

**Seafloor and Seep Sampling
Program – Labrador Offshore
to Jeanne d'Arc Basin (2014 to
2019) – Environmental
Assessment Amendment**



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TGS

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Report

May 4, 2018

SEAFLOOR AND SEEP SAMPLING PROGRAM – LABRADOR OFFSHORE TO JEANNE D’ARC BASIN (2014 TO 2019) – ENVIRONMENTAL ASSESSMENT AMENDMENT

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Abbreviations

C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Area
FLO	Fisheries Liaison Officer
IBA	Important Bird Area
MBES	multibeam echosounder
MMO	marine mammal observer
NAFO	Northwest Atlantic Fisheries Organization
SARA	Species at Risk Act
VEC	Valued Environmental Component
VME	Vulnerable Marine Ecosystem

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Introduction

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1.0 INTRODUCTION

TGS has proposed, planned, and implemented a seafloor and seep sampling program in the Labrador Offshore to Jeanne d’Arc Basin area during the 2014 to 2019 period (“the Project”). This Project required authorizations from the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), pursuant to the relevant provisions of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* (the Accord Acts).

1.1 Previous Environmental Assessment Review and Approval

TGS’s original Environmental Assessment (EA) entitled “Seafloor and Seep Sampling Program in the Labrador Offshore to Jeanne d’Arc Basin (2014 to 2019)” (Aivek Stantec Limited Partnership (Aivek Stantec) 2014; referred to as the original EA Report) pertained to its planned multibeam echosounder (MBES), sub-bottom profiler, and coring program activities offshore Labrador and the Jeanne d’Arc basin over the period 2014 to 2019. The original EA received approval by the C-NLOPB in August 2014. A survey was conducted in late summer 2014.

1.2 Proposed Project Modifications

The purpose and objective of this EA Amendment is to identify, describe and assess the following proposed modifications to the scope of the originally assessed Project:

1. An extension of the spatial scope of the project
2. Change in number of core samples collected
3. Change in coring apparatus
4. A change in the collection of MBES

Note that dredging will no longer be conducted as part of planned Project activities. A further discussion of the nature of, and rationale for, these proposed Project modifications is provided in Section 2.0.

1.3 Purpose and Structure of the EA Amendment

The purpose of this EA Amendment is to provide an update of information on the existing environment (e.g., special areas, commercial fishing data) and assess the potential environmental effects of the proposed modifications. Activities proposed for 2018 are also described.

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Detailed project description information is provided in Chapter 2, including proposed mitigation measures and consultation and engagement. Updated information on the existing environment is provided in Chapter 3. An assessment of the potential environmental effects of the proposed modifications is provided in Chapter 4. A concluding statement is provided in Chapter 5 and literature cited is listed in Chapter 6.

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Project Description

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2.0 PROJECT DESCRIPTION

2.1 Original Project Description

The original Study / Project / Assessment Area for the multi-year seafloor and seep sampling program is illustrated in Figure 2-1; coordinates are provided in Table 2.1. Coordinates for the 2018 program areas are provided in Table 2.2. The 2014 program focused on an area that extends from Labrador to the northeast Newfoundland offshore area, specifically the Hopedale Basin, Saglek Basin, St. Anthony Basin, and deep-water area of the Labrador Sea. The Program Area for activities in 2015 to 2019 was synonymous with the Study / Project / Assessment Area.

The sampling collection program included the following components:

- Sampling of potential natural seafloor seeps (by collecting water samples), using an AGI (GORE) or similar sampling kit
- Conducting seafloor heat flow measurements using a thermal probe attached to the core apparatus for sediment core locations
- Collection of sediment cores using a 3-m gravity core method
- Collection of rocks from outcrops using a towed dredge
- Multi-beam bathymetry from a vessel-mounted MBES
- Sub-bottom profiling using a vessel-mounted sub-bottom profiler

2.2 Planned Activities for 2018

TGS plans to collect 200 to 500 cores from four Program Areas (Areas of Interest) in 2018 (Figure 2-1), using a longer piston core. Multibeam and coring operations would be conducted between June to October 2018.

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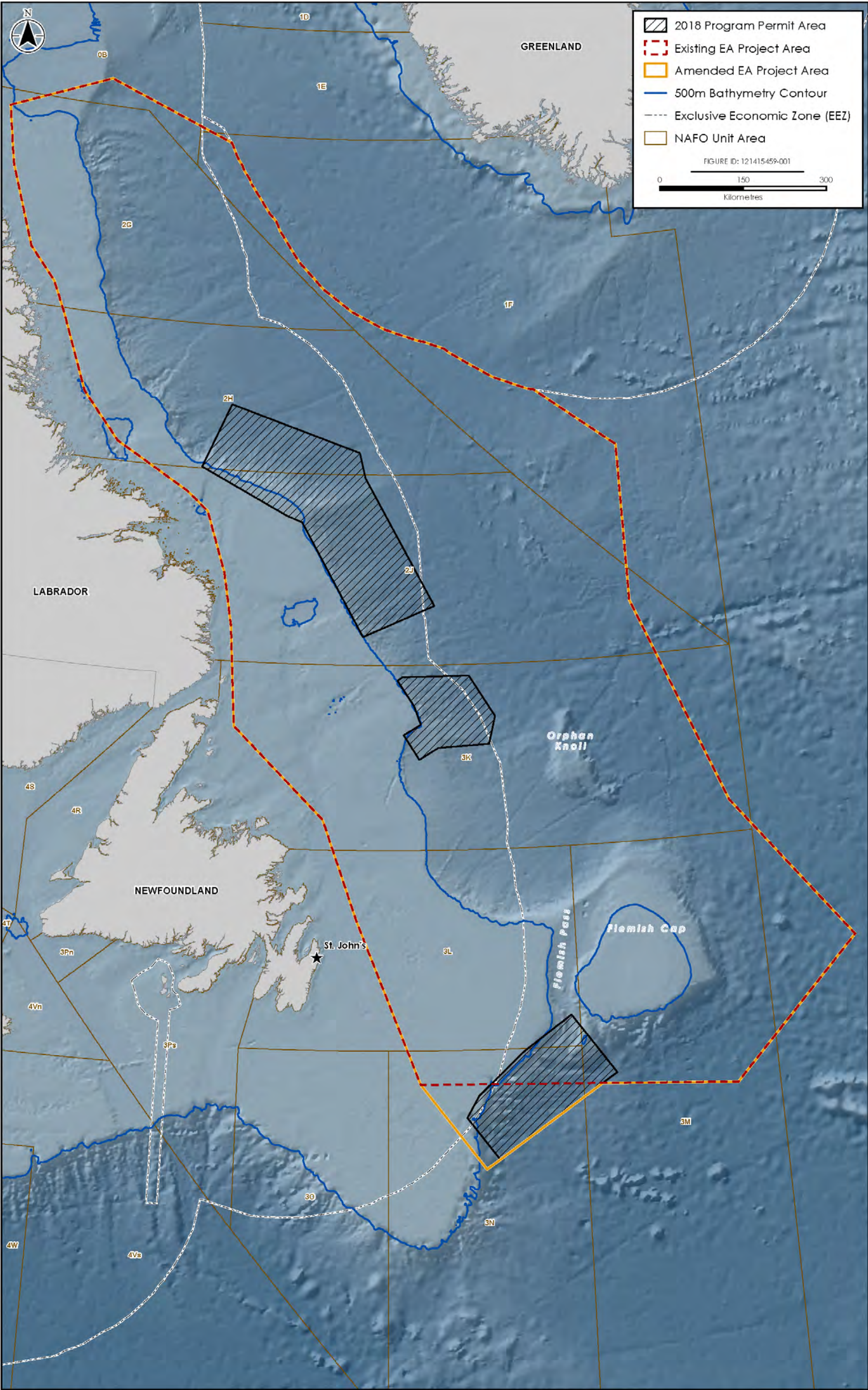


Figure 2-1 Original and Amended Multi-year Study / Project / Assessment Area and 2018 Program Area

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Table 2.1 Original and Amended Multi-year Study / Project / Assessment Area Coordinates (NAD 83 UTM Zone 21N)

Latitude	Longitude
45.91833	-56.1518
45.91602	-50.5223
48.09871	-51.7782
49.74191	-52.654
51.20247	-54.9941
52.81004	-55.2139
53.66833	-55.48
54.64711	-56.0544
54.94789	-56.6614
55.65154	-58.7666
56.38171	-59.8842
57.56946	-60.7863
58.07236	-61.2356
58.56886	-62.0987
59.83033	-63.0881
60.74068	-63.5424
61.43345	-60.3287
60.60988	-56.157
60.35798	-55.909
60.25912	-55.7655
60.18411	-55.6932
60.0478	-55.4982
59.96929	-55.4239
59.49454	-54.7642
59.39275	-54.5665
59.24164	-54.432
58.76153	-53.8012
58.34096	-53.0371
58.33371	-53.0186
58.32078	-52.9956
57.96984	-52.1221
57.96249	-52.0957
57.9623	-52.0952

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Latitude	Longitude
57.68948	-51.1355
57.5014	-50.1131
57.48806	-49.9636
57.36878	-49.3489
57.36815	-49.3423
57.30596	-49.2061
57.24433	-49.0115
57.18558	-48.8472
56.88707	-47.9344
56.67178	-46.9527
56.64719	-46.748
55.66576	-44.4975
53.13318	-44.516
49.76629	-42.4697
47.3636	-39.861
45.2269	-42.9687
41.50384	-47.4947
41.14344	-47.8193
40.73249	-48.8225
40.56932	-49.6623
40.53691	-50.5501
41.39452	-54.6846
41.70894	-55.6117
43.05143	-56.136
43.41123	-56.1555
45.91833	-56.1518

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Table 2.2 2018 Program Area Coordinates (NAD 83 UTM Zone 21N)

Details	Vertex Number	X	Y
NL02-LS_NL16-CFB03	1	56° 18' 3.678" W	55° 21' 22.602" N
NL02-LS_NL16-CFB03	2	55° 34' 3.372" W	56° 23' 40.602" N
NL02-LS_NL16-CFB03	3	51° 49' 32.027" W	55° 41' 18.358" N
NL02-LS_NL16-CFB03	4	51° 39' 10.955" W	55° 16' 35.636" N
NL02-LS_NL16-CFB03	5	49° 46' 4.711" W	53° 12' 36.190" N
NL02-LS_NL16-CFB03	6	51° 41' 0.765" W	52° 42' 28.486" N
NL02-LS_NL16-CFB03	7	53° 24' 13.208" W	54° 32' 31.535" N
NL02-LS_NL16-CFB03	8	53° 51' 3.198" W	54° 38' 41.830" N
NL02-LS_NL16-CFB03	9	56° 18' 3.678" W	55° 21' 22.602" N
NL01-NEN	1	50° 46' 12.884" W	52° 0' 13.267" N
NL01-NEN	2	50° 38' 16.316" W	52° 3' 36.363" N
NL01-NEN	3	48° 53' 43.120" W	52° 4' 6.349" N
NL01-NEN	4	48° 14' 53.310" W	51° 24' 15.020" N
NL01-NEN	5	48° 25' 14.172" W	50° 57' 14.937" N
NL01-NEN	6	49° 43' 36.961" W	50° 54' 33.586" N
NL01-NEN	7	50° 12' 51.776" W	50° 43' 7.674" N
NL01-NEN	8	50° 36' 44.640" W	51° 7' 8.434" N
NL01-NEN	9	50° 9' 59.660" W	51° 17' 22.271" N
NL01-NEN	10	50° 20' 22.355" W	51° 35' 20.848" N
NL01-NEN	11	50° 46' 12.884" W	52° 0' 13.267" N
NL01-SEN	1	46° 39' 34.656" W	46° 28' 7.103" N
NL01-SEN	2	45° 43' 13.869" W	45° 32' 23.345" N
NL01-SEN	3	48° 28' 51.037" W	44° 12' 59.337" N
NL01-SEN	4	49° 11' 58.875" W	44° 54' 15.679" N
NL01-SEN	5	48° 54' 54.402" W	45° 15' 24.005" N
NL01-SEN	6	47° 49' 48.059" W	45° 57' 54.859" N
NL01-SEN	7	46° 42' 23.251" W	46° 30' 50.365" N
NL01-SEN	8	46° 39' 34.656" W	46° 28' 7.103" N

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2.3 Proposed Modifications to the Project Description

2.3.1 Spatial Scope Extension

TGS proposes to extend the southern boundary of the original EA to encompass the Carson / Salar Basin (Sector NL01-SEN) (Figure 2-1); the coordinates are provided in Table 2.1.

2.3.2 Multibeam Echosounder Survey Modification

The MBES is a hull-mounted acoustic array that produces high-resolution bathymetric maps of the sea bottom. There is no in-sea equipment (e.g., towed streamers) or compressed air sound sources (MBES is similar to sonar technology used by most modern vessels). Multibeam acquisition will be conducted in swaths at a nominal line spacing of approximately 5 to 9 km at water depths 500 m and greater, not just over potential coring locations. The surveyed areas will change in a given survey year, but will be conducted in defined areas (i.e., not over the entire Study / Project / Assessment Area). Data is collected. The sound source (hull-mounted MBES) and output (30 kHz (the source level is less than 228.8 dB measured 1 m from the energy source stated in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2017)) will not change from that assessed in the original EA. Vessel speed during data collection is approximately 17 km/h (8 to 9 knots).

2.3.3 Core Sample Number Modification

Results from the MBES data are analyzed to detect seeps and select core targets. TGS proposes to increase the maximum number of cores collected in a program from 300 to 500 (typically collected over multiple areas within the Study / Project / Assessment Area).

2.3.4 Coring Equipment Modification

TGS proposes to use a piston core to collect samples (Figure 2-2). Navigated piston coring allows precision acquisition of core samples for geochemical analysis. The piston corer is tracked in real time through the water column using USBL navigation (acoustic positioning). Once in position just above the target, the piston is released and the coring rig free-falls into the seafloor to achieve the desired initial force on impact. The sliding piston inside the core barrel reduces inside wall friction and creates suction, enhancing the distance the seabed sample will move up the barrel. The core is brought back to the surface and onto the deck for observation and sub-sampling. Improvements in USBL mean that any target you can see with MBES data, you can core sample with good accuracy.

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Figure 2-2 Example of a Piston Core

2.4 Mitigation Measures

The scope of work for the proposed Project includes multi-beam bathymetry, seabed heat flow measurements, and collection of seabed cores. Interactions with the environment is primarily associated with the operation of the vessel(s) and the collection of sediment samples. Based on the previous survey and experience from recent similar surveys, mitigation measures proposed for the Project are provided in Table 2.3.

Plans will be developed to avoid or lessen potential effects on the commercial fishery. These plans will include elements such as communications (e.g., The Broadcast (CBC Radio) and Okalakatiget Society notifications and Notices to Shipping), and avoidance of areas during times of heavy fixed gear use. A compensation program will be made available by TGS which is consistent with C-NLOPB guidelines and past practices. This program covers damage to fishing gear (or vessels) caused by the survey vessel or survey gear, and includes the value of harvest lost as a direct result of an incident. TGS will follow procedures for responding to a claim similar to those outlined in the One Ocean Protocol document (these have been successfully employed in the past by other operators). Incidents will be reported to the C-NLOPB, which maintains a 24-hour answering service at 709-682-4426 for this purpose (709-778-1400 during working hours). Reports on contacts with fishing gear will include the exact time and location of initial contact, loss of contact and a description of identifying markings on the gear.

