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# Shipping Traffic Analysis and Risk Mitigation Measures for the West Coast of Haida Gwaii

Prepared for:

Technical Working Group and Project Committee of the  
Safe Distance Offshore / Proactive Vessel Management Pilot  
Project on Haida Gwaii

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## Executive Summary

The report documents analysis and research conducted for the Safe Distance Offshore / Proactive Vessel Management Pilot Project on Haida Gwaii (SDO-PVM pilot project). The project was co-led by the Council of the Haida Nation (CHN) and Transport Canada (TC), with input from other government agencies and a project committee including shipping industry representatives.

Two of the key goals of the project were to:

- (1) Determine a Safe Distance Offshore to ensure a high likelihood of effective response to prevent vessel drift grounding accidents along the coastlines around Haida Gwaii.
- (2) Assess the feasibility and effectiveness of implementing protective measures against this possibility and develop an associated implementation plan.

With a focus on the west coast of Haida Gwaii, Nuka Research analyzed commercial ship traffic and researched potential voluntary risk mitigation measures. The traffic analysis and research were implemented to answer questions developed by the Technical Working Group (CHN and TC) and informed by the project committee. Results of the analysis were discussed in project committee meetings.

The report considers three potential distances for voluntary offshore routing: 25, 50, or 75 NM. Automatic Identification System data provided by Clear Seas Centre for Responsible Marine Shipping were used for the vessel traffic analysis. In the years analyzed (2014-2016), ship transits within 75 NM of southern Haida Gwaii were primarily cruise ships and cargo ships voyaging to Alaska.

A voluntary routing measure that suggested ships stay 25 NM off the west coast of Haida Gwaii would align with the Pacific States-BC Oil Spill Task Force (2002) recommendation for vessels of 300 GT or larger. This measure would affect 38 vessels making 322 transits (based on 2016 data), primarily cargo and cruise ships going to and from Alaska. Adjusting to follow this route could add approximately 8 NM to a typical route going to Southeast Alaska and 1 NM to a typical route to Cook Inlet, Alaska (which includes the Port of Anchorage).

A voluntary routing measure that asked ships to stay 50 NM off the west coast of Haida Gwaii would align with the "higher risk" area identified by the Pacific States-BC Oil Spill Task Force (2002). It would affect approximately 563 transits by 73 ships (based on 2016 data), still primarily in the Alaska trade but with some Great Circle Route voyages and voyages to Northern BC ports affected as well. For vessels going to Southeast Alaska, staying outside Haida Gwaii would still be shorter than a route through Hecate Strait. Approximately 32 NM would be added to a typical voyage to or from Southeast Alaska, and 4 NM to a voyage to or from Cook Inlet, Alaska.

A voluntary routing measure that asked ships to stay 75 NM off the west coast of Haida Gwaii would keep them well outside the higher risk area identified by the Pacific States-BC Oil Spill Task Force (2002) and align with a previous recommendation for transiting laden tankers. It would affect approximately 620 transits by 106 ships (based on 2016 data), including 71 vessels on the Great Circle Route. At this point, it would be more than 20 NM shorter for vessels going to or from Southeast Alaska to travel through Hecate Strait instead of staying that far off the west coast to Haida Gwaii.

Tankers and most vessels traveling the Great Circle Route between North America and Asia would not be affected by any of the three distances considered.

At least three options were identified for implementation of a voluntary routing measure, including examples in Canada and elsewhere. These ranged from agreements with individual operators who travel the area frequently to a formal proposal to the International Maritime Organization.



## Acronyms

AIS	Automatic Identification System
ATBA	Areas to Be Avoided
BC	British Columbia
CCG	Canadian Coast Guard
CHN	Council of Haida Nation
DFO	Department of Fisheries and Oceans
ECA	Emissions Control Area
EEZ	Exclusive Economic Zone
ETV	Emergency Tow Vessel
HSC	Harbor Safety Committee
IMO	International Maritime Organization
MaPP	Marine Plan Partnership
MCTS	Marine Communications and Traffic Services
MPA	Marine Protected Areas
NM	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
OPP	Oceans Protection Plan
PNCIMA	Pacific North Coast Integrated Management Area
PPA	Pacific Pilotage Authority
PVM	Proactive Vessel Management
RFA	Reconciliation Framework Agreement for Bioregional Oceans Management and Protection
SDO-PVM pilot project	Safe Distance Offshore / Proactive Vessel Management Pilot Project
SK-B MPA	S <sup>G</sup> aan K <sup>I</sup> nghlas - Bowie Seamount Gin Siigee Tl'a Damaan K <sup>I</sup> nggangs Gin K <sup>I</sup> 'aalaagangs Marine Protected Area
SOLAS	Safety of Life at Sea
TC	Transport Canada
TEZ	Tanker Exclusion Zone
TWG	Technical Working Group
USCG	United States Coast Guard
VHF	Very High Frequency
VTs	Vessel Traffic Services
WSC	Waterway Safety Committee

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## 1 Introduction

The report documents analysis and research related to commercial shipping off the west coast of Haida Gwaii and potential measures intended to reduce the likelihood of a drift grounding there. The efforts described here were conducted for the Safe Distance Offshore for Haida Gwaii / Proactive Vessel Management Pilot Project (SDO-PVM pilot project) co-led by the Council of the Haida Nation (CHN) and Transport Canada (TC).

Answers to the research questions were sought via a combination of vessel traffic analysis, literature review, and interviews. Results were presented and discussed at workshops in June, August, and October 2019. While this report benefitted from the direction, discussion, and draft revisions from the project committee, such contributions do not constitute agreement with the resulting findings.

The research questions focused on informing project participants' shared understanding of vessel traffic and potential voluntary risk mitigation measures off the west coast of Haida Gwaii. This study does not consider the probability of a drift grounding or other incident occurring, nor the consequences of such an incident. As such, this report itself does not constitute a quantitative risk assessment but rather a summary of analysis and research conducted for the purpose of the SDO-PVM pilot project.

## 2 Background

This section provides background information on the project and related initiatives in the region.

### 2.1 Proactive Vessel Management

"Proactive Vessel Management (PVM) is a term developed by the Government of Canada. It refers to the collaboration of multiple parties to:

- Resolve marine safety issues in local and regional waterways and conflicts related to commercial shipping, and
- Protect the marine environment.

These solutions are developed cooperatively and adopted voluntarily." (Government of Canada, 2018).

### 2.2 Project Background

The Haida Nation formally raised the issue of vessel drift and grounding with Canada in 2014 after the M/V *Simushir* 'near miss' incident. CHN convened the *Lessons from the Simushir* workshop in May 2015 in HlGaagilda Skidegate with federal and provincial agencies, outside experts, and stakeholders (CHN, 2015). A key recommendation by the Haida Nation from this workshop included establishing a 50-100



NM risk mitigation zone for Haida Gwaii's west coast based on a 2002 study by the Pacific States-British Columbia (BC) Oil Spill Task Force.

Following a February 2018 letter from the CHN to the Pacific Pilotage Authority (PPA) and TC, the Executive Director of Oceans Protection Plan Implementation, TC, Yvette Myers, and President of the PPA, Kevin Obermeyer met with the CHN in June 2018 and committed to work with CHN on this issue.

The SDO-PVM pilot project operated under the governance structure established in the *Reconciliation Framework Agreement for Bioregional Oceans Management and Protection (RFA)*. Through the RFA, a Haida Gwaii Technical Working Group (TWG) was formed with representatives from CHN, TC, and the PPA. Other government partners that participated as observers from time to time in the project included: Nuu-Chah-Nulth Tribal Council, Parks Canada (Gwaii Haanas), Province of British Columbia, and Canadian Coast Guard (CCG).

Two of the key goals of the project were to:

- (1) determine a Safe Distance Offshore to ensure a high likelihood of effective response to prevent vessel drift grounding accidents along the coastlines around Haida Gwaii, and
- (2) assess the feasibility and effectiveness of implementing protective measures against this possibility and develop an associated implementation plan.

The TWG recognized the importance of engaging with industry representatives to address issues by developing voluntary measures to improve marine safety and minimize potential risks to the environment, cultural values and communities from shipping traffic. A project committee composed of CHN, TC, shipping industry, and other stakeholders collaboratively developed research questions that were addressed in the analysis described in this report. The project charter for the SDO-PVM pilot project outlines the project background, objectives, scope, key milestones, and the role of the project committee. The terms of reference outline the project committee's approach to work together to accomplish the project objectives, including details on the membership, member responsibilities, decision-making and advice, operating principles, and meeting procedures.

Representatives from CHN and TC co-chaired the project committee, which was comprised of the members identified below.

- Council of the Haida Nation – Russ Jones, Lindsay Galbraith
- Transport Canada – Louise Murgatroyd, Andrew Bak
- Canadian Coast Guard – Bob Crooks, Art Stratham
- Chamber of Shipping – Robert Lewis-Manning
- Shipping Federation of Canada – Chad Allen
- Cruise Lines International Association (North West and Canada) – Donna Spalding
- Council of Marine Carriers – Phill Nelson

- International Ship-Owners Alliance of Canada Inc. – Lanna Hodgson
- Pacific Merchant Shipping Association – Michael Moore
- Marine Exchange of Puget Sound – John Veentjer
- BC Coast Pilots – Robin Stewart, Roy Haakonson

Clear Seas Centre for Responsible Marine Shipping is also a partner in the project having contributed 2014-2016 Automatic Identification System (AIS) data on vessel movements in the region from exactEarth. Other stakeholders beyond the project committee were invited to participate for specific purposes.

Project committee members were asked to identify information gaps, review the proposed approach, and suggest issues to support development of research questions. The committee provided further guidance on the approach of the analysis at five in-person meetings in 2019 (February 4<sup>1</sup>, April 9, June 26, August 27, and October 10). Following the meetings where Phase 1 and Phase 2 analytical results were presented (June 26 and August 27, 2019), memos were drafted from the TWG to the project committee to confirm research questions and approach for subsequent analysis that were discussed over teleconference meetings on August 1 and September 20, 2019. Nuka Research completed three phases of analyses and research during 2019 in response to the project committee's research questions. These efforts are summarized in this report, which was reviewed by the project committee and discussed on December 3, 2019 and January 24, 2020.

## 2.3 Related Initiatives in the Region

On November 7, 2016 Canada introduced the national Oceans Protection Plan (OPP). Related to this, several initiatives related to marine protection and/or navigational safety in western Canada are occurring concurrently. This section briefly describes efforts underway that involve the same or similar governance partners or participants and relate to vessel activity and actual or potential impacts in northern BC. Some of these initiatives have informed this work, while others may *be informed by* this SDO-PVM project in future.

### 2.3.1 Emergency Towing

Effecting a timely emergency tow of a disabled vessel can reduce the risk of vessel drift and grounding. First Nations, including the CHN, and industry have raised concerns about the lack of existing resources on Canada's Pacific Coast. Two dedicated emergency towing vessels are currently patrolling the northern and southern portions of Pacific open waters. TC and CCG are working on emergency towing initiatives to examine capacity and system needs in order to support development of a long-term strategy with regards to emergency towing. Some work has been completed on assessing emergency

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<sup>1</sup> Many members were unable to attend the February 4 workshop, so a phone meeting took place on February 13. *Determining a Safe Distance Offshore in Haida Gwaii Technical Workshop* summary report was provided to the Project Committee on April 9, 2019.



towing needs that takes into account several considerations to enhance the Pacific Region's emergency towing system, such as: adequacy of the vessels of opportunity program, placement of leased ETVs (e.g. one in the northern patrol zone covering Dixon Entrance, the west coast of Haida Gwaii and Hecate Strait), and measures to increase the time available for a successful response, such as establishing a safe distance offshore. Because the presence of emergency towing relates to the safe distance offshore for vessels, the emergency towing-related initiatives have been of interest to the SDO-PVM pilot project.

### 2.3.2 Additional Related Initiatives

The project committee identified several other initiatives related to shipping around Haida Gwaii that were concurrent with potential relevance to the SDO-PVM pilot project. These included:

- A TC-commissioned Regional Risk Assessment of the risks of ship-source oil spills.
- The Haida Gwaii Marine Awareness Project (HGMAP), through which CHN is participating in a TC pilot project for the Enhanced Maritime Situational Awareness initiative, a real-time vessel traffic monitoring system.
- A trilateral collaborative Marine Protected Area Network planning and management process initiatives for the Northern Shelf Bioregion and the Scott Islands and the Haida Gwaii National Marine Conservation Area and the Scott Islands.
- A partnership between TC and the Pacific North Coast First Nations, including the CHN, to implement a five-year Cumulative Effects of Marine Shipping pilot project.

## 3 Haida Gwaii Context

This section describes the Haida Gwaii context related to vessel traffic and potential impacts from a vessel drift and grounding incident. Vessel traffic around Haida Gwaii is described in Sections 5 and 6.

### 3.1 Sensitivity of the West Coast of Haida Gwaii

*Xaayda Gwaay Haida Gwaii* is an archipelago on the edge of the continental shelf off the north coast of British Columbia and has been home to the Haida for thousands of years. Life in the sea around Haida Gwaii is the essence and well-being of the Haida Nation, and Haida communities and culture. The Haida Nation and Canada have made progress on cooperative governance for over 40 years. Today, more than 52% of the land is protected and 87% of the shoreline is protected and managed by the Haida Nation in collaboration with Canada and/or British Columbia. Nearly the entire west coast of Haida Gwaii is managed at a higher standard of protection by CHN and various federal or provincial partners through their respective laws at Duuguusd/Daawuuxusda Heritage Sites/Conservancies and Gwaii Haanas Haida Heritage Site, National Park Reserve, and National Marine Conservation Area. The Haida

Gwaii Marine Plan describes the upwelling of nutrient-rich waters that occurs near the west coast of Haida Gwaii, creating a productive habitat for kelp, eelgrass, shellfish, deepwater corals, and fish and seabird populations (Marine Planning Partnership Initiative, 2015).

The west coast of Gwaii Haanas is where the ancient Haida village SGang Gwaay is located, an internationally recognized World Heritage Site designated by UNESCO in 1981 and where some Haida visit and work as Haida Gwaii Watchmen. This is one of several ancient village sites on the west coast where remains of houses and poles and other archaeologically and culturally important places that continue to be visited and used by Haida today. The Haida Gwaii Rediscovery Program also hosts a cultural camp for youth at T'allan Stl'ang Lepas Bay in Duuguusd Heritage Site/Conservancy (Coast Funds, 2019).

While any actual response will be determined by the conditions at the time, the west coast of Haida Gwaii is likely to be a challenging place to respond to an emergency. Most of the west coast is accessible by boat only (the exception is Rennell Sound, an area of high tourism and recreation values). Just two potential places of refuge on the west coast of Haida Gwaii were identified where large vessels could go if they needed emergency assistance or repair, and both are subject to weather related limitations (CHN – TC, 2018).

### 3.2 CHN Efforts Related to Marine Shipping

In addition to its role in many of the initiatives described in Section 3.1, CHN has been active in several areas related to the potential impacts of marine shipping to the waters of Haida Gwaii.

In May 2015, CHN hosted a workshop that led to recommendations for changes to be made to the accident prevention and emergency response system based on lessons from the *Simushir* incident. The *Lessons from the Simushir* Report (2015) identified a lack of a coordinated and effective emergency response system in past incidents. CHN's key findings and recommendations from the workshop report (2015) include:

- **Prevention is the priority.** Prevention needs to come first given the remote location and challenges with oil spill response. Additional CCG assets are needed to improve response times.
- **Safe distance offshore.** The recommended distance offshore of 25 nautical miles is inadequate for transiting vessels and needs to be 50 to 100 miles based on past studies.
- **Rescue tugs.** There is a need for rescue tugs that are capable of severe weather rescue to be stationed in northern BC including on Haida Gwaii.

For CHN, the *Simushir* incident highlighted the need for ongoing planning and action to protect the coastlines and marine resources on Haida Gwaii over the long term. The incident brought to the forefront the readiness of the system to respond to shipping incidents and opened up a dialogue between decision-makers to learn from this incident and take meaningful actions to prevent future incidents from occurring.

Tripartite shipping discussions took place between 2014 and 2016 among First Nations of the Northern Shelf Bioregion, including CHN, and federal and provincial agencies. Subsequent collaborative processes between the CHN, Canada, and/or BC have identified a need to address shipping safety to mitigate potential impacts on Haida Gwaii communities and the marine environment, including:

- **Haida Gwaii Marine Plan (2015) and Marine Plan Partnership (MaPP) – Strategy 1.3c:** Work with relevant agencies and others to increase measures to prevent accidents or spills.
- **Pacific North Coast Integrated Management Area (PNCIMA) Plan (2017) – Strategy 2.2:** Assess or enhance management measures to prevent accidents or spills.
- **Gwaii Haanas Gina 'Waadluxan KilGulGa Land-Sea-People Management Plan (2018) – Objective 4.3, Target 1:** The AMB works with relevant agencies to strengthen communication about vessel movements in or near Gwaii Haanas. **Target 2:** The Archipelago Management Board works with relevant agencies to encourage large vessels to transit sufficiently far offshore of Gwaii Haanas to ensure adequate response time and prevent accidents.
- **SḠaan Kḡinghlas - Bowie Seamount Gin Siigee Tl'a Damaan Kḡinggangs Gin K'aalaagangs Marine Protected Area Management Plan (2019) – Objective 2.2a:** Large vessels are encouraged to transit a minimum of 50 NM from the SK-B pinnacle.

Despite these efforts to protect Haida Gwaii, CHN remains concerned about threats and challenges shipping poses to the marine environment of Haida Gwaii: Haida Gwaii lies on the Great Circle route between Asia and North America; vessel traffic is increasing in northern BC, particularly to and from the ports of Prince Rupert and Kitimat; and cruise ships regularly pass near Haida Gwaii's western shoreline traveling to and from Alaska. Ensuring sufficient capacity to respond to marine emergencies, such as the loss and foundering of vessels, loss of cargo, chemical and oil spills, remains a concern for CHN.

### 3.3 Risk Mitigation Measures in Place

Commercial ships operating around Haida Gwaii are subject to a number of international conventions and Canadian legislation regarding, among others, construction, crew safety and training, the use of AIS and other navigational equipment such as Electronic Navigation Charts, and oil spill prevention, response and compensation. This section provides a brief overview of some of the relevant requirements under which a commercial vessel must operate off of Haida Gwaii, as context for the findings and recommendations.

### 3.3.1 International Conventions

The International Maritime Organization (IMO) is a United Nations agency responsible for the safety and security of international shipping and preventing pollution from ships. As of 2020, membership comprised 174 nations, including Canada and the US (IMO, 2020). Among more than 50 international agreements related to international shipping, there are three primary IMO conventions: International Convention for the Safety of Life at Sea (SOLAS), International Convention for the Prevention of Pollution from Ships (MARPOL), and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).<sup>2</sup> These conventions are implemented through the domestic laws of the countries that are party to them, and establish a range of safety and pollution prevention requirements for commercial vessels, supported by port state control inspections of foreign-flagged ships, and by registering ships under their own flag. (IMO, 2013)

### 3.3.2 Federal Agency Responsibilities

Transport Canada is the lead federal agency responsible for the safety, security, efficiency, and environmental responsibility of transportation by water, land, and air (Transport Canada, 2019). This includes administering the *Canada Shipping Act, 2001*, and associated regulations, related to vessel design and construction standards as well as preparedness for marine oil spills. Canada inspects foreign-flagged vessels calling at its ports to verify that the vessels meet international requirements, and shares the results of those inspections with other countries through regional agreements.<sup>3</sup> Canada is also responsible for ensuring that Canadian-flagged vessels meet international requirements. Many of the vessels of interest in this study do not call at a Canadian port on the voyage past Haida Gwaii but are instead on a voyage from a U.S. port (and thus subject to inspection in the U.S.) when passing through Canadian waters.

The CCG has key responsibilities related to aids to navigation, search and rescue, pollution response, and vessel traffic services (CCG, 2017). Marine Communications and Traffic Services (MCTS) in British Columbia operates the vessel traffic service (VTS) in western Canadian waters. Vessels subject to the *Vessel Traffic Services Zones Regulations, Section 3* are required to report in to MCTS prior to or at certain points within the VTS. In the Pacific Region, that extends to 12 NM offshore which encompasses territorial waters (MCTS, n.d.). Many of the vessels within the scope of this study operate outside territorial waters. Vessels are not subject to VTS reporting requirements beyond 12 NM.

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<sup>2</sup> For more information on these and other International Conventions related to maritime operations, see: <http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/Default.aspx>

<sup>3</sup> For example, as a member of the Memorandum of Understanding (MOU) on Port State Control in the Asia-Pacific Region, Canada shares information with other countries in the Pacific about its inspections and benefits from information regarding deficiencies identified in their inspections. This allows the countries to work together to identify and address issues associated with individual vessels or patterns identified across flag states or classification societies. For more information, see: <http://www.tokyo-mou.org/>



### 3.3.3 Marine Pilotage

Certain vessels are required to take on a marine pilot within mandatory pilotage waters, which range from 2-6 NM off the west coast of Haida Gwaii. Marine pilots are experienced, highly trained mariners with extensive local knowledge of coastal waterways and associated navigational hazards. The majority of the vessel traffic examined in this study is outside pilotage waters.

### 3.3.4 Tanker Exclusion Zone

Since 1985, there has been a voluntary Tanker Exclusion Zone (TEZ) off the west coast of Canada.<sup>4</sup> This zone extends 75 to 110 NM off the west coast of Haida Gwaii. The TEZ applies to laden tankers passing through Canadian waters between Valdez, Alaska (the terminus of the pipeline from Alaska's North Slope oil production) and refineries in the "lower 48" U.S. states. It is not intended to apply to tankers calling at BC ports. While the TEZ is intended only for laden tankers (heading south), as discussed in Section 7.1, tankers going in both directions stay outside the TEZ (Transport Canada, 2017).

## 3.4 Past Incidents Requiring Towing Assist

Recent incidents reinforce the importance of emergency tow capacity and capability on the west coast. The emergency tow vessel(s) that may actually assist a vessel will be determined based on circumstances at the time. CCG or TC would not direct emergency tow vessel(s) to assist a vessel except in a crisis where no other option appears to exist (i.e. in a case where there is no response from a vessel or their owner but known imminent danger to persons). Instead, the master of a vessel would be directed to find and accept assistance from emergency tow vessel(s) of appropriate capabilities to assist the vessel. This avoids the potential for litigation over who contracted the vessel and who must pay for the contract.<sup>5</sup>

The following recent incidents, which took place in western Canada, are required tug assist (all were successful except the *Nathan E. Stewart* in 2016):

- **October 16, 2014:** M/V *Simushir*, a Russian-flagged general cargo/container ship, lost power ~20.5 NM off the west coast of Haida Gwaii and drifted to within 5.6 NM off shore during a major storm. The *CCGS Gordon Reid* established a tow on the third attempt and held the vessel until the *Barbara Foss* took the vessel under tow to Prince Rupert on October 18.
- **November 24, 2015:** M/V *North Star*, an U.S.-flagged roll-on/roll-off ship lost power for several hours approximately 50 NM west of Haida Gwaii, while transiting from Anchorage to

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<sup>4</sup> Note that this is different from the 2019 Oil Tanker Moratorium for the Pacific Coast, which prohibits oil tankers carrying more than 12,500 metric tons of persistent oil (including crude) from stopping, loading, or unloading in Northern BC. <https://www.tc.gc.ca/eng/marinesafety/oil-tanker-moratorium-british-columbia-north-coast.html>.

