



Nunavut Impact Review Board

Final Report for the

Strategic Environmental Assessment

in Baffin Bay and Davis Strait

NIRB File No. 17SN034



Volume 2: Background Information

July 2019

INSIDE COVER PAGE



The Nunavut Impact Review Board has conducted this assessment under the authority of Article 12, Section 12.2.4 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement)* and in accordance with the Board’s Primary Objectives set out in Article 12, Section 12.2.5 of the *Nunavut Agreement* and the *Nunavut Planning and Project Assessment Act*, S.C. 2013, c. 14, s. 23 as set out below:

12.2.5

In carrying out its functions, the primary objectives of NIRB shall be at all times to protect and promote the existing and future well-being of the residents and communities of the Nunavut Settlement Area, and to protect the ecosystemic integrity of the Nunavut Settlement Area. NIRB shall take into account the well-being of residents of Canada outside the Nunavut Settlement Area.

23(1) The Board must exercise its powers and perform its duties and functions in accordance with the following primary objectives:

- (a) to protect and promote the existing and future well-being of the residents and communities of the designated area; and
- (b) to protect the ecosystemic integrity of the designated area.

23(2) In exercising its powers or performing its duties and functions in accordance with the objective set out in paragraph (1)(a), the Board must take into account the well-being of residents of Canada outside the designated area.

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SIGNATURE PAGE



Photo 1: Board Members (left to right): Guy Alikut, Catherine Emrick, Philip (Omingmakyok) Kadlun, Kaviq Kaluraq, Elizabeth Copland, Allen Maghagak, Henry Ohokannoak, Uriash Puqiqnak, and Madeleine Qumuatuq.

THIS REPORT IS SUBMITTED TO THE HONOURABLE CAROLYN BENNETT, MINISTER OF CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS BY THE NUNAVUT IMPACT REVIEW BOARD ON THIS 31ST DAY OF JULY 2019.

	
Kaviq Kaluraq, Acting Chairperson	Philip (Omingmakyok) Kadlun, Board Member
	
Guy Alikut, Board Member	Henry Ohokannoak, Board Member
	
Allen Maghagak, Board Member	Madeleine Qumuatuq, Board Member
	
Catherine Emrick, Board Member	Uriash Puqiqnak, Board Member

FOREWORD

The Nunavut Impact Review Board (NIRB or Board) is an independent Institution of Public Government created by the *Nunavut Agreement* that has extensive experience performing impact assessments throughout the Nunavut Settlement Area. The Strategic Environmental Assessment of the potential for oil and gas development in Baffin Bay and Davis Strait (the SEA) was coordinated by the NIRB following a referral by the Minister of Northern Affairs in February 2017 through to the Final Public Meeting in March 2019 and issuance of this Final SEA Report in July 2019.

Currently there is a moratorium or ban on oil and gas exploration in the waters of the Canadian Arctic. This moratorium was put in place for five (5) years by the Government of Canada in December 2016. In 2021 the Government of Canada will revisit this decision. The findings and recommendations of the NIRB resulting from the SEA will contribute a Nunavut-based perspective to be considered by the Government when making this decision. The Board believes that these findings and recommendations will also be useful for informing other policy and planning initiatives for Nunavut and the Canadian Arctic moving forward.

The purpose of the SEA was to better understand the possible types of oil and gas related activities that could be proposed in Baffin Bay and Davis Strait and the potential risks, benefits, and management strategies related to these activities. The Final SEA Report describes the hypothetical development scenarios that were examined to better understand what these activities could look like, identify gaps in available information, address questions and gauge public concern, and lead to recommendations for moving forward. Summaries are provided of the comprehensive review of available literature and the extensive public engagement that was undertaken throughout this assessment, as well as the outcomes of the analysis of potential effects of possible oil and gas activities. Importantly, the report also includes extensive references to the background documentation and the knowledge and Inuit Qaujimagatjuangit that informed and enriched the SEA, leading to the Board's central conclusion and 79 recommendations for moving forward, set out in summary form in Chapter 1 and discussed in detail in the balance of the report.

The SEA was truly a collaborative effort that would not have been possible without the significant and ongoing contributions of the NIRB, Nunavut Tunngavik Incorporated, the Qikiqtani Inuit Association, the Government of Nunavut, Crown-Indigenous Relations and Northern Affairs Canada (collectively 'the SEA Working Group'), Nunami Stantec, intervenors, and the many community members from the 10 interested communities of Grise Fiord, Resolute, Arctic Bay, Pond Inlet, Clyde River, Qikiqtarjuaq, Pangnirtung, Iqaluit, Cape Dorset, and Kimmirut. Although at times this has been a challenging process for all concerned, the NIRB is confident that the lessons learned in this assessment establish an important foundation for future strategic assessments in Nunavut and the Canadian Arctic and for other types of development.

In particular, the Board recognizes that this assessment has made significant progress with the respect for and treatment of Inuit knowledge and experience, and the NIRB applauds the significant efforts of the Qikiqtani Inuit Association to coordinate the collection of input from communities and advise on its appropriate treatment. The Board thanks all who gave so generously

of their time, knowledge, experiences, stories, and perspectives; while the NIRB acknowledges that many participants faced time, capacity, and financial limits that affected their ability to fully engage in the SEA process, the Board is grateful for the contributions and sacrifices made by all who chose to participate.

The Board Members of the NIRB would like to thank the NIRB's staff for their professionalism and hard work over the past 2+ years to bring the SEA to completion. In particular, the Board recognizes that the SEA benefited significantly from the dedication and commitment of Heather Rasmussen, the Board's guiding hand throughout. Thank you, Heather for the countless hours you have dedicated to leading this work and ensuring that the Board heard a diverse range of perspectives and voices to support our decision-making for the SEA.

Sincerely,

A handwritten signature in blue ink that reads "M. Kaviq Kaluraq". The signature is written in a cursive, flowing style.

Kaviq Kaluraq
Acting Chairperson
Nunavut Impact Review Board

AVANT-PROPOS DE LA PRÉSIDENTE

La Commission du Nunavut chargée de l'examen des répercussions (la CNER ou la Commission) est un organisme gouvernemental public et indépendant créé en vertu de l'*Accord du Nunavut*. Elle possède une vaste expérience en matière d'évaluation environnementale dans la région du Nunavut. L'évaluation environnementale stratégique (l'EES) des possibilités d'exploitation pétrolière et gazière dans la baie de Baffin et le détroit de Davis a été coordonnée par la CNER à la suite d'une recommandation du ministre des Affaires du Nord. Le processus a été amorcé en février 2017 et s'est terminé avec la dernière assemblée publique ayant eu lieu en mars 2019 et la publication du rapport définitif de l'EES en juillet 2019.

En ce moment, il y a un moratoire ou une interdiction d'exploration pétrolière et gazière dans les eaux de l'Arctique canadien. Ce moratoire a été imposé par le gouvernement du Canada en décembre 2016 pour une période de cinq (5) ans. Cette décision fera l'objet d'une révision par le gouvernement du Canada en 2021. Grâce aux observations et aux recommandations de la CNER découlant de l'EES, le gouvernement pourra prendre cette décision à la lumière de la perspective du Nunavut. Selon la Commission, ces observations et recommandations serviront également à éclairer d'autres initiatives de planification et politiques futures concernant le Nunavut et l'Arctique canadien.

L'EES avait pour but de mieux comprendre les types d'activités pétrolières et gazières pouvant être proposés pour la baie de Baffin et le détroit de Davis, de même que les retombées, les stratégies de gestion et les risques éventuels se rapportant à ces activités. Le rapport définitif de l'EES présente les scénarios d'exploitation hypothétiques qui ont été examinés dans le but de mieux comprendre à quoi ces activités pourraient ressembler, de déterminer les lacunes qui existent sur le plan de l'information, de répondre aux questions du public et de mesurer ses inquiétudes, puis d'aboutir à des recommandations. L'analyse approfondie de la documentation disponible et les résultats de la mobilisation du public à grande échelle qui ont eu lieu dans le cadre de cette évaluation, de même que les résultats de l'analyse des effets potentiels des activités pétrolières et gazières possibles, sont résumés dans le rapport. Fait important, le rapport comprend également de nombreuses références à la documentation de base utilisée de même qu'aux connaissances et aux Inuit Qaujimagatuqangit qui ont éclairé et enrichi l'EES et permis d'aboutir à la conclusion centrale de la Commission ainsi qu'aux 79 recommandations, celles-ci étant résumées au chapitre 1 et abordées en détail dans le reste du rapport.

L'EES est le fruit d'un effort collectif qui n'aurait pu se concrétiser sans l'apport considérable et constant de la CNER, de Nunavut Tunngavik Incorporated, de la Qikiqtani Inuit Association, du gouvernement du Nunavut, de Relations Couronne-Autochtones et Affaires du Nord Canada (collectivement le « groupe de travail de l'EES »), de Nunami Stantec, de divers intervenants et de nombreux membres des dix collectivités concernées, soit Grise Fiord, Resolute Bay, Arctic Bay, Pond Inlet, Clyde River, Qikiqtarjuaq, Pangnirtung, Iqaluit, Cape Dorset et Kimmirut. Bien que le processus se soit avéré difficile pour toutes les personnes concernées par moments, la CNER estime que les leçons apprises dans le cadre de cette évaluation serviront de fondement important aux évaluations stratégiques susceptibles d'être menées à bien au Nunavut et dans l'Arctique canadien pour d'autres types de projets d'exploitation à l'avenir.

Par ailleurs, la Commission est d'avis que cette évaluation a permis de réaliser d'importants progrès sur le plan du respect et du traitement des connaissances et des expériences des Inuit. La CNER tient à souligner les efforts remarquables déployés par la Qikiqtani Inuit Association en matière de coordination de collecte de données auprès des collectivités ainsi que de conseils pour le traitement adéquat des données. La Commission tient à remercier toutes les personnes et tous les organismes qui ont généreusement fait don de leur temps, de leurs connaissances, de leurs expériences, de leurs histoires et de leurs perspectives. La CNER sait que de nombreux participants ont fait face à des contraintes sur le plan du temps, des capacités et des finances, contraintes qui les ont empêchés de se vouer entièrement au processus de l'EES. Néanmoins, elle est reconnaissante pour les contributions et les sacrifices faits par toutes les personnes qui ont prêté main-forte.

Les membres du conseil d'administration de la CNER remercient le personnel de la CNER pour son professionnalisme et son dur labeur au cours des deux dernières années et plus dans le but de mener l'EES à bien. En particulier, la Commission reconnaît que l'EES a considérablement bénéficié du dévouement et de l'engagement d'Heather Rasmussen, qui a su bien guider la Commission pendant toute la durée de l'évaluation. Heather, nous vous remercions pour les heures innombrables que vous avez consacrées à la direction de cette tâche et pour avoir permis à la Commission d'être à l'écoute d'un éventail de perspectives et d'opinions venant étayer les décisions prises dans le cadre de l'EES.

Cordialement,

A handwritten signature in blue ink that reads "M. Kaviq Kaluraq". The signature is fluid and cursive, with the first name "M." and the last name "Kaluraq" clearly legible.

Kaviq Kaluraq
Présidente intérimaire
Commission du Nunavut chargée de l'examen des répercussions

KEY TERMS

For the purposes of the NIRB's SEA Final Report, the Board uses the following key terms in accordance with the definitions that follow:

Ballast Water	water carried in special tanks in a ship to improve stability and balance of the vessel.
Bathymetry	the study of water depth: the distance of the seabed from the water surface.
Benthic flora and fauna	plants and animals on the seabed.
Bilge Water	wastewater that collects inside the hull of a ship.
Blowout Preventer	large piece of equipment that sits on top of the well with a valve that can be closed to prevent an uncontrolled release of oil or gas.
Climate Change	changes to weather conditions and climate that may be caused by human activities.
Cumulative Impacts	combined environmental impacts from past, present, and future projects and activities in an area.
Delineation Drilling	used to determine whether an oil or gas resource (reservoir) is there and how deep it is.
Effect	a change to a valued component of the environment from an activity.
Exploration Drilling	used to determine how wide the oil or gas resource (reservoir) is.
Fouling	accumulation of oil on equipment such as fishing gear of vessels.
Fracture gradient	the amount of pressure needed to generate fractures in a rock at a given depth.
Gas Hydrate	a solid ice-like form of water that contains gas inside its cavities. The gas is mostly methane and can form in pipelines and pose problems, so a substance is used to slow down or prevent gas-hydrates from forming.
Global Warming	the warming of the Earth from the release of greenhouse gases, such as carbon dioxide, into the air from human activities.
Greenhouse Gas	a gas that contributes to the warming of the Earth, for example, carbon dioxide.
Hydrocarbon	oil and/or gas.
Iceberg	a large piece of freshwater ice that has broken off a glacier and is floating freely in open water.
Impact	negative or positive influence from an activity and the environment.
Invasive Species	animals and plants that are not naturally found in the area and have been brought from somewhere else.

Inuit Qaujimajatuqangit	a morality that is the base for Inuit existence. It is the belief system at the core of Inuit identity and governs Inuit society.
Inuit Qaujimaningit	what Inuit know and a collective knowledge that is more recent in nature. It can be related to Inuit Qaujimajatuqangit that has evolved or changed in recent times.
Mitigation	a plan or an action taken to avoid or reduce a negative effect.
Oil and Gas Field	a location in the seabed where oil and gas quantities are large enough to support oil and gas production.
Plankton	small (microscopic) plants and animals living in marine water; are a source of food for other animals (for example, fish).
Polynya	open water surrounded by ice.
Pore pressure	the pressure of fluids within the pores of a reservoir.
Reservoir	a subsurface pool of oil or gas resource.
Sediment	a layer of sand particles on the seabed.
Seismic Activity	earthquakes and resulting tsunamis.
Seismic Survey	the use of sound generating devices to assist in locating oil and gas fields in the seabed.
Transboundary Effects	environmental impacts that can spread across other territories, provinces, or countries.
Turbot	commonly used in the communities to refer to Greenland halibut.
Wareship	anchored vessel for offshore storage to: carry fuel, drilling materials and other supplies; store and ship waste products; provide maintenance and repair operations, and support helicopter, well control, and oil spill response operations
Wellbore	hole drilled in explore and recover oil and gas resources.
Worst-case scenario	refers to the worst possible type of accident with the most negative effects that could potentially occur associated with a development, used for planning and preparing for required responses and prevention

ACRONYMS AND ABBREVIATIONS

ACRONYM DEFINITION

AFA	Arctic Fishery Alliance LP	HTA	Hunters and Trappers Association
AMAP	Arctic Monitoring and Assessment Programme	HTO	Hunters and Trappers Organization
BF	Baffin Fisheries	IBA	Important Bird Areas
BOP	Blowout preventer	INAC	Indigenous and Northern Affairs Canada
CAAQS	Canadian Ambient Air Quality Standards	IPCC	Intergovernmental Panel for Climate Change
CAPP	Canadian Association of Petroleum Producers	IUCN	International Union for the Conservation of Nature
CCG	Canadian Coast Guard	km	Kilometre
CDD	Commercial Discovery Declaration	LNG	Liquefied Natural Gas
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada	M	Magnitude (Richter scale)
CNG	Compressed Natural Gas	m	Metre
COGOA	Canada Oil and Gas Operations Act	MBS	Migratory Bird Sanctuary
CPRA	Canada Petroleum Resources Act	NADF	Non-aqueous drilling fluids
dB	Decibel	NEB	National Energy Board
DFO	Fisheries and Oceans Canada	NWA	National Wildlife Area
EAMRA	Environment Agency for Mineral Resources Activities	NFA	Nunavut Fisheries Association
EBSA	Ecologically and Biologically Significant Area	NIRB	Nunavut Impact Review Board
ECCC	Environment and Climate Change Canada	NMCA	National Marine Conservation Area
EL	Exploration Licence	NO_x	Nitrogen Oxides
FEED	Front end engineering and development	NRCan	Natural Resources Canada
FLNG	Floating Liquefied Natural Gas vessel	NTI	Nunavut Tunngavik Incorporated
FPSO	Floating Production Storage and Offloading vessel	NWA	National Wildlife Area
GHG	Greenhouse gas	NWMB	Nunavut Wildlife Management Board
GN	Government of Nunavut	PC	Parks Canada
Hz	Hertz	PL	Production Licence
		PM_{2.5}	Particulate Matter
		QC	Qikiqtaaluk Corporation
		QIA	Qikiqtani Inuit Association

QWB	Qikiqtaaluk Wildlife Board	USD	United States Dollars
RCP	Representative Concentration Pathways	VEC	Valued Ecosystem Component
SARA	<i>Species at Risk Act</i>	VOC	Volatile Organic Compounds
SBA	Significant Benthic Areas	VSEC	Valued Socio-Economic Component
SDL	Significant Discovery Licence	VSP	Vertical seismic profiling
SEA	Strategic Environmental Assessment	WBDF	Water-based drilling fluids
SSRW	Same Season Relief Well	WWF	World Wildlife Fund
TC	Transport Canada	2D	Two dimensional
TCF	Trillion cubic feet	3D	Three dimensional

REPORT MAP



Volume 1: SEA Summary Report

Foreword
Chapter 1: Summary Report



Volume 2: Background Information

Chapter 2: Introduction and Background
Chapter 3: History of Oil and Gas Activities
Chapter 4: Governance and Lifecycle
Chapter 5: Existing Environment in Baffin Bay and Davis Strait



Volume 3: Analysis of Scenarios, Key Findings and Recommendations

Chapter 6: Possible Development Scenarios in Baffin Bay/Davis Strait
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CHAPTER 2: INTRODUCTION AND BACKGROUND

2.1. INTRODUCTION

The NIRB's Strategic Environmental Assessment of the potential for oil and gas development¹ in Baffin Bay and Davis Strait (the SEA) was the first of its kind conducted by the Board. The SEA reflects a unique made-in-Nunavut approach that was developed by the NIRB, the participants in the SEA Working Group, and through feedback from Intervenors and community members; the Board's approach for the assessment was further modified as the assessment progressed, to better reflect Inuit and community knowledge and feedback from all participants. In this way, the Board is confident that the SEA represents a regional strategic assessment that reflects the unique regulatory structure established under the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement)*, and also the central role of Inuit Qaujimajatuqangit and participation of Nunavut communities in all stages of the assessment, from scoping through to the Final Public Meeting.

2.2. PURPOSE OF THE ASSESSMENT

On February 9, 2017 Crown-Indigenous Relations and Northern Affairs Canada (then Indigenous and Northern Affairs Canada) referred the SEA to the NIRB pursuant to section 12.2.4 of the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement)*.² The purpose of the SEA was to better understand the possible types of oil and gas related activities that could be proposed within a defined area of focus in Baffin Bay and Davis Strait, and their potential risks, benefits, and management strategies. Unlike a project-specific assessment, the SEA was designed to examine hypothetical oil and gas development scenarios in a specific area of offshore waters in Baffin Bay and Davis Strait to better understand what these activities could look like, identify gaps in available information, address questions and gauge public concern, and lead to recommendations for moving forward.

Recognizing the need to rely on both traditional knowledge and scientific information, the Minister requested that the NIRB use Inuit Qaujimaningit and Inuit Qaujimajatuqangit³ collected by the QIA and also create opportunities for communities to meaningfully contribute to the assessment.

The SEA was designed to:

- Provide background information;

¹ For the purpose of the SEA, 'oil and gas development' will refer to the discovery and exploitation of oil and gas deposits and encompasses exploration, production, and decommissioning activities.

² Public Registry ID: 308411

³ Inuit Qaujimajatuqangit refers to traditional values, beliefs, and principles while Inuit Qaujimaningit encompasses Inuit traditional knowledge (and variations thereof) as well as Inuit epistemology as it relates to Inuit Societal Values and Inuit Knowledge (both contemporary and traditional).

- Describe potential challenges, obstacles, and other factors relevant to possible oil and gas development;
- Describe possible oil and gas development scenarios;
- Assess the potential impacts and benefits;
- Identify knowledge and data gaps, areas of concern;
- Facilitate extensive public engagement; and
- Result in a Final Report and recommendations to serve as a key consideration in the Government of Canada’s review and reconsideration of the December 2016 decision to designate Canadian Arctic waters as off limits to future oil and gas licences for a five (5) year period (the moratorium).

In accordance with the Minister’s referral, the NIRB was responsible for coordinating the assessment and providing a final report with recommendations to the Minister by May 2019 (later extended to July 2019). The NIRB’s Final SEA Report and recommendations will inform the Government of Canada’s 5-year review of the current moratorium on oil and gas development in the Canadian Arctic (2016 – 2021).

2.3. STRATEGIC ENVIRONMENTAL ASSESSMENT OVERVIEW (SEA IN GENERAL AND IN CANADA)

For several decades, strategic environmental assessments (SEAs) have been used as a central tool supporting governments across the globe to promote sustainable development, by ensuring that environmental considerations are taken into account when developing and implementing policy, plans and programs that can have significant effects on the environment.⁴ SEAs are typically conducted to inform government policies in sectors such as resource conservation, exploration and development, agriculture, forestry, fisheries, transportation, land use planning, water management, and waste management.

Since the early 1990s, there have been a variety of “strategic environmental assessments” conducted in Canada under various instruments such as:

- strategic environmental assessment of federal policies, plans, and programs designed to further the goals of sustainable development conducted under the federal *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*;⁵
- strategic environmental assessments conducted to fulfill the sustainable development strategies of specific federal departments and prescribed under specific legislative enactments;⁶

⁴ See for example the EU (2001) *Strategic Environmental Assessment Directive (SEA)*.

⁵ See the most recent Implementation Guidelines, GC (2010).

⁶ See for example the mandatory environmental assessment requirements found in s. 5(2) of the *Farm Income Protection Act*, S.C. 1991, c. 22.

- strategic environmental assessments conducted to ensure specific departmental initiatives identify important environmental effects and are responsive to the environmental concerns raised by the public;⁷
- strategic environmental assessments conducted jointly with federal and provincial regulatory authorities as required under federal-provincial accords;⁸ and
- strategic environmental assessments conducted specifically to inform federal decision-makers considering the imposition or lifting of a moratorium⁹.

Although the process details may vary to reflect the specific legislative, policy and factual context of a given SEA, at its core, an:

*SEA is a step-by-step procedure to analyse and communicate environmental and health considerations related to development strategies, plans and programmes prepared by the governments. These considerations are collected in consultation with relevant authorities and the public so that decision makers can compare all the pros and cons of each planning option.*¹⁰

In general, the contrast between an SEA and the impact assessments conducted for individual projects (EIA) is summarized as follows:

*SEA extends the aims and principles of EIA to the higher levels of decision-making when major alternatives are still open and there is far greater scope than at the project level to integrate environmental considerations into development goals and objectives. It allows problems of environmental deterioration to be addressed at their “upstream source” in policy and plan-making processes, rather than mitigating their “downstream symptoms” or project-level impacts.*¹¹

In general, the SEA process is an iterative process that involves taking the following steps prior to adopting a proposed policy, plan, or program:¹²

- a preliminary scan/screening of the proposed policy, plan, or program to determine whether an SEA is appropriate;
- analysis of the scope and nature of the potential effects that could result from the proposed policy, plan, or program;
- analysis of the need for mitigation of potential adverse effects and the opportunities to enhance benefits or positive effects;
- analysis of the scope and nature of residual effects that would remain after mitigation measures and enhancement measures are adopted;

⁷ See for example the strategic environmental assessment process and public statements in respect of detailed strategic environmental assessments conducted by Innovation, Science and Economic Development Canada accessible online: <http://www.ic.gc.ca/eic/site/sea-ees.nsf/eng/ey00016.html>.

⁸ Hurley, G.V. (2011).

⁹ NRCan and Nova Scotia Petroleum Directorate. (1999). Georges Bank Review Panel Report .

¹⁰ UNECE. (2016). *Protocol on SEA, Facts and Benefits*, at p. 3.

¹¹ UNEP. (2004). *EIA and SEA: Towards an Integrated Approach*, at p. 8.

¹² As summarized in the Implementation Guidelines, GC. (2010), pp. 7-8.

- identification of follow up measures that may be necessary/advisable if the proposed policy, plan or program proceeds; and
- as appropriate, throughout the SEA, identifying and considering the concerns of stakeholders and members of the public most affected by the proposed policy, plan or program.

While mindful of the general approaches and emerging best practices for SEAs both nationally and internationally, very early on in the NIRB's SEA the Board identified that several factors warranted the modification of the typical SEA process to reflect a "made-in-Nunavut" approach. Factors, including the following, were considered by the Board to develop and implement the unique approach used to conduct this SEA:

- the central importance of Inuit Qaujimajatuqangit and Inuit Qaujimaningit must be reflected in the SEA;
- facilitating the participation of members of the potentially affected communities must be a focus throughout the process; and
- accommodations were made for significant information gaps and uncertainty associated with: baseline conditions in the region, the types of development scenarios that are likely to occur in the region, the potential economic benefits from these types of developments, the regulatory process that will be applicable to future oil and gas developments in the region, and the economic feasibility of future developments.

Recognizing that SEAs are expected to be iterative processes, the NIRB has throughout this process, sought feedback from participants to ensure that SEAs conducted by the NIRB in future will build on this assessment and continue to reflect Nunavut's unique context.

2.4. WORKING GROUP

Since its initiation by the NIRB in February 2017, the SEA has progressed with the support, expertise, and perspectives provided by a SEA-specific Working Group. Briefly, the roles and responsibilities of each of the Working Group Members in respect of the SEA were as follows:

- **NIRB:** Coordinate and lead the conduct of the SEA, including the Final Public Meeting and prepare the SEA Report and recommendations;
- **CIRNAC:** Initiate the SEA and refer to the NIRB, provide funding and ongoing project support, and coordinate input from federal departments into the SEA;
- **NTI:** Offer expertise and perspective to ensure the SEA process and resulting government decisions are consistent with the *Nunavut Agreement*;
- **QIA:** Collect Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut and information on Inuit harvesting activities and food security and provide advice and direction to the NIRB regarding the appropriate use and incorporation of Inuit knowledge throughout the process; and

- **GN:** Develop and provide education material on general oil and gas activities to the communities and provide access to relevant knowledge and data collected by the GN as part of its Nunavut Coastal Resource Inventory.

In addition to their specific contributions and participation in the NIRB's public engagement sessions, the Working Group generally provided ongoing feedback to the NIRB about the SEA process as the assessment progressed. Over the course of the SEA the NIRB, the QIA, and the consultants retained by the Board, Nunami Stantec, produced several summary reports, technical reports, and a preliminary findings report; this work benefited from the contributions, review, and/or comment of the Working Group as well. The Board participation, collaboration, and support of the Working Group was instrumental in advancing the SEA despite significant time pressures, competing priorities and resource challenges.

2.5. METHODOLOGY

2.5.1 *Methodology for the SEA*

The NIRB undertook an inclusive and public approach when conducting the SEA. Public feedback collected during each phase of the study was used to inform subsequent steps and produce information and analyses for the Board to consider. All incoming and outgoing correspondence and reports were filed online to the NIRB's public registry and distributed to the public distribution list.

Prior to initiating the SEA, a three (3) day workshop was coordinated and facilitated by the Government of Nunavut in 2015 to tackle the question: is Nunavut ready for oil and gas development? The workshop, which was held in Iqaluit, brought together a range of stakeholders representing the oil and gas industry, regulators, the federal government, non-government organizations, the Government of Nunavut, Inuit organizations, Nunavut communities, youth, and institutions. The final report from the workshop concluded that Nunavut stakeholders need more information and discussion through continuous engagement before Nunavut's readiness for oil and gas activities can be properly determined (P. Croal (facilitator) et al., 2015). The outcomes of the 2015 Oil and Gas workshop, concerns raised by the community of Clyde River regarding marine seismic surveys, and engagement undertaken by Indigenous and Northern Affairs Canada (as it was then-known) for an SEA with a more limited scope and focus, were actively considered by the NIRB and the SEA Working Group in determining the appropriate methods and approaches for this SEA.

During the first year of the SEA, the NIRB undertook a public scoping process to identify the factors to be addressed through the study, including a list of valued ecosystem and socio-economic components (See [2.6 Objectives and Scope of the Assessment](#) for additional information) and issues of public interest and concern. The NIRB contracted Nunami Stantec Ltd. (Nunami Stantec) to provide external and independent specialist consulting services and develop two (2) independent reports:

1. *Oil and Gas Life Cycle Activities and Hypothetical Scenarios and Environmental Setting;*
and

2. *Review of Potential Effects of Oil and Gas Activities.*

Summaries of information from these reports are provided throughout this Final SEA Report; for additional information on the methodology of these reports, see [2.5.2 Methodology for Nunami Stantec Documents](#). When distributing the two (2) documents for public comment, the NIRB further requested that parties identify any additional relevant literature that should be considered by for the Board.

Throughout the assessment, the QIA devoted significant resources to collecting Inuit Qaujimajatuqangit for the SEA, communicating and coordinating with the NIRB on a regular basis (see [2.9 Treatment of Inuit Qaujimajatuqangit and Inuit Qaujimaningit](#)). The QIA and the NIRB worked together to ensure appropriate treatment of Inuit knowledge throughout the SEA process. Staff from both the NIRB and QIA developed a joint Preliminary Findings Report¹³ that summarized the following information:

- Oil and Gas Life Cycle Activities and Hypothetical Scenarios Report;
- Environmental Setting and Review of Potential Effects of Oil and Gas Activities Report;
- Feedback on the two (2) reports received through the public commenting period;
- Baseline Inuit Qaujimajatuqangit collected by the QIA; and
- Information on Inuit harvesting activities and food security.

The objective of the Preliminary Findings Report was to summarize and present information in an accessible format for the public, highlighting what had been discovered through the SEA to date in considering what offshore oil and gas in Baffin Bay and Davis Strait could look like, and the associated potential for positive and negative impacts and effects. This report highlighted areas where the knowledge required to understand the environment and potential effects of development was currently available and where information gaps existed. Finally, this report was designed to reflect the knowledge shared by community members and interested parties, and to serve as a tool for members of the public to further inform themselves and actively participate in the remaining steps of the Strategic Environmental Assessment prior to its conclusion. The Preliminary Findings Report was distributed publicly in English and Inuktitut on September 26, 2018.

2.5.2 Methodology for Nunami Stantec Documents

Through a competitive public Request for Proposals, the NIRB contracted Nunami Stantec Ltd. (Nunami Stantec) to provide external and independent specialist consulting services and develop two (2) independent reports: *Oil and Gas Life Cycle Activities and Hypothetical Scenarios and Environmental Setting and Review of Potential Effects of Oil and Gas Activities*. The NIRB specified that all documents used be publicly available so that they could be uploaded to the Board's online public registry. The reports were posted online on June 5, 2018 and distributed to communities, organizations, the public, and government for feedback.

Nunami Stantec undertook the following process when developing the two (2) reports:

¹³ Public Registry ID: 320496.

a) *Strategic Environmental Assessment in Baffin Bay and Davis Strait Oil and Gas Life Cycle Activities and Hypothetical Scenarios Report*¹⁴

This report describes typical activities and components associated with oil and gas exploration and production and what types of activities and components could one day be proposed in Baffin Bay and Davis Strait through three (3) development scenarios. Potential accidents and malfunctions, as well as a worst-case scenario, were further described. Nunami Stantec developed this report using information collected through:

- Discussions with petroleum industry experts with Canadian and world-wide experiences in offshore exploration and development and its application to Baffin Bay and Davis Strait;
- An extensive database of published literature;
- Industry best practices; and
- Operational learnings from past and present offshore projects, and future technology advancements being made by the industry.

b) *Strategic Environmental Assessment in Baffin Bay and Davis Strait Environmental Setting and Review of Potential Effects of Oil and Gas Activities Report*¹⁵

Using scientific literature and published and publicly accessible Inuit Qaujimajatuqangit and Inuit Qaujimaningit reports, this report describes what is known about the physical, biological, and human environments in Baffin Bay and Davis Strait. The report also discusses the potential impacts and effects that oil and gas activities could have on components of the physical, biological, and human environments.

The review of potential effects (including the potential for cumulative or transboundary effects or effects resulting from an accident and malfunction) of routine oil and gas activities on the selected valued components was based on a description of routine activities considered likely to be associated with oil and gas development in an Arctic environment, as well as the hypothetical scenarios illustrating what a typical oil and gas development life cycle could look like in the Development Scenarios Area. Standard and additional or enhanced levels of mitigation and planning considerations were further included. Nunami Stantec further identified knowledge and data gaps associated with the physical, biological, and human environments.

2.5.3 Methodology for this report

The Board's Final SEA Report provides a summary of the information considered by the Board in developing its recommendations to the Minister of Crown-Indigenous Relations and Northern Affairs. This includes information provided through both verbal and written formats throughout the duration of the SEA. In addition to information provided during the NIRB's Final Public Meeting and associated final written submissions, this Final SEA Report has been organized to highlight:

¹⁴ Public Registry ID: 318009

¹⁵ Public Registry ID: 318010

- **Background Information:** Summaries of information related to the history of oil and gas in Nunavut, hypothetical oil and gas scenarios, governance¹⁶, and the environment¹⁷ provided to the NIRB by Nunami Stantec and the Qikiqtani Inuit Association (QIA) in the following reports:
 - Strategic Environmental Assessment in Baffin Bay and Davis Strait Oil and Gas Life Cycle Activities and Hypothetical Scenarios, referred to as *Oil and Gas Hypothetical Scenarios Report* (Nunami Stantec, 2018b);
 - Strategic Environmental Assessment in Baffin Bay and Davis Strait Environmental Setting and Review of Potential Effects of Oil and Gas Activities, referred to as *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a);
 - Qikiqtaaluk Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut for the Baffin Bay and Davis Strait Marine Environment, referred to as the *QIA Inuit Qaujimajatuqangit Report* (QIA); and
 - Evaluating the Role of Marine-Based Harvesting in Food Security in the Eastern Arctic, referred to as *Food Security Report* (QIA).
- **Views of Parties and Supplemental Information:** Summaries of publicly available recommended supplemental information, recommendations, and conclusions by parties. Focus was placed on final written submissions and discussions that took place during the Final Public Meeting and also include public comments on the *Oil and Gas Hypothetical Scenarios* (Nunami Stantec, 2018b) and *Environmental Setting and Potential Effects* (Nunami Stantec, 2018a) reports. This included the Uqausirisimajavut: What we have said. The Inuit view of how oil and gas development could impact our lives report, referred to as *Uqausirisimajavut Report* (QIA).
- **Views of the Board:** Analysis and conclusions provided by the Board after reviewing the evidence brought before it and outlined in previous sections.

More generally, the Board has taken care to emphasize the following throughout the Final SEA Report:

- Inuit Qaujimajatuqangit, Inuit Qaujimaningit,¹⁸ and Inuit Qaujimajangit Iliqqusingitigut¹⁹;
- Community knowledge;
- Findings;
- Research Opportunities;
- Concerns; and
- Additional Information Requirements.

¹⁶ The current applicable regulatory and royalty and spill response regimes will be written using information provided by the relative regulators.

¹⁷ Unless otherwise specified, the environment will refer to the physical, biological, and human environments.

¹⁸ Inuit Qaujimajatuqangit refers to traditional values, beliefs, and principles while Inuit Qaujimaningit encompasses Inuit traditional knowledge (and variations thereof) as well as Inuit epistemology as it relates to Inuit Societal Values and Inuit Knowledge (both contemporary and traditional).

¹⁹ Defined by the QIA as what Inuit are familiar with in their culture. It is how Inuit see their culture, their customs, and their practise.

2.6. OBJECTIVES AND SCOPE OF THE ASSESSMENT

Following a one (1) year scoping process, the NIRB released the Final Scope List for the SEA on March 9, 2019, which is available in Appendix A: Reference List (NIRB, 2018). The Final Scope List was used to identify the factors to be considered in the SEA and outlines the bounds of the study. The list was drafted with the view that this SEA was an initial study and predominantly undertaken to understand the relative information currently available in the Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b) and to identify gaps in available information. Considering public feedback provided, the NIRB identified the full range of possible offshore oil and gas activities, ecosystemic and socio-economic factors, and questions and concerns to consider throughout the SEA. The materials developed by, or on behalf of, the NIRB reflect the Final Scope List for the SEA. However, the NIRB acknowledges that some parties raised concerns and issues during the assessment that were outside of the scope for the SEA. Where practical, the Board has captured these concerns in this Report for the Minister's consideration.

The NIRB's scoping process was designed to collect feedback from government departments, industry, academia, non-governmental organizations, communities, and the general public. The NIRB also solicited input from the SEA working group and interested parties, including territorial federal government departments, Inuit organizations, and members of the public, as well as from potentially interested parties from the Inuvialuit Settlement Region, Eastern Canada, Greenland, and Alaska. The Final Scope List was developed through a public process that included two (2) written commenting periods as well as two (2) public engagement sessions held in each of the following 10 communities in the Qikiqtani Region of Nunavut: Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung.

Through the public scoping meetings, the NIRB collected and categorized comments as well as traditional and local knowledge shared by community members. The questions and issues raised at these public scoping meetings, combined with the input from other parties regarding the NIRB's scoping list, were used when compiling the Revised *Draft* Scope. Summary tables were enclosed with both the Revised *Draft* and the Final Scope lists to demonstrate how the suggested revisions offered through written comment submissions as well as the public engagement sessions were addressed, with an indication of where edits were incorporated into the Final Scope List, or if edits were not incorporated, a corresponding rationale.²⁰

Informed by feedback received throughout the NIRB's scoping process, the primary objectives of the SEA were to:

- **Provide background information.** This was to include the geology and oil and gas potential; history of oil and gas activity; the physical, biological, and socio-economic environment; the existing regulatory regime; and relative global factors.

²⁰ Public Registry IDs:

- **Describe potential challenges, obstacles, and other factors relevant to possible oil and gas development.** This was to include technical, policy, human and institutional capacity, economic and financial, and environmental consideration.
- **Describe possible oil and gas development scenarios.** Except for the “no oil and gas development” scenario, these scenarios were intended to represent phases of development unique to the offshore oil and gas sector and would be informed by projects carried out in similar environments elsewhere in the world. Scenarios were expected to take into account the unique environment of Baffin Bay and Davis Strait, and the associated technical challenges to possible development, including climate change.
- **Assess the potential impacts and benefits.** For each scenario, the potential for positive and negative ecosystemic and socio-economic effects to identified Valued Ecosystem Components and Valued Socio-Economic Components was to be discussed with an assessment of potential mitigative and monitoring measures.
- **Identify knowledge and data gaps, including areas of concern.**
- **Develop Final SEA Report with recommendations.** The report will address the matters described above and provide the Board’s recommendations. The final report will assist Indigenous and Northern Affairs Canada in its responsibilities for the administration of exploration rights in Baffin Bay and Davis Strait, and will inform the five (5) year review of the Government of Canada decision to designate Canadian Arctic waters as off limits to future oil and gas licences.

The Final Scope List included the following criteria:

- Past Oil and Gas Activities
- Activities and Components
- Spatial and Temporal Boundaries
- Valued Ecosystem and Socio-Economic Components to be considered and encompassing the Physical, Biological, and Human environments
- Assessment of Effects of Offshore Oil and Gas Projects/Activities
- Assessment of Effects of the Environment on Potential Offshore Oil and Gas Projects/Activities
- Assessment of Cumulative Effects
- Assessment of Transboundary Effects
- Consideration of climate change
- Jurisdiction and responsible authorities
- Accidents and malfunctions
- Other Relevant Matters

Finally, energy security and diversification as well as naturally occurring oil seeps were selected as subjects of note. While the scope list was further defined through both rounds of public

comments, the following three (3) significant changes were made to address public comments and concerns:

- Climate change was added as a separate component and given specific focus to highlight the importance and concerns regarding changing climatic conditions, particularly in the Arctic;
- Air quality was added as a separate valued ecosystem component; and
- Additional focus was placed on accidents and malfunctions, and a credible worst-case scenario was added to reflect a possible blowout.

2.7. SPATIAL AND TEMPORAL BOUNDARIES

2.7.1 *Spatial Boundaries*

There are two (2) marine areas on which the SEA is focused: the Development Scenario Area and the Area of Focus. The spatial boundaries were established by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC, then Indigenous and Northern Affairs Canada or INAC) and finalized by the SEA Working Group prior to the official referral of the SEA to the NIRB. Figure 1 and Figure 2 were created by CIRNAC.

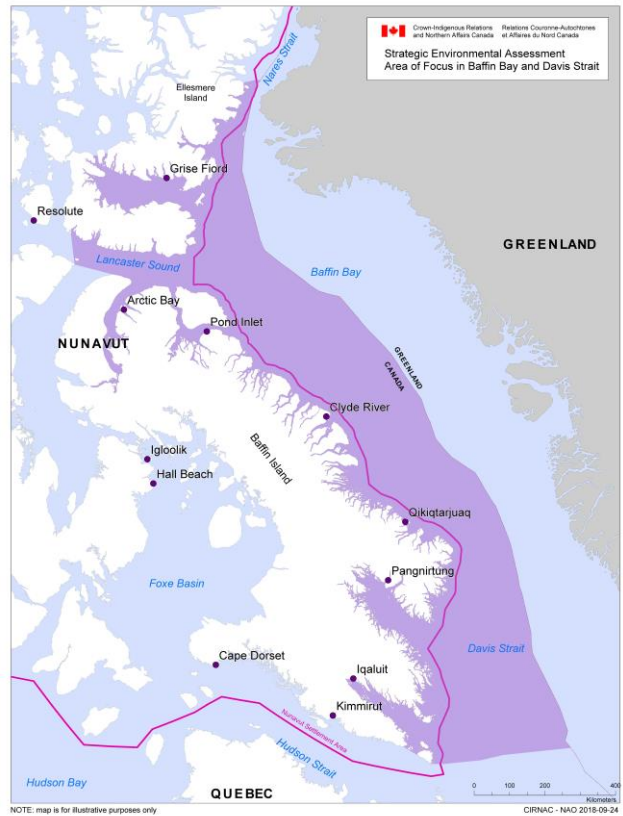
Development Scenario Area: Figure 1 outlines in green the offshore area under the jurisdiction of Crown-Indigenous Relations and Northern Affairs Canada where possible offshore oil and gas development scenarios considered. This area is outside of the NSA and the Tallurutiup Imanga (Lancaster Sound) National Marine Conservation Area and under the authority of the Government of Canada. The NIRB focused on possible development activities, infrastructure, or equipment within the Development Scenario Area when developing the hypothetical scenarios and industry engagement indicated that onshore processing infrastructure and transportation pipeline would be unlikely.

Area of Focus: Figure 2 features the SEA Area of Focus in Baffin Bay and Davis Strait in purple and is the greater area used to gather scientific information and Inuit Qaujimajatuqangit and Inuit Qaujimaningit on the existing physical, biological, and human environments and to assess the potential positive and negative impacts and effects of the oil and gas development scenarios.

Figure 1: Strategic Environmental Assessment Oil and Gas Development Scenarios Area (Source: CIRNAC, 2018a)



Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b)



2.7.2 Temporal Boundaries

The following is a summary based on Section 7: Realistic/Typical Life Cycle Timelines of the *Oil and Gas Hypothetical Scenarios Report*. Please refer to this section and report for additional information, including general timelines associated with individual activities.

Nunami Stantec assigned general timelines to the activities associated with each of the oil and gas scenarios. Recognizing that it can take decades for an offshore oil and gas field to be developed into active production, greater clarity exists regarding how earlier phases of potential development could be designed and carried out, which is reflected in the scenarios. The full life cycle from the start of seismic exploration, through exploration drilling to production, and eventually decommissioning and abandonment could be in the range of 45–80 years. Summaries of typical timelines associated with the three (3) scenarios (Exploration with Offshore Seismic Surveys, Exploration Drilling, and Field Development and Production Drilling) are provided in Volume 3, Chapter 6: Possible Development Scenarios in Baffin Bay and Davis Strait.

2.8. PROCEDURAL HISTORY

The SEA consisted of the following three (3) general phases:

Issues Scoping: The scope of the SEA outlined the factors to be considered within the assessment. Through scoping activities, the NIRB determined the full range of possible offshore oil and gas activities, physical, biological, and socio-economic components, and questions and concerns to be considered throughout the SEA

Analyze Potential Development Scenarios: The various possible oil and gas development scenarios (including a ‘no development’ scenario) were identified that could occur in Baffin Bay and Davis Strait within the context of the unique biophysical, socio-economic, and regulatory environment of the area. The associated potential positive and negative effects were assessed.

Develop Final SEA Report: A final public meeting to provide the Board members with the information necessary to engage in the decision-making necessary to prepare the Final SEA Report and recommendations to the government. Opportunities were provided for representatives of the ten (10) selected Qikiqtani communities to attend and share their views and concerns with the Board.

Table 4: Process for the NIRB's Strategic Environmental Assessment in Baffin Bay and Davis Strait below provides a brief summary of the key procedural steps associated with the SEA, including key milestones, opportunities for public participation, and involvement of parties throughout the NIRB process.

