061	Snohomish	322	12	1,043	4,281	222,042	16	22		2	5
LDD	061	Snohomish	22	2	39	43	10,495	4	5	4	0	0
LDG	061	Snohomish	9,034	125	7,271	113,291	2,216,305	66	134		37	102
			9,657	291	14,499	119,197	3,145,181	256	357	174		
HDD	067	Thurston	115	63	2,541	654	287,885	70	81	70	2	8
HDG	067	Thurston	137	5	435	1,885	91,798	7	9		1	2
LDD	067	Thurston	9	1	16	18	4,339	2	2	2	0	0
LDG	067	Thurston	4,119	52	3,290	53,678	916,276	27	56		15	42
			4,381	120	6,282	56,234	1,300,298	106	148	72		
HDD	073	Whatcom	73	40	1,613	415	182,716	44	51	44	2	5
HDG	073	Whatcom	88	3	274	1,151	58,263	4	6		0	1
LDD	073	Whatcom	6	1	10	11	2,754	1	1	1	0	0
LDG	073	Whatcom	2,590	33	2,043	32,787	581,557	17	35		10	27
			2,757	76	3,940	34,364	825,291	67	94	46		

* LDG = light duty gas, LDD = light duty diesel, HDG = heavy duty gas, HDD = heavy duty diesel

Puget Sound Emissions Inventory

Regional Clean Air Agency 2005 Data Supplied by WADOE, Locomotive Sources

Locomotive Emissions, Update 1
2005 Ecology Inventory, Preliminary
update includes data provided by BNSF

locomotiv	**fips**	**County Na**	**NOX**	**VOC**	**CO**	**SO2**		**PM10**	**PM2_5**
line haul	033	King	1,326	58	170	99		32	30
passenger	033	King	77	3	8	5		2	2
yard	033	King	201	17	31	13		5	5
passenger	035	Kitsap	0	0	0	0		0	0
passenger	045	Mason	0	0	0	0		0	0
line haul	053	Pierce	754	33	97	56		18	17
passenger	053	Pierce	34	1	4	2		1	1
yard	053	Pierce	131	12	21	9		4	3
line haul	057	Skagit	243	10	31	18		6	5
passenger	057	Skagit	2	0	0	0		0	0
line haul	061	Snohomish	948	41	120	69		22	21
passenger	061	Snohomish	45	2	5	3		1	1
yard	061	Snohomish	50	5	9	4		1	1
line haul	067	Thurston	427	18	54	31		10	9
passenger	067	Thurston	10	0	1	1		0	0
line haul	073	Whatcom	270	12	34	20		6	6
passenger	073	Whatcom	4	0	0	0		0	0
		Total	4,524	213	586	329		110	101
WADOE	Loco	King	1,604	78	210	116		40	37
WADOE	Loco	Kitsap	0	0	0	0		0	0
WADOE	Loco	Mason	0	0	0	0		0	0
WADOE	Loco	Pierce	919	46	122	67		23	21
WADOE	Loco	Skagit	245	10	31	18		6	5
WADOE	Loco	Snohomish	1,044	47	134	76		25	23
WADOE	Loco	Thurston	437	19	55	32		10	9
WADOE	Loco	Whatcom	274	12	35	20		6	6
		Total	4,524	213	586	329		110	101

Puget Sound Emissions Inventory
Regional Clean Air Agency 2005 Data Supplied by WADOE, Area Sources

Draft 2005 Area Source Inventory, Dept. of Ecology, Emissions in tons per year
Feb. 14, 2007

