

TERMPOL 3.2 – ORIGIN, DESTINATION & MARINE TRAFFIC VOLUME SURVEY

Trans Mountain Expansion Project

Prepared for:



Prepared by:



777 W. Broadway, Suite 301
Vancouver, BC, V5Z 4J7
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Termopol 3.2 – Origin, Destination & Marine Traffic Volume Survey

TRANS MOUNTAIN EXPANSION PROJECT

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Prepared by:

MOFFATT & NICHOL

Reviewed by:

MOFFATT & NICHOL

James Traber, EIT
Staff Engineer

Ron Byres, P.Eng.
Senior Project Manager

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TABLE OF CONTENTS

1. OBJECTIVES	1
2. REGIONAL MARINE TRAFFIC NETWORK	2
2.1 PROPOSED ROUTE	3
2.2 MAJOR TRAFFIC ROUTES	5
2.2.1 Passenger Ferry Routes	6
2.2.2 Commercial Routes.....	8
3. SHIPPING WITHIN MARINE NETWORK	9
3.1 SHIPPING NETWORK FOCAL POINTS	9
3.1.1 (A) Westridge Berth.....	9
3.1.2 (B) English Bay.....	9
3.1.3 (C & D) Strait of Georgia.....	10
3.1.4 (E) Turn Point.....	10
3.1.5 (F) Brotchie Ledge Pilot Station	10
3.1.6 (G) Race Rocks.....	10
3.2 SPECIAL OPERATIONS AREAS	10
3.2.1 Military Exercise and Offshore Exploration/Exploration Activity	10
3.2.2 Seaplane Activity	10
3.3 FISHING ACTIVITIES, SENSITIVE BIOLOGICAL AND HUMAN ENVIRONMENTS	11
4. DESCRIPTION OF EXISTING MARINE TRAFFIC	12
4.1 CLASSES OF MARINE TRAFFIC.....	12
4.2 CHARACTERISTICS OF VESSELS OPERATING IN THE REGION	13
4.2.1 General Cargo Vessels	13
4.2.2 Dry-Bulk Cargo Vessels (Bulk Carriers)	13
4.2.3 Container Cargo Vessels.....	13
4.2.4 Tankers (Oil, LPG, Chemical).....	13
4.2.5 Tug Traffic	13
4.2.6 Passenger Vessels (Cruise Ships)	13
4.2.7 Pleasure Craft (Sailing Yachts, Motor Yachts and Sports Fishing Boats).....	14
4.2.8 Government Vessels and Warships	14
4.2.9 Commercial Passenger Ferries	14
4.2.10 Service Vessels.....	14
4.2.11 Floatplane Activity.....	14
4.2.12 Commercial Fishing Vessels (All Types)	14
5. REGIONAL VESSEL TRAFFIC ANALYSIS	15
5.1 VESSEL TRAFFIC DATA SOURCES.....	15
5.2 VESSEL TRAFFIC	15
5.2.1 Overall Vessel Traffic.....	20
(a) Number of Sailings.....	20
(b) Sailed Nautical Miles.....	22
5.2.2 Segment 1: Westridge Terminal to Berry Point.....	25
5.2.3 Segment 2: Berry Point to 1.0nm west of Prospect Point.....	27
5.2.4 Segment 3: English Bay to Straits of Georgia, Sturgeon Bank.....	29
5.2.5 Segment 4: Strait of Georgia, Sturgeon Bank to 3.0nm North of East Point, Saturna Island.....	31

5.2.6 Segment 5: Boundary Pass and Haro Strait to Victoria pilot boarding station	33
5.2.7 Segment 6: Victoria Pilot Boarding Station to Race Rocks	35
5.2.8 Segment 7: Race Rocks, Strait of Juan de Fuca to Pacific Ocean.....	37
5.2.9 Segment 8 to 12	38
6. PROJECTED TRAFFIC DENSITY AND ANALYSIS	42
6.1 HISTORICAL TRAFFIC ANALYSIS	42
6.2 FUTURE TRAFFIC PROJECTION.....	43
6.2.1 Projections of Vessel Movements by Seaport.....	43
6.2.2 Specific Terminal Expansion Plans.....	44
(a) Deltaport Terminal Road and Rail Improvement	44
(b) Roberts Bank Terminal 2.....	45
(c) Pacific Gateway Terminal.....	45
(d) Vancouver Harbour	45
6.2.3 Future Traffic Growth Rates without TMEP	46
6.2.4 Future Projected Number of Sailings without TMEP	47
6.2.5 Future Projected Sailed Nautical Miles without TMEP	50
6.3 THE PROPONENT'S VESSELS	54
6.4 TANKER TRAFFIC INCREASE TO WESTRIDGE TERMINAL	55
6.4.1 Increase to Number of Sailings from TMEP Tanker Traffic.....	55
6.4.2 Increase to Sailed Nautical Miles from TMEP Tankers	56
7. REFERENCES.....	58
APPENDIX A: MARINE TRAFFIC DATA.....	59
APPENDIX B: SEAPORT CONSULTANTS CANADA REPORT.....	67

LIST OF FIGURES

Figure 2-1: Marine Traffic Network	2
Figure 2-2: Marine Communications and Traffic Services Map.....	3
Figure 2-3: In-out Bound Routes.....	5
Figure 2-4: Major Traffic Routes	6
Figure 2-5: Ferry Traffic Routes	7
Figure 2-6: Commercial Crossing Traffic Routes	8
Figure 3-1: Network Focal Points.....	9
Figure 3-2: Vancouver Aerodrome	11
Figure 5-1: Seasonal Variation in Monthly Traffic - Haro Strait (Source: Marine Exchange in Puget Sound, 2011)....	15
Figure 5-2: Segment Area	16
Figure 5-3: Cargo Traffic	16
Figure 5-4: Fishing Traffic	17
Figure 5-5: Passenger Traffic	17
Figure 5-6: Tanker Traffic.....	18
Figure 5-7: Towing	18
Figure 5-8: Towing Long and Wide Traffic	19
Figure 5-9: Tug Traffic.....	19
Figure 5-10: Overview Map of Cross Sections 1 through 5 (Det Norske Veritas Inc., 2012)	20
Figure 5-11: Overview Map of Cross Sections 6 and 7 (Det Norske Veritas Inc., 2012)	21
Figure 5-12: Sailed nautical miles by ship types for the study area (in 2012)	23
Figure 5-13: Sailed nautical miles (%) by ship types for the study area (in 2012)	24
Figure 5-14: Segment 1.....	25
Figure 5-15: Sailed Nautical Miles by Ship Type in Segment 1	26
Figure 5-16: Vessel track lines near Proposed Westridge Marine Terminal.....	26
Figure 5-17: Segment 2.....	27
Figure 5-18: Sailed Nautical Miles by Ship Type in Segment 2	28
Figure 5-19: Segment 3.....	29
Figure 5-20: Sailed Nautical Miles by Ship Type in Segment 3	30
Figure 5-21: Segment 4.....	31
Figure 5-22: Sailed Nautical Miles by Ship Type in Segment 4	32
Figure 5-23: Segment 5.....	33
Figure 5-24: Sailed Nautical Miles by Ship Type in Segment 5	34
Figure 5-25: Segment 6.....	35
Figure 5-26: Sailed Nautical Miles by Ship Type in Segment 6	36
Figure 5-27: Segment 7.....	37
Figure 5-28: Sailed Nautical Miles by Ship Type in Segment 7	38
Figure 5-29: Sailed Nautical Miles by Ship Type in Segment 8	39
Figure 5-30: Sailed Nautical Miles by Ship Type in Segment 9	39
Figure 5-31: Sailed Nautical Miles by Ship Type in Segment 10	40
Figure 5-32: Sailed Nautical Miles by Ship Type in Segment 11	40
Figure 5-33: Sailed Nautical Miles by Ship Type in Segment 12	41
Figure 6-1: Ship Calls by Cargo Type from 1995 to 2012 from PMV, VPA, and FRPA	43
Figure 6-2: Bulk Terminal Locations	45
Figure 6-3: Increase to Tanker Sailed Nautical Miles from TMEP Tanker Traffic.....	56

Figure 6-4: Increase to Vessels Sailed Nautical Miles from TMEP Tanker Traffic	57
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LIST OF TABLES