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Table 2.3 Commitment / Mitigation Measures

Potential Effects of Related Activities	Commitment / Mitigation Measure	Status
Interference with Indigenous activities in The Zone	At no time will a survey vessel enter or attempt to conduct survey work in restricted or protected areas, including the Nunatsiavut Zone ('The Zone'), established under the Labrador Inuit Land Claims Agreement (2005)	Restricted areas to be flagged on vessel for avoidance
Disturbance of marine mammals / seabirds	The program (collecting cores) is non-intrusive and its duration is short	Operations to be communicated in Weekly Reports
Disturbance of marine mammals	The Project will adhere to the Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment	
Disturbance of marine mammals	A marine mammal observer (MMO) will be on board	MMO to complete daily and weekly observation reports. Results and data from the marine mammal monitoring program will be included in the EA mitigation and monitoring report submitted to the C-NLOPB no later than six months after termination of the fieldwork
Disturbance of seabirds	A seabird observer will be on board	Sea bird observer to complete daily and weekly observation reports. The results of the seabird monitoring program will be included in the EA mitigation and monitoring report submitted to the C-NLOPB no later than six months after termination of the fieldwork
Interference with fishing activities	A Fisheries Liaison Officer (FLO) to be on board	FLO to be contracted through FFAW-Unifor
Potential disruption to the Post-season Trap Surveys	TGS will endeavor to obtain the time and locations of the Industry-DFO Collaborative Post-Season Snow Crab Trap Survey and Industry-DFO Halibut Longline Survey in 3NOPs4VWX to prevent potential disruption to the activities	Communications to be established with DFO and FFAW-Unifor

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Potential Effects of Related Activities	Commitment / Mitigation Measure	Status
Potential disruption to the Torngat Joint Fisheries Board Post-season Trap Survey	Surveys are typically conducted in early September. The FLOs on board the vessel will establish communications with the Torngat Joint Fisheries Board-DFO Collaborative Post-season Trap Survey to prevent potential disruption to the Post-season Trap Survey	Communications to be established with Torngat Joint Fisheries Board
Interference with the Torngat Joint Fisheries Board Post-season Trap Survey	Surveys are typically conducted in early September. The research vessel will remain 30 km from the Torngat Joint Fisheries Board Post-season Trap Survey locations and will not begin sampling these areas until after the survey is completed	Communications to be maintained with Torngat Joint Fisheries Board fisheries scientist to determine completion of the Post-season Survey
Potential conflict to other vessels	TGS will post Notices to Shipping (NOTSHIP), including a notice to The Broadcast (CBC Radio) and Okalakatiget Society (when surveys are conducted in the Labrador Shelf / Sea area)	Notice to Shippers will be posted immediately prior to start of survey
Potential conflict / damage to fixed gear	The vessel will avoid areas during times of heavy fixed gear use	FFAW-Unifor will provide direction for avoidance of areas of heavy fixed gear use
Potential conflict / damage to fixed gear	TGS will continue to consult with One Ocean and the FFAW-Unifor Petroleum Industry Liaison, Ocean Choice International, and Association of Seafood Producers regarding the location and timing of fishing activity and will avoid areas during times of heavy fixed gear use	FFAW-Unifor will provide direction for avoidance of areas of heavy fixed gear use. Meetings held with OO, FFAW-Unifor, OCI, and ASP. Communications will be ongoing
Interference with fishing activities	TGS will time the sampling of the identified areas in a sequence that creates the least disruption to local fishers	FLO will provide direction to reduce / avoid disruption to local fishers
Disturbance to seabirds	The vessel will maintain a minimum distance of 2 km from active seabird colonies	Minimum 2-km distance will be maintained from active seabird colonies
Stranding / Injury / mortality to birds	As there is potential for marine and migratory birds to be attracted to the vessel at night, the vessel crew will conduct routine checks for stranded birds and release of stranded birds per the Best Practices for Stranded Birds Encountered Offshore Atlantic Canada (Environment Canada 2015)	Seabird observer to complete daily and weekly observation reports. The results and data from the seabird monitoring program will be included in the EA mitigation and monitoring report submitted to the C-NLOPB no later than six months after termination of the fieldwork
Stranding / Injury / mortality to birds	A Live Seabird Salvage permit will be acquired from the Canadian Wildlife Service prior to operations	Application to be made for the Research Vessel. Expected to receive permit prior to Operation start date

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Potential Effects of Related Activities	Commitment / Mitigation Measure	Status
Potential conflict with DFO research vessels	TGS will contact DFO prior to start of the Project to determine where DFO research vessels are conducting surveys and will revise the sampling location order to avoid conflict with DFO research vessels	Contact: George Sheppard, DFO, for DFO research vessel locations update
Potential conflict with DND vessels	TGS will contact DND prior to start of the Project to determine where naval exercises are being conducted and will revise the sampling location order if necessary to avoid interaction with naval vessels	Contact: MARLANT (Maritime Forces Atlantic) Headquarters Safety and Environmental Officer for Commander for confirmation of naval exercises locations
Potential damage to fishing gear	A compensation program will be made available by TGS consistent with C-NLOPB guidelines and past practices. This program will cover damage to fishing gear (or vessels) caused by the survey vessel or survey gear, and includes the value of harvest lost as a direct result of an incident. Incidents will be reported to the C-NLOPB	TGS will have a compensation program in place consistent with C-NLOPB guidelines and past practices
Potential damage to fishing gear	If in the unlikely event of a corer is lost, then a risk assessment of the impact would be undertaken with consultation with relevant parties, and appropriate action then undertaken for recovery if required	Risk assessment of retrieving / not retrieving a lost core would be conducted with relevant parties
Potential pollution of the marine environment	TGS will contract a vessel that has equipment and protocols and procedures in place for prevention of pollution by oil, sewage and associated waste materials in accordance with the <i>Canadian Shipping Act</i> and international standards and certification authorities	TGS will contract a Canadian-flagged geotechnical vessel which has which has the proper equipment and protocols and procedures in place
Potential damage to corals, sponges, rare or endangered species	TGS's primary focus area for the 2018 program overlaps The Labrador Slope, Orphan Spur, and the northeast corner of the Lily Canyon / Carson Canyon EBSA areas. A TGS Senior Geoscientist will be on board performing continual near-real-time analysis of the non-invasive MBES dataset as it is acquired. The data are high-resolution and coupled with back-scatter data, environmental habitats will be identified during acquisition of the data. A TGS Senior Geoscientist will select core locations based on geological merit, and strict emphasis is noted on avoidance of identified habitats	The three EBSAs, as well as areas identified in Figure 3-7, will be provided as Shapefiles on the live navigation screen during acquisition of the non-invasive MBES dataset. During MBES acquisition within the EBSAs and marine refuges, particular emphasis will be given to identifying core locations based on geological and geochemical merit, but in particular on avoidance of habitats identified in the MBES and backscatter datasets.

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2.5 Consultation

To date TGS has provided an overview of the Project and an invitation to meet to the following stakeholders:

- C-NLOPB
- DFO
- Environment and Climate Change Canada
- Nunatsiavut Government
- Fish, Food and Allied Workers-Unifor Union (FFAW-Unifor)
- Ocean Choice International (OCI)
- One Ocean
- Atlantic Seafood Producers

TGS has met with the following stakeholders:

- C-NLOPB
- DFO
- Environment and Climate Change Canada
- FFAW-Unifor
- OCI

One Ocean indicated that they could not attend either the FFAW-Unifor or OCI meetings; a copy of the presentation was provided to One Ocean. TGS has made numerous attempts to set up a meeting with the Nunatsiavut Government and Atlantic Seafood Producers. Copies of presentation materials were provided by email to representatives of both organizations with invitations to discuss the 2018 program at their convenience. Receipt of the presentations was received and representatives indicated they would reach out to TGS if they had questions. As of the time of submission no questions have been received.

Issues raised during the consultations include:

- Ability to avoid active fishing areas (TGS has no set sampling order for the four program areas; sampling would be weather- and fishing activity-dependent)
- Ability to interact with active fishing vessels (TGS will have an FLO on board)
- Ability to avoid sensitive areas of corals and sponges (MBES can detect aggregations of corals and sponges in areas larger than 15 m x 15 m (resolution of MBES); if the core contacts smaller aggregations TGS will not collect any additional cores at that location)

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Existing Environment

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3.0 EXISTING ENVIRONMENT

The existing environment provided in the following sections reflects new information since submission of the original EA report and/or information pertaining to the amended Study / Project / Assessment Area.

3.1 Fish and Fish Habitat

The Study / Project / Assessment Area is a highly productive ecosystem. Coral and sponges are an important component of the benthic habitat; they are structure-forming species that provide habitat for many other species. Coral, sponge, and sea pens are found throughout the Study / Project / Assessment Area (Figure 3-1). Fish and shellfish species common to the Study / Project / Assessment Area include both pelagic and demersal finfishes, as well as commercially important macroinvertebrates such as shrimp and crab. There are approximately 188 species of marine fish known to occur offshore Newfoundland and Labrador (Templeman 2010, in Amec 2014). Critical habitat as defined under the *Species at Risk Act* (SARA) has not yet been defined for the listed marine fish species known to occur in the Study / Project / Assessment Area.

3.2 Commercial Fisheries and Other Ocean Users

3.2.1 Commercial Fisheries

The Study / Project / Assessment Area encompasses Northwest Atlantic Fisheries Organization (NAFO) Unit Areas 2GHJ3KLMNO and small sections of 3Ps and 4Vs. Commercially important species in these NAFO Unit Areas include northern shrimp, snow crab, Greenland halibut, cod, Atlantic halibut, redfish, yellowtail flounder, skates, white hake, swordfish, monkfish, pollock, hagfish, and molluscs (e.g., whelks).

Harvest locations for all species in all months from 2012 to 2016 are illustrated in Figure 3-2. Fixed and mobile gear use is indicated in Figures 3-3 and 3-4, respectively. As per the original EA, figures for northern shrimp, snow crab, and Greenland halibut are provided in Appendix A.

Within the Study / Project / Assessment Area, northern shrimp are harvested throughout, with main harvesting activity occurring along the Labrador Shelf and Grand Banks, which encompass Shrimp Fishing Areas (SFA) 4, 5, and 6. Changes in northern shrimp species health and distribution over recent years, have also influenced availability of stocks for harvest and the total allowable catch (TAC) that is assigned for the species within the various SFAs. In the most recent assessment by DFO on northern shrimp in SFAs 4, 5, and 6, the fishable biomass in SFA 6 declined from 785,000 t in 2006 to 104,000 t in 2016. There was a 25 percent decrease in the fishable biomass between 2015 and 2016, decreasing from 138,000 t to 104,000 t (DFO 2017a). The female spawning stock biomass also declined from approximately 466,000 t in 2006 to 65,000 t in 2016, with a 27 percent decline between 2015 and 2016 (DFO 2017a). This puts the female stock spawning biomass within DFO’s “critical zone” (DFO2017a). As a result, the TAC for northern

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shrimp in SFA 6 was reduced from 48,196 t in the 2015/2016 fishing season, to 27,825 t for 2016/2017. This number was cut again to 10,400 t for the 2017/2018 season, and again to 8,730 t for 2018/2019 (DFO 2017b).

Within SFAs 4 and 5, the female spawning biomass has been listed in the “healthy zone” and the changes in stocks have not been as drastic as those in SFA 6. As a result, the TAC in SFA 4 has remained the same since the 2013 / 2014 fishing season (DFO 2017a). In DFO’s most recent fisheries management decision (2018), the TAC was increased by 754 t from 14,971 t to 15,725 t (DFO 2017b). The TAC in SFA 5 increased by 10 percent between the 2015 / 2016 and 2016 / 2017 fishing season by approximately 10 percent. Recently, the TAC for SFA 5 was reduced by approximately 14 percent to 22,000 t for the 2017 / 2018 season, to achieve a 20 percent exploitation rate of the stock. The most recent 2018 decision by DFO has increased the TAC for SFA 5 to 25,630 t (DFO 2017b).

Snow crab is another species that has gone under changes its distribution, and commercial landings. In the most recent assessment on snow crab in offshore Newfoundland and Labrador (NAFO Divisions 2HJ3KLMNOP4R), landings peaked in 2009 at 53,500 t, and then declined to 42,000 t in 2016. The total exploitable biomass of snow crab has been in decline since 2013, and is now at its lowest observed levels (DFO 2017c). Landings in NAFO Divisions 2HJ have remained low, at less than 2,000 t since 2011 (DFO 2017c), which can partially be explained by the natural range and distribution of snow crab; however, snow crab landings in NAFO Division 3K declined by 63 percent since 2009 to their lowest observed level in two decades to (5,600 t) (DFO 2017c). Due to these changes in biomass, and resulting implications on commercial landings, TAC and quotas for snow crab have changed as well. In 2016, the quota TAC for the Newfoundland and Labrador snow crab fishery in areas 2HJ, 3KLNO, 3Ps, and 4R3Pn was approximately 45,667 t. That quota number was reduced by approximately 22 percent in 2017 to 35,419 t, and again in 2018 to 28,975 (DFO 2017b). The opening and tentative closing dates for the 2018 fishing season are shown in Table 3.1.

Greenland halibut is another commercial species that is harvested within the Study / Project / Assessment Area, and is managed by NAFO for stocks in Subarea 2 and within Divisions 3LMNO. In 2010, NAFO adopted a Management Strategy Evaluation for the fishery, which uses a survey-based harvest control rule to set TACs and quotas for the species. This rule is based on multiple variables and science to determine the appropriate TAC, which is assessed on an annual basis. During NAFOs 39th annual meeting, NAFO members agreed on a TAC for Greenland Halibut in 2+3LMNO of approximately 16,500 t for 2018, representing an 11 percent increase (NAFO 2017). Of that amount, approximately 12,227 t (74 percent) was allocated to fisheries in 3KLMNO.

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Table 3.1 Fishing Window for Snow Crab, 2018 Season

NAFO Division	Crab Fishing Area	2018 Season Dates
2GHJ	2GH, 2J North	TBD
2J South	All fleets	TBD
3K	3A	April 14 - July 15
	3BC, 4	April 14 - June 30
	3D	April 16 - June 30
	3B	April 22 - June 30
	3C	April 30 - June 30
3KLNO	Most Areas	April 9 - July 31
	8Bx South	April 9 - July 15
3Ps	10A, 10B, 11S	April 9 – June 15
	11E, 11W	April 9 – May 31
4R3Pn	All fleets	April 9 – June 15
Source: DFO 2018		

3.2.2 Other Ocean Users

Annual research studies are conducted by DFO throughout NAFO divisions within Canada’s 200 nm Exclusive Economic Zone. In 2018, the *RV Needler* will be conducting its Fall Survey from mid-September to end November in 2J3KLNO, while the *RV Teleost* will be conducting its Fall Survey from late October to mid-December in 2HJ3K. The *RV Teleost* will be conducting the NL Summer Atlantic Zone Monitoring Program survey over three weeks in July.

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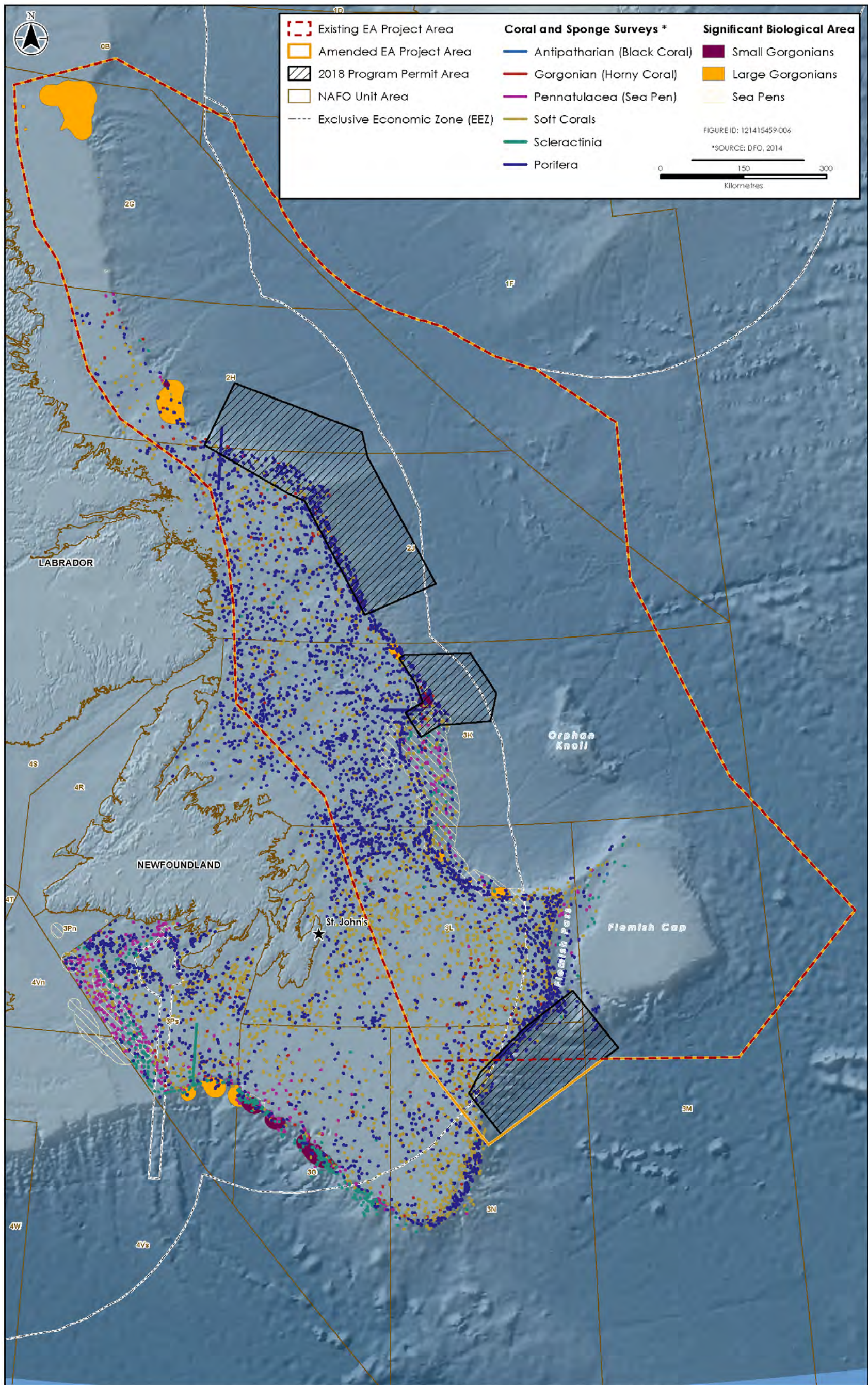