<sup>5</sup> Information provided by Bob Crooks, CCG, January 27, 2020.

Washington. The *CCGS Gordon Reid* was deployed as a precaution and the ship regained propulsion and made port without assistance.

- **October 13, 2016:** *Nathan E. Stewart*, U.S.-flagged tug and articulated barge, ran aground near Bella Bella en route from Alaska, spilling 110,000 litres of diesel and more than 2,200 litres of engine lubricants. The tug *Haisea Guardian* took the barge in tow when it separated from *Nathan E. Stewart*.
- **January 31, 2018:** *MOL Prestige*, a Singapore-flagged container ship, suffered an engine fire en route from Vancouver to Tokyo and was adrift approximately 207 NM southwest of Haida Gwaii. The ship owner contracted the tug *Denise Foss*, which successfully towed the ship to Seattle. A CCG Emergency Towing Vessel was dispatched as a precaution until the vessel was safely under tow.
- **January 24, 2019:** *Alam Sayang*, a Panama-flagged bulk carrier, lost power approximately 190 NM off the west coast of Haida Gwaii. CCG's *Atlantic Raven* was tasked to stand by. *Denise Foss* took the ship in tow.

There are other incidents on the U.S. coast of North America as well, sometimes involving vessel traffic that travels through western Canadian waters. One significant incident was the *M/V Selendang Ayu* oil spill in the Aleutian Islands in 2004. This Malaysian-flagged bulk carrier lost power and grounded after 52 hours adrift and multiple unsuccessful efforts to establish a tow. The incident resulted in the loss of six crew and 336,000 gallons of fuel oil, followed by an 18-month cleanup.<sup>6</sup>

## 4 Vessel Traffic Characterization

The project committee agreed on a need to better understand vessel movements around Haida Gwaii, particularly off the west coast). Clear Seas Centre for Responsible Marine Shipping (Clear Seas) provided AIS data that was used to characterize the number and type of vessels and voyages within the area of interest. Nuka Research and CHN conducted the analysis described here to answer the following research questions:

1. What commercial vessels operate in the Canadian waters offshore of Haida Gwaii and what are they doing there?
  - a. What number and type of vessels are operating in the area?
  - b. Where do vessels transit?
  - c. What are the characteristics of these vessels (e.g. tonnage, flag, age, and estimated petroleum capacity)?
  - d. What are the variations in tracks by year and season?

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<sup>6</sup> National Transportation Safety Board. (2004, December 8). *Marine Accident Brief*. <https://www.nts.gov/Investigations/AccidentReports/Reports/MAB0601.pdf>

- e. What trades are these vessels engaged in, and what variations in tracks exist within each trade?
  - f. Which vessels are under Canadian Port State control and which are transiting in innocent passage?
2. How does the vessel traffic intersect with the probability rescue zones defined in the Clear Seas Vessel Drift and Response Analysis for Canada's Pacific Coast?
  - a. What are the relative risks posed by these vessels?
  - b. What protective measures, used in other places to proactively manage this type of vessel traffic, may reduce the likelihood or severity of vessel accidents with minimal impact on vessel operations?
  - c. Are there any known potential unintended consequences of implementing such protective measures? If so, what are they?
3. Do traffic directions (inbound/outbound) tell us anything about traffic behaviour for vessels crossing the southern passage line?
4. Were the 2015 and 2016 traffic patterns substantially the same for 2017 and 2018?
5. Does an examination of monthly traffic patterns show differences that do not show up in the seasonal analysis?
6. Do emergency tow vessel (ETV) patterns tell us anything more about the strengths/weaknesses of the findings and potential risk reduction measures?
7. Do all tanker trades comply with the voluntary Tanker Exclusion Zone (TEZ) or just the Alaska Trade?
8. What do trans-Pacific weather patterns tell us about traffic patterns crossing the southern Haida Gwaii passage line?
9. What do 2014 traffic patterns tell us about possible future 2020 traffic patterns when the new International Maritime Organization (IMO) measures limiting sulphur dioxide in ship fuel come into force in January 2020?
10. What does this information tell us about possible unintended consequences of vessel transits taking place further offshore?
11. If the unintended consequences of establishing a safe distance offshore the west coast of Haida Gwaii might drive traffic either through Hecate Strait or SGaan Kinghlas - Bowie Seamount Marine Protected Area:
  - a. What is the 2016 baseline for these areas?
  - b. What factors might cause the traffic to re-route to these areas rather than other areas?
12. What are the traffic characteristics for the northern passage line and the Dixon Entrance passage line?

#### **4.1 Method for Characterizing Vessel Traffic**

Clear Seas provided AIS data for 2014-2016 which had been procured from exactEarth. The dataset had been processed into a set of ships and associated tracks identified from their AIS transmissions to satellite receivers. Nuka Research had processed the data on contract to Clear Seas for a prior project, and, with their permission, used the processed data to conduct the analysis described here. (See Appendix A.)

#### 4.1.1 Geographic Scope and Passage Lines

Only vessel tracks that passed Haida Gwaii within the Exclusive Economic Zone (EEZ) were included in the analysis. This was determined using four passage lines. A passage line is an analytical tool used to identify any time and direction of travel when a vessel crosses a particular line; in this case, four lines drawn from points on the north and south of Haida Gwaii's West Coast out to the edge of Canada's EEZ, across Dixon Entrance (between Haida Gwaii and Alaska), and across Hecate Strait (between Haida Gwaii and the mainland). Figure 4.1-1 shows the passage lines. Passage lines served a second function as well: vessel tracks were tabulated according to where a vessel crossed the passage line to determine how far offshore Haida Gwaii the vessel was traveling at that time.<sup>7</sup>

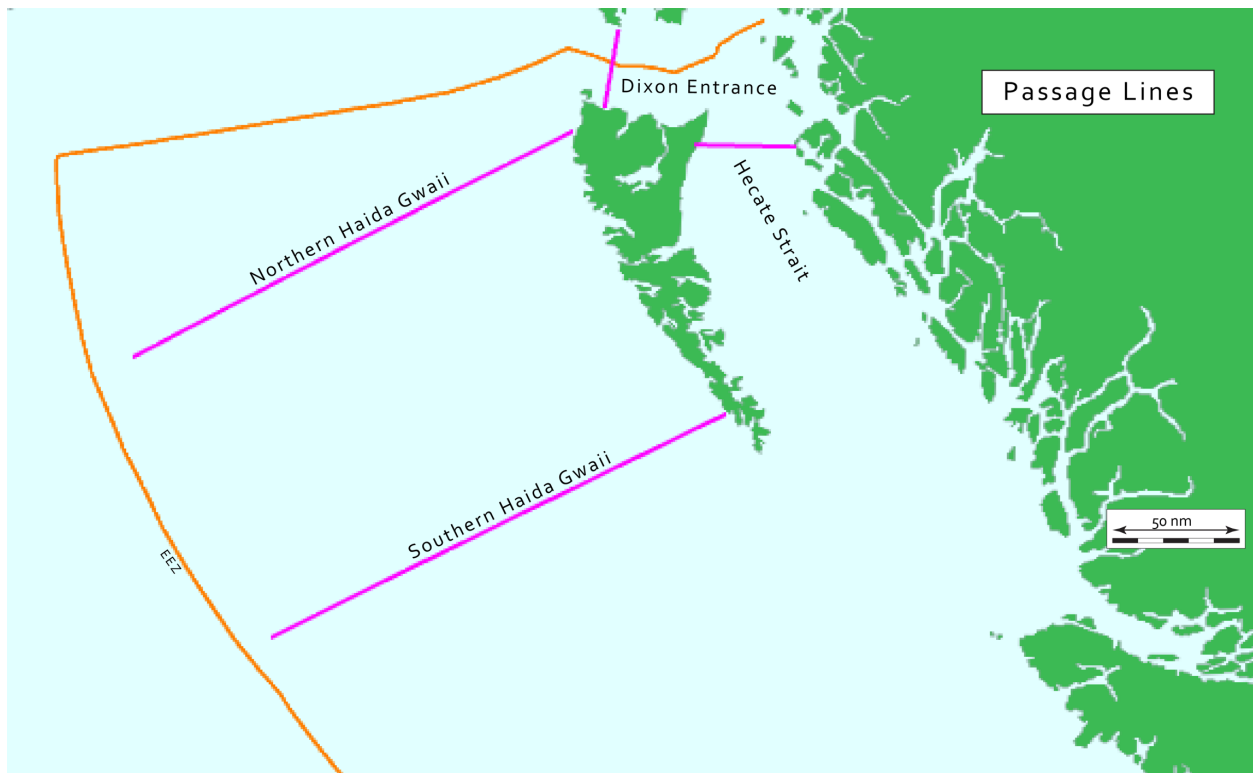


Figure 4.1-1. Study area including passage lines used to include/exclude vessels from analysis

<sup>7</sup> For readers familiar with the Clear Seas 2018 report, Vessel Drift and Response Analysis for Canada's Pacific Coast, the authors note that these passage lines do not correspond with the transect lines shown on the mapped results in the 2018 report. This results in slight differences in the distances and probabilities presented in later sections of this report.

#### 4.1.2 Ship Types

Three ship types were included in this analysis: **cargo vessels** (including container ships, bulk carriers, vehicle carriers, and other cargo<sup>8</sup> ships), **cruise ships**, and **tankers**. These vessels were identified as crossing at least one of the four passage lines in Figure 4.1-1 during 2014-2016 *and* fit the project scope regarding vessel types of interest.

Other commercial vessel such as ferries and the tug-and-barge trade were excluded because, while common in inside waters they generally do not transit the west coast of Haida Gwaii. Given the focus of this project on preventing a potential drift grounding and associated pollution from a large vessel, fishing vessels, private vessels (e.g. yachts), and government vessels (e.g. research vessels) were excluded even if they *did* cross one of the passage lines described in Section 4.1.1.

#### 4.1.3 Trades

In addition to knowing the type of vessel and where it is operating, it is also relevant for this project to consider the trade in which a vessel is engaged. Commercial vessel tracks from 2016 were classified according to one of 4 trades, as defined below:

- Vessels calling at ports in British Columbia:
  - Northern BC ports (e.g. Prince Rupert, Port McNeil)
  - Southern BC ports (e.g. Vancouver, Victoria)
- Vessels transiting Canadian waters *without* a port call in Western Canada:
  - Vessels trading between Washington State and Alaska
  - Great Circle Route vessels trading (primarily vessels transiting between Washington State and East Asian ports; this route passes through the North Pacific or through the Aleutian Islands into the southern Bering Sea)

#### 4.1.4 Limitations

AIS data affords opportunities for monitoring and analyzing vessel movements, but it still has limitations. Information about the vessel type and size or other characteristics is often incomplete or missing, though attempts were made to fill gaps as described in Appendix B. It is also possible that there will be disruptions of the AIS signal transmitted from a vessel, or its reception by a satellite (e.g. if a satellite is not overhead). (Satellite AIS data was used for this analysis.)

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<sup>8</sup> Ship type characterized as 'other cargo' encompasses general cargo and roll-on/roll-off ships.



The SDO-PVM pilot project benefitted from Clear Seas' willingness to share AIS data that was already processed; however, vessel activity will not necessarily be the same in the future. This was discussed by the committee who indicated comfort with looking at port volumes as a readily available proxy.

## 5 Vessel Traffic on the West Coast of Haida Gwaii

Vessel traffic off the West Coast of Haida Gwaii was characterized by identifying the type, trade, direction, and location of vessels crossing the Southern Haida Gwaii Passage Line. Seasonal variations were also examined. Based on the initial analysis of the data, the voyages closest to shore in this area are either cargo vessels or cruise ships; subsequent analysis focused on these two vessel types (including breakdowns of vessel behaviours by the four subtypes of cargo vessel: bulk carrier, container ships, vehicle carriers, and other cargo). Tanker traffic is described (section 4.3.4) but not in the same level of detail as the cargo (Section 4.3.1) and cruise (Section 4.3.2) traffic, because most tankers travel more than 100 NM offshore.

Figure 5-1 shows all cargo vessel, cruise ship, and tanker tracks in the dataset for 2016, whether or not they crossed the Haida Gwaii passage lines. The volume of tracks that goes directly from the EEZ to the Strait of Juan de Fuca illustrates the fact that the bulk of Great Circle Route voyages does *not* pass by Haida Gwaii within 200 NM.

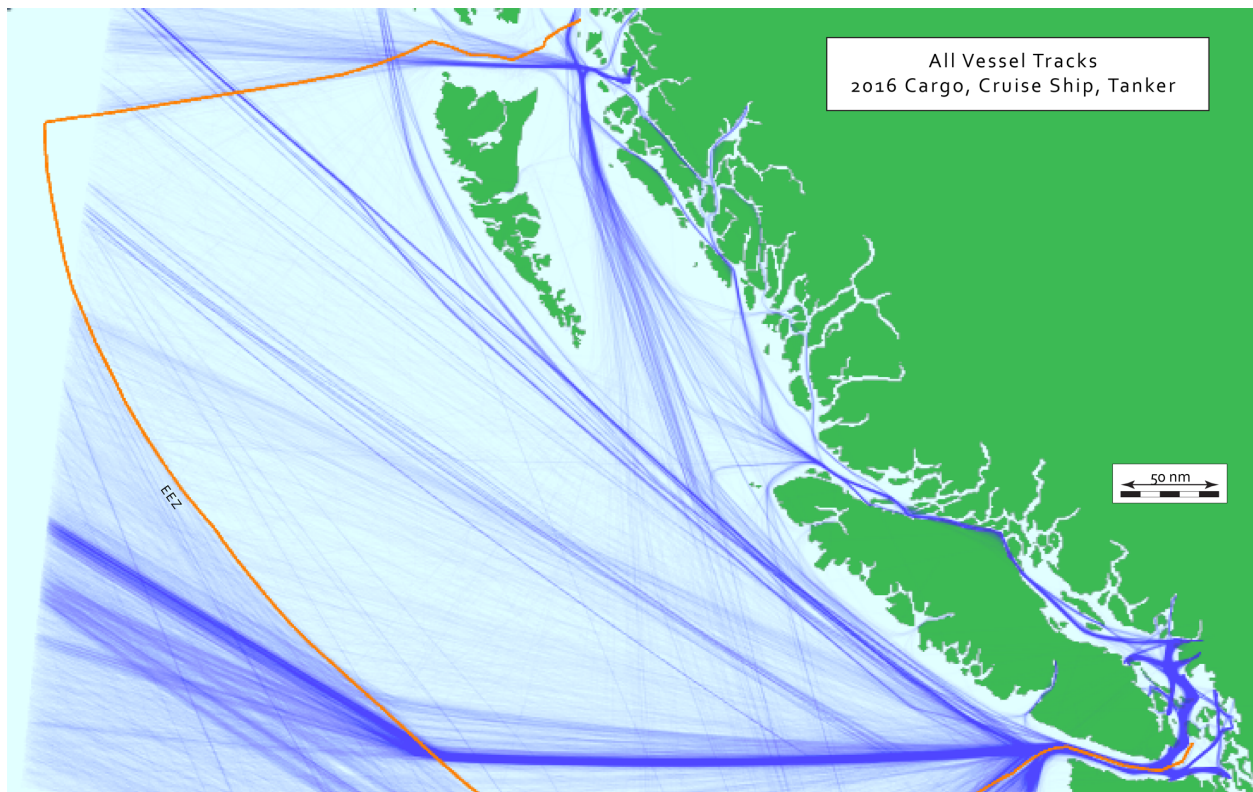


Figure 5-1. All Cargo, Cruise Ship, and Tanker vessel tracks in 2016 AIS data

By contrast, Figure 5-2 shows only the tracks that crossed one of the passage lines around Haida Gwaii used for the analysis. These are the tracks examined in Sections 5 and 6 of this report.

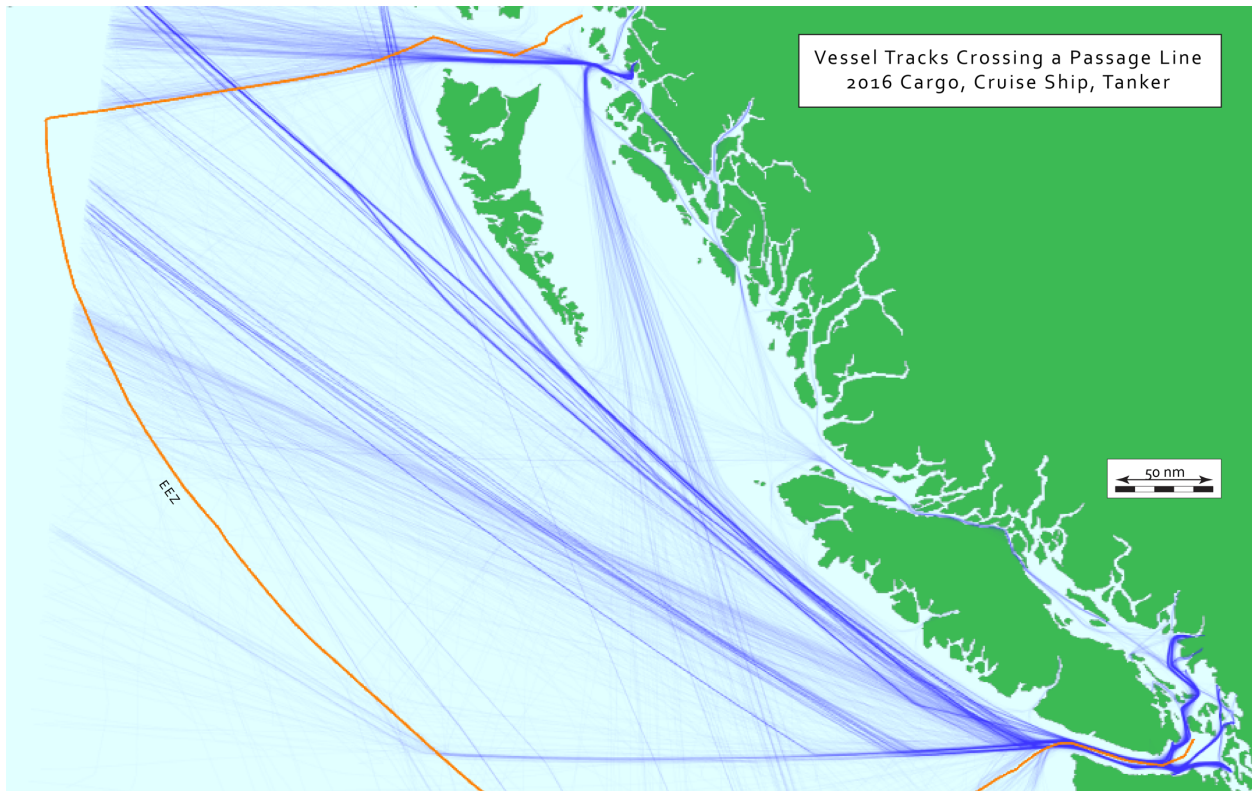


Figure 5-2. Cargo, Cruise Ship and Tanker vessel tracks that crossed Haida Gwaii or Dixon Entrance Passage Lines in 2016.

### 5.1 Cargo Ship Traffic Type, Trade, Season, and Direction

With 788 total cargo voyages counted across the Southern Haida Gwaii Passage Line in 2016, there were far more cargo ship tracks than tankers (305) or cruise ships (194). Within the cargo vessel type category, the number of tracks counted at this passage line were:

- Container ships: 293
- Bulk carriers: 183
- Other cargo vessels: 267
- Vehicle carriers: 35

Figures 5.1-1 shows cargo vessels that crossed a passage line in 2016 according to their trade. Figure 5.1-2 shows the cargo vessel tracks that crossed the Southern Haida Gwaii Passage Line in 2016. The vessels passing within 50 NM of the outer coast of Haida Gwaii are primarily in the Alaska trade. These are container ships and other cargo ships engaged in regular service without much seasonal variation (Figures 5.1-3 and 5.1-4, respectively). There were also container ships and other cargo ships trading at British Columbia ports and on the Great Circle Route, but these voyages were farther off shore at the

Southern Haida Gwaii Passage Line. Bulk carriers cross all along the passage line, but as shown in Figure 5.1-5, most of these voyages were between 100-150 NM from shore. The much smaller number of vehicle carrier transits (Figure 5.1-6) are spread along the passage line all engaged either in Great Circle Route or Southern British Columbia trade.

Cargo vessels in the Alaska trade travel the route regularly, so there are fewer vessels associated with the tracks shown closer to shore on the passage line than is the case for the ships coming to/from the Strait of Juan de Fuca. See Section 8.3.3 for more specific information.