Table 4: Process for the NIRB's Strategic Environmental Assessment in Baffin Bay and Davis Strait

Date	Party	Process Step	Notes
February 9, 2017	Indigenous and Northern Affairs Canada (now CIRNAC)	Referral to the Board to initiate the SEA pursuant to Section 12.2.4 of the <i>Nunavut Agreement</i>	The Board is responsible for coordinating the SEA, facilitating public engagement, and submitting a final report to the Minister of Crown-Indigenous Relations and Northern Affairs by March, 2019
April 20 – May 15, 2017	NIRB	Round 1 Public Engagement Meetings: Building Public Awareness	Accompanied by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Tunngavik Inc. (NTI), Qikiqtani Inuit Association (QIA), and the Government of Nunavut (GN), afternoon meetings and evening sessions in the Qikiqtani communities of Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung
September 11, 2017	NIRB	Draft Scope Released for public comment	

Date	Party	Process Step	Notes
October 18-28, 2017; November 6-16, 2017	NIRB	Round 2 Public Engagement Meetings: Issues Scoping	Accompanied by CIRNAC, NTI, QIA, and the GN, visited the Qikiqtani communities of Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung
November 30, 2017	Parties	Comments received on <i>Draft Scope</i>	Comments from National Energy Board (NEB), Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), Natural Resources Canada (NRCan), Parks Canada (PC), Coastal and Ocean Resources, World Wildlife Fund Canada (WWF), Greenpeace Canada, P. Croal, and Benoit Hudson
December 20, 2017	NIRB	<i>Revised Draft Scope</i> released for public comment	
February 5, 2019	Parties	Comments received on <i>Revised Draft Scope</i>	Comments from GN, WWF, Greenpeace Canada, P. Croal, and the Environmental Agency for Mineral Resources Activities – Government of Greenland (EAMRA)
March 9, 2018	NIRB	Final Scope issued for Information	
April 30 to May 2, 2018	QIA	QIA Workshop with Inuit Qaujimajatuqangit Holders	NIRB staff and consultants from Nunami Stantec met with the QIA and the Inuit Qaujimajatuqangit Committee in Iqaluit
June 5, 2018	NIRB	Nunami Stantec Possible Development Scenarios Report released for public comment	Describes typical activities and components associated with oil and gas exploration and production and what types of activities and components could one day be proposed in Baffin Bay and Davis Strait
June 5, 2018	NIRB	Nunami Stantec Environmental Setting and Effects Assessment Report released for public comment	Using scientific literature and published and publicly accessible Inuit Qaujimajatuqangit and Inuit Qaujimaningit reports, document describes and discusses what is known about the physical, biological, and human environments in Baffin Bay and Davis Strait and provides potential impacts and effects of hypothetical oil and gas activities on the environment

Date	Party	Process Step	Notes
July 6, 2018	NIRB	Request for extension to SEA timeline	Request to CIRNAC to extend the original SEA timeline to ensure Inuit Qaujimagatuqangit was given due consideration
July 20, 2018	CIRNAC	Granting of request for extension to SEA timeline	Extension of deadline for the Board's Final SEA Report to be submitted to the Minister to May, 2019
December 11, 2018	Parties	Comments received on Nunami Stantec reports	Comments from: P. Croal, CIRNAC, Canada-Newfoundland and Labrador Offshore Petroleum Board, The Canadian Association of Petroleum Producers (CAPP), ECCC, Greenpeace Canada, Inuit Circumpolar Council – Canada, NRCan, PC, TC, WWF, GN, DFO and the Canadian Coast Guard (CCG), NEB, and EAMRA
September 26, 2018	NIRB/QIA	Release of Preliminary Findings Document for Information	Document summarized: Oil and Gas Life Cycle Activities and Hypothetical Scenarios Report; Environmental Setting and Review of Potential Effects of Oil and Gas Activities Report; Feedback on the two (2) reports received through the public commenting period; baseline Inuit Qaujimagatuqangit collected by the QIA; and information on Inuit harvesting activities and food security
September 27-October 7, 2018; October 29-November 8, 2018	NIRB	Round 3 Public Engagement Meetings: Preliminary Findings	Accompanied by CIRNAC, NTI, QIA, and the GN, afternoon open house and evening sessions conducted in the Qikiqtani communities of Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung
November 15, 2018	Resolute Hunters and Trappers Association (Resolute HTA)	NIRB distribution of the Preliminary Findings Document	Comments submitted on the process undertaken for the SEA, the Preliminary Findings Report, and the potential for offshore oil and gas in the region
November 22, 2018	NIRB	NIRB distribution of the Preliminary Findings Document	The NIRB responded to comments from the Resolute HTA on the process undertaken for the SEA, the Preliminary Findings Report, and the potential for offshore oil and gas in the region

Date	Party	Process Step	Notes
December 11, 2018	Nangamautaq (Clyde River) Hunters and Trappers Organization	NIRB distribution of the Preliminary Findings Document	Comments submitted on the process and documents produced for the SEA
December 19, 2018	NIRB	Notice of Final Public Meeting, <i>Draft</i> Agenda, Intervenor Application Deadline, and Invitation to provide Final Written Submissions circulated for public response	
December 20, 2018	NIRB	Information Requests issued	NIRB contacted the following parties to provide specific information: Makivik Corporation, Nunavik Marine Region Impact Review Board, Nunatsiavut Government, Nunavut Wildlife Management Board, Baffin Fisheries, Arctic Fishery Alliance (AFA), Torngat Wildlife, Plants & Fisheries Secretariat, CCG, and the CAPP
December 21, 2018	NIRB	Request to local organizations regarding selection of community representatives sent	NIRB contacted the hunters and trappers organizations (HTO), Hamlets, and QIA in in the Qikiqtani communities of Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung.
January 7, 2019	NIRB	NIRB distribution of the Preliminary Findings Document	NIRB responded to comments from the Nangmautaq (Clyde River) HTO submitted on the process and documents produced for the SEA
January 25, 2019	Parties	Intervenor applications received	Intervenor applications received from: NRCan, PC, TC, CAPP, Oceans North, WWF, Ikajutit (Arctic Bay) HTO, Nangmautaq (Clyde River) HTO
January 25, 2019	QIA	Reports submitted	The QIA submitted two (2) reports in support of the SEA
January 25, 2019	AFA	Response information to request received	Submission of correspondence responding to the NIRB's Information Request issued

Date	Party	Process Step	Notes
January 30, 2019	NIRB	Intervenor status granted	Intervenor status granted to NEB, NRCan, PC, TC, Oceans North, WWF, Ikajutit Arctic Bay HTO, CAPP, Nangmoutaq Clyde River HTO, and Mittimatalik (Pond Inlet) HTO. Intervenor status automatically granted to members of the SEA working group and potential regulators.
February 15, 2019	NIRB	Distribution of Final Agenda for the Final Public Meeting	
February 25 – March 18, 2019	Parties	Receipt of Final Written Submissions	Submissions received from NTI, QIA, NWMB, GN, CIRNAC, DFO, ECCC, NRCan, PC, TC, CAPP, Oceans North, WWF, Ministry of Fisheries, Hunting and Agriculture – Government of Greenland, QWB, Ikajutit (Arctic Bay) HTO, and Mittimatalik (Pond Inlet) HTO
March 6, 2019	NIRB	Revised Final Agenda for Final Public Meeting posted to the Public Registry	
March 17, 2019	NIRB	Community Information Session	Afternoon community information session conducted in Iqaluit for community representatives and interested members of the community
March 18-22, 2019	NIRB	Final Public Meeting held in Iqaluit	Technical session and Community Roundtable held over five (5) days, including two (2) evening sessions
March 29, 2019	NFA	Final Written Submission Received	Submission received from the Nunavut Fisheries Association (NFA). The Record of Proceedings was kept open for the NFA's submission
March 29, 2019	NIRB	The Final Public Meeting Record closed	In response to a request from the NFA, the Board kept the Record of Proceedings solely for the receipt of a comment submission from the NFA to be considered by the Board
May 21, 2019	NIRB	Request for extension to SEA timeline	Request to CIRNAC to extend the extended SEA timeline and delivery of Final SEA

Date	Party	Process Step	Notes
			Report and Recommendations to ensure significant contributions by participants is reflected
June 3, 2019	CIRNAC	Granting of request for extension to SEA timeline	Extension of deadline for the Board's Final SEA Report to be submitted to the Minister to July, 2019

2.9. TREATMENT OF INUIT QAUJIMAJATUQANGIT AND INUIT QAUJIMANINGIT

In the Minister's referral of the SEA to the NIRB, Inuit Qaujimajatuqangit was highlighted as an essential component of the SEA:

We understand that the Strategic Environmental Assessment will rely on both traditional knowledge and scientific information to consider potential interactions of oil and gas activities with the natural and social environment in the region. We have heard, and we agree, that Inuit Qaujimajatuqangit is an essential component of strategic considerations related to long-term sustainable resource development and conservation planning in the region. We request that the Nunavut Impact Review Board integrate Inuit Qaujimajatuqangit work conducted by the Qikiqtani Inuit Association, as well as provide opportunities for all stakeholders, with a strong emphasis on meaningful community engagement, to ask questions, share concerns, and present observations and research to inform recommendations, as the Board would in its project-specific environmental assessments.

...one of the goals we had as committee members [was] how can we use Inuit Qaujimajatuqangit when it comes to oil and gas and that has never been done before ... we're just getting started here... we haven't heard all the rules related to wildlife knowledge from the Inuit.

The Inuit Qaujimajatuqangit is valuable. How can we use this in this area? This is a good question to ask ourselves...

[L. Kooneeliusie, Qikiqtarjuaq, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 817-818, lines 11-14, 22, 25-26 and 1-4.]

This expectation reflects the NIRB's previous approach to project-specific assessments, in that the NIRB has required Inuit Qaujimajatuqangit and Inuit Qaujimaningit²¹ to inform the impact assessment statement prepared by the proponent of a specific project. However, based on the initial guidance from communities, the QIA, other members of the Working Group, and participants in the SEA, it became apparent that the Board's existing processes for gathering and sharing such knowledge needed to be supplemented to reflect the central importance of Inuit Qaujimajatuqangit and Inuit Qaujimajangit, Inuit practices, principles, priorities and

²¹ The term "Inuit Qaujimajatuqangit" is used by the Board in the report to denote a morality that is the base for Inuit existence. It is the belief system at the core of Inuit identity and governs Inuit society. The Board uses the term "Inuit Qaujimaningit" to describe what Inuit know and a collective knowledge that is more recent in nature. It can be related to Inuit Qaujimajatuqangit that has evolved or changed in recent times. For many participants in the SEA the term "Inuit Qaujimajatuqangit" is used to describe both aspects of Inuit knowledge.

viewpoints in this assessment. As noted in the *QIA Inuit Qaujimajatuqangit Report*, Inuit Qaujimajatuqangit and Inuit Qaujimaningit is not information that can be understood in isolation from its context or separated from the holders of this knowledge, and so the NIRB modified the SEA process to provide as many opportunities as possible (given logistical and resource constraints) to hear directly from the region's many knowledge holders.

Consequently, the NIRB conducted extensive community engagement sessions in the 10 interested communities of Grise Fiord, Resolute, Arctic Bay, Pond Inlet, Clyde River, Qikiqtarjuaq, Pangnirtung, Iqaluit, Cape Dorset, and Kimmirut, from the scoping through to Final Public Meeting stages of the SEA. In addition, the QIA gathered existing and new Inuit Qaujimajatuqangit and Inuit Qaujimaningit from the six communities nearest to the Baffin Bay and Davis Strait, Ikpiarjuk (Arctic Bay), Mittimatalik (Pond Inlet), Pangnirtung, Qikiqtarjuaq, Kangiatugaapik (Clyde River) and Grise Fiord (Ausuiktuq) and shared this knowledge with the participants in the SEA in the form of the *Inuit Qaujimajatuqangit Report* and *Food Security Report* and the QIA's presentation regarding this work provided during the Final Public Meeting.

The NIRB acknowledges the concern of the QIA and of the knowledge holders who shared Inuit Qaujimajatuqangit and Inuit Qaujimaningit with the Board during the SEA that the information provided is deeply personal, holistic and should not be "segmented to fit a process". This guidance has informed the Board's approach to considering and relying on the Inuit Qaujimajatuqangit and Inuit Qaujimaningit gathered and shared to inform the SEA.

As emphasized throughout the report, Inuit Qaujimajatuqangit and Inuit Qaujimaningit shared emphasized the importance of the marine environment to Inuit in the region as a "life source"; essential to sustaining the well-being of Inuit physically, emotionally and culturally.

Consequently, the Inuit Qaujimajatuqangit and Inuit Qaujimaningit shared with the Board during the SEA provides a foundation for more than 25 of the NIRB's approximately 80 recommendations. Although the detail of these recommendations is discussed the relevant topic areas elsewhere in the Report, and provided in Volume 3, Chapter 10: Summary of Recommendations, Inuit Qaujimajatuqangit and Inuit Qaujimaningit was central to the development of the Board's views and recommendations in Recommendations #2, #3, #6, #10 #16, #20, #21, #51, #61, #64, #66, #67 and #79, which involve:

- understanding existing environmental and socio-economic conditions in the region;
- assessing the potential for positive and negative changes to the environmental and socio-economic conditions in the region to occur if oil and gas development activities were allowed to proceed in Baffin Bay and Davis Strait; and
- understanding the extent to which communities may find the potential for changes to the environmental and socio-economic conditions in the region from oil and gas development activities to be acceptable.

In addition, the Board has made several specific recommendations to ensure that Inuit Qaujimajatuqangit, Inuit Qaujimaningit and Inuit priorities, principles, and worldviews are central to future strategic and project-specific assessments. These recommendations include suggestions to modify regulatory processes and structures so that regulators are better able to seek out and understand this information in context and in consultation with knowledge holders

(Recommendations #2, #3, #6). The Board has also recommended that an Inuit-led process be developed to establish an accessible central holding place in Nunavut to house Inuit Qaujimajatuqangit and Inuit Qaujimaningit studies gathered and shared during these processes (Recommendation #12). Building on the work conducted by the QIA during the SEA, the Board has also recommended that support be provided for QIA to continue research into the importance of harvesting to food security, the costs of harvesting, and the importance of country food sharing in communities (Recommendation #67).

As the Board's role in the current SEA ends, the Board intends to build on its approach to considering Inuit Qaujimajatuqangit and Inuit Qaujimaningit in future SEAs, and in any future project-specific impact assessments of proposed oil and gas development projects in the region. Although there continue to be challenges and barriers to reconciling, in meaningful ways, scientific knowledge with Inuit Qaujimajatuqangit and Inuit Qaujimaningit, the Board believes that the SEA provides an important example of the kinds of inclusive and collaborative approaches that can further this goal.

2.10. UNCERTAINTY AND THE PRECAUTIONARY PRINCIPLE

Throughout the SEA, the Board has heard from potentially affected communities, intervenors, regulators, and members of the public that although a great deal of information has been collected to support the Board's assessment, considerable uncertainty remains with respect to issues such as the:

- type, timing, and general location of oil and gas development that is likely to be feasible in the Region;
- existing baseline conditions in the Region;
- predicted effects of climate change in the Region;
- predicted effects of oil and gas development on the marine wildlife and the marine environment in the Region; and
- predicted socio-economic effects, including uncertainty regarding the benefits that are likely to accrue to the communities most likely to be affected in the Region, Nunavummiut, and Canadians in general.

The Board recognizes that the unique structure and prospective nature of strategic assessments, including not having a specific project proposed by a given proponent of a specified duration in a defined area, means that this type of assessment will be characterized by higher levels of uncertainty compared to project-specific assessments. To manage this uncertainty, while still fulfilling the NIRB's assessment obligations within the scope of the SEA, the Board has been guided by the "precautionary principle".

As noted in the Board's previous project-specific assessments, when conducting a project-specific impact assessment/Review the Board has adopted the description of the precautionary principle as found in Principle 15 of the Rio Declaration on Environment and Development (1992): "Where there are threats of serious or irreversible damage, lack of full scientific certainty *shall not be used*

as a reason for postponing cost-effective measures to prevent environmental degradation” [emphasis added].²² This notion of the precautionary principle has been relied upon by the Board to engage in environmental decision-making that reflects the potential for adverse environmental impacts, even though the risk of such impacts cannot be definitively proven.

The reliance on the precautionary principle and associated adaptive management to address uncertainty with respect to the potential for environmental harm is becoming well-accepted practice within Canada and has been characterized as an emerging international norm in environmental impact assessment and environmental regulatory decision-making.²³ With respect to the marine environment in particular, the Federal Department of Fisheries and Oceans Canada (DFO) expressly recognizes the precautionary principle as a guiding principle in DFO’s planning and management of Marine Protected Areas.²⁴

Building upon this fairly accepted and standard notion of the precautionary principle, and recognizing that strategic assessments similar to the SEA typically have a higher level of uncertainty than project-specific assessments, it has been argued in previous Canadian strategic assessments that the form of the precautionary principle that should be implemented in these types of assessments should essentially consist of “erring on the side of caution”, as follows:

*Many presenters invoked this principle, and argued that it was preferable to err on the side of caution and extend the moratorium, in the face of a lack of definitive scientific information proving that petroleum activities would cause no harm to the biodiversity, productivity, and fisheries of Georges.*²⁵

Throughout the SEA, the Board heard a very similar sentiment from community participants:

Let's think about the environment because it's tangible. The marine areas are more important. ...we need to ensure that there are...no impacts to the marine areas. I think we should say no to development right now in regards to oil and gas development. And I think for those of us sitting around here I hear more people saying no. Let's not hurry...Lastly, I think we should work slowly. I know there's probably things that we should understand more...²⁶

The Board notes that the application of this “erring on the side of caution” version of the precautionary principle has often provided the foundation for implementing or maintaining a moratorium for specific industrial activities until the necessary baseline, traditional, and scientific knowledge has been provided to regulators to demonstrate that the specified activities can be

²² UN (United Nations). 1972. *Rio declaration on environment and development*. In: Report of the United Nations Conference on the Human Environment, Stockholm, pp. 5-16.

²³ *114957 Canada Ltée (Spraytech, Société d'arrosage) v. Hudson (Town)*, [2001] 2 SCR 241, 2001 SCC 40 (CanLII), <http://canlii.ca/t/51zx> at para. 31; and *Morton v. Canada (Fisheries and Oceans)*, 2015 FC 575 (CanLII), <http://canlii.ca/t/ghjfq> at paras 41-43.

²⁴ <http://dfo-mpo.gc.ca/oceans/networks-reseaux/principles-principes-eng.html>.

²⁵ Natural Resources Canada and Nova Scotia Petroleum Directorate, *Georges Bank Review Panel Report* (Halifax: 1999) available on-line at: <https://www.cnsopb.ns.ca/pdfs/georgesbankreport.pdf> at p. 52.

²⁶ L. Ningiuk, *Grise Fiord*, NIRB Final Public Meeting File No. 17SN034, Transcript, March 21, 2019, p. 816, lines 11-21.

conducted in a manner that would cause no harm.²⁷ In the case of the SEA specifically, the Board agrees that given both the uncertainty regarding the scope and nature of the oil and gas developments that may reasonably be proposed for the Region in the future, significant gaps in baseline data (including Inuit Qaujimajatuqangit) for the Region, and uncertainty regarding the potential for both positive and negative effects, it is appropriate, and arguably critical for the Board to adopt an “err on the side of caution” approach to this assessment.

In practice, applying this notion of precaution to the SEA has resulted in the Board paying particular attention to:

- Identifying information gaps and research priorities for baseline and effects assessment to address information deficiencies that prevent the Board from being confident that the risks of potential adverse ecosystemic and socio-economic effects can be adequately understood and/or mitigated based on the current state of technical knowledge and Inuit Qaujimajatuqangit for the Region;
- Considering, in an equally precautionary manner, the assessment of the “no future development alternative scenario” (i.e., the moratorium stays in place); and
- Ensuring that Inuit Qaujimajatuqangit and community knowledge is considered in a fulsome way that is consistent with the precautionary principle of not requiring “certainty” to establish the potential for harm to ecosystemic components such as the marine environment and socio-economic components such as culture, food security, land use, and Inuit rights such as harvesting and self-determination.

2.11. COMMUNITY AND PUBLIC ENGAGEMENT

2.11.1 *Background*

A central focus of the SEA was to provide multiple opportunities for the public to become engaged and provide questions, comments, and knowledge for consideration by the NIRB and parties. As demonstrated throughout this report, a broad range of questions, input, community knowledge, and Inuit Qaujimajatuqangit and Inuit Qaujimaningit was freely shared with the Board throughout the assessment. Public feedback and information provided not only informed the SEA process, but significantly contributed to the scope of the assessment and played a central role in the Board’s identification of information gaps and understanding of the environment of the Area of Focus and the concerns and priorities of its communities. The NIRB’s public engagement strategy for the SEA was focused on ensuring transparency and providing many opportunities for members of the public to provide input into the process through interactive public engagement sessions, written submissions, and the final public meeting. During each phase of the SEA, the NIRB held public engagement sessions in each of the 10 potentially interested communities – Grise Fiord, Resolute, Arctic Bay, Pond Inlet, Clyde River, Qikiqtarjuaq, Pangnirtung, Iqaluit, Cape Dorset and Kimmirut – and provided the following opportunities for written comments:

²⁷ For example, see S. Phillips and M. Goldberg, “*Natural Gas Development: Extracting Externalities – Towards Precaution-Based Decision-Making*”(2013) 8:2 McGill Journal of Sustainable Development Law, p. 151, available in-line at: <https://www.mcgill.ca/mjsdl/journalonline/volume-82-2013>.

- Phase 1: SEA Scope List;
- Phase 2: NS documents;
- Phase 3: SEA Final Public Meeting Agenda and Final Written Submissions.²⁸

The NIRB created a distribution list specific to the SEA that included:

- Community organizations, including the hamlets and hunters and trappers' organizations, within the 10 potentially interested communities;
- Designated Inuit Organizations;
- Territorial and federal government departments and agencies;
- Transboundary organizations and governments;
- Professional associations;
- Non-governmental organizations; and
- Individuals.

As noted in the sections that follow, the SEA provided extensive opportunities for engagement in the 10 targeted Nunavut communities. Despite this, the Board heard from some community members during community meetings and at the Final Public Meeting that this engagement often felt rushed and some participants would have preferred to have more time to consider information fully before moving to the next step in the assessment. While the Board recognizes the challenges faced by community members and sacrifices made to engage with the Board throughout the SEA, the Board is enormously grateful to all who gave generously of their time and shared their views, knowledge, experiences and stories with the Board. The SEA was shaped by the important contributions of all who participated in whatever form.

The Board acknowledges that there were significant challenges in ensuring communities could participate as fully in the SEA as they wished within the constraints of time and resources available to both communities and the Board, including: the importance of the SEA; the technical nature of some of the information; the absence of participant funding; the significant knowledge gaps about the oil and gas industry and the marine environment in general; and uncertainty regarding effects and benefits associated with the potential for oil and gas development in the region. The SEA once again emphasized to the Board that a participant funding program is critical to supporting the capacity of communities and would greatly advance community participation in any future SEA or project-specific assessment by ensuring communities have the financial resources to compensate knowledge holders, to retain internal and external consultants as considered necessary and to support the preparation and presentation of submissions to the Board. For additional detail on the Board's public engagement for the SEA, see Volume 3, Appendix E: Public Engagement Events and Opportunities.

²⁸ The NIRB considered feedback provided throughout the SEA process.

2.11.2 *Views of Interested Parties*

Within its final written submissions, the Government of Nunavut (GN) recommended that after release of the Board’s Final SEA Report, the Government of Canada should commission additional outreach to better equip communities to engage in the five (5) year review of the current offshore moratorium and subsequent development of the regulatory, policy, and management regime for the industry. The GN recommended that such outreach should be designed in collaboration with the GN, Inuit organizations, and Nunavut communities potentially affected by oil and gas activities. It was noted that sufficient time, resources and funding for communities to review documents prior to meetings must be made available. The GN further recommended that the government of Canada, the GN, and Inuit organizations collaborate to create a “cultural awareness program” for future proponents.

Free, Prior, Informed Consent (FPIC) of Indigenous People

Free: Consent must be free of manipulation or coercion and be the result of a self-directed process that reflects those affected by a project.

Prior: Consent must be sought in advance of activities being authorized or commencing and be sought with sufficient time for communities to review information and get responses to questions.

Informed: Satisfactory information on the key points of the project must be provided (e.g. scope, nature, size, pace, duration, reversibility, need for and alternatives to the project).

Consent: Decision-making must be based on the pillars of meaningful participation and consultation with Indigenous People affected by the project.

[Note: FPIC is not expressly defined in the *UN Declaration on the Rights of Indigenous Peoples, UN General Assembly, (2007)*, but the concepts are established in FPIC requirements in Articles 19 and 32].

Greenpeace Canada discussed community consent in its public written comments, and recommended that the SEA discuss how the United Nations Declaration on the Rights of Indigenous Peoples would be reflected in offshore oil and gas development projects, and how community consultations and consent would be respected.

Within its final written submissions, Oceans North Canada indicated that the “question of oil and gas in Baffin Bay and Davis Strait should first be answered by the communities most affected by such development”. It was noted that for these discussions to take place, key information must be made available before communities can reach informed conclusions. Attached to the submission was a summary of the history of Inuit responses to proposed offshore oil and gas activities within the Area of Focus, spanning more than thirty (30) years. The summary identified a long history of Inuit opposition to seismic and exploratory drilling programs in the Area of Focus. The submission urged the NIRB to acknowledge and be aware of these past responses to oil and gas development during the SEA. The recommendations with respect to community and public engagement focused on ensuring

that regulatory processes ensure Free, Prior, Informed Consent and socio-economic participation of Inuit, particularly in the communities most likely to be affected by oil and gas development in the region.

In the final written submissions of the Ikajutit (Arctic Bay) Hunters and Trappers Organization (Ikajutit HTO), it was identified that given the complexity, length, and technical nature of much of the information generated during the SEA, such as the NIRB's Preliminary Findings Report and Development Scenarios Report, the Ikajutit HTO did not feel they had sufficient time to review information and adequately prepare for the associated engagement sessions. These concerns were also echoed by the Resolute Bay Hunters and Trappers Association in its final written submissions.

Within its final written submission, the World Wildlife Fund (WWF) cited similar concerns indicating that the receipt of complex documents that are not easily understood and lengthy is insufficient to ensure communities, stakeholders, and other rights holders are sufficiently informed about the issues. Consequently, the WWF recommended that additional assistance is required to engage with rights holders and stakeholders, such as preparing one-page summaries on specific topics. In addition, the WWF noted that the basis for the NIRB's conclusions and findings in respect of the SEA process must be clearly communicated to communities.

Similarly, the final written submission of the Qikiqtaaluk Wildlife Board (QWB) emphasized the "necessity of meaningful consultation with HTO boards and communities at every stage of any environmental assessment process." The QWB also noted that in order to ensure HTOs can participate effectively, financial support and adequate review time is required to facilitate the review of technical submissions, to prepare responses, and to highlight concerns and opportunities. It was further noted that engagement on transboundary issues must also be considered, not just with affected groups in Greenland, but also other adjacent areas such as Nunavik and Nunastivut. The QWB recommended that there must be sufficient technical, legal, and administrative support provided to all HTOs in future assessments so that they can "fully participate in the NIRB process, the full range of future IPG processes, and in support of direct engagement with research on oil and gas, as well as interaction with such companies in the future."

In the statement of the Nangmoutaq (Clyde River) HTO (read into the record at the Final Public Meeting) the NIRB was also urged to recognize the importance of ensuring future decisions about oil and gas development in the Area of Focus are the result of Free, Prior, and Informed Consent, as follows:

Regarding free, prior, and informed consent. The HTO recognizes that oil and gas is a very controversial issue in the Qikiqtani region. The HTO believes it should not be allowed unless Qikiqtani Inuit consent to it, and that all parties must respect the Inuit value of consensus decision-making; and, therefore, all communities in the region should give consent to oil and gas through community plebiscites.²⁹

During the Final Public Meeting, many Community Representatives discussed the importance of being included in the SEA process. For example, a Community Representative from Cape Dorset noted that "...I'm happy to be here and brought here to the meeting because I'm going to be affected -- be the first to be affected. And, also, at the same time the seismic if that should happen,

²⁹ J. Price, Qikiqtaaluk Wildlife Board on behalf of the Nangmoutaq (Clyde River) HTO, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 789, lines 12-19.

I will be affected by that because our sea mammals eat the species down there, and I'm affected by that".³⁰

Throughout the SEA and during the Final Public Meeting, the NIRB heard about the lack of capacity in the communities to participate in technical assessments, including the SEA:

Our HTO does not have the capacity to review and comment on almost 700 pages of technical documents and this has been an impediment to the meaningful engagement of our community (Resolute HTA, 2019).

Complex documents. Our HTO does not have the capacity to review and comment on almost 700 pages of technical documents, and this has been epitome to the meaningful engage of our community.³¹

I wish we could have the same types of structures or organizations, and we need better administration and administration costs.³²

2.11.3 Views of the Board

As with the Board's previous assessments, the NIRB notes the absence of a stable, predictable, and adequate participant funding program within Nunavut. As such, engagement with rights holders and stakeholders in the communities and also potentially affected transboundary stakeholders can be limited, fragmented, and can require significant financial and person sacrifices of the organizations and individuals who "self-fund" their participation. While the Board recognizes that the participation of some participants benefitted from receiving essential technical, administrative, or financial support from others, such as the Qikiqtani Inuit Association, the World Wildlife Fund, Oceans North Canada, etc., the Board notes that these avenues of support should not be a substitute for the establishment of a reliable participant funding regime.

With respect to concerns and criticisms of the Board's engagement for the SEA, particularly when the NIRB went into communities to discuss the Development Scenarios Report and the NIRB and QIA's Preliminary Findings Report in October 2018, the Board noted at the Final Public Meeting that there may have been miscommunication about the purpose of those meetings. As summarized by the NIRB staff:

...the purpose of those communities [sic visits] in October were to share the preliminary findings report. So we weren't expecting that communities would be familiar with it in advance. We were there to share the information, explain it, and help communities prepare and think about that information in advance of this public meeting.

³⁰ A. Nuna, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 862, lines 8-13.

³¹ J. Kiguktak, Arctic Bay Presenting on Behalf of the Arctic Bay () HTO, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 741, lines 6-9.

³² B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p.778, lines 8-10.

*So that's where I think there was miscommunication. We weren't in the communities saying, here's a report we released a week ago. It's 100 pages, and we'd like your feedback on it right now. That wouldn't have been appropriate. What we were trying to do was help the communities prepare for this meeting by creating that report with the Qikiqtani Inuit Association about what communities told us is important to hear about.*³³

Following the public engagement sessions in the fall of 2018, the Board recognized the importance of returning to the 10 communities in the Area of Focus to present the Board's findings, recommendations, and conclusions as contained in the Final SEA Report. Reflecting the importance of this step, the Board modified the Board's budgets, timelines, and associated SEA work plan to add in these additional engagement steps. The Board appreciates the feedback of all participants who indicated that translated documentation in plain language, presented in a variety of formats and media is central to ensuring that all participants are understood and able to contribute fully to this assessment.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to community and public engagement, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing consultation, coordination, and public engagement:

Recommendations to address prior to lifting the moratorium:

- Timely, predictable and adequate participant funding should be provided for all future Strategic Environmental Assessments and project-specific assessments to facilitate active participation by Nunavut communities, Inuit organizations, local hunters and trappers organizations, interested individuals and other interested groups (#6); and
- In consultation with communities, relevant regulatory authorities should prepare community "toolkit" materials in plain language and general terms, which support community members becoming involved in research conducted in the Area of Focus and in the regulatory and marine planning processes associated with potential future oil and gas development in the Area of Focus (#8).

³³ R. Barry, NIRB Staff, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 747, lines 2-17.

CHAPTER 3: HISTORY OF OIL AND GAS ACTIVITIES

This chapter provides information on oil and gas activities undertaken within Eastern Nunavut, with a focus on Baffin Bay and Davis Strait, as well as in other Arctic jurisdictions. The proceeding sections provide a summary of relevant information available in the *Oil and Gas Hypothetical Scenarios Report*. Supplementary information provided by parties and considered by the Board has further been provided.

3.1. BACKGROUND AND HISTORY OF OIL AND GAS ACTIVITIES IN NUNAVUT

This section summarizes oil and gas activities that have occurred in the past within the Area of Focus in Baffin Bay and Davis Strait (Figure 2) as described in Section 2: Background and History of Oil and Gas in Baffin Bay and Davis Strait of the *Oil and Gas Hypothetical Scenarios Report*.

Nunavut has had a long history of oil and gas exploration and some limited production has occurred in the high Arctic Islands of the Sverdrup Basin. The first comprehensive field study was undertaken in the Sverdrup Basin in 1954, and after field studies – including seismic surveys – throughout the 1960s and 1970s a series of discoveries were made by the Panarctic Oil Consortium. These discoveries included the Drake and Hecla gas fields on Melville Island and the Bent Horn oil field on Cameron Island. By 1996, drilling ceased due to plummeting petroleum prices and Panarctic Oil operations were shut down. Over a 25-year period 176 wells were drilled in the Arctic islands, along with approximately 80,000 kilometres (km) of onshore and offshore two dimensional (2D) seismic surveys. There were 18 significant discoveries totaling 2 billion barrels of oil and 26 trillion cubic feet (TCF) of natural gas identified. There were 112 onshore and 36 offshore wells drilled in the Nunavut Arctic Islands.³⁴

By comparison, the eastern Arctic region of Nunavut, the focus of this SEA, has had a much smaller level of interest and activity. The earliest data of the geology of the seafloor were collected in Davis Strait and the northern Labrador Shelf in 1969. Approximately 30,000 km of 2D marine seismic surveys were shot in Baffin Bay and Davis Strait in the 1970s, mostly in Davis Strait. However, no wells were drilled in Lancaster Sound Basin and a moratorium was put in place in 1978 for that area. The earlier marine seismic data collected throughout the Canadian waters of Baffin Bay and Davis Strait have not been considered of sufficient quality or quantity to accurately map potential hydrocarbon prospects or identify promising drilling locations (although a Significant Discovery Licence was granted). Inuit in the Area of Focus have expressed significant questions and concerns about the potential for seismic activities to cause adverse and lasting effects on marine mammals, marine fish, and birds that, to date, have remained largely unaddressed. This was recently illustrated by the legal action brought by the community of Clyde River (as represented by the Hamlet and the Nammautaq Hunters and Trappers Organization)³⁵ in opposition to the 2014 NEB approval of a seismic survey program in search of oil reserves in Baffin Bay and Davis Strait. As the Board heard throughout the SEA, in both community sessions and during the

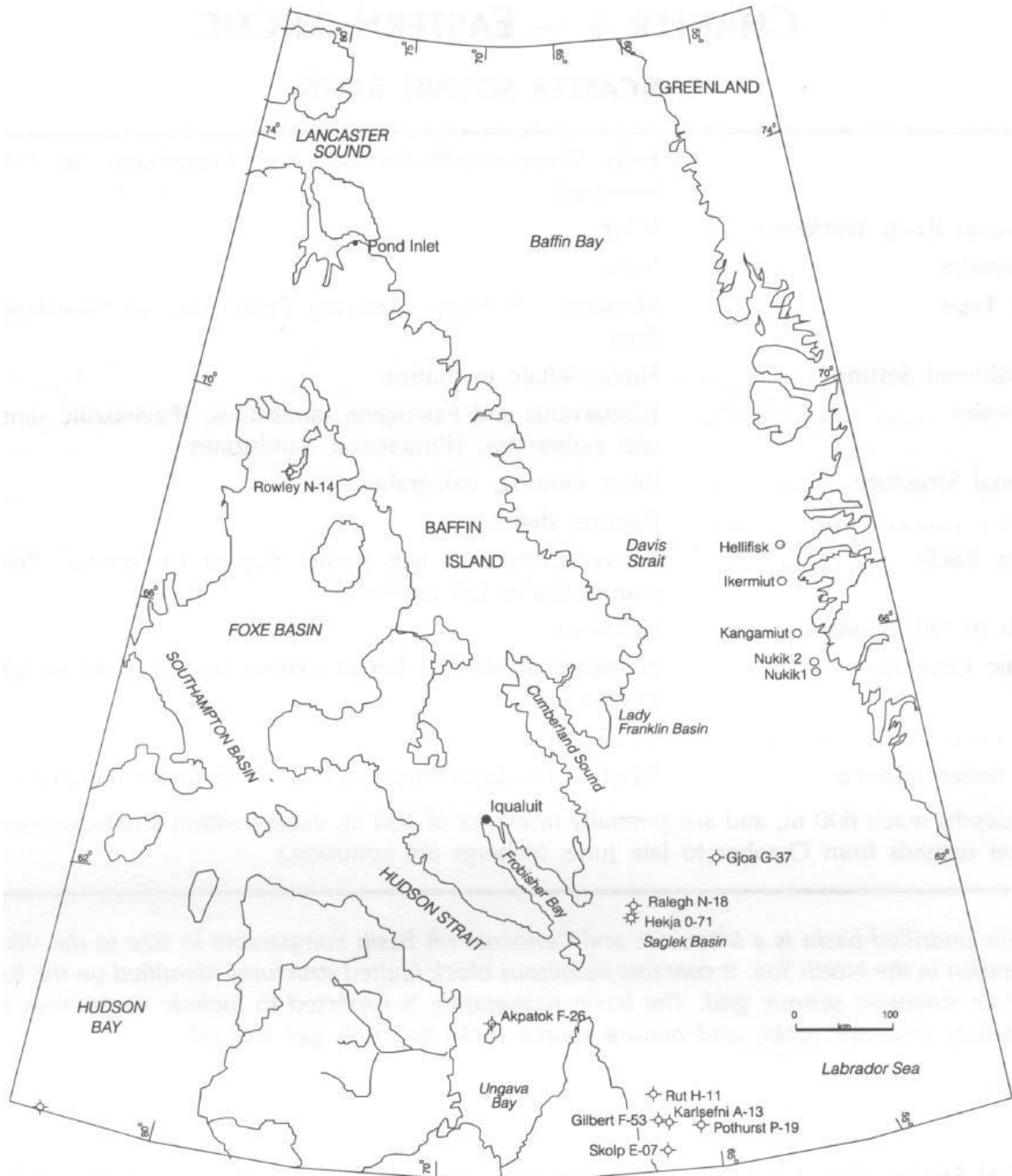
³⁴ C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 661, lines 19-22.

³⁵ *Clyde River (Hamlet) v. Petroleum Geo-Services Inc.*, 2017 SCC 40

Final Public Meeting, these questions and concerns are not confined to Clyde River, and community members throughout the region have consistently expressed serious concerns that the potential for effects on marine wildlife from seismic programs would in turn adversely affect opportunities to harvest marine wildlife to provide food and other economic opportunities.

No wells have been drilled in the Canadian waters of Baffin Bay. Three (3) wells were drilled in the Canadian waters of Davis Strait in the Saglek Basin in the early 1980s (see Figure 6: Drillwell Locations in Davis Strait (Source: Morrell et al., 1995; from Nunami Stantec, 2018b)). Two (2) of the wells were dry and one (1), the Hekja O-71 well, discovered natural gas. Although a Significant Discovery Licence was granted, the potential volumes of natural gas identified were not considered commercially viable at the time. Within its public comments on the *Oil and Gas Hypothetical Scenarios Report*, the NEB provided information from a frontier database search and noted that 234 geophysical programs have been completed in Baffin Bay and Davis Strait, including seismic surveys, processing and interpretation of existing seismic data, seismic survey reports, side sonar surveys, aeromagnetic surveys, wellsite surveys, and environmental studies.

Figure 6: Drillwell Locations in Davis Strait (Source: Morrell et al., 1995; from Nunami Stantec, 2018b)³⁶



³⁶ Place names are not up to date and do not include all Qikiqtani communities. In addition, Iqaluit is spelled incorrectly. Figure 6 has been included to provide a visual of the location of past drilling locations, particularly with regards to the Hekja well, which has formed the basis of multiple parties' positions.

3.1.1 *Known Oil and Gas Reserves*

This section summarizes the known oil and gas reserves in the Development Scenarios Area in Baffin Bay and Davis Strait (Figure 1) as described in Section 2 of the *Oil and Gas Hypothetical Scenarios Report*.

Cretaceous and Paleocene shales (mapped by the Geological Survey of Canada) are possible source rocks for potential oil and gas and occur along the narrow east Baffin Island shelf and to the east along the much broader West Greenland shelf. Based on the absence of a thick sedimentary basin required for hydrocarbons to accumulate along Baffin Island (with the exception of Lancaster Sound³⁷), and poor results from exploration drilling in the Greenland portion of Baffin Bay, Nunami Stantec noted that future interest could be focused more on the southern portion of Davis Strait (Saglek Basin) rather than further north into Baffin Bay.

Natural subsea oil seeps along the coast of Baffin Island show surface oiling at several locations, such as Scott Inlet. Additional information on the oil seeps is available in [5.1.1.10 Naturally Occurring Oil Seeps](#).

Estimating potential hydrocarbon for the region is difficult to predict with the limited seismic, drilling, and field data collected to date. While there are multiple estimates of the potential reserves in the area, the ultimate volumes for oil-in-place and recoverable in the Baffin Bay and Davis Strait is approximately two (2) billion barrels in place and at least 500 million recoverable barrels. Estimates for gas are approximately 15 TCF in place and 10 TCF recoverable.³⁸

Past exploration has identified the following factors which may influence future interest in the region:

- Sedimentary basins with oil and gas potential underlying Baffin Bay and Davis Strait are largely unexplored;
- Potential recoverable volumes appear fairly small (Nunami Stantec noted that future seismic data and drilling on the West Greenland Shelf along the Canadian Labrador Shelf, if conducted, might change this outlook);
- There appears to be more gas than oil in the region; and
- Future exploration activities in the Saglek Basin on the southwest Greenland and on the Labrador Shelf could change the picture. If a discovery was large enough, it could lead to interest in exploring Baffin Bay and Davis Strait further.

³⁷ Activities such as mineral and hydrocarbon exploration and development, and ocean dumping would be prohibited within the boundaries of the proposed Tallurutiup Imanga (Lancaster Sound) National Marine Conservation Area.

³⁸ Note: these numbers include the Lancaster Basin, which makes up a significant component of this potential but has been withdrawn from future exploration.

3.1.2 *Oil and Gas Activity in the Arctic*

This section summarizes examples of global offshore exploration and development as described in Sections 5 and 8 of the *Oil and Gas Hypothetical Scenarios Report*. Please refer to these sections for additional information, including examples of different equipment and technologies used. Nunami Stantec noted that there are few examples of recent oil and gas projects in the north due to the costs of development and unknowns regarding the Arctic environment making it difficult to explore or develop oil and gas projects.

Seismic and Exploration

Following approximately 85,000 kilometres (km) of three dimensional (3D) seismic data collected, eight (8) exploratory wells were drilled in West Greenland, starting in 2011. The discovered oil and gas reservoirs appear to have been too small to be commercially attractive to develop under current conditions. It was further identified that most of the licences held have since been relinquished. As noted above, exploration activities were conducted in the Sverdrup Basin in the Nunavut High Arctic Islands during the 1960s and 1970s. Both land and marine seismic data were collected which led the way to developing new technologies and operations.

The Canadian Beaufort Sea was explored after the discovery of oil and gas at Prudhoe Bay Alaska in 1968. Exploration of the Beaufort Sea was conducted until 2005, with a total of 93 exploration wells drilled. There has further been 48 Significant Discovery Licences issued in the Beaufort Sea, although no development or offshore production has occurred from these discoveries.

The Labrador Shelf and Grand Banks region of Eastern Canada also provide examples of exploration and production of oil and gas in the Arctic and in varying ice conditions, as well as the long timelines typically required from discovery to production. Additional details on environmental conditions, equipment used, and timelines are available in the *Oil and Gas Hypothetical Scenarios Report*.

Production

The Bent Horn field on Cameron Island produced approximately three (3) million barrels of crude oil to a surface facility over an 11-year production period. The produced oil was transported to a refinery in Montreal during the ice-free season. Panarctic Oils Ltd. (Panarctic) discovered a major gas field on Melville Island in 1969 and conducted a trial gas flow test during the 1970s on the Drake subsea pipeline at Drake Point, connecting a production well to shore. Rather than being exported, produced gas was used for fuel. Studies are still being conducted on the integrity of the pipeline and the effectiveness of the measures adopted to protect the line against ice.³⁹

Norway has had an active oil and gas exploration and development program in its offshore waters since the 1960s, and more recently interests have been expanded farther north into the Barents Sea, up to the permanent ice pack. It was noted that the Norwegian developments provide examples of the trend towards limiting or avoiding landfall by using Floating Production Storage and Offloading vessels (FPSO) for oil production. In Norwegian waters of the Barents Seas, these

³⁹ K. Landra, National Energy Board, NIRB Final Public Meeting File. 17SN034, Transcript, March 20, 2019, p. 531, lines 1-17.

vessels are currently being used for production for the Goliat project and planned for the Johan Castberg project.

One of the world's largest natural gas fields, which is also an example of a major undeveloped discovery, is the Shtokman field in the Barents Sea. With an estimated 130 trillion cubic feet of gas, development has not begun due to high costs, technical challenges, and the expansion of global supplies. Both use of a Floating Liquefied Natural Gas vessel (FLNG) or pipeline to shore have been considered. The only hydrocarbon production platform on the Arctic shelf is the Pirazlomnaya Oil Platform in the Pechora Sea, which as a gravity-based structure with concrete bases that sits directly on the seafloor. This platform was installed in 2013 and is located 60 kilometres offshore and in 20 metres of water. Sakhalin Island in Russia currently has a shore-based natural gas liquefaction plant and a loading terminal.

The Grand Banks in offshore Newfoundland has been explored since the 1960s and has multiple fields, including: Hibernia, Terra Nova, White Rose, and Hebron fields. Both gravity-based structures as well as FPSOs have been used.

While there are six (6) FLNG vessels in service around the world, there are currently no FLNG facilities in the Arctic.