Figure 3-1 Coral, Sponge, and Sea Pens in the Study / Project / Assessment Area

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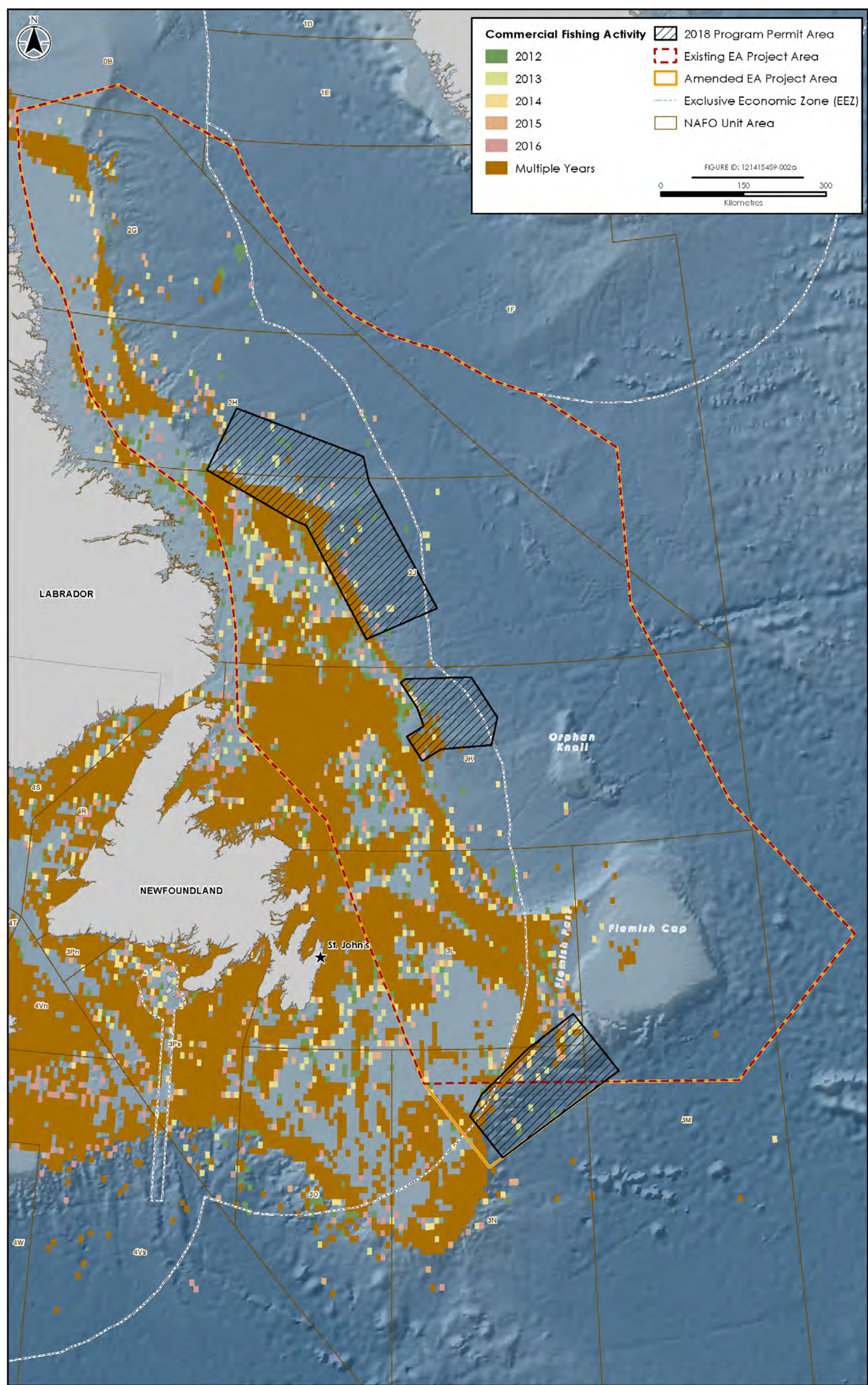


Figure 3-2 Commercial Fishing Activity, All Species, All Months, 2012 to 2016

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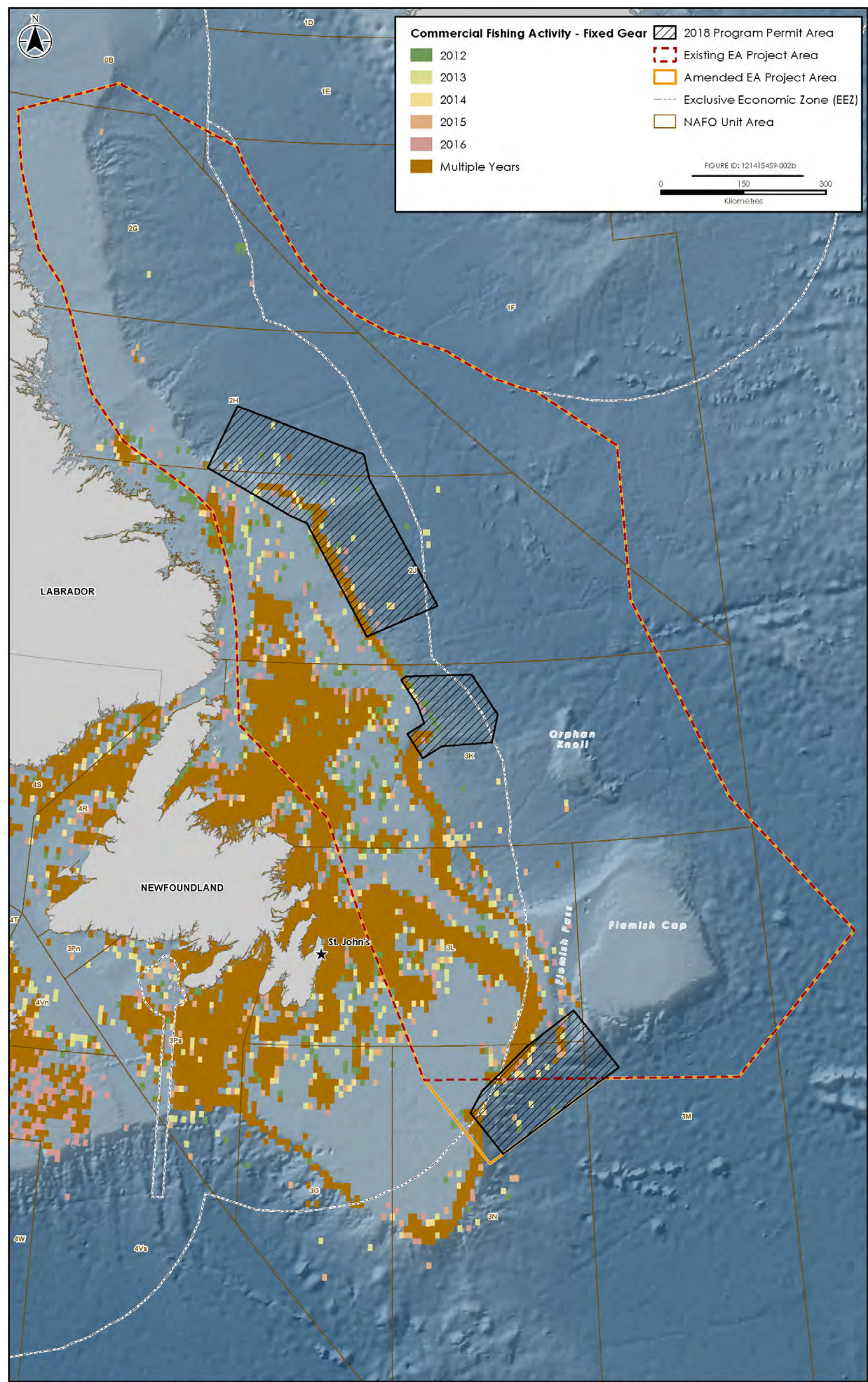


Figure 3-3 Fixed Gear Harvesting Locations, 2012 to 2016

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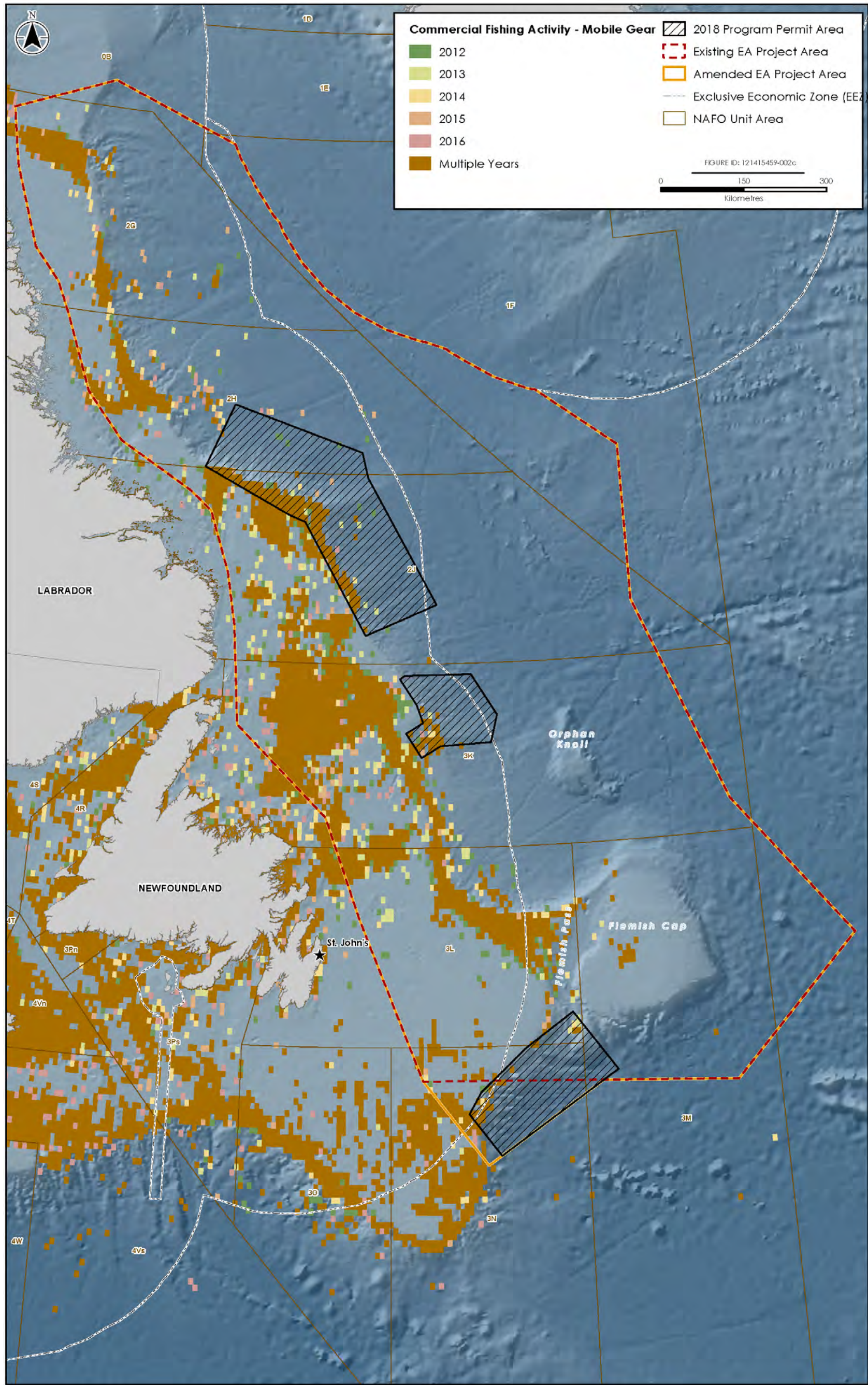


Figure 3-4 Mobile Gear Harvesting Locations, 2012 to 2016

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The DFO-Industry Collaborative Post-season snow crab survey is conducted annually and typically starts in September of each year. The stations illustrated in Figure 3-5 are based on 2017 locations and could change annually. The locations of the 2018 collections are anticipated in May 2018. An Industry-DFO halibut longline survey in 3NOPs4VWX began in 1998; an expanded stratified random survey was initiated in 2017 (Figure 3-5). It will include more stations in 3NOP (R. Lee Anderson, pers. comm.). The survey begins in late May and continues until the end of July. The Torngat Joint Fisheries Board-DFO Collaborative Post Season Trap Survey (see Figure 3-5) is typically conducted in early September and lasts five days.

The waters off Canada’s East Coast contain 1,100 known unexploded ordnance sites (Amec 2014); known shipwrecks and legacy sites in the Study / Project / Assessment Area are illustrated in Figure 3-6. The location of known submarine cables (both active and inactive) is illustrated in Figure 3-6.

3.3 Seabirds

A variety of seabirds, coastal waterfowl, and shorebirds birds either feed or migrate through the Study / Project / Assessment Area, including cormorants, gannets, phalaropes, gulls, terns, alcids, jaegers and skuas, fulmars and shearwaters, storm-petrels, loons, and grebes (Appendix B). Seabirds are typically concentrated at shelf edges and areas where currents mix which create productive environments (Husky Energy 2012). Waterfowl are typically categorized as dabbling ducks (primarily inland breeders) and diving ducks (or sea ducks that spend much of the non-breeding season at sea). Outside of the breeding season, seaducks are typically found in coastal water. Shorebirds typically nest in wetland or upland habitats with exceptions such as willet and piping plover (which raise their young in coastal environments) and phalaropes (which typically forage in offshore upwelling areas).

3.4 Marine Mammals and Sea Turtles

Marine mammals that can be found within the Study / Project / Assessment Area include mysticetes (toothless / baleen whales), odontocetes (toothed whales), and phocids (seals). Sea turtles include the leatherback, loggerhead, and Kemp’s ridley.

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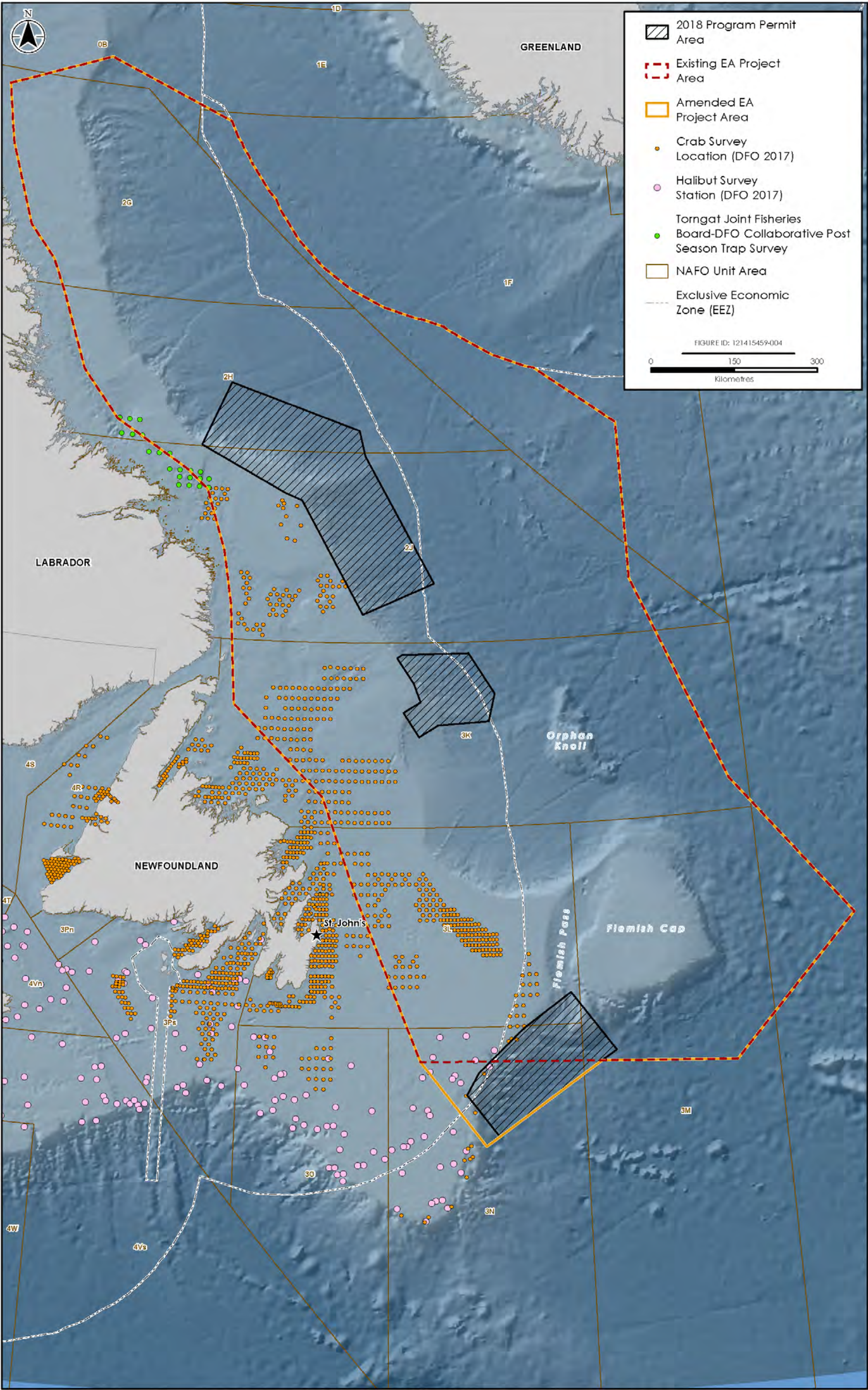