Table 5-1: Number of Sailings (in 2012).....	21
Table 5-2: Sailed nautical miles per segment 1 to 7 (Category 1)	22
Table 5-3: Sailed nautical mile per segment 8 to 12 (Category 2)	22
Table 5-4: Tanker Traffic for Segment 8, 9, 10, 11, & 12	38
Table 6-1: Foreign Ship Calls by Cargo Type from 1995 to 2012 from PMV, VPA, and FRPA	42
Table 6-2: Summary of Estimated Growth Rates by Seaport	44
Table 6-3: Bulk Terminals East of Second Narrows	45
Table 6-4: Projected Growth Rates per Annum for 2012 to 2018	47
Table 6-5: Projected Growth Rates per Annum for 2018 to 2030	47
Table 6-6: Number of Sailings at Cross Section 1 - Victoria	47
Table 6-7: Number of Sailings at Cross Section 2 - Haro Strait	48
Table 6-8: Number of Sailings at Cross Section 3 - Strait of Georgia	48
Table 6-9: Number of Sailings at Cross Section 4 - Burrard Inlet	48
Table 6-10: Number of Sailings at Cross Section 5 - Westridge Terminal	49
Table 6-11: Number of Sailings at Cross Section 6 - West of Westridge Terminal	49
Table 6-12: Number of Sailings at Cross Section 7 - East of Westridge Terminal	49
Table 6-13: Sailed Nautical Miles in Segment 1	50
Table 6-14: Sailed Nautical Miles in Segment 2	50
Table 6-15: Sailed Nautical Miles in Segment 3	50
Table 6-16: Sailed Nautical Miles in Segment 4	51
Table 6-17: Sailed Nautical Miles in Segment 5	51
Table 6-18: Sailed Nautical Miles in Segment 6	51
Table 6-19: Sailed Nautical Miles in Segment 7	52
Table 6-20: Sailed Nautical Miles in Segment 8	52
Table 6-21: Sailed Nautical Miles in Segment 9	52
Table 6-22: Sailed Nautical Miles in Segment 10	53
Table 6-23: Sailed Nautical Miles in Segment 11	53
Table 6-24: Sailed Nautical Miles in Segment 12	53
Table 6-25: Sailed Nautical Miles in All Segments	54
Table 6-26: Increase to Number of Tanker Sailings from TMEP Tanker Traffic	55
Table 6-27: Increase to Number of Vessels Sailings from TMEP Tanker Traffic	55
Table 6-28: Increase to Tanker Sailed Nautical Miles from TMEP Tanker Traffic	56
Table 6-29: Increase to Vessels Sailed Nautical Miles from TMEP Tanker Traffic	57

1. OBJECTIVES

In accordance with the Termpol Code, TP743E 2001, the objectives of this survey are to quantify and describe all recreational, commercial and any other vessel traffic movement that collectively form the regional marine traffic network. The following items comprise the contents of this survey:

- Details of the types and size of vessels currently operating in the region with particular emphasis on those likely to be encountered by the design vessel (refer Termpol 3.9 for design vessel details) en route to and from the Westridge Terminal;
- Variations in traffic density statistics including those projected as a result of the Trans Mountain Pipe Line Expansion Project;
- Special operational areas (naval and airborne exercise areas, offshore exploration and exploitation activities and seaplane activities);
- Network focal points, or nodes, which indicate the locations of where close-quarter situations are likely to occur and, particularly, where there is crossing traffic;
- Major traffic routes including seasonal variations;
- Possible alternative routes for the design ship giving consideration to the above information and assessment of the experience of similar ships travelling in the same or similar areas.

In addition, this survey includes a local marine traffic survey focusing on the immediate geographical area of the proposed marine terminal. The objectives are to identify particulars of:

- The types and sizes of vessels in the area of the terminal;
- Local fishing operations;
- Local recreation and other marine activities; and
- Routing traffic support services in the terminal area and approaches.

2. REGIONAL MARINE TRAFFIC NETWORK

The marine traffic network of interest is located on the south coast of British Columbia, Canada. This marine network stretches from the western entrance of Juan De Fuca Strait to Burrard Inlet. Figure 2-1 shows the general overview of this area and the major large vessel routes. The tanker, passenger, and cargo routes shown below are created from a limited database of vessel track lines and highlight the some major traffic routes. For more detailed depiction of the vessel routes refer to section 5.2 Vessel Traffic, which shows maps of vessel track lines.

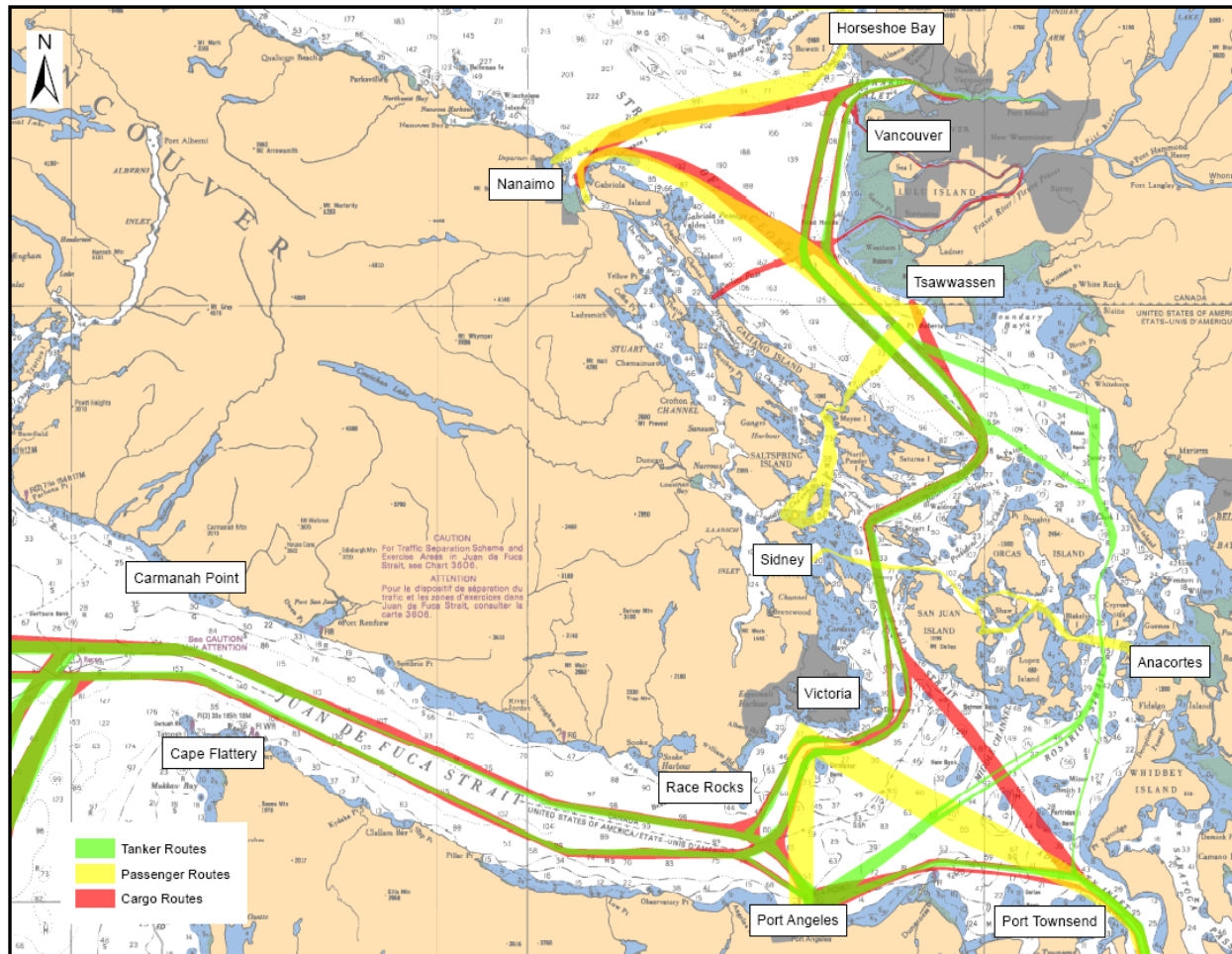


Figure 2-1: Marine Traffic Network

The portion of the routes through the Juan de Fuca Strait, Haro Strait, Boundary Pass, and the Southern Strait of Georgia straddle the Canada/US international border, and vessels transiting the area participate in Vessel Traffic System (VTS) programs operated by both countries. Figure 2-2 shows the different VTS areas for Vancouver, Victoria, Tofino, and Puget Sound.

In 1979 the Canadian Coast Guard and the United States Coast Guard established the Co-operative Vessel Traffic System (CVTS) for the waterways along the international boundary. (United States Coast Guard, 2008). Depending on which section of the CVTS the vessels are operating in, they will communicate with VTS operators in Tofino, Victoria, or Puget Sound according to which VTS office has jurisdiction over that area. The Canadian section of the VTS is provided by the Marine Communications and Traffic Services (MCTS). Refer to Termpol Study 3.2, Origin, Destination and Marine Traffic Volume Survey, for more details on the services provided by MCTS.