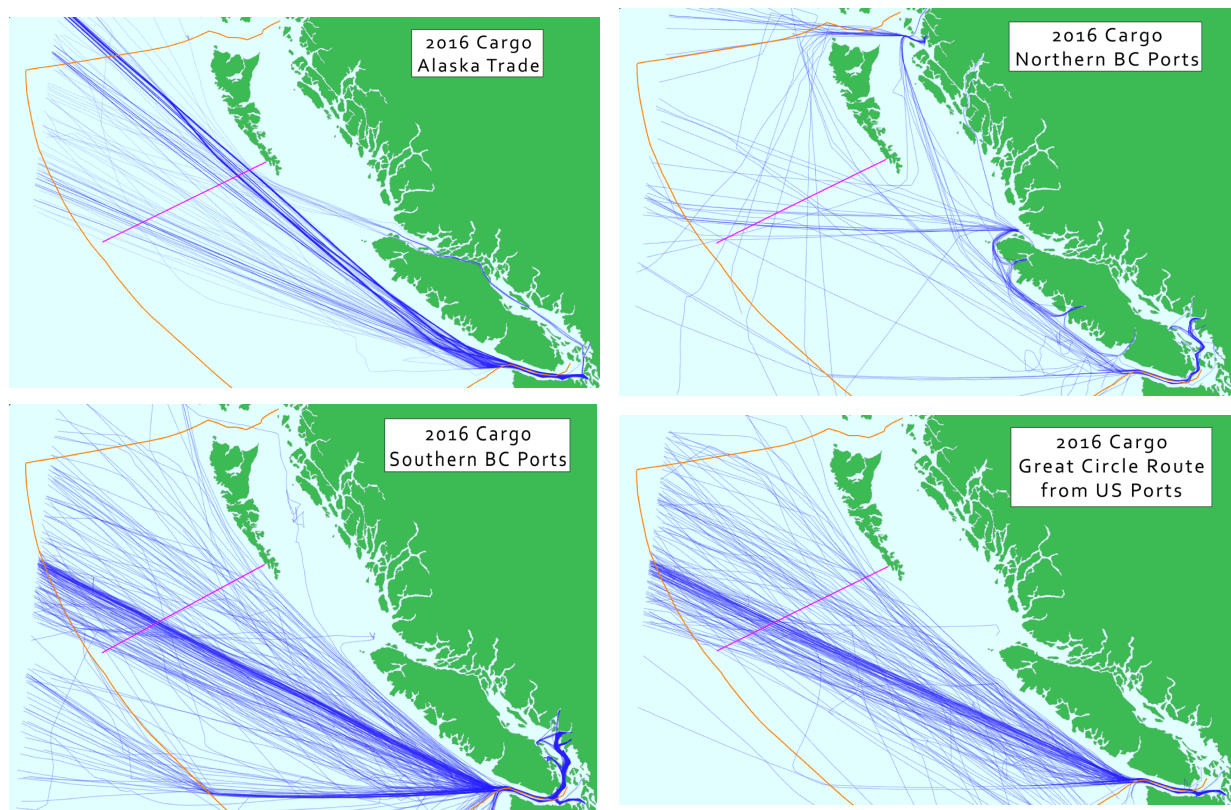


Figure 5.1-1. Comparison of 2016 Cargo Vessel Tracks by Trade that Crossed the Southern Haida Gwaii Passage Line

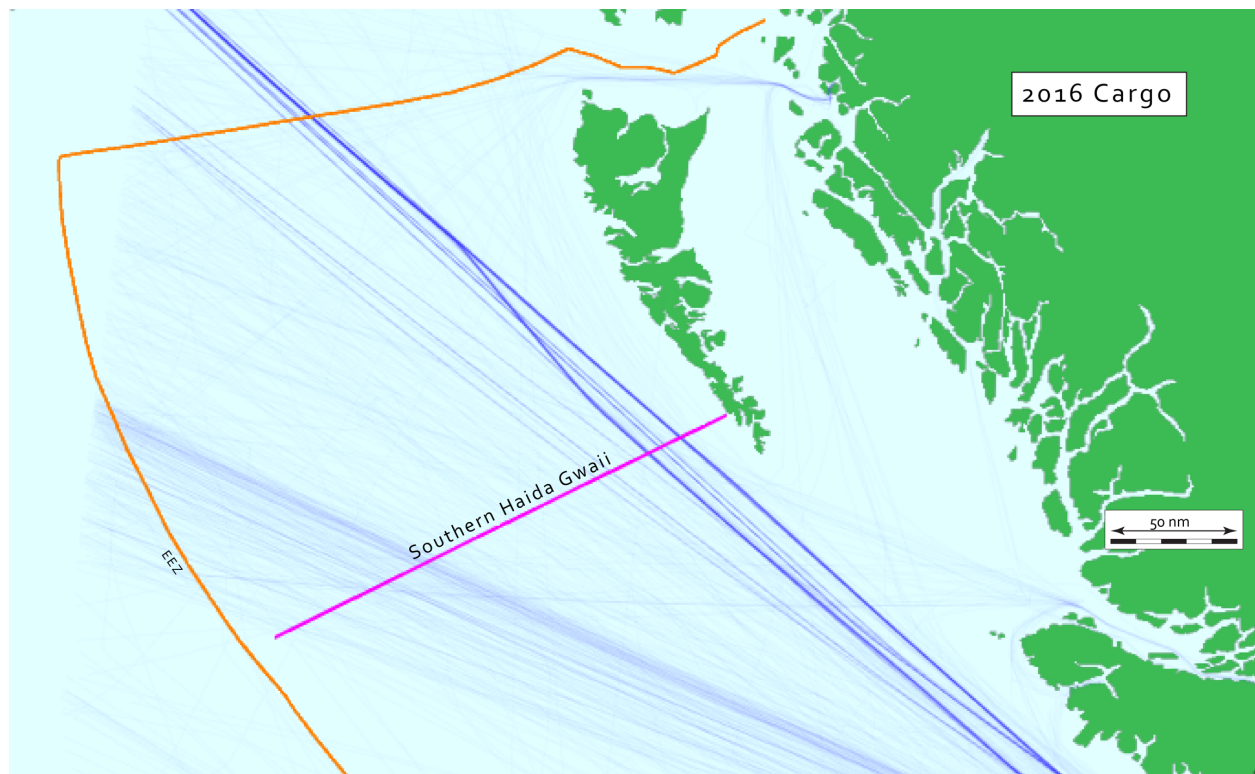


Figure 5.1-2. Cargo vessel tracks that crossed Southern Haida Gwaii Passage Line in 2016

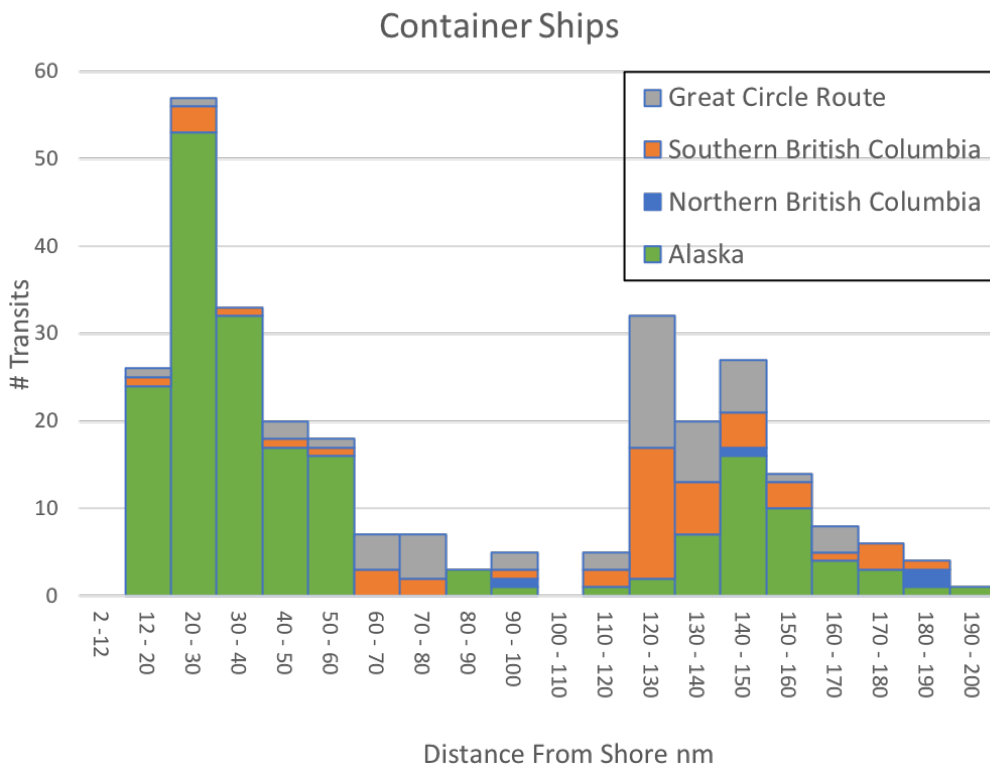


Figure 5.1-3. Southern Haida Gwaii Passage Line Vessel Tracks (2016) and Distance from Shore by Trade – Container Ships

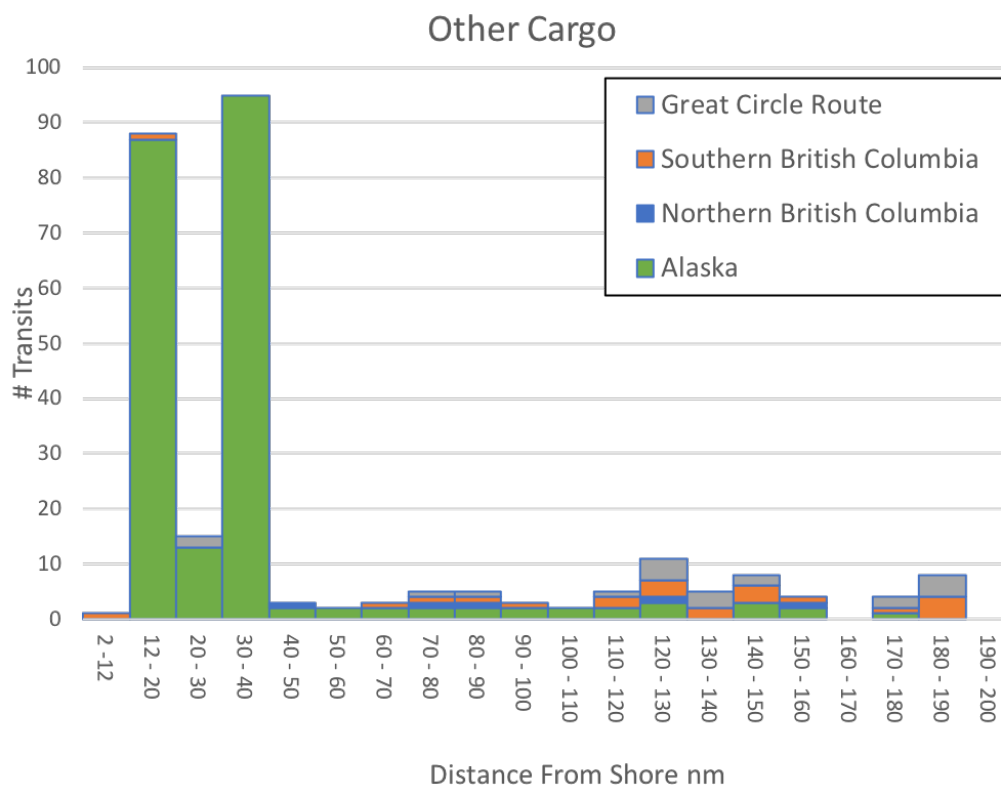


Figure 5.1-4. Southern Haida Gwaii Passage Line Vessel Tracks (2016) and Distance from Shore – Other Cargo Ships (general cargo, roll-on/roll-off vessels)



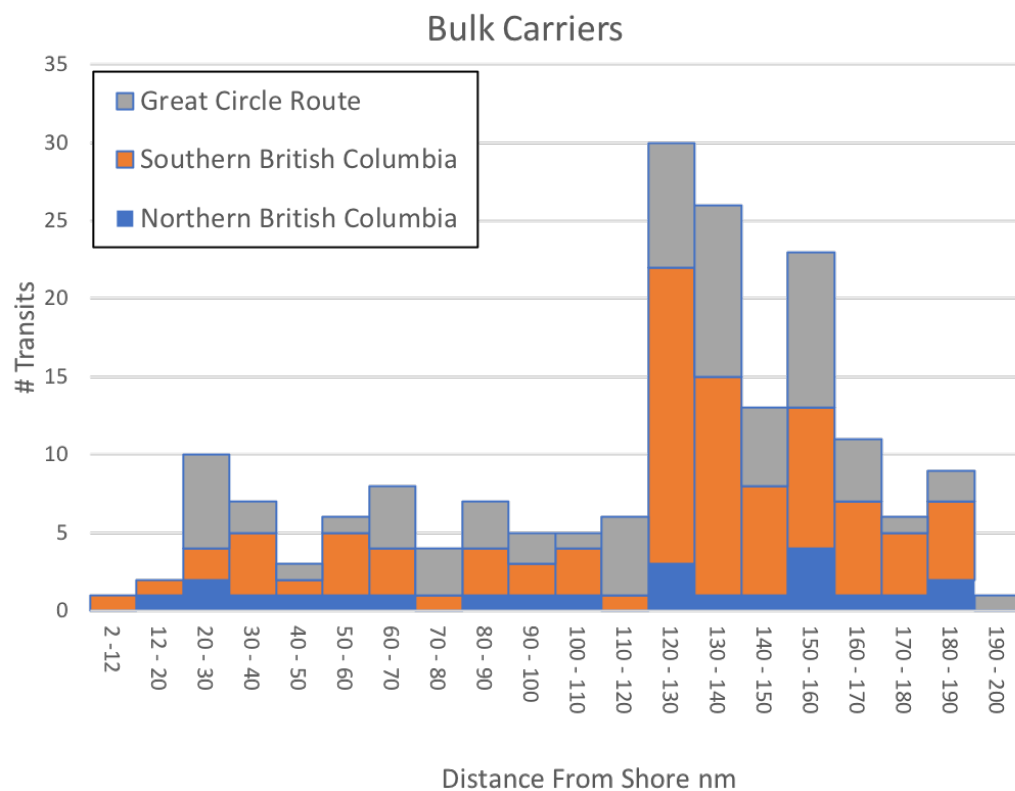


Figure 5.1-5. Southern Haida Gwaii Passage Line Vessel Tracks (2016) and Distance from Shore – Bulk Carriers

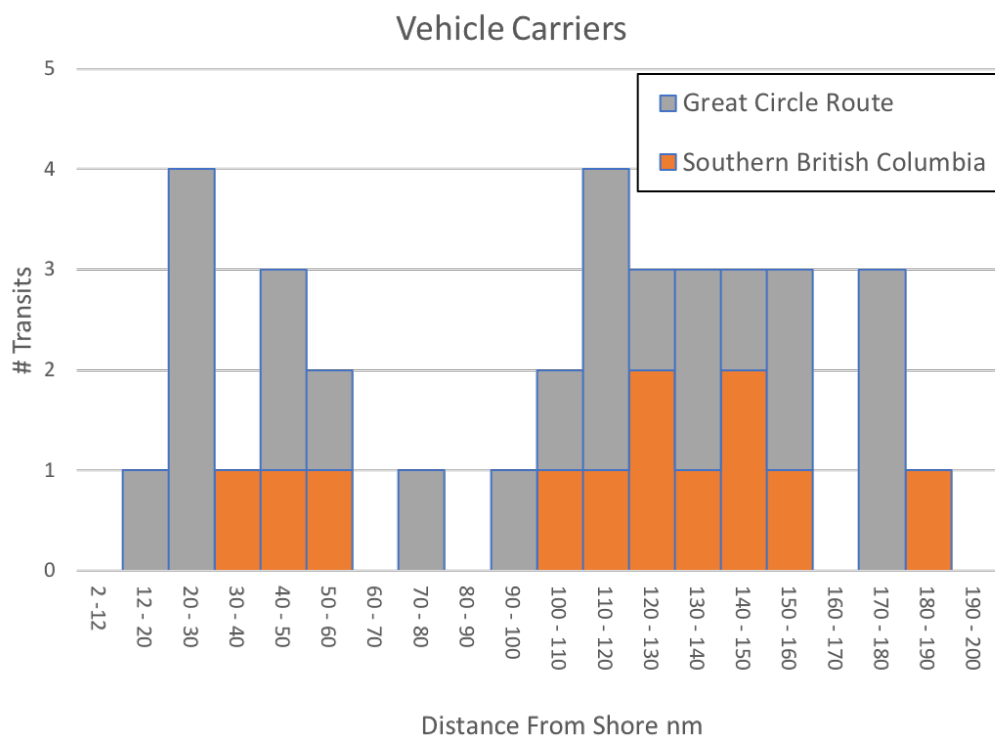


Figure 5.1-6. Southern Haida Gwaii Passage Line Vessel Tracks (2016) and Distance from Shore – Vehicle Carriers



More cargo vessels crossed the Southern Haida Gwaii Passage Line in winter than summer, largely because container ships, bulk carriers, and vehicle carriers on trans-Pacific voyages were more likely to enter and exit the EEZ farther north – and thus be captured in the passage line – than in summer, when they tended to use the more direct route in and out of the EEZ without crossing the passage line at all. This seasonal shift in routes is attributed to the tendency of vessels on the Great Circle Route to travel the northern route through the Aleutian Islands during the winter to avoid large swells in the north Pacific. This shift does not impact the other cargo vessels nearly as much. Both container ships and other cargo ships going back and forth between Alaska and Washington tended to keep the same routes, so although the number of cargo ship voyages *outside* 50 NM increased in winter, the number *within* 50 NM of shore representing the Alaska cargo trade did not. See Table 5.1-1.

Table 5.1-1. Number of Times a Vessel Track Crossed the Southern Haida Gwaii Passage Line in 2016 by Season

	SUMMER (May-Sep)	WINTER (Oct-Apr)
<b>Bulk Carriers</b>	47	136
<b>Container Ships</b>	95	198
<b>Other Cargo</b>	130	136
<b>Vehicle Carrier</b>	4	31

Cargo vessel tracks crossing at the Southern Haida Gwaii Passage Line were also accounted depending whether they were going north or south when they crossed the line. This is shown for container ships, bulk carriers, and other cargo vessels in Figures 5.1-7 through 5.1-9.

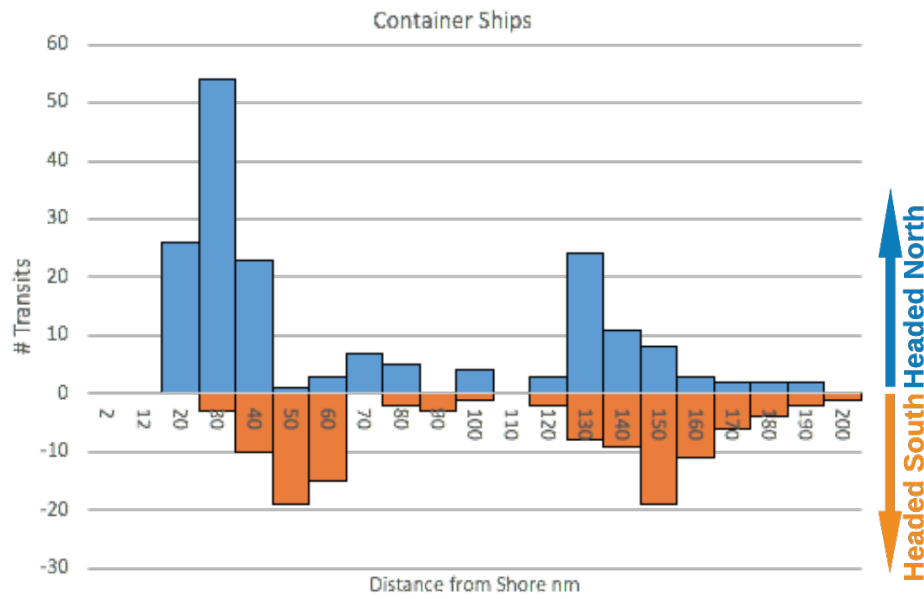


Figure 5.1-7. Southern Haida Gwaii Passage Line Vessel Tracks (2016) Showing Distance from Shore and Direction – Container Ships

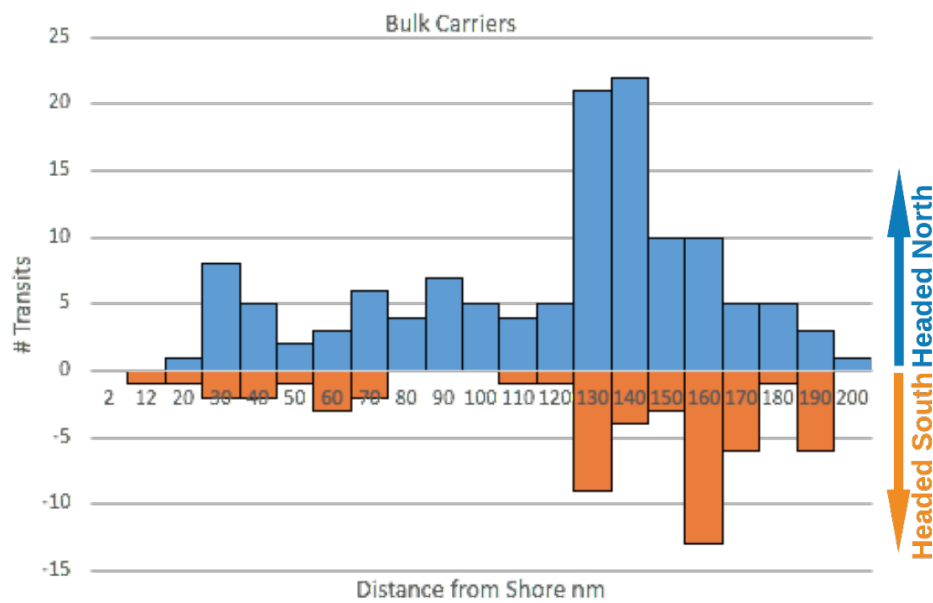


Figure 5.1-8. Southern Haida Gwaii Passage Line Vessel Tracks (2016) Showing Distance from Shore and Direction – Bulk Carriers

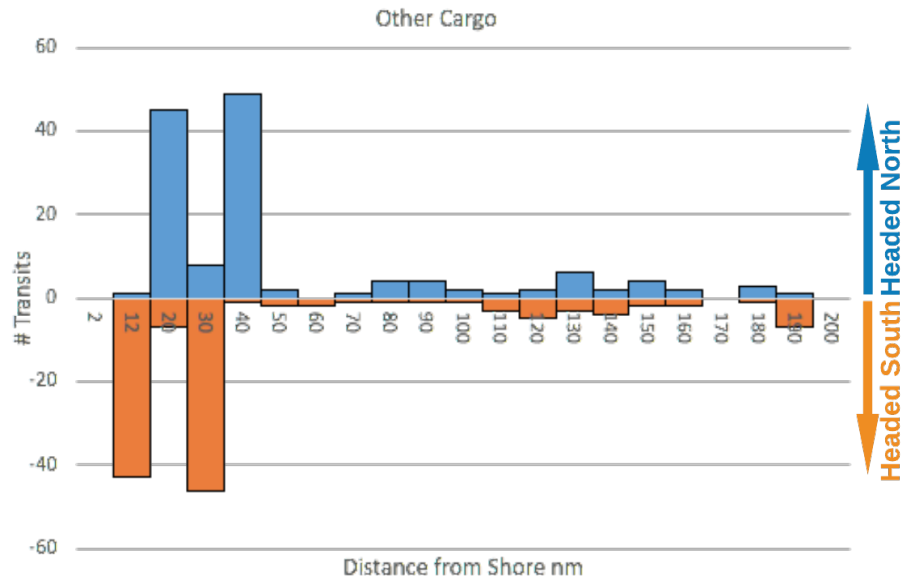


Figure 5.1-9. Southern Haida Gwaii Passage Line Vessel Tracks (2016) Showing Distance from Shore and Direction – Other Cargo

## 5.2 Cruise Ship Traffic by Type, Trade, Season, and Direction

Cruise ships are almost entirely engaged in the Alaska trade, bringing passengers to and from Southeast Alaska during the summer only. As shown in Figure 5.2-1, cruise ships at the Southern Haida Gwaii Passage Line usually cross within 40 NM of shore, though more often within 12-20 NM. There were 194 cruise ship transits of the Southern Haida Gwaii Passage Line in 2016, more than 140 of which crossed the passage line between 12-20 NM in 2016. Just 14 vessels made these 140 transits.