Figure 3-5 DFO Collaborative Post-season Surveys

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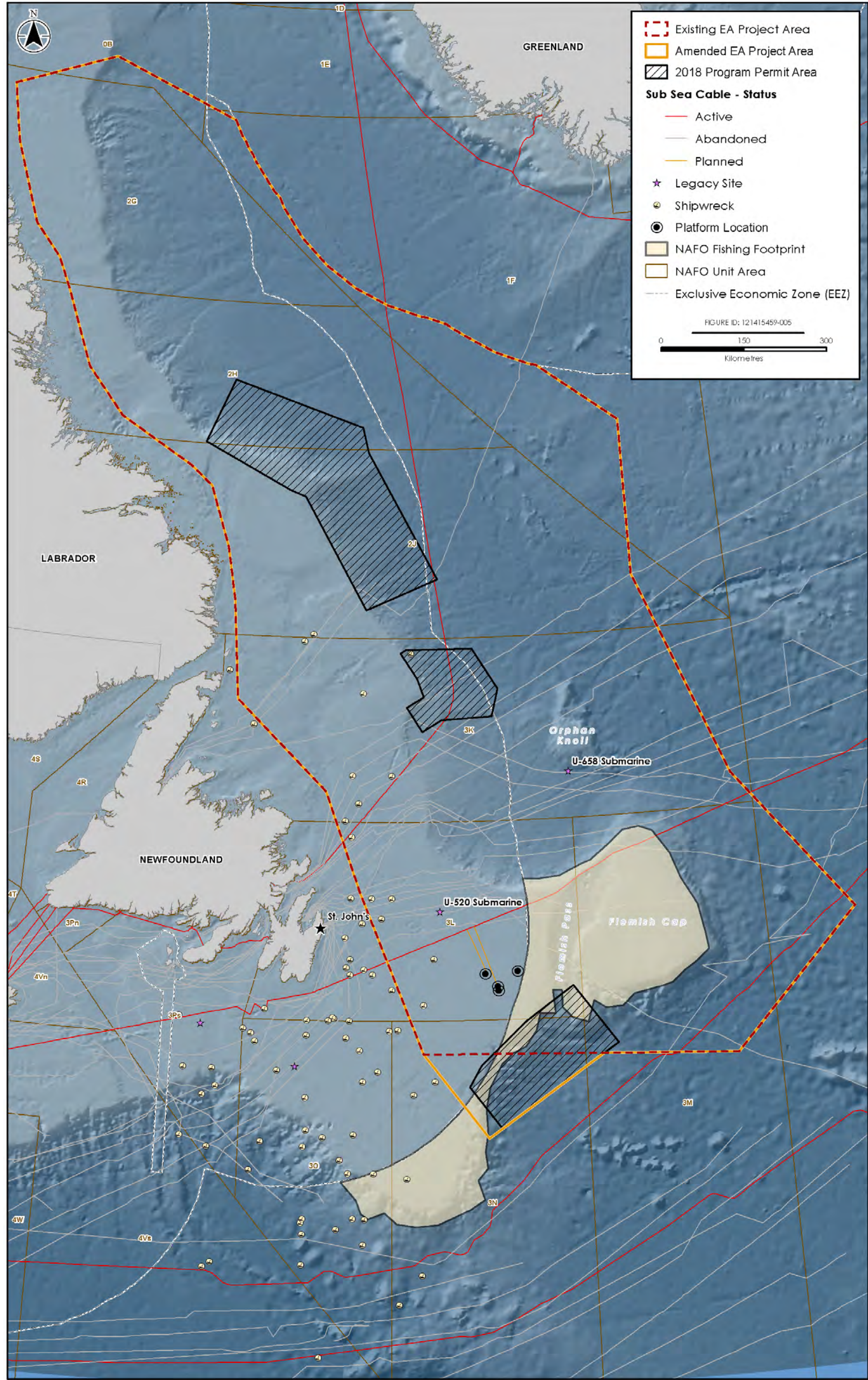


Figure 3-6 Submarine Cables, Shipwrecks, and Legacy Sites

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3.5 Species at Risk

The following SARA-listed species at risk have the potential to occur within the Study / Project / Assessment Area (Table 3.2):

- Atlantic wolffish occur in water depths of <100 to 400 m at temperatures ranging from -0.5°C to 6.5°C (Amec 2014); the Southeast Shoal and the Tail of the Banks EBSAs are home to a high concentration of this species.
- Northern wolffish are found on the Grand Banks and Flemish Cap in water depths of 150 to 1,000 m in spring and fall. They live in the open ocean and feed on benthic crustaceans and invertebrates (COSEWIC 2012a).
- Spotted wolffish are found off Newfoundland on substrate of coarse sand and a sand and shell mix with rocks in water depths of 50 to 800 m, at temperatures ranging from -1°C to 6°C (COSEWIC 2012b).
- White shark (Atlantic population) is at the northern edge of their range and while it is a rare visitor to the Northwest Atlantic, there have been sightings recorded on the northeast Newfoundland shelf. They highly mobile, migrate seasonally, and are found in water depths of 0 to 1,300 m (COSEWIC 2006b, in BP 2016).
- Blue whale (Atlantic population) has primarily seen in the St. Lawrence Estuary and shallow coastal zones during the spring, summer, and fall; they occur off southern Newfoundland in the winter and frequent the Davis Strait during the summer (Beauchamp et al. 2009; LGL 2014; Waring et al. 2016).
- Fin whale (Atlantic Population) regularly occur in northeastern and eastern Newfoundland waters from early summer to late fall, feeding on small schooling fish such as herring and capelin, squid, and crustaceans including mysids and krill (DFO 2017d).
- North Atlantic right whale is a rare visitor to southern Newfoundland (Sergeant 1966 in Husky Energy 2012; Gaskin 1991, in Husky Energy 2012); it is typically found from the coastal waters of the US to Newfoundland and the Gulf of St. Lawrence (DFO 2014).
- Northern bottlenose whale (Scotian Shelf population) occur primarily in The Gully and adjacent canyons of the eastern Scotian Shelf; other populations occur in Davis Strait, Baffin Bay, and Labrador Sea (Reeves et al. 1993, in Husky Energy 2012). The Scotian Shelf population is estimated at 163 individuals (Whitehead and Wimmer 2005, in Husky Energy 2012), with a home estimated to be a few hundred kilometres or less (Wimmer and Whitehead 2004, in Husky Energy 2012).
- Sowerby's beaked whale is only found only in the cold temperate waters of the North Atlantic (COSEWIC 2006a; DFO 2017e). As most information is based on stranding records or a few opportunistic sightings (Lien and Barry 1990, in Husky Energy 2012), numbers in Newfoundland are unknown and would likely occur in relatively low numbers.
- Leatherback sea turtle (DFO 2013) can be found in the Northwest Atlantic in both shelf and offshore slope waters; they also occur in the Gulf of St. Lawrence (COSEWIC 2012f, in BP 2016) from April to December (highest densities are July to September). They are commonly found off the south coast of Newfoundland, as well as the southern Gulf of St. Lawrence, in the shelf waters off Cape Breton Island, and in offshore Scotian Slope waters (LGL 2014).

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Table 3.2 SARA-listed Species at Risk with Potential to Occur within the Study / Project / Assessment Area

Common Name	Scientific Name	SARA Status ¹	Potential for Occurrence ²	Timing of Presence
Marine Fish				
Atlantic wolffish ^A	<i>Anarhichas lupus</i>	Special Concern (Schedule 1)	High	Year-round
Northern wolffish ^{B,C}	<i>Anarhichas denticulatus</i>	Threatened (Schedule 1)	High	Year-round
Spotted wolffish ^{B,C}	<i>Anarhichas minor</i>	Threatened (Schedule 1)	High	Year-round
White shark (Atlantic population) ^D	<i>Carcharodon Carcharias</i>	Endangered (Schedule 1)	Low	July to October
Marine Mammals				
Blue whale (Atlantic population) ^{B,C}	<i>Balaenoptera musculus</i>	Endangered	Low	Year- round (highest concentrations from June to September)
Fin whale (Atlantic Population) ^{B,E}	<i>Balaenoptera physalus</i>	Special Concern	High	Year- round (highest concentrations from June to October)
North Atlantic right whale ^{B,C}	<i>Eubalaena glacialis</i>	Endangered	Low	May to September
Northern bottlenose whale (Scotian Shelf population) ^{B,F}	<i>Hyperoodon ampullatus</i>	Endangered	High	Year-round
Sowerby's beaked whale ^{A,B}	<i>Mesoplodon bidens</i>	Special Concern	Low	Year-round
Sea Turtles				
Leatherback sea turtle ^{B,C}	<i>Dermochelys coriacea</i>	Endangered (Schedule 1)	Moderate	June to November

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Common Name	Scientific Name	SARA Status ¹	Potential for Occurrence ²	Timing of Presence
Birds				
Ivory Gull ^B	<i>Pagophila eburnea</i>	Endangered	Likely	April
Piping Plover (<i>melodus</i> subspecies)	<i>Charadrius melodus melodus</i>	Endangered	Unlikely	Unlikely
Red Knot <i>rufa</i> ssp.	<i>Calidris canutus rufa</i>	Endangered	Unlikely	Unlikely
Roseate Tern	<i>Sterna dougallii</i>	Endangered	Unlikely	Unlikely
Harlequin Duck	<i>Histrionicus histrionicus</i>	Special Concern	Unlikely	Unlikely
Barrows Goldeneye	<i>Bucephala islandica</i>	Special Concern	Unlikely	Unlikely
<p>Notes:</p> <ol style="list-style-type: none"> 1. The <i>Species at Risk Act</i> establishes Schedule 1 as the official list of wildlife species at risk. However, note that while Schedule 1 lists species that are extirpated, endangered, and threatened, the prohibitions do not apply to SOCC or those on Schedule 2 or 3 regardless of status. 2. This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and sightings data for each species within the Study / Project / Assessment Area. <p>A = Management Plan B = Recovery Strategy C = Action Plan anticipated in 2017 D = Recovery Strategy anticipated in 2017 E = Management Plan anticipated in 2017 F = Action Plan</p>				

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- Ivory Gull nest in the high-Arctic from May to early June; outside the breeding season they live near the edges of pack ice in the North Atlantic, particularly in the Labrador Sea and the Strait of Belle Isle areas of Newfoundland (COSEWIC 2006b). There have been sightings in eastern Newfoundland offshore waters. Piping plover (*melodus* subspecies) red knot *rufa* ssp., roseate tern, harlequin duck, and Barrows goldeneye are shore birds / coastal birds and are unlikely to be present within the Study / Project / Assessment Area.

The COSEWIC-assessed species that may be found within the Study / Project / Assessment Area (as of November 2017) are listed in Table 3.3. A potential new population of northern bottlenose whale was identified in the Sackville Spur area of the Flemish Pass; it has yet to be determined if it is part of the Davis Strait-Baffin Bay-Labrador Sea population or Gully population.

Table 3.3 COSEWIC-assessed Species of Conservation Concern with Potential to Occur within the Study / Project / Assessment Area

Common Name	Scientific Name	COSEWIC Designation
Marine Fish		
Acadian redfish (Atlantic population)	<i>Sebastes fasciatus</i>	Threatened
American eel	<i>Anguilla rostrata</i>	Threatened
American plaice (Newfoundland and Labrador population)	<i>Hippoglossoides platessoides</i>	Threatened
Atlantic bluefin tuna (Grand Banks of Newfoundland only)	<i>Thunnus thynnus</i>	Endangered
Atlantic cod (Newfoundland and Labrador population)	<i>Gadus morhua</i>	Endangered
Atlantic salmon (various populations)	<i>Salmo salar</i>	Endangered, Threatened, Special Concern
Basking shark (Atlantic population)	<i>Cetorhinus maximus</i>	Special Concern
Blue shark (Atlantic population)	<i>Prionace glauca</i>	Special Concern
Cusk	<i>Brosme brosme</i>	Endangered
Deepwater redfish (Northern population)	<i>Sebastes mentella</i>	Threatened
Porbeagle shark	<i>Lamna nasus</i>	Endangered
Roughhead grenadier	<i>Macrourus berglax</i>	Special Concern
Roundnose grenadier	<i>Coryphaenoides rupestris</i>	Endangered
Shortfin mako shark (Atlantic population)	<i>Isurus oxyrinchus</i>	Threatened
Smooth skate (Laurentian-Scotian population)	<i>Malacoraja senta</i>	Special Concern
Smooth skate (Funk Island Deep population) ^A	<i>Malacoraja senta</i>	Endangered
Spiny dogfish (Atlantic population)	<i>Squalus acanthias</i>	Special Concern

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Common Name	Scientific Name	COSEWIC Designation
Thorny skate	<i>Amblyraja radiata</i>	Special Concern
White hake (Atlantic and Northern Gulf of St. Lawrence population)	<i>Urophycis tenuis</i>	Threatened
Winter skate (Eastern Scotian Shelf – Newfoundland population)	<i>Leucoraja ocellata</i>	Endangered
Marine Mammals		
Beluga whale (various populations)	<i>Delphinapterus leucas</i>	Endangered, Threatened, Special Concern
Bowhead whale (Eastern Canada – west Greenland population)	<i>Balaena mysticetus</i>	Special Concern
Harbour porpoise (Northwest Atlantic population)	<i>Phocoena phocoena</i>	Special Concern
Killer whale (Northwest Atlantic / Eastern Arctic population)	<i>Orcinus orca</i>	Special Concern
Northern bottlenose whale (Davis Strait-Baffin Bay-Labrador Sea population)	<i>Hyperoodon ampullatus</i>	Special Concern
Sea Turtles		
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Endangered
Birds		
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Special Concern
<p>A = Note: Nose of the Grand Banks population has been assessed by COSEWIC as Data Deficient; there is also a Flemish Cap population that is outside Canadian jurisdiction, but within the 2017 to 2027 Study Area).</p> <p>B = Recovery Strategy</p> <p>C = Action Plan anticipated in 2017</p> <p>D = Management Plan anticipated in 2017</p>		

3.6 Sensitive Areas

The Study / Project / Assessment Area contains a number of sensitive and special areas, including Ecologically and Biologically Significant Areas (EBSAs), Vulnerable Marine Ecosystems (VMEs), NAFO identified coral and sponge closure areas, seamounts, Bonavista Cod Box, Marine Protected Areas and Areas of Interest, and preliminary Representative Marine Areas (Figure 3-7).

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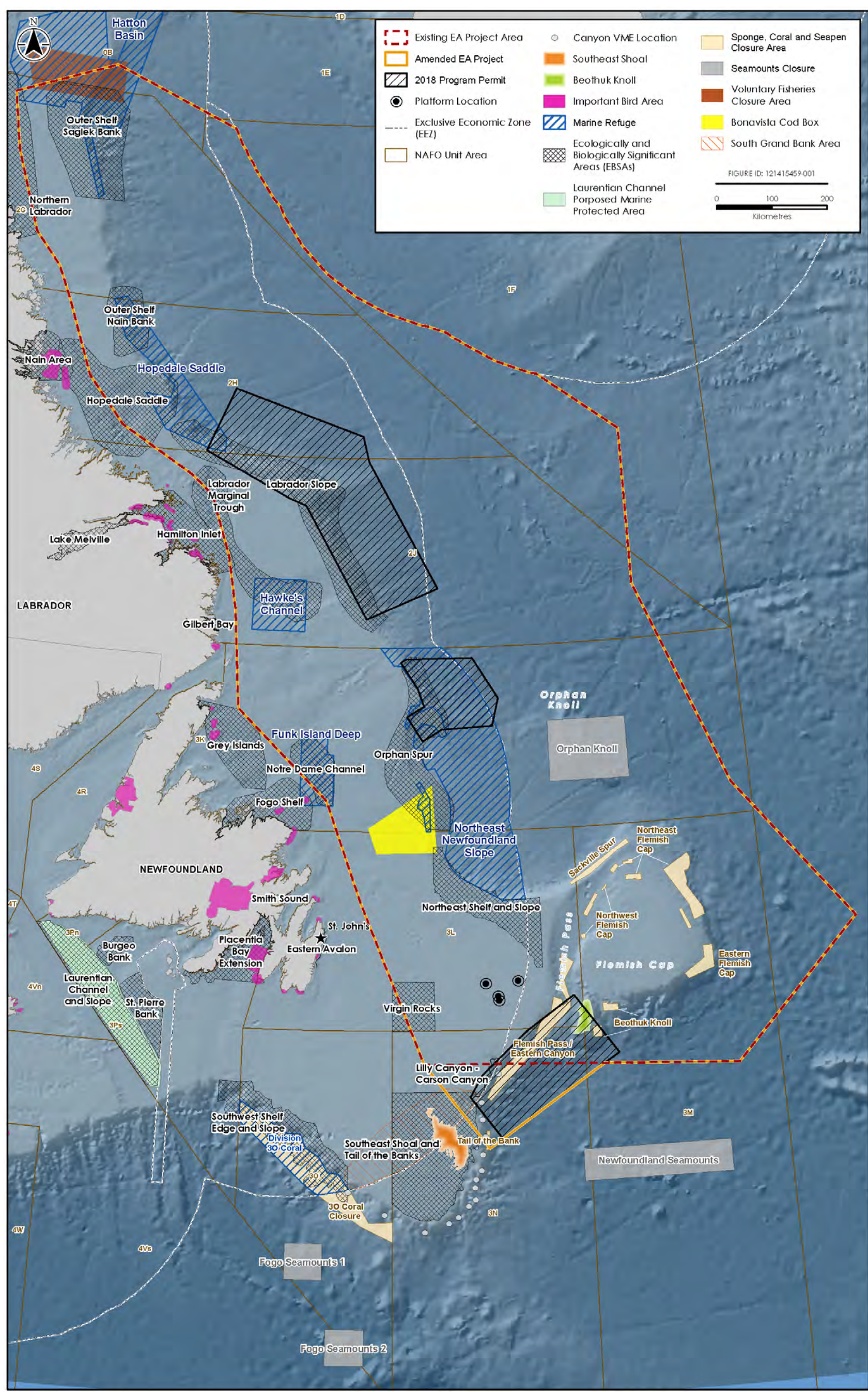


Figure 3-7 Sensitive Areas within the Study / Project / Assessment Area

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3.6.1 Ecologically and Biologically Significant Areas

DFO identified EBSAs according to pre-established criteria (DFO 2004a). DFO has identified 13 EBSAs in the area: Outer Shelf and Saglek Bank; Northern Labrador; Outer Shelf Nain Bank; Hopedale Saddle; Labrador Slope; Labrador Marginal Trough, Orphan Spur; Notre Dame Channel; Northeast Shelf and Slope; Virgin Rocks; Lily Canyon-Carson Canyon; Southeast Shoal and Tail of the Banks; and Southwest Shelf Edge and Slope.