CHAPTER 4: GOVERNANCE AND LIFECYCLE

4.1. APPLICABLE REGULATORY, ROYALTY, AND BENEFIT REGIMES

4.1.1 *Background*

4.1.1.1. *The Existing Regulatory Regime*

The information provided in this section based on summaries of:

- *Oil and Gas Hypothetical Scenarios Report* provided to the NIRB by Nunami Stantec (Nunami Stantec, 2018b),⁴⁰
- Written submission by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) on the *Oil and Gas Hypothetical Scenarios Report*, response to information request issued by the NIRB, and discussions and the Final Public Meeting; and
- Information provided by the National Energy Board (NEB) during the Final Public Meeting.

There are two (2) main authorities to assess and regulate oil and gas activities within the [Figure 1: Strategic Environmental Assessment Oil and Gas Development Scenarios Area](#) (Source: CIRNAC, 2018a), which is within the Canadian Arctic offshore region outside of the Nunavut Settlement Area (NSA) and is considered an Energy Frontier Area.⁴¹

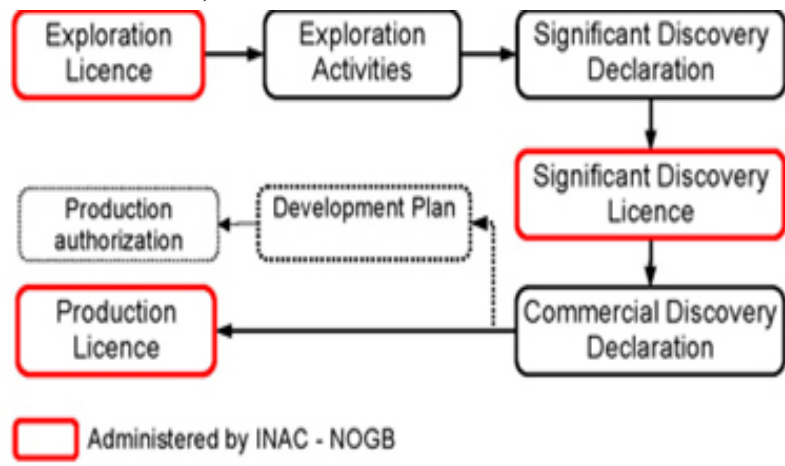
- **Crown-Indigenous Relations and Northern Affairs Canada** – responsible under the *Canada Petroleum Resources Act* for managing oil and gas resources, including: issuing rights to an area; issuing exploration, significant discovery, and production licences if required; and administering Canada Benefit Plans and royalty management.
- **National Energy Board**—responsible for administering *Canada Oil and Gas Operations Act* and its many technical regulations and guidelines and authorizes oil and gas activities. The NEB is the regulator for oil and gas activity for both the onshore and offshore in Nunavut, as well as Crown lands, and has oversight over the lifecycle of project.

The primary regulatory operating framework is outlined in [Figure 7: Summary of Offshore Oil and Gas Primary Regulatory Roles](#) (Source: CIRNAC, n.d.).

⁴⁰ Public Registry ID:

⁴¹ Canada’s energy frontier areas (“lands”) are defined under the *Canada Petroleum Resources Act* and include areas that either belong to the federal government or for which the Government has the right to dispose of or exploit natural resources, including areas in Nunavut or the continental shelf of Canada regulated by CIRNAC and the NEB.

Figure 7: Summary of Offshore Oil and Gas Primary Regulatory Roles (Source: CIRNAC, n.d.)



In addition to the primary regulatory responsibilities of CIRNAC and the NEB with respect to offshore oil and gas developments, there are also multiple regulatory requirements of general application that would also govern aspects of oil and gas development. [Table 5: Overview of Additional Land and Resource Management Roles and Responsibilities](#) provides a summary overview of these additional regulatory requirements that apply within and outside the NSA. This table was developed with input by SEA working group members and refined on the basis of submissions at the Final Public Meeting.

Table 5: Overview of Additional Land and Resource Management Roles and Responsibilities

Resource Management	Inside Nunavut Settlement Area	Outside Nunavut Settlement Area
Economic Benefits	Qikiqtani Inuit Association, Economic Development and Transportation (Government of Nunavut) ^a Crown-Indigenous and Northern Affairs Canada	Crown-Indigenous and Northern Affairs Canada
Environmental assessment	Nunavut Impact Review Board	National Energy Board
Fisheries and Marine Mammals	Nunavut Wildlife Management Board, Hunters and Trappers Organizations, Fisheries and Oceans Canada, Environment (Government of Nunavut) ^b	Nunavut Wildlife Management Board, Fisheries and Oceans Canada
Greenhouse Gases and other Airborne Pollutants	Environment and Climate Change Canada, National Energy Board, Environment (Government of Nunavut) ^b	Environment and Climate Change Canada, National Energy Board
Protected Areas (includes National Marine Conservation Areas, National and Marine Wildlife Areas, and Migratory Bird Sanctuaries)	Fisheries and Oceans Canada, Parks Canada, Environment and Climate Change Canada, Transport Canada	Fisheries and Oceans Canada, Parks Canada, Environment and Climate Change Canada, Crown-Indigenous and Northern Affairs Canada, Transport Canada

Resource Management	Inside Nunavut Settlement Area	Outside Nunavut Settlement Area
Noise	Fisheries and Oceans Canada, National Energy Board, Transport Canada	Fisheries and Oceans Canada, National Energy Board, Transport Canada
Oil and Gas Activities	National Energy Board, Crown-Indigenous and Northern Affairs Canada	National Energy Board, Crown-Indigenous and Northern Affairs Canada
Shipping	Transport Canada, Canadian Coast Guard, Environment and Climate Change Canada	Transport Canada, Canadian Coast Guard, Environment and Climate Change Canada
Accidents/waste/oil spills	Transport Canada, Canadian Coast Guard, National Energy Board, Crown-Indigenous and Northern Affairs Canada, Environment and Climate Change Canada	Transport Canada, Canadian Coast Guard, National Energy Board, Crown-Indigenous and Northern Affairs Canada, Environment and Climate Change Canada
General Policy	Nunavut Marine Council, Nunavut Tunngavik Incorporated, Qikiqtani Inuit Association, Government of Nunavut, National Energy Board, Crown-Indigenous and Northern Affairs Canada, Fisheries and Oceans Canada, Parks Canada, Environment and Climate Change Canada, Transport Canada	Nunavut Marine Council, Government of Nunavut, Nunavut Tunngavik Incorporated, Qikiqtani Inuit Association
Notes:		
a) The GN expressed their interest and desire to be involved in these areas but does not currently have formal regulatory jurisdiction for these areas in the offshore region. b) Interest but no formal jurisdiction.		

During the SEA it was noted that the regulatory roles, responsibilities, and processes related to possible offshore oil and gas development in the Canadian Arctic may be significantly altered by proposed changes to the National Energy Board and to the federal impact assessment regime under Bill C-69,⁴² and modernization of the operational requirements for frontier and offshore oil and gas activities under the *Frontier and Offshore Regulatory Renewal Initiative*. However, recognizing that, at the time of the SEA, the timelines and extent of changes that will be adopted under these initiatives are unclear, it is not feasible for the NIRB to analyze, comment on, or otherwise speculate about the regulatory requirements that may be applicable in future. While the NIRB acknowledges that undoubtedly there will be further regulatory, operational, and procedural changes in the future, rather than attempt to speculate about likely changes, the NIRB has confined the high-level summary that follows to the current CIRNAC and NEB regulatory process framework as applicable to the Development Scenarios. The discussion that follows reviews the

⁴² *An Act to enact the Impact Assessment Act and the Canadian Energy Regulator Act, to amend the Navigation Protection Act and to make consequential amendments to other Acts*, S.C. 2019, c. 28 (received royal assent on June 21, 2019 but not yet proclaimed in force) (referenced throughout this Report as Bill C-69).

current regulations related to the exploration and drilling, production, conservation, processing, and transportation of oil and gas in Canada's frontier and offshore areas.

CIRNAC Regulated Activities Pursuant to the CPRA

Management of Oil and Gas Resources

As set out under the *Canada Petroleum Resources Act (CPRA)*⁴³ CIRNAC has the administrative responsibility for mineral resources and rights in Nunavut waters. Existing processes for allocation of Crown land and water for oil and gas exploration involves a sequential administration of licences that could include a call for bids to an area. While CIRNAC issues Exploration Licences (EL), Significant Discovery Licences (SDL), and Production Licences (PL) to the rights holder under the *CPRA*, CIRNAC does not actually authorize the undertaking of the work required to develop oil and gas resources. Any such activities can only take place when the NEB has decided that the company proposing to conduct the activities has demonstrated it can operate safely, protect the environment, respond in event of emergencies, and manage the oil and gas resources most effectively and efficiently.

The Government of Canada is currently negotiating with the Government of Nunavut (GN) and Nunavut Tunngavik Incorporated (NTI) for the transfer of administrative responsibility for public lands, mineral resources, and rights in Nunavut waters, generally referred to as "devolution". Devolution could also change the royalty and benefits regime currently applicable to the offshore at some future date (CIRNAC, 2018c), but no detail regarding what these changes would involve was available at the time the NIRB conducted the SEA to inform these discussions. Consequently, the NIRB has confined the section that follows to a discussion to the present requirements for benefits and royalties in place under the *CPRA*.

NEB⁴⁴ Regulated Activities Pursuant to the COGOA

As established under the *National Energy Board Act*⁴⁵ and the *Canada Oil and Gas Operations Act (COGOA)*,⁴⁶ the NEB's mandate is to promote and oversee the safety, protection of the environment, and the conservation of Canada's oil and gas resources. The NEB's mandate is further derived from the *CPRA*. The NEB is a quasi-judicial tribunal (a decision-making body with some of the functions of a court, such as the jurisdiction to conduct hearings and elicit evidence) and operates at arms-length from the Federal government. The NEB sets the terms and conditions of any authorized approval and conducts regular field inspections and monitoring of the operator to ensure compliance with all requirements. The NEB has the authority to shut activities down if an operator is not complying with the terms and conditions of their authorization or the applicable regulations and NEB guidelines. Between 2010 and 2011, the NEB conducted a review of offshore drilling in the Arctic, which resulted in the development of the NEB's Filing Requirements for Offshore Drilling in the Canadian Arctic in 2011. These Requirements have been updated since their introduction in 2011 and currently require operators to describe their plans

⁴³ R.S.C. 1985, c. 36 (2nd Supp.).

⁴⁴ Although under Bill C-69 the National Energy Board will be renamed to be the Canadian Energy Regulator and some of the regulatory duties currently handled by the NEB will be handled by various new agencies such as the Canadian Energy Regulator, the Canadian Energy Regulator's Commission and the Canadian Impact Assessment Agency, as Bill C-69 has not yet been proclaimed in force, the Report references the current roles and responsibilities of the NEB.

⁴⁵ R.S.C. 1985, c. N-7.

⁴⁶ R.S.C. 1985, c. O-7.

for ensuring compliance with all regulatory requirements applicable to the Canadian Arctic offshore, including outlining their emergency response procedures and contingency plans. Within the NEB's public written comments, it clarified that these Requirements do not apply to marine seismic survey programs, although specific filing requirements for these types of geophysical programs are anticipated to be developed once the new Framework Regulations from the Frontier and Offshore Regulatory Renewal Initiative come into force. To undertake oil and gas development work, a company would be required to obtain an Operator's Licence for any associated work or activity associated with the first three (3) scenarios (seismic surveys, exploration drilling, and production drilling). If the development involves drilling a well, the NEB also requires the operator to obtain a Well Approval for each well drilled. Please see Section 3 of the *Hypothetical Scenarios Report* for more detail regarding the approvals and associated plans required to be submitted.

Laws of General Application

Under the current federal impact assessment regime under the *Canadian Environmental Assessment Act, 2012*,⁴⁷ the NEB is the responsible authority for assessing the potential environmental impacts of oil and gas developments that are located outside of the Nunavut Settlement Area (NSA), including Baffin Bay and Davis Strait. Although this process is proposed to change under *Bill C-69*,⁴⁸ with a separate new federal Impact Assessment Agency assuming the responsibility for conducting federal assessments, as the timeline associated with the implementation of the changes to the current regime have not been determined at the time of writing this Report, the NIRB has not speculated on the upcoming changes to the existing regulatory structure and has confined the Board's analysis to the current federal impact assessment process.

Consideration of Potential Oil and Gas Development under the *Nunavut Agreement*

The *Nunavut Agreement* also authorizes the NIRB to assess a project proposal located outside the NSA if the proposed project may have significant adverse effects within the NSA. Any such review by the NIRB would also be subject to the requirements of the *Nunavut Planning and Project Assessment Act*.⁴⁹

In addition, the effects of oil and gas development in the marine environment may also be addressed in recommendations made by the Nunavut Marine Council (NMC) if the development could affect parts of Canada's internal waters or territorial sea within the NSA (defined as marine areas under the *Nunavut Agreement*). The NMC is established under Article 15, Section 15.4.1 of the *Nunavut Agreement* and allows for the NIRB, the Nunavut Water Board, the Nunavut Planning Commission, and the Nunavut Wildlife Management Board to act jointly as the NMC, or individually as Institutions of Public Government, to advise and make recommendations to other government agencies regarding the marine areas. The Government (defined under the *Nunavut Agreement* to include the Federal or Territorial Government) is required to consider the NMC's advice and recommendations when making decisions which affect marine areas. The *Nunavut*

⁴⁷ S.C. 2012, c. 19, s. 52.

⁴⁸ *An Act to enact the Impact Assessment Act and the Canadian Energy Regulator Act, to amend the Navigation Protection Act and to make consequential amendments to other Acts*, S.C. 2019, c. 28 (received royal assent on June 21, 2019 but not yet proclaimed in force) (referenced throughout this Report as Bill C-69).

⁴⁹ S.C. 2013, c. 14, s. 2.

Agreement does not place limits on the scope of the NMC’s advisory mandate in relation to marine issues which could be the subject of recommendations to Government by the NMC.

Additional Regulatory Requirements and Considerations

In addition to meeting the specific requirements under the Federal *CPRA* and *COGOA*, a company wishing to develop an oil and gas project in Baffin Bay and Davis Strait would also be required to comply with all other generally applicable Acts and Regulations for operating in the Arctic offshore, including but not limited to:

- Arctic Waters Pollution Prevention Act⁵⁰
- Canada Shipping Act, 2001⁵¹
- Fisheries Act⁵²
- Nunavut Land Claims Agreement Act⁵³
- Oceans Act⁵⁴
- Species at Risk Act⁵⁵

4.1.1.2. *The Existing Royalties and Benefits Regime*

Canada Benefit Plans and Royalty Management

Currently, before any oil and gas activity could take place, a company is required to prepare a Benefits Plan for approval by the Minister of Crown-Indigenous Relations and Northern Affairs. Each Benefits Plan would be specific to a proposed project, and therefore cannot be considered in detail by the Board during the SEA. In general, a Benefits Plan for oil and gas development in the region would be expected to include:

- Conducting early and frequent meetings and communication with northern stakeholders and Indigenous organizations, using a variety of techniques, to share information on potential training, employment and business opportunities;
- Implementing business and procurement processes that maximize northern benefits;
- Supporting opportunities for education and training with sufficient lead time;
- Promoting transferrable skills and succession planning;
- Using a transparent and fair procurement and contract award process;
- Conducting bid requests in a timely manner to support local supplier participation;
- Using best efforts to remove impediments to local supplier participation;
- Consideration of qualified northern indigenous residents and other northern residents for employment and business opportunities;

⁵⁰ R.S.C. 1985, c. A-12.

⁵¹ S.C. 2001, c. 26.

⁵² R.S.C. 1985, c. F-14; note that significant amendments to the Federal Fisheries Act have been assented to in *An Act to amend the Fisheries Act and other Acts in consequence*, S.C. 2019, c. 14 (received royal assent on June 21, 2019 but not yet proclaimed in force) (referenced throughout this Report as Bill C-68). However, the amendments are not yet proclaimed into force at the time of writing this Report, and so the Board has confined the description of the regulatory regime to the current *Fisheries Act*.

⁵³ S.C. 1993, c. 29.

⁵⁴ S.C. 1996, c. 31.

⁵⁵ S.C. 2002, c. 29.

- Providing a forecast of total planned hiring, types of jobs, wages, and work hours; and
- Providing a forecast of its total planned procurement expenditures.

Generally, it would be expected that an operator would have reporting requirements to CIRNAC on the implementation, execution, and results of an approved Benefits Plan and the Plan would be expected to change as project activities change. A Benefits Plan is a documented commitment by the operator, and CIRNAC has published “*Benefits Plan Guidelines for the North*” to provide guidance for operators regarding the development and implementation of acceptable Benefits Plans. As the possible development scenarios considered during the SEA are all located outside the NSA in Canadian offshore waters and the scenarios do not involve requiring the development of infrastructure on Inuit Owned Land (IOL), the NIRB has assumed that an Inuit Impact and Benefit Agreement (IIBA) with the Regional Inuit Association, the QIA, would not be required. However, for proposed development occurring outside the NSA, the *Nunavut Agreement* contains numerous provisions that could still apply to address project effects on wildlife harvesting or Inuit rights.

CIRNAC sets, collects, and administers the royalties associated with oil and gas developments in the Northwest Territories, Nunavut, and the northern offshore under the *Canada Petroleum Resources Act*⁵⁶ and the *Frontier Lands Petroleum Royalty Regulations*.⁵⁷ The *Act* governs the setting and collecting of royalties while the *Regulations* prescribe the royalty rates, the calculation of royalties due, the reporting required and the imposition of interest and penalties associated with failing to remit and report royalties as required. Under the current royalty regime, the Government of Nunavut, Nunavut Tunngavik Incorporated and the QIA would not have rights or responsibilities with respect to the setting, collection and enforcement of royalty requirements, as these responsibilities are exclusively managed by CIRNAC.

However, associated development or exploitation of resources or placement of project infrastructure partially or wholly on IOL would result in an operator being required to enter into an IIBA as prescribed under Article 26 of the *Nunavut Agreement*. However, as the possible development scenarios are located outside the NSA in Canadian offshore waters and not on Inuit Owned Land, an IIBA is unlikely to be required for those activities. Although no IIBA may be required for proposed development occurring outside the NSA, several Articles (e.g. Articles 5, 6, 20 and 21) of the *Nunavut Agreement* contain provisions that could apply to offshore oil and gas developments the developments have adverse effects on wildlife, wildlife harvesting, or Inuit rights.

4.1.2 *Views of Interested Parties*

4.1.2.1. *Existing Regulatory Regime*

Within its final written submission and during the Final Public Meeting, the Government of Nunavut (GN) requested that the Board’s Final SEA Report include a regulatory road map with visual descriptions of current roles and responsibilities, including changes under the proposed Bill

⁵⁶ R.S.C. 1985, c. 36 (2nd Supp.).

⁵⁷ SOR/92-26.

C-69. It was further requested that the consideration and incorporation of community input into the process be included as well. The GN recommended that post-SEA options for instituting an offshore co-management regime in the Area of Focus responsible for the regulation of petroleum development in Nunavut offshore waters be explored. A need was further identified to more formally and meaningfully define roles for the GN, Inuit organizations, and communities in a co-management regime applicable to the oil and gas industry. During the Final Public Meeting, the Canadian Association of Petroleum Producers (CAPP) discussed that in Newfoundland and Nova Scotia Offshore Petroleum Boards have been established to regulate the offshore oil and gas industry in those areas in place of the National Energy Board (NEB).⁵⁸

Following a question from the NIRB staff during the Final Public Meeting as to whether the NEB has discretion to adapt its processes to reflect a co-management approach with other neighbouring authorities, the NEB noted that:

*...the NEB could enter something like a memorandum of understanding with the NIRB for a project-specific review and work together to design a process that might work for both boards and would also work for that area in particular. So we would look to the public interest and -- and the community members and design -- and co-design a process that would work for most people.*⁵⁹

In response to a question by the NIRB staff regarding how the NEB would coordinate with other authorities to ensure potential impacts and transboundary effects are appropriately mitigated, the NEB noted that there were many ways to undertake such coordination, noting that the NEB “has the ability to work with other jurisdictions on compliance when a project is operating...Setting up letters of understanding and memorandums of understanding is one way to communicate the cooperation.”⁶⁰ During the Final Public Meeting, the NEB submitted supplementary information on model agreements the NEB has in place for conducting assessments/reviews/regulations in other areas where co-management regimes may exist.⁶¹

Recognizing that there may be potentially significant changes to the regulatory regime governing future oil and gas development (e.g., changes to the National Energy Board and Federal impact assessment and fisheries regimes under Bill C-69 and Bill C-68) and the potential implications associated with the devolution of specified federal responsibilities for Nunavut to the GN, many parties urged the NIRB to provide recommendations regarding how the current regulatory regime should be reshaped. In its final written submission, the World Wildlife Fund (WWF) emphasized that the future regulatory regime for oil and gas development in the region should be based on the principles of “Free, Prior and Informed Consent”. As summarized in Appendix A of the public comments on the Nunami Stantec reports (2018a and 2018b) of Oceans North, the historical experience of Inuit in the region with oil and gas development has been characterized by very little, if any, consultation with affected communities in general or Inuit specifically. As summarized

⁵⁸ P. Barnes, Canadian Association of Petroleum Producers, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, p. 98, lines 3-12.

⁵⁹ C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 544, lines 8-15.

⁶⁰ C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 545, lines 4-11.

⁶¹ Public Registry ID 324053.

during the Final Public Meeting by Joanasie Akumalik, a former resident of Arctic Bay, when oil and gas development was taking place with Panarctic Oils Ltd.:

About 40, 45 years ago, when I was younger, I – I was a labourer, shovelling snow, taking out garbage and dumping, painting, sweeping and all that, on Melville Island, west of Melville Island, in a little place called rig 12, when Panarctic was still around. At that time, Inuit were never part of negotiation for benefits or training. I am happy that Inuit now can take part in the process like this, as much as we never had any benefits while working for the mine near Arctic Bay at a place called Nanisivik.⁶²

The desire to extend the role of the Nunavut Marine Council to regulate oil and gas development in the region was expressed by several participants during the Final Public Meeting.^{63,64}

4.1.2.2. *Existing Royalties and Benefits Regime*

With respect to the issue of royalties and benefits, Nunavut Tunngavik Incorporated (NTI), the Qikiqtani Inuit Association (QIA), Government of Nunavut (GN), Greenpeace Canada, Oceans North Canada (Oceans North), the World Wildlife Fund (WWF), the Ikajutit (Arctic Bay) Hunters and Trappers Organization (Ikajutit HTO), the Nangmoutaq (Clyde River) HTO (Nangmoutaq HTO), and the Resolute Hunters and Trappers Association (Resolute HTA), and Community Representatives all discussed the uncertainty and lack of information on the level of potential benefits from possible offshore oil and gas activities on Inuit in the Qikiqtani region.

The QIA noted that as the hypothetical oil and gas scenarios are all located outside the Nunavut Settlement Area (NSA) in the offshore, the current Inuit Impact Benefit Agreements (IIBA) structure under the *Nunavut Agreement* would not apply and there is currently nothing in place to ensure benefits accrue to Inuit within the NSA from impacts of offshore oil and gas development.

The GN recommended that the Board recommend that guidelines for benefits plans for oil and gas projects in Baffin Bay and Davis Strait specific to the needs of Nunavummiut and Inuit be developed with the involvement of communities, the QIA, and the GN. In discussing compensation for impacts, especially on wildlife and livelihood activities, the GN further recommended that post-SEA, the Government of Canada determine the scope of a compensation plan and how/if it could adequately address community

For the sea mammals that we consume, if they should change and if they dissipate somewhere else, can us Inuit -- would we be compensated for the loss of the wildlife if they go somewhere else and not come back? Because this is our -- our livelihood, and for fish and sea mammals are our main food.

[S. Keenainak, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 526, lines 14-19.]

⁶² J. Akumalik, on behalf of City of Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, pp. 6-7, lines 19-26 and 1-2.

⁶³ P. Quassa, Member of the Public, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 212-213.

⁶⁴ B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 219-220.

concerns regarding impacts on wildlife from potential oil and gas activity. In response to questions raised by the GN on whether there are provisions available for compensation for indirect impacts from routine communities (e.g., on harvesting), the NEB stated that currently there are no specific provisions for compensation without an incident, such as a spill. However, the NEB added that *“in the past, the NEB has required companies to set out a compensation plan with potentially affected communities”*.⁶⁵

In the Ikajutit HTO’s presentation at the Final Public Meeting, the HTO questioned the extent to which potentially affected communities could receive royalties directly from oil and gas development. Similarly, the submissions of the Nangmoutaq HTO read into the record at the Final Public Meeting stated: *“The HTO argues that Clyde River must be a partner in any oil and gas project that takes place near their community, and the community must be guaranteed financial benefits.”*⁶⁶

Throughout the SEA and during the Final Public Meeting several parties indicated that until there was greater clarity regarding how benefits would accrue to Inuit, there will be little support for oil and gas development moving forward. The statement of the Clyde River QIA Representative as read into the Public Meeting Record expressed this view as follows:

*And the message here is that the North has been exploited before, and there's fears that the exploitation is still going to occur with oil and gas. And so again these benefits associated with oil and gas must -- there must be clearly outlined benefits going to Inuit if there's going to be any sort of discussion on even moving forward.*⁶⁷

Within its final written submission, the Qikiqtaaluk Wildlife Board recommended that benefits to communities should be:

- Expressed explicitly; and
- Include financial compensation, Inuit employment, community investment, and infrastructure.

In the WWF’s final written submission, it was recommended that proponents of specific oil and gas development projects should, as part of their agreements with governments, agree to develop IIBAs or other mechanisms to contribute to local communities in conjunction with their development of offshore resources. WWF further recommended several ways for companies to make these types of contributions, including specified payments, in-kind benefits, and preferred access for Inuit to business, employment and training opportunities. WWF emphasized that, to be successful, local benefits should be established through local involvement in determining local needs and interests and to set appropriate goals. WWF noted that appropriate governance mechanisms must also be in place to ensure local needs and interests remain the driver behind such benefits. WWF also cited the recommendation of the Arctic Council in a recent report that local

⁶⁵ Exchange between A. Cyr-Parent, Government of Nunavut, and C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 486, lines 6-20.

⁶⁶ J. Price, Qikiqtaaluk Wildlife Board on behalf of Nangmoutaq (Clyde River) HTO, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 787, lines 16-19.

⁶⁷ S. Lonsdale, Qikiqtani Inuit Association on behalf of David Iqaqrialu, Clyde River QIA Representative, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 794, lines 11-17.

benefits should involve the establishment of infrastructure and health care facilities so that the benefits to local infrastructure and services are longer term and maintained even after development activities have ceased or declined.

Reflecting their comments, parties provided the following recommendations:

- Regulatory changes are required to maximize benefits and opportunities for Inuit.
- Establish a clear and explicit impact and benefits regime to provide clarity for all parties regarding the extent to which potential projects outside of the NSA are required to protect Inuit rights, including how such projects will provide benefits, despite the potential impacts.
- Clarify the extent to which *Canada Oil and Gas Operation Act* benefits can be accrued in Nunavut.
- Clarify benefits framework for scenarios with onshore infrastructure.
- Conduct a cost-benefit analysis to consider the impacts and benefits of oil and gas development at the community level in order for communities to be able to make informed assessments of specific future offshore oil and gas developments.
- Establish a framework for wildlife compensation for impacts from projects in the marine environment.
- Extend the involvement of the Nunavut Marine Council.

And if there should be a spill and the accident happens, the organizations in the community level, NTI and other organizations and agencies, would you apologize to them? Would you compensate them?

[A. Alasuaq, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 524, lines 13-16.]

4.1.3 *Views of the Board*

As communicated to the Board during the community scoping sessions and as summarized in the final written submissions of Greenpeace Canada and Oceans North, over the last 30 years regulatory processes leading to the authorization of oil and gas developments in Nunavut have not generally been the result of meaningful consultation and accommodation with Inuit rights and knowledge holders. Although there are several regulatory improvement initiatives underway and legal enforcement options available to Nunavut Inuit that may vastly improve these processes moving forward, in many of the 10 communities who contributed to the SEA, the Board heard concern that Inuit voices and perspectives must not only be heard, they must be central pillars in decision-making.

As highlighted in the Foreword to this Report, the Board clearly agrees with the views expressed by multiple organizations and community members and representatives that Inuit Qaujimagatuqangit, Inuit practices, principles and priorities, and Inuit worldviews must be central pillars in not only this assessment and future SEAs, but also in any future project-specific impact assessments for proposed oil and gas development projects in the region.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to the regulatory regime, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing the regulatory, royalty, and benefits regimes and processes:

Recommendations to address through future assessments:

- Structure future assessments conducted in, or adjacent to, the Nunavut Settlement Area and associated decision-making processes with the express recognition of Inuit rights, Inuit Qaujimajatuqangit and Inuit Qaujimaningit, and the requirement to actively engage with Inuit knowledge holders and Nunavut communities (#16).

As highlighted by parties and Board Members during the Final Public Meeting, the current benefits regime under the *Nunavut Agreement* does not extend to areas outside the Nunavut Settlement Area, and this creates concern and uncertainty regarding the nature and extent of benefits associated with oil and gas development in the Areas of Focus. As summarized by the Qikiqtani Inuit Association at the Final Public Meeting:

So the next bullet actually speaks to something that I believe [Board Member] Allen [Maghagak] you mentioned on our first day here, and it was about regimes for benefit agreements outside of the Nunavut Settlement Area. So we're recommending that a new impact benefit structure be developed that includes the scenario of projects outside of the Nunavut Settlement Area. So the recommendation is to establish an appropriate regime that would provide clarity to all parties and a new benefit structure for area outside the Nunavut Settlement Area. So potential projects outside the Nunavut Settlement Area, they provide less certainty to Inuit about protection of rights and possible benefits despite the fact that there are potential impacts to Inuit from activities outside the Nunavut Settlement Area. So it's important that this be clarified and that the regime reflect that reality.⁶⁸

In addition, the Board heard from NTI and the GN that although there could be greater benefits accruing to Nunavut generally and local communities specifically if oil and gas developments used onshore facilities such as ports and pipelines to support offshore development, it remained unclear how substantial any increase to benefits would be, recognizing the current royalty and benefits structure. In the Board's view there is a significant gap and uncertainty regarding the nature, extent, and duration of royalties and other benefits, including compensation for impacts to wildlife and Inuit harvesting rights, that would accrue to Nunavut and the 10 communities in the Area of Focus if oil and gas development activities were approved to take place in the offshore area outside the Nunavut Settlement Area. This lack of information makes it impossible for the communities to make informed decisions about future oil and gas developments.

⁶⁸ R. D'Orazio, Qikiqtani Inuit Association, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 317, lines 7-25.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to potential royalties and benefits, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing regulatory, royalty, and benefits regimes:

Recommendations to address prior to lifting the current moratorium:

- Clear descriptions should be developed to explain the royalties and benefits regime applicable to:
 - oil and gas developments occurring exclusively in the Canadian offshore adjacent to the Nunavut Settlement Area; and
 - oil and gas developments occurring in the Canadian offshore adjacent to the Nunavut Settlement Area which are supported by land-based infrastructure within the Nunavut Settlement Area.

This analysis should clarify the extent to which *Canada Oil and Gas Operations Act* benefits can be accrued in Nunavut and specify the framework that would apply to compensation for interference with Inuit harvesting or damage to marine wildlife or wildlife habitat (within the Canadian offshore and the Nunavut Settlement Area) (#13).

Recommendations to address through future assessments:

- Assessments of proposed oil and gas projects should clearly identify the predicted benefits and potential compensation accruing to the region and potentially affected communities (#15).

For Board recommendations related to regulatory, royalty, and benefits regimes see Volume 3, Chapter 7.3.1.6: Land and Marine Use.

4.2. SPILL RESPONSE REGIME

4.2.1 *Background*

4.2.1.1. *The Existing Regime*

Unless otherwise indicated, the information provided in this section is based on summaries of information as provided jointly by the various Government of Canada agencies with spill response and the National Energy Board (NEB) during the Final Public Meeting during a joint Government of Canada presentation on the National Marine Oils Spill Preparedness and Response Regime.⁶⁹ Canada has a National Marine Oil Spill Preparedness and Response Regime (the Regime) and a marine safety system designed to protect life, health, property, and the environment. The Regime

⁶⁹ A. Gudmundson, Transport Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 450-464.

takes a multi-agency approach to protecting the environment and communities from the risks and impacts of oil spills. There are three (3) components to the Regime: prevention; preparedness and response; and liability and compensation. The federal government is responsible for the legislative and regulatory framework, which includes oversight of preparedness and response actions both before and during a spill. Industry is responsible for funding, responding to, and cleaning up ship-source oil spills. The Regime distinguishes between requirements specific to vessels in transit and requirements specific to offshore oil and gas exploration and production, including ships engaged in those activities.

The Regime is led by several Government of Canada agencies including Transport Canada (TC), the Canadian Coast Guard (CCG), Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO) and the NEB. For spills in or affecting territorial waters, the Government of Nunavut (GN) and Inuit communities would also be involved. Each federal agency has its own mandate as they relate to spill response as follows:

Transport Canada is considered to be the lead federal agency with respect to regulatory and legislative requirements. TC is the lead federal regulatory agency responsible for vessels in transit that are engaged in oil and gas development and production activities. Along with ECCC, TC operates the National Aerial Surveillance Program that monitors shipping activities and ice conditions and TC can assist in the case of a pollution event. TC's mandate is established in the following legislation:

- i) The *Canada Shipping Act* provides the overall regime to protect safety and the environment for vessels operating in waters under Canadian jurisdiction. Regulations under the *Act* include requirements for vessels construction (e.g., ensuring vessels are safe to travel in the ice in the Arctic), management of ballast water, pollution control, the arrangements for emergency response, and crew qualifications.
- ii) The *Arctic Waters Pollution Prevention Act* provides enhanced protection for vessels operating in waters in the Canadian Arctic. The Government of Canada has recently developed new regulations under the *Act* known as the *Arctic Shipping Safety and Pollution Prevention Regulations*, which prescribe additional requirements with respect to discharges into Arctic waters, including requirements that prevent pollution by oil, sewage, garbage, and other noxious liquid substances in bulk.
- iii) The *Marine Liability Act* requires vessels operating in waters under Canadian jurisdiction to carry insurance and to pay for damages including:
 - a. Damage caused by pollution from their vessels or facilities, and includes environmental damage and economic losses;
 - b. Expenses incurred and associated with measures taken to prevent, repair, remedy, or minimize pollution damage; and
 - c. Costs associated with the issuance of direction orders given by the CCG; and

- iv) The *Marine Transportation Security Act* provides the framework for security of the marine transportation system in Canada and vessels and marine facilities in Canada except those under the authority of the Minister of National Defence.

Canadian Coast Guard is the lead federal department that ensures an appropriate marine pollution response plan is in place for ship-source, oil handling facility, and mystery-source marine pollution incidents in Canadian waters. The CCG would take the lead in overseeing a spill response in conjunction with TC, reviewing the extent and nature of the spill; identifying potential impacts; and identifying what help may be needed from others. The CCG also provides national preparedness capability to respond when a polluter is unknown, unwilling, or unable to respond. The CCG's authority and mandate are established under the *Canadian Shipping Act* and the *Oceans Act*.

Environment and Climate Change Canada has the mandate to protect Canadians and the environment from the effects of environmental emergencies through the provision of science-based expert advice (e.g., reviewing planned mitigation measures to provide advice regarding whether mitigations are likely to be effective) and through regulations under the *Canadian Environmental Protection Act, 1999*. ECCC also provides scientific information during the preparedness and response processes and operates the National Environmental Emergencies Operations Centre to coordinate ECCC's response and input into emergencies.

Fisheries and Oceans Canada is responsible for providing scientific and technical advice with respect to fish and marine mammals including critical fisheries resources, key habitats, and the timing and location of fishing activities. DFO also provides support in spill tracking and trajectory modeling; provides advice in support of clean-up operations and strategies; and monitors the potential impact of response strategies.

National Energy Board is currently the lead federal regulator for all offshore oil and gas exploration and production activities, including regulating the ships involved in oil and gas exploration activity.⁷⁰ The NEB would lead and support the Chief Conservation Officer in overseeing the response of an operator to an offshore oil and gas spill and would call on other government agencies for support as needed. The NEB's mandate and authority with regards to oil and gas operations is guided by the *Canada Oil and Gas Operations Act (COGOA)* and the *Canada Petroleum Resources Act* and regulations and guidelines developed under these Acts.

Operator Responsibilities

Ultimately, it is the responsibility of a ship operator or company to follow all applicable laws and regulations and to take all the necessary steps to prevent spills and accidents. To ensure preparedness, ships must carry an approved shipboard oil pollution emergency plan (SOPEP). If there is a spill or accident, the operator is responsible for managing the emergency response and the spill clean-up by first protecting crew and ship, then stopping source of pollution and executing

⁷⁰ Although when Bill C-69 comes into force the NEB's regulatory responsibilities will largely be transferred to the Canadian Energy Regulator (CER) and the CER's Commission, as Bill C-69 has not yet been proclaimed in force, the existing NEB regime is discussed here.

the SOPEP.⁷¹ Executing the SOPEP includes notifying TC and the CCG and/or the NEB when the incident is related to oil and gas exploration activities. This responsibility applies to vessels in transit, drill ships on station or engaged in oil and gas exploration, oil and gas exploration platform or production facilities, and any vessels attached to such facilities. Operators are required to use ships constructed for safe passage in the Arctic and must following specific construction and maintenance practices. Companies must file a sailing plan and meet various reporting obligations, including reporting their position daily and notifying regulators of any changes to their plans as previously filed.

An operator is also responsible to cover the cost of clean-up as well as any compensation for damage caused by spills. The *Marine Liability Act* sets out a legal requirement for vessels operating in Canadian waters to have insurance to pay for damages that may occur due to a spill or other incident causing damage. The liability regime operates under the polluter-pay principle, which requires an operator to be responsible for both cleanup as well as compensation. There is also federal funding and international funding available under the Canadian based Ship-Source Oil Pollution Fund and the International Oil Pollution Compensation Funds for cleanup costs, environmental damage, property damage, and economic losses, including damages related to Inuit harvest of wildlife.⁷² There are also requirements for compensation under Article 6 of the *Nunavut Act* and under the *Surface Rights Tribunal Act* that would apply within Nunavut waters.

Under the *COGOA* companies have absolute liability when exploring or drilling in the Arctic, regardless of negligence or fault, for loss or damage resulting from their actions. Operators are required to provide proof of financial responsibility throughout the duration of work or activity. The NEB sets the amount of financial responsibility for loss or damage caused during the review process for a specific project. The NEB may suspend or revoke its authorization for oil and gas development activities if an operator fails to maintain proof of financial responsibility throughout the lifetime of a project. Proof of financial responsibility includes letters of credit, bonds, insurance, guarantees, and audited financial statements. The NEB can directly pay out claims from the security held and claims can also be sued for and recovered in court.

Community Engagement

During the Final Public Meeting the importance of communities' involvement in spill response was emphasized. The federal government responded that during the preparedness and planning process, the CCG would work with the GN on the development of specific oil marine spill plans and would involve communities to ensure priorities are established according to Inuit Qaujimajatuqangit as well as identifying sensitive biological and traditional use areas.

In the event of a spill, TC may need to identify a place of refuge where a ship can conduct repairs or dock. TC would maintain lists of community contacts in order to engage the community(ies) to understand what impacts there may be to the local environment, to sensitive areas, and any other information and Inuit Qaujimajatuqangit that could be shared. The CCG may also contact

⁷¹ A. Gudmundson, Transport Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 451-452; 461-462, lines 25-26 and 1-2; 25-26 and 1-4.

⁷² A. Gudmundson, Transport Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 458, lines 6-23.

impacted communities to assist in developing priority protection zones (i.e., emergency marine protected areas) and to provide input into response plans and operations.⁷³

During project planning, companies must prepare the required emergency response plans, and are expected to consult with potentially affected Inuit communities while developing those plans, taking into account possible damages to those communities. In setting the financial responsibility amount, the NEB “*will take into consideration the input that’s received during the review process, which will include input, information, recommendations provided by Indigenous organizations and Indigenous communities.*”⁷⁴

Response to spill

How spills are responded to also depends on whether the incident involves the release of oil or the release of gas. Dry gas is left to disperse in the environment. Natural gas has liquids called condensate and is a very volatile flammable liquid that would not be safe to collect, so it is left to evaporate through weathering into the air. In the event of an oil spill there are various tiers of response as follows:

- **Tier 1 Infield Resources:** Immediate response at the scene of an activity by an operator. For example, by law, a drilling unit must have a standby vessel within 20 minutes of an installation at all times and these vessels would be required to have a Tier 1 level of spill response capability in the field. The response options to recover spilled product can include deployment of absorbent booms as well side-sweep type of spill response.
- **Tier 2 National/Federal Response:** Would bring in other national capabilities through the CCG and other organizations. TC and the CCG would work together to review the situation and determine the lead federal agency overseeing spill response related to vessel transits, which would likely be the CCG. The NEB would lead the response to spills related to offshore oil and gas exploration and production.
- **Tier 3 Global Response:** A global network of spill response agencies would respond to the emergency.⁷⁵

The amount of personnel required for a response would be dependant on a specific event and determined during project planning. During the Final Public Meeting an example was provided where thousands of people were involved in the spill response.⁷⁶ In response to questioning regarding typical spill response planning at the Final Public Meeting, the CAPP subsequently provided a copy of an Oil Spill Response Plan developed for an exploration drilling project.⁷⁷

While spill response is critical, source control and containment efforts would be necessary to stop a flow and would need to be actioned quickly to minimize impacts. Drilling relief wells and

⁷³ A. Gudmundson, Transport Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 462-463, lines 22-26 and 1-13.

⁷⁴ B. Chambers, National Energy Board, NIRB Final Public Meeting File No.17SN034 Transcript, March 20, 2019, pp. 469, line 15-19.

⁷⁵ K. Landra, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 476-477, lines 5-26, 1-13.

⁷⁶ Exchange between K. Kaluraq, NIRB Board, and K. Landra, National Energy Board, NIRB Final Public Meeting File No. 17SN034, March 20, 2019, pp. 560-561, lines 17-26 and 1-17.

⁷⁷ Public Registry ID: 324049

installing a capping stack are typical source control and containment measures during well blow outs, which are undertaken by the operator in parallel with the mobilizing of the federal agencies responding to a spill. For additional information, see Volume 3, Chapter 8: Accidents and Malfunctions.

4.2.2 *Views of Interested Parties*

4.2.2.1. *Response Regime*

Within its final written submission the Government of Nunavut (GN) commented on the lack of a response organization operating north of the 60th parallel and recommended that prior to oil and gas development, work should be undertaken to develop a robust and effective spill response regime that includes spill prevention, spill response capacity, infrastructure, equipment and technology, and notification to communities. The GN further noted during the Final Public Meeting that:

*the Arctic has large distances between locations with any capacity infrastructure to respond to unplanned events as well as limited communications infrastructure. As such, more information is required on the emergency response planning for the oil and gas sector, activities in the Arctic, effectiveness of oil spill response in the Arctic, and spill response capacity.*⁷⁸

... who monitors once it gets going? As an Inuk, as a beneficiary of Nunavut, I am very worried that federal government and others might just sit back and let -- just let it go until something happens like Mexico. You have oil spill, you know, and everybody jumps and gets moving and all that stuff.

[B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, p.92, lines 13-18.]

In response to questions from the GN about how its safety procedures and standards compare to other regulators in the Arctic, the NEB noted that it is a member of the International Regulators Forum and the Arctic Offshore Regulators Forum and these organizations have international membership and experience with ice and ice management. It was further noted that the NEB's regulations blend prescription and performance-based standards and that Greenland has adopted many of Arctic Canada's offshore oil and gas requirements.⁷⁹

⁷⁸ B., MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 177, lines 10-17.

⁷⁹ Exchange between A. Cyr-Parent, Government of Nunavut, and K. Landra, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 481-482, lines 10-26 and 1-26.

Within its final written submission, the World Wildlife Fund (WWF) similarly concluded that significant legislative, capacity, information, infrastructure, communication, and funding gaps exist in the current spill response framework across the Canadian Arctic, including Baffin Bay and Davis Strait. It was noted that due to limitations on the availability of equipment and contractor response capability, spill response can take more than 10 times longer than in waters south of 60 degrees' latitude. WWF further emphasized its position that major weaknesses exist in the availability of, access to, and condition of oil-spill response equipment, training resources, and reliable communications infrastructure in the communities. WWF made multiple associated recommendations, including about community and ship-board equipment and training requirements, and noting that immediate steps, including substantial investment in response capacity and on-shore infrastructure, should be taken before offshore oil and gas activities take place. It was further recommended that a formal review of Canada's capacity to respond to major spills in the Arctic be undertaken. WWF also recommended that the use and carriage by ships of heavy fuel oil be phased out in the Arctic. During the Final Public Meeting, the WWF noted that it had been working with members of Resolute as well the CCG and DFO to develop community oil spill response plans.⁸⁰

The community [Resolute] has never been trained in using this equipment if there was an oil spill. They have a response kit in the community. They have no idea how to use this equipment.

[P. Okalik, World Wildlife Fund, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 692, lines 11-14.]

In response to questions by WWF on what is required to better prepare for potential oil spills, the NEB referenced the Arctic offshore funding requirements. It was noted that operators would be required to have approved emergency response plans in place that take possible damages to Inuit communities into account. In addition, proponents would be required to consult potentially affected communities and determine needs for training, preparedness, equipment etc.⁸¹ Ultimately, the NEB clarified that a response regime specific to a given oil and gas development project would be developed for that project, and that an operator would not be authorized to conduct work unless it's the ability to respond to offshore spills and blowouts had been proven.⁸² The WWF and a Community Representative from Iqaluit questioned whether Arctic specific regulations should be developed.^{83,84} In response to the WWF, the NEB stated that "*the beauty of a performance-based regulation is that it is a all-applicable-hazards approach to whatever the scenario is so -- and whatever the unique environmental conditions are of the operating area*".⁸⁵

⁸⁰ M. Brooks, World Wildlife Fund, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 699-700, lines 15-26 and 1-3.