FIPS	County Name	sector	Category	NOx	VOC	CO	SO2		PM10	PM2_5	DPM10
009	Clallam	Area	Agricultural Tilling						16	3	
009	Clallam	Area	Area Source Solvents		664						
009	Clallam	Area	Fuel Use, exc Woodstoves	6	0	2	5		1	1	0
009	Clallam	Area	Outdoor Burning	28	81	967	1		155	139	
009	Clallam	Area	Road Dust						259	8	
009	Clallam	Area	Woodstoves and Fireplaces	34	639	1,976	4		264	264	
				68	1,384	2,945	11	0	694	415	0
029	Island	Area	Agricultural Tilling						38	8	
029	Island	Area	Area Source Solvents		478						
029	Island	Area	Fuel Use, exc Woodstoves	40	2	16	12		3	3	1
029	Island	Area	Outdoor Burning	11	31	204	1		94	86	
029	Island	Area	Road Dust						244	8	
029	Island	Area	Woodstoves and Fireplaces	37	678	2,203	5		293	293	
				88	1,190	2,423	18	0	672	398	1
031	Jefferson	Area	Agricultural Tilling						5	1	
031	Jefferson	Area	Area Source Solvents		225						
031	Jefferson	Area	Fuel Use, exc Woodstoves	11	1	4	8		1	1	0
031	Jefferson	Area	Outdoor Burning	16	46	562	1		83	74	
031	Jefferson	Area	Road Dust						363	22	
031	Jefferson	Area	Woodstoves and Fireplaces	16	285	929	2		124	124	
				43	556	1,495	10	0	576	222	0
045	Mason	Area	Agricultural Tilling						9	2	
045	Mason	Area	Area Source Solvents		408						
045	Mason	Area	Fuel Use, exc Woodstoves	17	1	7	6		2	1	0
045	Mason	Area	Outdoor Burning	16	45	475	1		102	92	
045	Mason	Area	Road Dust						313	15	
045	Mason	Area	Woodstoves and Fireplaces	28	468	1,666	4		220	220	
				61	922	2,148	10	0	645	331	0
055	San Juan	Area	Agricultural Tilling						4	1	
055	San Juan	Area	Area Source Solvents		112						
055	San Juan	Area	Fuel Use, exc Woodstoves	6	0	2	6		1	1	0
055	San Juan	Area	Outdoor Burning	3	9	58	0		27	25	
055	San Juan	Area	Road Dust						224	20	
055	San Juan	Area	Woodstoves and Fireplaces	10	168	609	1		81	81	
				19	289	670	8	0	336	127	0
057	Skagit	Area	Agricultural Tilling						585	117	
057	Skagit	Area	Area Source Solvents		1,045						
057	Skagit	Area	Fuel Use, exc Woodstoves	96	6	40	14		8	8	1
057	Skagit	Area	Outdoor Burning	15	46	314	1		116	107	
057	Skagit	Area	Road Dust						511	20	
057	Skagit	Area	Woodstoves and Fireplaces	45	925	2,500	6		337	337	
				156	2,022	2,854	21	0	1,557	589	1
067	Thurston	Area	Agricultural Tilling						60	12	
067	Thurston	Area	Area Source Solvents		1,676						
067	Thurston	Area	Fuel Use, exc Woodstoves	174	10	72	27		15	14	1
067	Thurston	Area	Outdoor Burning	35	100	824	4		275	252	
067	Thurston	Area	Road Dust						791	24	
067	Thurston	Area	Woodstoves and Fireplaces	104	1,993	5,995	14		802	802	
				313	3,780	6,891	45	0	1,943	1,104	1
073	Whatcom	Area	Agricultural Tilling						492	98	
073	Whatcom	Area	Area Source Solvents		1,838						
073	Whatcom	Area	Fuel Use, exc Woodstoves	166	10	70	18		14	14	1
073	Whatcom	Area	Outdoor Burning	21	59	414	2		175	160	
073	Whatcom	Area	Road Dust						794	32	
073	Whatcom	Area	Woodstoves and Fireplaces	75	1,548	4,238	10		571	571	
				262	3,454	4,721	30	0	2,046	876	1
				1,010	13,597	24,148	154	0	8,469	4,062	5

Puget Sound Emissions Inventory

Regional Clean Air Agency 2005 Data Supplied by WADOE, Area Sources

Sources Inventoried

Secto	**Category**	**Sub-Category**
Area	Agricultural Tilli	Agricultural Tilling
Area	Area Source So	Architectural Surface Coating
Area	Area Source So	Consumer/Commercial Solvents
Area	Area Source So	Degreasing
Area	Area Source So	Dry Cleaning
Area	Area Source So	Graphic Arts
Area	Area Source So	Industrial Surface Coating
Area	Area Source So	Other Solvent Use
Area	Fuel Use, exc W	Residential Fuel Use, exc Woodstoves
Area	Outdoor Burnin	Agricultural Burning
Area	Outdoor Burnin	non-Federal Range Fire
Area	Outdoor Burnin	Residential Trash Burning
Area	Outdoor Burnin	Residential Yard Waste Burning
Area	Outdoor Burnin	Silvicultural Burning
Area	Road Dust	Paved Road Dust
Area	Road Dust	Unpaved Road Dust
Area	Woodstoves an	Woodstoves and Fireplaces

Sources Not Included (not exhaustive)

Dust from Construction Activities
Windblown Dust
Landclearing Burning
Small Commercial/Institutional/Industrial Source Fuel Use


HYUNDAI
CAPITAL
APL


HORIZON ANCHORAGE
MORNING DEW
PANAMA


seaspan