- The Outer Shelf and Saglek Bank EBSA is an important area for corals, sponges and seapens, marine mammals, and seabirds and extends from the northern extent of the Study / Project / Assessment Area down along the outside edge of Saglek Bank (DFO 2013).
- The Northern Labrador EBSA extends from Cape Chidley to just south of Saglek Bay and includes part of the Saglek Bank. It is an important migratory area for the Eastern Hudson Bay beluga whale, and high concentrations of seabirds use the area (DFO 2013).
- The Outer Shelf Nain Bank EBSA is important to corals (including black and stony cup corals), marine mammals (e.g., hooded seal), seabirds (including Ivory Gull) and various fish species. This EBSA is in deeper water of the Labrador shelf and slope, adjacent to the Nain EBSA, which is outside the Study / Project / Assessment Area (DFO 2013).
- The Hopedale Saddle EBSA is an important overwintering area for the Eastern Hudson population of the beluga whale, and other species such as ivory gull, spotted and Atlantic wolffish, and corals (soft corals, small gorgonians, and sea pens). This EBSA is adjacent to the Nain Bank EBSA (outside the Study / Project / Assessment Area) and includes parts of the Labrador Marginal Trough and Makkovik Bank (DFO 2013).
- The Labrador Slope EBSA is an important area for soft and black corals and sponges and species at risk including northern and spotted wolffish. This EBSA extends from the Makkovik Bank south to the outer edge of the Belle Island Bank (DFO 2013).
- The Labrador Marginal Trough EBSA is an important area for seabirds, fish, and marine mammals (including a fall feeding area and harp seal whelping and feeding area). This EBSA encompasses most of the Labrador Marginal Trough from the Cartwright Saddle to the Hawke Saddle (DFO 2013).
- The Orphan Spur EBSA The Orphan Spur encompasses the Orphan Spur and part of the Trinity Trough Mouth, with water depths extending from 400 to 2,000 m. This EBSA has high concentrations of corals, fish, marine mammals. and seabirds, including rare or endangered species (DFO 2013).
- The Notre Dame Channel EBSA is important for many species, including cetacean migration and feeding. High densities of commercial important fish species (as well as species at risk) occur in this EBSA, as do a number of seabirds and harp seal. This EBSA extends from Notre Dame Bay to the inner edge of Funk Island Bank and out to the Labrador Slope (DFO 2013).
- The Northeast Shelf and Slope EBSA contains two important coral areas at Tobin’s Point (recently declared part of the Northeast Newfoundland Slope Closure (see Section 3.6.6)) and Funk Island Spur, supports spotted wolffish and Greenland halibut populations, and is a known feeding area for marine mammals, particularly harp seals, hooded seals, and pilot whales (CPAWS 2009).

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- The Virgin Rocks EBSA supports marine birds (an estimated 1,000 to 2,000 common eiders commonly overwinter near the Virgin Rocks (CPAWS 2009)) and several fish species (Ollerhead et al. 2004). The site has dense kelp beds in the rocky shallow subtidal and shows high plankton productivity (CPAWS 2009).
- Lily Canyon-Carson Canyon EBSA is strongly influenced by the Labrador Current and can be highly productive. The EBSA has an abundance of Iceland scallop and is a feeding and overwintering of marine mammals (Ollerhead et al. 2004; CPAWS 2009).
- The Southeast Shoal and Tail of the Banks EBSA has the warmest bottom water temperatures on the Grand Banks and a well-defined gyre; this results in a high level of primary production (CPAWS 2009). The EBSA also supports reproducing populations of capelin and groundfish (Walsh et al. 2001; Fuller and Myers 2004).
- The Southwest Shelf Edge and Slope EBSA is an area of upwelling and has high coral species richness, groundfish biomass, and seabird diversity (Kulka and Miri 2003; Ollerhead et al. 2004; Edinger et al. 2007). Leatherback sea turtles and cetaceans are known to congregate in this EBSA to feed (CPAWS 2009).

3.6.2 Vulnerable Marine Ecosystems

NAFO has identified the following VMEs with the goal of managing deep-sea fisheries and the potential environmental effects that such fishing could have:

- Seamounts and Knolls – include the Fogo Seamounts 1 and 2, Newfoundland Seamounts, and Beothuk Knoll. These areas support habitat-structure forming communities such as coral and sponges, which in turn attract aggregations of deep-sea fishes and their predators.
- Canyons - 13 deep-water canyons have been identified by NAFO (Denys Canyon, Cameron Canyon, Jackman Canyon, Guy Canyon, Hoyles Canyon, Kettle Canyon, Clifford Smith Canyon, Lilly Canyon, Carson Canyon, and Unnamed Canyons 1, 2, 3, and 4) that support a rich, diverse community (Gordon and Fenton 2002), including corals and sponges, deep-water fishes, and marine mammals (Whitehead et al. 1997; Strain and Yeats 2005; Edinger et al. 2010).

3.6.3 NAFO Coral, Sponge, and Sea Pen Closure Areas

Corals are structure-building organisms, creating areas for nurseries, feeding, breeding, and spawning for numerous species. DFO has developed the Coral and Sponge Conservation Strategy for Eastern Canada, which identifies DFO and NAFO closures zones in important coral and sponge area (DFO 2015a). The coral closures designated by NAFO include the Coral Protection Zone in Division 3O (closed by NAFO in 2007 to bottom-contact fishing gear) and an additional 12 important coral and sponge zones around the Flemish Cap (DFO 2015a; NAFO 2016).

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3.6.4 Bonavista Cod Box

The Bonavista Cod Box was identified as being important as an Atlantic cod spawning area (AMEC 2014), and was designated as an experimental protected area in 2003.

3.6.5 Marine Protected Areas

The approximately Gilbert Bay Marine Protected Area in Labrador was established in 2005 to protect and conserve a genetically distinct sub-population of Atlantic cod (Husky 2010). It is divided into three management zones that have different levels of restrictions depending on the importance to the cod subpopulation. This area is outside the Study / Project / Assessment Area.

The Eastport Marine Protected Area on the Bonavista Peninsula, insular Newfoundland, was established in October 2005 and there is an Area of Interest at Leading Tickles, also on the Island of Newfoundland. Both of these areas are outside the Study / Project / Assessment Area.

A large portion of the southern Grand Bank has been identified by Parks Canada as a Preliminary Representative Marine Area due to its ecological importance in offshore Newfoundland and Labrador; it is known as a feeding area for whales, a breeding area of capelin, and has several species of corals present (Fuller and Myers 2004).

3.6.6 Important Bird Areas

Important Bird Areas (IBAs) are discrete areas that support nationally or globally important groups of birds. Although IBAs are not legally protected, they are often found within areas that have been designated as protected areas by federal or provincial authorities. None of IBA sites are within the Study / Project / Assessment Area (Figure 3-7).

Gannett Islands Ecological Reserve is comprised of seven islands and their surrounding marine waters, just south of the southern boundary of the Zone. This Ecological Reserve is home to the largest razorbill colony in North America and is the largest seabird colony in Labrador (Husky Energy 2010).

3.6.7 Marine Refuges

Five new marine refuges (closed to various fishing activities) in the Study / Project / Assessment Area were announced by the federal government in December 2017 (DFO 2017f):

- Northeast Newfoundland Slope has dense aggregations of corals and sponges and supports high diversity (e.g., roundnose grenadier). This area also overlaps with 32 percent of the Orphan Spur EBSA. This area is closed to bottom contact fishing activities (DFO 2017g).
- Funk Island Deep has benthic habitat important to Atlantic cod, smooth skate Funk Island Deep population (assessed as Endangered by COSEWIC), and substantial concentrations of groundfish and other fish species and is an important feeding area for marine mammals. This

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area also overlaps portions of the Notre Dame Channel and Fogo Shelf EBSAs. This area is closed to bottom trawl, gillnet, and longline fishing activities (DFO 2017h).

- Hawke’s Channel has benthic habitat important to Atlantic cod and Atlantic wolffish and supports a high diversity of groundfish populations (e.g., Greenland halibut). This area also overlaps the Labrador Margin Trough EBSA. This area is closed to bottom trawl, gillnet, and longline fishing activities (DFO 2017i).
- Hopedale Saddle has dense aggregations of corals and sponges, is an area of high diversity, and supports an important overwintering area for the Eastern Hudson Bay Beluga. This area also overlaps three EBSAs: Outer Shelf Nain Bank (46 percent), Labrador Slope, and Hopedale Saddle. This area is closed to bottom-contact fishing activities (DFO 2017j).
- Hatton Basin has large aggregations of small and large gorgonian corals, sponge species, black corals, stony corals, and hydrocorals. It is also the only known overwintering area for northern Hudson Bay narwhal. This area overlaps with approximately 21 percent of the Outer Shelf Saglek Bank EBSA. This area is closed to all bottom fishing activities (DFO 2017k).

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4.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The Project interacts with the following Valued Environmental Components (VECs):

- Fish and Fish Habitat
- Commercial Fisheries
- Seabirds
- Marine Mammals and Sea Turtles
- Species at Risk
- Sensitive Areas

4.1 Focus and Findings of the Original Environmental Assessment

The original EA Report for the Project provided an analysis and evaluation of the potential environmental effects of the planned coring program. The original EA Report considered the then proposed Project components and activities in assessing and evaluating its potential environmental effects on each of the VECs.

The original EA Report for the Project therefore concluded that given that the Project consisted of deploying and retrieving fishing lines to collect oil samples on the water surface, use of MBES and SBP to refine sampling locations, lowering and raising a sample corer (with thermal probes) to collect sediment cores, collecting rocks from outcrops and lowering and raising a CTD meter to collect metocean data from a research vessel, interaction with the environment was limited and environmental effects were assessed to be negligible. The adverse residual environmental effects of this Project were assessed as not significant. Given the limited interaction with the environment, biological and follow-up monitoring was not required for the Project.

4.2 Assessment of the Proposed Project Modifications

The following provides an identification and analysis of implications of the proposed Project modifications for the original EA Report’s predicted environmental effects; the mitigation measures proposed by TGS are provided in Section 2.4, Table 2.2.

4.2.1 Spatial Scope Extension

As described in Section 2.3.2, TGS is seeking to extend the spatial scope (Figure 2-1) of the Project and its associated EA approval to incorporate the Carson / Salar Canyons area. The expanded area encompasses the entire Lily Canyon – Carson Canyon, which is an area that supports feeding and overwintering of marine mammals. This area has been described in Section 3, including updated commercial fisheries, marine birds, and sensitive areas information. Activities will be carried out as described and assessed in the original EA, with the exception of the various proposed modifications addressed in Sections 4.2.3 and 4.2.4.

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The relevant mitigation measures identified and committed to by TGS in the original EA (and as described in Table 2.1) will continue to be implemented in relation to the spatial scope of this Project. The potential environmental effects will be the same as those assessed in the original EA report.

4.2.2 Multibeam Echosounder Survey Modification

The MBES is part of the research vessel's infrastructure and operates at 30 kHz. The MBES will be restricted to the 2018 Program Areas (to provide detailed bathymetry to verify core location selection). MBES frequencies do not overlap with those used predominantly by baleen whales and pinnipeds and while some MBES pulses may be audible to toothed whales, they are unlikely to mask communication signals due to the fact that they are short and have narrow beam widths (Husky Energy 2010). In addition, coral colonies larger than 15m x 15 m could be identified by the MBES and thereby avoided.

The relevant mitigation measures identified and committed to by TGS in the original EA (and as described in Table 2.1) will continue to be implemented in relation to MBES activities carried out under this Project. The potential environmental effects will be the same as those assessed in the original EA report.

4.2.3 Number of Collected Core Samples Modification

While the total number of cores will be increased, the MBES will allow the survey team to focus locations in substrate that will likely permit good penetration of the seabed, limiting the number of times a core needs to be taken. The relevant mitigation measures identified and committed to by TGS in the original EA (and as described in Table 2.1) will continue to be implemented in relation to core collection activities carried out under this Project. The potential environmental effects will be the same as those assessed in the original EA report.

4.2.4 Coring Equipment Modification

Samples will be collected with a longer piston corer. This will facilitate core penetration and allow a larger core to be corrected. The collection locations will avoid areas of commercial fishing activity as identified through consultation with the FFAW's Petroleum Industry Liaison. Core samples will not be collected within The Zone, nor will the vessel enter The Zone to turn. Core collection will avoid coral closure areas and other identified sensitive areas.

The relevant mitigation measures identified and committed to by TGS in the original EA (and as described in Table 2.1) will continue to be implemented in relation to coring activities carried out under this Project. Potential environmental effects of the collection of core samples will be the same as assessed in the original EA report.

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5.0 CONCLUSION

TGS has proposed, developed, and implemented a marine seafloor and seeps sampling program that includes completed and planned data collection (via cores) in the Labrador Shelf / Sea, and Jeanne d’Arc and Flemish Pass Basins from 2014 through 2019. This Project required authorizations from the C-NLOPB. EA approval for the Project was received in August 2014.

This EA Amendment provides an overview and analysis of proposed modifications to the Project as compared to that which was described and assessed in the original EA Report. These include a change in the spatial scope (amending the existing Study / Project / Assessment Area to include the Carson / Salar Canyon area), a change in the MBES collection method, and a change in the coring mechanism (from a 3-m long gravity corer to a longer piston corer).

As noted in the original EA Report, each of the potential environmental issues and effects that could be associated with the proposed Project can be avoided or otherwise mitigated through the use of good planning and Project-specific and industry standard mitigation that have been identified, committed to, and implemented by TGS as part of the Project and its EA. Overall, the proposed Project will entail localized, short-term, and transient disturbance in the marine environment at any one location and time throughout the temporal scope of the Project. The proposed Project modifications described and assessed herein do not result in changes in the original environmental effects predictions, required mitigation, or effects significance evaluations for any component of the environment. The proposed changes to the Project are therefore not likely to result in significant adverse environmental effects.