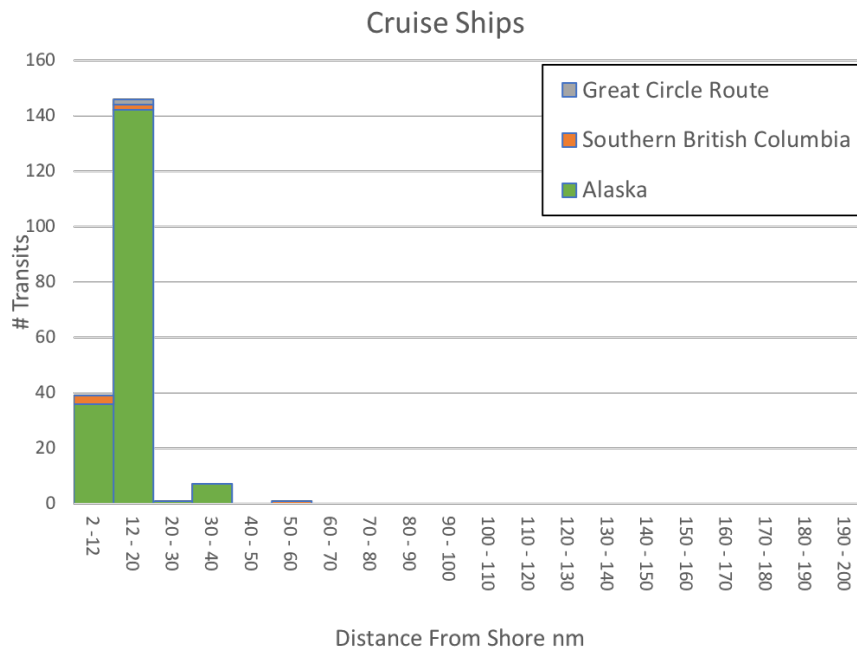


Figure 5.2-1. Southern Haida Gwaii Passage Line Vessel Tracks (2016) and Distance from Shore – Cruise Ships



Figure 5.2-1. Cruise ship vessel tracks that crossed Southern Haida Gwaii Passage Line in 2016

Cruise ship voyages were almost evenly split between those traveling north vs. south at the passage line, but those going south were almost exclusively within 20 NM of shore whereas those going north were spread a bit more between 2-50 NM. See Figure 5.2-2.



Figure 5.2-2. Cruise ship voyages recorded at Southern Haida Gwaii Passage Line in 2016 based on Direction of Travel

### 5.3 Tanker Routes by Trade at Southern Haida Gwaii Passage Line in 2016

As noted above, tanker traffic crossing the Southern Haida Gwaii Passage Line was generally farther offshore than cargo vessels and cruise ships. Figure 5.3-1 shows the tanker tracks in 2016 that crossed the Southern Haida Gwaii Passage Line by trade. Most of the tankers identified were engaged in the Alaska trade, moving crude oil south to refineries in the U.S. The maps also show the voluntary TEZ.

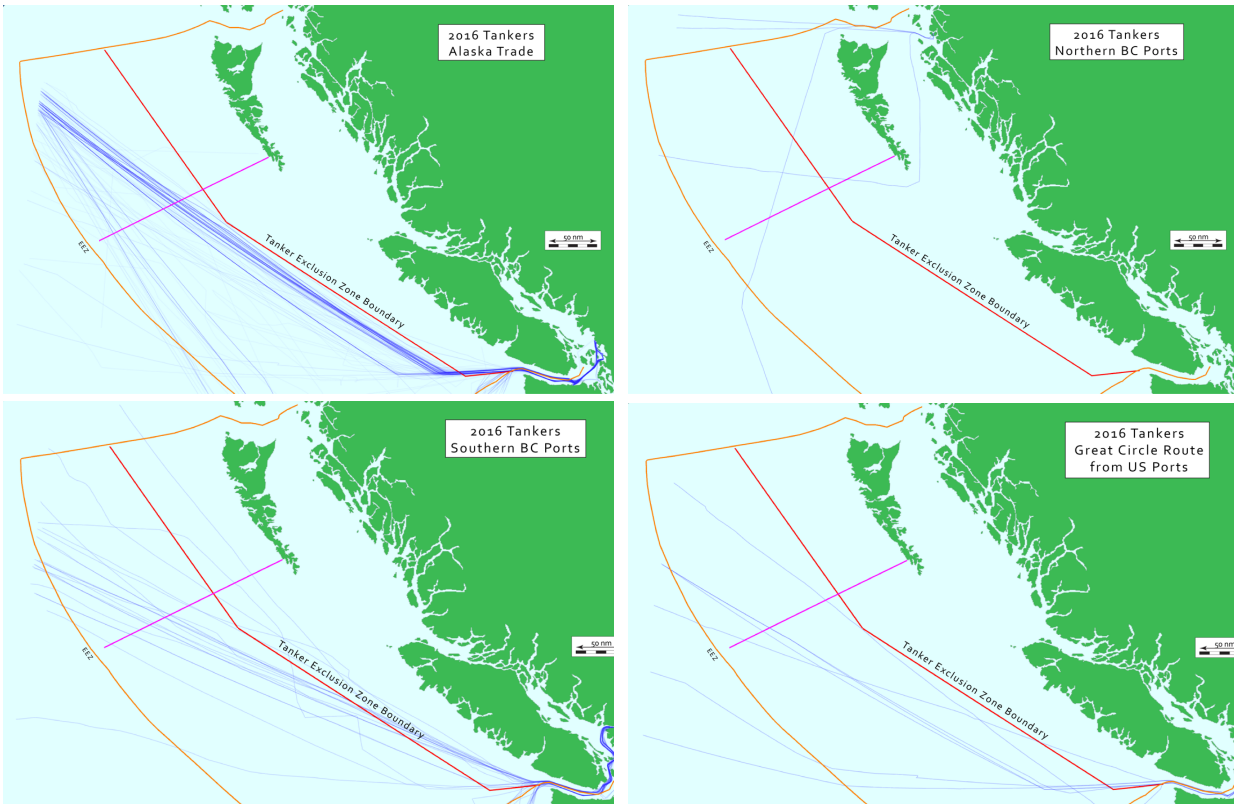


Figure 5.3-1. Comparison of tanker tracks by trade that crossed the Southern Haida Gwaii Passage Line, 2016

### 5.4 Annual Variations in Vessel Tracks at Southern Haida Gwaii Passage Line

Figure 5.4-1 shows the tracks recorded each year (2014-2016) by vessel type along with graphs showing the number of vessels of each type that crossed. The maps only show tracks of vessels that crossed one of the passage lines around Haida Gwaii, and so do not include tracks that stayed to the south (including many on the Great Circle Route) or stayed entirely in inside waters without going through Dixon Entrance or Hecate Strait.

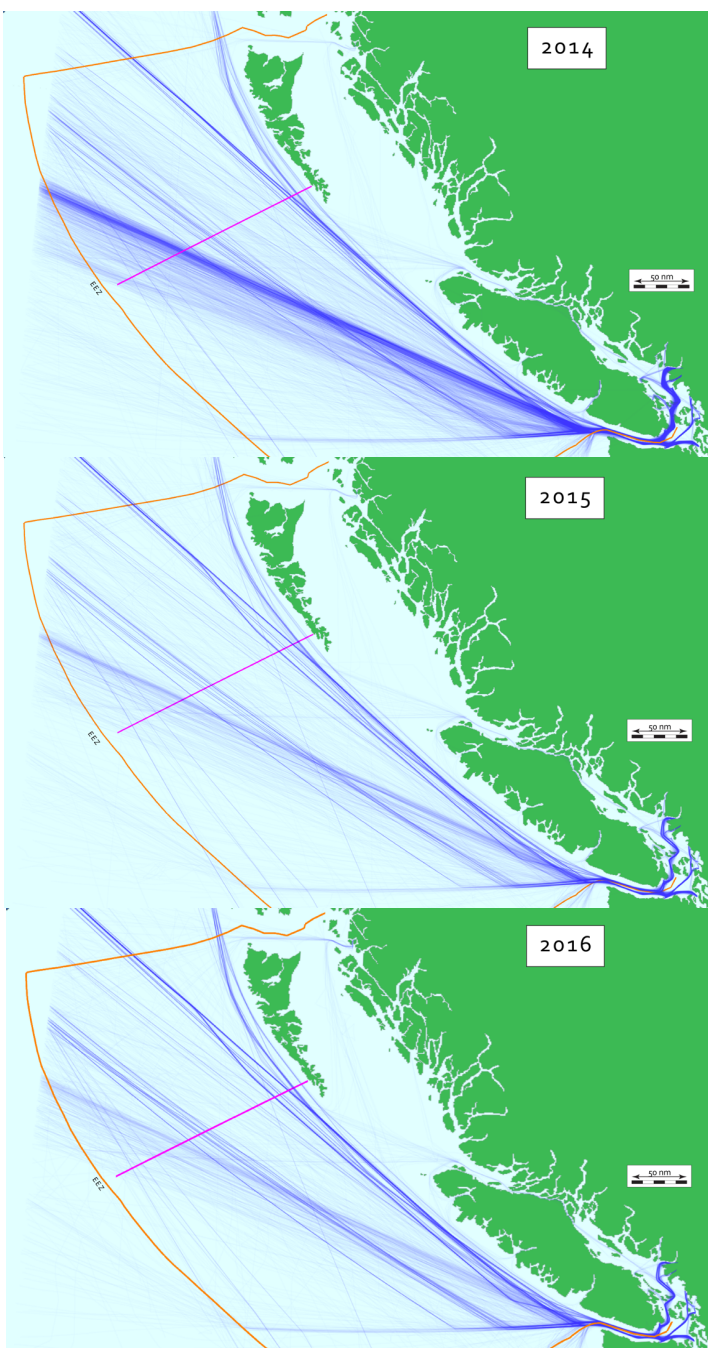


Figure 5.4-1. Comparison of Cargo, Cruise Ship, and Tanker Vessel Tracks that crossed the Southern Haida Gwaii Passage Line in 2014, 2015, 2016

This broad look across three recent years shows one significant shift. While the number of cruise ships did not vary much across years, cargo vessels traffic on the North Pacific Great Circle Route shifted south beginning in 2015 when more stringent fuel standards took effect in the North American Emissions Control Area (ECA).<sup>9</sup> After this, more vessels used the most direct route between the Strait

<sup>9</sup> In 2015, the allowable sulphur limit in ship fuels used within the North American ECA, which includes all Western Canadian marine waters, dropped from 1.00% to 0.01% (Transport Canada, 2016).



of Juan de Fuca and the edge of the Canadian EEZ, thus minimizing time spent in the ECA. Following this shift, vessels using this more direct route no longer crossed one of the passage lines around Haida Gwaii. As Figure 5.4-2 through 5.4-4 show, the number of cargo voyages that crossed the Southern Haida Gwaii Passage Line drops significantly for 2015 and 2016 as compared to 2014. Most of these vessels were 100 NM or more from shore.

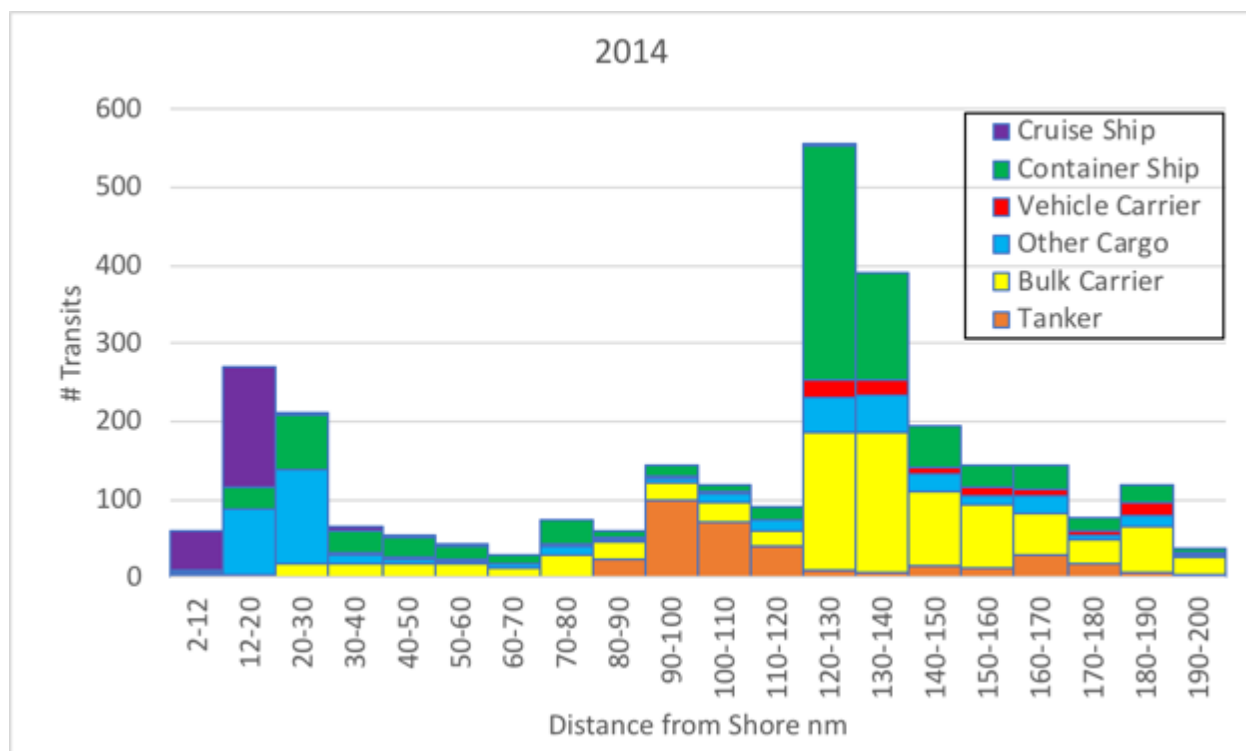


Figure 5.4-2. Distribution of Vessels by Type Across Southern Haida Gwaii Passage Line, 2014

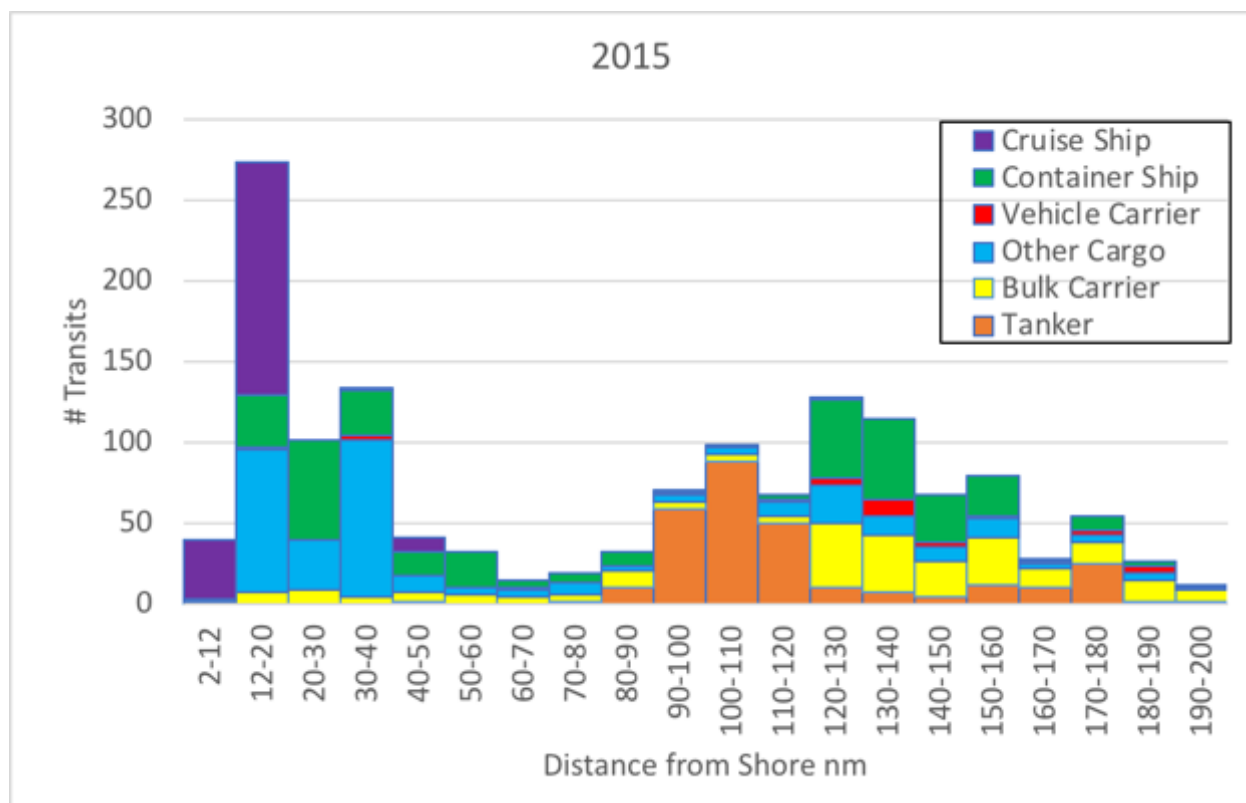


Figure 5.4-3. Distribution of Vessels by Type Across Southern Haida Gwaii Passage Line, 2015

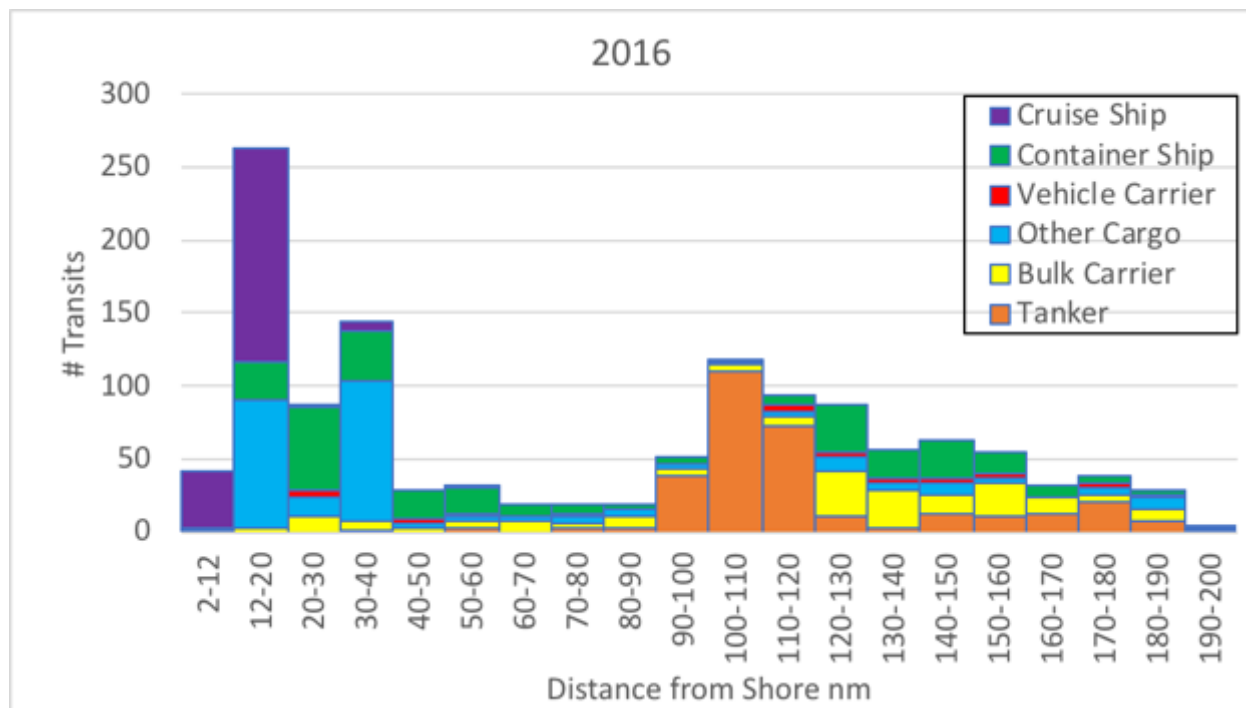


Figure 5.4-4. Distribution of Vessels by Type Across Southern Haida Gwaii Passage Line, 2016

Also, in order to understand whether these three recent, although not current, years of data could be considered to reflect current traffic, the volume of cargo reported to be delivered at Vancouver, Prince Rupert, and the U.S. ports of Seattle and Tacoma was compared for 2014-2018. This comparison indicates some variability across years but no reason to assume that at least cargo traffic in 2014-2016 was significantly different from 2018. The project committee acknowledged the limitations of this approach, but agreed that it was suitable to the purpose of identifying any significant changes in cargo traffic, at least, when considering the data from 2014-2016. Acquiring and analyzing data from 2017 and 2018 was not feasible within the budget and timeframe of the project.

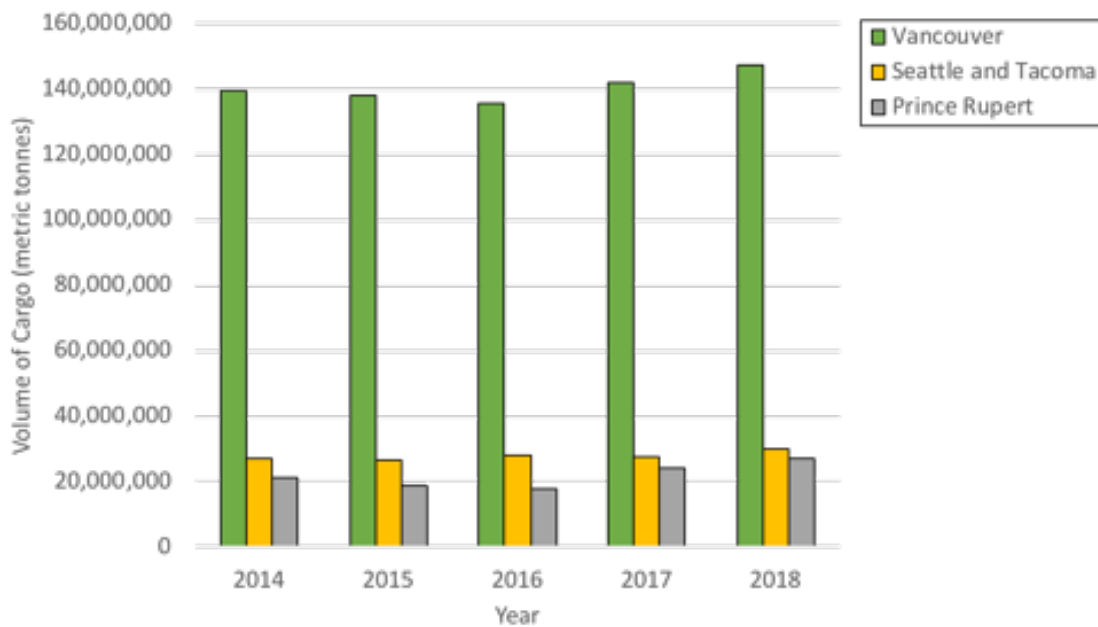


Figure 5.4-5. Comparison of Cargo Volume Recorded at Key Ports, 2014-2018<sup>10</sup>

### 5.5 Presence of Emergency Tow Vessels in Region

Until recently, although many tugs engage in coastal trade through BC, there was no dedicated emergency tow vessel (ETV) there. The closest dedicated ETV was in Neah Bay, Washington. In 2018, the Government of Canada contracted two dedicated ETVs for service in western Canadian waters. The vessels patrol throughout the coast. CCG provided AIS data for these vessels for January – April 2019, but there was not enough information to estimate a percentage of time spent in the vicinity of Haida Gwaii. The information about the location of these ETVs also does not necessarily indicate where they

<sup>10</sup> <https://www.portvancouver.com/about-us/statistics/>  
<https://www.nwseaportalliance.com/stats-stories/cargo-stats>  
<https://2018.rupertport.com/>

may be directed to operate in the future, either, which could be informed by the analysis described here and efforts of the project committee overall.