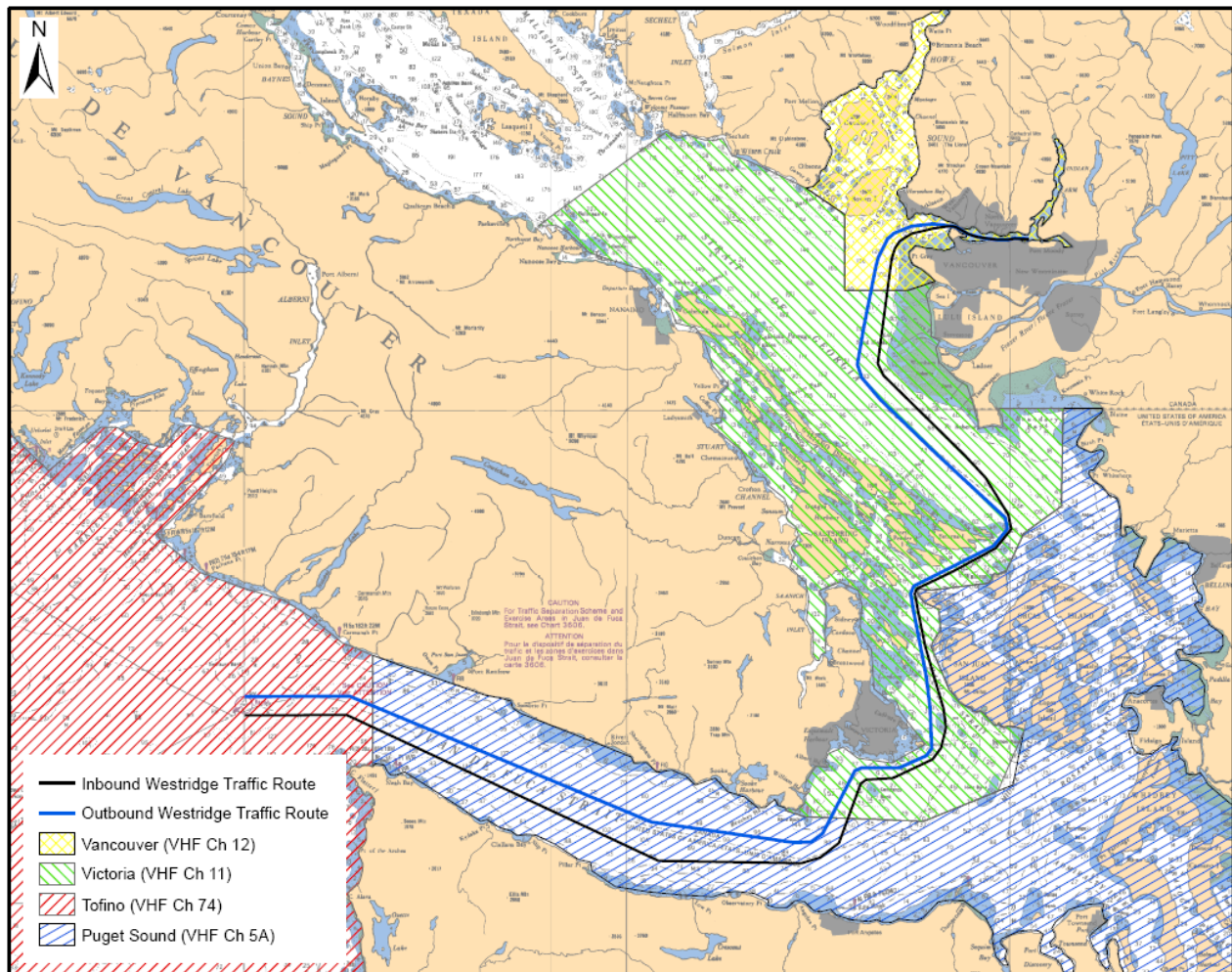


Figure 2-2: Marine Communications and Traffic Services Map

2.1 PROPOSED ROUTE

The proposed route for tankers traveling to and from the Trans Mountain Westridge Terminal is described briefly below. A more detailed description is provided in Termpol 3.5, Route Analysis, Approach Characteristics and Navigability Survey.

Partially loaded Aframax tankers will transit along an established shipping route to and from Vancouver Harbour and the Pacific Ocean. The outbound route begins at the Westridge Marine Terminal in Vancouver Harbour, approximately five kilometres east of Second Narrows. The tanker will leave the terminal under pilotage and with tug assist and depending on the available state of daylight, draft, and current restrictions at the Second Narrows, the tanker will either depart immediately or anchor and wait for the appropriate time to transit the Second Narrows Movement Restriction Area (MRA). When the tanker is ready to depart, two licensed pilots from the British Columbia Coast Pilots Ltd. (BCCP) will board the tanker to navigate the tanker through the harbour. Each pilot is equipped with a Personal Pilotage Unit (PPU) that provides the pilots with independent input as regards the tanker's position, direction and speed of travel as well as rate of turn. Both pilots are provided an orientation by the ship's bridge team and then become part of the team. Of the two pilots assigned to the tanker, only one shall have the con at any time and the other shall provide backup and consultation to the pilot having the con as well as continue to keep the vessel's bridge team informed and involved in the progress of the tanker. The tanker will start by traveling west to Berry Point with a minimum of three tethered escort tugs, two at the stern and one at the bow of the tanker. The tanker will enter the MRA at Berry Point and travel west through Second Narrows to enter the inner harbour of Port Metro Vancouver and continue to travel west passing the First Narrows and enter English Bay. Once in English Bay, depending on the prevailing conditions, traffic and based upon the pilots' requirements the tanker will disconnect from the escort tugs and travel through the Strait of Georgia without tug escort. An escort tug will reconnect 2 nautical miles north of East Point on Saturna Island just before the tanker enters Boundary Pass. From East Point the tanker will travel through Boundary Pass and Haro Strait and arrive at Brothie Ledge. The tug will disconnect from the tanker and the two pilots will disembark from the tanker. The tug will continue untethered escort of the tanker to Race Rocks. The tanker will then travel through the Juan De Fuca Strait and exit into the Pacific Ocean passing Buoy J. The tanker will then continue to its final destination.

The inbound route for ballasted tankers (i.e. unladen) will transit from the Pacific Ocean to Vancouver harbour along the same generally established shipping route as described above. Ballasted tankers require only one pilot to board at Brothie Ledge Pilot Station for the journey to the Westridge terminal. The restrictions at First and Second Narrows are also decreased due to lower environmental risk and increased manoeuvrability of tankers in ballast, however the tanker will require tethered tug through Second Narrows. Figure 2-3 shows the inbound and outbound routes.

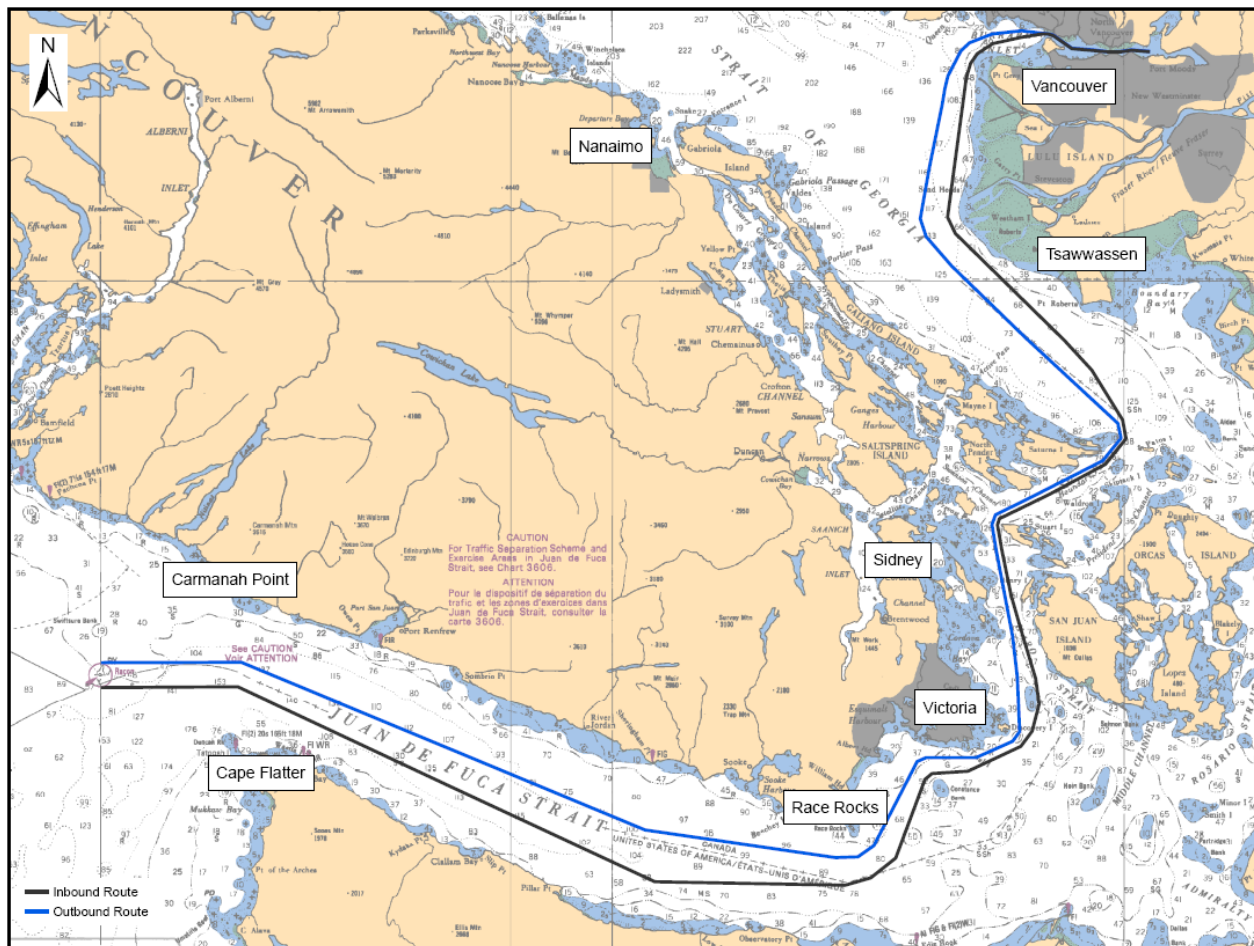


Figure 2-3: In-out Bound Routes

2.2 MAJOR TRAFFIC ROUTES

Deep-sea vessels in transit between Vancouver Harbour and the Pacific Ocean follow well-established shipping routes. The route transits Vancouver harbour, Strait of Georgia, Boundary Pass, Haro Strait, and Juan De Fuca Strait. The route has many established traffic crossing locations due to ferry traffic and commercial traffic. Figure 2-4 shows the major traffic routes and various traffic crossing routes. The route crosses the international boundaries of Canada and USA at a few locations, and since these waterways are jointly managed there is no additional burden imposed on the vessel's crew or pilots.