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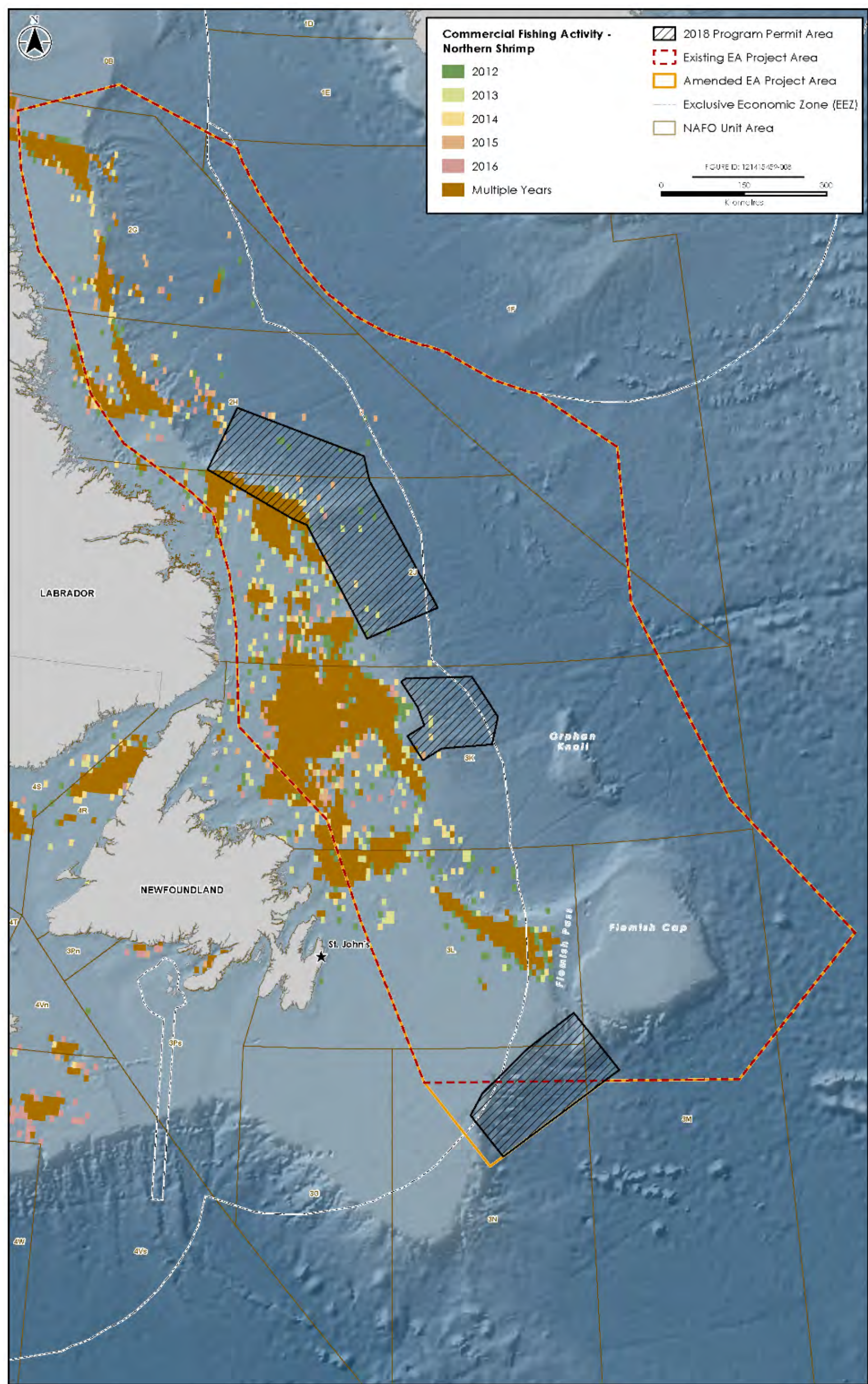
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APPENDIX A

Commercial Fishing Activity: Snow Crab, Northern Shrimp,
and Greenland Halibut, All Seasons, 2012 to 2016