## 6 Vessel Traffic in Other Areas Around Haida Gwaii

The project focused on vessel traffic off the west coast of Haida Gwaii. However, it was recognized that if any traffic were to be asked to route differently, vessels might elect to transit through Hecate Strait and/or Dixon Entrance instead of staying in outside waters. The project committee also recognized that there are concerns about potential vessel impacts on the SK-B MPA and so wanted to understand the potential for inadvertently increasing traffic there by developing a routing measure intended to protect the west coast. This section of the report provides a general baseline analysis of the number, type, and location of vessels crossing passage lines at Hecate Strait and Dixon Entrance, and the number and type of vessels entering the SK-B Seamount MPA boundary.

### 6.1 Number and Type of Cargo and Cruise Ships at Hecate Strait Passage Line

Table 6.1-1 shows the vessel tracks across Hecate Strait Passage Line in 2014-2016 by type. This line was intended to capture traffic to and from Prince Rupert and Kitimat as well as the Inside Passage route to and from Alaska. Figure 6.1-1 shows vessels that crossed that passage line at some point in the three years.

Table 6.1-1. Number of Tracks Across Hecate Strait Passage Line in 2014-2016

Type	2014	2015	2016	Total
<b>Bulk Carriers</b>	159	147	178	484
<b>Other Cargo</b>	78	77	87	242
<b>Vehicle Carriers</b>	1	1	2	4
<b>Container Ships</b>	164	179	204	547
<b>Cruise Ships</b>	530	536	539	1605
<b>Tankers</b>	14	5	8	27
<b>Total</b>	<b>946</b>	<b>945</b>	<b>1018</b>	<b>2909</b>

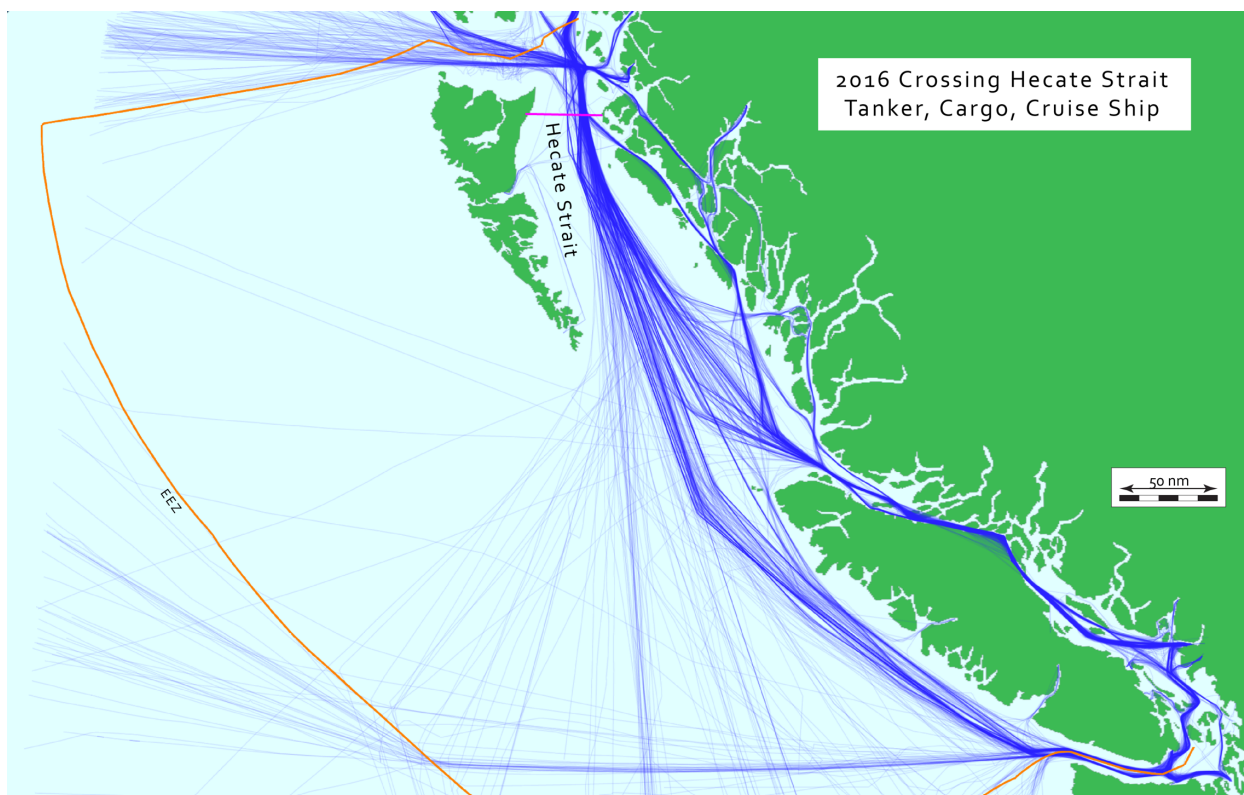


Figure 6.1-1. Cargo vessel, cruise ship and tanker tracks that crossed Hecate Strait Passage Line in 2016

## 6.2 Number and Type of Cargo and Cruise Ships at Dixon Entrance Passage Line

Similar to Hecate Strait, the Dixon Entrance Passage Line captures vessel traffic in and out of Kitimat and Prince Rupert (see Figure 6.2-1). Unlike Hecate Strait, however, this route does not capture voyages in inside waters. The voyages captured at this passage line for the three years of AIS data are shown in Table 6.2-1 below.

Table 6.2-1. Number of Tracks Across Dixon Entrance Passage Line in 2014-2016

Type	2014	2015	2016	Total
<b>Bulk Carriers</b>	453	403	401	1257
<b>Other Cargo</b>	89	83	106	278
<b>Vehicle Carriers</b>	1	1	2	4
<b>Container Ships</b>	170	186	211	567
<b>Cruise Ships</b>	124	100	109	333
<b>Tankers</b>	17	10	13	40
<b>Total</b>	<b>854</b>	<b>783</b>	<b>842</b>	<b>2479</b>

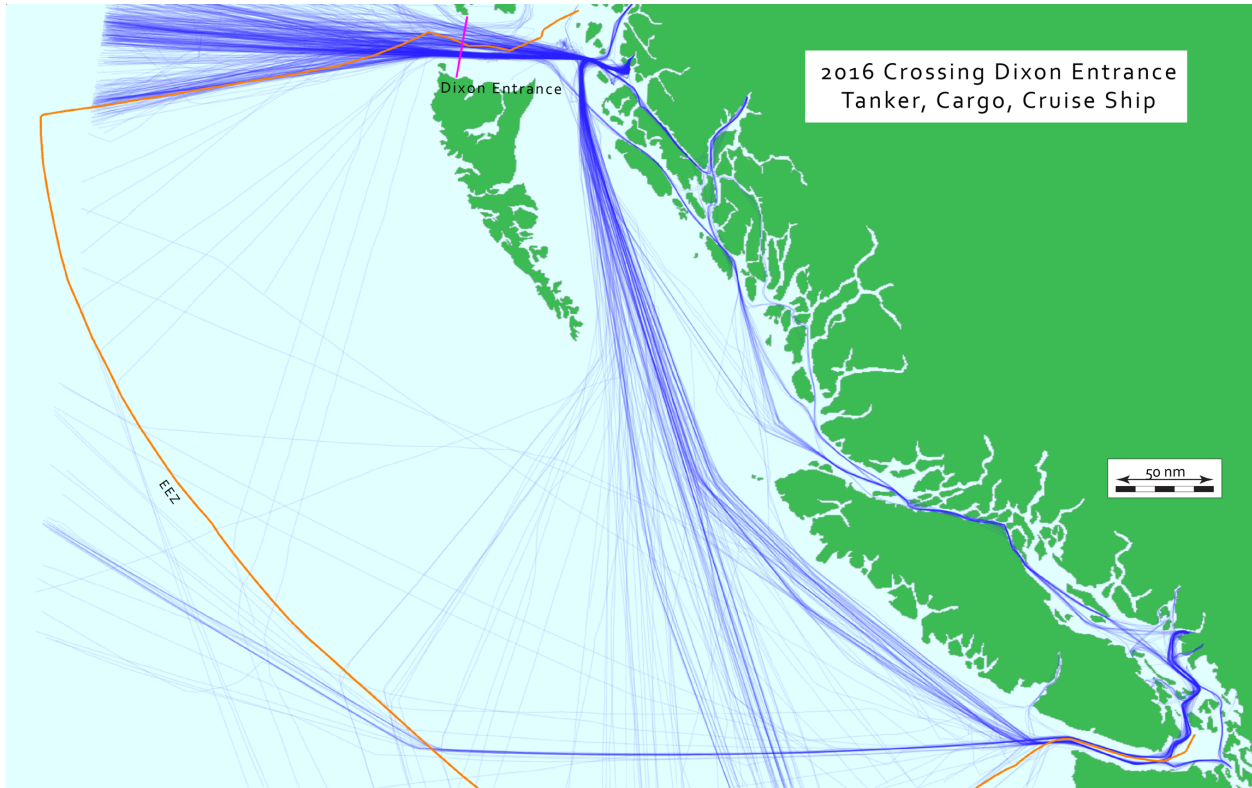


Figure 6.2-1. Cargo vessel, cruise ship and tanker tracks that crossed Dixon Entrance Passage Line in 2016

Most vessels crossing the Northern Haida Gwaii Passage Line would also have crossed the Southern Haida Gwaii Passage Line. It is evident from the vessel routes plotted using AIS data that cargo vessels in the Alaska trade that were within 50 NM of southern Haida Gwaii would likely have been roughly the same distance from Haida Gwaii in the north as in the south, and those engaged in the Great Circle Route would have been farther offshore in the north than they were in the south. Because of this an analysis of the northern passage line was not undertaken. However, the Northern Haida Gwaii Passage Line was used to identify vessels that both crossed this line *and* the passage line at Dixon Entrance. These vessels are required to make a turn at the northern tip of Haida Gwaii, where they approach Langara Island. In 2016, this route was used by two tankers and 19 cargo vessels (17 bulk carriers and 2 other cargo vessels).

### 6.3 SGaan Kinghlas-Bowie Seamount Gin Siigee Tl'a Damaan Kinggangs gin K'aalaagangs Marine Protected Area

The SGaan Kinghlas Bowie Seamount Marine Protected Area Gin Siigee Tl'a Damaan Kinggangs gin K'aalaagangs (SK-B MPA) surrounds a seamount that rises from the seafloor 3,000 m deep to within 24 m of the surface (CHN and DFO, 2019). A polygon was used to identify the vessels that entered the MPA boundaries in 2014-2016. The results are presented in Table 6.3-1 and Figure 6.3-1. Results were

consistent across years, except for an increase in vehicle carriers in 2016 as compared to the two previous years.

Table 6.3-1. Number of Tracks Entering SK-B MPA in 2014-2016

Type	2014	2015	2016	Total
Bulk Carriers	33	21	26	80
Other Cargo	44	47	45	136
Vehicle Carriers	2	1	6	9
Container Ships	119	113	123	355
Cruise Ships	1			1
Tankers	1	2		3
Total	200	184	200	584

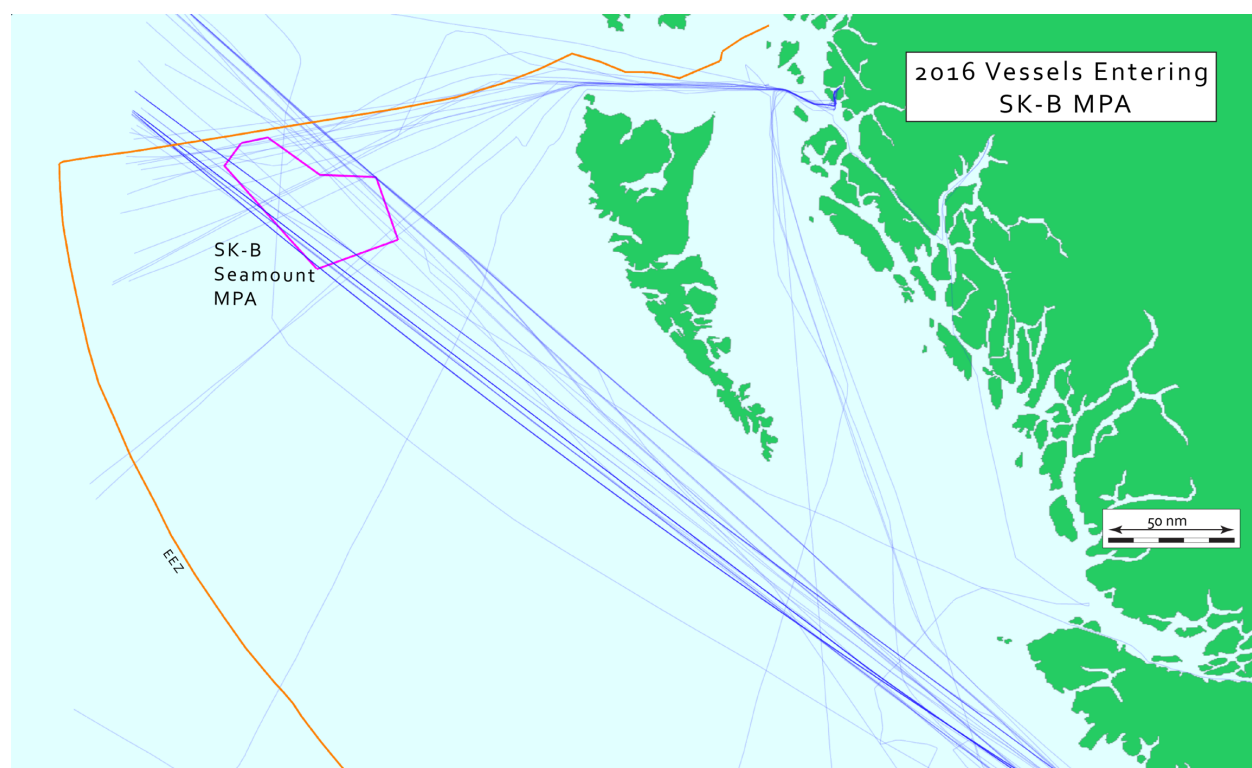


Figure 6.3-1. Cargo vessel, cruise ship and tanker tracks that entered the SK-B MPA in 2016



## 7 Vessel Traffic Management Measures

The project committee reviewed potential commercial vessel management measures intended to reduce the likelihood of a distressed ship grounding off the west coast of Haida Gwaii. Of these, three relate specifically to vessel routing while the other two address more general risk management measures. In keeping with the focus of the PVM initiative, all of the measures considered are voluntary.

Potential measures to recommend that certain vessels stay a specified distance offshore the West Coast of Haida Gwaii:

- Agreement with operating companies
- Routing guidelines
- IMO-recognized Area to Be Avoided (ATBA)

Potential measures that are complementary to a vessel routing recommendation:

- Waterway safety committee or similar body to develop, communicate, and maintain a waterway safety plan for the region
- Long-term presence of an Emergency Towing Vessel to serve the region

### 7.1 Offshore Routing Measures

This section describes three measures that could be used to establish a voluntary recommendation that vessels stay a certain distance offshore: agreement with operators, routing guidelines, and IMO-approved Area to be Avoided. It also addresses considerations related to communications and monitoring which apply to all three of these measures.

#### 7.1.1 Agreement with Operators

A voluntary agreement could be crafted with specific vessel operators – or a group of operators – regarding where they travel or other procedures used in a specific area.

The existing TEZ is one example of this type of measure. It is identified in *Sailing Directions* (Fisheries and Oceans Canada, 2006) and on Transport Canada’s website (TC, 2017). Figure 7.1-1 shows that, based on the AIS data analyzed for this project, tankers in the Alaska trade generally follow this measure both when laden and in ballast (going north).

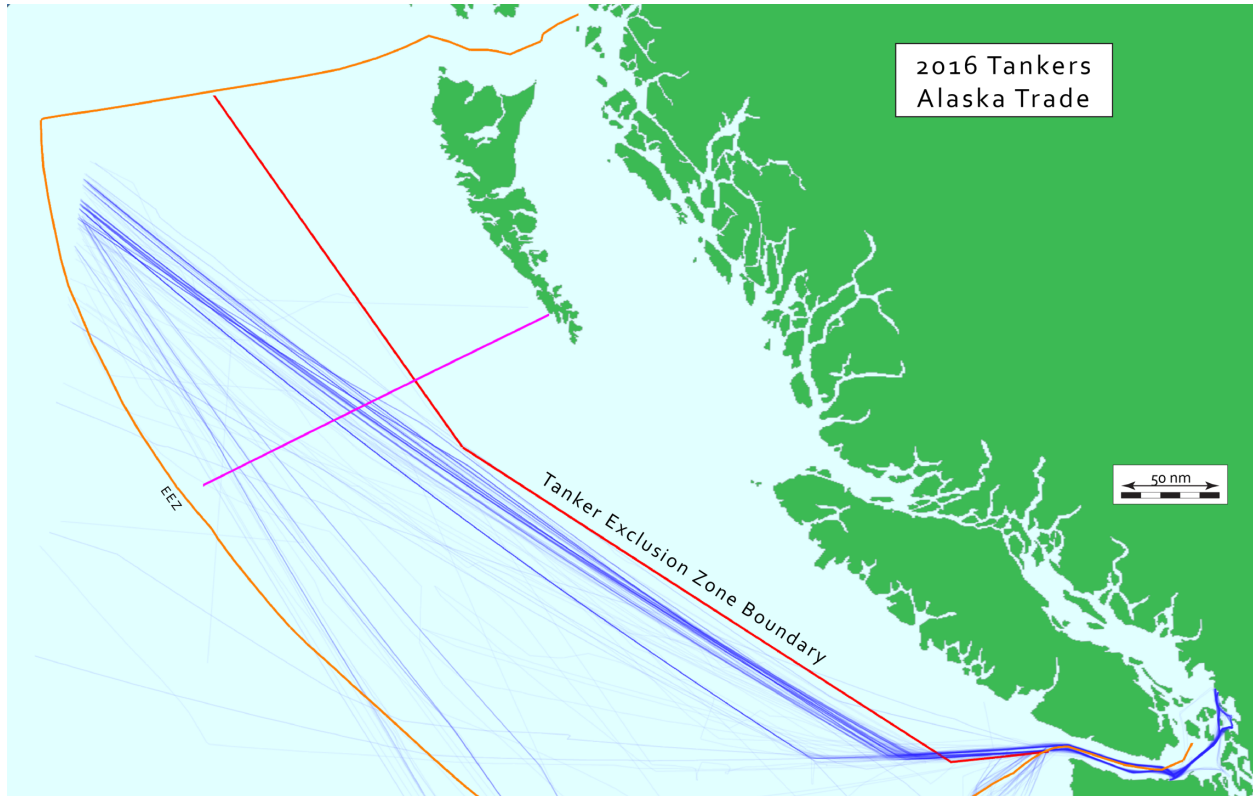


Figure 7.1-1. Tankers in the Alaska trade, 2016

This type of measure could be explored with the operators that typically travel closest to shore, where relatively few vessels go back and forth to Alaska (cruise ships in summer only and cargo ships year-round). It would be difficult to implement for trans-Pacific traffic due to the diversity of vessel types and owners. This type of measure could be readily implemented *if* the relevant operating companies are willing. However, there would be no ready mechanism in place to identify and engage different operators if others begin using routes within the same area nor would it reach operators that may enter the area only occasionally. The TEZ had the advantage of applying to a small number of operators that have an existing relationship through their shared use of the Alaska pipeline and terminal as well as the oil spill prevention and response system in Prince William Sound.

#### 7.1.2 Routing Guideline

A vessel routing guideline could also be developed with the intent that it applies more broadly than to a specific company or group of companies.

An example guideline is found in the Saguenay-St. Lawrence Marine Park (Québec), where speed restrictions, recommended routes, and areas to be avoided have been designated with the goal of reducing impacts to marine mammals. These measures were developed by a collaborative group. The Marine Park monitors compliance via AIS data, using a method developed with the marine pilots

regarding how to monitor conformity (especially of the speed restrictions). Non-compliant operators are contacted directly. Overall, compliance has been satisfactory. This is attributed in no small part to the fact that the guidelines are entirely within mandatory pilotage waters and the marine pilots have been active participants throughout the process. The group who developed the guidelines is reportedly considering formalizing the measures through a proposal to the IMO.<sup>11</sup>

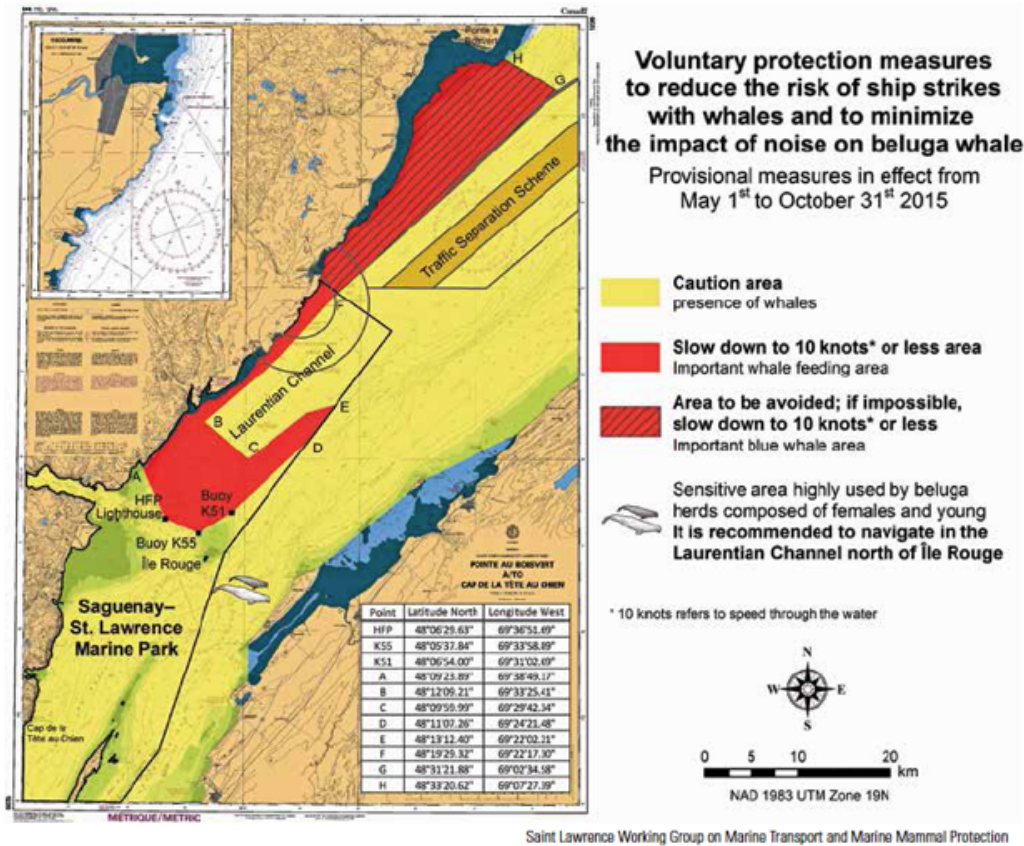


Figure 7.1-2. Informational flyer describing voluntary protection measures established in St. Lawrence River

### 7.1.3 IMO Area to be Avoided

The IMO is the international organization through which countries cooperate on issues related to international shipping. Member states can propose and approve vessel routing measures including the designation of Areas to be Avoided (ATBA) and other routing measures such as two-way routes, precautionary areas, and traffic separation schemes. IMO-approved ATBAs, along with other routing measures, are documented in the publication *Ships Routing* (IMO, 2019).