⁸¹ Exchange between M. Brooks, World Wildlife Fund, and C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 492-493, lines 14-26 and 1-18.

⁸² Exchange between M. Brooks, World Wildlife Fund, and K. Landra, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. lines 8-26 and 1-9.

⁸³ M. Brooks, World Wildlife Fund, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 501, lines 1-6.

⁸⁴ B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, March 20, 2019, p. 511, lines 14-21.

⁸⁵ K. Landra, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 501, lines 15-18.

DFO and the CCG noted in their public written comments that there are “challenges related to oil spill response in the Arctic, including lack of reliable communications to coordinate a response (e.g., lack of connectivity); and the distances between potential drilling /accident location and the response resources, and therefore the time required to respond.” DFO also noted that there are existing CCG assets (e.g., environmental response depots and caches) to be utilized in the event of a spill and provided a reference to the Coast Guard Marine Spills National Contingency Plan (see Volume 3, Appendix C: Recommended Documents). TC also noted that there are no Response Organizations North of 60. Consequently, the onus to have an adequate oil pollution prevention and response plan lies entirely with the company and the vessels operating in the Arctic.

The Canadian Association of Petroleum Producers (CAPP) recommended two (2) publications related to emergency preparedness and response be reviewed (see Volume 3, Appendix C).

In response to the Government of Canada’s presentation on the federal spill response regime, a Community Representative from Qikiqtarjuaq noted:

*There's a disconnect between IQ committee and you. How is -- how are you going to include IQ as part of your regime? IQ, and I'm in that committee, but I don't feel you. So -- and because of that, as the IQ committee, if it's going to be included in part of the overall regime while there's -- during cleanups, will you be working closely with the IQ committees?*⁸⁶

The NEB noted in response that it has “an enhanced Indigenous engagement program that we undertake to ensure that we follow, to ensure that we -- we hear the voices of Indigenous people to help us make -- make our decisions”.⁸⁷

During the Final Public Meeting, a community member from Resolute expressed concern that Canada’s regulations would not be followed by shippers flying under international flags.⁸⁸

In response to a question by the Board on how places of refuge are identified, the NEB noted that there are predetermined areas that could be used and that communities would be consulted prior to use.⁸⁹ The Board further questioned whether the oil spills preparedness and response regime is built on existing infrastructure or is used to identify infrastructure needs in responding to a spill. In response, the NEB noted that while the spill response regime is built on existing infrastructure, during a project assessment stage, existing infrastructure would need to be enhanced if found inadequate.⁹⁰

⁸⁶ L. Kooneeliusie, Qikiqtarjuaq, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 520, lines 1-7.

⁸⁷ B. Chambers, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 521, lines 3-6.

⁸⁸ J. Amagoalik, Resolute, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 517, lines 1-25.

⁸⁹ Exchange between P. Kadlun, NIRB Board Member, and O. Jihangir, Transport Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 5554-555, lines 23-26 and 1-23.

⁹⁰ Exchange between P. Kadlun, NIRB Board Member, and K. Landry, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 554-556, lines 16-22, 24-26, and 1-13.

4.2.2.2. *Financial Security and Compensation*

During the Final Public Meeting, multiple parties, including the QIA, the WWF, and Community Representatives raised questions about the financial liability of operators. The QIA expressed concerns about the accessibility of funds for communities.⁹¹ The NEB clarified that an operator must provide at least \$100 million that could be accessed by the NEB for compensation and reclamation, and these funds are secured under a letter of credit or similar instrument. This minimum of \$100 million can be based on the NEB's review and input by Indigenous communities. In addition to financial security, an operator must also demonstrate that the company has access to internal financial resources of at least \$1 billion. The liability regime is an "absolute liability regime", which requires the operator to pay out even if the operator was not at fault.⁹² Both of these funding sources can be accessed immediately and outside of the court system. In response to questioning at the Final Public Meeting the NEB indicated it was unaware of any provisions that would provide funding for legal support to individuals who need to access funds through the court system.⁹³ WWF expressed concern that \$1 billion in internal financial resources may be insufficient, and questioned whether the NEB could remove the liability cap similar to jurisdictions like Norway and Greenland where there is no limit on liability. In response, the NEB clarified that

But how do you compensate someone's loss of livelihood, for their loss of food source, for their loss of their culture?

[M. Brooks, World Wildlife Fund, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 711, line 18-21.]

There is no cap on legal liability for the – for the proponent in the event of an incident. The – the funding that is required in the course of a project, if it were to be approved, is -- is what I referred to earlier is absolute liability, and it -- it's a just term to describe the funding that is available to those claiming compensation, irrespective of how much the -- the company would ultimately be liable for. It's to provide immediate compensation to those individuals, organizations, communities that would be seeking to obtain funding to address any compensation issues.⁹⁴

Multiple parties, including Community Representatives and the Board asked about compensation during the Final Public Meeting:

If there's an oil spill, what will we do? And there isn't any mention at all of compensation if anything like that happened in the future.⁹⁵

⁹¹ S. Lonsdale, Qikiqtani Inuit Association, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 473, lines 19-26.

⁹² B. Chambers and C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 470-473.

⁹³ C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 474, line 26.

⁹⁴ B. Chambers, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 489, lines 15-25.

⁹⁵ H. Oshutapik, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, pp. 107-108, lines 25-26 and 1.

*we need to know more about how we would receive compensation. We can't just walk away without knowing that there is going to be compensation for us.*⁹⁶

*We have lots of whales in Qikiqtarjuaq area. If there should be a spill of gas and oil and -- and the ships would have to go through that area, so that will be the route and the -- the -- it's a breeding ground for whales and narwhals, and is there -- I wonder -- we're wondering why the whales arrived early last year. --And if their -- if their migration route has changed, can we be compensated somehow?*⁹⁷

*If there is an oil spill in the Arctic, will there be loss of compensation for our loss of food? And would this compensation account for all terms impacts if the environment is polluted? This should be in place before any exploration happens.*⁹⁸

A Board member questioned whether the NEB has data for subsistence harvesting to generate a model for compensation values for loss of resources similar to the Food Security study conducted by the QIA. The NEB noted that while it does not have that level of data, it would welcome such information for its analysis and calculation for compensation.⁹⁹

4.2.2.3. **Identified Gaps**

Currently there is no region-specific spill modeling that adequately reflects local environmental conditions (e.g. ice conditions, weather, currents, sea conditions). In addition, communities made it clear that they are not adequately informed regarding the existing spill response regime in Nunavut and it is unclear what roles community members may play in responding to spills.

In addition, there are challenges with communications to coordinate a response and the availability of equipment to respond in the event of a spill. Currently, emergency response resources are not located North of 60, resulting in prolonged response times for large-scale clean up and equipment to arrive.

4.2.3 **Views of the Board**

There were many concerns brought forth from parties and from communities regarding a lack of preparedness to respond to oil and gas spills in the Arctic. The Board heard from both regulators as well as organizations and Community Representatives that Canada is not ready to adequately respond to a major oil spill in the Arctic as there are very limited, to no, northern resources available. While it was noted that there are currently no response organizations north of 60, the Board recognizes that there are limited response organizations operating north of 60 (e.g.,

⁹⁶ B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p.196, lines 21-24.

⁹⁷ J. Keeyookta, Qikiqtarjuaq, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 533, lines 6-7.

⁹⁸ J. Kiguktak, Arctic Bay, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 734, lines 21-24.

⁹⁹ Exchange between K. Kaluraq, NIRB Board Member, and C. Wickenheiser, National Energy Board, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 553-554, lines 22-26 and 1-11.

Mackenzie Delta Spill Response Corporation and Oil Spill Response Limited). Currently the onus is on the company or vessels operating in the Arctic to have adequate pollution prevention and response plans. Recommendations have been made by parties to invest and develop response capacity and additional vessels, marine and transportation infrastructure (e.g., deepwater ports), and a need to develop emergency response plans with communities that include training, preparedness, and equipment.

At the Final Public Meeting the Board also heard an appetite for Arctic-specific laws and regulations necessary to recognize that operating conditions in the Arctic are unique and present a unique set of challenges.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to the spill response regime and accidents and malfunctions, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing consultation, co-ordination, and public engagement:

Recommendations to address irrespective of the current moratorium:

- Building on the data collected in Recommendation #29, develop accessible public guidance on the roles and responsibilities of Nunavut stakeholders (Federal agencies, Government of Nunavut, Inuit organizations, and communities) for oil and gas spill response within the Nunavut Settlement Area and in the Canadian offshore adjacent to the Nunavut Settlement Area (#1).

Recommendations to address prior to lifting the current moratorium:

- Building on the data collected in Recommendation #29, initiate a formal review of the existing capacity to respond effectively to a major spill of oil in the Area of Focus, highlighting the expected role of communities and community capacity in responding to emergencies. The Government of Nunavut, Designated Inuit Organizations, and Nunavut communities should be actively engaged through the review process (#31).

Recommendations to address should the current moratorium be lifted:

- Establish a long-term, comprehensive Arctic spill prevention, response, and evaluation research program to:
 - predict and evaluate the effects of spills on the Arctic biological, physical, and human environments; and
 - identify and evaluate effective spill prevention and response methods, equipment, and technology in the Arctic environment (#55).

CHAPTER 5: EXISTING ENVIRONMENT IN BAFFIN BAY AND DAVIS STRAIT

5.1. PHYSICAL ENVIRONMENT

This section summarizes the existing conditions of the physical environment for the Area of Focus in Baffin Bay and Davis Strait (Figure 2) and includes a discussion on climate change. Unless otherwise noted, the summary is based on the following information provided to the NIRB:

- Environmental Setting and Review of Potential Effects of Oil and Gas Activities Report, referred to as “*Environmental Setting and Potential Effects*” (Nunami Stantec, 2018a);
- Qikiqtaaluk Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut for the Baffin Bay and Davis Strait Marine Environment Report, referred to as “*Inuit Qaujimajatuqangit Report*” (QIA, 2018a);
- Evaluating the Role of Marine-Based Harvesting in Food Security in the Eastern Arctic, referred to as “*Food Security Report*” (QIA, 2018a); and
- Information gathered during the NIRB’s public scoping sessions.

5.1.1 *Background*

5.1.1.1. *Climate and Meteorology*

Background Information

The following is a summary of information on climate and meteorology provided in Section 3.1 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a) and Section 4.0 of the QIA *Inuit Qaujimajatuqangit Report* (QIA, 2018a). Please refer to these reports for additional information.

The average air temperature from 1981-2010 at Clyde River, which is centrally located to Baffin Bay and Davis Strait, ranged from 5 degrees Celsius (41 degrees Fahrenheit) in July to -30 degrees Celsius (-22 degrees Fahrenheit) in February.¹⁰⁰ Most precipitation falls as snow in autumn and winter. Within its public written comments, ECCC noted that precipitation amounts are generally higher in the southern part of the Area of Focus than the north due to the more humid air masses that accompany the storms coming from the south. Heavy rain is rare on Baffin Island and snow can occur at any time of the year. Wind mostly comes from the north, northwest, and west. High winds occur relatively often in the Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b) with recorded extreme wind gusts of up to 122 km/hr. Storms occur most frequently in October and November and can include wind events that can drive waves and swells to fracture and decay ice. Fog is common over Baffin Bay and Davis Strait year-round because the water is typically much colder than the nearby land. Fog also often develops near ice floe edges and over polynyas.

¹⁰⁰ Observations from the Clyde River station may not be representative of the conditions over the entire Area of Focus.

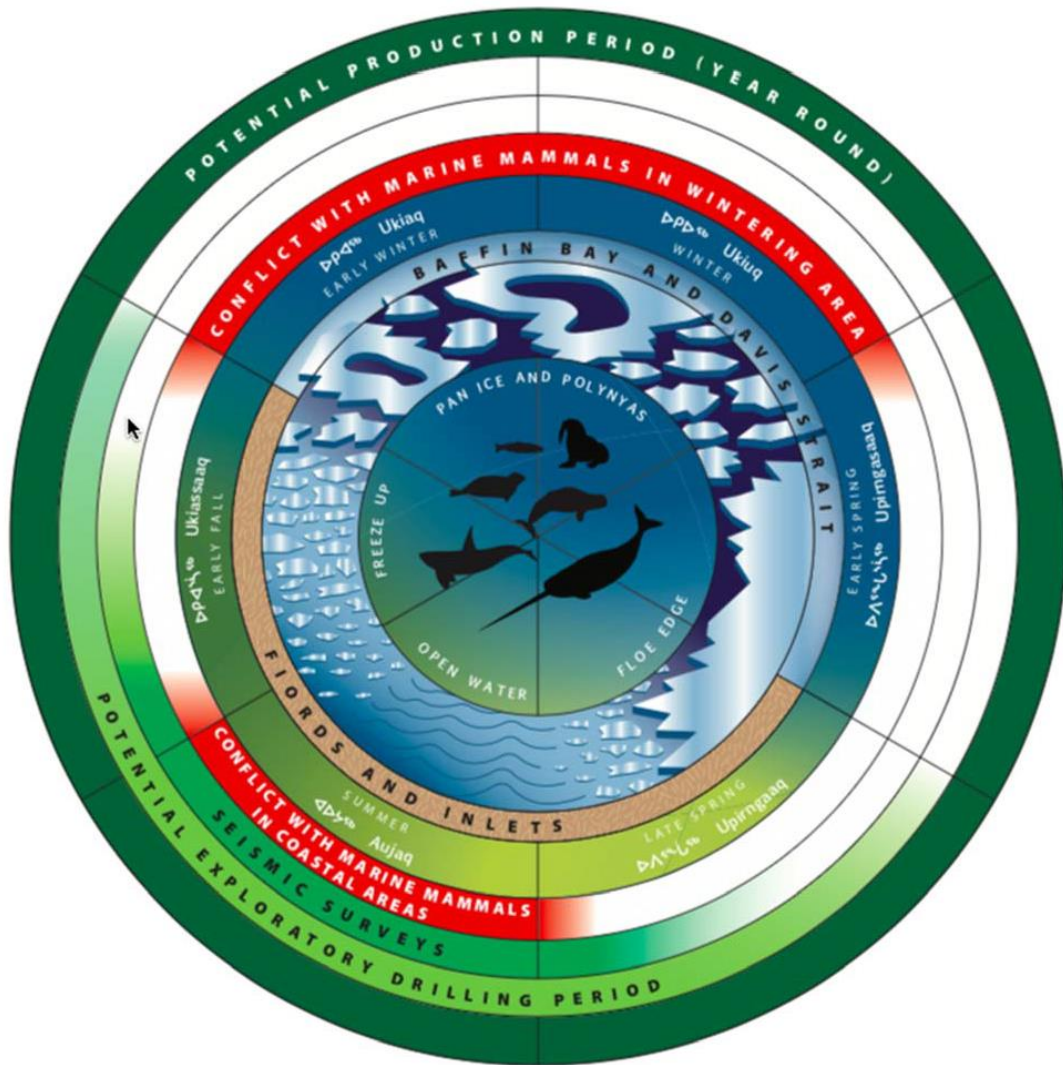
The QIA *Inuit Qaujimajatuqangit Report* focused on the six (6) communities of Arctic Bay, Clyde River, Grise Fiord, Pangnirtung, Pond Inlet, and Qikiqtarjuaq. When visiting the communities, the QIA asked Inuit Qaujimajatuqangit advisors about seasonal conditions specific to each community to identify not only regional differences but as baseline to predict potential effects. The QIA *Report* explains that understanding *sila* was once a life skill critical to survive in the Arctic and highlights that the Inuktitut language is full of terms specific to Arctic weather and environmental conditions that explain the changing seasons and what to expect. There are terms specific to snow, ice, navigation, and life. All conditions of ice needed to be understood (e.g., was it safe to travel?) and today, *sila* is more closely related to day-to-day weather.

Seasonal travel was part of life. Until the middle of the last century, Inuit were semi-nomadic, following the animals and establishing campsites to meet specific needs. Winter camps were located on sea ice to be closer to ringed seals. Spring camps would be near shores to take advantage of both the sea ice hunting for seals and whales, as well as, inland hunting for eggs laid by newly arrived geese and ducks. Fall campsites were situated close to rivers to coincide with the annual Arctic char runs, where char migrate back from the sea to spawn and overwinter in lakes and rivers. These movements were not random. They followed a specific seasonal pattern, taking advantage of seasonal conditions, animal migrations, and cultural exchanges. In order to survive, an intimate knowledge of the land and seasons was needed

QIA, 2018a

Figure 8: Inuit Calendar (Source: QIA, 2018a) reflects environmental conditions general to the Qikiqtaaluk communities of Grise Fiord, Arctic Bay, Pond Inlet, Clyde River, Pangnirtung, and Qikiqtarjuaq marking the length of day and ice conditions. Seasons are described as daylight and darkness periods, periods of ice, and melt and are organized according to six (6) seasons: winter, early spring, late spring, summer, early fall, fall, and early winter. Each season is also related to specific activities and what foods can be found during each part of the year (Table 6: Qikiqtaaluk seasonal calendar and related activities (Source: QIA, 2018a)).

Figure 8: Inuit Calendar (Source: QIA, 2018a)



Inuit have reported that the sun's rays are increasing, and temperatures are warmer throughout the year, altering the timing and duration of traditional hunting seasons. Inuit have also observed that *Aniuvat* (permanent snow patches) are decreasing in size and permafrost is melting, there is more rain, and the snow and ice form later in the year and melt earlier.

The weather seems to be a little less sure, but all I can say is that the weather always changes and is unpredictable year to year, because some days, some seasons and years do not behave exactly as the years before them (Boas H, as cited in GN-DOE 2005, as cited in Nunami Stantec, 2018a, p.5.91).

Weather forecasts are based on measuring the weather elements (temperature, pressure, humidity, wind speed, and wind direction) for as many locations as possible and then using this information in combination with historical conditions to predict what conditions will be in the future. As outlined in the *Environmental Setting and Potential Effects Report*, confidence in the conclusions for the potential effects of the environment on oil and gas activities are based on future climate predications and the existing climate information collected for Baffin Bay and Davis Strait. Weather forecasting and climate change modelling is more accurate in areas where there is a weather observation station and currently there is a lack of weather and climate monitoring stations in the Area of Focus.

Views of Interested Parties

Within its final written submission, Environment and Climate Change Canada (ECCC) noted that the four (4) meteorological stations (Clyde River, Qikiqtarjuaq, Cape Hooper, and Cape Dyer) chosen by Nunami Stantec to characterize the existing climate and meteorological conditions in the Area of Focus do not cover the range of weather that would be experienced over the entire region. ECCC recommended that climate data from Iqaluit and Pond Inlet also be considered to represent the southern and northern portions of the Area of Focus. ECCC further provided documented climate normals for the period of 1981-2010 and the National Marine Weather Guide giving a brief description of the weather to be expected over the Area of Focus (see Volume 3, Appendix C: Recommended Documents).

In discussing fog formation in Baffin Bay and Davis Strait and potential hazards associated with lack of visibility, ECCC recommended that additional information on fog formation near ice edges and over polynyas be included and provided a fog safety overview and related weather data (see Volume 3, Appendix C).

5.1.1.2. Air Quality

Background Information

Nunami Stantec provided and described air quality and greenhouse gases in Section 3.2 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Ambient air quality is monitored by federal, provincial, and territorial agencies across Canada under the National Air Pollution Surveillance program. There are federal Canadian Ambient Air Quality Standards (CAAQS) and Nunavut regulatory requirements that include ambient air quality standards and emission limits; however, ambient air quality is only measured in a few locations across Nunavut.

Emissions within Nunavut currently come from the combustion of fossil fuels (diesel fuel, natural gas, and fuel gas) used for heating homes, transportation (e.g., airplanes, cars, and trucks), marine shipping (e.g., supply vessels and cruise ships), and diesel generators for power production in communities and industrial activities (e.g., mining and oil and gas). Ground level ozone, aerosol particles (including black carbon and sulphates), as well as polycyclic aromatic hydrocarbons can also be transported to the Arctic region from locations in Asia, North America, and Europe.

A summary of the quantities of air contaminants released to the atmosphere in Nunavut is provided in Table 7: Air Contaminants and GHG Emissions – Nunavut 2015. “For context, the greenhouse gas (GHG) emissions from Canada are 722,000,000 tonnes carbon dioxide equivalents (CO₂e) per year for the year 2015” (ECCC, 2017c, as cited in Nunami Stantec, 2018a) with Nunavut contributing approximately 0.08%.

Table 7: Air Contaminants and GHG Emissions – Nunavut 2015

Emissions (tonnes per year)									
Air contaminants, 2015						Greenhouse gases (GHGs), 2015			
TSP	PM _{2.5}	NO ₂	SO ₂	CO	THC	CO ₂	CH ₄	N ₂ O	CO ₂ e
10,400	-	12,600	2,560	2,040	700	581,000	360	51	626,000 ^a
Notes: a) Some hydrofluorocarbons are not shown but are included in the total value.									
Source: ECCC, 2017c, 2017d, as cited in Nunami Stantec, 2018a									

A summary of the 2016 air quality data from Iqaluit is provided in Table 8: Summary of Measured Concentrations (µg/m³)—Iqaluit—2016. Measured concentrations for Nitrogen Oxides (NO_x), and Particulate Matter (PM_{2.5}) and ozone are well below the Nunavut Ambient Air Quality Standards which suggests that the air quality is generally good. The NO_x from sources in Nunavut makes up the largest percentage of total national emissions at 0.7%, with the majority being produced by marine vessel traffic. The concentrations of volatile organic compounds (VOC) are not measured in Nunavut and are likely to be nominal on average due to the small number of sources currently in the region.

Table 8: Summary of Measured Concentrations (µg/m³)—Iqaluit—2016

Value	Average Period	Maximum	Percentiles			Minimum	Nunavut Ambient Air Quality Standards (µg/m ³)
			98 th	95 th	90 th		
NO _x	1-hour	248	75.7	36.3	26.9	3.58	400
	24-hour	65.7	51.2	28.6	23.9	5.83	200
PM _{2.5}	24-hour	23.0	11.0	8.00	6.00	0	30
Ozone	8-hour	84.4	76.6	72.6	68.7	9.82	124
Notes: NO _x = nitrogen oxides; PM = total particulate matter							
Source: ECCC, 2017a, as cited in Nunami Stantec, 2018a							

While progress has been made in recent years to increase the understanding of air pollution in the Arctic, the sensitivity of the Arctic climate to emissions of pollutants is not well characterized. As outlined by Nunami Stantec in the *Environmental Setting and Potential Effects Report*, there are substantial uncertainties when it comes to quantifying the effects of air pollution on climate change, ecosystems, and human health. Long-term surface observations provide the main source of information on seasonal trends in Arctic pollutants however, there is a lack of air quality data for the Area of Focus, including over the water. Baseline information is needed on the amount of GHGs such as methane under the sea ice and within the terrestrial environment, and the likelihood of those gases being released as the climate changes. Additionally, since the Arctic atmosphere is a cold stable air mass, with suppressed mixing of pollutants, there is an important vertical component that influences the fate of airborne pollutants and their transfer from the atmosphere (troposphere) to the surface. “Understanding vertical transport of [air pollutants] in the Arctic was identified as one of the key uncertainties in evaluating the impacts of extra-Arctic pollutants on the Arctic.” (Arnold et al, 2016 as cited in Nunami Stantec 2018a).

In the future, as the climate changes and the sea ice diminishes, Nunami Stantec noted that shipping routes will remain ice-free for longer durations and shipping levels would be expected to increase contributing to the cumulative effects of air pollutants and air quality.

As noted in the *Environmental Setting and Potential Effects Report*, potential greenhouse gas emissions from an offshore oil and gas industry in Nunavut must be analyzed at various scales of development in combination with other GHG emission activities such as marine shipping.

Views of Interested Parties

Environment and Climate Change Canada (ECCC) noted in its final written submission that it has developed a Marine Emission Inventory Tool, which is an activity-based emissions inventory of all marine vessels operating in Canadian waters. ECCC noted that it has investigated the impact of shipping emissions in the Canadian Arctic and recommended source of information be considered for future work (see Volume 3, Appendix C: Recommended Documents).

ECCC also noted that the federal government issued the Canadian Ambient Air Quality Standards (CAAQS) for SO₂ and NO₂ in October 2016 and December 2017 respectively. The CAAQS’s were developed under *Canadian Council of Ministers of the Environment* guidelines using a collaborative process with federal, provincial and territorial governments, indigenous peoples, representatives and stakeholders from industry, and health and environmental organizations. ECCC made recommendations regarding updating the CAAQS included in the *Environmental Setting and Potential Effects Report*

5.1.1.3. Bathymetry

Background Information

Baffin Bay and Davis Strait are both semi-enclosed oblong basins. Baffin Bay is about 1,400 kilometres (km) long and 550 km wide, and its deepest point is more than 2,300 metres (m). Davis Strait is smaller than Baffin Bay and is about 300 km wide and has depths up to 1,000 m. On the

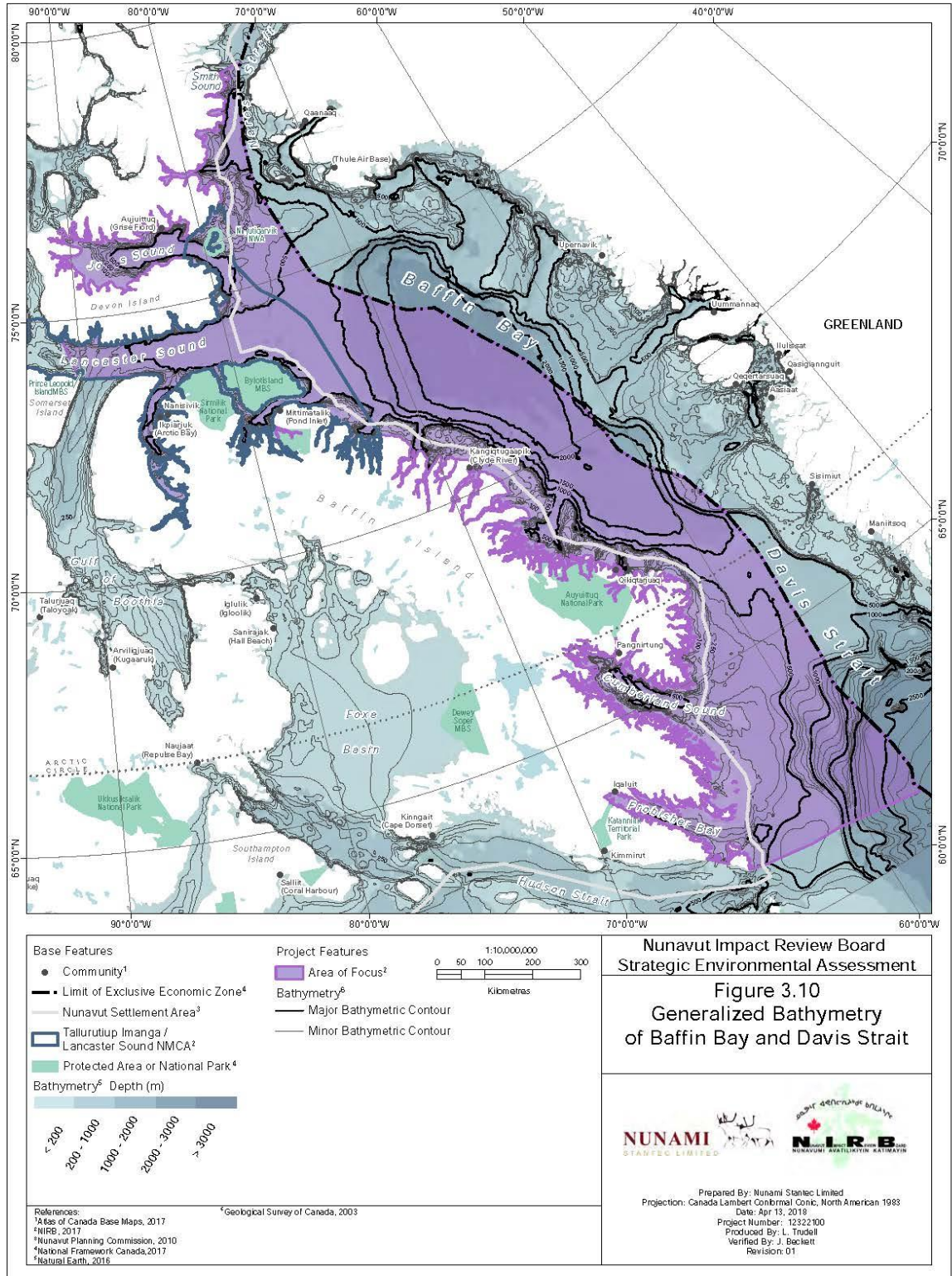
Greenland side of Baffin Bay, there is a wide shelf extending approximately 150 km, while on the Baffin Island side there is a much narrower shelf extending approximately 35 km. Figure 9: Generalized Bathymetry of Baffin Bay and Davis Strait (Nunami Stantec, 2018a) shows the generalized bathymetry of the region. Greater detail on the bathymetry found in Baffin Bay and Davis Strait is available in Section 3.3 of the *Environmental Settings and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

The bathymetry of Baffin Bay is unique among the Arctic seas due to the presence of shallow sills to the north and south, which restrict water movement and create a relatively isolated body of cold, deep, polar water. Baffin Bay connects to both the Arctic and Atlantic Oceans across these sills, and while these sills restrict deep water flow, they still permit cold Arctic surface waters to enter Baffin Bay from the north via Lancaster Sound (55 km wide, 125 m deep), Jones Sound (30 km wide, 190 m deep), and Nares Strait (40 km wide, 220 m deep). These sills also permit intermediate waters from the Atlantic Ocean to enter from the south through Davis Strait.

Unlike Baffin Bay, Davis Strait is widely open to the rest of the Northwest Atlantic Ocean without obvious bathymetric barriers such as shallow sills. Arctic waters entering Baffin Bay to the north through Lancaster Sound, Jones Sound, and Nares Strait flow south through Davis Strait to enter the Northwest Atlantic Ocean.

As outlined by Nunami Stantec in the *Environmental Setting and Potential Effects Report*, the general bathymetry of the Baffin Bay and Davis Strait and the seabed in the Area of Focus is limited as the area has not been adequately surveyed since the 1970s. While some areas of the Area of Focus have been investigated in detail (e.g., the Scott Seep), most areas within Baffin Bay and Davis Strait require further investigation through detailed multi-beam surveys. Bathymetric information is required to support planning and design of oil and gas projects, as well as to complete assessments of potential effects to the physical and biological environments.

Figure 9: Generalized Bathymetry of Baffin Bay and Davis Strait (Nunami Stantec, 2018a)



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Views of Interested Parties

In response to a Community Representative from Cape Dorset’s question during the Final Public Meeting on whether the ocean bottom has been mapped, especially where icebergs travel, the Canadian Coast Guard noted that seabed mapping is conducted by the Canadian Hydrographic Service and that the maps are publicly available.¹⁰¹ In addition, a Community Representative from Pangnirtung requested clarification on whether additional studies would be conducted of the area including bathymetry, benthic environment, and the bottom of the ocean.¹⁰² A Board Member similarly requested clarification on whether any bathymetry studies have been done to determine the depth of the sea in certain parts of the North noting that “*there are some areas that are –that are experiencing tidals and tidal waves, ...there’s less sea water*”.¹⁰³ In response, it was noted by both Transport Canada and Fisheries and Oceans Canada that surveys of the Arctic are ongoing and navigation charts will be made available once complete.^{104,105}

5.1.1.4. *Oceanography (including water quality)*

Background Information

The following sections provide an overview of the key oceanographic conditions and characteristics for the Area of Focus in Baffin Bay and Davis Strait, including currents, sea water temperature, salinity, tides, upwelling and polynyas, trends, extreme events, and seasonal variations as provided in Section 3.4 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a), unless otherwise stated. Please refer to this section and report for additional information.

Currents

The region is dominated by two (2) strong currents, the Baffin Island Current and the West Greenland Current, with several smaller currents also present (see Figure 10: Generalized Currents in Baffin Bay and Davis Strait (Nunami Stantec, 2018a)). The cold and fresh Arctic water entering Baffin Bay through Lancaster Sound, Jones Sound, and Nares Strait form the broad, surface-intensified Baffin Island Current, originating from the West Greenland Current in Nares Strait off the coast of Grise Fiord. This fresh water entering Baffin Bay is somewhat confined to the margins of the bay as part of a counterclockwise circulation pattern. The Baffin Island Current travels north to south bringing cold and fresh water down the east coast of Baffin Island and into the western half of Davis Strait, eventually feeding into the Labrador Current.

¹⁰¹ Exchange between A. Alasuaq, Cape Dorset and K. Knapp, Canadian Coast Guard, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 819-820, lines 12-16 and 7-14.

¹⁰² S. Keenainak, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 410, lines 9-15.

¹⁰³ U. Puqignak, NIRB Member, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 552, lines 10-12.

¹⁰⁴ A. Gudmundson, Transport Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 552-553, lines 20-26 and 1.

¹⁰⁵ A. Doherty, Fisheries and Oceans Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 553, lines 5-19.

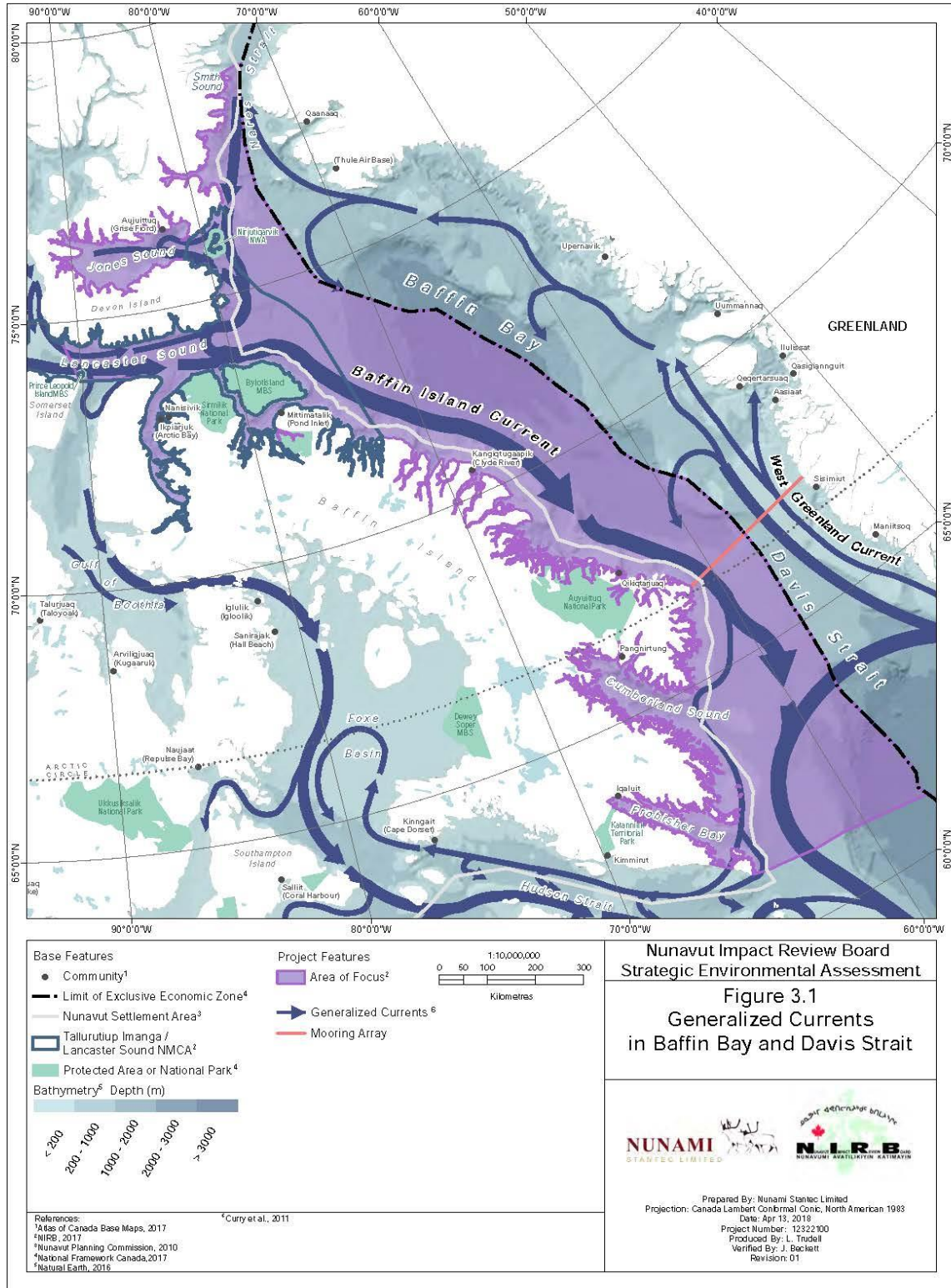
Along the west Greenland shelf and slope, the West Greenland Current transports cold and fresh Arctic water northward as a continuation of the Eastern Greenland Current, and relatively warm and salty water from the Irminger Sea further offshore. The majority of the water originating in the Irminger Sea is circulated counterclockwise around the northern Labrador Sea and is constrained by the bathymetry of Davis Strait. However, a portion of this water from the Irminger Sea continues to flow northward along the slope into Baffin Bay as a continuation of the West Greenland Current.

In addition to the Baffin Island Current and West Greenland Current, other currents in the Area of Focus contribute to circulation patterns observed in the region. The *Pikialasorsuaq* (North Water Polynya) is a nexus for ocean currents flowing northwards up the east side of Davis Strait, and those flowing eastwards (Lancaster and Jones Sounds) and southwards (Nares Strait) from the Arctic through the Canadian Arctic Archipelago. These various currents transport and mix water derived from Atlantic, Arctic, and Pacific Oceans, as well as water from multiple rivers and sea ice melt.

The complex geometry of the Canadian Arctic Archipelago includes many small channels that can give rise to large tidal currents at small scales. Tidal currents can contribute to the vertical transport of heat and nutrients through the generation of internal tides. Tidal currents can also produce sufficient turbulence to cause the vertical mixing capable of forming and maintaining a polynya. Slow-moving tidal currents that encounter a shallow and/or narrow strait area can move warmer, deeper water to the surface, preventing the formation of ice.

As heard during the NIRB Public Scoping Sessions, Elders and hunters throughout the communities have observed that currents are now stronger, and tides are more pronounced than in the past and need to be better understood. In Grise Fiord, it was noted that many items have been found there that have drifted from Greenland. It was noted in Qikiqtarjuaq that the sea water is different from Pond Inlet in terms of temperature and clarity, and there is less current in the High Arctic. During the public engagement sessions to discuss the Preliminary Findings Report, a resident in Resolute noted that the currents as identified in posters created by Crown-Indigenous Relations and Northern Affairs Canada did not accurately reflect direction near the community. Further, the West Greenland Current loses heat as it moves north. As noted in the *Inuit Qaujimaqatuqangit Report*, currents have a significant influence in wintertime open water areas and that strong tidal currents can sweep marine wildlife away or hunters can be swept under the ice.

Figure 10: Generalized Currents in Baffin Bay and Davis Strait (Nunami Stantec, 2018a)



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Sea Water Temperature and Salinity

There are multiple layers of water present in Baffin Bay and each of these represent different temperatures and salinities. The temperature and salinity in the Area of Focus have limited seasonal variability, except in the upper 300 metres (m) of eastern Davis Strait, northern Baffin Bay and the mouth of Lancaster Sound, suggesting that winter convection does not penetrate deeper than this depth. Higher salt content has been noted in the waters around Clyde River. The water in the northwest region of Baffin Bay is four (4) degrees Celsius cooler than in the southeast region as a result of the counterclockwise circulation patterns observed within Baffin Bay. Further, salinity in the central part of Baffin Bay has been noted to be higher than that of coastal waters. In general, the saltwater has been reported to be warmer in recent years

Tides

Tides are different depending on the location within Baffin Bay and Davis Strait, with the tides being semi-diurnal¹⁰⁶ throughout. Baffin Bay has a tidal range of three (3) m in the southern part of the bay, with a tidal range of 2.8 m in the northern part of the bay at the entrance to Lancaster Sound. Tidal ranges vary throughout the region with the smallest tidal range observed near Clyde River where the tidal range is 1.4 m to the largest observed in Frobisher Bay, on southeast Baffin Island, where tidal range of up to 11 m in height is observed.

It was noted within the *Environmental Setting and Potential Effects Report* that community members have observed changes in the currents and tides with currents being noted as stronger and tides being noted as more pronounced (high tides are higher and low tides are further from the shoreline). Further, community members have observed that neap tides are stronger than usual, with areas that were bare before now being under water.

Upwelling and Polynyas

Within the Area of Focus, localized upwelling events in shallow coastal areas are associated with the formation and maintenance of polynyas. A polynya is a geographically fixed region of open water or low average sea-ice thickness that is isolated within thicker pack ice. In general, polynyas in the Arctic are created at the periphery of central basins and near the coasts where favourable conditions for formation and maintenance occur. Shallow coastal areas are the most favourable sites for the formation of polynyas because these are areas of localized upwelling, and convective and tidal mixing. For the most part, polynyas tend to be roughly oval or circular in shape, but may be irregularly shaped. The formation of recurring open water sites in ice-covered seas, including polynyas and shore-fast leads, reflect local geography, ice conditions, water movements, and wind.

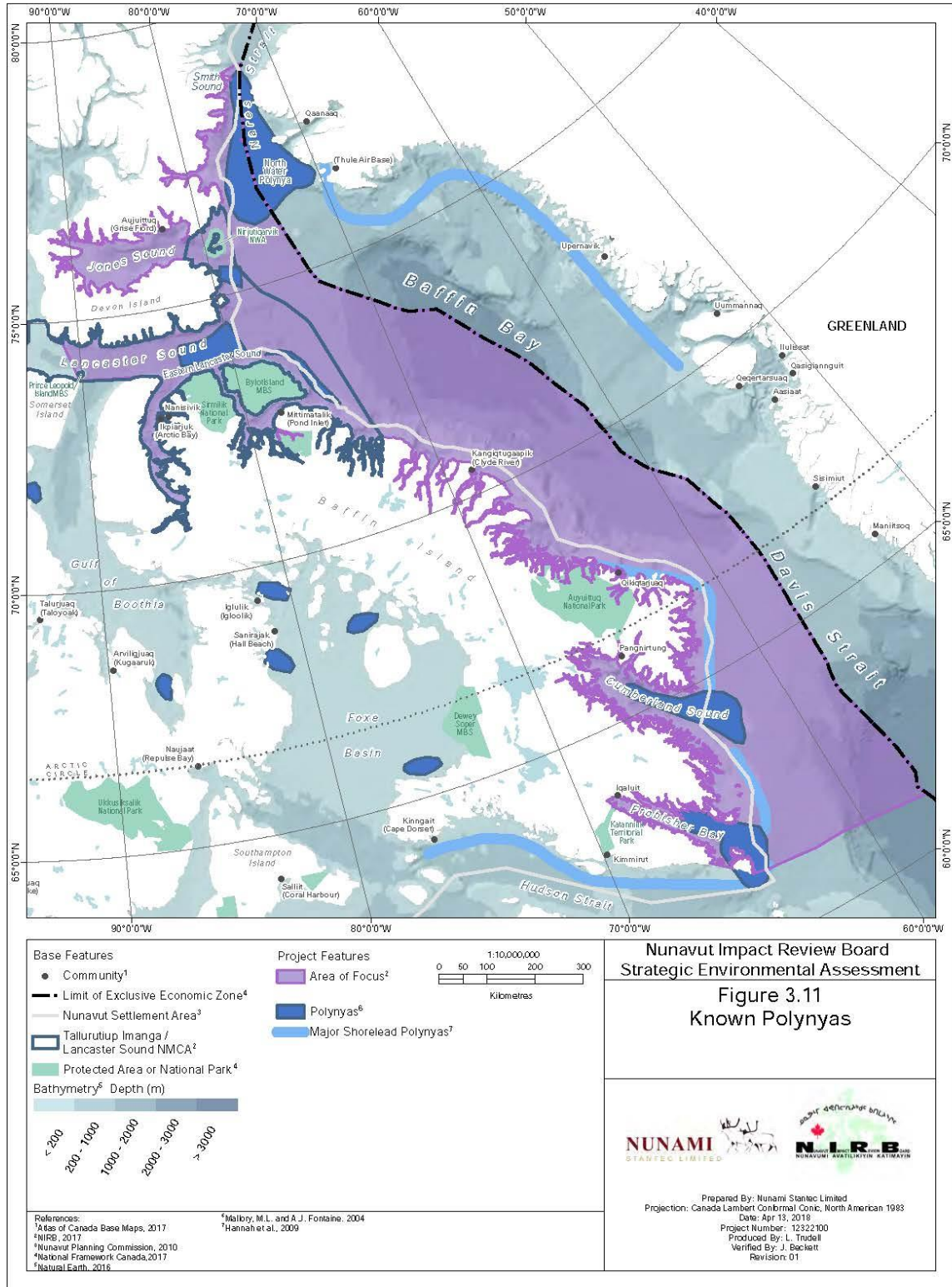
There are several known polynyas in the Area of Focus with the major ones identified as the *Pikialasorsuaq* (North Water Polynya; large concentration of polynyas located in the northern section of the Area of Focus in Smith Sound and in northern Baffin Bay), Bylot Island Polynya (large concentration of polynyas in northwest Baffin Bay located at entrance to Lancaster Sound), Cumberland Sound Polynya (large concentration of polynyas located in western Davis Strait in Cumberland Sound), and Frobisher Bay Polynya (large concentration of polynyas located in southwestern Davis Strait in Frobisher Bay). Based on Hannah et al. (2009), additional polynyas

¹⁰⁶ Semi-diurnal tides occur approximately every half day with the two highs and two lows being approximately the same height.

exist in the area that were not addressed in the Nunami Stantec's report including Lady Ann/Coburg Island Polynyas (polynyas located at the entrance to Jones Sound). See Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b) for a map of the current known polynyas in the Area of Focus.