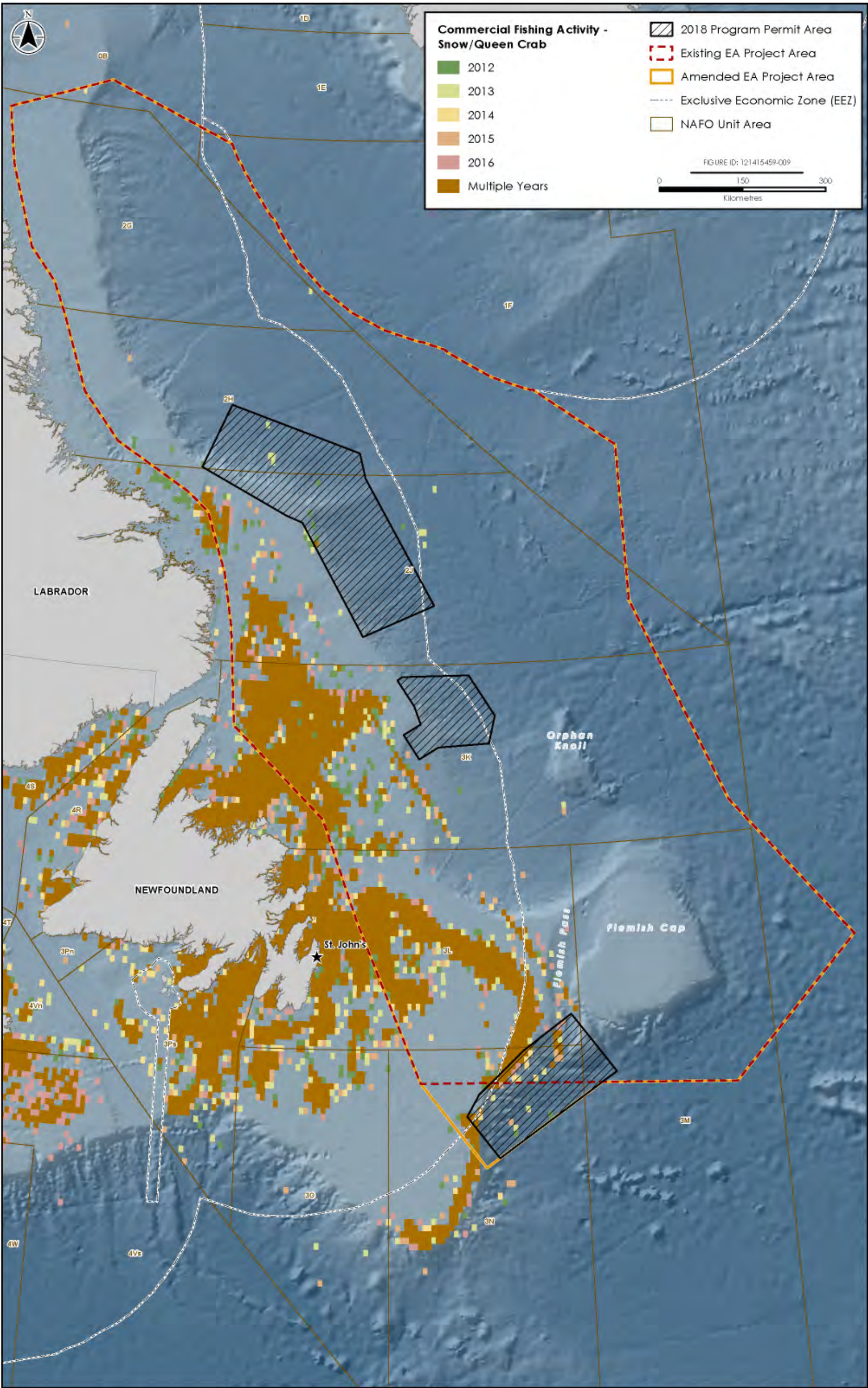


Figure A.2 Commercial Harvesting Locations, Snow Crab, 2012 to 2016

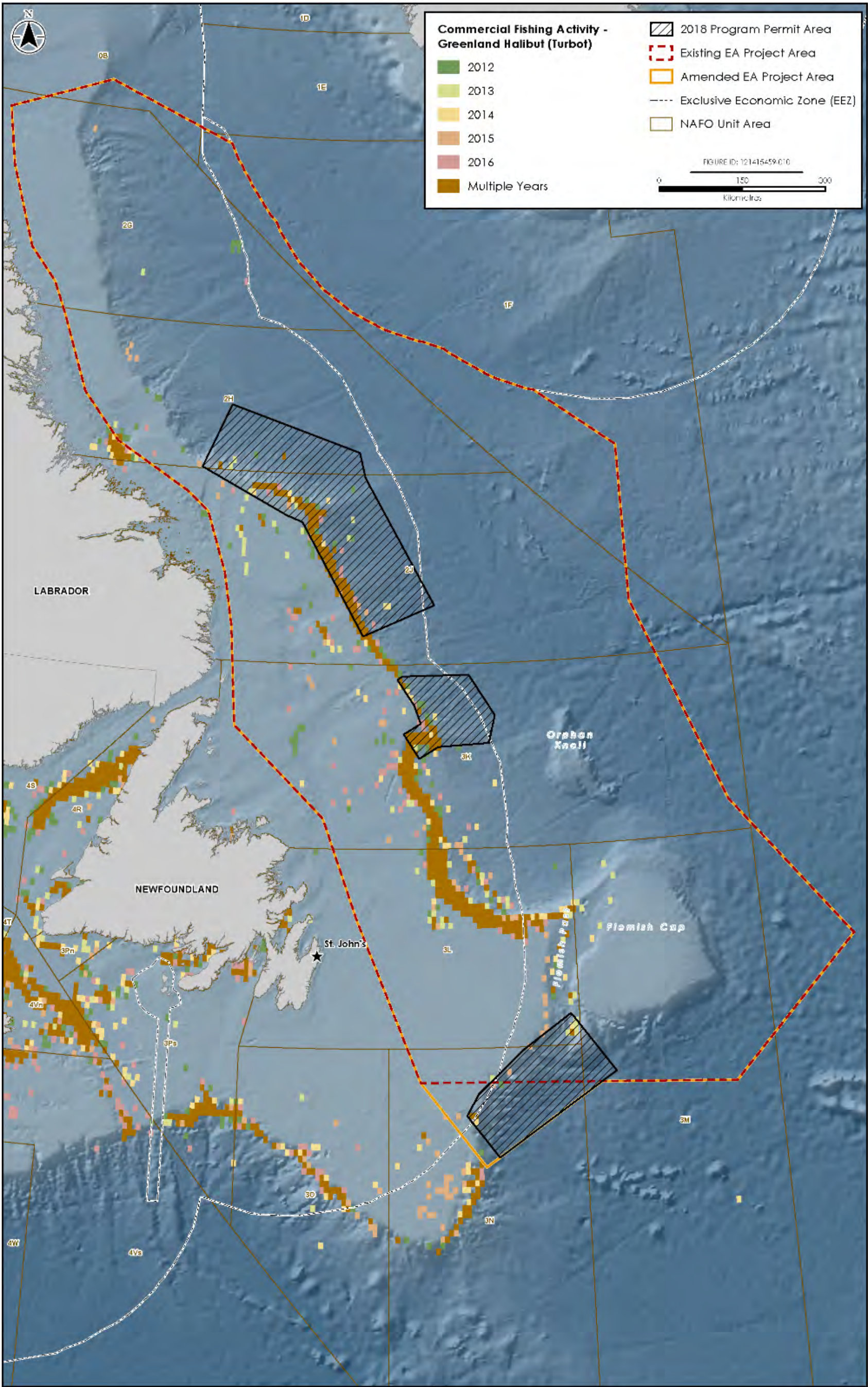


Figure A.3 Commercial Harvesting Location, Greenland Halibut, 2012 to 2016

APPENDIX B

Marine Birds Distribution Mapping

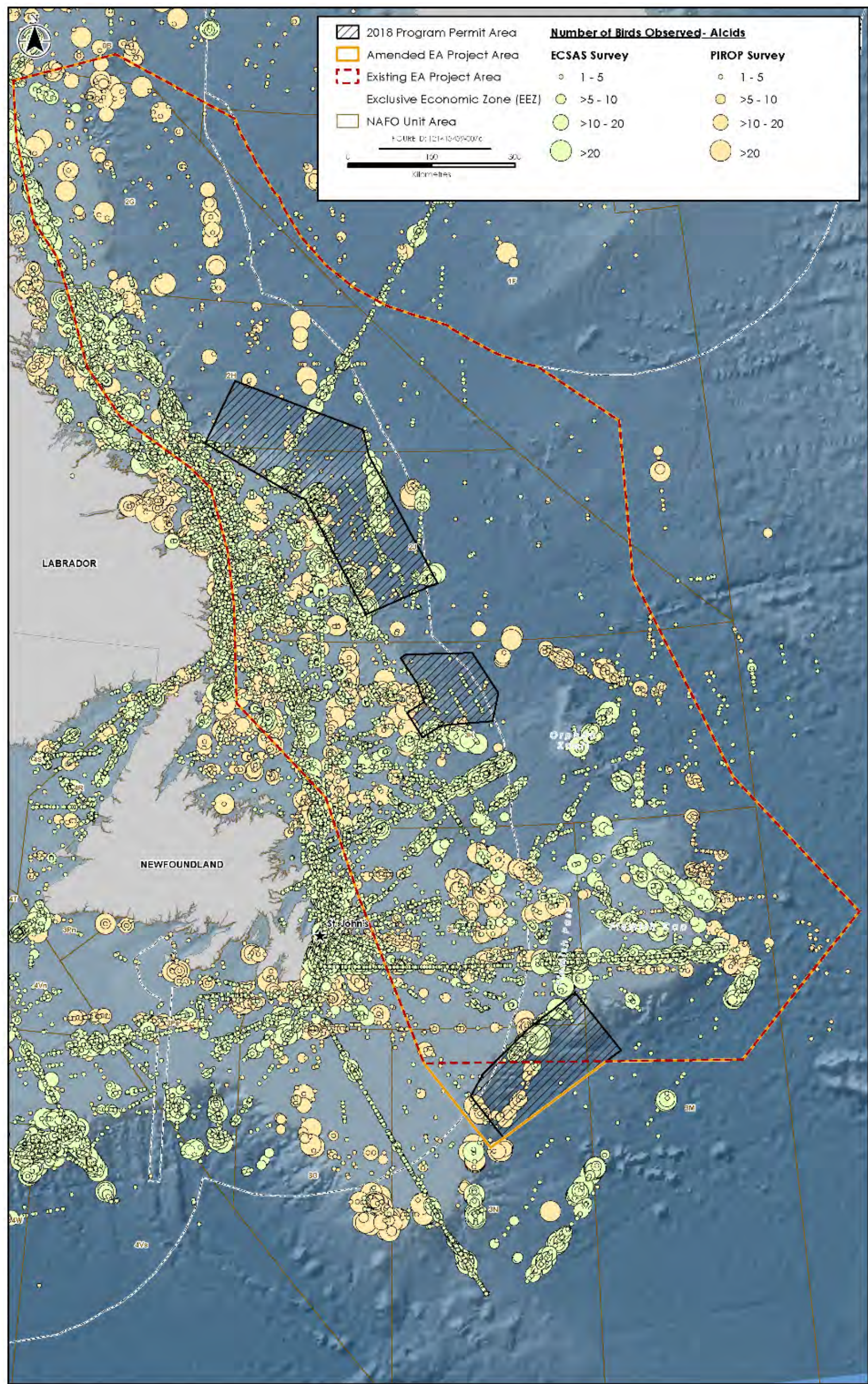


Figure B.1 Seabird Observations, Alcids

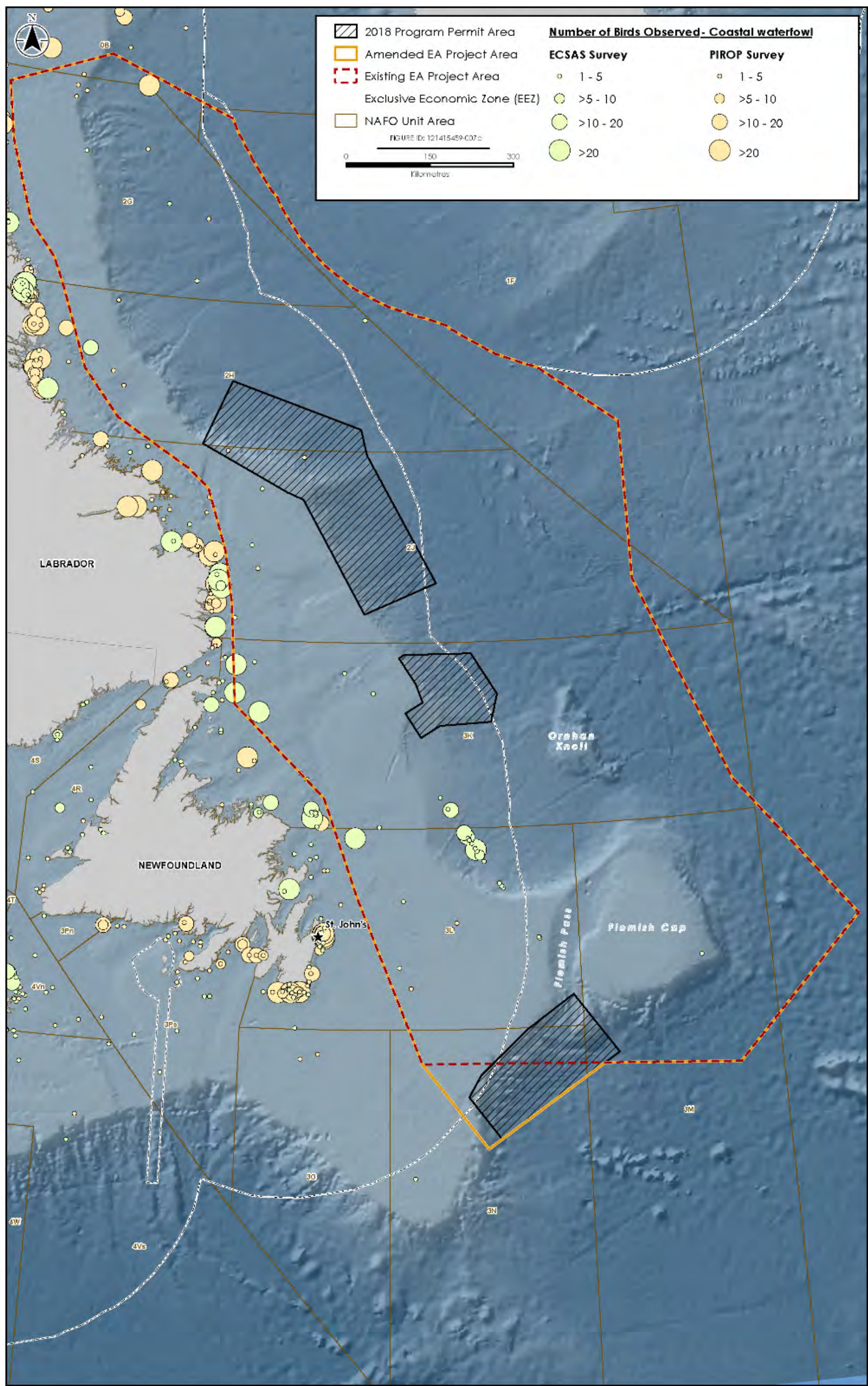


Figure B.2 Seabird Observations, Coastal Waterfowl

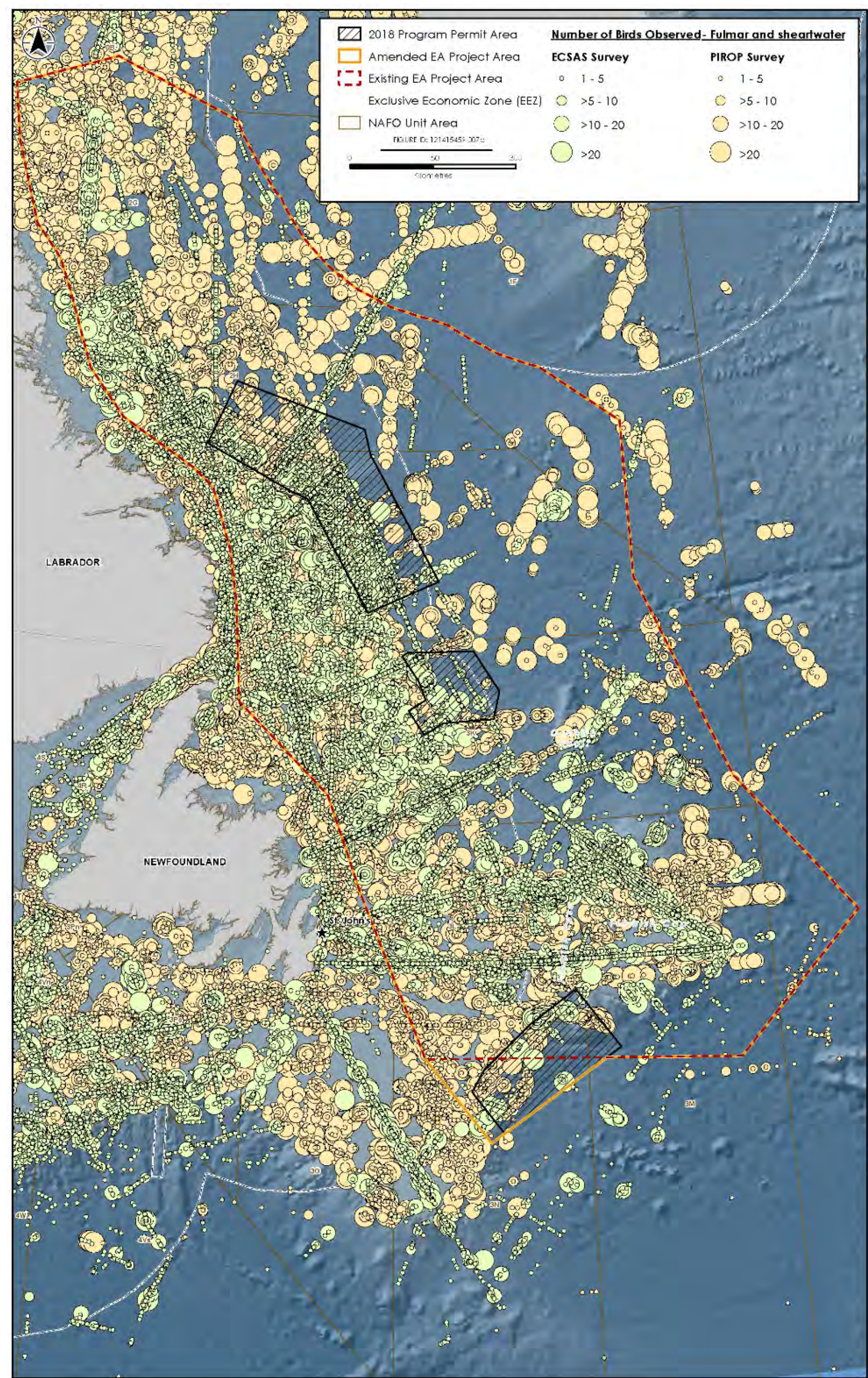


Figure B.3 Seabird Observations, Fulmars and Shearwaters

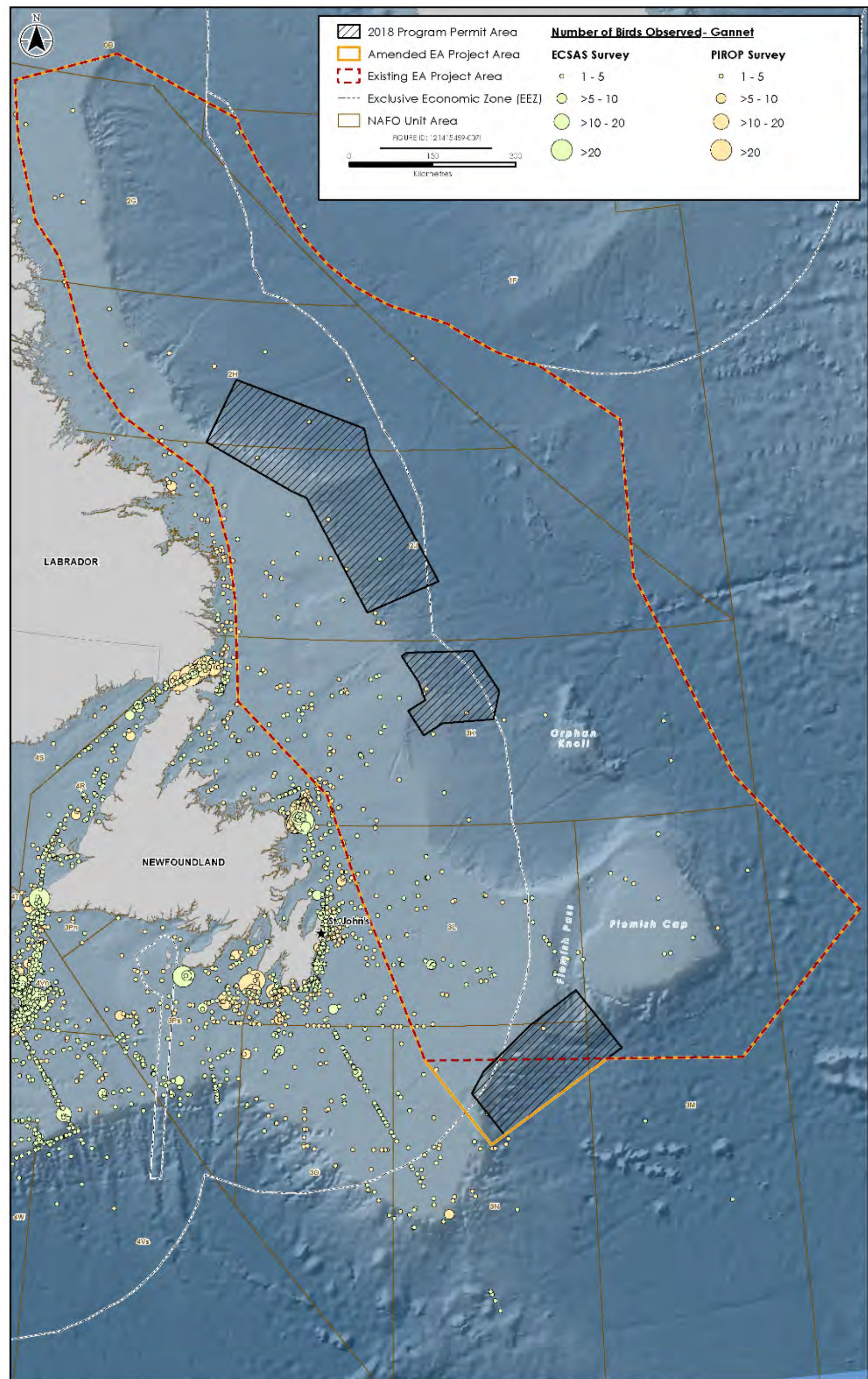


Figure B.4 Seabird Observations, Gannet