An ATBA may be established because of hazards to vessels in a particular area, to avoid collisions with offshore infrastructure, or to protect the environment. ATBAs apply to a particular vessel size, type, or

<sup>11</sup> Based on interview with Nadia Ménard, Parks Canada, August 13, 2019.

cargo. There are more than 70<sup>12</sup> ATBAs approved by the IMO, only one of which is mandatory. About half of IMO-approved ATBAs explicitly identify environmental protection or the protection of wildlife as the purpose for the measure. ATBA language can specify that the measure is intended only for vessels transiting the area, not those calling on local ports and not intended to affect traffic headed to local ports. While they are voluntary, the Convention on the Safety of Life at Sea (SOLAS) [Regulation V.8(g)] states that governments "*shall adhere to the measures adopted by the (IMO) concerning ships' routeing [sic]. They shall promulgate all information necessary for the safe and effective use of adopted ships' routeing systems. A government or governments concerned may monitor traffic in those systems. Contracting governments will do everything in their power to secure the appropriate use of ships' routeing.*" (IMO, 2019)

IMO routing measures in western Canadian waters include the traffic separation schemes and precautionary areas in the Strait of Juan de Fuca, Haro Strait, Boundary Pass, and the Strait of Georgia. Although there is no IMO-approved ATBA in Canada's Pacific region, one was established in Canadian waters south of Nova Scotia in 2008: the Roseway Basin ATBA recommends that transiting ships of 300 GT and larger avoid the area from June to December to protect North Atlantic Right Whales (IMO, 2019). A compliance rate of approximately 70% was estimated in its first year of implementation (Vanderlaan and Taggart, 2009).

There are two ATBAs in U.S. states adjoining BC. An ATBA in Washington since 1995 recommends that transiting vessels 400 GT or larger or any ship or barge carrying oil or hazardous materials as cargo should stay about 25 NM off the Olympic Peninsula (IMO, 2019). The Olympic Peninsula National Marine Sanctuary monitors vessel traffic and posts compliance reports on its website. Sanctuary staff work with the U.S. Coast Guard to notify vessels that appear not to be adhering to the ATBA as part of a compliance education effort. In 2018, overall compliance across vessel types was estimated to be more than 95% (NOAA, 2019). Vessels of 400 GT and larger transiting through the Aleutian Islands, a common voyage for the Great Circle Route between North America and East Asia, are recommended to stay outside of five ATBA in the Aleutian Islands which keeps them about 50 NM offshore unless using one of the approved passes there (IMO, 2019).

An IMO-approved ATBA off the coast of Haida Gwaii would be included on nautical charts, *Ships' Routing*, and the *Sailing Directions*. While SOLAS compels both flag states and the coastal state (Canada) to encourage vessels to follow the recommended measures, the exact mechanisms are not prescribed. MCTS could monitor traffic at least out to the extent of their capabilities (approximately 50

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<sup>12</sup> Some measures include more than one "area" while in other cases there may be multiple distinct but related ATBA or other routing measures within close vicinity.

NM depending on conditions) and contact non-compliant vessels.<sup>13</sup> This approach would benefit from clear and established pathways for communication inclusive of vessels in international voyages.

#### 7.1.4 Communications Considerations

Clear communication to mariners will be important to the success of any offshore routing measure applied. This may include direct communication, communication via industry association, Notice(s) to Mariners issued by CCG, demarcation on nautical charts, and inclusion in the *Sailing Directions*. Information could also be included in the *U.S. Coast Pilot* (similar to Canada's *Sailing Directions*). If a waterway safety plan is developed, the measures could be documented there as part of a standard of care. If IMO approval is obtained, the measure will be included in the IMO publication, *Ships' Routing*.

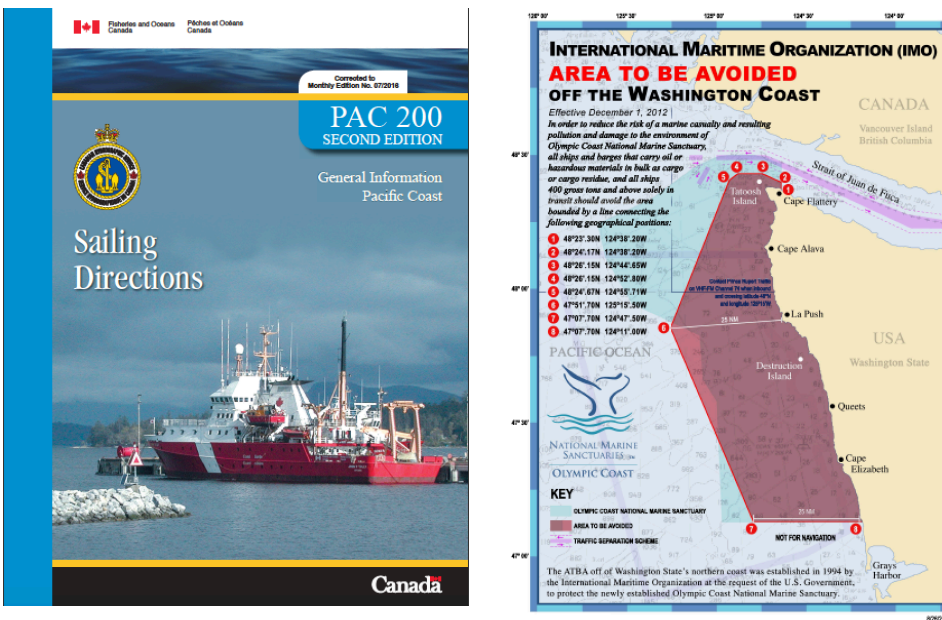


Figure 7.1-1. Example options for informing mariners of any routing recommendations include the *Sailing Directions* (upper left), informational flyers distributed by pilots and others (upper right), or on nautical charts (bottom).

<sup>13</sup> Per Bob Crooks, MCTS (August 9, 2019)

### 7.1.5 Monitoring Considerations

Although none of the measures described here are mandatory, oversight by MCTS (as part of its normal duties monitoring vessel traffic) and/or via a collaborative tool such as the Haida Nation's use of Transport Canada's Enhanced Maritime Situational Awareness system are options. A method of oversight and procedures for contacting non-compliant vessels would need to be implemented for any measure put in place.

## 7.2 Complementary Measures

The two complementary measures described here could be implemented

### 7.2.1 Establish Waterway Safety Committee

A waterway safety committee (WSC) is one approach to promoting safe and efficient maritime operations in a particular area by fostering coordination among different waterway users and stakeholders. WSCs may establish waterway safety plans or other standards of care or recommended best practices. WSCs (or HSCs) in the U.S. are typically not led by government, though the participation of relevant agencies is important.

A key function of WSCs is to develop, maintain, and communicate a safety plan which:

- Includes standards of care specific to the operations and environment of the area
- Complements existing regulations by advising mariners of unique conditions and requirements
- Does *not* replace existing regulations or the decision-making authority and judgment of a vessel master

Other roles include identifying and discussing emerging navigational safety or other issues among the maritime community outside of a regulatory/compliance context. Funding may be provided by government, members, or outside sources such as grants.

There are different options for organizational structure. One approach is to have a managing board that oversees a committee with designated seats representing different sectors/interests. Regardless of the exact structure chosen, committee membership should be tailored to the area, but should include the relevant range of industry groups, operators, and other interests.

Two of many U.S. examples of harbor or waterway safety committees are the Puget Sound Harbor Safety Committee (HSC) and the Aleutian Islands Waterway Safety Committee. The Puget Sound HSC was formally established in 2000 following a series of predecessor committees. The HSC is funded by industry, with administrative functions housed in the Puget Sound Marine Exchange administered by Puget Sound Marine Exchange.<sup>14</sup> Multiple iterations of a harbor safety plan documenting best practices

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<sup>14</sup> John Veentjer, email August 14, 2019.



(which are not geography-specific) and standards of care (which *are* geography-specific) for vessel operations in Puget Sound have been issued. The 2017 version includes 18 different standards of care developed with the concurrence of all members (Puget Sound HSC, 2017). The Aleutian Islands WSC is much newer. It was founded in 2017 with short-term grant funding for administrative functions. That group's first Waterway Safety Plan was released in 2019 (Aleutian Islands WSC, 2019).

For a different example, the Working Group for Maritime Transportation and Marine Mammal Protection that developed the measures discussed above in Québec is led by government and focused specifically on marine mammal protection. In that case, on-going agency leadership has provided institutional stability while also engaging the perspectives of industry, non-profits, and academic institutions as well.<sup>15</sup>

A WSC for the Haida Gwaii area could address a range of possible topics related to vessel traffic. Committee participation should be representative of the vessel types/trades in the area as well as other interests (e.g. communities, environmental organizations, etc.). Before developing a new organization, it would be important to consider whether there are any existing organizations that could serve the functions desired by a WSC for the Haida Gwaii area, as well as the appropriate geographic scope, ability to sustain operations, and number and type of seats that should be included.

### 7.2.2 Long-term Presence of Emergency Tow Vessels in Region

The operation of a capable emergency tow vessel (ETV) able to respond quickly to assist a vessel that loses propulsion or steering off Haida Gwaii is one way to reduce the likelihood of a drift grounding. This option contemplates the presence of a vessel that is dedicated to response, as opposed to a vessel-of-opportunity. ETVs would need to be positioned in such a way as to be able to mobilize with sufficient time to establish a tow and control a vessel.<sup>16</sup>

The Government of Canada recently assessed emergency towing needs on the west coast, and is developing a long-term national ETV strategy (Paul Rudden Consulting, 2019).

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<sup>15</sup> Phone interview with Nadia Ménard, Parks Canada, August 13, 2019.

<sup>16</sup> The authors note that the availability of a CCG ETV does not guarantee that it will be used. In recent incidents the ETV from Neah Bay has been called out by the operating company.



## 8 Considering a Safe Distance Offshore

This section describes the criteria and key resources used for considering three different potential "safe distances offshore." There are different ways to consider a "safe" distance offshore for vessel traffic, as well as anticipating or minimizing potential negative impacts to shipping activity or other sensitive environments. The criteria used here are described in Section 8.3.1.

### 8.1 Distances Considered

Three options were considered for how far off Haida Gwaii's west coast vessels could be asked to transit: 25, 50, and 75 NM. All three of these distances are within Canada's EEZ but outside territorial waters.

### 8.2 Key Resources

The outcome of any incident on the water depends on myriad factors related to the condition of the vessel, actions and abilities of the crew, availability and activation of help, and weather and sea conditions. There is no way to predict the exact outcome of a ship losing power or steering, but the question has been considered over the years. This report references three studies that examine the issue using similar, though not identical, approaches:

- "West Coast Offshore Vessel Traffic Risk Management Project, Final Report," (2002). This was co-sponsored by the Pacific States-BC Oil Spill Task Force and U.S. Coast Guard, Pacific Area. The report, which includes recommendations, was developed by a workgroup including federal and provincial/state agencies, organizations, and maritime operators.
- "Vessel Drift and Response Analysis for Canada's Pacific Coast," (2018). This analysis by Clear Seas considered the probability of a distressed vessel grounding before an emergency tow vessel can take it under control. Results show how ETV location may affect these outcomes.
- "Tanker Boundary Study," (n.d.) This study by the Canadian Coast Guard analyzed the potential drift of a disabled tanker to ground on the west coast of Canada. The focus of the study was tankers traveling from Alaska to refineries in lower 48 U.S. states. The CCG concluded by recommending the TEZ discussed in this report.

The authors note that there have been changes in vessel design since two of the three studies above were conducted. Vessel design and operational changes over time will primarily relate to the probability of an incident occurring, such as loss of propulsion or steering, or the consequence of the incident, such as the amount of oil released to the environment if a ship grounds. (The more recent study, by Clear Seas, does not consider the likelihood of an incident or the consequences, so changes such as the use of redundant propulsion or steering or the presence of a double hull or fuel tank protection are not relevant to the results.)

### 8.2.1 Pacific States-BC Oil Spill Task Force Report (2002)

The West Coast Offshore Vessel Traffic Risk Management Project involved industry and agency experts who conducted and collected research, analysis, and expert input between 1999-2002. The goal of the project was to reduce the risk of collisions or drift groundings resulting from traffic along the west coast of North America, with a geographic scope extending out to the Exclusive Economic Zones of Canada and the U.S. from Cook Inlet, Alaska to San Diego, California. Vessels of 300 GT and larger were considered. The report itself is extensive and should be referenced for further information; this section only attempts to summarize key information related to identifying a possible safe distance offshore Haida Gwaii.

Figure 8.2-1, excerpted from the 2002 study, shows areas of higher risk (red) and moderate risk (yellow) with the red areas extending to 50 NM off Haida Gwaii and yellow areas to approximately 100 NM off southern Haida Gwaii. A series of vessel incident scenarios was modeled and then scored according to nine factors: volume of oil/vessel design, drift rates, areas of higher collision hazards, distance offshore, weather/season, ETV availability, coastal route density, historic casualty rates (by vessel type), and environmental sensitivity. Scenario scoring considered the results of a vessel drift/response analysis conducted for the project that drew on historical wind data and the availability of ETV at the time. Some elements of vessel type/design were also considered, including single-hulled tankers (no longer in use) and redundant steering/propulsion on some vessels (Task Force, 2002).

Overall, the study found that that "the risk of a grounding/collision generally increases the closer a vessel transit to shore." (Task Force, 2002) While in most places the higher risk, or red, extended to 25 NM from shore, northern British Columbia was one of three locations where this was extended to 50 NM.<sup>17</sup> The report explains that, "vessel transiting within these higher risk areas have a greater potential for a grounding due to one or more of the risk criteria than if they transited offshore of these areas." (P. 61). The workgroup concluded with recommendations specific to the distance offshore that vessels travel, including:

- Unless pre-empted by an existing routing measure, vessels 300 gross tons or larger transiting anywhere between Cook Inlet and San Diego should stay a minimum distance of 25 NM offshore.
- Tank ships with crude oil or another persistent petroleum product should stay a minimum of 50 NM offshore.
- These voluntary measures should be noted on nautical charts and in Canada's *Sailing Directions* and the *U.S. Coast Pilot*. (The measures were included in the U.S. but not in Canada. They were

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<sup>17</sup> The other locations were Southeast Alaska and Point Arguello in California.

also noted on U.S. nautical charts though not identified at each headland as was suggested in the recommendation.) (Task Force, 2002)

**Laden Tankers/Cargo/Passenger Vessels -- British Columbia**



Figure 8.2-1. Figure from 2002 Pacific States-BC Oil Spill Task Force Report Identifying Areas of Moderate and High Risk (2002)

#### 8.2.2 Clear Seas Vessel Drift and Response Analysis (2018)

In 2018, Clear Seas released a vessel drift and response analysis for Canada's Pacific Region. This study focused on the probability that an emergency tow vessel could reach a given location before a hypothetical drifting ship ran around. Historical winds from buoys around the coast were used along with assumed vessel drift rates based on wind speeds. The model developed was used to understand how the location of actual or hypothetical emergency towing vessels affects the probability of a grounding should a vessel become disabled. The study did not consider consequences or other aspects of ship design or loading, nor did it include recommendations. The results of the study are presented in a set of zones showing the areas where the probability of a save is 0-50%, 50-90%, 90-95% and 95-99%. Seven scenarios were used to show how the results varied depending on the location of one or more emergency towing vessels, or whether those vessels were assumed to be already underway (Clear Seas, 2018).

Three scenarios included in the study were considered in the SDO-PVM pilot project discussions. Scenario 1 assumes a dedicated (but not underway) ETV in Neah Bay, Washington. This was the closest dedicated rescue tug for the region until 2019 when CCG contracted two ETVs to be on patrol throughout Pacific Region waters. Having two vessels on patrol means that they are more likely to be already underway and available to respond immediately. Scenario 6 reflects this, assuming the two ETVs are on patrol in Hecate Strait and off Vancouver Island. Scenario 5 of the Clear Seas study contemplates three ETVs: the actual ETV in Neah Bay and two more ETVs docked in Prince Rupert and

Port Hardy. Figures 8.2-1 through 8.2-3 show the results for these three scenarios in maps excerpted from the Clear Seas study.

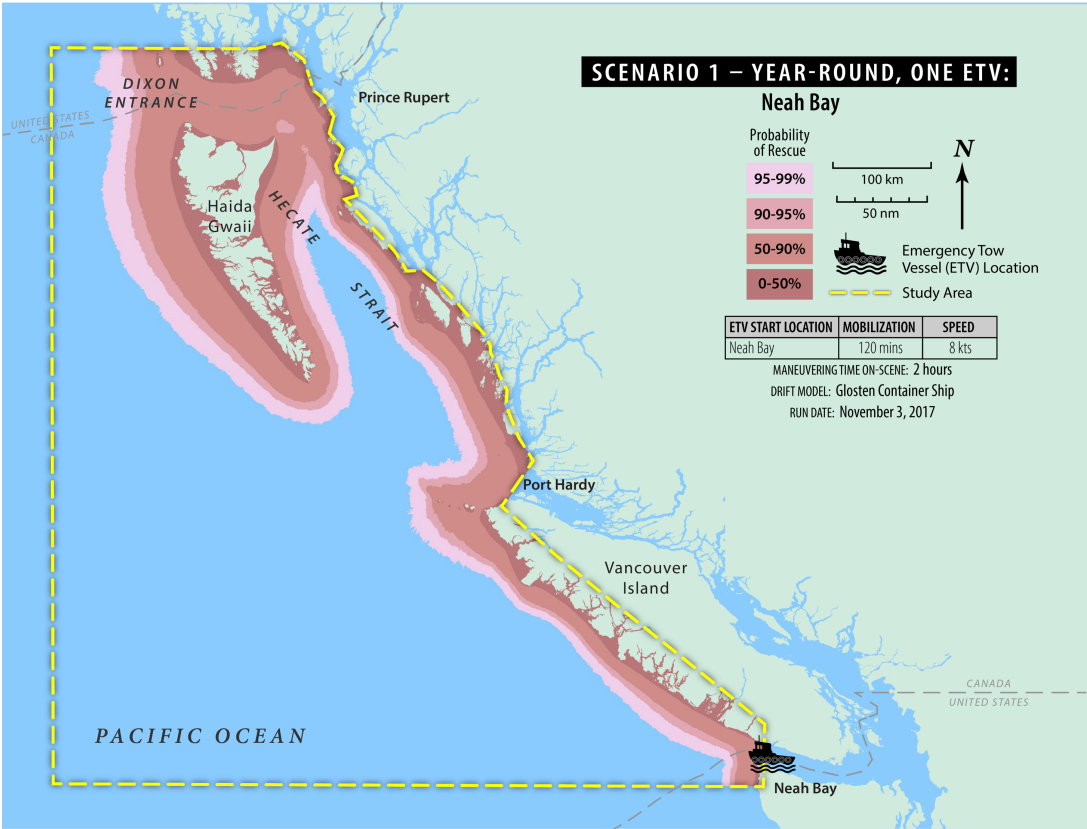


Figure 8.2-1. Clear Seas Results with Single ETV at Neah Bay, Washington

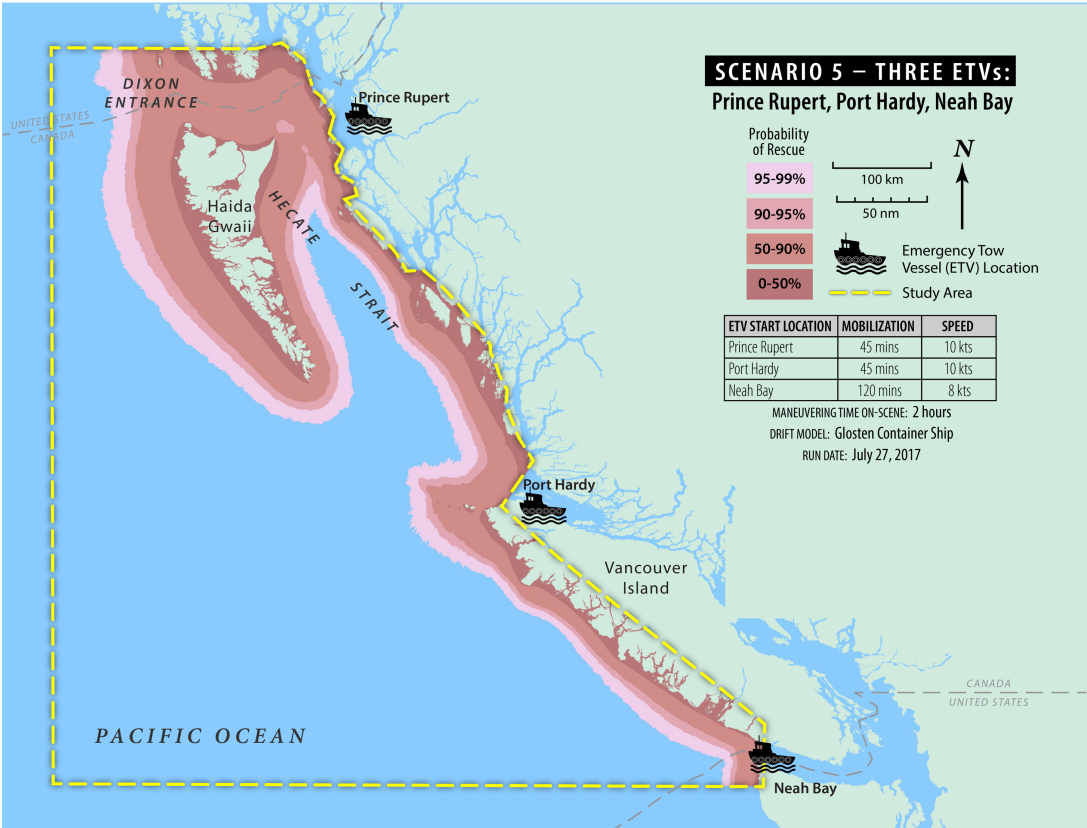


Figure 8.2-2. Clear Seas Results with ETV in Prince Rupert, Port Hardy, and Neah Bay