Further, there are also major shorelead polynyas in the Area of Focus. One such shorelead polynya is known to occur along the coast of Greenland in Baffin Bay, which stretches from approximately Saunders Øer Island in the north and Disko Island to the south. Another follows the coast of Baffin Island in Davis Strait and through Hudson Strait, beginning near Qikiqtarjuaq and ending near Cape Dorset. However, as noted within the *Environmental Setting and Potential Effects Report* reported Inuit Qaujimaningit has indicated that sea currents are becoming stronger annually, and therefore polynyas are being found in unusual places and ice is becoming thinner. According to the *QIA Inuit Qaujimajatuqangit Report*, new polynyas have been observed in recent years, including a small one at Clyde River and one near Qikiqtarjuaq, which previously was one of the few communities not associated with a polynya.

Figure 11: Known Polynyas to occur in the Area of Focus (Nunami Stantec, 2018a)



Polynyas that reliably occur each year are believed to be ecologically significant and are valued by Inuit as overwintering habitat for marine mammals and essential wintertime harvesting areas. There is also a positive correlation between recurrent open water sites and the abundance of marine organisms such as whales, seals, and marine birds. Further, the availability of food from increased primary production in phytoplankton, ice algae, and marine plants is a major contributing factor in the abundance of marine organisms observed at recurrent open water sites.

Pikialasorsuaq (North Water Polynya) is considered a critical resource and habitat for key marine mammals, fish, and seabirds upon which communities depend upon. Due to its biological diversity, the polynya has been an important hunting ground, providing Inuit with food and resources for making clothes and tools, and thus, deemed invaluable for cultural and spiritual well-being.

NIRB Community Scoping Meetings

Trends, Extreme Events, and Seasonal Variations

The physical and chemical properties of Baffin Bay and Davis Strait are susceptible to localized and indirect impacts of climate change and other environmental stressors. Oceanographic changes such as warming temperatures, ocean acidification, and changing nutrient regimes have been observed within the Baffin Bay and Davis Strait area, with the potential for substantial impacts on ecosystem biodiversity, productivity, and species distribution.

Even though there is little seasonal variation in temperature and salinity – except in the upper 300 m of eastern Davis Strait, northern Baffin Bay, and the mouth of Lancaster Sound of the Area of Focus – there is strong inter-annual variation in both temperature and salinity. In terms of currents, seasonal variation in Baffin Bay is complex, but a general trend has emerged that currents in the summer and fall tend to be stronger than those in the winter and spring at all depths. The largest seasonal variation in currents in the Area of Focus occurs at the mouth of Lancaster Sound and on the Baffin Island slope.

Increases in the freshwater input from the Greenland ice sheet and Canadian glaciers can impact the salinity in Baffin Bay and Davis Strait coastal currents. However, the long-term effects of the growing freshwater input on stratification and thermohaline circulation on the Labrador coasts and Grand Banks ecosystem is not known. Along with changes to freshwater input, changing sea ice conditions and changing weather also can influence oceanographic conditions in Baffin Bay and Davis Strait. The variability of currents in the Area of Focus can cause contrasting ice conditions on the eastern and western sides of Davis Strait.

Identified Gaps

The *Environmental Setting and Potential Effects Report* noted that the location of polynyas in Baffin Bay and Davis Strait are known and represent areas with localized upwelling events; however, a greater understanding of upwelling in the region is needed. A better understanding of wave heights, tides, and wind in the Area of Focus is also needed, especially as it relates to public safety in the case of extreme events and the potential impacts on communities in the Area. Information on chemical and physical oceanography is required to assess potential effects of oil

and gas developments, as well as to better understand important oceanographic processes in Baffin Bay and Davis Strait, and potential effects of climate change.

Views of Interested Parties

The Government of Nunavut (GN) indicated in its final written submission that there is a gap in data on physical oceanography, including on the water column structure, water masses, and current fields. The GN recommended that a discussion be included that references the difference between open-water and under-ice seasons. The GN further noted that extensive physical oceanographic data in Baffin Bay and Davis Strait is required to construct robust regional and local hydrodynamic spill models that would inform potential environmental effects and spill response. The GN recommended that following the SEA, additional baseline studies be conducted during the under-ice and open-water seasons in the Area of Focus and regionally to inform potential environmental effects and oil spill modelling and to update the map(s) created through this process. The GN recommended the following items be studied:

- Identification of upwelling zones;
- Measurements of ocean currents (under-ice/open-water);
- Profiling thermohaline characteristics;
- Bathymetry; and
- Measurements of local wind fields.

During the Final Public Meeting, the GN further stressed that the extensive physical oceanographic data in Baffin Bay and Davis Strait would be required to construct regional and local spill models to be able to inform potential environment effects and spill response. The GN indicated that “[w]hile the preliminary findings

Extensive physical oceanographic data in Baffin Bay and Davis Strait is required to construct regional and local spill models and will inform potential environmental effects and spill response.

[B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 171, lines 9-12]

report presented information on general currents in the region, there was no presentation of measured current velocities, mixed layer depths, and how they changed from open-water to ice-covered conditions.” The GN also stressed that it would be important to discuss the differences between the open-water and under-ice seasons.¹⁰⁷

Within its public written comments, Environment and Climate Change Canada recommended two (2) publications related to polynyas, tidal currents and sea ice features be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents) and made recommendations regarding a polynya map within Hannah et al. (2009). ECCC further noted that

¹⁰⁷ B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 170-172, lines 22-26, 1-26 and 1-3.

wind is missing from the list of factors considered within the scope of the *Environmental Setting and Potential Effects Report* for the formation of recurring open water sites in ice-covered seas. A Community Representative from Pangnirtung noted concern during the Final Public Meeting that there are many information gaps yet to be resolved before a decision is made, especially related to currents and water flow.¹⁰⁸

5.1.1.5. *Sea Ice and Iceberg Conditions*

Background Information

Nunami Stantec provided and described the sea ice and iceberg conditions within Baffin Bay and Davis Strait in Section 3.5 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a) and the following provides a summary of this description. Please refer to this section and report for additional information.

Variation in the formation, presence, and melting of sea (or pack) ice, glacial ice, and icebergs in the Area of Focus are great due to the ocean currents, waves, storm surges, the atmospheric circulation, the air temperature, the sea surface temperature, salt content, and ice sheet melt in Greenland. A large variability in sea ice conditions can therefore be experienced from year to year, and also in any given year on time scales of days to weeks and over comparatively small geographic scales of tens of kilometres.

Within Baffin Bay, sea ice forms through the fall and winter months and is usually at a maximum in March with the Bay often covered by early January. It was noted that sea ice is jammed fast to the coasts and extends over the ocean as a solid sheet. The area of Davis Strait may or may not be covered by ice depending on the year. Ice begins to thin and melt in April, and both Baffin Bay and Davis Strait are nearly ice free in *Aujaq* (August to September). Most of the sea ice in Baffin Bay and Davis Strait is less than one (1) year old, although in some years, multi-year ice forms when all the ice does not melt. As noted in the *Inuit Qaujimagatuqangit Report*, Inuit knowledge identified that ice is essential habitat to polar bear and to ringed seal for birthing. In much of the Arctic, including Baffin Bay and Davis Strait, the extent of sea ice has gotten smaller over time, especially the minimum extent (this is the extent of sea ice in September). Within the *Environmental Setting and Potential Effects Report* it was noted that community members in Arctic Bay, Iqaluit, and Pangnirtung have observed: ice freezing-up later in the year and over a longer period; thinner sea ice conditions; more snow accumulating on the ice; new areas of open water; and earlier ice break-up. Based on Mudryk et al. (2018), historical datasets show that the fraction of Canadian land and marine areas covered by snow and ice is decreasing over time, with seasonal and regional variability in the trends consistent with regional differences in surface temperature trends.

The Canadian Coast Guard (CCG) has also observed in recent years that thick multi-year sea ice has been transported from the High Arctic and Canadian Arctic Archipelago to downstream areas where this thick multi-year ice cover is advected during winter. As the Arctic ice pack has declined

¹⁰⁸ H. Oshutapik, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 200, lines 10-17.

in aerial extent and thickness, the CCG noted in its research that the ice pack has become increasingly mobile. This has contributed to increased ice transport through narrow channels along the periphery of the Arctic Ocean (i.e., Bering Strait, Nares Strait, and interisland straits of the Canadian Arctic Archipelago) and increased the presence of thick multi-year sea ice from the High Arctic at more southern locations that have typically not contended with such sea ice (Barber et al., 2018).

The *Inuit Qaujimagatuqangit Report* highlights that *Sinaaq* (“floe edge”) is a critical part of sea ice conditions, which is at the margin of the seasonal ice and open water that winter and early spring harvesting takes place and it is considered an active biological area. The QIA

Siku (sea ice) is not barren to Inuit. It is essential wildlife habitat whether floe edge, landfast ice, or icebergs. *Sinaaq* (floe edge), is where wildlife feed, mate, and give birth

QIA, 2018a

research and the NIRB’s scoping sessions documented harvesters commenting on the receding sea ice extent. The floe edge is closer to communities than in the past. For example, in Pangnirtung where the QIA interviewed harvesters, the sea ice only extends halfway into Cumberland Sound as compared to the extent in the past. It is also not considered as safe to travel on as previously.

In contrast to sea ice, icebergs are made of a lighter, stronger ice, that is formed from glaciers, and ice shelves that typically originate on land. Most of these have broken off from a larger glacier in Greenland called the Greenland Ice Sheet, however some icebergs also come from glaciers in the Canadian high Arctic. The icebergs follow the direction of the major currents, eventually exiting Baffin Bay to the south through Davis Strait and into the Atlantic Ocean. The distribution of icebergs in Baffin Bay is not uniform. The sources of the icebergs and the ocean currents result in a much greater concentration of icebergs at locations within 50 kilometres (km) of the Greenland coast. From 50 km to 150 km offshore, the iceberg distribution is more dispersed, and beyond 150 km (in the central part of the Bay), icebergs are rarely observed.

As noted within the *Inuit Qaujimagatuqangit Report*, Clyde River harvesters reported that icebergs can contact and rub against the ocean floor as they are moved by wind and currents and that icebergs, along with other ice formations, are a form of critical wildlife habitat. These harvesters have observed that seals, walruses, whales, fish, and birds can be found in the wake of large icebergs – drawn to the iceberg’s trailing edge where plankton and krill are exposed. The habitat associated with icebergs is similar to that found at the floe edge. For example, walruses can use icebergs as haul outs. Icebergs are also an indicator of the location of the floe edge according to Qikiqtaaluk harvesters and are used as a travel marker. During the NIRB’s Public Scoping Sessions, a community member from Arctic Bay shared knowledge on ice movement through Admiralty Inlet, noting that packs of ice move through Lancaster Sound into Baffin Bay with large blocks of multi-year ice blocking the mouth of Admiralty Inlet. Community members in Grise Fiord and Cape Dorset shared knowledge related to multi-year ice noting that there is no more multi-year ice in the areas and that ice is thinner and smoother, which was thought to be attributed to climate change. In Resolute, community members commented on the tides and ice flow in Baffin Bay and through Lancaster Sound. Residents in Resolute, Cape Dorset, and Qikiqtarjuaq discussed the characteristics of icebergs. The NIRB also heard in Cape Dorset that icebergs near

Qikiqtarjuaq and Greenland are extremely large and sometimes contain large rocks, which was attributed to climate change.

The National Research Council has developed a reliable iceberg drift forecasting model (National Research Council Iceberg Drift Model) in collaboration with the Canadian Ice Service, academia, and other consulting firms. This model incorporates comprehensive physics of iceberg motion, deterioration and calving, and a robust numerical method and helps to increase the accuracy of forecasts over previous methods. However, efforts are still needed to improve the monitoring, detection, and forecasting of icebergs and this can be improved with the use of more satellite data.

While current ice management procedures are generally effective, there is a need for additional knowledge related to the following areas:

- Iceberg towing in pack ice;
- Detection of small icebergs in pack ice; and
- Improved methods of detection and monitoring of icebergs;

Nunami Stantec, 2018a

Views of Interested Parties

During the Final Public Meeting, a representative for Nunavut Tunngavik Incorporated (NTI) noted that two (2) scenarios were considered in their own research with respect to oil and gas and that the challenges associated with sea ice in both Baffin Bay and Davis Strait needs to be considered in the operations of oil and gas.¹⁰⁹ In response to a question on the scenarios it presented, NTI indicated that while there are risks to having onshore facilities (e.g., pipelines could be scoured by icebergs), the risks for the onshore facilities were less than those of the offshore facilities as currently there are no operations being conducted in ice or in areas affected by the amount of icebergs seen in the Area of Focus.¹¹⁰ Following questions on the different types of ice found in the Arctic, NTI indicated that multi-year ice is coming through Nares Strait from the Arctic Ocean while seasonal ice is declining throughout the region, noting that seasonal ice is melting in the Arctic Islands and releasing multi-year ice.^{111,112}

Within its final written submission, the Government of Nunavut provided a summary on potential oil behaviour in ice conditions, noting that the behaviour of oil in ice conditions is complex and that more research is needed.

Fisheries and Oceans Canada provided links within its public written comments to literature produced by the Arctic Council and the Arctic Monitoring and Assessment Programme that

¹⁰⁹ W. Johnson, Nunavut Tunngavik Inc., NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 244, lines 16-23.

¹¹⁰ Exchange between J. Beckett, Nunami Stantec and W. Johnson, Nunavut Tunngavik Inc., NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 261-263, lines 1-14, 17-24, 1-8, 18-26 and 1-8.

¹¹¹ Exchange between F. Petrovic, Crown-Indigenous Relations and Northern Affairs Canada and W. Johnson, Nunavut Tunngavik Inc., NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 270-271, lines 5-12, 16-26, and 1-13.

¹¹² Exchange between L. Audlaluk, Grise Fiord and W. Johnson, Nunavut Tunngavik Inc., NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 282-284, lines 2-4, 24-26, 1-4.

provide information on the current state of the Arctic marine environment and the impacts of climate change and pollution. DFO noted that many of these reports provide specific information related to the Baffin Bay and Davis Strait region. DFO also recommended that one (1) report related to snow, water, ice, and permafrost be reviewed for any future assessments (see Volume 3, Appendix C: Recommended Documents).

Environment and Climate Change Canada (ECCC) indicated in its public written comments that the management of sea ice incursions as part of the activities associated with offshore oil and gas exploration and development in the Area of Focus should be considered as part of the assessment. ECCC recommended that the link between North Atlantic Oscillation and Atlantic Multidecadal Oscillation be considered and that the potential effects these could have on the environmental setting of Baffin Bay and Davis Strait be evaluated. ECCC further noted that multi-year ice needs to be considered due to the contributions of multi-year ice by advection to the Area of Focus. ECCC recommended that additional information be provided to distinguish between the different types of ice and include important contributions of multi-year ice by advection to the Area of Focus by reviewing Barber et al., 2018. ECCC discussed the conclusion made in the *Environmental Setting and Potential Effects Report* that the sea ice extent is reaching a lower value earlier in the year for Baffin Bay and indicated that current data by the National Snow and Ice Data Center provides conflicting evidence. In addition, ECCC noted that the iceberg melt rate should consider wave action in addition to surface temperature, solar radiation, winds, and whether the icebergs are caught up with sea ice.

ECCC also noted that Baffin Bay and Davis Strait are seasonal ice regimes and their ice-regimes are region specific. Finally, ECCC recommended seven (7) reports related to sea ice conditions, melt season duration, changes in the exchange of sea ice, ice thickness and historical trends for the Canadian Arctic Archipelago be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents).

At the Final Public Meeting, Natural Resources Canada stressed that the Baffin region is more prone to the effects of ice, iceberg scour, and sea ice.¹¹³

The Resolute Hunters and Trappers Association (HTA) noted within its public written comments that changes to sea ice are being observed (thinner at the bottom) were not necessarily due to climate change but also due to changes in the currents as the currents do not flush out water the same way.

¹¹³ M.E. Lenghan, Natural Resources Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 569-570, lines 26 and 1-2.

In response to a Community Representative's question at the Final Public Meeting on whether the movements of icebergs are tracked through the channels (towards Davis Strait) and their depths, ECCC noted that the Canadian Ice Service is responsible for the monitoring iceberg movement to inform vessels but was not aware of any specific studies conducted in the area.¹¹⁴ NTI had a similar question following the Canadian Association of Petroleum Producers' (CAPP) presentation on whether the ice flows and the amount of ice that would be in Baffin Bay or Lancaster Sound would be taken into account if development was to occur.¹¹⁵ CAPP noted that it is an existing information gap that would need to be filled before any activity is undertaken.¹¹⁶

...what is the extent of the ice? What is the nature of the ice? What -- what -- how much of -- in a year that's ice free, what are the flows and characteristics of that ice? It is definitely a piece of information that would be needed by an oil and gas operator before it undertakes any activity associated in exploration drilling or even production in this area.

[P. Barnes, Canadian Association of Petroleum Producers, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 619-620, lines 25-26 and 1-6.]

At the Final Public Meeting, a Community Representative from Pond Inlet noted that studies were conducted on the ice movements in the 1970's in their community and that the studies indicated that erosion occurs when icebergs hit the seabed.¹¹⁷

A Community Representative from Cape Dorset shared Inuit knowledge with respect to icebergs travelling around the region noting that icebergs (called *Piqalujaq*) will stay in the area around the winter, have their own characteristics, and are a good source of water. The Community Representative further noted concern with unpredictable icebergs:

*I am concerned about the ice and the concerns that the ice might bring to crafts in the water. Sometimes the icebergs are unpredictable. Sometimes they go against the current.*¹¹⁸

In response to a Board question on whether mapping conducted by the Canadian Hydrographic Service includes iceberg movements, ECCC noted that the Canadian Ice Service is responsible for monitoring the movement/tracking of icebergs but was not aware of any studies currently conducted in Davis Strait.¹¹⁹

¹¹⁴ Exchange between A. Alasuaq, Cape Dorset and B. Summerfield, Environment and Climate Change Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 818-821, lines 17-26 and 1-20, 2-4 and 9-12.

¹¹⁵ P. Irngaut, Nunavut Tunngavik Inc. NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 619, lines 17-22.

¹¹⁶ P. Barnes, Canadian Association of Petroleum Producers, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 620, lines 2-5.

¹¹⁷ E. Panipakoocho, Pond Inlet, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 280, lines 4-11.

¹¹⁸ A. Alasuaq, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 818-819, lines 23-26, 1-11 and 16-20.

¹¹⁹ Exchange between E. Copland, NIRB Board, and B. Summerfield, Environment and Climate Change Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 820-821.

5.1.1.6. *Acoustic Environment*

Background Information

The following is a summary of the acoustic environment of Baffin Bay and Davis Strait as described in Section 3.6 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Underwater Noise

Natural ambient underwater noise levels in the Arctic region are highly variable with regard to season (e.g., ice cracking in winter), environmental conditions (e.g., changing wind speeds, rate of precipitation), and in relation to mechanical and thermal stresses within the ice cover. At a given location,

Natural sources of ambient noise (i.e., environmental and biological) in the Arctic marine environment include wind and waves, precipitation, thermal agitation, sea ice, and marine mammals (mainly whale sounds).

Nunami Stantec, 2018a

sound transmission conditions vary with changing temperature and salinity profiles. During the winter, in areas of heavy ice cover and areas with continuous land-fast ice cover, the dominant source of ambient noise is ice cracking induced by thermal stresses as a result of temperature changes. During summers in Baffin Bay, the dominant source of ambient noise is also associated with ice, from ice melt, iceberg collisions, ice floes, break-up, and turnover of ice formations.

Marine mammals also contribute to the underwater ambient noise environment of the Arctic. For example, bowhead whales (*Balaena mysticetus*) produce broadband songs (approximately 30–5,000 kilohertz) between November and late April/early May, as well as low frequency (less than 500 hertz [Hz]) sounds that can be detected up to 30 kilometres (km) away.

Recent year-round studies that characterized the ambient soundscape in Baffin Bay and Melville Bay on the West Greenland side indicated that the ambient sound level measurements for Baffin Bay includes little anthropogenic noise and is typical of an open ocean environment, with highest sound pressure levels (SPLs) in the 10–100 hertz (Hz) and 100–1,000 Hz bands. For Melville Bay on the west side of Greenland, the ambient noise levels were dominated by sounds from glacial ice melt with dominant frequencies in the 1,000–10,000 Hz band.

Atmospheric Noise

Anthropogenic activities in Baffin Bay and Davis Strait are mainly related to shipping and marine traffic to support the small number of communities along the coasts; however, anthropogenic noise from snowmobiles, motorboats, non-industrial machinery, and rifle-fire is also present. In 2017, 1,869 ships entered the Polar Code area (PAME, 2019). As the marine traffic volumes are relatively low in Baffin Bay compared to other Arctic regions, the airborne acoustics environment in Baffin Bay and Davis Strait is expected to be dominated by natural sounds from weather (winds, waves, precipitation),

Dispersion of noise in the Arctic atmosphere is not well understood as knowledge gaps for the Acoustic Environment are related to airborne noise, including ambient sound pressure level measurements in the air over the water in the Area of Focus.

Nunami Stantec, 2018a

marine life (e.g., marine birds, polar bears, walrus), and the cracking of ice when strongly influenced by winds, ocean currents or other forces. Noise during the summer when Baffin Bay is mostly ice free is expected to be louder than during the months when Baffin Bay is ice covered, mainly because the presence of ice tends to diminish the sounds from natural wave motions. However, as indicated by the Nunami Stantec, few studies have been done to confirm whether this theory is valid. Further, there are very few publications available on acoustics or noise in the atmosphere over Baffin Bay and Davis Strait.

Identified Gaps

It was noted in the *Environmental Setting and Potential Effects Report* that there are very few publications available on acoustics or noise in the atmosphere over Baffin Bay and Davis Strait. In addition, dispersion of noise in the Arctic atmosphere is not well understood as knowledge gaps for the Acoustic Environment are related to airborne noise, including ambient sound pressure level measurements in the air over the water in the Area of Focus.

Views of Interested Parties

Within its public written comments, Fisheries and Oceans Canada recommended two (2) reports on determining how sea ice affects sound waves and the effects of cold temperatures on the velocity profile be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents).

A Community Representative also noted that different animals have different sensitivities to noise noting that “[s]eals are more sensitive to noise. And I think the whales are less sensitive to -- and the harp seals are able to hear quite far and sensitive to the noise.”¹²⁰ Other Community Representatives also noted that marine mammals such as whales¹²¹ are very sensitive to noise with a Community Representative from Pangnirtung noting “ever since, I noticed that they hear very quickly and sensitive to noise. I have many stories to tell, but I want say this concerning the whale. They're very sensitive to sound.”¹²²

5.1.1.7. *Geology*

Background Information

Nunami Stantec provided and described the geological setting and geohazards in Baffin Bay and Davis Strait in Section 3.7 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a) and the following provides a summary of this description. Please refer to this section and report for additional information.

¹²⁰ E. Panipakoocho, Pond Inlet, NIRB Final Public Meeting File No.: 17SN034 Transcript, March 21, 2019 p. 806, lines 8-12.

¹²¹ Amagoalik, Resolute, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 724, lines 25-26.

¹²² L. Ishulutaq, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp.783-784, lines 25-26 and 1-23.

Baffin Bay is the northwestern extension of the North Atlantic-Labrador Sea rift system. The Baffin Bay and Davis Strait region was subjected to tensional forces when Greenland and North America separated in response to active seabed spreading in the Labrador Sea (ca. Lower-Mid Cenozoic). Seabed spreading also resulted in graben¹²³ development which form the Lancaster Sound, Jones Sound, Cumberland Sound, Frobisher Bay, and Hudson Strait. The Davis Strait is an oblong basin and physiographic high that separates Baffin Bay from the Labrador Sea. Baffin Bay has areas to the north and south that restrict water flow (see [5.1.1.3 Bathymetry](#) for more details on the bathymetry of the Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b)).

Exploration of the seabed in the region began with hydrocarbon exploration and development in the 1970s using single and multi-channel seismic, echosounder, and side-scan sonar surveys along with borehole sampling. Limited surveys have occurred since, resulting in data gaps and lack of detail across the region.

Bedrock and Surficial Geology

The bedrock and surficial rock types in the region range in age from Precambrian to Cenozoic. The margins of Baffin Bay and Davis Strait, as well as the surrounding landmasses, are comprised of Precambrian igneous and metamorphic rock, which also outcrops on the northern Baffin Island shelf. Proterozoic rocks also likely underlie the Mesozoic sediments of Baffin Bay and border Lancaster Sound to the north and south. Lower Paleozoic sediments, primarily carbonate and detrital rocks, occur in western and northwestern Baffin Island and are widely distributed in the Canadian Arctic Islands. Seismic reflection and magnetic and gravity data suggest that Ordovician rocks underlie the southeast Baffin Island shelf between Frobisher Bay and Cumberland Sound. Phanerozoic rocks, ranging from Cretaceous to Tertiary in origin, also occur on the shelves of Baffin Bay and Davis Strait, with the oldest Mesozoic bedrock found in Cumberland Sound.

Sediments in Baffin Bay were sourced from the surrounding highlands of Baffin Island and from the Lower Paleozoic hinterlands of the Canadian Arctic Islands via major drainage systems. The fill of the Baffin Basin consists of Mesozoic, Tertiary, and Quaternary sediments. Sedimentary strata are thickest along the narrow eastern Baffin Island shelf and the broader West Greenland shelf.

On the northern Baffin Island shelf there are eight (8) major cross-shelf troughs that lie offshore of fiords or large inlets, which are characterized by steep sides and were deepened by glacial erosion. Sediment accumulations are generally thinner on the trough walls and thicker on the trough floors. The areas between troughs of the northern Baffin Island shelf are marked by longitudinal ridges and depressions.

The Baffin Fan is a 12 kilometre (km) thick sedimentary wedge of Eocene to Pleistocene age (ca. ~ 56 Ma to 11,700 years before present) in northwestern Baffin Bay that has been determined to have resource potential similar to that of the Beaufort-Mackenzie Basin.

Nunami Stantec, 2018a

¹²³ Graben – a valley with a distinct escarpment on each side caused by the displacement of a block of land downward.

Marine sediments in the Area of Focus are described in greater detail in [5.1.1.9 Marine Sediment](#).

Seismicity and Geohazard Events

Existing geohazards identified for the northern Baffin Island shelf included ice scour, steep and uneven seabed caused by glacial features, glacial fluting, hydrocarbon venting features, and slope failures on trough margins. These geohazards are consistent with those observed on other glaciated continental shelves; however, the high level of seismic activity in the area is an additional hazard on the northern Baffin Island shelf.

SEISMICITY

Unlike the majority of Canada's passive eastern continental margin, the Baffin Bay and Davis Strait region is unique because it is seismically active. Seismic hazard maps show that Baffin Bay has a relative level of hazard comparable to that of coastal British Columbia, ranging from low-moderate to moderate-high. A large number of seismic events have occurred in the deep water of the Baffin Fan. The November 20, 1933 7.3 M (Magnitude; Richter's magnitude scale¹²⁴) earthquake is the largest recorded passive margin earthquake in Canada and is also the largest known earthquake north of the Arctic Circle.

According to the National Earthquake Database, there have been 4,156 earthquakes within a 1,500 km radius from a central point in the Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b) from 1985 to February 2018. Almost all of these events were in the range of 1 to 4 M.¹²⁵ There were 20 events with a 5.0 M, and only one (1) event with a 6.0 M; none were larger than a 6.0. Most events occurred in the central part of Baffin Bay and Davis Strait and along the east coast of Baffin Island. On the shelves, clusters of seismic events occur at Buchan Trough, Scott Trough, and Home Bay. Seismic events greater than 6.0 M may trigger slope failures on the steep slopes along the margins of troughs but are not believed to have much effect on bank tops.

GEOHAZARD EVENTS

Glacial Features

Lancaster Sound and part of Baffin Bay were occupied by glacial ice during the last glaciation and there is evidence of other previous glaciations as far back as the early Pleistocene. Multibeam echosounder mapping reveals the distribution of glacial features in northern Baffin Bay and Lancaster Sound including ice scour, sediment wedges, and fluting.

Three (3) large sediment wedges were observed in the western end of Lancaster Sound and were 50 to 200 m high and collectively cover approximately 5,400 km² of the seabed. These wedges were likely deposited during the late Pleistocene retreat of ice in Lancaster Sound. Other till deltas and wedges have been deposited on the Lancaster Sound Trough-Mouth Fan. The Baffin Fan is also a large sediment wedge located in northwestern Baffin Bay.

Glacial Fluting

¹²⁴ Richter's magnitude scale is a logarithmic scale used to compare the size of earthquakes, with each whole number increase representing a tenfold increase in measured amplitude. Relative magnitudes are expressed as M.

¹²⁵ Earthquakes of magnitude 4 (4 M) and lower are generally detectable only by instruments and have minimal to no effects on the surface.

Glacial fluting is long, streamlined ridges of sediment aligned in the direction of ice flow that are produced beneath a glacier. Streamlined drumlins and seabed lineations are the result of glacial fluting and are present along the southern portion of Lancaster Sound in northern Navy Board Inlet, and northeast of Bylot Island in Baffin Bay. The high slopes (up to 60 degrees) associated with some of these glacial features could pose a hazard to seabed infrastructure.

Previous work in the region indicates the ice moved from west to east during the last glaciation. The streamlined drumlins and lineations northeast of Bylot Island in Baffin Bay indicate an ice flow direction to the southeast. While the length of the lineations is unknown, these flutes are known to be up to approximately 1,000 m wide, rise up to 75 m above the seabed, and cut as deep as 75 m into the subsurface. These lineations and drumlins were observed over approximately 3,100 km² of the seabed, but additional data is required to determine the full extent of glacial fluting. Similar glacial features are also present in the troughs on the northern Baffin Island shelf.

Ice Scour

Ice scour has disturbed much of the seabed of the northern Baffin Island Shelf, caused by both modern and ancient icebergs, with drafts deep enough to contact the seabed and cause long scours with side berms as the ice is moved by wind and currents. Modern icebergs are capable of scouring depths up to at least 430 m in Baffin Bay and Lancaster Sound; however, relict iceberg scour has been observed at a depth of 850 m.

Multibeam echosounder mapping in northern Baffin Bay and Lancaster Sound shows relatively little iceberg scour in Lancaster Sound, as approximately 80 percent of icebergs only move approximately 100 km into Lancaster Sound from Baffin Bay before being pushed back out into Baffin Bay and continue south with the Baffin Island Current.

Slope Failure

Slope failures can occur throughout the Area of Focus and can be triggered by many factors, including: over-steepened slopes, rapid sedimentation, seismic activity, glacial loading, weak geological layers, and high pore-water pressure in slope sediments. Many of these factors are present on the northern Baffin Island shelf and widespread slope failure is observed on the continental slope (e.g., area offshore of Clyde Inlet). Sediment failure can also occur along trough margins when glacial ice retreats from a trough and removes support from margin sediments.

Identified Gaps

Nunami Stantec has identified gaps in the general understanding of the geology of the Area of Focus related to seismic events and other geohazards, that would be useful in planning and designing oil and gas projects, especially regarding mitigation of potential environmental impacts. Geohazards on the northern Baffin Island shelf that were identified to require more research prior to exploratory drilling programs include: iceberg scour, slope instability, ocean currents, gravity-driven currents, and sediment movement. Additional knowledge is required on overall spatial distribution of foundation conditions such as rock or sediment type and properties before exploratory drilling or placement of structures on the seabed.

Additional data are suggested to confirm the presence of sediment failure and gullies, including data to determine if the trough margin gullies present in the Area of Focus are active conduits for sediment transport.

Views of Interested Parties

The Government of Nunavut (GN) noted in its final written submission that additional information is required on the number and type of geohazards in Baffin Bay and Davis Strait to support the development of plans and approaches to mitigate geohazards that are specific to the region and recommended research be undertaken to address the knowledge gaps in the Area of Focus. In addition to seabed geology, the GN identified information gaps on geohazards similar to that of Natural Resources Canada (NRCan), specifically:

- Seabed stability analysis and underwater slope stability;
- Geohazard identification and analysis in deep water (water depths greater than 300 metres (m)), as well as near shore and coastal areas (water depths 0 m to about 50 m);
- Geohazard identification and analysis in the fiords of Baffin Island;
- Underwater earthquake locations, probabilities, and other seismic factors;
- Tsunami probabilities, and specific locations; and
- Ice scour frequency rate, scour probabilities, return rates for large scours for Baffin Bay.

During the Final Public Meeting, the GN questioned NRCan on whether additional studies could be conducted by NRCan in terms of mapping the seabed and tsunami-prone zones to fill in the knowledge gaps in term of geohazards in the Area of Focus.¹²⁶ In response, NRCan noted that currently studies are being conducted in the Area of Focus and that studies were conducted last summer “...to investigate the stability of the seabed in the region, to investigate the natural leakage of buried oil and gas deposit at the seabed, and to learn about what types of bedrock are exposed at the seabed,” with further studies planned for this summer.¹²⁷

NRCan provided a list of recent documents and reports within its comment submission that should be considered in the literature review for the SEA which were not included in the initial *Environmental Setting and Potential Effects Report*. The papers and reports (total of 45 documents) are related to seismicity, geohazards, seabed geology, geotechnical considerations, petroleum potential, bedrock and subsurface geology, slick-like sea surface features, seeps, and the geology of Davis Strait (see Volume 3, Appendix C: Recommended Documents).

It has been noted by NRCan, both in its public written comments and final written submission, that geology and geohazards in the nearshore and deep water regions of Baffin Bay, and the fiords of Baffin Island, have not been adequately addressed or researched, and therefore represent a significant gap in the understanding of the geology and potential geohazards in the Area of Focus.

¹²⁶ A. Cyr-Parent, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 576, lines 18-25.

¹²⁷ M.E. Lengan, Natural Resources Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 577, lines 3-16.

NRCan also recommended two (2) more recent papers that should be referenced regarding geology and geohazards (Bennett et al., 2014; Syvitski et al., 2012; see Volume 3, Appendix C for more information).

NRCan also noted that more information is required on geotechnical properties of marine sediment, as understanding the properties of the sediment in general in the region can be used to evaluate potential risks such as earthquake-caused slope failure. In addition, geotechnical data and analyses would be required before any seabed drilling or construction of marine infrastructure could proceed. NRCan noted that an additional paper has come out on deep water geology since the *Environmental Setting and Potential Effects Report* was released and should be reviewed for any work to be conducted (Jenner et al., 2018; see Volume 3, Appendix C for more information). In addition, NRCan recommended two (2) publications related to geotechnical properties of sediment in Baffin Bay be considered or any future work conducted (Campbell et al., 2017 and Bennett & Higgins, 2016; see Volume 3, Appendix C for more information).

NRCan indicated in its comment submission that in other Arctic regions with potential petroleum development such as the Beaufort Sea and Sea of Okhotsk, extensive data was collected on ice scour to identify potential risks before development started. While some information has been collected in the Area of Focus, as indicated in [5.1.1.8 Coastal Landforms](#), that information has been restricted to research in limited areas of northern Baffin Bay and Lancaster Sound, preventing any sort of large-scale analyses on the frequencies, probabilities, and at risk areas of ice scour.

NRCan further noted that while some types of geohazards in the Area of Focus may occur globally, others, such as iceberg scour, are specific to Arctic regions. Information on Arctic-specific geohazards may be available from industry leaders in arctic exploration and production (such as Equinor, formerly StatOil), and other Arctic nations.

Further, geohazards in the Baffin region differ from elsewhere on Canada's eastern continental margin. It is a seismically-active passive margin and its Arctic location means the area is more prone to the effects of iceberg scour and sea ice.

It's important here to note that the Baffin Region is one of the most seismically active area in Eastern Canada...Geohazards in Baffin Bay include hydrocarbon venting features, seabed instability and sediment transport, uneven seabed caused by glacial seabed features, ice scour, and seismic activity...

[M.E. Lenghan, Natural Resources Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 569-570, lines 24-26 and 2-6.]

Before determining the viability of any seabed development and how to mitigate the impacts of geohazards on a given project, a scientific understanding of geohazard is essential.

[M.E. Lenghan, Natural Resources Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 571, lines 16-20]

Within its final written submission, NRCan noted that Appendix B of the *Environmental Setting and Potential Effects Report* provided few details on how hazardous geological conditions would be mitigated to conduct safe hydrocarbon exploration. Other oil and gas jurisdictions in Canada require a detailed site survey for proposed drilling sites in order to ascertain what geohazards are present in the area. However, limited data in Baffin Bay creates challenges in constructing a detailed plan to mitigate geohazards for proposed potential projects. During the Final Public Meeting, NRCan recommended that standard

mitigation approaches and planning consideration for geohazards be developed in consultation with offshore petroleum boards and the NEB.¹²⁸

Concerns were raised during the Final Public Meeting by a Community Representative from Clyde River regarding potential seismic events such as earthquakes and tsunami in the Area of Focus and the resulting risks to communities.¹²⁹ A community member from Pangnirtung similarly expressed concern with the frequency and magnitude of earthquakes in the Area of Focus and the potential for submarine slope failure off the coast of Baffin Island near Clyde River.¹³⁰

Additional concern was raised during the Final Public Meeting by a Community Representative from Resolute that increased crustal rebound due to reducing ice levels in Greenland might be a contributing cause to greater seismic activity in the region.¹³¹

In response to a question by the Board on its process for establishing research priorities, NRCan noted that within the Area of Focus researchers would focus on gaps in existing information and would prioritize research when there is a lack of data. It was further noted that pursuant to the Geological Survey of Canada's strategic plan for 2018, the goal of the Geo-mapping for Energy and Minerals program is to completely map the surface geology of the Arctic onshore and offshore at a coarse scale by 2020.¹³²

¹²⁸ M.E. Lenghan, Natural Resources Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 571-572, lines 14-26 and 1-4.

¹²⁹ J. Enuaraaq, Clyde River, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 796-797, lines 25-26 and 1-2.

¹³⁰ H. Oshutapik, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 840-841, lines 18-26 and 1-18.

¹³¹ J. Amagoalik, Resolute, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 518, lines 1-12.

¹³² M.E. Lenghan, Natural Resources Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 22, 2019, pp. 881-882, lines 23-26 and 1-12.

5.1.1.8. *Coastal Landforms*

Background Information

The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 3.8: Coastal Landforms (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

The topography and/or landscape of the Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b) has very steep and high fiords, mountains, and cliffs along the eastern side of Baffin Island and the coasts of Lancaster Sound and Nares Strait. Large glaciers occur on Baffin and Ellesmere Islands which calve large icebergs into the Nares Strait. Coastlines and shorelines vary considerably and are scoured by drifting fragments of ice or piles of ice driven onshore in the winter. Shoreline appearance is controlled by sea level and the sediment that makes up the shoreline. Any change to these and the availability of sediment could mean a retreat of shorelines inland or advancement.

Nunavummiut have observed that shoreline erosion is more pronounced in recent times (Nunavut Tunngavik Incorporated 2005, as cited in Nunami Stantec, 2018a). Waves in Baffin Bay are normally relatively small, community members have noticed larger waves and increased shoreline erosion around Grise Fiord in recent years which may also be influenced by changes in mean sea level and land surface slope (Nunavut Department of Environment n.d., as cited in Nunami Stantec, 2018a). However, Nunami Stantec stated that due to limited data in Baffin Bay it was a challenge to create detailed plans for mitigation and monitoring of impacts due to oil and gas activities.

Views of Interested Parties

Public written comments from Environment and Climate Change Canada (ECCC) and final written submission from the World Wildlife Fund stated that there is a lack of information known on the sensitive environments and/or habitats along the coasts and that more research is required to ensure that any sensitive areas would be protected. ECCC recommended that a shoreline sensitivity atlas be developed that includes baseline coastal information such as shoreline form, substrate and vegetation type, biological resources, and sensitive human use resources as well as indication of potential oil residency in different shoreline/substrate types.

5.1.1.9. *Marine Sediment*

Background Information

The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 3.9: Marine Sediment (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Marine sedimentation in Baffin Bay is influenced by the fresh meltwater from land, icebergs, and seasonal pack ice. The impact of these sources varies depending on the location in the Figure 2:

Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b). The thickness of the sediments varies throughout the Area; the northern part of Baffin Bay and Lancaster Sound have the greatest thickness due to the higher rates of sediment transport and an ancestral Lancaster Sound water drainage system, respectively. The thinnest sediment layer is likely in Davis Strait. The sediment deposited are made up of various combinations of silt, clay, sand, and gravel, with the occasional layer of organic material.

Nunami Stantec noted that some sediment surveys have been conducted in the Area of Focus and that Scott Inlet Seep (detailed in [5.1.1.10](#) Naturally Occurring Oil Seeps) has been well defined. However, other areas are sparse with little research conducted. Additionally, information regarding area specific chemistry of sediment was not included in the Report; however, the change to chemistry from oil and gas activities were considered in the effects analysis and is further detailed in Volume 3, Chapter 7.1.1.6: Marine Sediment.

Views of Interested Parties

Within the *Uqausirisimajavut Report*, the Qikiqtani Inuit Association (QIA) noted that there is potential for changes in the sediment quality from proposed oil and gas development of Baffin Bay and Davis Strait. The changes could be localized; however, this change could affect benthic and planktonic invertebrates including the numbers and health of animals. It was noted that this could be linked to the drilling into, laying down of materials on, and movement of benthic (seabed) sediments, and increased localized sediment suspension due to drilling apparatus, anchoring devices, and hydrocarbon extraction systems. As such, the QIA stressed the importance of protecting animal habitat and recommended that more Inuit Qaujimagangit and scientific information be collected on marine mammals' habitats and what they need to 'survive and thrive'. The QIA further recommended that this information, once collected, be used in developing mitigation measures related to maintaining sediment quality. QIA also recommended that parties respect traditional rules and practices when collecting Inuit Qaujimagangit and baseline information to develop mitigation measures to maintain sediment quality.

The Government of Nunavut (GN) noted within its final written submission that the current understanding of the Arctic environment related to baseline water and sediment quality is lacking and further research is required. The GN further stressed at the Final Public Meeting that baseline parameters could be compared with federal guidelines for the protection of marine life to better determine the natural variability of the marine environment in the Area of Focus and aid in effects monitoring.¹³³ The GN recommended that, following the SEA, additional baseline water and sediment quality data be collected in the Area of Focus along with water sampling from multiple depths accordingly to temperature and salinity within the ocean water, with sampling to be performed during both the open-water and under-ice seasons. The GN also recommended that local and regional water and sediment quality data be compared to Canadian Council of Ministers of the Environment guidelines for the protection of marine life to understand the baseline environment and assess potential effects from exploration and production activities.

¹³³ B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 182, lines 11-22.