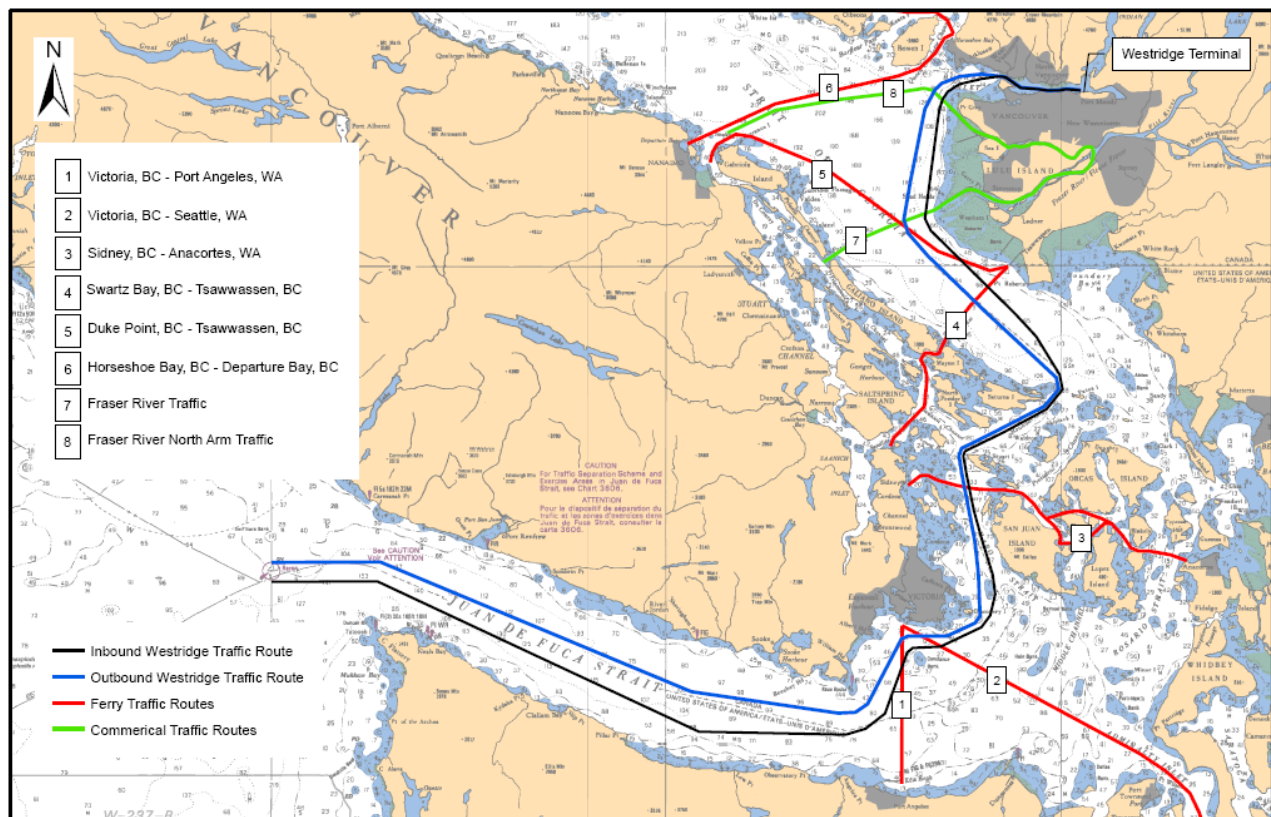


Figure 2-4: Major Traffic Routes

2.2.1 Passenger Ferry Routes

There are six major passenger ferry routes transiting between the mainland and the islands. Five of these routes directly cross the proposed vessel route to and from Vancouver Harbour. Ferry vessels are exempted from having pilots but their crews possess local knowledge and are extremely familiar with the various waterways; all ferries participate in the compulsory international Vessel Traffic Services (VTS) system jointly operated by Canadian and US authorities. The major ferry routes are outlined below:

- Victoria, BC and Port Angeles, WA
- Victoria, BC and Seattle, WA
- Sidney, BC and Anacortes, WA
- Swartz Bay, BC and Tsawwassen, BC
- Duke Point, BC and Tsawwassen, BC
- Horseshoe Bay, BC and Departure Bay, BC

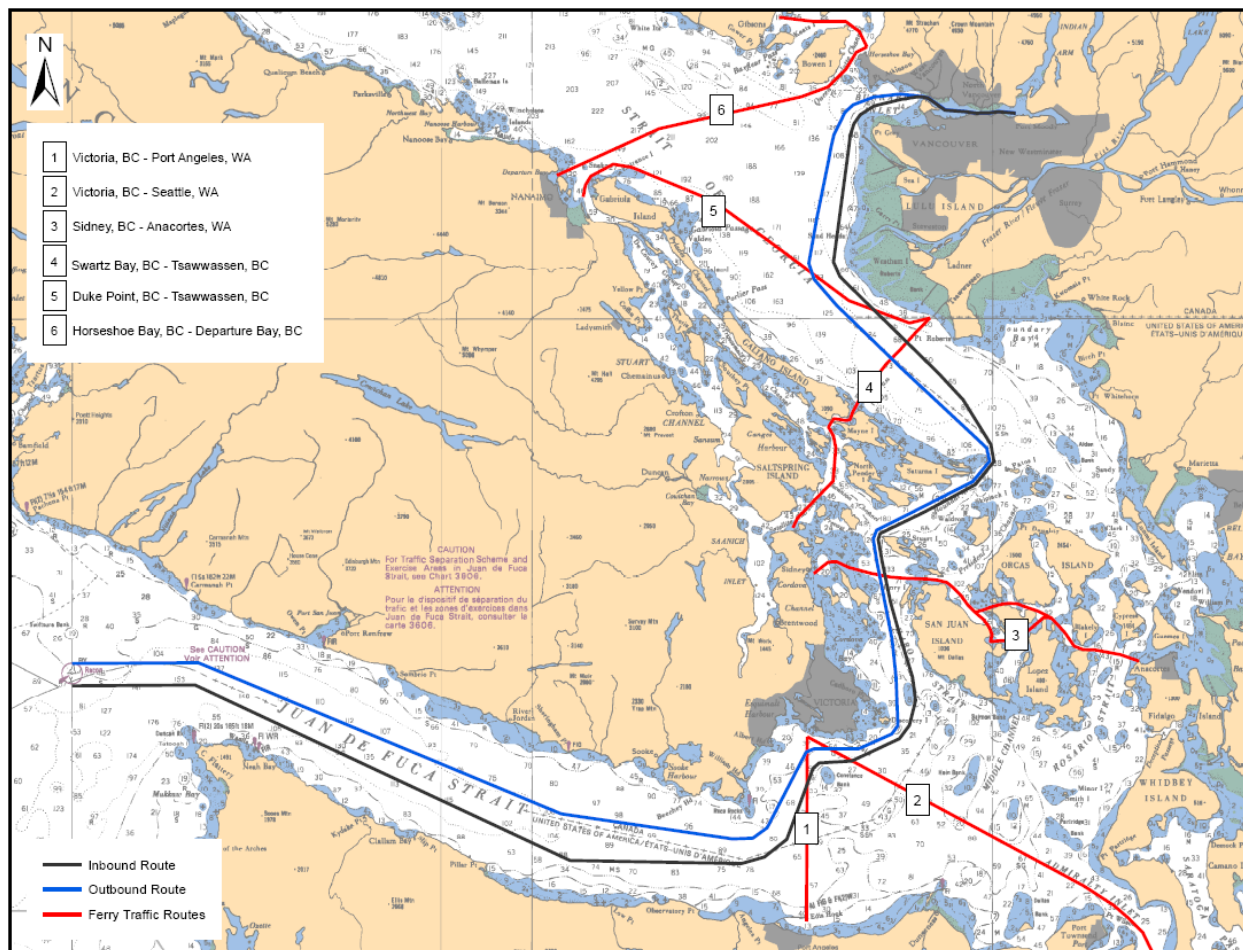


Figure 2-5: Ferry Traffic Routes

2.2.2 Commercial Routes

There are two main commercial traffic routes that cross the proposed route at the North and South Arm of the Fraser River. This commercial traffic is primarily barge traffic. Figure 2-6 below shows these two routes.