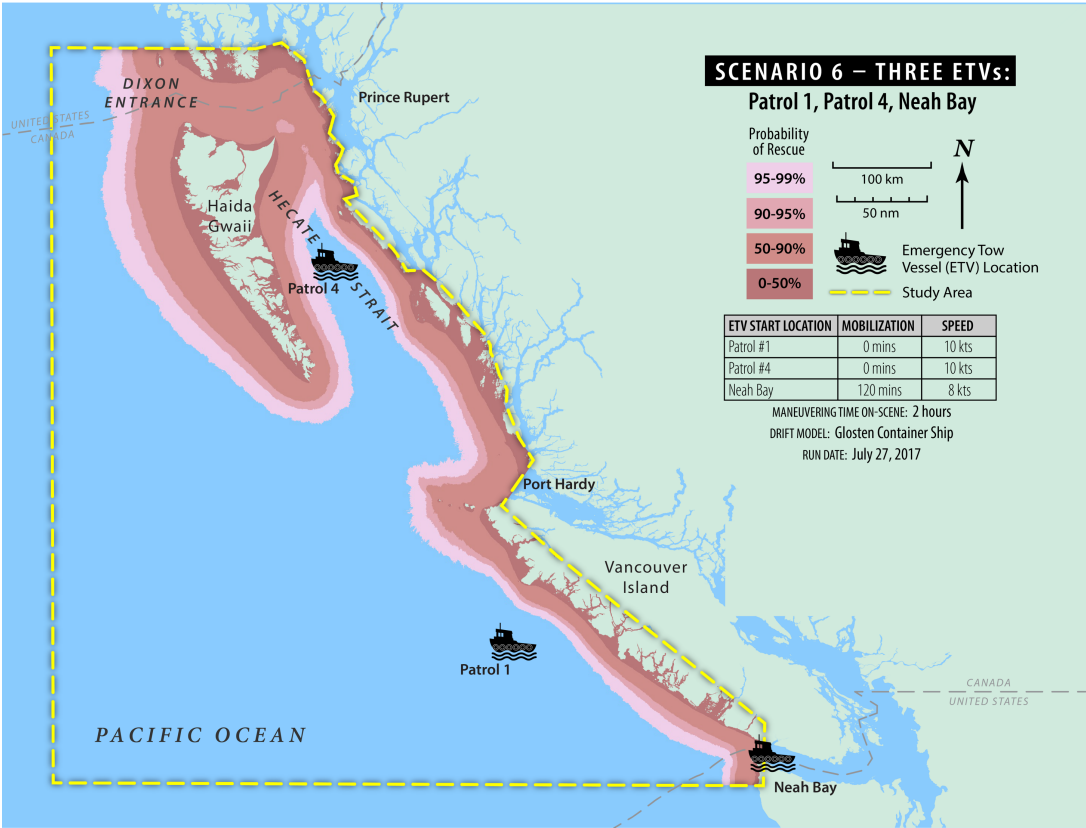


Figure 8.2-3. Clear Seas Results with ETV in Neah Bay and Two Patrolling ETVs

### 8.2.3 Tanker Boundary Study

This study also modeled vessel drift, in this case with a focus specifically on tankers. It also considered the availability of ETVs at the time and the additional cost to vessels of routing outside of a particular area. The project concluded by recommending the TEZ as it was later implemented: 73 to 115 NM off Haida Gwaii and approximately 50 NM off Vancouver Island (CCG, n.d.).

### 8.3 Criteria Applied to Consideration of Distances Offshore

For the purposes of discussion and analysis, Nuka Research chose three criteria relevant to comparing different potential distances offshore. The criteria were selected based on two sources: information required in an application for an IMO ATBA guidelines (IMO, 2003) and criteria used in developing recommendations for reducing the risk of incidents in the West Coast Offshore Vessel Traffic Risk Management Study (Task Force, 2002). Neither of these sets of criteria was designed for this purpose, but the SDO-PVM pilot project TWG suggested the two sources be reviewed to identify possible criteria. See Table 8.3-1.

Table 8.3-1 Criteria from IMO (2003) and West Coast Offshore Vessel Traffic Risk Management Study (Task Force, 2002)

	<b>IMO Routing Measure: Application requirements</b>	<b>West Coast Offshore Vessel Traffic Risk Management Study: Criteria for considering risk mitigation measures</b>
1	Importance of area and surrounding waters	Supported by data [in the study]
2	Vulnerability to impacts from international shipping activity	Realistic (capable of being implemented with available technology and expertise)
3	Quality of hydrographic charting in the region	<b>Effective to protect environment</b>
4	<b>Extent to which distance may reduce chance of drift groundings on the West Coast of Haida Gwaii</b>	<b>Economically feasible</b> (does not impose “unreasonable cost increase” on vessel owners/operators, ports, and customers)
5	<b>Extent to which known shipping routes/activity may be affected</b>	Flexible (NOTE: really refers to the mechanism, not the distance)
6	<b>Potential impacts to other areas from modified vessel routing</b>	Level playing field and <b>minimal disruption to industry</b> (this is not a listed criterion, but a stated objective related to the recommendations)

For the purpose of discussion, Nuka Research assessed different potential "safe distances offshore" according to the following three criteria and metrics based on combining the bolded items in Table 8.3-1:

1. **Extent to which distance may reduce chance of drift groundings by disabled vessels on the west coast of Haida Gwaii.** *Metric:* Results of studies described in Section 8.2 compared to 25, 50, and 75 NM offshore west coast of Haida Gwaii.
2. **Extent to which known shipping routes/activity may be affected.** *Metrics:*
  - Type of affected vessels and number of tracks within of 25, 50, and 75 NM of west coast of Haida Gwaii in 2016;
  - Extent of route deviations that would be required for main routes affected by establishing a "safe distance offshore" of 25, 50, or 75 NM.
3. **Potential impacts to other areas from modified vessel routing.** *Metric:* Review of alternative route options and changes to baseline traffic if vessels routed there.

Other (not bolded) items do not vary depending on a distance offshore and are thus not used to compare the different distances proposed for discussion.

### 8.3.1 Criterion #1: Reducing Drift Groundings

Table 8.3-2 summarizes the recommendations or results from the key resources described in Section 8.2 which analyzed potential vessel drift and response from different perspectives. The results of these studies were used as a proxy for whether or not a routing recommendation would be effective *should a vessel become disabled*. For example, a recommendation that vessels stay 25 NM offshore would align with the recommendation from the Pacific States-BC Task Force in 2002.

Table 8.3-2 below summarizes the probabilities of an ETV arriving in time to achieve a rescue along the two passage lines *used in this study*, based on the Clear Seas analysis. This was done by processing the results of the Clear Seas model at the two passage lines used for the vessel traffic analysis described in this study. The probability is rounded to the nearest 5 percent.<sup>18</sup> The relevant recommendations from the other two studies discussed in the previous section are shown as footnotes to the table. The distances that are the focus of this section (25, 50, and 75 NM) are highlighted.

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<sup>18</sup> Probabilities were rounded to the nearest 5% to reflect the uncertainty in the model.



Table 8.3-2 Results at the Northern Haida Gwaii and Southern Haida Gwaii Passage Lines Used in this Study for Selected Example Distances, based on the Clear Seas ZONS analysis (2018)<sup>19</sup>

Passage Line from SDO-PVM Traffic Analysis	Distance from Shore (NM)	Clear Seas (2018) Probability of an ETV Reaching a Disabled Vessel Prior to Grounding		
		Scenario 1 1 ETV Neah Bay	Scenario 5 3 ETVs Neah Bay Port Hardy Prince Rupert	Scenario 6 3 ETVs (2 on patrol) Neah Bay N. Vancouver Is. Hecate Strait
Northern Haida Gwaii Passage Line	12	50%	70%	70%
	25*	65%	90%	85%
	30	70%	95%	90%
	40	75%	99%	95%
	50**	85%	99%	99%
	75***	95%	99.9%	99.9%
Southern Haida Gwaii Passage Line	12	50%	60%	75%
	25*	65%	85%	95%
	30	70%	90%	99%
	40	75%	95%	99%
	50**	80%	99%	99.9%
	75***	95%	99.9%	99.9%

\* 25 NM is recommended as voluntary distance offshore for most vessels > 300 GT from San Diego to Cook Inlet, Alaska in Pacific States-BC Task Force Report (2002)

\*\* Recommended for laden tankers with persistent oil cargo (where other measures do not already exist) in Pacific States-BC Task Force Report (2002)

\*\*\* Recommendation for laden tankers (CCG, n.d.). ("Average risk" area is identified as more than 100 NM offshore in Northwest BC) in Pacific States-BC Task Force Report (2002)

<sup>19</sup> See footnote 7, p. 11

### 8.3.2 Criterion #2: Impacts to Shipping

The analysis used two metrics to assess potential impacts to industry: type of vessels and number of voyages that would be asked to modify their route (based on 2016 AIS data) and the additional distance associated with route modifications.

Table 8.3-3 shows the number of transits and associated vessel types and trades for cargo and cruise ships within 25 NM, 50 NM and 75 NM off the west coast of Haida Gwaii is summarized here based on 2016 analysis of the Southern Haida Gwaii Passage Line as presented in Section 5. The table also shows the number of transits identified between 75 NM and the EEZ for context. This indicates the extent to which a particular trade may be impacted within the region overall. (All tanker transits were outside 75 NM except those going to Northern BC ports.)

Table 8.3-3. Number of Cargo and Cruise *Transits* Recorded at Southern Haida Gwaii Passage Line within Different Distances from Coast, 2016

Trade	Within 25 NM	Within 50 NM	Within 75 NM	75 NM – EEZ
<b>All Cargo (container ships, bulk carriers, vehicle carriers, other)</b>				
Alaska	121	323	345	66
Northern BC	1	6	8	24
Great Circle Route from Strait of Juan de Fuca**	14	41	73	262
<b>Cruise Ships</b>				
	186	193	194	0
<b>TOTAL</b>				
	322	563	620	352

\*\*includes vessels on this route whether departing/arriving U.S. or Canadian ports (both the Southern BC Ports and Great Circle Route trades)

Table 8.3-4, below, shows the number of individual cargo vessels and cruise ships that made the transits recorded in Table 8.3-3, above. As described in the general discussion of vessel traffic in this area previously, the vessels nearer shore are dominated by those moving either goods or passengers to and from Alaska. For example, only 9 cargo ships made the 121 recorded tracks within 25 NM of shore.

Table 8.3-4. Number of Cargo and Cruise Vessels Recorded at Southern Haida Gwaii Passage Line within Different Distances from Coast, 2016

Trade	Within 25 NM*	Within 50 NM*	Within 75 NM*	75 NM – EEZ
<b>All Cargo (container ships, bulk carriers, vehicle carriers, other)</b>				
Alaska	9	12	12	10
Northern BC	1	6	8	22
Great Circle Route from Strait of Juan de Fuca**	14	41	71	206
<b>Cruise Ships</b>				
Alaska	14	14	15	0
<b>TOTAL</b>				
	38	73	106	238

\*Does not include transits inside 2 NM from west coast of Haida Gwaii

\*\*Includes vessels on this route whether departing/arriving U.S. or Canadian ports

In addition to considering how many vessels and voyages could be asked to change their routes for each distance considered, Nuka Research estimated the additional distance and time associated with those route changes. Typical routes passing within 75 NM of the west coast – shown in Figure 8.3-1 - are engaged in trade with Alaska and routing to/from Chatham Strait (Southeast Alaska) or ports in and around Cook Inlet (including Kodiak). Typical routes to Valdez – the tankers – are already outside 75 NM, as are most voyages on the Great Circle Route.

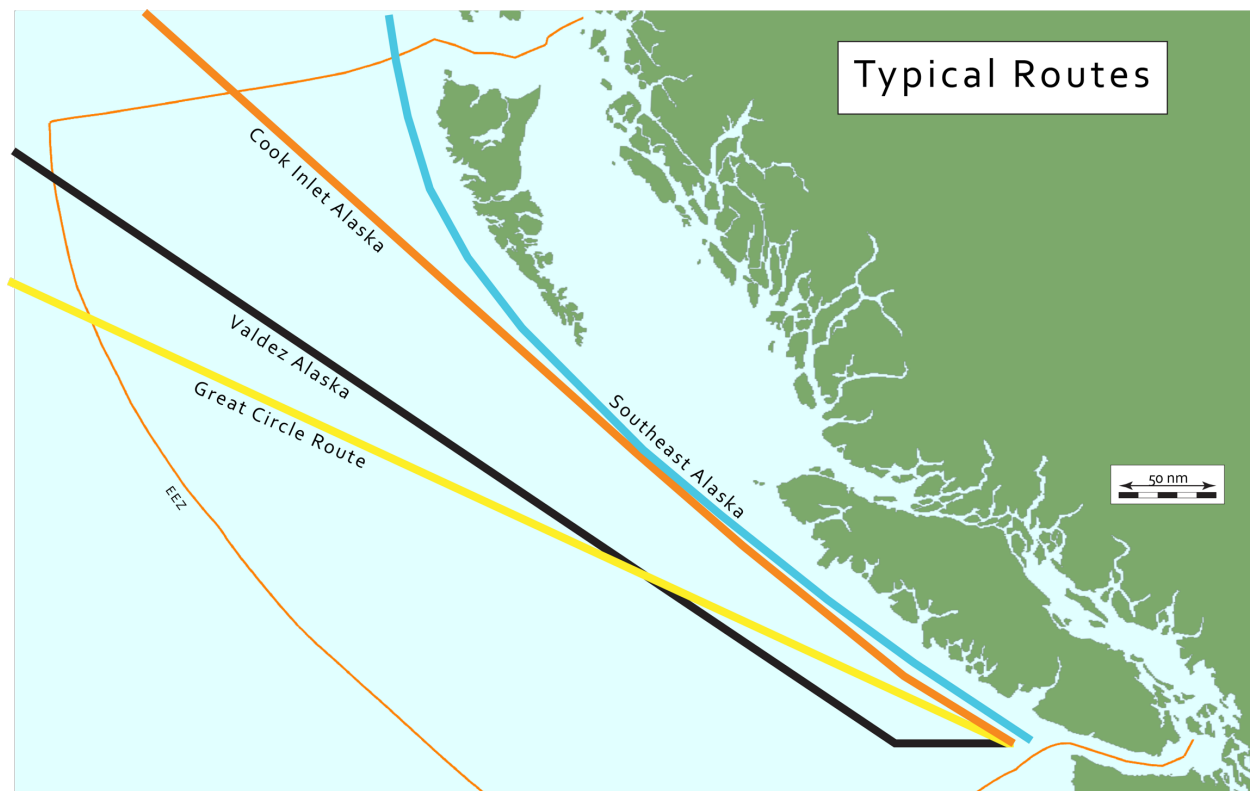


Figure 8.3-1. Typical Routes Affected by Offshore Routing Measure of 25, 50, or 75 NM

The typical voyages to Southeast Alaska and Cook Inlet, those most likely to be impacted by an offshore routing measure of 25, 50, or 75 NM, were measured for their total distance from the entrance to the Strait of Juan de Fuca. The routes were then modified as needed to follow potential offshore routing measures as shown in Figures 8.3-2 and 8.3-3.

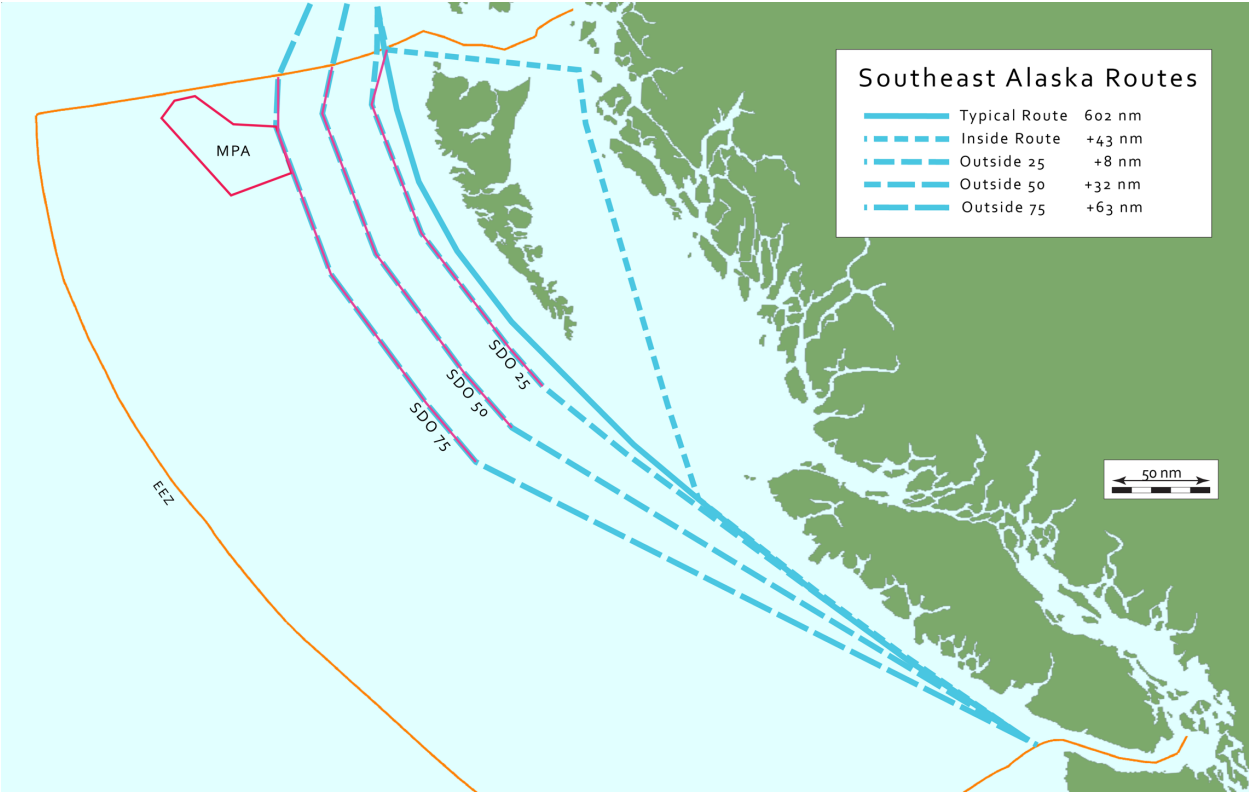


Figure 8.3-2. Typical Route and Potential Modified Routes for Southeast Alaska Traffic

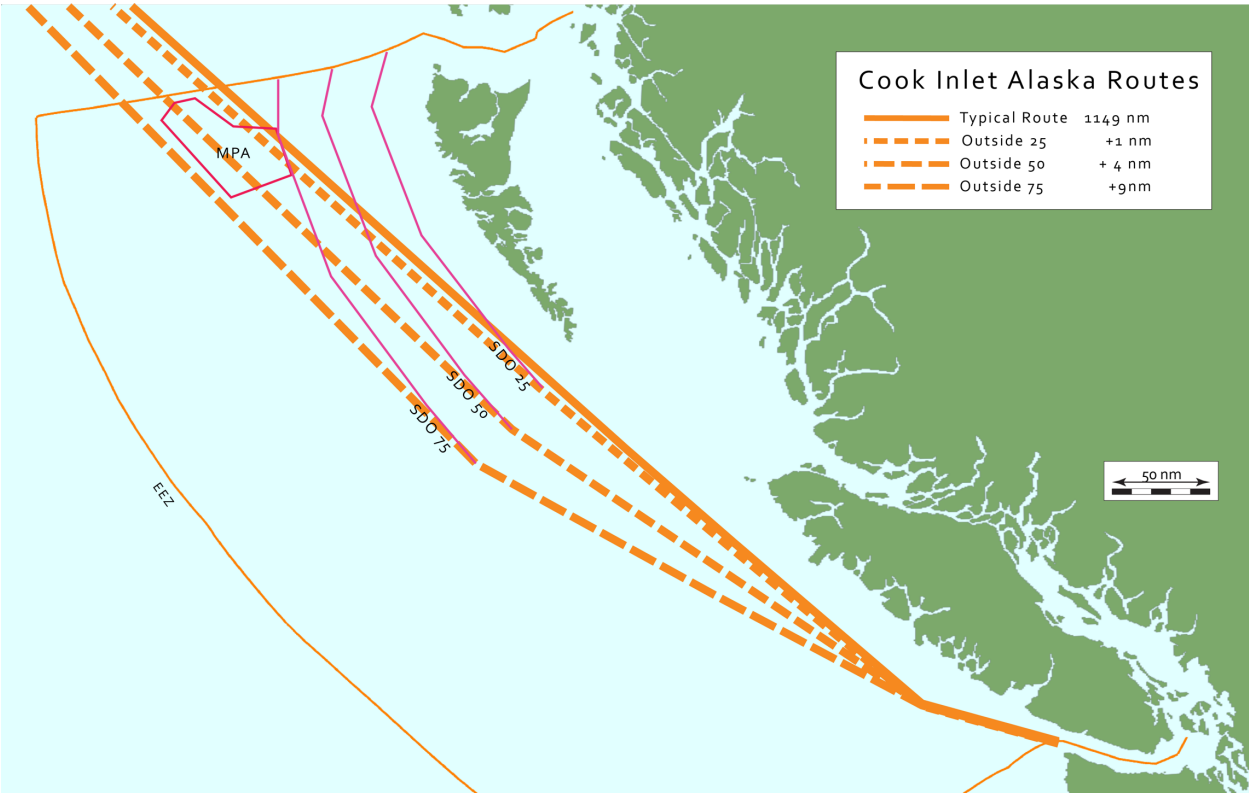


Figure 8.3-3. Typical Route and Potential Modified Routes for Cook Inlet Traffic

Table 8.3-5 shows the estimated distances for typical voyages to/from Southeast Alaska and Cook Inlet, and the additional distance that would be required to stay outside certain distances from Haida Gwaii. These distances are roughly translated into additional time, assuming a vessel traveling at 20 knots. Fuel costs were not estimated but could be.