5.1.1.10. *Naturally Occurring Oil Seeps*

Background Information

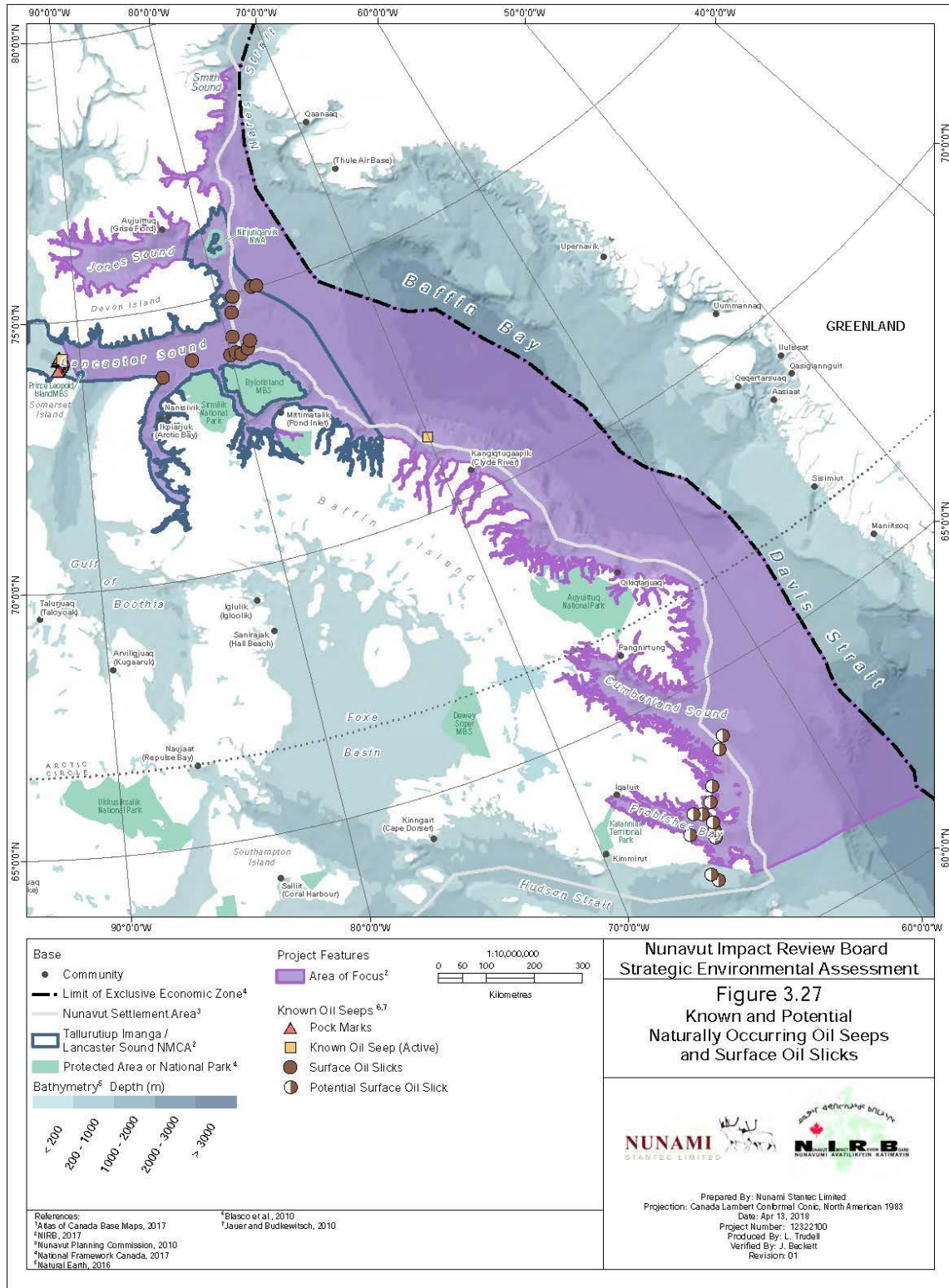
The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 3.7: Hydrocarbon Venting and Naturally Occurring Oil Seeps (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Scott Inlet has an oil seep, which is a place where oil and/or gas naturally escapes from the seabed (see Figure 12: Known and Potential Naturally Occurring Oil Seeps and Surface Oil Slicks (Source: Nunami Stantec 2018a)). The seep was identified after numerous surveys were conducted, including remote sensing, seismic data, water column sampling, and submersible investigations. It has been observed that the Scott Inlet oil seep has microfauna, carbonate-bound sediments, and other characteristics similar to other oil and gas seeps in other oceans of the world.

While Scott Inlet and Lancaster Sound are the only two (2) documented locations of naturally occurring oil slicks, it is believed that other seeps and/or slicks occur in the Area of Focus. During community meetings, NIRB staff noted that residents of Clyde River and Qikiqtarjuaq asked questions regarding mitigation measures for the seep and were not in favour of it. Reports published in 2010 and 2015 (Blasco et al. 2010; Foster et al. 2015; as cited in Nunami Stantec, 2018a, p. 3.62) note that potential surface oil slicks have been observed along southeast Baffin Island including near the entrances to Cumberland Sound and Frobisher Bay and the Government of Nunavut has begun surveys to look at the presence of seeps.

In general, Nunami Stantec noted that a better understanding of the naturally occurring oil seeps in the Area of Focus was required and this would assist with identifying areas where surface slicks are observed.

Figure 12: Known and Potential Naturally Occurring Oil Seeps and Surface Oil Slicks (Source: Nunami Stantec 2018a)



Views of Interested Parties

The lack of research into naturally occurring oil seeps noted by Nunami Stantec suggests that more research in the Area of Focus is required to understand natural seeps and slicks, which was reiterated by Natural Resources Canada (NRCAN) and the Government of Nunavut (GN) in its final written submissions. The GN recommended that the Government of Canada, in consultation with the GN and other relevant stakeholders, undertake additional research to address knowledge gaps for naturally occurring oil and gas seep locations, flow rates, and other characteristics.

Additionally, the GN, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and other partners, including the Geological Survey of Canada, are currently conducting reconnaissance mapping and physical sampling on the naturally occurring oil seeps in Baffin Bay and Davis Strait. This study will increase the understanding of the geographical extent of oil seepage and the petroleum systems involved and could be used to inform decision-making on resource management in the region. The GN stated during the Final Public Meeting that it expects the results of this study to be available in spring/summer 2019.¹³⁴

NRCAN further noted within its final written submission that while it is unclear where oil and gas exploration might occur if it were to proceed in Baffin Bay, it would likely follow areas with previous exploration agreements or early seismic surveys. NRCAN noted that historic reports on drilling prospects, seismic exploration, and original land parcels have, or are currently being compiled, by the Geological Survey of Canada and could be reviewed.

In response to a Community Representative's concern during the Final Public Meeting regarding the extent of naturally occurring oil seeps and possible interaction with the shoreline environment, NRCAN noted that further research is required to address the information gap.¹³⁵

5.1.2 Views of the Board

The Board notes that there are identified gaps in available information on the physical environment as highlighted above that should be addressed prior to any decisions to lift the current moratorium on offshore oil and gas activity and/or should be addressed as applicable by any project-specific assessments. Each of these gaps are discussed further below.

With so many gaps in the existing environment, the Board finds it difficult to plan for or make recommendations related to offshore oil and gas activities. Pursuant to the rules of Inuit Qaujimagatuqangit, the Board would like to emphasize that an understanding of current conditions is needed before any decisions are made. This information should be collected from both Inuit Qaujimagatuqangit and science and should be specific to communities, regions, and projects/initiatives. Communities must be involved in both the collection and analysis of information.

¹³⁴ A. Cyr-Parent, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp 43-44, lines 22-26 and 1-5.

¹³⁵ J. Kango, Arctic Bay, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp 867, lines 12-16.

The Board agrees with the information presented by parties indicating the size and diversity of the Area of Focus. The Board emphasizes that both the similarities and differences between Inuit Qaujimajatuqangit and science should be considered when viewing the information and when collecting and assessing new information to address data gaps prior to decisions being made to lift the moratorium or not, or within project-specific assessments, if approved.

5.1.2.1. *Climate and Meteorology*

The Board acknowledges that weather forecasting is more difficult in areas where the surface weather monitoring network is sparse, as is the case for the Area of Focus. The occurrence of extreme weather events, snow, rainfall, and wind speed extremes are also becoming more difficult to predict.

Inuit rely on Inuit Qaujimajatuqangit and their ability to predict and know the environmental conditions associated with each season as it is related to specific activities and what foods can be found during each part of the year. Observations by Inuit illustrate that there are changes to the climate and the weather patterns have become more unpredictable and seasons have shifted. As weather elements (temperature, wind, and ocean currents) change what was known to be normal in the past (e.g., snowdrifts created by winds to guide travellers; sea and lake ice conditions; and wildlife migratory patterns) will become more unreliable. See Volume 3, Chapter 7.4: Analysis of Potential Effects – Climate Change for more details. The Board further notes the lack of monitoring stations throughout the Area of Focus and agrees with Environment and Climate Change Canada that a better surface weather monitoring network is needed in the Area of Focus to better forecast current weather conditions and monitor changing climate conditions into the future.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to climate and meteorology, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing mitigation, monitoring, modelling, mapping, and prediction:

Recommendations to address prior to lifting the current moratorium:

- Develop an improved surface weather monitoring network for the Area of Focus designed to increase the accuracy of weather forecasting throughout the region, including mechanisms for taking into account rapidly changing climate conditions (#65).

5.1.2.2. *Air Quality*

Commercial marine vessels are a significant source of air pollution and greenhouse gas emissions, and as noted in the *Environmental Setting and Potential Effects Report* and by Environment and Climate Change Canada, shipping levels are expected to increase in the future as sea ice diminishes

with shipping routes remaining ice-free for longer durations. This has the potential to contribute to the cumulative effects of air pollutants and air quality.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to air quality, greenhouse gas emissions, and climate change, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing modelling, mapping, and predictions:

Recommendations to address should the current moratorium be lifted:

- Shipping emissions associated with proposed oil and gas development should be modelled to understand the potential direct, indirect, and cumulative effects on air quality and contributions of greenhouse gas emissions (#74).

5.1.2.3. ***Bathymetry***

The Board acknowledges the gaps identified within *Environmental Setting and Potential Effects Report* and recognizes that most areas within Baffin Bay and Davis Strait require further investigation related to the seabed and bathymetry, as heard at the Final Public Meeting. This lack of information makes the prediction of potential effects and decision making more generally difficult; the Board emphasises the importance of adequately understanding the existing environment and encourages collection of this information when planning for development of project specific requirements, if allowed to proceed in future. The Board acknowledges that the Canadian Hydrographic Service is responsible for updating the navigation charts in the region for key areas in the Arctic that has been identified as priority. This information would be important to understand the existing environment and to ensure that navigational hazards have been identified properly.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to bathymetry, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address irrespective of the current moratorium:

- Conduct additional bathymetry research to identify navigational hazards in the Area of Focus and to improve the safety of shipping in the region (#22).

5.1.2.4. ***Oceanography***

Like the Government of Nunavut and Environment and Climate Change Canada, the Board also acknowledges the lack of information related to the chemical and physical oceanography and that a better understanding is required of upwelling, water column structure, water masses, current

fields, wave heights, tides, and wind for the formation of recurring open water sites in ice-covered and open-water seas in the Area of Focus. This information is needed to understand the existing environment and to inform planning for project specific requirements and to assess potential effects of oil and gas developments, if allowed to proceed. Further, this information should be used to inform decisions related to the moratorium.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to oceanography, spill response regime, and accidents and malfunctions, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address prior to lifting the current moratorium:

- Conduct baseline research to improve understanding of oceanographic processes in Baffin Bay and Davis Strait during ice-covered and open-water conditions. This baseline information should be used to inform analysis of potential environmental effects and oil spill modeling (#34).

5.1.2.5. Sea Ice and Iceberg Conditions

The Board recognizes that knowledge and monitoring of sea ice and iceberg conditions is required for marine vessel navigation and ice management as part of offshore marine seismic survey activities and oil and gas exploration and development. Consideration of potential ice-structure interaction is an essential element of ship, drilling rig or platform design, and selection. Several particular risks include ‘bergy bits’ and ‘growlers’ which may be difficult to detect, icebergs which due to their size or shape or the sea conditions at the time are difficult to tow or deflect, and hard, multi-year ice. Therefore, the ability to predict iceberg presence, distribution, and trajectory is necessary in ice management, and in reducing the risk to ocean-going vessels, as well as oil and gas exploration and production activities, in Baffin Bay and Davis Strait. The Board encourages government, industry, and researchers to continue to work together to understand the current state of the Arctic marine environment and the impacts of climate change and pollution. The Board also recommends an understanding of the temporal and spatial occurrence of sea ice, as well as sea ice characteristics is required to plan and design project stages (e.g., seismic programs), as well as assess potential environmental effects (routine activities and accidents and malfunctions), and to better understand potential effects of climate change.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to sea ice and iceberg conditions, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research and impact modelling, mapping, and predictions:

Recommendations to address irrespective of the current moratorium:

- Conduct baseline research on sea ice conditions, including sea ice characteristics, iceberg presence and distribution, and the effects of climate change on sea ice distribution (#30).
- Based on updated baseline information generated in Recommendation #30, model the temporal and spatial occurrence of sea ice in the Area of Focus (#68).

5.1.2.6. *Acoustic Environment*

The Board acknowledges the gaps identified within *Environmental Setting and Potential Effects Report* and that dispersion of noise in the Arctic atmosphere, especially for under-ice conditions, for most areas within the Baffin Bay and Davis Strait would require further investigation. Consideration of potential differences in the dispersion of underwater versus atmospheric noise should be understood and confirmed to understand the acoustic environment in the Arctic. In addition, community members should not only be engaged by parties attempting to determine and assess the acoustic environment but should be involved in the development and analysis of associated criteria and results. This information should not only be collected by proponents for specific oil and gas projects, if allowed to proceed, but also used to inform decisions related to the moratorium.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to the acoustic environment, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address should the current moratorium be lifted:

- Conduct baseline research to:
 - establish baseline atmospheric and underwater sound levels in Baffin Bay and Davis Strait;
 - improve understanding of the potential effects of underwater noise and seismic activities on plankton, benthic organisms and invertebrates (including shellfish and arthropods), fish, waterbirds, and marine mammals; and
 - apply research to develop threshold criteria for assessing injury and behavioural disturbance (#41).
- Based on baseline research conducted under Recommendation #41 to establish baseline atmospheric and underwater sound levels in Baffin Bay and Davis Strait, complete updated modeling of the dispersion of sound from anthropogenic sources and the potential direct, and cumulative effects, of noise from oil and gas development activities on wildlife receptors (including marine fish, waterbirds and marine mammals) (#75).

5.1.2.7. *Geology*

The Board acknowledges the gaps identified within the *Environmental Setting and Potential Effects Report* and by the Government of Nunavut and Natural Resources Canada with respect to geology and geohazards of Baffin Bay and Davis Strait. The Board notes there is a significant gap in the understanding of deep water or nearshore geohazards in the Area of Focus, and that while some types of geohazards in the Area of Focus may occur globally, others, such as iceberg scour are specific to Arctic regions. Additionally, the Baffin Bay and Davis Strait region has a high level of seismic activity, resulting in substantial concern from both government and communities on the potential for seismic events and associated slope movement or tsunami probability. Geohazard and seismic event information would be necessary in planning and designing any potential oil and gas projects, especially regarding mitigation of potential environmental impacts. The data would also be applicable for infrastructure such as communication cables and hazards to communities caused by events such as seismic events and submarine landslides.

The Board also notes that other oil and gas jurisdictions in Canada require a detailed site survey for proposed drilling sites to ascertain what geohazards are present in the area. Discussions with both Canadian and global industry leaders could be useful in developing standard mitigation approaches and planning considerations in relation to geohazards.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to geology, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address should the current moratorium be lifted:

- Conduct research, in consultation with industry leaders in petroleum exploration and production and other Arctic regions with oil and gas developments, to improve understanding of geohazards in the Area of Focus (e.g., glacial feature distribution, ice scour analyses, and seabed and underwater slope stability assessments) and geotechnical properties of marine sediment relevant to exploratory drilling and placement of structures on the seabed (#42).

5.1.2.8. *Coastal Landforms*

The Board agrees with parties that there is a lack of information about sensitive environments and that additional information is required on the sensitivity of the coastal landforms and shoreline environments within the Figure 2: Strategic Environmental Assessment Area of Focus in Baffin Bay and Davis Strait (Source: CIRNAC, 2018b) and emphasises the importance of understanding the existing environment. The Board encourages the use of this information when planning for project specific requirements, which could occur through identification of sensitive areas to either be protected or where development is restricted when developing spill response plans and associated shoreline cleanup.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to coastal landforms, marine sediment, and marine wildlife, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research and mitigation, monitoring, modelling, mapping, and predictions:

Recommendations to address prior to lifting the current moratorium:

- Undertake research to establish baseline information on coastal habitat features such as:
 - shoreline form, substrate, and vegetation type;
 - biological resources, presence of sensitive species;
 - life stages;
 - sensitive human use resources; and
 - the potential oil residency in different shoreline/substrate types (#35); and
- Based on additional baseline research on coastal habitat features conducted in accordance with Recommendation #35, develop a coastal/shoreline sensitivity atlas (#70).

5.1.2.9. *Marine Sediment*

The Board acknowledges a lack of baseline data on water and sediment quality which makes it difficult to construct impact predictions and make related decisions. As recommended by the Qikiqtani Inuit Association and the Government of Nunavut, more work is required to understand how changes to baseline sediment quality could affect the habitats of marine species.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to marine sediment, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address prior to lifting the current moratorium:

- Establish baseline information for water and sediment quality in the Area of Focus to include:
 - water sampling conducted during both open water and ice covered conditions;
 - water sampling from multiple depths chosen to reflect variances in temperature and salinity; and
 - comparison of local and regional water and sediment quality data to all applicable guidelines for the protection of marine life water and sediment quality sampling (e.g., Canadian Council of Ministers of the Environment guidelines) (#36).

For related Board recommendations, see [5.1.2.9 Marine Sediment](#).

5.1.2.10. *Naturally Occurring Oil Seeps*

The Board agrees with parties that the collection of additional data regarding natural oil seeps and slicks would be beneficial in understanding the environment of the Baffin Bay and Davis Strait. The Board acknowledges that the Government of Nunavut, in collaboration with the Government of Canada and Nunavut Tunngavik Incorporated, is studying the natural oil seep in Scott Inlet and the Area of Focus and that a summary of these study results will be available to the public once complete. In addition, as described by Natural Resources Canada, a review of historic reports on past exploration prospects would better define areas of future potential development and inform future decision-making process.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to naturally occurring oil seeps, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations baseline research:

Recommendations to address irrespective of the current moratorium:

- Conduct research to:
 - identify naturally occurring oil and gas seep locations in the Area of Focus; and
 - determine flow rates and other relevant characteristics (#23).

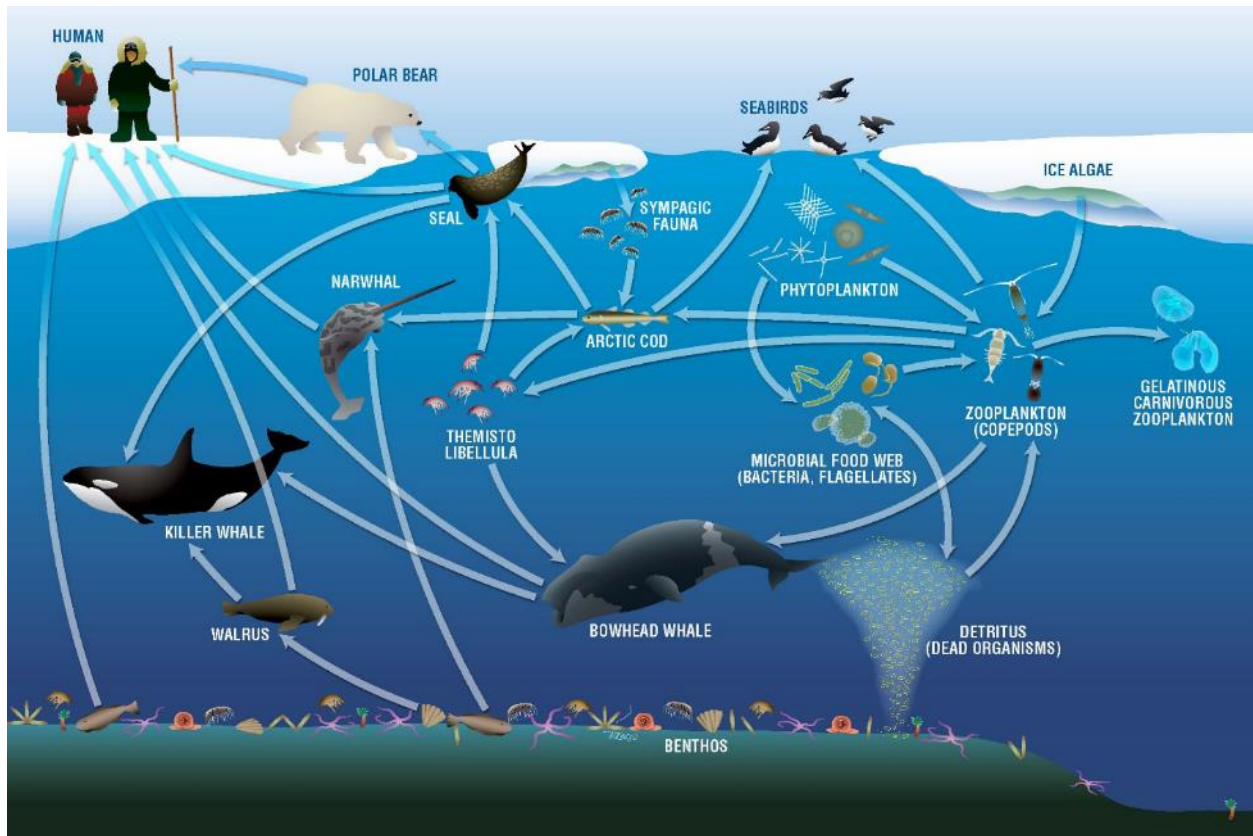
5.2. BIOLOGICAL ENVIRONMENT

This section summarizes the existing conditions of the biological environment for the Area of Focus in Baffin Bay and Davis Strait (Figure 2). Unless otherwise noted, the summary is based on the following information provided to the NIRB:

- Environmental Setting and Review of Potential Effects of Oil and Gas Activities Report, referred to as “*Environmental Setting and Potential Effects*” (Nunami Stantec, 2018a)
- Qikiqtaaluk Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut for the Baffin Bay and Davis Strait Marine Environment Report, referred to as “*Inuit Qaujimajatuqangit Report* (QIA, 2018a)
- Evaluating the Role of Marine-Based Harvesting in Food Security in the Eastern Arctic, referred to as “*Food Security Report*” (QIA, 2018a); and
- Information gathered during the NIRB’s public scoping sessions.

The schematic representation of the Canadian Arctic marine food web as shown in Figure 13: Schematic Representation of Canadian Arctic Marine Food Web (Source: Nunami Stantec, 2018a) is relevant to all aspects of the biology discussed in the following sections. This figure shows both the interconnectedness and interdependence of components of the environment.

Figure 13: Schematic Representation of Canadian Arctic Marine Food Web (Source: Nunami Stantec, 2018a)



5.2.1 Background

5.2.1.1. Coast and Shoreline Environment

Background Information

The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 4.2: Coast and Shoreline (Nunami Stantec, 2018a). Please refer to this section and report for additional information. Additional discussion on coastal environments can be found in [5.1.1.8 Coastal Landforms](#) of this report.

The coast and shoreline environment in the Area of Focus varies considerably and creates various habitats for plants and invertebrates along the shoreline and intertidal areas. The flora identified in the Area of Focus are comparable to that of other Arctic areas with consistent ice cover. The lower diversity of marine plants as compared to that of other coastal environments may be the result of continuous ice scour. A comparison of seaweed composition across the study area shows the highest species diversity from the Ellesmere and Baffin Islands shoreline and intertidal areas.

According to the *Inuit Qaujimagatuqangit Report*, the Baffin Island shoreline is rich in *kuanniq* (edible kelp) and *qiqquaq* (hollow stemmed kelp), dulse and other seaweeds which are harvested to flavour food, provide salt, and for some medicinal purposes.

Community members have noted that kelp in the Qikiqtarjuaq area is growing larger than in the past and that kelp tastes better from colder waters (Nunavut Department of Environment n.d., as cited in Nunami Stantec, 2018a).

Views of Interested Parties

The Government of Nunavut (GN) noted in its final written submission that additional information is required regarding the sensitivity of Nunavut's coastline environments. Habitat sensitivity information could be used to support decision-making related to development areas, and to support the understanding of potential effects of an oil spill. Additionally, coastal areas that support large congregations of marine mammals, breeding seabird colonies and other environmentally sensitive areas should be identified (including the presence of sensitive species, life stages, and/or habitats) to inform mitigation in case of a spill. The GN recommended that a coastal sensitivity atlas be developed (similar to other parties' recommendations under [5.1.1.8 Coastal Landforms](#)) and the atlas should identify sensitive habitats and conservation areas and include associated avoidance set-backs and time periods more susceptible to impacts. At the Final Public Meeting, the GN stressed that a coastal sensitivity analysis should be conducted to identify sensitive habitats, noting that this analysis should reflect time periods when areas and species may be most sensitive to impacts. The GN indicated that this analysis could provide the basis for establishing buffers and setbacks from sensitive areas and also be used to inform and prioritize mitigations to be implemented in the case of a spill based on the presence of sensitive species' life stages and/or habitats.¹³⁶

Community members at the Final Public Meeting expressed concern regarding the potential for an oil spill to negatively impact the shoreline environment. Further information and discussion regarding this topic can be found in Volume 3, Chapter 8.2: Accidents and Malfunctions.

During the Final Public Meeting, a Community Representative from Arctic Bay asked whether an oil spill or blowout incident could cause shoreline erosion. In response, Nunavut Tunngavik Incorporated noted that although an oil spill or blowout event is unlikely to contribute to shoreline erosion, such an event would be likely to have a significant impact on shorelines and shore wildlife.¹³⁷

¹³⁶ B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 180, lines 1-16.

¹³⁷ Exchange between J. Kango, Arctic Bay and W. Johnson, Nunavut Tunngavik Incorporated, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 278, lines 12-13 and 20-26.

5.2.1.2. *Plankton*

Background Information

Plankton consists of small marine organisms that move passively in aquatic ecosystems, drifting according to currents and other oceanographic processes, and are widespread across the Area of Focus. Taxa in this group include microscopic marine plants (phytoplankton), invertebrates (zooplankton), vertebrate eggs and larvae (ichthyoplankton), bacteria, and fungi which can form associations with species of plankton. Plankton comprise the largest group of organisms in the ocean in terms of both diversity and biomass, with the most dominant feature of planktonic life at high latitudes being the pronounced seasonality. Consequently, marine plankton play a foundational role in the marine environment as they serve as the base layers of most food webs (primary and secondary production). Plankton are also the mechanism by which nitrogen and carbon are absorbed into the marine environment from the atmosphere.

Greater detail on the plankton found in Baffin Bay and Davis Strait is available in Section 4.3 of the *Environmental Settings and Potential Effects Report* (Nunami Stantec, 2018a). However, it is important to note that there are two (2) categories of primary producers present in Arctic ecosystems: ice algae growing on the underside of sea ice and phytoplankton growing in open waters. The availability of food as a result of primary production in phytoplankton, ice algae, and marine plants is a major contributing factor in the abundance of marine organisms observed at recurrent open water sites, such as the *Pikialasorsuaq* (North Water Polynya). In general, Arctic oceans have a brief and intense phytoplankton bloom immediately after the break-up of sea ice. However, this can also be influenced by the presence of large polynyas, where sea ice breaks up earlier, and local upwelling can lead to very high production. When compared to the Atlantic and Pacific coasts of Canada, the Canadian Arctic has the highest diversity of marine phytoplankton taxa recorded in Canada.

In general, Arctic oceans have a brief and intense phytoplankton bloom immediately after the break-up of sea ice. However, when compared to the Atlantic and Pacific coasts of Canada, the Canadian Arctic has the highest diversity of marine phytoplankton taxa recorded in Canada.

Nunami Stantec, 2018a

Views of Interested Parties

During the Final Public Meeting, a Community Representative from Pangnirtung noted that additional information should be collected on the zooplankton found in the area to be able to assess potential threats posed to these organisms by oil and gas activities.¹³⁸ As noted by a Community Representative from Iqaluit, given the importance of zooplankton to marine wildlife and the dependence of coastal communities on marine wildlife, “*if they go, then we are doomed.*”¹³⁹

¹³⁸ S. Keenainak, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 412, lines 5-13.

¹³⁹ B. Kovik, Iqaluit NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 342, line 7.

5.2.1.3. *Benthic Flora and Fauna (including soft corals and seaweed)*

Background Information

Benthic habitat has a central role in the Arctic marine ecosystem in terms of elemental cycling, ecosystem function, and biodiversity. Multiple biological and physical parameters affect benthic communities, including temperature, depth, food input, sediment composition, disturbance level (e.g., ice scouring), and current regimes. In terms of benthic macrofaunal assemblages (animals associated with the seabed) in the Arctic, it has been emphasized that patterns of species composition were highly variable, even at sites in proximity to one another, and that temperature and salinity are the most important environmental variables in determining species richness (Cusson et al., 2007 as cited in Nunami Stantec, 2018a, p. 4.12). Greater detail on the benthic flora and fauna found in Baffin Bay and Davis Strait is available in Section 4.3 of the *Environmental Settings and Potential Effects Report* (Nunami Stantec, 2018a).

Benthic Flora (plants and macroalgae)

There is a scarcity of published information regarding plants and macroalgae in the Area of Focus, which was noted in the *Environmental Settings and Potential Effects Report* to likely be attributable to this marine area containing habitat that is generally not conducive to marine plants and macroalgae. In addition, there are fewer species of macroalgae and marine plants found in the Arctic than in the Atlantic and Pacific Oceans due to their reliance on photosynthesis to produce energy and due to the possibility that they are subject to continuous ice scouring (see [5.1.1.7 Geology](#)). Most of Baffin Bay and Davis Strait is too deep for these species and does not contain the hard substrate that most macroalgae need to establish holdfasts. However, marine plants that may occur below the intertidal zone (also referred to as the foreshore, seashore, and littoral zone) include kelps (e.g., *Laminaria sp.*), which are limited to the extent of the photic zone, as they are photosynthetic organisms. For more details on benthic substrate, please refer to [5.2.1.1 Coast and Shoreline Environment](#)).

Benthic Invertebrates

Benthic invertebrates are animals associated with the seabed, which either live in the substrate (infaunal) or live on or attached to the substrate (epifaunal). As a group they are comprised of diverse taxa that play a variety of roles in the ecosystem (e.g., detritivores, filter feeders, carnivores) and form an important part of the food chain.

Benthic Infaunal Invertebrates

The number of marine benthic infaunal taxa found in the Canadian Arctic is approximately 992, and studies have found that the deepest sites sampled in Davis Strait had the highest species richness, and that habitats were similar among sites. This supports the overall trend that greater species richness is observed on the continental slope than on the continental shelf.

Benthic Epifaunal Invertebrates

As discussed in the *Environmental Settings and Potential Effects Report*, a number of research studies on the epifaunal communities within Baffin Bay and Davis Strait have found the following species to be of importance to the local communities, with regular harvesting as a local food source and/or for commercial fisheries: echinoderms blue mussels (*Mytilus edulis*), clams (*Mya truncata*),

green sea urchins (*Strongylocentrotus droebachiensis*), Icelandic scallop (*Chlamys islandica*), snow crab (*Chionoecetes opilio*), and whelk (*Buccinum sp.*). Benthic epifaunal communities of these species are generally found throughout the Area of Focus, except for Icelandic scallop, snow crab, and whelk. The distribution of snow crab in Nunavut waters is poorly understood; however, within the Area of Focus, snow crabs are known to occur in Davis Strait. Though their general distribution is poorly known, based on the stomach contents of bearded seals, whelk are known to occur offshore of Grise Fiord, Pond Inlet, and Clyde River.

According to the *Inuit Qaujimagatuqangit Report*, seabed dwellers (e.g., barnacles, clams, crabs, crayfish, jellyfish, shrimp, starfish, and urchins) form part of the Baffin Bay and Davis Strait food cycle, with community members from the six (6) communities¹⁴⁰ included in the study noting that these species form part of their own diet and medicinal treatments.

Cold-water Corals (*Sessile Benthic Invertebrates*)

Cold-water corals are present in the Area of Focus, with the largest recorded concentrations occurring on the slope of the Northeast Baffin Shelf in western Baffin Bay, and in the western part of Davis Strait off the Southeast Baffin Shelf. Cold-water corals are particularly vulnerable to disturbance (e.g., bottom fishing) due to their slow growth rates and longevity. Temperature and the presence of suitable substrate (on which to settle, secrete a basal holdfast, and build their skeleton) are important environmental controls for cold-water corals.

Sponges (*Sessile Benthic Invertebrates*)

Sponges are sessile benthic invertebrates that are characterized by bodies built around a system of canals through which water is pumped to supply food and oxygen and remove waste. They can form structurally complex habitat for fish and invertebrates, especially when they occur in dense aggregations known as ‘sponge grounds’. Sponges are an important component of benthic ecosystems that enhance both local nutrient and energy exchange in the deep sea. As identified by Parks Canada during the commenting period of Nunami Stantec’s report, there are more than one (1) genus of sponges found in the Area of Focus based on current studies. For example, Dinn and Leys (2018) identified a total of 12 genus of sponges (*Biemna*, *Haliclona*, *Lycopodina*, *Phorbos*, *Mycale*, *Polymastia*, *Tentorium*, *Hymeniacidon*, *Geodia*, *Craniella*, *Sycon*, *Asconema*) during a study of the Baffin Bay and Davis Strait marine ecoregion between 2015 and 2017.

Views of Interested Parties

Fisheries and Oceans Canada (DFO) and Oceans North Canada (Oceans North) noted within their public written comments and final written submissions, respectively, that little is known of the biology or ecology of corals, sponges, and sea pens in the Area of Focus, making it difficult to assess potential threats posed by oil and gas activities for these organisms. It was noted by Oceans North that there is little information on the distribution of coral, sponges, and sea pens along the shelf break of Davis Strait and raised concerns that these organisms could be affected by oil spills immediately settling along the shelf break. Public written comments received from DFO and Parks Canada noted that updated information on coral distribution and sponges for the Area of Focus are available and should be considered to accurately reflect the most up to date understanding of the

¹⁴⁰ Arctic Bay, Clyde River, Grise Fiord, Pangnirtung, Pond Inlet, and Qikiqtarjuaq

biological environment. It was recommended that a report related to *Arctic marine biodiversity*: CAFF (2017); and a report related to *sponges in the eastern Canadian Arctic*: Dinn and Leys (2018) be reviewed for any future activities planned for the area (see Volume 3, Appendix C: Recommended Documents).

In response to a Community Representative's question on studies that are currently being conducted on marine species, DFO noted that baseline studies are being conducted under the Ocean Protection Program to understand the substrates in the bottom of the ocean, including a study of benthic organisms with one of the study locations being Iqaluit in the first year of the four (4) year program that will be completed in 2019.¹⁴¹ DFO further noted the importance of understanding the benthic communities in the Arctic Ocean as this is a "largely unstudied area", that there is very limited information on the specific benthic invertebrates and how they relate to the fisheries, and that in general "there has not been a systematic look at the benthic communities, especially in some of the deeper waters."¹⁴² A Community Representative from Pangnirtung noted that it sounded as though it would take several years to conduct the different benthic species studies needed to understand this aspect of the marine environment, and noted that it would be important to determine what species in the ocean are food sources for marine mammals prior to oil and gas development, because the impacts would remain unknown if the food sources are unknown.¹⁴³

In response to a Board's question on whether any studies have been done on benthic invertebrates, DFO noted that there is very limited information on the specific benthic invertebrate population in the Arctic ocean, especially in the deeper zones, and how they relate to fisheries which is the reason that studies are currently being conducted by DFO.¹⁴⁴

5.2.1.4. *Fish and Fish Habitat*

Background Information

The following section provides a short discussion of the relevant fish species (including ichthyoplankton, pelagic shrimp, and squid) that may occur in or near the Area of Focus, with an emphasis on marine fish species that are locally, culturally, and commercially important (see Table 9: Marine Fish Species found in Baffin Bay and Davis Strait). Greater detail on fish and fish habitat found in Baffin Bay and Davis Strait is available in Section 4.5 of the *Environmental Settings and Potential Effects Report* (Nunami Stantec, 2018a). Biological features that describe the fish habitat have been previously presented in Chapters [5.1 \(Physical Environment\)](#), [5.2.1.1 \(Coast and Shoreline Environment\)](#), [5.2.1.2 \(Plankton\)](#), and [5.2.1.3 \(Benthic Flora and Fauna \(including soft corals and seaweed\)\)](#).

¹⁴¹ Exchange between S. Keenainak, Pangnirtung and A. Doherty, Fisheries and Ocean, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 410-411, lines 8-14, 19-26 and 1-13.

¹⁴² A. Doherty, Fisheries and Ocean, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 412-413, lines 18-25 and 6-13.

¹⁴³ S. Keenainak, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 411-412, lines 16-25 and 1-13.

¹⁴⁴ A. Doherty, Fisheries and Ocean, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 413, lines 7-13.

The *Inuit Qaujimajatuqangit Report* identified that *iqaluk* is both a general term for fish and a specific term for “char”. Key fish species harvested by community members today include char, cod, sculpin, and Greenland halibut. These same species have also been found in the stomachs of seals, narwhal, and beluga harvested by Inuit, confirming their importance to marine mammals as well.

Table 9: Marine Fish Species found in Baffin Bay and Davis Strait

Abundant Marine Fish Species	Common Marine Fish Species	Uncommon Marine Fish Species
Arctic char (<i>Salvelinus alpinus</i>)	Atlantic cod (<i>Gadus morhua</i>)	Atlantic wolffish (<i>Anarhichas lupus</i>) ^a
Arctic cod (<i>Boreogadus saida</i>)	Arctic skate (<i>Amblyraja hyperborea</i>)	
Fourhorn sculpin (<i>Myoxocephalus quadricornis</i>)	Capelin (<i>Mallotus villosus</i>)	
Greenland cod (<i>Gadus ogac</i>)	Greenland shark (<i>Somniosus microcephalus</i>)	
Greenland halibut (<i>Reinhardtius hippoglossoides</i>)	Northern wolffish (<i>Anarhichas denticulatus</i>) ^a	
Roundnose grenadier or rock grenadier (<i>Coryphaenoides rupestris</i>) ^{b,c}	Polar cod (<i>Arctogadus glacialis</i>)	
Roughhead grenadier (<i>Macrourus berglax</i>)	Spotted wolffish (<i>Anarhichas minor</i>) ^a	
Northern shrimp (<i>Pandalus borealis</i>)	Thorny skate (<i>Amblyraja radiata</i>) ^a	
Boreoatlantic armhook squid (<i>Gonatus fabricii</i>)	Striped pink shrimp (<i>Pandalus montagui</i>) ^{b,d}	
<p>Notes: a) Designated as endangered, threatened, or of special concern under SARA and/or by the COSEWIC. b) Not discussed in the <i>Environmental Setting and Potential Effects Report</i>. c) See COSEWIC, 2008a d) See DFO, 2019</p>		

Throughout its range, Arctic char is also important to commercial and sport fisheries (see [5.3.1.10 Commercial harvesting](#) for more details).

The *Environmental Setting and Potential Effects Report* and the *Inuit Qaujimajatuqangit Report* identify Arctic cod as having high ecological value because they are an important prey species for seabirds, whales, and other fish species; Arctic cod is a critical component of the Arctic marine food web.

Capelin represents a local food source, are important forage fish species and provide a food source for seabirds, marine mammals and other fish sources, and are important to commercial fisheries outside the Area of Focus (i.e., northeast coast of Newfoundland).

As noted in the *Environmental Setting and Potential Effects Report*, Inuit Qaujimaningit collected in Pangnirtung by the Government of Nunavut indicated that in the 1990’s there were less Greenland halibut and more Greenland shark early in the winter. Community members in

Pangnirtung also noted concerns that changes in sea ice patterns were affecting the winter fishing seasons.

Arctic skate are caught as bycatch in longline and trawl fisheries for Greenland halibut. Fourhorn Sculpin is occasionally caught as food fish throughout coastal Nunavut. Greenland shark are caught as substantive bycatch in longline commercial fisheries for Greenland halibut. Northern wolffish are caught as bycatch in fisheries for Greenland halibut and Snow Crab.

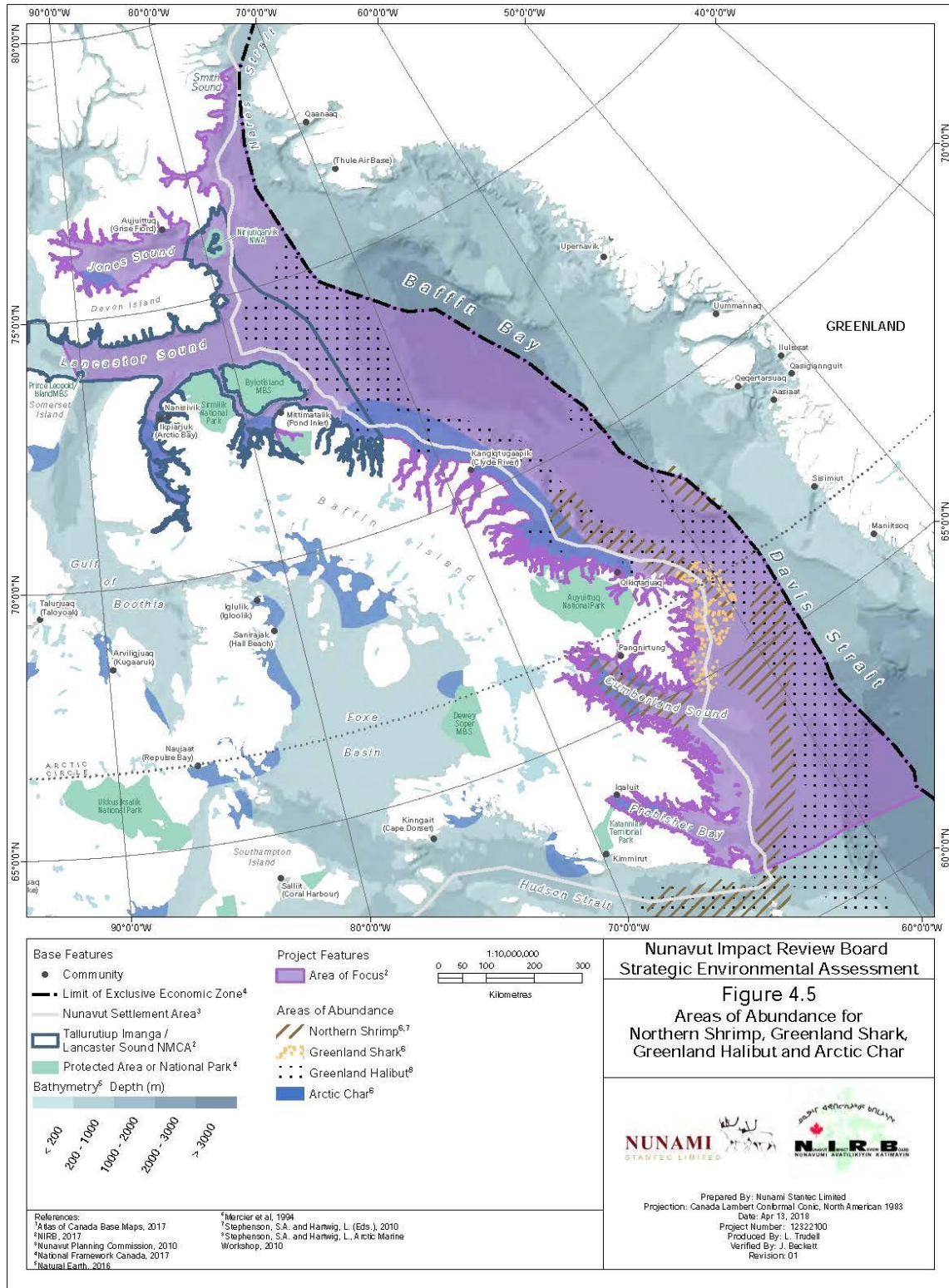
There are no commercial fisheries for roundnose grenadier in the Area of Focus, but this is an important commercial species elsewhere in Atlantic Canada (Coad & Reist, 2004). Roughhead grenadier are occasionally caught as bycatch in Greenland halibut fisheries in Cumberland Sound and Davis Strait. Spotted wolffish are caught mainly as bycatch in commercial fisheries for Greenland halibut and snow crab. Thorny skate are caught as bycatch in longline and trawl commercial fisheries for Greenland halibut and are a commercially important species elsewhere in Atlantic Canada. Squid are sometimes used as bait in fisheries for Greenland halibut and snow crab.

Spatial information on fish abundance in the Area of Focus that is available for Northern Shrimp, Greenland shark, Greenland halibut and Arctic char is denoted in Figure 14: Areas of Abundance for Northern Shrimp, Greenland Shark, Greenland Halibut and Arctic Char (Source: Nunami Stantec, 2018a).

Overall, sampling effort in the Canadian Arctic has been insufficient to allow for a precise assessment of fish diversity and there is a need to develop systematic surveys.

Nunami Stantec, 2018a

Figure 14: Areas of Abundance for Northern Shrimp, Greenland Shark, Greenland Halibut and Arctic Char (Source: Nunami Stantec, 2018a)



Overall, sampling effort in the Canadian Arctic has been insufficient to allow for a precise assessment of fish diversity and there is a need to develop systematic surveys. However, it appears that the species diversity of marine fishes is lower in the Arctic when compared to that of the Atlantic and Pacific coasts of Canada (as noted in the *Environmental Setting and Potential Effects Report*).

Views of Interested Parties

Within its public written comments, Fisheries and Oceans Canada (DFO) focused on the following topics and identified information gaps regarding:

- types of existing habitat and its use by fish and marine mammals;
- the distribution and ecology of important fishery species and species at risk;
- Inuit community fishery and commercial fishery harvest information and the value of landings; and
- sensitivity of habitats, fishery species, and landings to impacts resulting from oil spills, the release of deleterious substances, and noise.

DFO noted that the information provided on the distribution and abundance of focal fish species in the Area of Focus was underrepresented, and recommended that information on the distribution and abundance of fish species in the Area of Focus should be updated using more recent information and data as it becomes available. DFO recommended that this updated

It [is] noted that there was a lack of information about the distribution, the ecology, habitat of important species both commercial and subsistence fisheries as well species at risk and the effects on these important or sensitive species or areas

[A. Doherty, Fisheries and Oceans Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 397, lines 14-19.]

analysis should provide detailed information so that more extensive analyses of potential effects and consequences of risk can be conducted. DFO also indicated that the linkages of fish to higher levels in the trophic system (e.g., predators) should also be considered to ensure that the consequences of effects of oil and gas development activities on species or habitats of interest are traced along the ecosystem pathways. DFO also noted this type of updated analysis should also be applied to habitats used by the focal fish and identified the need to develop potential linkages to various activities and the potential consequences of hydrocarbon development. Finally, DFO noted that both northern shrimp and striped shrimp are found in waters adjacent to Nunavut and should be properly referenced.