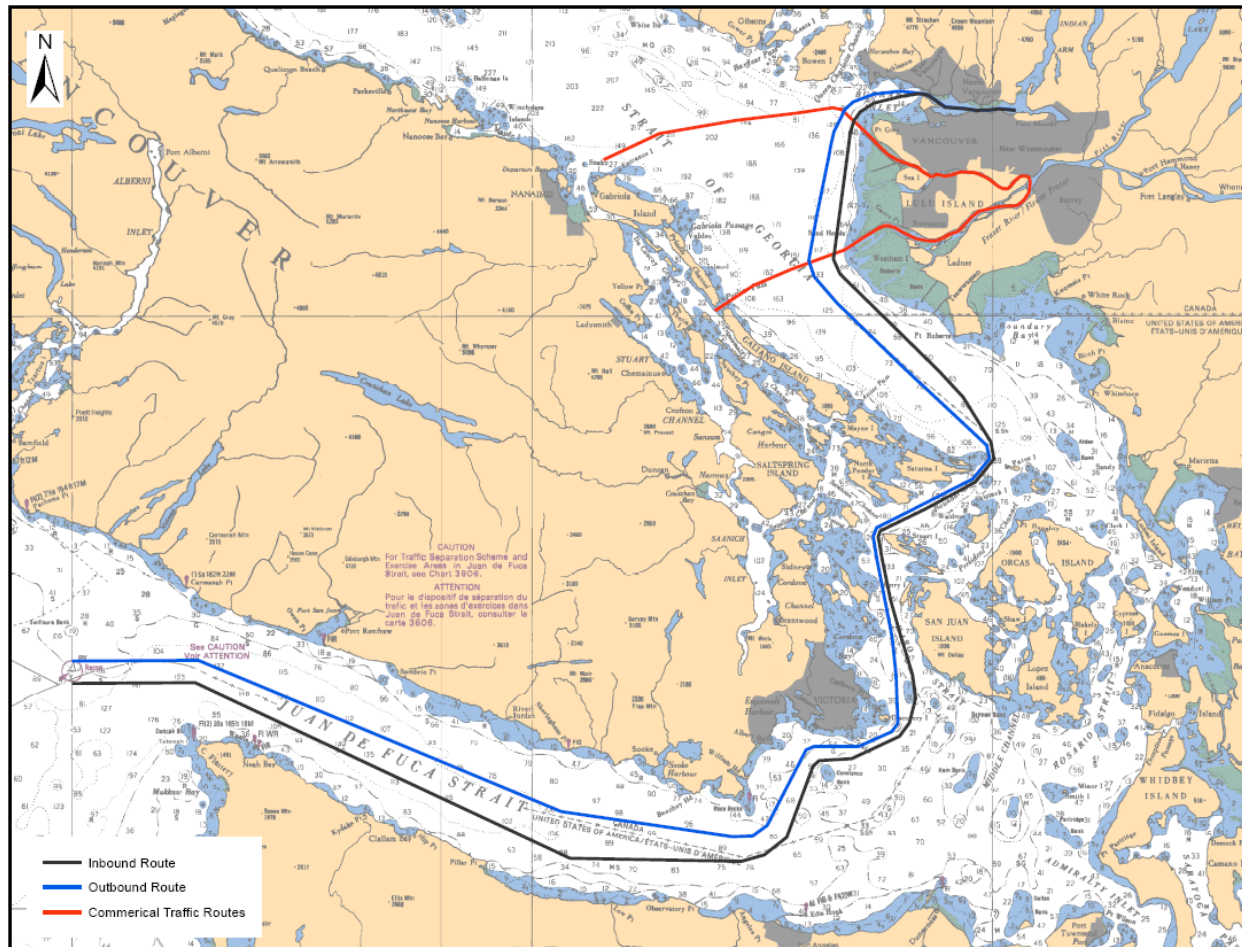


Figure 2-6: Commercial Crossing Traffic Routes

3. SHIPPING WITHIN MARINE NETWORK

3.1 SHIPPING NETWORK FOCAL POINTS

Within the area of interest there are key network focal points, or nodes that require specific navigational focus. Figure 3-1 shows the various focal points of interest for the proposed vessel route.

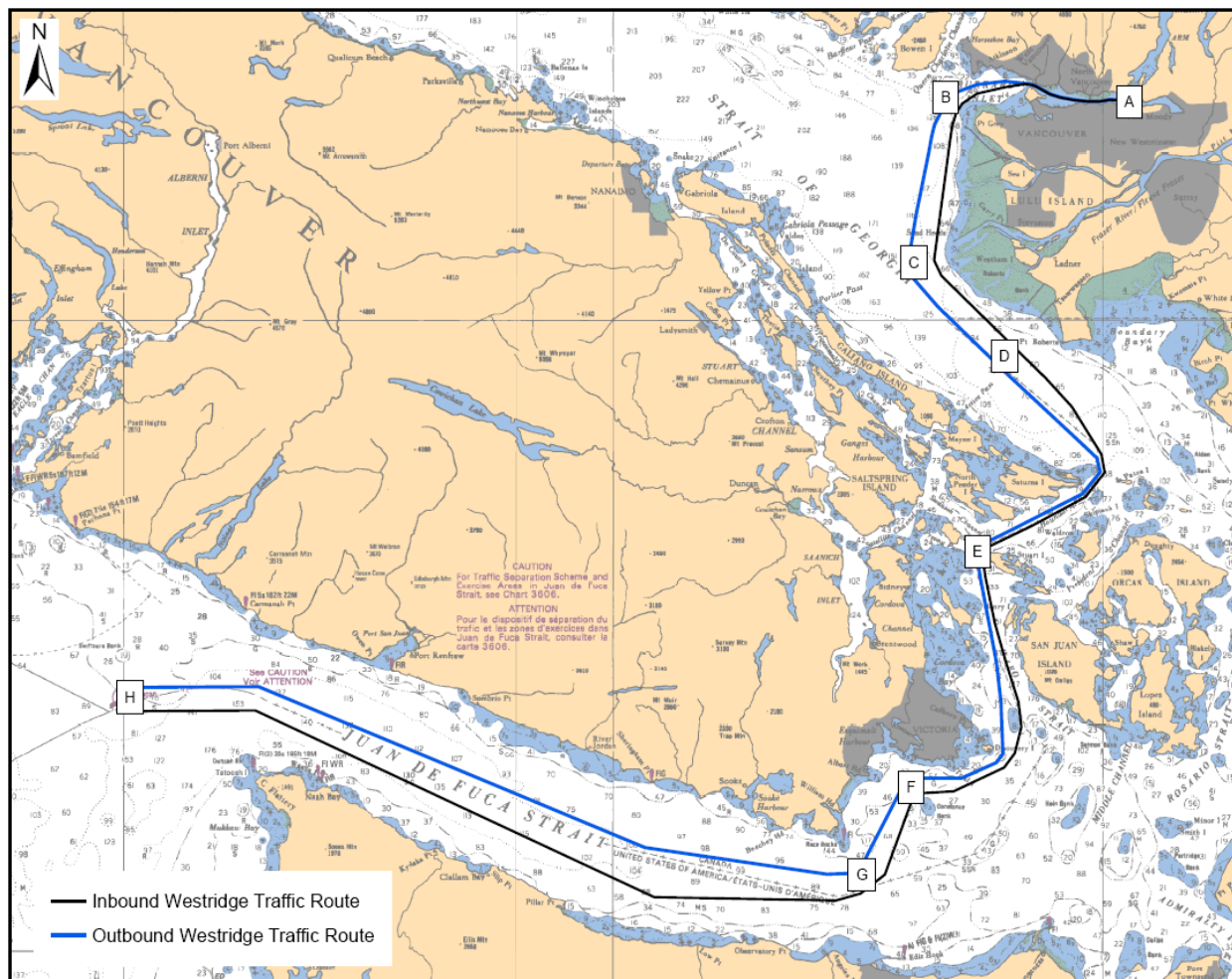


Figure 3-1: Network Focal Points

3.1.1 (A) Westridge Berth

The Westridge berth is located approximately 5 km east of the Second Narrows.

3.1.2 (B) English Bay

English Bay is located west of the First Narrows Bridge and is a common anchoring location for vessels awaiting berth assignments at the various berths within the harbour. In the rare scenario that an outbound Aframax Tanker cannot transit Boundary Passage due to tidal restrictions (Pacific Pilotage Authority, 2013), the tanker will anchor in this area and wait for the appropriate departure time.

3.1.3 (C & D) Strait of Georgia

The Strait of Georgia experiences the maximum concentration of vessel traffic along the proposed route. This area has the most crossing traffic from passenger ferries and barge traffic but also has the most space for vessels to navigate and avoid obstacles and each other.

3.1.4 (E) Turn Point

Turn Point connects Haro Strait and Boundary Passage and is considered a Special Operating Area (SOA) and specific restrictions on vessels of 100 metres or more in length (LOA) are published by the United States Coast Guard in *TURN POINT – SPECIAL OPERATING AREA (SOA)* (United States Coast Guard, 2013).

Vessels transiting North in Haro Strait and west in Boundary Passage are required to communicate with each other and adjust their passages so as not to arrive at Turn Point simultaneously. This restriction is controlled by the Pilots communicating with inbound and outbound traffic and monitored by VTS.

3.1.5 (F) Brotchie Ledge Pilot Station

Brotchie Ledge is located just south of Victoria, British Columbia, and is where the pilots embark and disembark, inbound and outbound vessels respectively.

3.1.6 (G) Race Rocks

Race Rocks is located east of the Juan de Fuca Strait and forms the Southern most point of Vancouver Island. At this point the escort tugs terminate their duties and outbound loaded tankers proceed without escort through the Juan du Fuca Strait to the Pacific Ocean.

3.2 SPECIAL OPERATIONS AREAS

3.2.1 Military Exercise and Offshore Exploration/Exploration Activity

Special Operation Areas are areas that are designated for military exercises, offshore exploration and exploitation activities. At present there are no offshore exploration activities along the vessel routes. A number of military exercise areas exist along the route in the Strait of Georgia and Juan de Fuca Strait. These areas (e.g. Royal Canadian Navy Exercise Areas WA, WB, WE, WH, WK, WL WE, and US Navy Exercise Area 2) are well marked on nautical charts. Mariners are notified of activities occurring in these areas through the Coast Guard's Notice to Mariners service.

3.2.2 Seaplane Activity

The Vancouver water aerodrome is located east of Coal Harbour and is the busiest water aerodrome in Canada. The aerodrome landing zone is south of the main vessel traffic routes. Figure 3-2 below shows the Vancouver aerodrome and the various vessel traffic routes.