Table 8.3-5. Approximate Length of Typical Voyages from Strait of Juan de Fuca to Southeast Alaska and Cook Inlet, Alaska, with Additional Distances Required to Stay 25, 50, or 75 NM off the West Coast of Haida Gwaii

Typical/ Modified Voyage	Length of voyage to/from Southeast Alaska (staying outside Haida Gwaii)	Length of voyage to/from Cook Inlet
<b>Typical Voyage</b>	602 NM	1149 NM
<b>25 NM offshore</b>	+8 NM (~25 min)	+1 NM (~ 3 min)
<b>50 NM offshore</b>	+32 NM (~1 ½ hr)	+4 NM (~ 12 min)
<b>75 NM offshore</b>	+63 NM (~3 hr)	+9 NM (~27 min)

In addition to the impact of distance and associated travel time and fuel costs, vessels could also face rougher seas farther offshore. None of the voluntary offshore routing measures described in Section 7 precludes a vessel master's ability to maneuver the vessel as needed to avoid weather or otherwise ensure safety.

### 8.3.3 Criterion #3: Impacts to Other Areas

There were two questions that arose related to the potential for vessels that change their routes to impact other areas, essentially shifting the risk to a different location than the west coast of Haida Gwaii. The first is the possibility that vessels may travel through Hecate Strait instead, and the second is the potential for increased impacts from shipping traffic on the SK-B MPA.

Vessels would have the choice as to whether to stay on the outside of Haida Gwaii or go around it through Hecate Strait rather than move farther offshore. While this would be a significant deviation for vessels heading to/from Cook Inlet, vessels heading for Southeast Alaska may be more likely to choose this route. Using the same approach as above, the additional distance (and associated time) for a vessel traveling between Southeast Alaska and the Strait of Juan de Fuca was calculated. The distance was calculated at 645 NM if a vessel went through Hecate Strait, compared to 602 NM using the current typical route outside Haida Gwaii. Even if that vessel went 25 NM or 50 NM offshore Haida Gwaii, the total distance (610 NM and 634 NM, respectively) would still be less than going through Hecate Strait. It

was concluded that even vessels going the closest-to-shore route past Haida Gwaii would, based strictly on distance and time, most likely continue to stay in offshore waters if asked to stay 25 or 50 NM offshore. If asked to stay 75 NM offshore, then the option to go through Hecate Strait would be shorter, reducing the voyage by an estimated 20 NM. See Figure 8.3-2.

Cruise ships currently travel both through Hecate Strait and on the outside of Haida Gwaii. Since these vessels may seek sightseeing opportunities for their passengers, in addition to time, distance, and safety considerations, it is possible that cruise ships could opt for Hecate Strait even if it is longer than staying 25 or 50 NM off the west coast. If *all* cruise ships that used the west coast of Haida Gwaii in 2016 had chosen the Hecate Strait route, the number of cruise ship transits of Hecate Strait would have increased by 35%.

The SK-B MPA abuts the 75 NM offshore line at its southeast corner. Vessels going to Southeast Alaska and Cook Inlet may interact with this area differently:

- **Southeast Alaska:** Vessels going to Southeast Alaska do not currently enter the SK-B MPA, nor would they if the safe distance offshore was 25 or 50 NM. If it was 75 NM, they would likely pass by the edge of the SK-B MPA, if they chose to stay farther offshore instead of taking what would be a 20- NM shorter route through Hecate Strait. (See Figure 8.3-2.)
- **Cook Inlet:** Some vessels going to Cook Inlet currently do enter the MPA. If they adjusted their voyages to stay 25 or 50 NM offshore, more may do so. At 75 NM, the most direct route to Cook Inlet would take them west of the MPA. (See Figure 8.3-3.)

As noted, transiting tankers already stay outside 75 NM. Their most direct route to Prince William Sound (Valdez, Alaska) outside the TEZ also takes them west of the SK-B MPA.



## 9 Discussion

This section summarizes findings from the traffic analysis and research, and provides some options for implementation of voluntary offshore routing measures.

### 9.1 Findings

The following findings resulted from the analysis and research and were shared with the project committee for discussion.

#### Findings Related to Vessel Traffic Characterization

The following findings are based on the vessel traffic analysis conducted using AIS data from 2014-2016:

1. In 2016, almost 1000 commercial voyages passed between 2-200 NM offshore Haida Gwaii, most of which were cargo vessels. Given that cargo tonnages at major ports in BC and Washington (U.S.) have not changed significantly from 2014-2018, it is expected that the general type and behaviour of traffic in 2016 is likely the same today.
2. There were more transits between 2-200 NM off Haida Gwaii in 2014 than in 2015 or 2016, likely due to changes in routing when new requirements within the ECA took effect in 2015. (At this point, vessels on the Great Circle Route shifted south to have a more direct line in and out of the Strait of Juan de Fuca, thus minimizing time in the ECA.) It is expected that current and future traffic will continue to follow the pattern seen in in 2015 and 2016 even with the new global sulphur emissions requirements in 2020.
3. In 2016, 563 commercial vessel transits passed southern Haida Gwaii between 2-50 NM of shore. Twenty-one individual vessels made 91% of these voyages: nine cargo vessels (container ships and other cargo) and 12 cruise ships.
4. In all years (2014-2016) the tracks between 2-50 NM of southern Haida Gwaii were primarily cruise ships and cargo ships (mostly other cargo and container ships, with a few bulk carriers) voyaging to Alaska.
5. There is a seasonal variation between summer and winter for vessels on the Great Circle Route. These vessels tend to be somewhat closer to Haida Gwaii in winter (particularly October – December) as they are staying farther north through the Aleutians to avoid winter sea conditions in the North Pacific. This same variation does not exist for cargo vessels transiting to or from Alaska. (Cruise ships do not operate in this area in winter.)
6. Tankers were primarily beyond 75 NM – closer to 100 NM – from southern Haida Gwaii and farther than this off northern Haida Gwaii. Tankers transiting through the area passed outside

the voluntary Tanker Exclusion Zone (TEZ) whether laden or unladen. Tankers calling at Northern BC ports tended to follow best routes to the port.

7. Bulk carriers and other cargo ships tend to travel closer to shore when heading south as compared to their voyages going north.

### **Findings Related to Vessel Routing Generally**

It is not possible to judge from AIS data alone whether a vessel operator is choosing the best route at any given time. The following findings relate to discussions with operators through the project process, not AIS analysis.

1. Operators interviewed expressed that ships would still generally choose routes that stay outside the ECA as long as possible even after the 2020 global sulphur cap on ship emissions takes effect in 2020. Thus, the general routes for vessels on the Great Circle Route will likely be similar to those analyzed for 2016.
2. Vessel operators and masters consider many factors when choosing a route, including weather.

### **Findings Related to Comparison of Distances Offshore for Potential Recommended Routing Measure**

The following findings relate to the implications of recommending that transiting vessels stay 25, 50, or 75 NM offshore Haida Gwaii.

1. A voluntary routing measure that asked vessels to stay 25 NM off the west coast of Haida Gwaii would align with the Pacific States-BC Oil Spill Task Force (2002) recommendation for vessels of 300 GT or larger. This would also mean that an ETV from Neah Bay, Washington (the closest long-term, dedicated ETV) would have a 50-90% probability arriving in time to save a vessel that begins drifting from this distance (Scenario 1 from Clear Seas analysis), or 90% if there are also ETVs stationed in Port Hardy and Prince Rupert (Scenario 5 from Clear Seas analysis).

A measure at this distance offshore Haida Gwaii would:

- a. Affect approximately 322 transits (based on 2016 data), primarily in Alaska trade (121 cargo transits and 186 cruise ship transits).
- b. Affect approximately 38 ships (based on 2016 data), primarily in Alaska trade (9 cargo ships and 14 cruise ships).
- c. Add approximately 8 NM or 25 minutes to typical route going to Chatham Strait (Southeast Alaska) and 1 NM or 3 minutes to the typical route to Cook Inlet (typical voyages to Valdez or via the Great Circle route would not be affected).

- d. Still be shorter for vessels going to Chatham Strait (Southeast Alaska) than going inside Hecate Strait instead.
  - e. Increase traffic through the SK-B MPA (some vessels headed to/from Cook Inlet, Alaska).
- 2. A voluntary routing measure that asked vessels to stay 50 NM off the west coast of Haida Gwaii would align with the "higher risk" area identified by the Pacific States-BC Oil Spill Task Force (2002). There is an *almost* 90% probability<sup>20</sup> of an ETV from Neah Bay, Washington (the closest long-term, dedicated ETV) arriving in time to save a vessel that begins drifting from this distance (Scenario 1 from Clear Seas analysis). This is improved to more than 99% if there are also ETVs stationed in Port Hardy and Prince Rupert (Scenario 5 from Clear Seas analysis).

A measure at this distance offshore Haida Gwaii would:

- a. Affect approximately 563 transits (based on 2016 data), primarily in Alaska trade (323 cargo transits and 193 cruise ship transits). Approximately 41 Great Circle Route voyages and 6 voyages to Northern BC ports would also be affected.
  - b. Affect approximately 73 ships (based on 2016 data): 12 cargo vessels in Alaska trade, 14 cruise ships going to/from Alaska, and 41 vessels on the Great Circle Route.
  - c. Adds approximately 32 NM or 90 minutes to typical route going to Chatham Strait (Southeast Alaska) and 4 NM or 12 minutes to the typical route to Cook Inlet (typical voyages to Valdez or via the Great Circle route would not be affected).
  - d. Still shorter for vessels going to Chatham Strait (Southeast Alaska) than going inside Hecate Strait instead.
  - e. Increase traffic through the SK-B MPA (some vessels headed to/from Cook Inlet, Alaska).
- 3. A voluntary routing measure that asked vessels to stay 75 NM off the west coast of Haida Gwaii would keep vessels well outside the higher risk area identified by the Pacific States-BC Oil Spill Task Force (2002) and align with the recommendation for transiting laden tankers. If the only dedicated ETV in the region was the one in Neah Bay, there would be a slightly greater than 95% chance it would reach a disabled vessel that began drifting from 75 NM offshore. With more ETVs in the region, there would be a greater than 99% probability of a save.

A measure at this distance offshore Haida Gwaii would:

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<sup>20</sup> The 90% contour in the Clear Seas analysis (2018) is 55 NM from the southern tip of Haida Gwaii.

- a. Affect approximately 620 transits (based on 2016 data), primarily in Alaska trade (345 cargo transits and 194 cruise ship transits). Approximately 73 Great Circle Route voyages and 8 voyages to/from Northern BC ports would also be affected.
  - b. Affect approximately 106 ships (based on 2016 data): 12 cargo vessels in Alaska trade, 15 cruise ships going to/from Alaska, and 71 vessels on the Great Circle Route.
  - c. Add approximately 63 NM or 3 hours to typical route going to Chatham Strait (Southeast Alaska) and 9 NM or 27 minutes to the typical route to Cook Inlet (typical voyages to Valdez or via the Great Circle route would not be affected).
  - d. Potentially incentivize vessels going to Southeast Alaska to take the shorter route through Hecate Strait (20 NM shorter than staying outside 75 NM from Haida Gwaii).
  - e. Not necessarily increase traffic through the SK-B MPA, though would likely bring more vessels close to the boundary.
4. Great Circle Route vessels would not be impacted when traveling the shortest route and could deviate from a recommended route if safety dictates that this is the most prudent course.
  5. Tank vessels going to/from Valdez would not be impacted by a recommended offshore route of 25, 50, or 75 NM as they are already outside 75 NM from shore per the voluntary TEZ.
  6. A recommended offshore route would not necessarily apply to vessels calling at Northern BC ports. A separate best practice could apply to them (e.g. not cutting the corner at Dixon Entrance).

### Findings Related to Potential Voluntary Routing Measures and Implementation

The following findings relate to research and discussion conducted for this project regarding potential mitigation measures:

1. There are at least three options for implementing a voluntary offshore route on the west coast of Haida Gwaii. There are precedents for all three within Canadian waters.
2. The effectiveness of any recommended routing measure is largely dependent on communication and monitoring.
3. Communication methods may include: messaging directly to operating companies, flyers/information distributed via marine pilots (even though the measures are outside pilotage waters and ports in BC, potentially distributing information via U.S. ports/pilots and the Puget Sound Marine Exchange, printing on charts (Canadian and U.S.), reference in *Sailing Directions* (Canada) and *Coast Pilot* (U.S.), and notifications to mariners sent via CCG and the U.S. Coast

Guard. (If the IMO approved an ATBA, it would also go in the IMO publication *Ships' Routing* and be required on all international charts.)

4. Real-time monitoring for adherence to an offshore routing measure could be done via MCTS or possibly via the Council of the Haida Nation's use of the Enhanced Maritime Situational Awareness system that Transport Canada is now piloting (if available long-term). The purpose of this would be two-fold: to promptly identify a vessel that may require assistance and to educate the vessel operator about the measure for their future reference. The latter purpose could also be achieved through periodic (monthly, annual) analyses of AIS data provided by the government or purchased from exactEarth. A communications protocol would need to be developed.
5. An offshore routing measure could include a recommendation that vessels that seek to deviate from the recommendation (to avoid rough weather or other reason at the discretion of the vessel master) should contact MCTS to notify them of the expected course of action and reason it is needed. This information could be reviewed periodically to understand the nature and justification for deviations that do occur.
6. Communications and outreach would be easier with the smaller number of vessels affected by a shorter distance offshore, since approximately 25 vessels travel within 25 NM off the west coast of Haida Gwaii. While they are not all U.S.-flagged vessels, all are headed to Alaska which would mean that cooperative outreach by Canada and the U.S. would likely reach all vessel operators. By 50 or 75 NM, the number of vessels increases significantly because more Great Circle Route traffic is included than at 25 NM offshore.

### **Findings Related to Other Potential Protective Measures**

1. The presence of one or more dedicated ETVs able to respond around Haida Gwaii would increase the likelihood that an ETV would reach a disabled vessel before it grounds there. The current ETV presence is subject to change. Work is now underway by other parties to explore options for this.
2. A waterway safety committee would be a viable option for the waters around Haida Gwaii, but additional discussion is needed to establish the purpose and focus, and determine the participants and administrative or financial support required.

## **9.2 Options for Implementation**

Implementation options depend on the final conclusions of the project committee. Proceeding with any of the five measures described in this report will require agreement from diverse parties. This section assumes that agreement is achieved and does not discuss the likelihood of that agreement.

Possible options are summarized in Table 9.2-1 for the offshore routing measures.

Table 9.2-1. Considerations Regarding Implementation of Offshore Routing Measures

Potential Measure	Timing	Resources	Possible Next Step
<b>Agreement with operators</b>	Within project (3-5 months)	Project committee could implement  Time for negotiation, implementation planning	Reach out to operators via project committee
<b>Guideline/standard of care</b>	Within project (3-5 months); (unsure process for chart update)	Project committee could implement  Need to engage other agencies (re charting etc.)	Determine process/participants  Reach out to operators, agencies
<b>IMO-approved ATBA</b>	Post-project (12-24 months); prepare proposal, 2 IMO mtgs, 6 months to implementation	Preparation of proposal  Outreach to facilitate passage (see next step)  Possible travel to IMO meetings (1 or 2)	Engage Transport Canada Marine Safety and Security to explore feasibility/further requirements

Options for the two complementary measures are in Table 9.2-2. The Waterway Safety Committee would provide a mechanism for ongoing communication among a group such as the project committee to determine a wider range of best practices if appropriate (or address other geographic areas around Haida Gwaii), or through which to consider amendments so the offshore routing distance or measures. This could be initiated in the near-term by the project committee.

If the group reached agreement on the need for a long-term presence of ETV in the region and the approach to achieve this, members could collectively advocate for such an approach.

Table 9.2-2. Considerations Regarding Implementation of Complementary Measures

Potential Measure	Timing	Resources	Possible Next Step
<b>Waterway Safety Committee/plan</b>	Within project (3-5 months)	Project committee could implement  Time for negotiation, implementation planning	Determine desired structure, possible overlap with existing organizations
<b>Long-term ETV presence</b>	Could advocate for this within project, though likely an ongoing long-term emergency towing strategy initiative  (12-24 months, uncertain)	Additional analyses regarding vessel requirements, operations, funding	Engage Transport Canada Marine Safety and Security to explore feasibility/further requirements.

## 10 Conclusion

Nuka Research analyzed and characterized commercial ship movements on the west coast of Haida Gwaii to inform project committee discussions as part of the Haida Gwaii SDO-PVM pilot project. The analysis was complemented by research of voluntary approaches to encouraging vessels to stay offshore certain areas or follow certain routes. Examples were identified from Canada and elsewhere.

### *Offshore Routing Distance*

After review and discussion by the project committee, three distances were considered for possible voluntary routing measures off the west coast of Haida Gwaii: 25, 50, and 75 NM. Commercial vessels active in this area are predominately cargo and passenger ships, with some tankers farther offshore. Common cargo and passenger vessel routes to and from Alaska regularly transit this area, as well as some vessels on trans-Pacific voyages. The extent to which these vessels would have to change course to stay farther offshore was considered for each of the three distances analyzed. The analysis also considered whether a recommended offshore route would have the unintended consequence of routing vessels to travel through the SK-B MPA or to divert to interior waters.

The results of the analysis were presented as findings that described the potential effectiveness, based primarily on prior studies, and potential for some possible unintended consequences associated with 25, 50, and 75 NM.



### *Communications*

Research of other examples of voluntary vessel routing measures identified mechanisms used to communicate voluntary routing with vessel operators. These may include navigational information for both Canada and the U.S., since many vessels in the area are traveling to a U.S. port or other types of outreach depending on the routing measure and affected vessels.

### *Monitoring*

As was the case throughout the project, having information about vessel movements that could be shared, analyzed, and discussed was informative to the SDO-PVM pilot project effort overall. Research into other voluntary vessel routing measures indicated that the extent to which they are monitored (and how that information is shared) varies widely. However, a transparent monitoring effort could be important to provide all parties with a shared understanding of whether the measure is having the intended effect. Monitoring could also help assess whether efforts to encourage adherence are effective, or if there are frequent necessary deviations for safety or other reasons.

### *Future Considerations*

There are other ongoing efforts related to this project, including an Emergency Towing Strategy initiative led by TC. The project committee discussed the need for a formal maritime risk assessment to support further dialogue on additional or more formalised routing measures, such as a uniform distance for all vessels, or an IMO Area to Be Avoided.

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## Appendix A – AIS Data Processing

The AIS data used in this project was procured by Clear Seas Centre for Responsible Marine Shipping in 2017 for a vessel traffic study for Canada's Pacific Region. This Appendix provides an overview of the methods applied to the raw AIS data from exactEarth to identify vessels and establish vessel tracks based on the AIS transmissions compiled.

Previously for Clear Seas, Nuka Research had applied the following overall approach to compiling and processing vessel traffic data:

1. Process AIS data to remove bad data and reduce number of points
2. Develop Vessel Track Database from processed AIS data
3. Develop Vessel Attribute Database
4. Associate attribute data with track data
5. For some analyses, classify individual tracks
6. Develop vessel track and petroleum carriage density plots (heat maps)
7. Develop statistics for tracks that crossed passage lines or called at ports

The AIS dataset was recorded by satellite and included ship signals received within the study area during 2014-2016. When an AIS signal is transmitted from the vessel to a receiver, a data point is logged identifying the position of the vessel. Each data point includes the vessel, time, date, location, and limited vessel particulars. When the next signal is received, a track of the vessel's movement can be interpolated for the Vessel Track Database. The vessel identification is added to the Vessel Attribute Database.

### Vessel Track Database

Nuka Research developed a Vessel Track Database from sequential AIS points for each individual vessel within the study area using a custom computer program. The program removed records that did not have valid vessel identification, transmitted time, latitude, or longitude position data. Only data transmitted by vessels with mandatory (Class A) AIS transmitters was kept.<sup>21</sup>

Data points were grouped by vessel and ordered chronologically. Vessel tracks were then built for each vessel using the following method:

1. The first and last points are always kept.

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<sup>21</sup> Class B transmitters send a lower power signal and are voluntarily carried by vessels not required to transmit an AIS signal.

2. Beginning with the first point chronologically, each succeeding point is compared to the previous point. The successive point is excluded if it is less than three minutes since, or closer than 0.2 NM to, the previous point.
3. Tracks are then constructed from the remaining set of points for each vessel. A new track is started if a successive point is greater than 7 days or 50 NM from the previous point, the designation information provided by the vessel in the AIS signal changes, or the vessel does not move for more than four hours.
4. Tracks are stored in a geo-spatial dataset and spreadsheet. Each track is identified with a specific vessel based on that vessel's Maritime Mobile Service Identity (MMSI) number and then associated with vessel-specific attributes based on the same number.

The code reduces the number of data points associated with each vessel track, while retaining the information necessary to determine where the vessel traveled. The dataset for all of Canada's Pacific Region waters was thus reduced from 91 million points to 19 million points.

### **Passage Lines**

Passage lines are used to capture information about vessels as they move in and out of port areas or water bodies. They operate as a "tripwire" in the analysis to identify each time a vessel in the dataset crosses one of the passage lines. These are depicted in the report (Figure 4.1-1).

### **Vessel Attribute Data**

Vessel attribute data are associated with each track in the track database.

The original AIS dataset included more than 7,500 unique vessels transmitting Class A signals (meaning they are required to do so by the IMO) within the Clear Seas study area of all marine waters in Pacific Canada. Some vessel attributes are provided with the AIS data. However, past experience has shown that this self-disclosed information is not always accurate, so additional data were collected from vessel registries and other sources as described in this section. A Vessel Attribute Database was assembled from multiple data sources in order to provide the most accurate information about each vessel.

Nuka Research purchased vessel attribute data for 5,511 individual vessels from the worldwide vessel registry maintained by IHS.<sup>22</sup> Nuka Research also maintains a database of vessels encountered in other studies. Where information was still missing, an attempt was made to collect information from other public sources, such as U.S. government databases and online ship identification sources.

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<sup>22</sup> <https://www.ihs.com/products/maritime-world-ship-register.html>

While merging the multiple data sources, Nuka Research assigned values based on the following order of priority. IHS data was considered the primary source. If data was missing from IHS then data was extracted from the AIS data, followed by Nuka Research vessel attribute data, then researched data, and finally calculated values.

Vessels excluded from the dataset in the following cases:

- Vessels less than 300 gross tonnes, except for tugs.
- Tugs less than 15 m.
- Vessels not included in the study include fishing vessels, ferries, government vessels and pleasure craft.
- Vessels for which no vessel type could be identified.

For the purpose of the Clear Seas project, commercial vessels were assigned to one of four types: cargo, passenger, tanker, and tug. Type categories were selected to be consistent (though not identical to) the Canadian Coast Guard Marine Communications and Traffic Services database and a previous vessel traffic study for the British Columbia Ministry of the Environment (Nuka Research, 2013).

Because the analysis was based primarily on AIS data, focusing on those vessels required by the International Maritime Organization to carry transmitters (Class A),<sup>23</sup> vessels over 300 GT are included, regardless of type, and all tank ships are included regardless of size. Tugs below the 300 GT size threshold were captured if engaged in commercial service.

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<sup>23</sup> International Convention for the Safety of Life at Sea (Regulation 19, Chapter V)