And when my dad and I went fishing in summertime when the fish went into the ocean and our 18-foot canoe -- they're very small up to when you see it again -- and we arrived to the fishing area. We -- we didn't have to tell each other. We had to paddle so that the fish could stay, because they can hear the motor. And I didn't think they would hear us because I was -- and I didn't think they would smell anything. But I was just following my father along, and he taught me that I didn't have to make any noise when I step out on the land, wherever it is, even if they're not here, they could hear you. And wherever they -- we're trying to arrive to a certain spot, we had to be careful.

[M. Savearjuk Jaw, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 537-538-570, lines 19-26 and 1-5.]

Oceans North noted in its final written submission that the continental shelf break at the confluence of Davis Strait, Northern Labrador, South Eastern Nunavut, and South Western Greenland is likely an important habitat and spawning ground for Greenland halibut, a key fishery species and that spills or environmental degradation in this area as a result of the movement of the Labrador Current could have detrimental effects on spawning fish, larval survival, and juvenile survival.

Parks Canada noted in its public comment submission that the Board should consider adding information with respect to Greenland shark and

narwhal movements within Tremblay Sound in the Area of Focus based on tracking data collected by DFO.

5.2.1.5. Waterbirds (seabirds, coastal waterfowl and shorebirds)

Background Information

This section describes the overall presence, distribution and seasonal abundance of marine-associated bird species in the Area of Focus (see Table 10: Waterbird Species Found in Baffin Bay and Davis Strait). Greater details on waterbirds can be found in Section 4.6 of the *Environmental Settings and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Table 10: Waterbird Species Found in Baffin Bay and Davis Strait

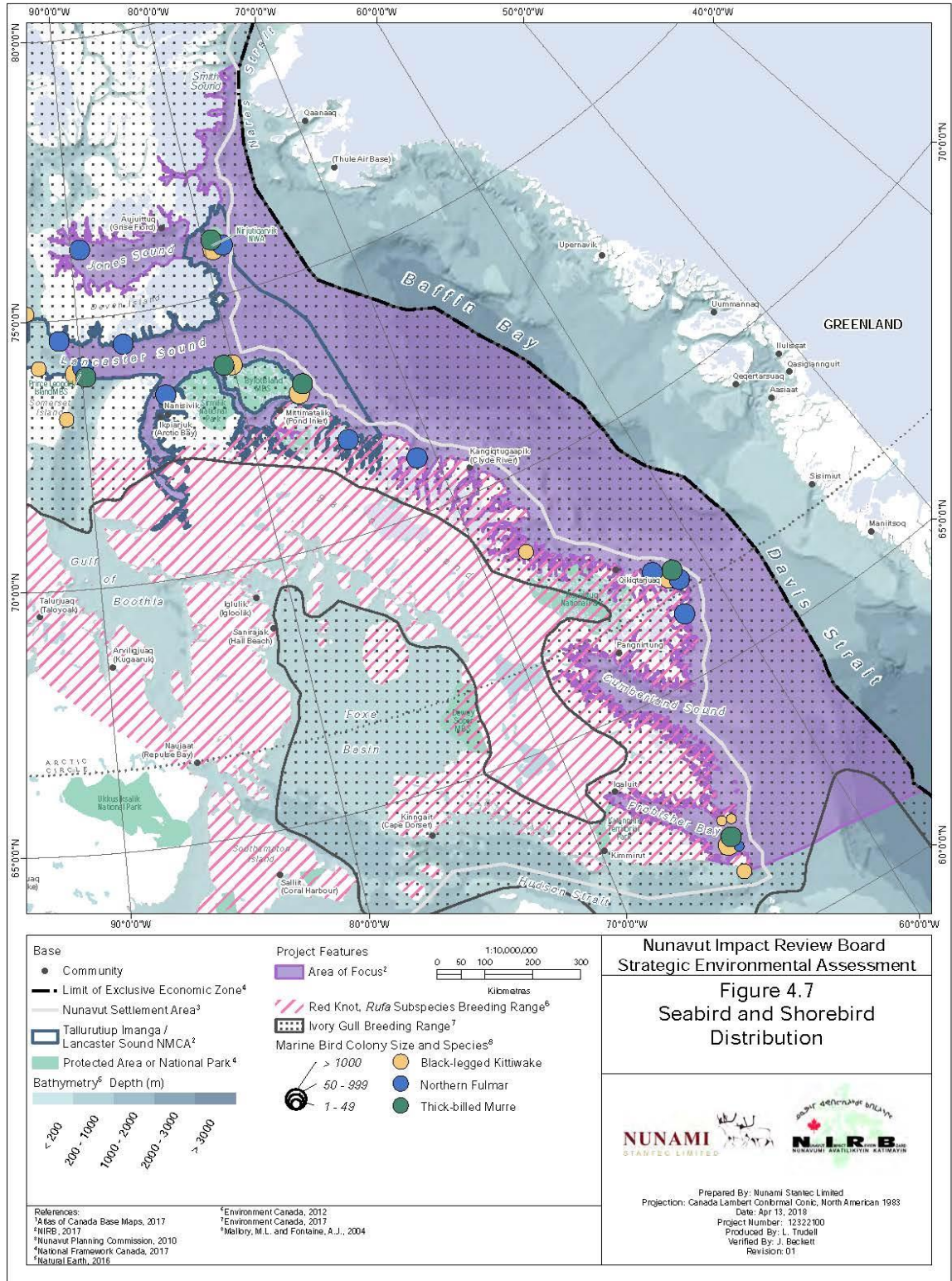
Seabirds	Coastal Waterfowl	Shorebirds
Arctic tern (<i>Sterna paradisaea</i>)	Brant (<i>Branta bernicla</i>)	American golden plover (<i>Pluvialis dominica</i>)
Atlantic puffin (<i>Fratercula arctica</i>) ^{a,d}	Canada goose (<i>Branta canadensis</i>)	Baird's sandpiper (<i>Calidris bairdii</i>) ^h
Black guillemot (<i>Cephus grille</i>) ^{c,d}	Cackling goose (<i>Branta hutchinsii</i>)	Black-bellied plover (<i>Pluvialis squatarola</i>)
Black-legged kittiwakes (<i>Rissa tridactyla</i>) ^{c,d,e}	Common eider (<i>Somateria mollissima</i>)	Buff-breasted sandpiper (<i>Calidris subruficollis</i>) ^b
Dovekie (<i>Alle alle</i>) ^d	Common loon (<i>Gavia immer</i>)	Purple sandpiper (<i>Calidris maritima</i>) ^h
Glaucous gull (<i>Larus hyperboreus</i>)	Greater white-fronted goose (<i>Anser albifrons</i>)	Pectoral sandpiper (<i>Calidris melanotos</i>)

Seabirds	Coastal Waterfowl	Shorebirds
Iceland gull (<i>Larus glaucooides</i>)	Harlequin duck (<i>Histrionicus histrionicus</i>) ^{b,c,g}	Common ringed plover (<i>Charadrius hiaticula</i>) ^h
Ivory gull (<i>Pagophila eburnea</i>) ^{b,d}	King eider (<i>Somateria spectabilis</i>)	Red knot (<i>Calidris canutus</i>) ^b
Parasitic and long-tailed jaegers (<i>Stercorarius parasiticus</i> and <i>Stercorarius longicaudus</i>)	Long-tailed duck (<i>Clangula hyemalis</i>)	Red phalarope (<i>Phalaropus fulicarius</i>) ^h
Northern fulmar (<i>Fulmarus glacialis</i>) ^d	Pacific loon (<i>Gavia pacifica</i>)	Red-necked phalarope (<i>Phalaropus lobatus</i>) ^{b,h}
Sabine's gull (<i>Xema sabini</i>)	Red-throated loon <i>Gavia stellate</i>)	Ruddy turnstone (<i>Arenaria interpres</i>) ^h
Ross's gull (<i>Rhodostethia rosea</i>) ^{b,c,f}	Snow goose (<i>Chen caerulescens</i>)	Sanderling (<i>Calidris alba</i>)
Thayer's gull (<i>Larus thayeri</i>)	Ross's goose (<i>Chen rossii</i>)	Semipalmated plover (<i>Charadrius semipalmatus</i>) ^h
Thick-billed murre (<i>Uria lomvia</i>) ^d	Red-breasted merganser (<i>Cygnus colombianus</i>)	Semipalmated sandpiper (<i>Calidris pusilla</i>) ^h
	Tundra Swan (<i>Cygnus colombianus</i>)	White-rumped sandpiper (<i>Calidris fuscicollis</i>)
	Yellow-billed loon (<i>Gavia adamsii</i>)	

Notes: a) Considered Vulnerable in Nunavut by the Canadian Endangered Species Conservation Council (CESCC 2016).
b) Designated as endangered, threatened, or of special concern under SARA and/or by the COSEWIC.
c) Not discussed in the *Environmental Setting and Potential Effects Report*.
d) See Latour et al., 2008
e) See Mallory & Fontaine, 2004
f) See COSEWIC, 2007
g) See COSEWIC, 2013; BirdLife International, 2018 and Robert et al., 2008
h) Occur extensively throughout the Area of Focus

Western Baffin Bay and Davis Strait provide a variety of coastal and offshore habitats for waterbirds, including sheltered inlets and bays, estuaries, exposed waters, sounds, islands, islets, and cliffs. While several species will use coastal and offshore areas in Baffin Bay and Davis Strait year-round, this region serves as important breeding grounds and staging areas for millions of waterfowl, seabirds, and shorebirds on their way to and from arctic breeding grounds. See Figure 15: Seabird and Shorebird Distribution (Source: Nunami Stantec, 2018a) for waterbird distribution in Baffin Bay and Davis Strait. The Area of Focus is located along the Atlantic Flyway, which is a major north-south flyway for migratory birds in North America. The flyway route generally starts in Greenland, then follows the Atlantic coast of Canada, then south down the Atlantic Coast south to the tropical areas of South America and the Caribbean.

Figure 15: Seabird and Shorebird Distribution (Source: Nunami Stantec, 2018a)



The coastal and offshore areas in Baffin Bay and Davis Strait regularly provide habitats for 40 species of coastal waterfowl, seabirds, and shorebirds during breeding, wintering, and migratory periods. Many waterbird species are used traditionally by local Inuit, as identified through oral and written evidence provided in Inuit Qaujimaningit and traditional knowledge studies.

Nunami Stantec, 2018a

Seabirds and waterfowl are of high socio-economic value in Nunavut as these species are hunted and used for egg gathering. They also have strong cultural significance to Nunavummiut and are often featured in carvings. One study noted that about 6,000 common and king eiders are harvested each year in Nunavut (Sea Duck Joint Venture 2015a as cited in Nunami Stantec, 2018b, p. 4.44).

Seabirds

The Area of Focus provides seasonal or year-round habitat for alcids, gulls, terns, fulmars, and jaegers. Seabirds breed, winter, and migrate through the Area of Focus, but their seasonal distribution is heavily influenced by ice coverage. Seabirds migrate to the region between mid-May through late June and will form large aggregations along ice edges or ice-free coastlines, depending on food availability.

Most seabird species breed in colonies found throughout the Area of Focus, with the extensive rocky coasts and islands representing a substantial portion of their breeding range. Large aggregations of seabirds will form at breeding, foraging, and migratory staging areas throughout the Area of Focus. Seabird nesting sites are considered particularly sensitive to human disturbance because they nest in colonies and occur in large congregations.

Large numbers of duck, tern, and gull eggs are gathered in the Qikiqtarjuaq region. The *Inuit Qaujimajatuqangit Report* points to both thick-billed murre and black guillemot wintering in the offshore east of Baffin Island. Guillemot are considered the birds on which Inuit youth could learn how to hunt birds. Clyde River hunters did not consider the meat to be very tasty but did say that it was eaten when nothing else was available. However, thick-billed murre eggs are gathered by Pond Inlet community members. Northern fulmars are not traditionally harvested in Nunavut even though they are found throughout the Area of Focus with large colonies reaching up to ~ 44,000 pairs as noted by Latour et al. (2008).

As noted in Table 10: Waterbird Species Found in Baffin Bay and Davis Strait, three (3) seabird species were not discussed within the *Environmental Settings and Potential Effects Report* but are found in the Area of Focus: black guillemot, black-legged kittiwakes, and Ross's gull. As noted by Latour et. al. (2008), black guillemot breed throughout Baffin Bay and Davis Strait, with breeding colonies located at Nirjutiqavvik, Scot Inlet, and Western Cumberland Sound, while, based on Mallory & Fontaine (2004), black-legged kittiwakes breed throughout Baffin Bay and Davis Strait, with notable colonies located along northern Baffin Island and eastern Devon Island. Ross's gull population is designated "Threatened" under Schedule 1 of the federal *Species at Risk Act* (SARA). The Ross's gull has a circumpolar distribution, which is poorly understood due to limited knowledge. It is the rarest breeding gull in North America with only four nesting locations found, three of them in Nunavut (Cheyne Islands, Prince Charles Island, Penny Strait) and one in Manitoba (near Churchill) (COSEWIC, 2007). Recent evidence have shown the presence of

Ross's gull at the floe edge between Bylot Island and Baffin Island within the Area of Focus and the total known breeding population in Canada is as high as 10 pairs and as low as none (COSEWIC, 2007).

Coastal Waterfowl

The Area of Focus provides seasonal or year-round habitat for loons, swans, geese, and diving ducks. Coastal waterfowl will aggregate in large numbers in polynyas during winter and migration periods, as they represent productive foraging sites. Eastern Jones Sound, Eastern Lancaster Sound, and Frobisher Bay provide important habitats for eiders and long-tailed duck. King eider, common eider, and harlequin ducks can occur in the Area of Focus year-round.

Frobisher Bay has been identified as an important feeding, staging, and breeding area for several waterfowl species including Canada goose, harlequin duck, and long-tailed duck. Canada geese and common eider ducks have also been reported to breed more frequently in the vicinity of Pangnirtung in recent years, while Grise Fiord has been identified as an important area for cackling geese since the late 1980's. King eiders, common eider, and harlequin ducks occur in arctic and subarctic coastal habitats and have a circumpolar distribution that includes Russia, Alaska, Canada, and Greenland. Large numbers of king eider have been recorded at the southern tip of Baffin Island with smaller numbers in Frobisher Bay that quickly redistribute into smaller groupings. Studies have also shown that the offshore area at Store Hellefiskebanke and adjacent coastline are very important wintering habitat for king eiders breeding in the eastern Canadian Arctic (Mosbech et al., 2006, Boertmann et al., 2007).

As noted in Table 10: Waterbird Species Found in Baffin Bay and Davis Strait, harlequin ducks were not discussed within the *Environmental Settings and Potential Effects Report* but is a species of coastal waterfowl found in the Area of Focus. The Greenland Wintering Population of harlequin ducks occur in Nunavut and are known to breed on southern Baffin Island and winter along Greenland's southwest coast. The eastern population of harlequin ducks is designated as Special Concern on Schedule 1 of SARA (COSEWIC, 2013) and Least Concern by IUCN (BirdLife International, 2018). Studies have also shown that considerable numbers of harlequin ducks move to West Greenland waters to moult and some to winter (Robert et al., 2008).

Coastal waterfowl are of high socio-economic value in Nunavut and are sensitive because they nest in colonies and occur in large aggregations during the flightless molt period or staging on their way to and from breeding sites. They are used for subsistence (meat, eggs, and feathers) during the spring and summer. Large numbers of eiders, geese (Canadian and Snow), and ducks are hunted, or have their eggs collected, by community members in Pond Inlet, Clyde River, and Pangnirtung. According to the *Inuit Qaujimagatuqangit Report*, community members indicated that the collection of goose and duck eggs would take place as soon as laying was finished. Every community had their favourite collecting spots. Egg collecting was one of the first chores that children would learn when going on the land. The skin and feathers have featured in clothing in the past, but this type of use is no longer popular.

Shorebirds

The Area of Focus provides seasonal or year-round habitat for phalaropes, turnstones, sandpipers, and plovers. Species that occur more extensively include ruddy turnstone, Baird's sandpiper,

purple sandpiper, semipalmated sandpiper, common ringed plover, semipalmated plover, red phalarope, and red-necked phalarope.

There are no especially large aggregations of breeding shorebirds or Important Bird Areas that have been identified within the Area of Focus as supporting globally or nationally significant habitat for shorebird species. Breeding habitat within the Area of Focus is the northernmost extent for shorebirds migrating along the Atlantic Flyway, from wintering grounds in temperate regions of South America and sub-tropical areas of the United States and Mexico. Existing literature does not indicate that the Area of Focus supports key migratory staging or wintering habitat for shorebirds.

As noted in the *Environmental Setting and Potential Effects Report*, shorebirds are not typically harvested for meat or eggs on their breeding grounds but have been hunted historically in parts of their winter range. Most shorebird species do not have strong cultural significance for Inuit in local communities.

Identified Gaps

Data gaps exist for waterbird distribution (i.e., migration patterns and seasonal distribution) and abundance, as well as sea ice biota in the Area of Focus, particularly in southeastern Baffin Bay. As noted in the *Environmental Setting and Potential Effects Report*, little detailed information was found in the review of literature on the status of the Nunavut population of king eider duck, common eider duck, harlequin duck, Atlantic puffin, and red phalarope. Migratory patterns of eastern king eiders are largely unknown, as is the distribution of king eider ducks along the east side of Baffin Island. Similarly, specific migration routes and behaviour for Eastern Canadian Arctic puffins are not well known. However, based on comments received from parties on the *Environmental Setting and Potential Effects Report* new information on the migration routes for king eider ducks between breeding grounds in Arctic Canada and moulting and wintering areas in Greenland are available.

To better understand the current status of, and potential impacts to, important waterbird populations and sensitive habitats (e.g., migratory bird sanctuary, Important Bird Areas, key habitat sites, and risk intolerant sites), further research was recommended by Nunami

There is a lack of information on the status of the Nunavut population of king eider duck, common eider duck, harlequin duck, Atlantic puffin and red phalarope.

Nunami Stantec, 2018a

Stantec in the *Environmental Setting and Potential Effects Report* on waterbird population densities and breeding success, and monitoring of seasonal waterbird migration patterns, sensitive waterbird breeding and foraging habitat, oceanographic data, productivity, and prey abundance and distribution (e.g., of plankton and fishes).

Further, the *Environmental Setting and Potential Effects Report* noted that there are different views among bioacousticians about the best method for estimating injury and disturbance effects on marine animals, and there is little consensus on how to perform those assessments across different taxa. Canada has not developed prescribed sound level criteria for assessing injury or behavioural responses of waterbirds or marine mammals to underwater noise. In the absence of defined criteria

or thresholds, potential noise-based effects on waterbirds and marine mammals are best characterized based on the available information in peer-reviewed scientific literature. Additional research is needed to more confidently characterize the effects of in-air and underwater noise on waterbird species and to develop more relevant threshold criteria for assessing injury and behavioural disturbance.

Views of Interested Parties

During the Final Public Meeting, the Government of Nunavut (GN) stressed that additional baseline research should be conducted by the Government of Canada in consultation with the GN with respect to waterbirds, and recommended that these studies should focus on the habitat used by bird species, particularly during winter, migration, and the moulting period.¹⁴⁵

Within its public written comments, the Environment Agency for Mineral Resources Activities – Government of Greenland (EAMRA) indicated that new information is available for king eider ducks with respect to the migration between breeding grounds in the Canadian Arctic and moulting and wintering areas in Greenland and recommended two (2) reports be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents). In addition, the EAMRA recommended one (1) report related to harlequin duck population structure in eastern North America be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents).

Environment and Climate Change Canada (ECCC) noted in its public written comments that Ross' gull was missing from the discussion and should be added, as it has a circumpolar distribution, and it recommended one (1) report be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents). ECCC also noted that there is new information available for king eider ducks on the migration between Arctic Canadian breeding grounds and moulting- and wintering areas in Greenland, information that would be relevant to include in the SEA.

During the Final Public Meeting, a Community Representative from Pangnirtung requested clarification from Nunami Stantec on whether the report discussed the different species of birds and how their food sources could be affected by oil and gas development activities.¹⁴⁶ In response, Nunami Stantec noted that indirect effects from birds and their food sources were discussed in the literature review report.¹⁴⁷

The Mittimatalik (Pond Inlet) Hunters and Trappers Organization (Mittimatalik HTO) presented during the Final Public Meeting, noting that millions of waterfowl, such as *akpa* and *auks*, dwell near the floe edge in the spring, and feed on cod and shrimp under the ice. The HTO stressed that

¹⁴⁵ B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 173, lines 1-16.

¹⁴⁶ S. Keenainak, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, p. 75, lines 14-16.

¹⁴⁷ J. Beckett, Nunami Stantec, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, p. 76, lines 11-19.

this type of Inuit Qaujimagatuqangit was important to understanding the cycles of wildlife in the study area.¹⁴⁸

5.2.1.6. *Marine Mammals*

Background Information

Baffin Bay and Davis Strait provide a variety of seasonal habitats for fifteen (15) types of marine mammals including pinnipeds (e.g., ringed, harp, bearded and harp seals and walrus), toothed whales (e.g., narwhal, killer whale, beluga whale, northern bottlenose whale, sperm whale), baleen whales (e.g., bowhead, humpback, fin, and minke whales), and polar bear (see Table 11: Marine Mammal Species found in Baffin Bay and Davis Strait). Greater detail on marine mammals can be found in Section 4.7 of the *Environmental Settings and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information. Based on parties' comments, it is noted that the *Environmental Setting and Potential Effects Report* did not include a discussion specific to hooded seals, minke whales, and sperm whales that are found in the Area of Focus. However, these species are listed in the table below for information purposes and additional information can be found on these species by reviewing Andersen, et al. (2009), Davidson (2016), Gardiner and Dick (2010), and Sergeant (1963).

Table 11: Marine Mammal Species found in Baffin Bay and Davis Strait

Pinnipeds	Toothed Whales	Baleen Whales	Other
Ringed seals (<i>Phoca hispida</i>)	Narwhal (<i>Monodon monoceros</i>): the Baffin Bay population ^a	Bowhead whales (<i>Balaena mysticetus</i>): Eastern Canada-West Greenland population ^a	Polar bears (<i>Ursus maritimus</i>) ^{a,f}
Bearded seals (<i>Erignathus barbatus</i>)	Beluga whales (<i>Delphinapterus leucas</i>): Eastern High Arctic/Baffin Bay ^a and Cumberland Sound populations ^a	Humpback whales (<i>Megaptera novaeangliae</i>)	
harp seals (<i>Pagophilus groenlandicus</i>)	Killer whales (<i>Orcinus orca</i>) ^a	Fin whales (<i>Balaenoptera physalus</i>) ^a	
Hooded seals (<i>Cystophora cristata</i>) ^{a,b,c}	Northern bottlenose whales (<i>Hyperoodon ampullatus</i>): the Davis Strait-Baffin Bay-Labrador Sea population ^a	Minke whales (<i>Balaenoptera acutorostrata</i>) ^{b,e}	
Walrus (<i>Odobenus rosmarus rosmarus</i>) ^{a,d}	Sperm whales (<i>Physeter macrocephalus</i>) ^{b,e}		
Notes: a) Designated as endangered, threatened, or of special concern under SARA and/or by the COSEWIC. b) Not discussed in the <i>Environmental Setting and Potential Effects Report</i> . c) See Andersen et al., 2009 d) See COSEWIC; 2017 and DFO, 2018 e) See Davidson (2016), Gardiner & Dick (2010), and Sergeant (1963) f) See COSEWIC, 2008b, and SOR/2011-233			

¹⁴⁸ E. Panipakoocho, Mittimatalik HTO, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 769, lines 5-15.

Seals

Ringed Seals (*Phoca hispida*)

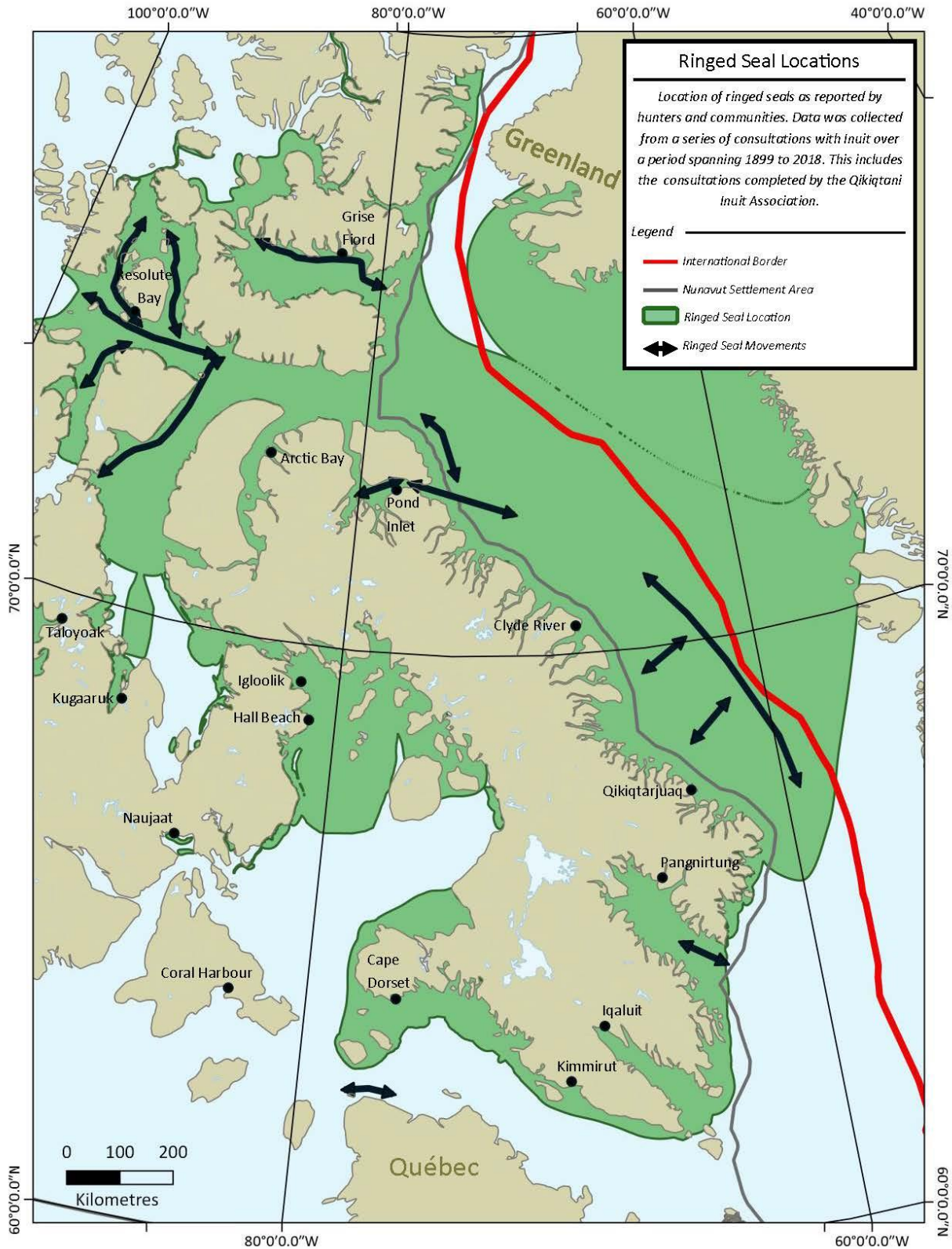
Within the Area of Focus, ringed seals can be found year-round, especially near coastal areas with high densities of hauled-out ringed seals in Lancaster Sound, Barrow Strait, and Peel Sound, and distributions of ringed seals in the pack ice and in the coastal areas of Baffin Island. See Figure 16: Ringed Seal locations and movement based on Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut (Source: QIA, 2018a) for the locations of ringed seal based on studies conducted by QIA (2018a). As indicated in the *Environmental Setting and Potential Effects Report*, community members in Grise Fiord have observed a decrease in the number of ringed seals relative to previous years and indicated that the seals generally appear to be smaller, while community members in Qikiqtarjuaq have noted an increase in seals. During the NIRB's Public Scoping Sessions, a community member from Resolute noted that about three (3) years earlier there had been no seals there, and then there was a sudden increase in Baffin Bay.

Ringed seals are of particular importance to the diet of Nunavut Inuit, as seals are the most common marine mammal consumed, and are a mainstay in the local diet. The *Inuit Qaujimajatuqangit Report* also identified that ringed seals are unique compared to most other seals in that they can scrape *aglu*, or breathing holes, in the winter. That means they can be hunted year-round and are also an essential food source for polar bear. Ringed seals are so important to Inuit that they even feature in Inuit place names (e.g., a cape, called *Nattiqsujuup Nuvua*, near Clyde River is specifically identified with ringed seals).

Threats to ringed, bearded and harp seals include a longer ice-free season and reduced sea ice cover which is predicted to affect the distribution and abundance of prey and reduce body condition of ringed seals. Further, a decrease in winter/spring snowfall is anticipated to reduce snow depth and snow drift formation, leading to reduced availability of suitable birthing lair habitat, and lower pup survival due to greater exposure to predation by polar bear.

Nunami Stantec, 2018a

Figure 16: Ringed Seal locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqqusingitigut (Source: QIA, 2018a)



Bearded Seal (*Erignathus barbatus*)

While bearded seals are found within the Area of Focus, there is limited information available on their distribution and seasonal movements in the eastern Canadian Arctic due to the absence of commercial exploitation of the species and low numbers harvested by Inuit. Access to open water and habitat near open water is important for bearded seals and the *Pikialasorsuaq* (North Water Polynya) provides this species with important winter habitat in the Area of Focus. Studies for the *Inuit Qaujimagatuqangit Report* also identified that bearded seals have started remaining year-round more recently, than was the case in the past, when the seals would leave with the onset of winter. As indicated in the *Environmental Setting and Potential Effects Report*, community members from Grise Fiord have seen an increase in bearded seals, while in Qikiqtarjuaq, community members have reportedly seen fewer bearded seals. Identified threats to this species include loss of sea ice associated with climate change, as the species is highly dependent on productive benthic habitats that receive nutrient transfer from ice-associated production.

Harp Seals (*Pagophilus groenlandicus*)

The Northwest Atlantic harp seal population is found in Baffin Bay and Davis Strait during the summer season, as the seals migrate north into Arctic waters with the retreating ice, and have been shown to summer in areas such as Cumberland Sound and in the *Pikialasorsuaq* (North Water Polynya). Conservation assessments show that harp seals appear to have a large population with no clear evidence of decline. As indicated in the *Environmental Setting and Potential Effects Report*, community members from Grise Fiord have observed fewer harp seal in recent years, community members from Qikiqtarjuaq noted both an increase and decrease in harp seals, and community members from Kimmirut and Pond Inlet observed an increase. Inuit from Clyde River have reported that polar bears are eating harp seals more often in recent years because of changes with sea ice.

Harp seals are considered the ‘dog team’ of narwhal as they return just before the whales and are an indication that whales will be coming.

QIA, 2018a

Atlantic Walrus

Based on an updated report by COSEWIC (2017) and DFO (2018), two (2) of the three (3) Atlantic walrus (*Odobenus rosmarus rosmarus*) populations [High Arctic and Central/Low Arctic] are found throughout the Area of Focus, with the *Pikialasorsuaq* (North Water Polynya) being an important winter habitat. Walrus will haul out onto ice floes and form large social groups in winter, while during other times of the year walrus tend to gather in large herds and become associated with drifting pack-ice. In summer and fall, when ice is lacking, Atlantic walrus congregate on land in a few predictable haul-out locations, including along the southeast coast of Baffin Bay (DFO, 2018). The

Walrus have been and continue to be critical to Inuit survival and culture. Walrus are feared and admired by Inuit because of their powerful strength. Traditionally, walrus were a prized food and resource and could be hunted year-round. Walrus is still actively harvested, with each of the study area communities noting it is harvested for ivory and as a food source for both humans and dog.

QIA, 2018a

research completed for the *Inuit Qaujimagatuqangit Report* and knowledge shared with the NIRB during the Public Scoping Sessions identified that walrus have predictable habitat needs and are

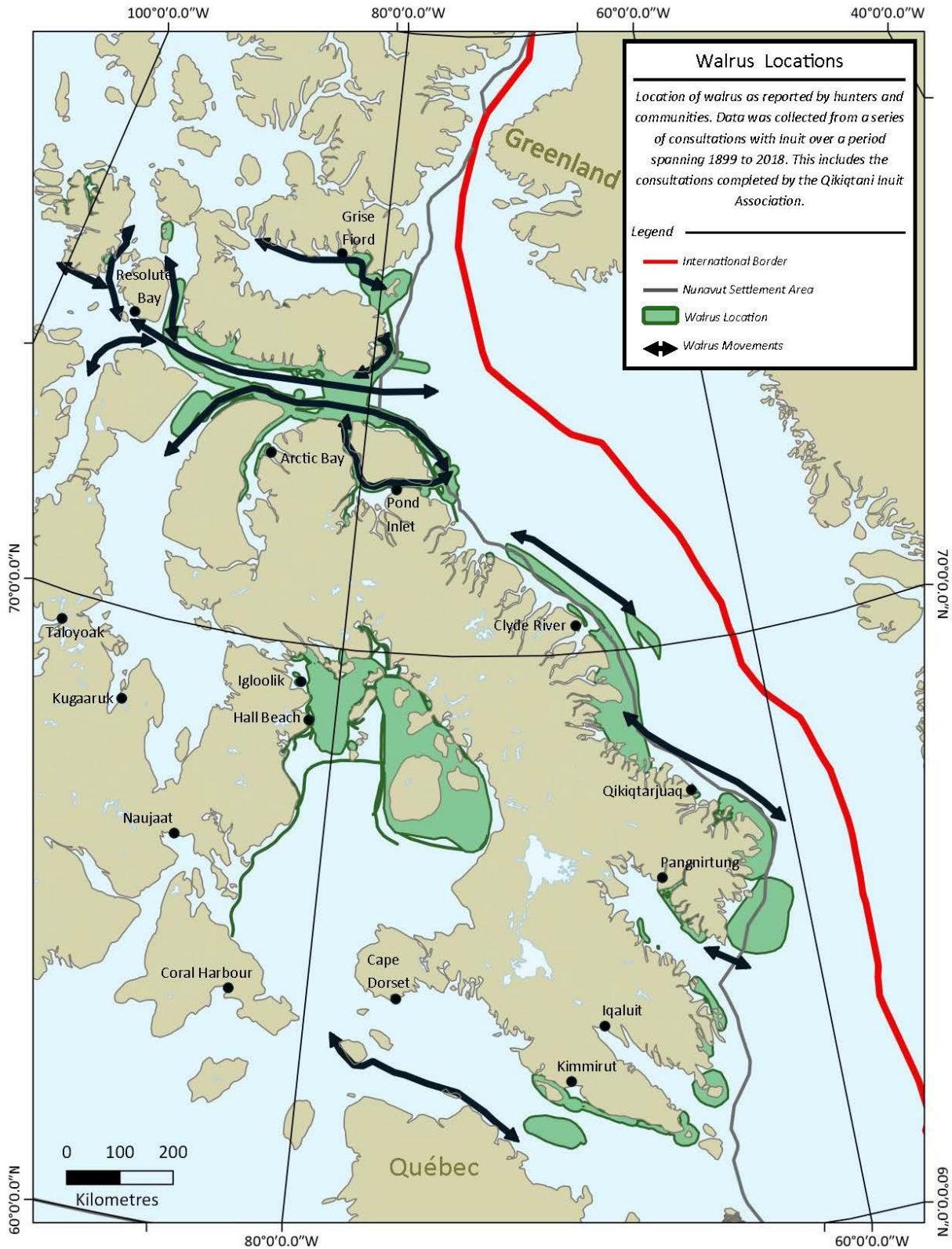
found year-round throughout Baffin Bay and Davis Strait, with the largest population found along the east side of Ellesmere Island in Baffin Bay. See Figure 17: Walrus locations and movement based on Inuit Qaujimagatugangit and Inuit Qaujimagangit Iliqqusingitigut (Source: QIA, 2018a) for the locations of walrus based on studies conducted by QIA (2018a).

Threats to the Atlantic walrus populations in Canada include hunting, noise disturbance, habitat loss, and environmental contamination. Following disturbance, walrus have been known to abandon uglit (haul outs) in favour of less accessible islands and shorelines.

Nunami Stantec, 2018a

As indicated in the *Environmental Setting and Potential Effects Report*, community members in Grise Fiord have observed an increase in walrus along the south side of Jones Sound, with fewer sightings on the north side of this waterway. A report by COSEWIC (2017) notes that this population may become threatened if commercial shipping related to industrial development in the Arctic increases, particularly because the species is sensitive to human disturbance, and proposed routes run through core habitat.

Figure 17: Walrus locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqqusingitigut (Source: QIA, 2018a)



Whales

The *Inuit Qaujimajatuqangit Report* noted that along the Qikiqtani coast, beluga, narwhal, and bowhead whales have been consistently harvested by Inuit for centuries, and are often spoken of together with, and in relation to, seals.

Narwhal (Monodon monoceros)

The Baffin Bay population, which is one (1) of the three (3) recognized narwhal populations present in Canada, inhabits the Area of Focus from the southern end of Baffin Island north to the waters of Hall Basin, between the west coast of Greenland and Ellesmere Island, with a preference for deep and offshore waters. The Baffin Bay narwhal population summers north of Baffin Bay and along the eastern and southern coasts of Baffin Island while the *Pikialasorsuaq* (North Water Polynya) is an important winter habitat. See Figure 18: Narwhal locations and movement based on Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqusingitigut (Source: QIA, 2018a) for the locations of narwhal based on studies conducted by QIA (2018a).

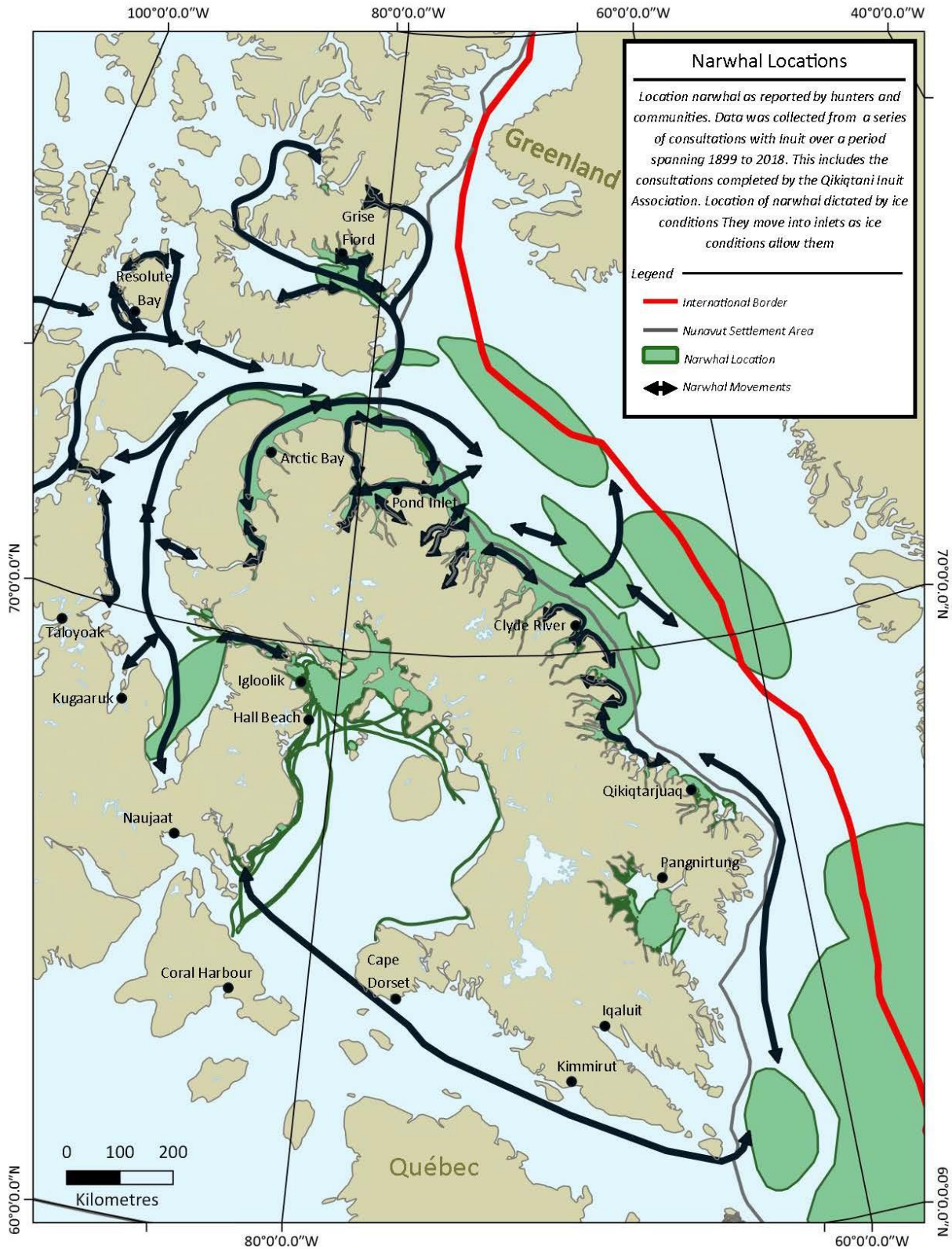
During the collection of Inuit Qaujimajatuqangit by the QIA, both Arctic Bay and Pond Inlet harvesters mentioned the *Pikialasorsuaq* (North Water Polynya) as being a critical habitat for narwhal. Fisheries and Oceans Canada (DFO) have also identified an area east of Qikiqtarjuaq as critical overwintering habitat for narwhal (narwhal Overwintering and Coldwater Coral Zone). The Zone was established as a marine refuge to protect concentrations of corals and to minimize the impacts on food sources used by narwhals in the winter. Inuit harvesters have reported that narwhal stocks in Nunavut appeared to be healthy and growing, and as indicated in the *Environmental Setting and Potential Effects Report*, community members in Grise Fiord have observed an increase in narwhal sightings in recent years.

Threats to Narwhal include ice entrapment (e.g., in artificially opened and natural channels that refreeze), predation by killer whales and polar bears, disease and parasites, changes in prey abundance and habitat alteration associated with climate change, environmental contaminants, underwater noise from offshore oil and gas activities, disturbance or strikes associated with shipping, hunting, and commercial fisheries that target prey species.

Nunami Stantec, 2018a

As noted by harvesters in the *Inuit Qaujimajatuqangit Report* and as remarked to the NIRB during the public scoping meetings, narwhal are extremely sensitive to noise. Narwhal use highly directional acoustic signals during ascents and descents in the water column for echolocation of prey. The click of the narwhal is the most directional acoustic signal reported for any species to date.

Figure 18: Narwhal locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqqusingitigut (Source: QIA, 2018a)



Beluga Whale (*Delphinapterus leucas*)

The ranges of at least two (2) of the seven (7) defined populations of beluga whales present in Canada overlap the Area of Focus: the Eastern High Arctic/Baffin Bay population; and the Cumberland Sound population. The Eastern High Arctic/Baffin Bay beluga population migrates from open-water overwintering areas of Baffin Bay, the High Arctic, and West Greenland, to spring and summer calving and feeding areas of the Canadian High Arctic, including Lancaster Sound, Barrow Strait, Prince Regent Inlet and Peel Sound; while the Cumberland Sound population summers in Cumberland Sound. The winter distribution of beluga is not well understood by Inuit hunters and the scientific community, but, in general, seems dependent on areas of shifting ice where open water provides access to air. It is believed that many belugas spend the winter in the *Pikialasorsuaq* (North Water Polynya). Inuit hunters from Iqaluit, Pangnirtung, and Kimmirut believe that some belugas spend the winter near the mouth of Frobisher Bay. Kimmirut Elders and hunters reported that belugas visit Kimmirut in the spring when feeding off Arctic cod at the floe-edge or when following the direction of the currents while searching for cod in the summer. See Figure 19: Beluga whale locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimajangit Iliqqusingitigut (Source: QIA, 2018a) for the locations of beluga whale based on studies conducted by QIA (2018a).