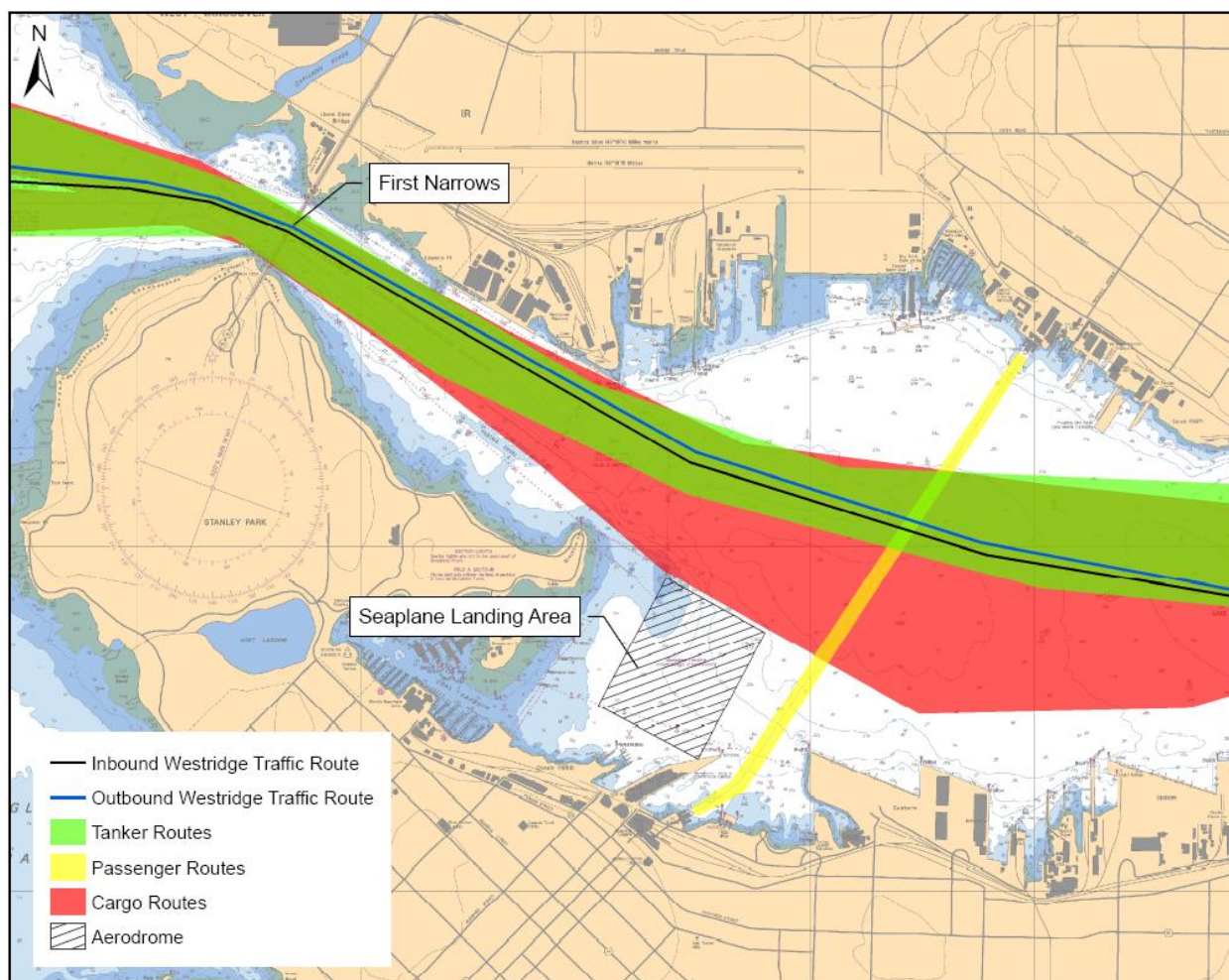


Figure 3-2: Vancouver Aerodrome

3.3 FISHING ACTIVITIES, SENSITIVE BIOLOGICAL AND HUMAN ENVIRONMENTS

Fishing grounds and periods of fishing activity are discussed in Termpol Study 3.3, Fisheries Resource Survey, and the reader is directed there for further information. Sensitive biological and human environments are documented through the Environmental Assessment process as part of the project filings with the National Energy Board (NEB). Through previous discussions with the Termpol Review Committee (TRC) during the scoping process for these studies, it was agreed that the Termpol studies should focus primarily on issues affecting vessel traffic and navigation, while environmental issues (including socio-economic studies and the potential nature and consequences of oil spills) would be addressed through an Environmental and Socio-economic Assessment (ESA) in the NEB process. These issues are therefore not discussed here.

4. DESCRIPTION OF EXISTING MARINE TRAFFIC

The various types and sizes of vessels traveling along and interacting with the proposed route to and from the Westridge terminal are described in the following section.

4.1 CLASSES OF MARINE TRAFFIC

Depending on the vessel size and cargo there are two requirements that could be imposed on transiting vessels. Larger vessels are subjected to compulsory pilotage, and are required to participate in the Canada/US Cooperative Vessel Traffic Management System. (CVTS) described earlier. Although all piloted vessels are required to participate in the CVTS, not all reporting vessel are required to have a pilot onboard. Pilotage and reporting requirements are explained in more detail below.

(1) Piloted Traffic

Ships are subject to compulsory pilotage if the vessel is over 350 gross tons for non-pleasure craft vessels and over 500 gross tons for pleasure craft vessels. Compulsory pilotage does not apply to government vessels, ferries, or United States government ships under 10,000 gross tons. In British Columbia coastal waters¹, pilots are provided by the British Columbia Coast Pilots Ltd. under license from the Pacific Pilotage Authority.

(2) Reporting Traffic

Canadian Coast Guard provides VTS via several Marine Communications and Traffic Services (MCTS) centers, which communicate with vessels and provide advisory information about other vessel traffic operating in the area. Ships required to participate in VTS include:

- every ship twenty metres or more in length;
- every ship engaged in towing or pushing any vessel or object, other than fishing gear, where;
- the combined length of the ship and any vessel or object towed or pushed by the ship is forty five metres or more in length; or
- the length of the vessel or object being towed or pushed by the ship is twenty metres or more in length (Canadian Coast Guard, 2012)

Exceptions to vessels required to participate in VTS are those towing or pushing inside log booming grounds, pleasure yachts less than 30 meters in length, and fishing vessels that are less than 24 meters in length and not more than 150 tons gross. (Canadian Coast Guard, 2012)

¹ In the Fraser River, pilots are provided by the Fraser River Pilots.

4.2 CHARACTERISTICS OF VESSELS OPERATING IN THE REGION

There are a variety of vessel types that transit the southern British Columbia coast. These different vessel types are described in the following section.

4.2.1 General Cargo Vessels

General cargo vessels or freighters are ships that can carry a variety of goods (e.g. machinery, forest products, vehicles, food, etc). Vancouver generally imports construction tools and materials, such as rebar, heavy machinery, steel, and pipes and exports logs, lumbers, wood pulp, and paper. (Port Metro Vancouver, 2011)

4.2.2 Dry-Bulk Cargo Vessels (Bulk Carriers)

Dry Bulk Carriers are ships that carry loose commodity materials such as coal, grain, or ore. The vessel is segmented into large holding bins to store the various materials. Vancouver primarily imports minerals such as sugar and exports coal, grain, sulphur, and potash. (Port Metro Vancouver, 2011)

4.2.3 Container Cargo Vessels

Container cargo vessels carry steel box containers designed to integrate with onshore semi-trucks. These containers can carry wide variety of goods. The capacities of these vessels are measured by twenty-foot equivalent units (TEU). Vancouver primarily imports household goods, such as electronics and clothing, and exports lumber and specialty crops, such as peas and chick peas. (Port Metro Vancouver, 2011)

4.2.4 Tankers (Oil, LPG, Chemical)

Tankers are designed to carry liquid bulk materials, which include crude oil, refined petroleum products, Liquefied Petroleum Gas (LPG), Liquefied Natural Gas (LNG), ammonia, chlorine, fresh water, vegetable oil, etc. Tankers are typically designed to carry separate grades of a single type of cargo in a number of cargo tanks in the vessel. Tanker traffic has unique transiting requirements and restrictions depending on the area (Pacific Pilotage Authority, 2013).

4.2.5 Tug Traffic

Tug traffic accounts for a majority of the traffic movements in British Columbia. These vessels are capable of towing floating material such as, logs and barges carrying containers, water, fuel, bulk non-liquid and liquid commodities, etc.

4.2.6 Passenger Vessels (Cruise Ships)

Passenger vessels or cruise ships are vessels designed to carry passengers for recreational voyages. These are seasonal vessels primarily sailing in the summer months.

4.2.7 Pleasure Craft (Sailing Yachts, Motor Yachts and Sports Fishing Boats)

Pleasure craft are vessels used for recreational purposes. These are seasonal vessels primarily sailing in the summer months. Pleasure craft vessels less than 30 meters are not required to participate with VTS. Therefore MCTS does not have data for these vessels (Canadian Coast Guard, 2012).

4.2.8 Government Vessels and Warships

Warships and other government vessels include Canadian Coast Guard and government survey ships as well as larger frigates and destroyers. These vessel report to VTS, unless they are on active duty, where secrecy is required.

4.2.9 Commercial Passenger Ferries

Passenger ferry traffic is a major contributor to traffic movement counts. There are six major ferry routes along the southern British Columbia coast. Major ferry providers such as British Columbia Ferry Services, Inc. and Washington State Ferries operate all year round with an increase in vessel sailings in the summer months to address the recreational demand. Smaller ferry providers such as Clipper Vacations (Clipper Navigation, Inc, 2013) and Black Ball Ferry Line primarily operate as a recreational service in the summer months.