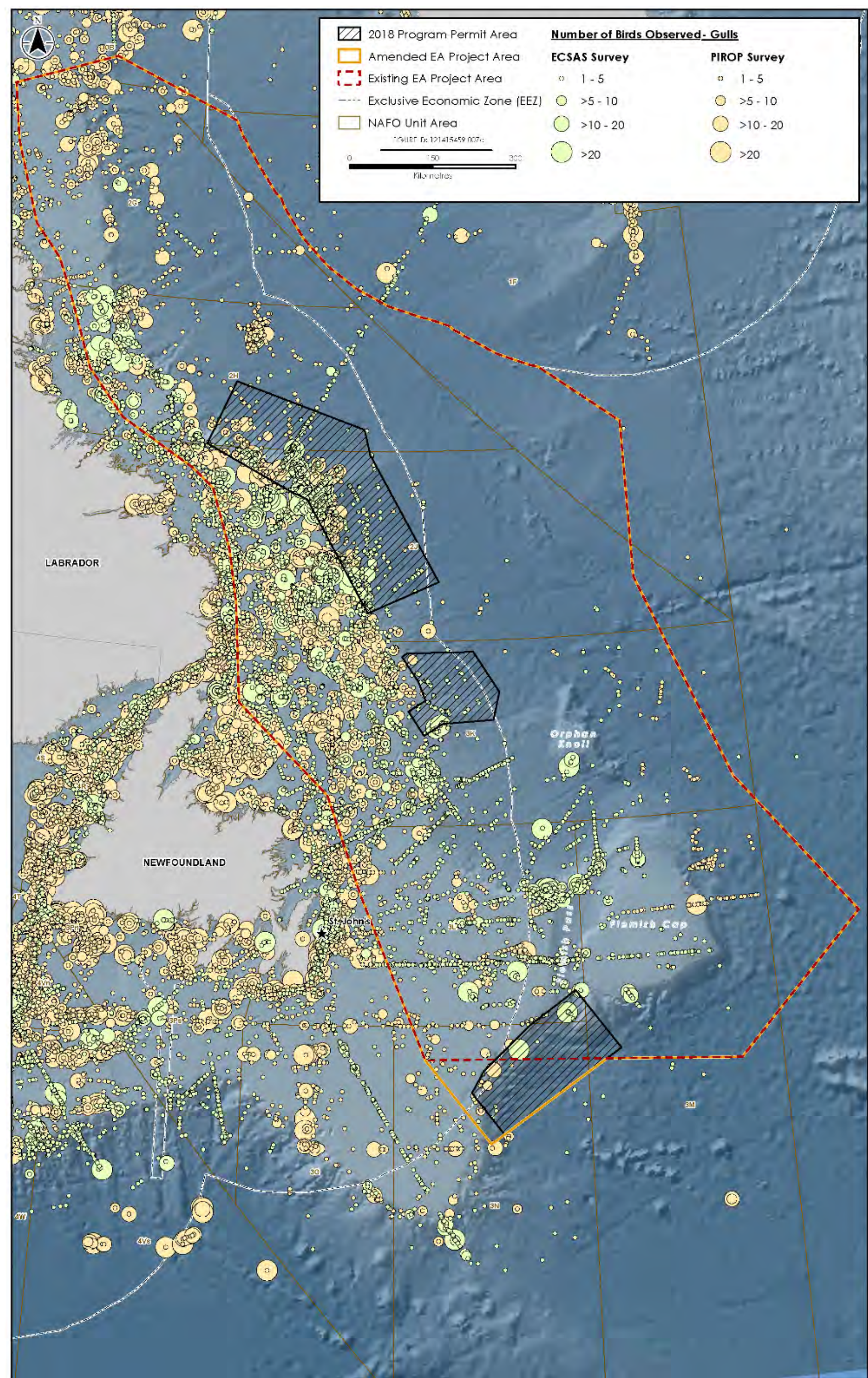


Figure B.5 Seabird Observations, Gulls

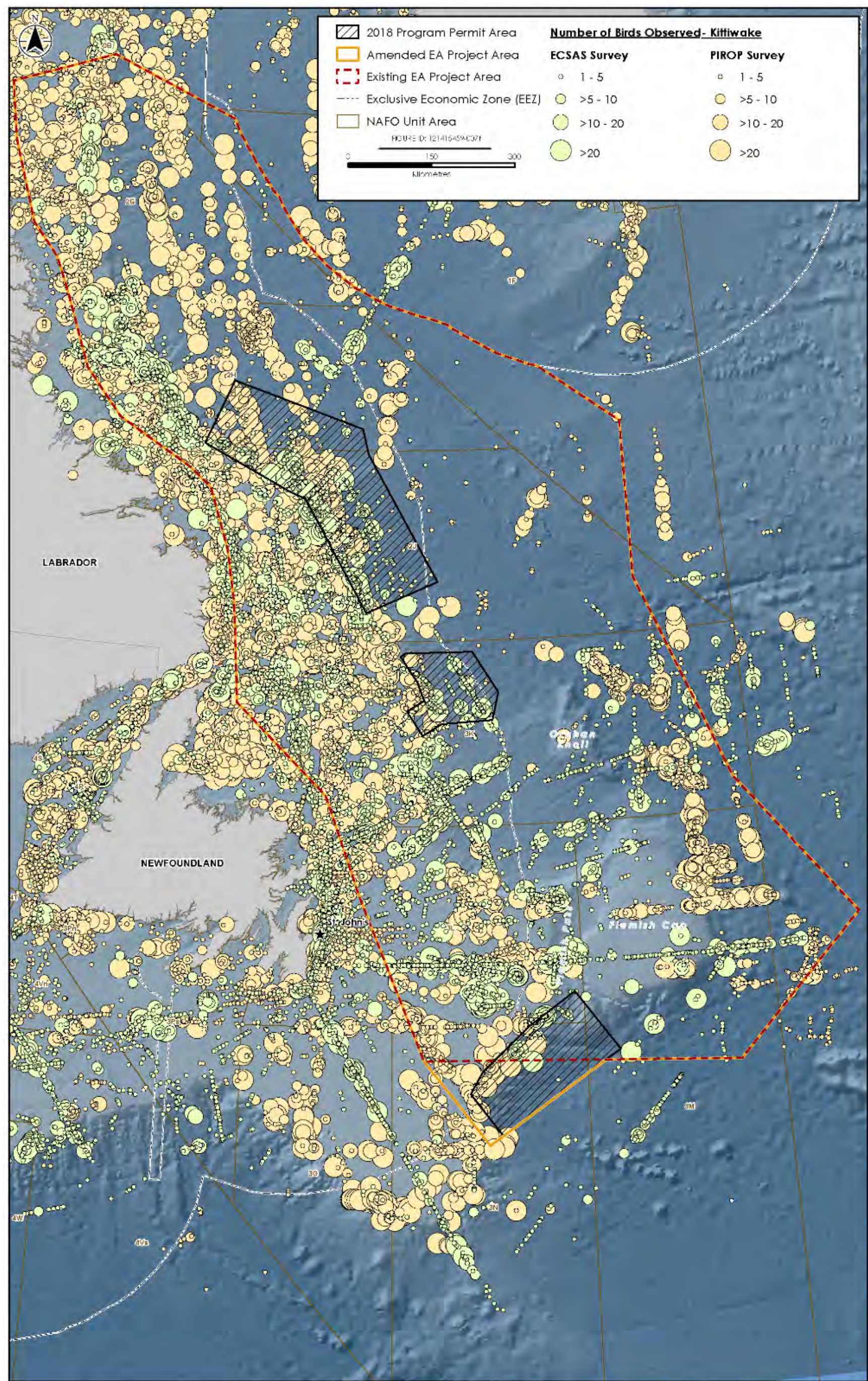


Figure B.6 Seabird Observations, Kittiwake

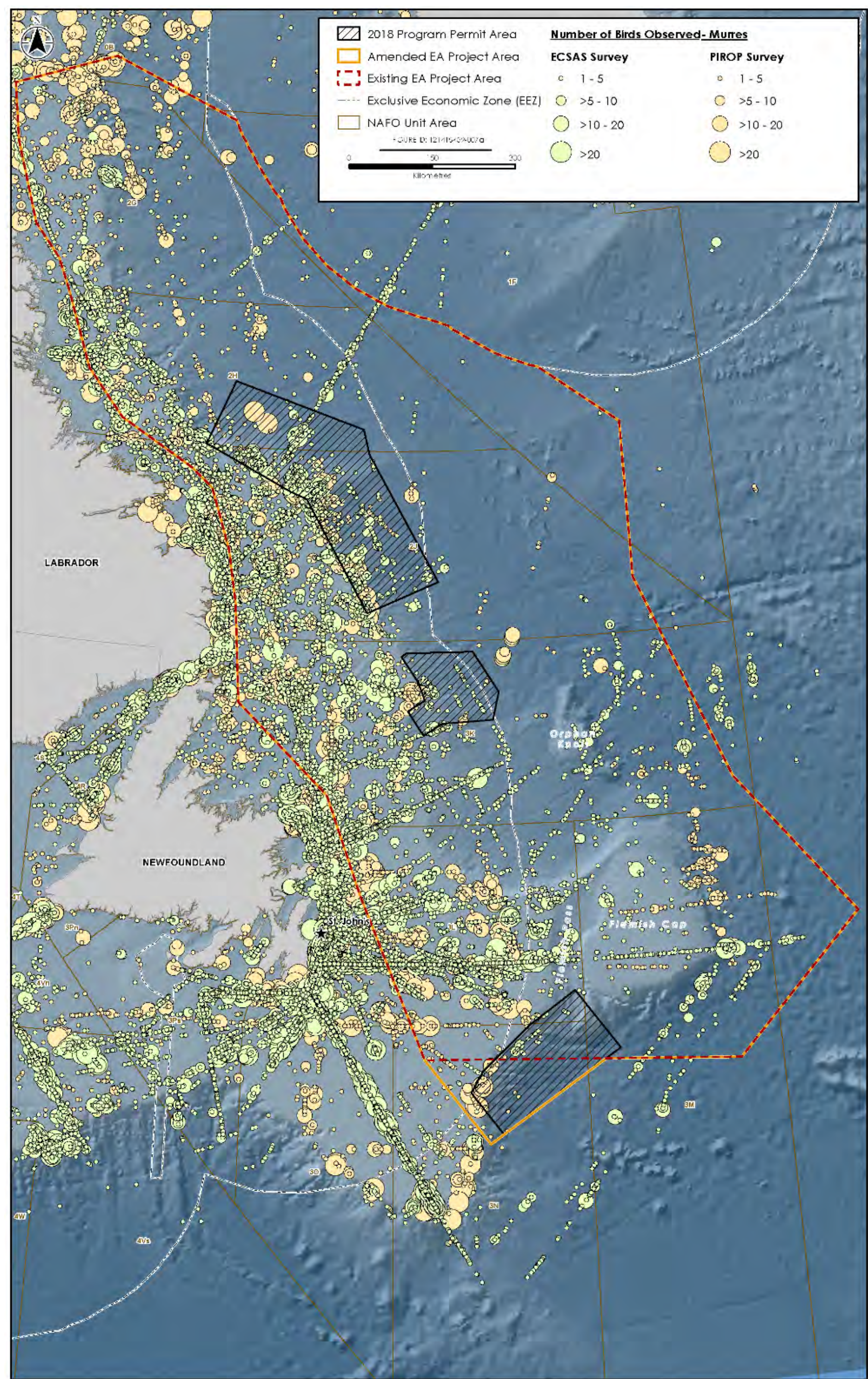


Figure B.7 Seabird Observations, Murre

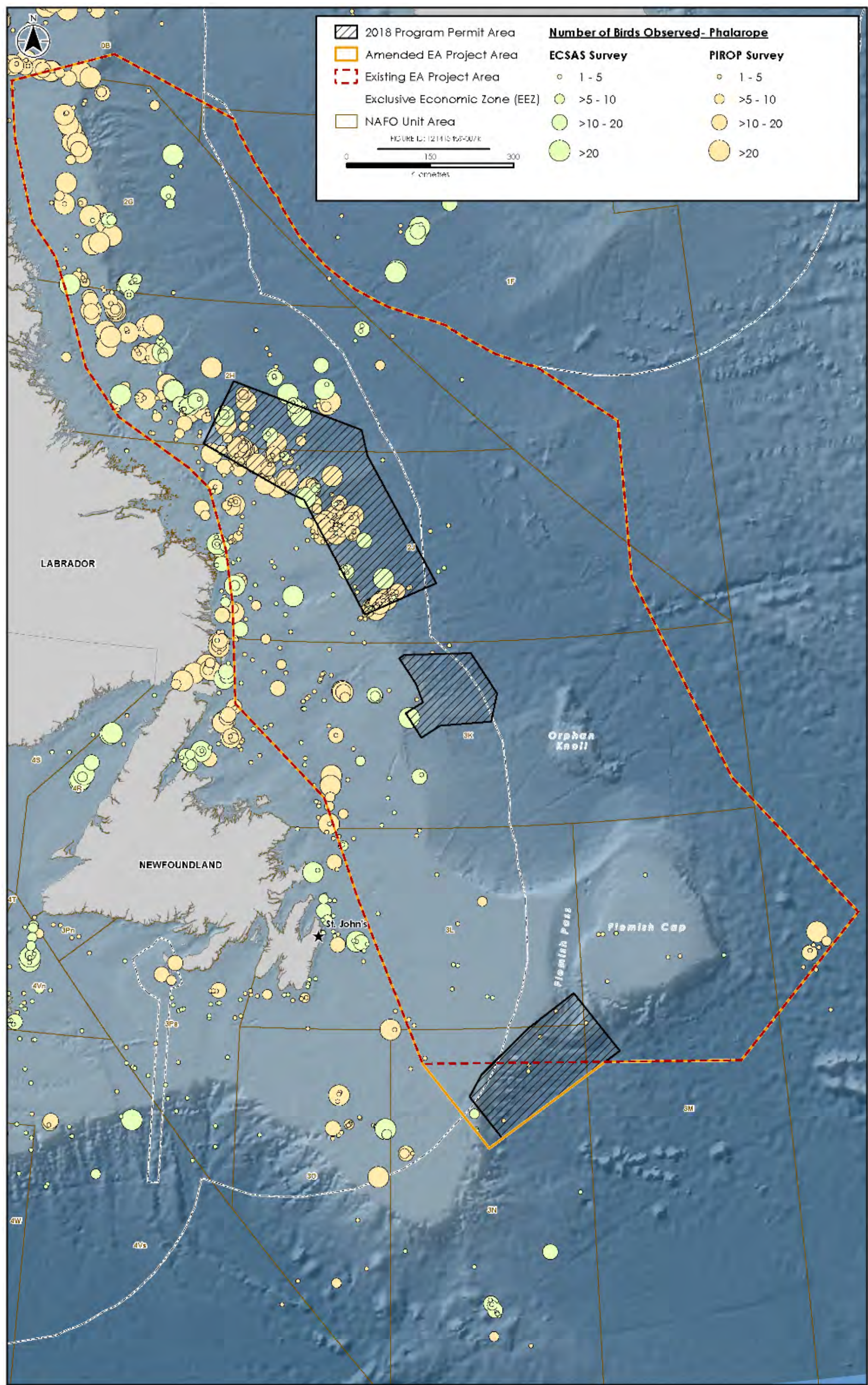


Figure B.8 Seabird Observations, Phalarope

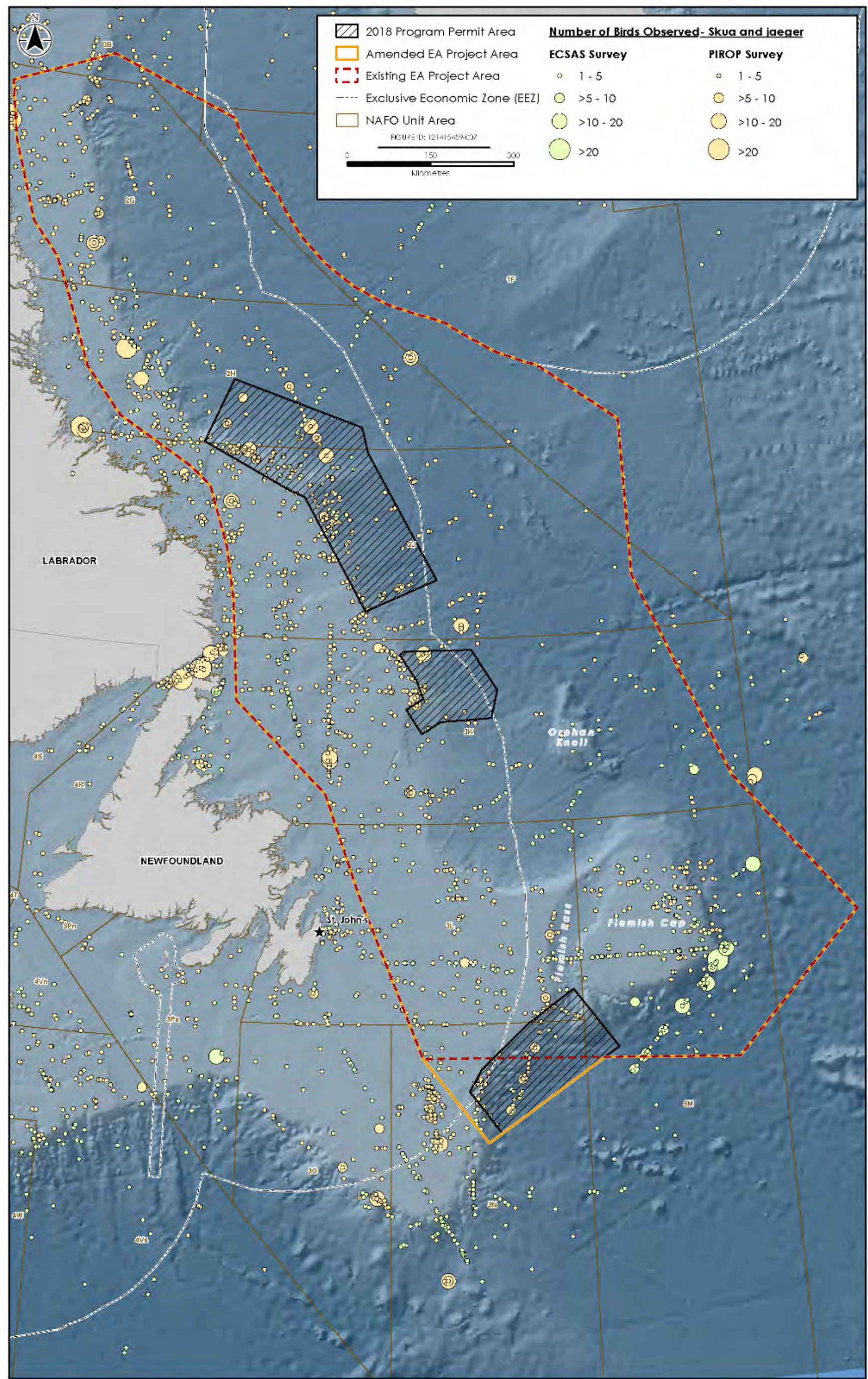


Figure B.9 Seabird Observations, Skua and Jaeger

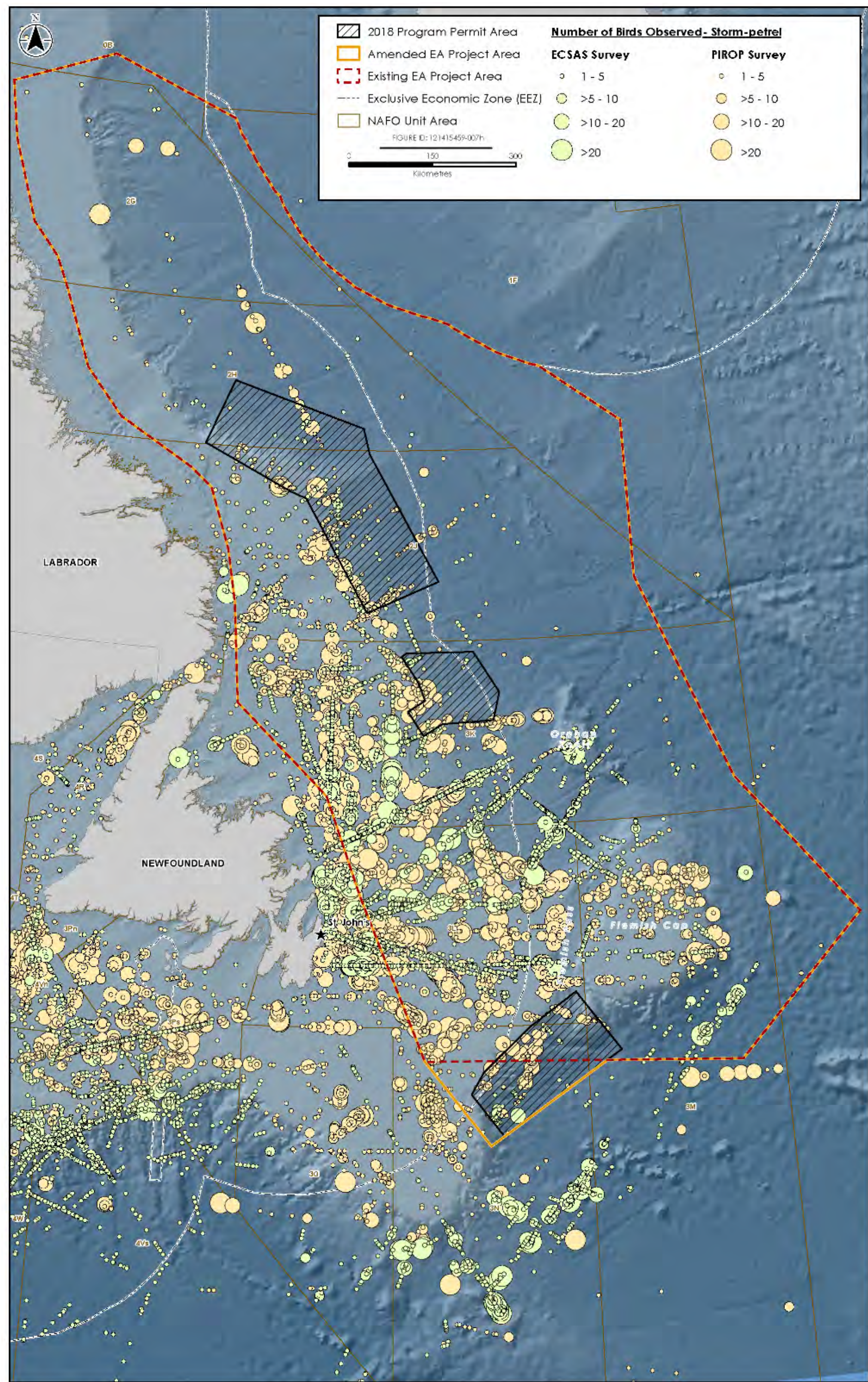


Figure B.10 Seabird Observations, Storm Petrel

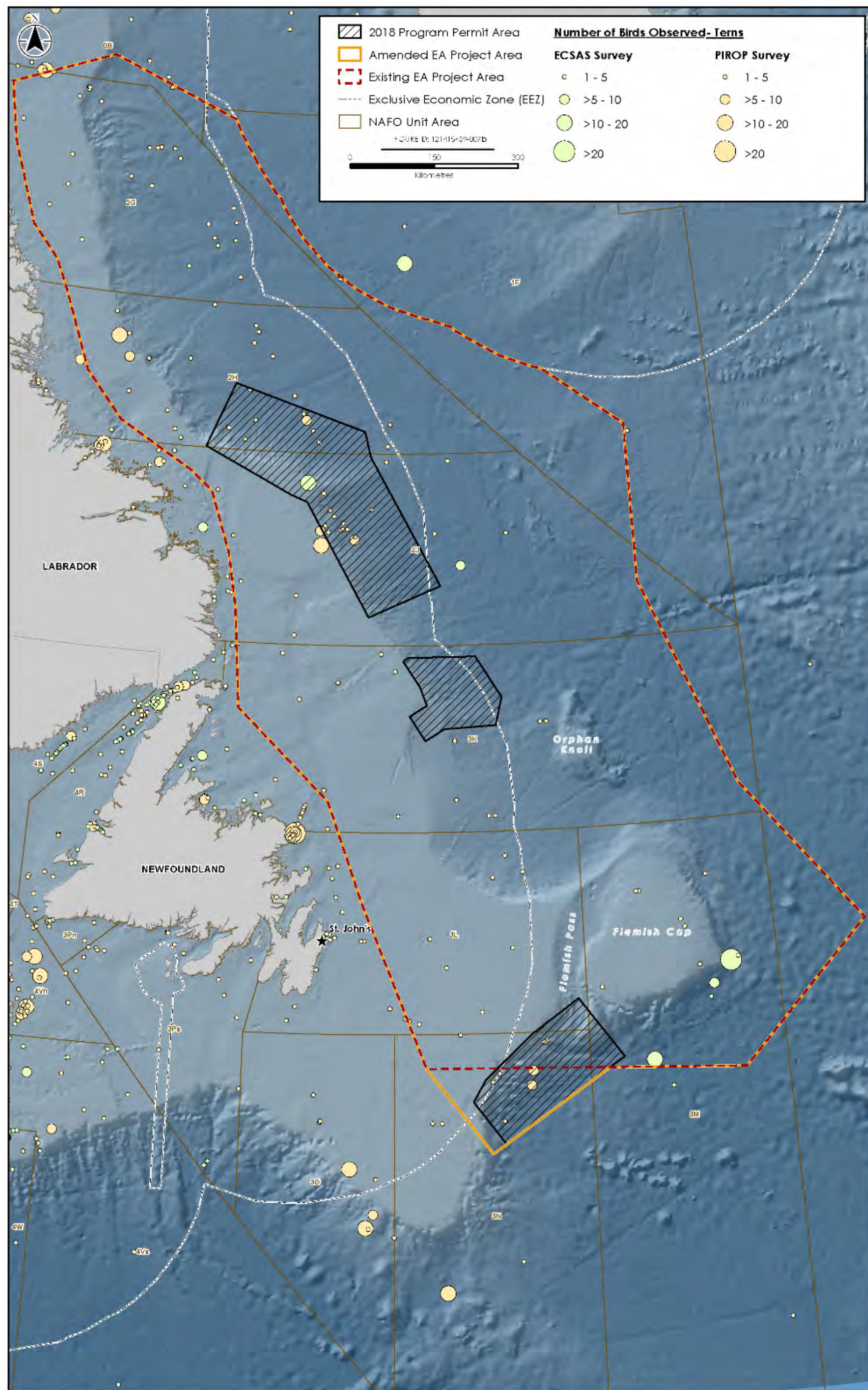


Figure B.11 Seabird Observations, Terns