4.2.10 Service Vessels

Service vessels include the following vessel types: anti-pollution, icebreaker, law enforcement, logistics naval vessels, medical transportation, military operations, patrol vessels, pilot vessels, port tenders, pollution control vessels, research/survey vessels, reserved vessels, salvage/rescue vessels, SAR, special craft vessels, standby safety vessels, tenders, and trailing suction hopper dredgers.

4.2.11 Floatplane Activity

Floatplane activity occurs primarily in the Vancouver Harbour Aerodrome, away from the routes of large commercial vessels plying the harbour. Harbour Air Seaplanes, Westcoast Air, and Whistler Air are the primary floatplane operators in this area. With 53,010 traffic movements in 2011, this is the 34th busiest Aerodrome in Canada. (Statistics Canada, 2001)

4.2.12 Commercial Fishing Vessels (All Types)

Fishing vessels less than 24 meters in length and not more than 150 tons gross are exempt from participating with VTS (Canadian Coast Guard, 2012). Therefore these vessels are not presented in this report. There are three types of commercial fishing boats: purse seine, gillnet, and troll (Fisheries and Oceans Canada, 2013). Purse Seiners are the largest commercial fishing vessels and utilize a large hydraulic boom and a take-up drum mounted aft to pick up the net. Gillnets are smaller commercial fishing vessels that extend nets designed to entangle fish. Fish are then removed as the net is hauled on board by a drum. These nets can extend as much as 550 meters behind the vessel at 10 meter depth. Trollers fit long lines with leaders and lures that are paid out and trolled behind the vessel (Fisheries and Oceans Canada, 2013).

Refer to Termpol 3.3 Fisheries Resource Survey for a more detailed description of fishing activities in the region.

5. REGIONAL VESSEL TRAFFIC ANALYSIS

5.1 VESSEL TRAFFIC DATA SOURCES

The vessel traffic data provided in this report is from the Marine Exchange of Puget Sound (MEPS). MEPS provided 2012 AIS vessel waypoints with timestamps to Det Norske Veritas (DNV), who processed the waypoints into vessel track lines to represent the vessel movements in the various waterways along the southern coast of British Columbia. MEPS can only track and communicate with vessels participating in the Vessel Traffic Services (VTS) or carrying AIS equipment. See Appendix A for comparisons of data for previous years from a number of different sources, including the Marine Communications & Traffic Services (MCTS), Marine Exchange of Puget Sound, Pacific Pilotage Authority (PPA), Port of Metro Vancouver, and Ferry Traffic from online schedules.

Marine traffic along the southern British Columbia coast has about a 60% increase in seasonal traffic in the summer months due to an increase in pleasure craft and ferry traffic. Commercial traffic is fairly constant all year round. Figure 5-1 below shows this seasonal variation for Haro Strait. Haro Strait is indicative of the overall area of interest and is used to represent traffic fluctuations along the proposed route.

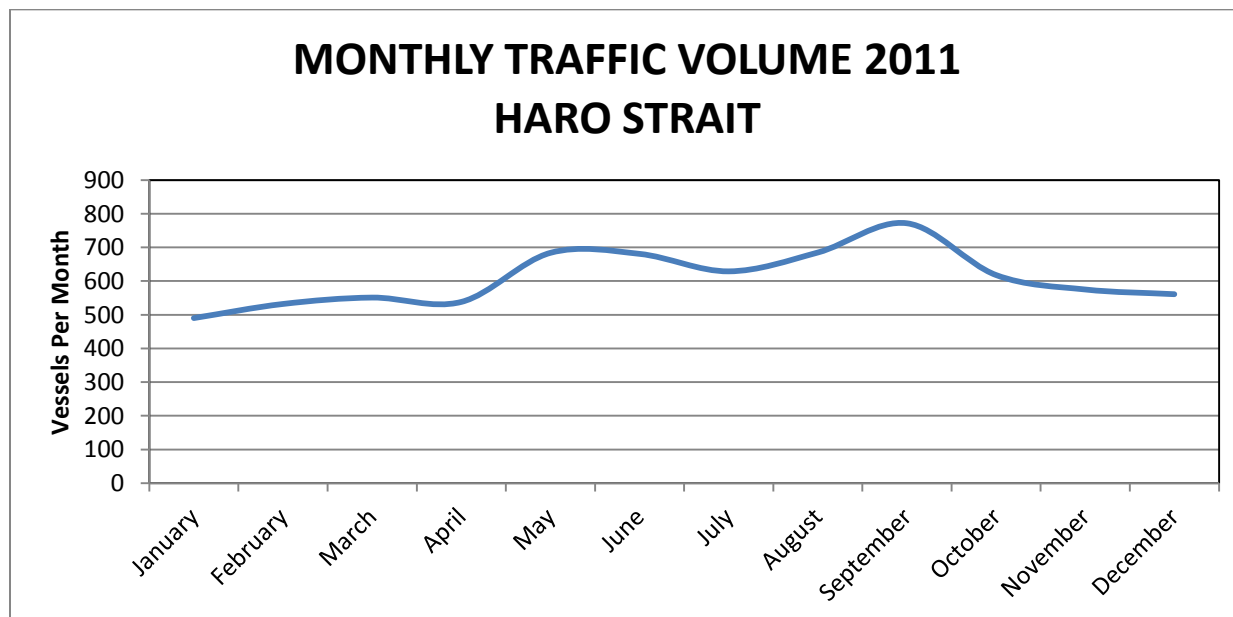


Figure 5-1: Seasonal Variation in Monthly Traffic - Haro Strait (Source: Marine Exchange in Puget Sound, 2011)

5.2 VESSEL TRAFFIC

The primary purpose of quantifying the existing vessel traffic volumes within the Termpol studies is to provide input to Termpol Study 3.15, General Risk Analysis and Intended Methods of Reducing Risks. Marine traffic was studied over a defined area in the southern coast of British Columbia that stretched from Westridge Marine Terminal to the western entrance of the Juan de Fuca Strait. The study area was divided into 12 different segments and the traffic pattern in each segment was evaluated. The traffic volume is reported in terms of the number of vessels crossing certain sections of the route (see Table 5-1), and in terms of

total nautical miles sailed (see Table 5-2 and Table 5-3). It is the latter measure (total nautical miles sailed) that is more useful for the purposes of the risk assessment in Termpol 3.15. Figure 5-2 below shows the overall area and segment areas. Figure 5-3 thru Figure 5-9 shows the vessel track lines for the different vessel types.

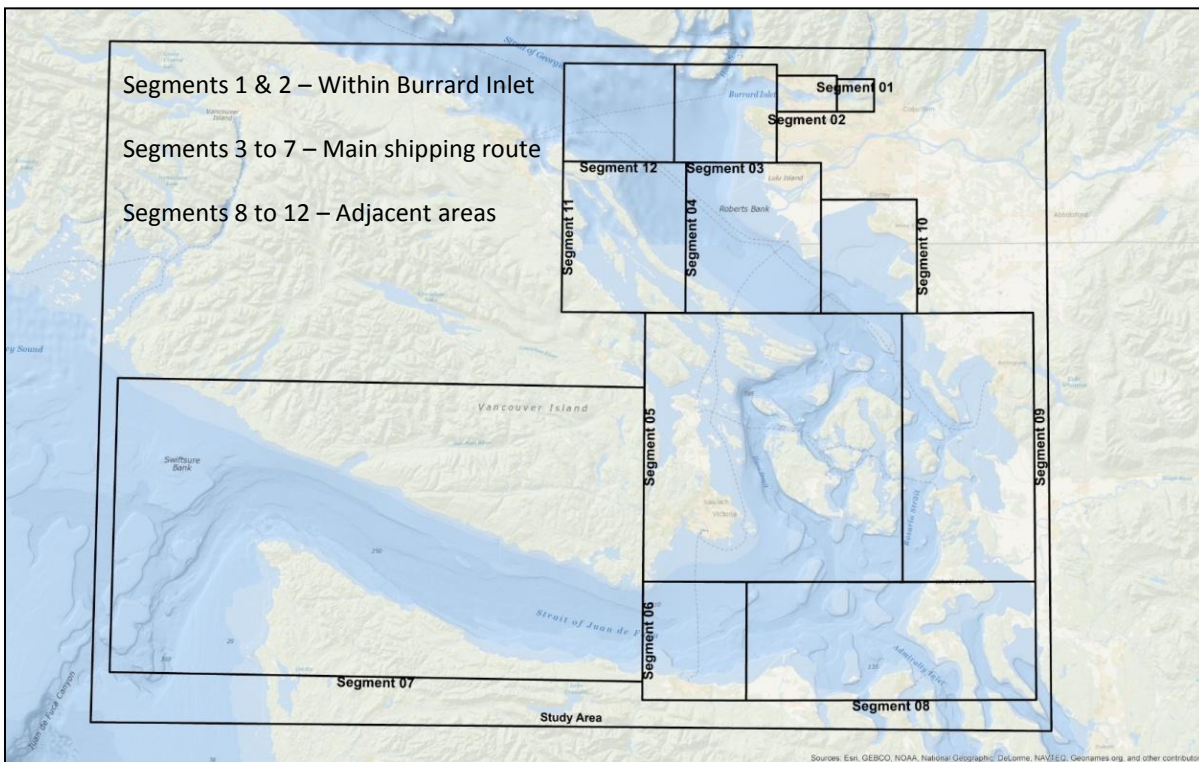


Figure 5-2: Segment Area

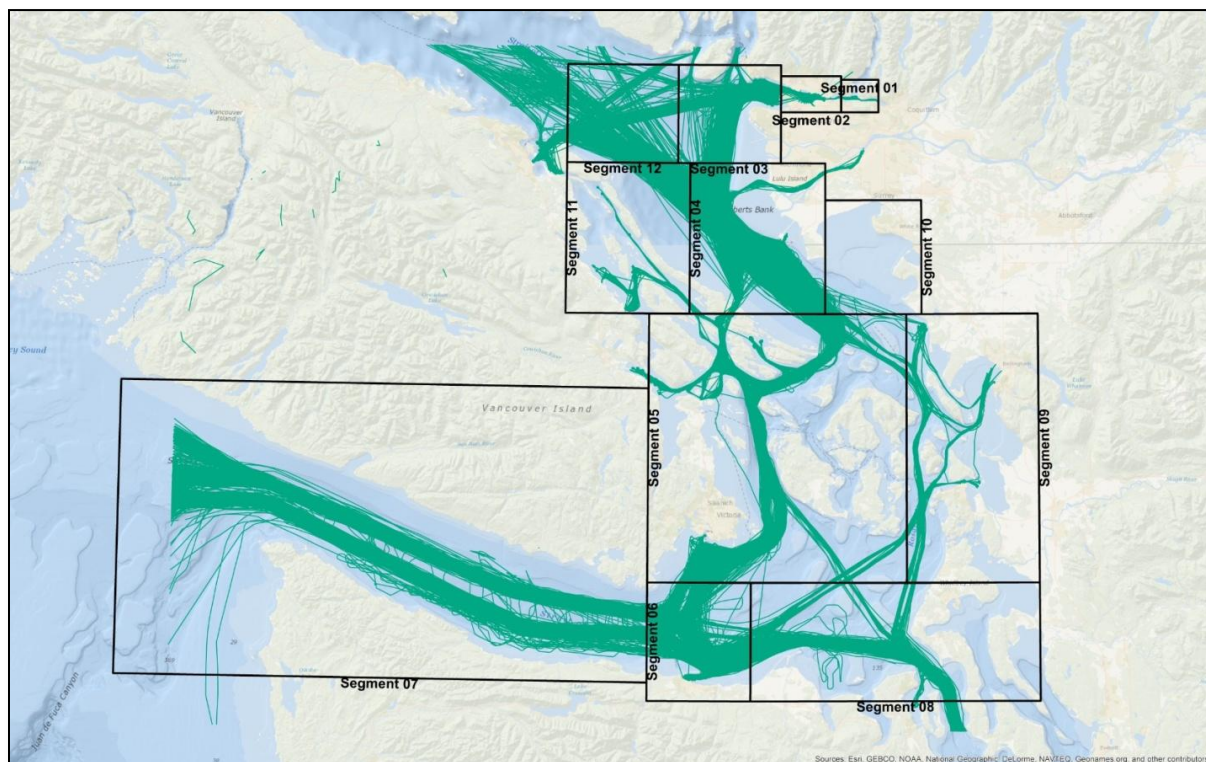


Figure 5-3: Cargo Traffic

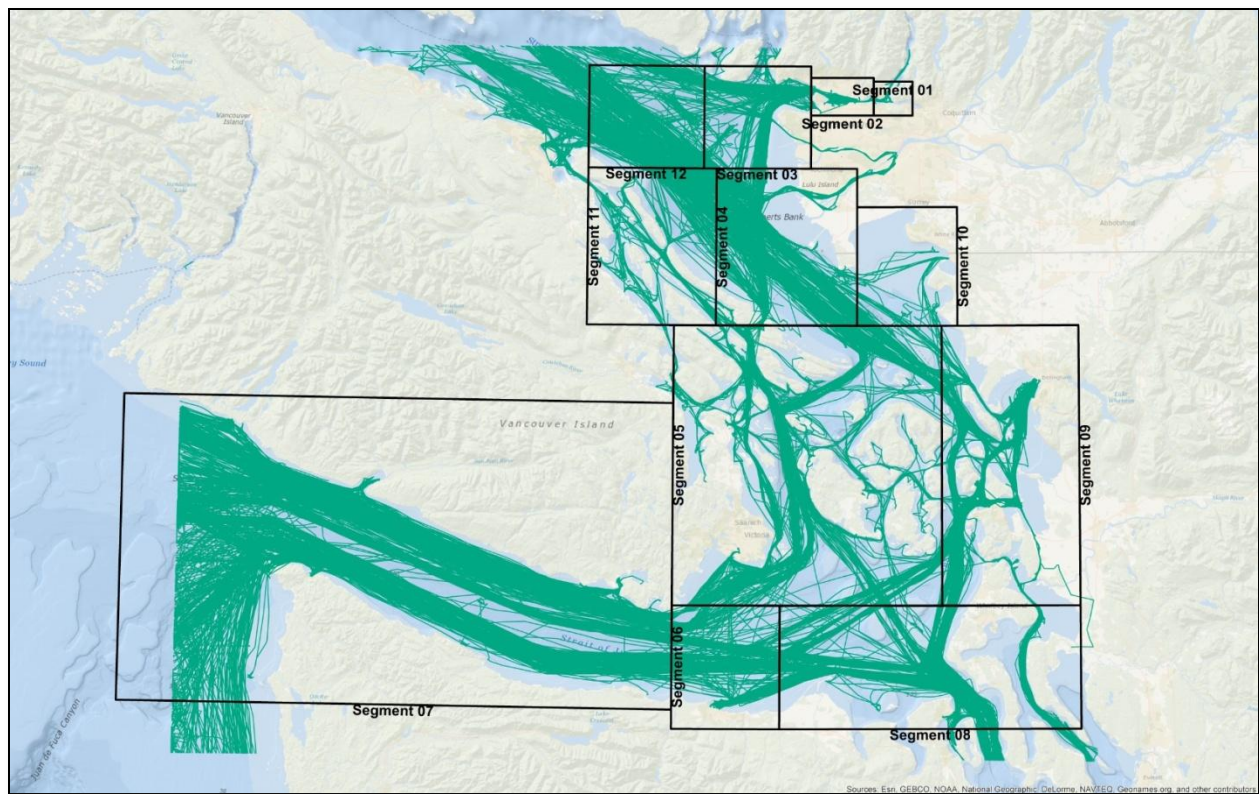


Figure 5-4: Fishing Traffic

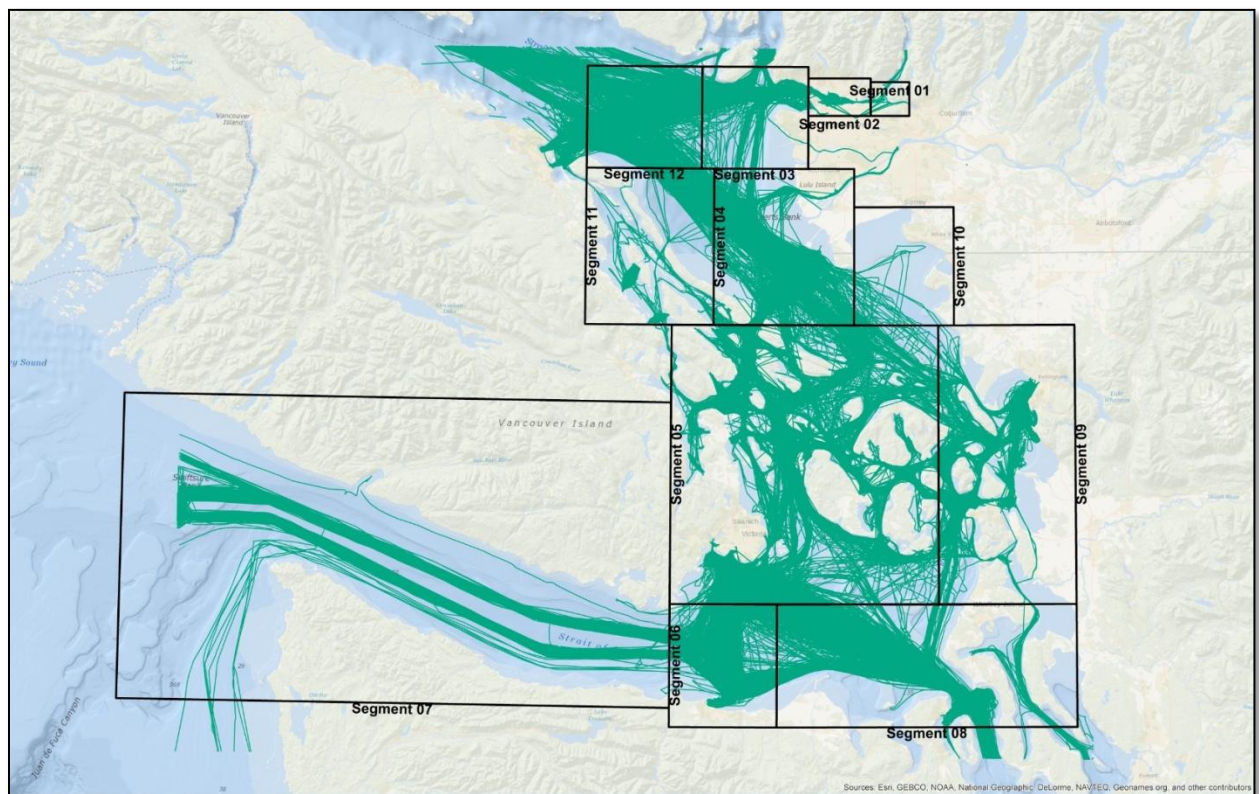


Figure 5-5: Passenger Traffic