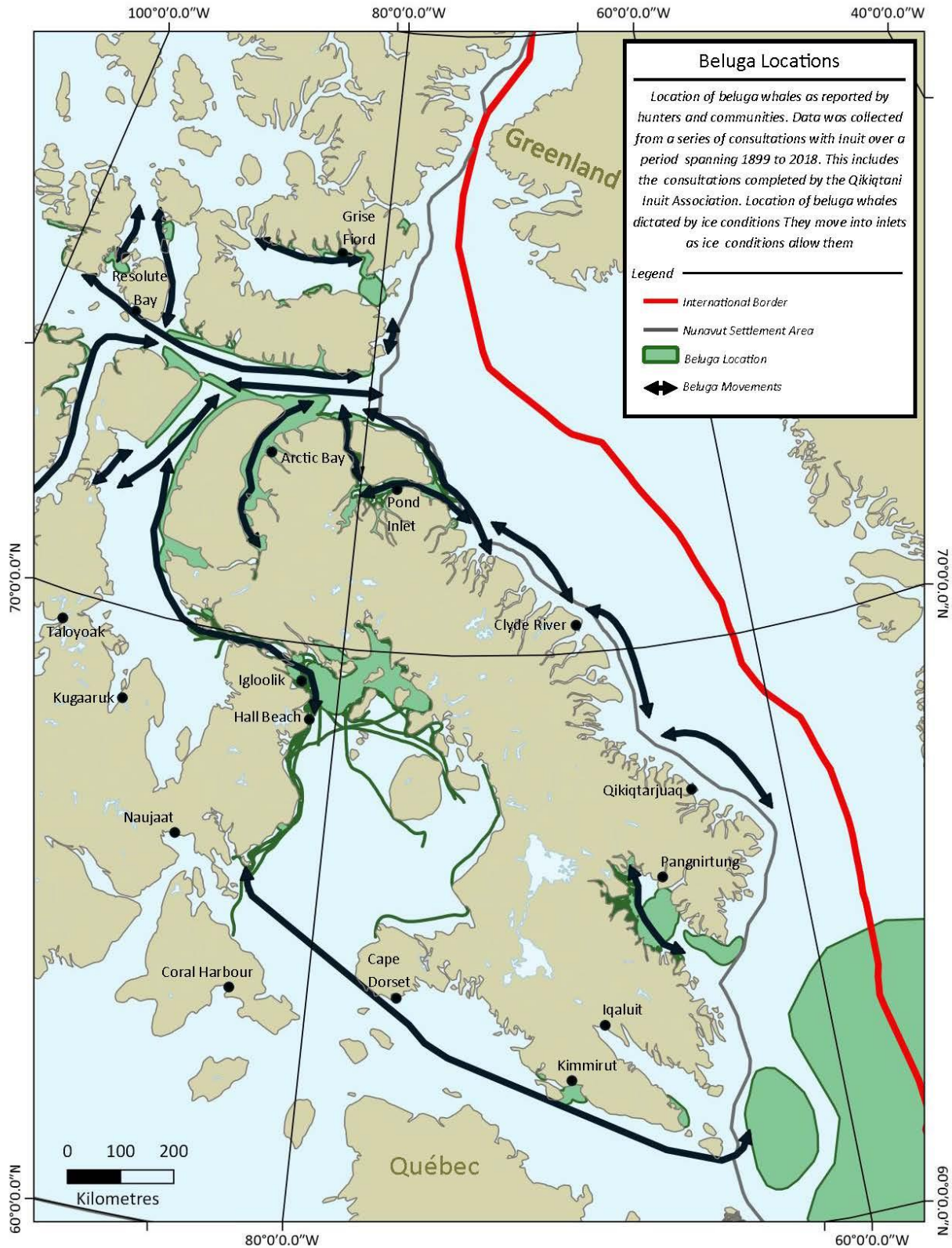
Elders from Iqaluit have observed an overall decline in whale populations compared with the 1950s. Similarly, Inuit from Grise Fiord have recently noted a decline in the beluga whale population, while Inuit of Qikiqtarjuaq noted that beluga sightings were rare (as indicated in the *Environmental Setting and Potential Effects Report*). Hunters from Kimmirut and Iqaluit have also reported changes in migration patterns. According to the *Inuit Qaujimagatuqangit Report*, hunters from Arctic Bay, Clyde River, and Qikiqtarjuaq have noted that beluga avoid areas when they are disturbed by shipping and moved off their migratory paths.

Threats to Beluga populations present in the Area of Focus include hunting, particularly off west Greenland; increased predation linked to the expansion of the range of killer whales influenced by climate-change induced changes in ice cover; predation by polar bear; environmental contamination; ship strikes; and behavioural disruption by underwater noise generated by vessels and seismic exploration.

Nunami Stantec, 2018a

Belugas are a highly vocal and social species, with high-pitched whistles and grunts thought to be used for communication, and to express alarm. The species has a well-developed hearing capability and uses echolocation to detect prey in dark waters at depth.

Figure 19: Beluga whale locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqusingitigut (Source: QIA, 2018a)



Killer Whale (*Orcinus orca*)

Killer whale presence and distribution in Nunavut is limited by ice, with the species tending to avoid heavy ice cover (greater than 50% coverage). Since the mid-1990s killer whales have expanded their range from Baffin Bay and Davis Strait into northern Foxe Basin and Hudson Bay. Killer whales have been sighted regularly in Cumberland Sound, Pond Inlet/Bylot Island, Lancaster Sound, Admiralty Inlet and western Hudson Bay (particularly in the Repulse Bay area). The highest number of sightings were reported in the Lancaster Sound region. The *Inuit Qaujimajatuqangit Report* notes that killer whales are found throughout Baffin Bay and Davis Strait. See Figure 20: Killer whale locations and movement based on Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut (Source: QIA, 2018a) for the locations of killer whales based on studies conducted by QIA (2018a).

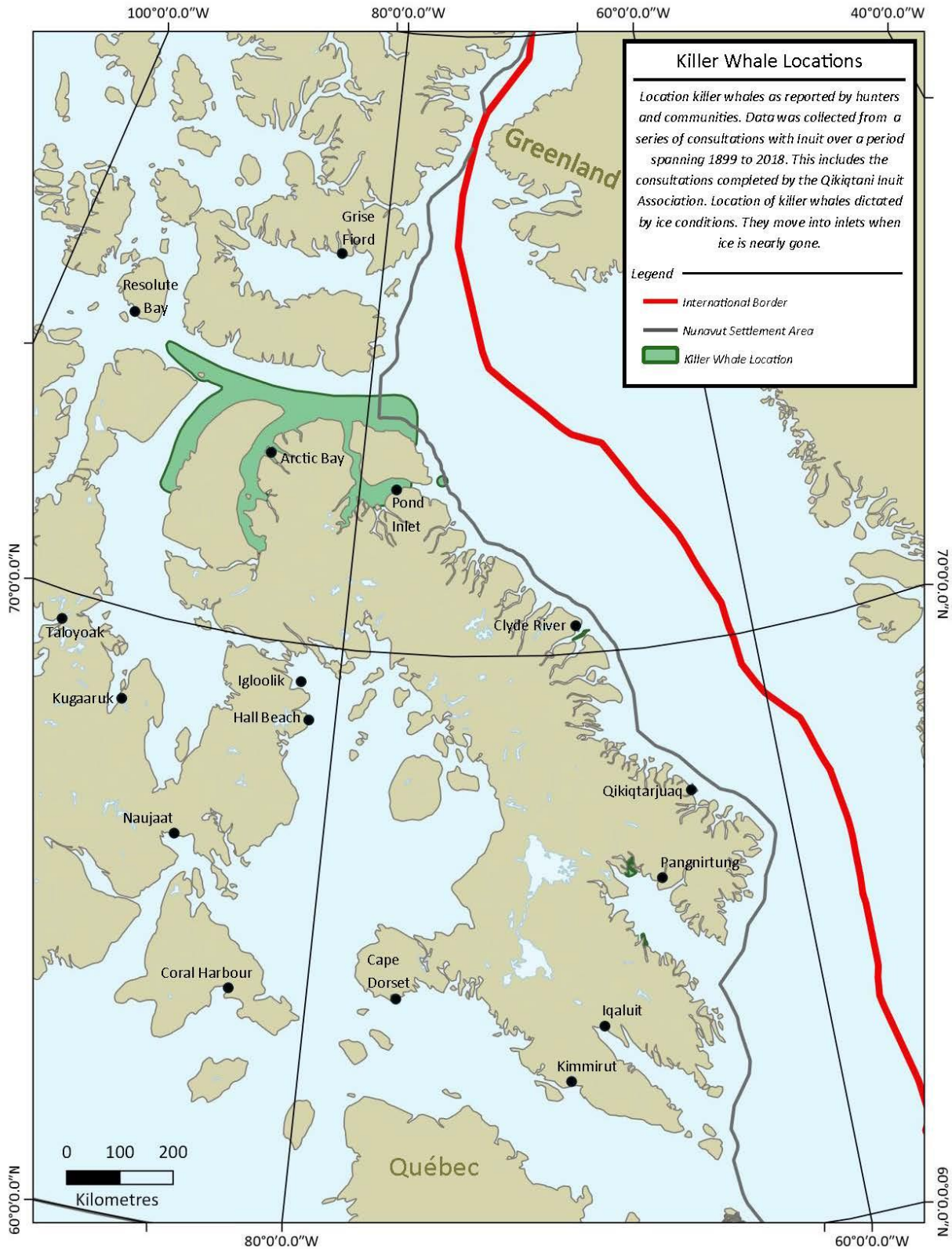
The primary cause of killer whale mortality is hunting, predominantly by Greenland Inuit. Other threats to killer whale populations include reduced prey availability, physical and acoustic disturbance, and susceptibility to chemical contaminants (e.g., persistent bioaccumulating toxins) linked to the long life and apex-predator status of the species.

Nunami Stantec, 2018a

Inuit hunters and Elders from coastal communities of Nunavut indicated that killer whale sightings were of similar or higher frequency than previous decades; however, their numbers were estimated to be small (around 12 to 500). The *Inuit Qaujimajatuqangit Report* indicated that killer whales have a unique place in the lives of Inuit and were generally feared; referred to

as “wolves of the sea”. Killer whales were not hunted much but were used by hunters as sentinels or hunting aids for the location of other whales and prey species such as seals. The report further noted that as with other whales, killer whales seem to avoid areas with too many boats and appear to be sensitive to noise.

Figure 20: Killer whale locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqqusingitigut (Source: QIA, 2018a)



Bowhead Whales (*Balaena mysticetus*)

Bowhead whales found in Nunavut are known as the Eastern Canada-West Greenland population. The summer range of the Eastern Canada-West Greenland bowhead population covers northwestern Hudson Bay, and extends from northern Foxe Basin, through Prince Regent Inlet, Gulf of Boothia, and Lancaster Sound, and across western Baffin Bay into Cumberland Sound. The population winters in areas of unconsolidated icepack in northern Hudson Bay, Hudson Strait, central Davis Strait, and southern Baffin Bay. See [Figure 21: Bowhead whale locations and movement based on Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut](#) (Source: QIA, 2018a) for the locations of bowhead whales based on studies conducted by QIA (2018a). Critical bowhead habitats are identified as regions of shallow water/continental shelf. Important bowhead habitats include dense annual pack ice, shear-zone/leads, polynyas, open water, and ice edges (pack ice and open water). Other habitats used by bowhead whales include loose annual pack ice and shelf break regions. The Ninginganiq National Wildlife Area on the northeast coast of Baffin Island supports the largest known concentrations of bowhead whales in Canada. The *Inuit Qaujimajatuqangit Report* notes that bowhead generally arrive at the floe edge around May/June and make their way into inlets and open areas between July and September.

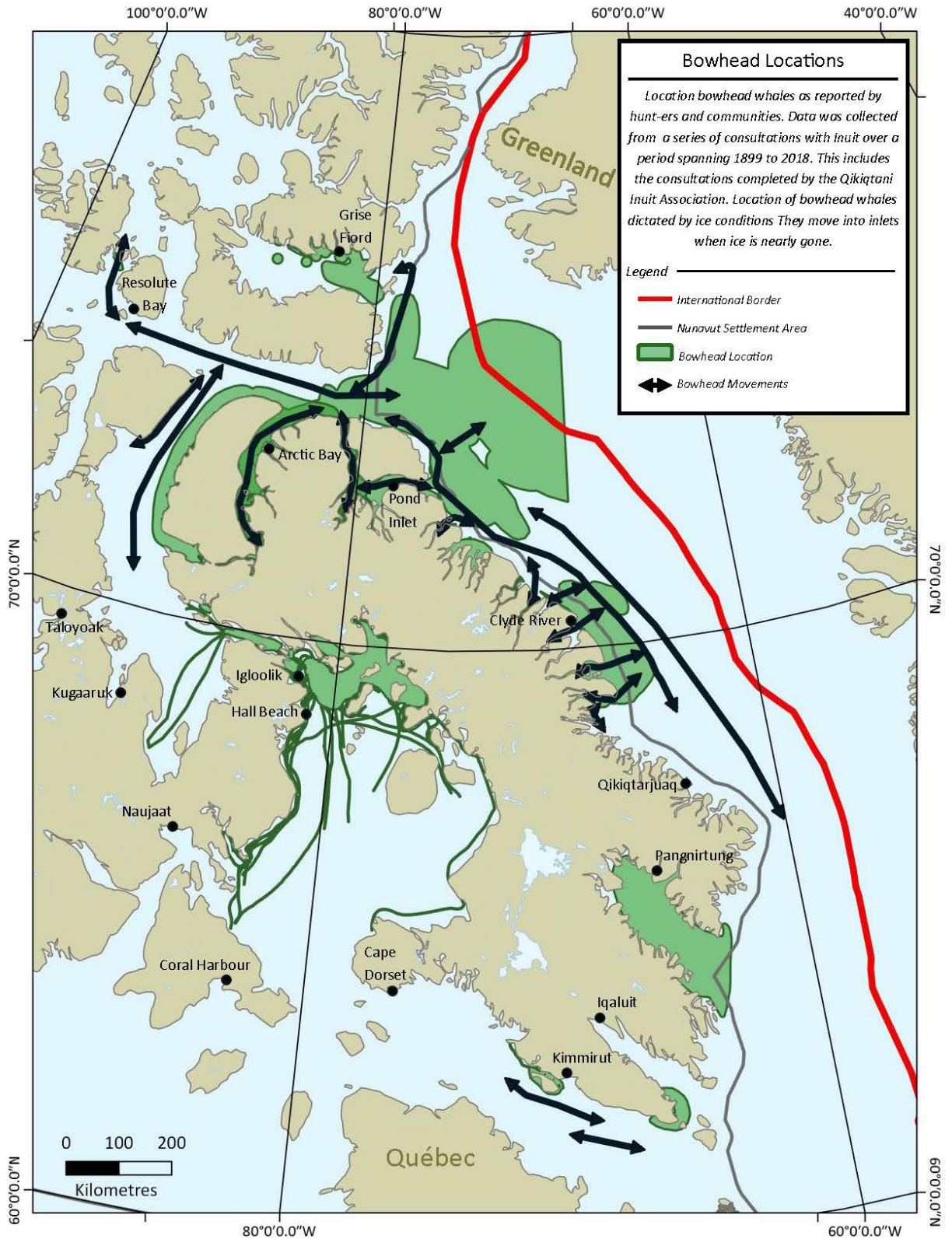
Current threats to bowhead whales include predation, environmental contamination, disease, illegal hunting, ship strikes, accidental ingestion of foreign objects (e.g., plastics), and potential disturbance and displacement from preferred habitats by offshore oil and gas exploration, commercial shipping, and tourism. Predation by killer whales, not observed in the region until the mid-1990s, is a growing concern and may currently be the primary threat to bowhead whale populations in the eastern Canadian Arctic.

Nunami Stantec. 2018a

Inuit from Arctic Bay, Clyde River, Iqaluit, Kimmirut, Pangnirtung, Pond Inlet, and Qikiqtarjuaq have reported increases in bowhead whale populations and Inuit from Qikiqtarjuaq have indicated there is killer whale predation on bowhead whales in the area. Inuit from Pangnirtung have observed a decline in bowhead whales, as well as other marine mammals in Cumberland Sound, and have attributed this to the killer whales.

According to the *Inuit Qaujimajatuqangit Report*, hunters have noted that bowhead are sensitive to noise, but are not as sensitive compared to other whales, as they do not react to small boats and outboard engines in the same manner as they do for larger ships. During the NIRB's community scoping sessions, an individual from Pangnirtung also stated that when animals hear too much noise they leave and sometimes come back. In the scoping sessions in Iqaluit, a community member noted that there are many marine mammals in Baffin Bay and Davis Strait and that bowhead whales migrate north in the spring and south in the fall.

Figure 21: Bowhead whale locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqusingitigut (Source: QIA, 2018a)



Northern Bottlenose Whale (*Hyperoodon ampullatus*)

One (1) of two (2) genetically distinct populations of northern bottlenose whale present in Canada are found in the Area of Focus: the Davis Strait-Baffin Bay-Labrador Sea population. This whale population is found in deep (greater than 500 metres(m)) waters, typically in continental slope waters (between 800 and 1,500 m deep), and appear to prefer cold waters along the edge of pack ice during the spring and summer.

Northern bottlenose whales were not traditionally harvested by Inuit but were subject to intense commercial whaling in the past, which significantly reduced their population numbers. The two (2) main current principal threats to the species are entanglement in fishing gear in the Labrador Sea and behavioural disruption from underwater noise throughout its range

Humpback Whales (*Megaptera novaeangliae*)

Four (4) recognized humpback stocks occur in the western North Atlantic; the “western Greenland” stock’s summer range has been observed to include the Area of Focus. In their summer higher-latitude feeding grounds, humpback whales tend to concentrate around areas of upwelling and high productivity.

Threats to humpback whales in the western North Atlantic include predation, parasitism, disease, biotoxins, changes in prey species abundance (e.g., capelin), accidental beaching, vessel strikes, and entrapment.

Nunami Stantec, 2018a

Populations of humpback whales have slowly increased following the extensive commercial whaling (90-95% of the world-wide population were killed by commercial whaling) but these populations have not rebounded to the former levels found. Humpback whales were not traditionally harvested by Inuit.

Fin Whales (*Balaenoptera physalus*)

The Atlantic Northern hemisphere fin whale population extends into Davis Strait and the southern portion of Baffin Bay. Migrations of fin whale appear to generally occur between high-latitude summer foraging grounds and lower-latitude breeding and calving winter grounds. Fin whales exhibit a preference for low surface temperatures and oceanic fronts during the summer that support high concentrations of prey. Fin whales in the western North Atlantic may be found close inshore to far beyond the continental shelf break.

Potential threats to Atlantic fin whales include acoustic disturbance from shipping and seismic exploration, ship strikes, entanglement in fishing gear, and habitat degradation possibly due to altered prey quality or abundance.

Nunami Stantec, 2018a

Commercial whaling reduced the Atlantic population of fin whales during the 20th Century up until a cessation of hunting in 1971, but abundance is thought to have increased off the coast of western Greenland since. Climate change may increase the number of summer-visiting baleen whales, such as fin whales, in the southern portion of the North Atlantic Arctic, as well as increase the duration of their stay.

Polar Bear

Polar bears (*Ursus maritimus*) are circumpolar and rely on the sea ice for hunting and travel. There are 19 subpopulations of polar bear, including subpopulations identified for Baffin Bay, Davis Strait, and Lancaster Sound. Their distribution within the Area of Focus, in spring and summer, is often associated with moving first year ice, and the density and distribution of ice-dependent seals (especially ringed seals) that they prey upon. From early winter until spring break-up of annual sea ice, polar bears disperse throughout the Area of Focus, and Lancaster Sound has the highest polar bear density in the Canadian Arctic. Polar bears may range over 200 kilometres (km) offshore, but are most frequently present near the 300-metre (m) depth contour (on shelf waters and near land). Coastal regions of Baffin Island, Bylot Island, Coburg Island, and Devon Island have denning habitat for polar bears, including maternity dens and shelter dens, which are typically occupied from early October to mid-March. The *Inuit Qaujimagatuqangit Report* notes that polar bears are found along the entire Baffin, Devon and Ellesmere Island coastlines. See [Figure 22: Polar Bear locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqqusingitigut](#) (Source: QIA, 2018a) for the locations of polar bears based on studies conducted by QIA (2018a).

Female polar bears typically spend most of the year closer to land than males, except at the end of breakup (June-July) where they remain on offshore sea ice as long as possible to maximize feeding. Potential long-distance swimming events identified through collar transmissions during the summer have seen polar bears swim over 100 km (from offshore sea ice to Baffin Island), and the observed frequency of these events has increased between the 1990s and 2000s. Critical habitats for polar bear include shore-fast ice, dense annual pack ice, and land denning areas. Polar bears exhibit long-fidelity to these habitats, and sea ice habitats are conducive to polar bear predation on marine mammals. Other important habitats for polar bear include loose annual pack ice, multi-year pack ice, and shear zones/leads. Denning habitat on Baffin Island, Coburg Island, and Devon Island are characterized by snowdrifts, or sometimes frozen ground, located on steep slopes near the coast. In recent years, polar bears on Baffin Island have been denning at higher elevations in areas of steeper slopes, are entering dens later, and leaving dens sooner. Inuit from Pond Inlet and Clyde River noted that bears may be moving further inland and explained that if there is less snow or if polar bear populations increase, polar bears will travel higher into fiords where there is more snow and fewer bears (Nunavut Environment, 2017; as cited in Nunami Stantec, 2018a, p. 4.87). Polar bears are the natural predator of various Arctic marine mammals with harp seal being their primary food source; however, hooded seals form their primary prey in northern Davis Strait.

Inuit of Grise Fiord, Qikiqtarjuaq, Pond Inlet, and Clyde River have noted increases in polar bear sightings in recent years; however, Inuit in Grise Fiord have noted that larger bears are no longer seen. While scientific studies have reported a declining polar bear population, theories suggested by Inuit for the apparent increase in community observations of bears in Baffin Bay include:

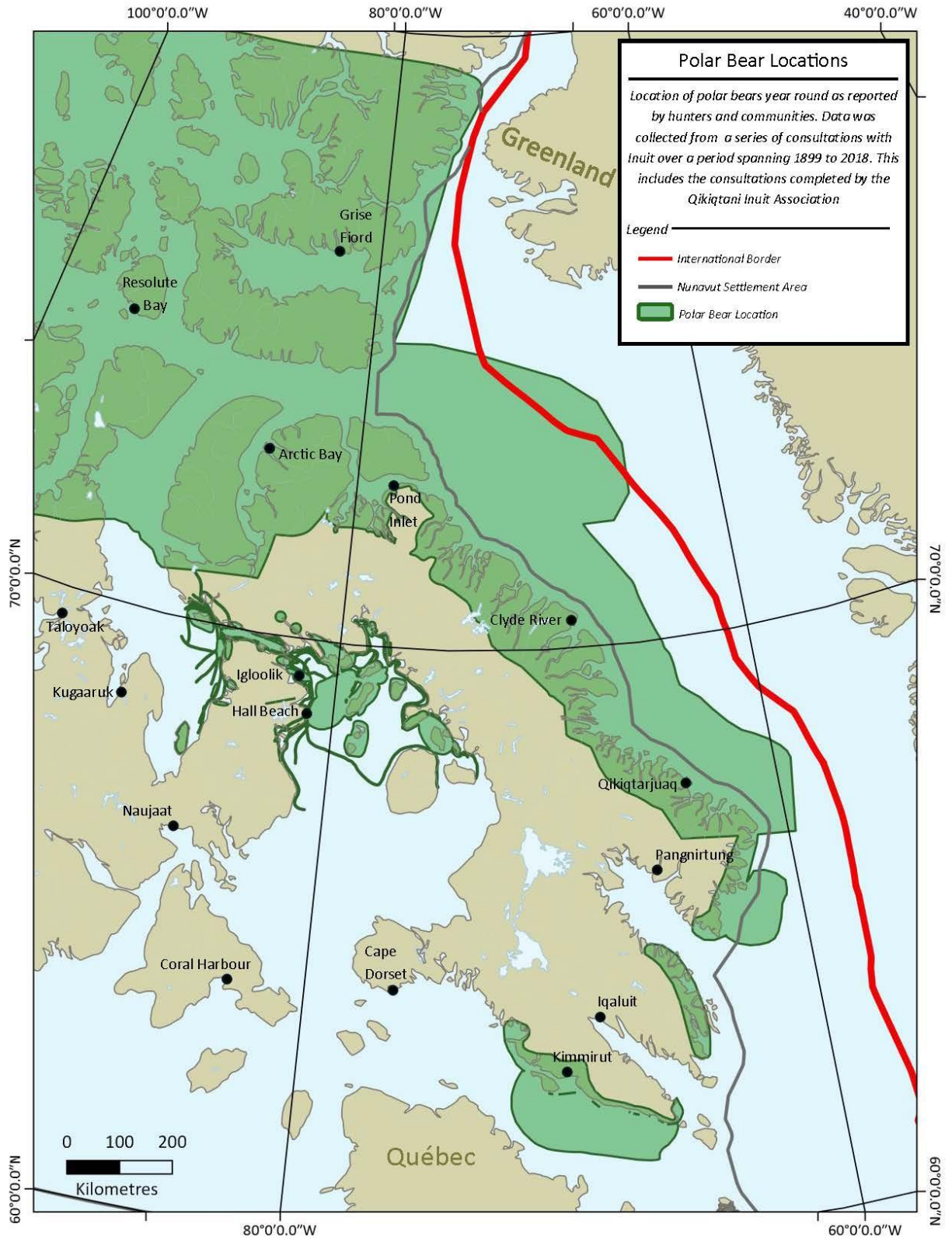
- immigration of individuals from a nearby abundant population (Lancaster Sound);
- scientific studies have underestimated the population; and
- climate change has caused an increase in densities of bears along the coast by inducing changes in their habitat.

The *Inuit Qaujimagatuqangit Report* indicated that even though polar bears are ubiquitous in the Arctic, there is only limited Inuit knowledge documented for the Area of Focus. However, polar bears or *Nanuq* are spoken of for their strength and bearing, and feature prominently in Inuit lore and mythology. Traditionally, polar bears have been an important source of protein and clothing for Inuit. The report further noted that polar bears are still actively harvested according to a quota management system established by the Government of Nunavut. Generally, the whole skin or pelt would be sold as an income source, while the meat is considered a delicacy and consumed locally.

Threats to polar bears include declines in sea ice and increases in the duration and extent of ice-free periods. Consultations with Hunters and Trappers Organizations from communities on Baffin Bay found that there was a shared concern that increased marine traffic in Baffin Bay was negatively affecting local sea ice conditions and having an adverse impact on polar bear habitat.

Nunami Stantec, 2018a

Figure 22: Polar Bear locations and movement based on Inuit Qaujimagatuqangit and Inuit Qaujimagangit Iliqqusingitigut (Source: QIA, 2018a)



Identified Gaps

As noted in the *Environmental Setting and Potential Effects Report*, there is little known about the distribution, abundance, migratory patterns, and key habitat availability and quality for many marine mammal species in the Area of Focus. These gaps make it very difficult to assess the potential for oil and gas development activities to impact these species. It can be generally assumed that effectively containing and recovering spills close to the source of release is important to prevent impacts on these various species and habitats, and that risks to marine species and habitats associated with marine pollution incidents may also be reduced by identifying and implementing enhanced measures for spill prevention and techniques for containment and recovery in Arctic environments.

Data on some species of marine mammals in the Area of Focus has been collected on a regular basis. However, confidence about the potential effects to populations from oil and gas development activities is dependent on ongoing monitoring and Inuit Qaujimagatuqangit and Inuit Qaujimaningit collection and sharing of information regarding the body condition of individuals, prey availability, key habitat availability, abundance, and distribution is required. This is particularly the case for ice-associated species (e.g., seals and polar bear) that are considered the most vulnerable to the loss of habitat through sea ice loss associated with climate change. It was recommended

in the *Environmental Setting and Potential Effects Report* that increased monitoring of the distribution and seasonal movements and habitat use of bearded seals and ringed seals throughout the year, the winter distribution of beluga, and the wintering grounds and calving areas of fin whale will increase the level of confidence regarding potential effects on these species in the Area of Focus.

Confidence in the prediction of effects on marine mammals would be increased with further studies on the behavioural responses of these species to underwater noise and habitat alterations. The behavioural response of marine mammals to disturbance is often context dependent; further information on habitat use in the Area of Focus and how species respond to disturbance would be valuable. Further to this, expanded research on whether and how the impacts of individual changes in behaviour are transferred to population level effects will increase confidence in the assessment of potential effects on population viability and cumulative effects.

So in this area here, the difference in colour doesn't necessarily mean that it's less important. It's just that there's less knowledge of this area, because it's not where harvesters and Inuit have gone to share that information. And it's mainly because it's wintering habitat. So we know that it's very important, but we need more knowledge about what happens in those wintering grounds. We -- it's known that there's migration routes that flow through that area that are critically important for the marine species and mammals that we -- that are found in the coastal areas. So this is all migration routes. It's wintering grounds.

[R. D'Orazio, Qikiqtani Inuit Association, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 306, lines 11-23]

Views of Interested Parties

Within its public written comments and final written submission, the Government of Nunavut (GN) noted that polar bears should be considered as an indicator species separate from other marine mammals. It was further noted that the assessment of effects should reference the available information on environmental effects of oil and gas activities on polar bears in the Beaufort Sea and be updated to include the most recent available baseline data.

The GN further noted in its final written submission that there was insufficient information for the Area of Focus on marine wildlife, including scientific, Inuit Qaujimagatuqangit, and traditional knowledge, and that additional baseline data (including distribution and migratory routes) is required to support a comprehensive understanding of the use of the Area of Focus by wildlife. The GN recommended this data, including GN-delineated polar bear denning areas, be presented on a map, with topics in respect of which there are knowledge gaps clearly highlighted. The GN further recommended that the Government of Canada, in consultation with other interested parties, conduct additional baseline studies related to marine mammals and waterbirds and their migration season habitat use. The GN also noted that baseline data collection programs should be conducted on a regular basis and that the baseline information should be integrated within the coastal sensitivity atlas. The lack of baseline information on marine wildlife in the Area of Focus was reiterated by the GN at the Final Public Meeting.¹⁴⁹

Additional baseline data is – is needed to support a comprehensive understanding of the wildlife area in the area of focus.

[B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p.172, lines 7-10.]

During the Final Public Meeting, the GN also stressed that additional baseline research should be conducted by the Government of Canada, in consultation with the GN, with respect to marine mammals and waterbirds' winter and migration seasonal habitats, as well as studies into habitat use by waterbirds.¹⁵⁰

During its presentation at the Final Public Meeting, Crown-Indigenous and Northern Affairs Canada (CIRNAC) noted that it has started and will continue to contribute to closing the knowledge gaps identified during the SEA. It was noted there is an Arctic Regional Environmental Studies program, which is funding some research in Baffin Bay and Davis Strait region, and that is based on community priorities heard during the community visits. CIRNAC summarized some of the areas of studies conducted:

...we've worked on monitoring migration of whales, studying narwhal movement and food linkages, understanding narwhal stocks and habitat, researching effects of oil contaminants on marine species, predicting offshore distribution of seabirds,

¹⁴⁹ B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p.172, lines 6-25.

¹⁵⁰ B. MacIsaac, Government of Nunavut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 17, lines 1-16.

*and assessing earthquake activity and natural seeps. And we will continue funding research projects next year as well.*¹⁵¹

Within its public written comments, Fisheries and Oceans Canada (DFO) noted that discussions on hooded seals, minke whales, and sperm whales were not included in the *Environmental Setting and Potential Effects Report*, and recommended that future SEAs should include these marine mammals. DFO recommended five (5) reports be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents). DFO also noted that the conservation status of many of the marine mammals discussed needs to be reassessed as the information provided by Nunami Stantec appeared to be outdated. It was further noted that the distribution and ecology of Atlantic walrus should include the four (4) stocks or management units: Baffin Bay, Penny Strait-Lancaster Sound, West Jones Sound, and Hudson Bay-Davis Strait. DFO indicated this information would support better understanding about the habitat used by the walrus and would identify established haul-out sites.

We protect our oceans and aquatic ecosystems and species from the negative impacts of humans and invasive species, both through sound science and also in collaboration with Inuit communities.

[A. Doherty, Fisheries and Oceans Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 392, lines 7-11.]

Oceans North Canada noted in its final written submission that Baffin Bay and Davis Strait contain year-round narwhal habitat, as well as habitat for summering whales, such as northern bottlenose whale, sperm whale, fin whale, and blue whale.

The Qikiqtaaluk Wildlife Board confirmed its support for the Qikiqtaaluk Hunters and Trappers Organizations' (HTOs) call for the extension for the moratorium on oil and gas exploration in Baffin Bay and Davis Strait, citing the HTOs' rationale that more information is needed to understand the potential for effects. The information gaps identified by the HTOs included gaps in research on a variety of fronts such as: baseline research on wildlife and fisheries populations and migrations; a lack of information on the potential for impacts from seismic testing on wildlife, fisheries and sea bottom dwelling organizations; and the impacts of oil spills in Arctic environment.

Within its public written comments, the Nangmoutaq (Clyde River) Hunters and Trappers Organization (Nangmoutaq HTO) indicated that there remain significant gaps in the baseline data about marine mammals, their habitat, and the potential for effects on marine mammals that are critical to fully understanding the risks and opportunities of offshore oil and gas. The Nangmoutaq HTO recommended marine wildlife populations and locations (e.g., narwhal, seal, walrus, bowhead whales, etc.) need to be better understood in order to know what the potential impacts of oil and gas activities might be on these animals, including assessing the sensitivity of Arctic wildlife and ecosystems to pollution, and information on habitat, migration patterns, diet and distribution. In particular, the HTO indicated that more information is needed on populations,

¹⁵¹ M. Hopkins, Crown-Indigenous and Northern Affairs Canada, NIRB Final Public Meeting File No.17SN034 Transcript, March 19, 2019, p.368, lines 9-16.

locations and the potential impacts of oil and gas on sea-bottom dwelling organisms and plants (e.g. phytoplankton, capelin, clams, shrimp, coral).

5.2.1.7. *Species at Risk*

Background Information

The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 4.1: Species at Risk (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Species of Cultural Interest

It was stressed during the NIRB’s Public Scoping Sessions for the SEA, within the *Inuit Qaujimajatuqangit Report* and the *Food Security Report*, and also by Nunami Stantec that marine mammals, birds, and fish are still critical in the lives of Inuit. Inuit Qaujimajatuqangit and Inuit Qaujimaningit has shown that the species of primary importance to Inuit culture include: ringed and bearded seal, walrus, narwhal, beluga, polar bear, black guillemot, thick-billed murre, various ducks and geese, Arctic char, Arctic cod, and Greenland halibut (turbot). These species themselves are supported by seaweed, kelp, clams, mussels, and plankton. The other *puijiit* (marine mammals) migrate from the area as ice forms, largely moving into the open water areas of Baffin Bay and Davis Strait, and returning with ice break-up. For discussions related to Traditional Activity see [5.3.2.5 Traditional Activity and Knowledge](#).

Species Conservation

Of the various marine species which may occur in or near the Area of Focus, a number of these are listed as endangered, threatened, or of special concern under the *Species at Risk Act* (SARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); these are listed below in Table 12: Listed species populations occurring in or near the Area of Focus which have been designated as endangered, threatened, vulnerable or of special concern by COSEWIC and/or SARA. While yellow-billed loon, common eider, and long-tailed duck¹⁵² are not included in this listing and not considered “at risk” in Canada, these species are hunted by Qikiqtani harvesters according to the QIA’s Inuit Qaujimajatuqangit studies, and are thus considered important. These species may be considered “at risk” in European countries and the United States where they spend their winters.

Threats to Species at Risk may include habitat loss, climate change, noise disturbance, hunting, fishing, and environmental contamination.

¹⁵² Formerly “Oldsquaw”.

Table 12: Listed species populations occurring in or near the Area of Focus which have been designated as endangered, threatened, vulnerable or of special concern by COSEWIC and/or SARA¹⁵³

Marine Mammals	Waterbirds	Marine Fish
Atlantic walrus <i>High Arctic; Central / Low Arctic</i> (<i>Odobenus rosmarus rosmarus</i>)	Harlequin duck (<i>Histrionicus histrionicus</i>) ^a	Atlantic wolffish (<i>Anarhichas lupus</i>)
Beluga whale <i>Eastern High Arctic; Baffin Bay; Cumberland Sound</i> (<i>Delphinapterus leucas</i>)	Ivory gull (<i>Pagophila eburnea</i>)	Northern wolffish (<i>Anarhichas denticulatus</i>)
Bowhead whale <i>Eastern Canada – West Greenland</i> (<i>Balaena mysticetus</i>)	Ross's gull (<i>Rhodostethia rosea</i>) ^a	Spotted wolffish (<i>Anarhichas minor</i>)
Fin whale <i>Atlantic population</i> (<i>Balaenoptera physalus</i>)	Red knot, <i>rufa</i> subspecies (<i>Calidris canutus rufa</i>)	Roundnose grenadier (<i>Coryphaenoides rupestris</i>)
Killer whale <i>Northwest Atlantic – Eastern Arctic population</i> (<i>Orcinus orca</i>)	Red knot, <i>islandica</i> subspecies (<i>Calidris canutus islandica</i>)	Thorny skate (<i>Amblyraja radiata</i>)
Narwhal <i>Baffin Bay</i> (<i>Monodon monoceros</i>)	Buff-breasted sandpiper (<i>Calidris subruficollis</i>)	
Northern bottlenose whale <i>Davis Strait – Baffin Bay – Labrador Sea population</i> (<i>Monodon Monoceros</i>)	Red-necked phalarope (<i>Phalaropus lobatus</i>)	
Polar bear (<i>Ursus maritimus</i>)		
Ringed seal (<i>Phoca hispida</i>) ^b		
Harbour porpoise <i>Northwest Atlantic</i> (<i>Phocoena phocoena</i>) ^c		
<p>Notes: Changes made to the table prepared by Nunami Stantec to highlight species in the Area of Focus as follows:</p> <p>a) Identified through parties' comments as missing in the <i>Environmental Setting and Potential Effects Report</i>.</p> <p>b) Discussed in the <i>Environmental Setting and Potential Effects Report</i> but not included in the table in the <i>Report</i>.</p> <p>c) Identified through the QIA's Inuit Qaujimaqatuqangit studies.</p>		

Additional information on the status level of species is available in the following sections of the *Environmental Setting and Potential Effects Report*: 4.5 (Fish and Fish Habitat), 4.6 (Waterbirds), and 4.7 (Marine Mammals).

Views of Interested Parties

Within their public written comments, the Government of Nunavut (GN), Environment and Climate Change Canada (ECCC), and Fisheries and Oceans Canada (DFO) noted that there was limited baseline available in the *Environmental Setting and Potential Effects Report* for marine species, whether they were listed under the *Species at Risk Act* (SARA) or were species discussed

¹⁵³ *Species at Risk Act* and / or Committee on the Status of Endangered Wildlife in Canada.

elsewhere in the report. ECCC and DFO observed that the information collected to date for the SEA did not appear to include the potential adverse effects of oil and gas development activities on each of the species listed and their critical habitat, or identify measures that could be taken to avoid or lessen those effects, or propose specific monitoring to confirm the assessment and/or ensure effectiveness of proposed measures. However, some of this information was included in other sections of the report and the reader is referred to [5.2.1.5 Waterbirds](#) (seabirds, coastal waterfowl and shorebirds) and [5.2.1.6 Marine Mammals](#). ECCC also emphasized that it was essential that proponents review the Species at Risk registry for the most up to date listing of species and to assess species at risk separately in impact assessments due to their conservation status. ECCC also recommended four (4) publications related to key marine habitat sites for migratory birds be reviewed for any future work to be conducted (see Volume 3, Appendix C: Recommended Documents).

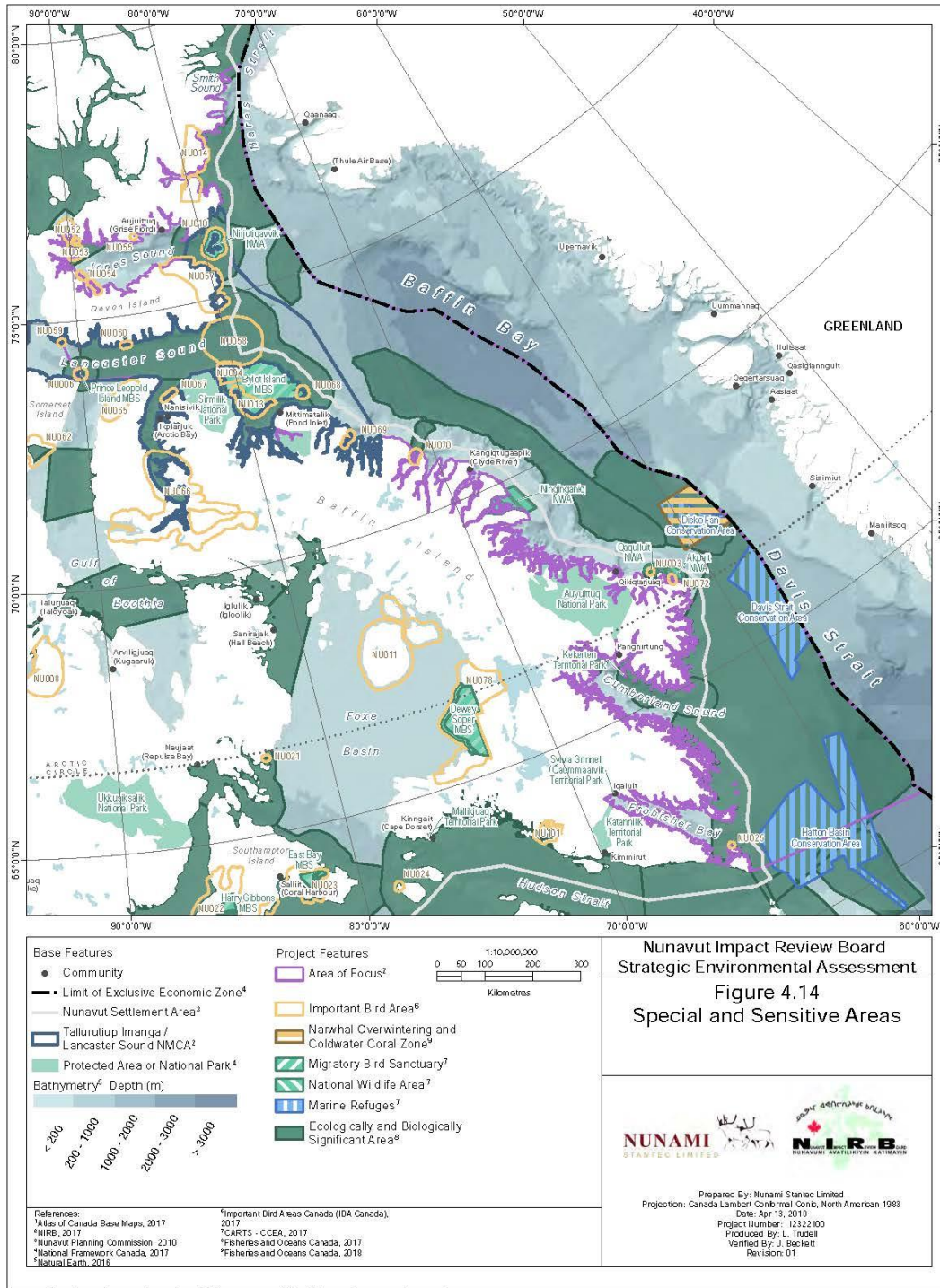
DFO further indicated that since impacts were expected in localized areas, sensitive or critical habitat should be identified and oil and gas activities should be limited, restricted, or prevented from occurring in these areas. Further, DFO recommended specific Marine Protected Areas should be identified in areas identified as extremely important to Species at Risk.

5.2.1.8. *Special and Sensitive Areas*

Background Information

The Area of Focus contains, or is near to, several conservation-related designated areas that have various levels of protection as identified in Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a) and further described below. Commercial or industrial activities such as mineral and hydrocarbon exploration and development, are prohibited by legislation from occurring within all National Parks, National Marine Conservation Areas, and National Wildlife Areas. Development activities are also typically not allowed within Territorial Parks, except for outfitting and/or guiding business. Activities that could harm migratory birds, or their nests and eggs are prohibited within Migratory Bird Sanctuaries. Marine Refuges established under the *Fisheries Act* do not allow human activities that are incompatible with the conservation of the ecological components of interest occurring within Marine Refuges. Mining or oil and gas activities are not specifically prohibited in Marine Refuges. There are no specific legal protections for Important Bird and Biodiversity Areas, and Environmentally and Biologically Significant Areas, that would prevent oil and gas development from being authorized in these areas.

Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)



Note: Park boundaries are incorrect as an older GIS layer was utilized by Nunami Stantec (2018a) in the development of the figure.

- 1) Ukkusiksalik National Park should include what used to be IOL RE-32/56H with the park boundaries.
- 2) Qausuittuq National Park should include Young and May Inlets within the park boundaries.
- 3) Sirmilik National Park should include Baillarge Bay within the park boundaries

The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 4.9: Areas of Concern or Importance (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

National Parks

Each National Park is part of a countrywide system of representative natural areas of Canadian significance and Parks Canada works to maintain or restore the ecological integrity of each of the parks. National Parks are administered federally under the *National Parks Act* and, as directed by the Nunavut Agreement and relevant Inuit Impact and Benefit Agreements, National Parks in the Nunavut Area are cooperatively managed. There are three (3) national parks located within the Area of Focus: Auyuittuq, Sirmilik, and Quttinirpaaq, national parks (see Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)).

Auyuittuq National Park is located on Baffin Island's Cumberland Peninsula and the landscape is 85% rock and ice, and the area is dominated by steep and rugged mountains, with vast glaciers and powerful rivers. Quttinirpaaq National Park covers the northern portion of Ellesmere Island and contains highly productive sedge grasslands, which support many northern species including the endangered Peary caribou. Finally, Sirmilik National Park is located at the northwest end of Baffin Island and represents the Northeastern Arctic Lowlands natural region and parts of the Lancaster Sound marine region.

National Marine Conservation Area

National Marine Conservation Areas (NMCA) are established and managed by Parks Canada under the *Canada National Marine Conservation Areas Act* to protect and conserve representative marine areas for the benefit, education and enjoyment of all people. The purpose of NMCAs is to achieve ecological sustainability in these areas, create enjoyable experiences for visitors, promote awareness and understanding among Canadians, and provide benefits for Indigenous peoples and coastal communities. Sustainable commercial uses such as fishing and shipping are permitted in NMCAs, while mineral and hydrocarbon exploration and development are prohibited. While outside the Development Scenario Area, the Tallurutiup Imangua (Lancaster Sound) NMCA protects one of the most ecologically significant areas in the Arctic. Natural marine processes such as currents, tides, and upwelling, result in polynyas and high productivity in Lancaster Sound, and the area provides critical habitat for seabirds, polar bear, bowhead whale, narwhal, beluga whale, and ringed seals (see Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)).

National Wildlife Areas

National Wildlife Areas (NWA) are created and managed by Environment and Climate Change Canada (ECCC) under the *Wildlife Area Regulations* and the *Canada Wildlife Act* for wildlife conservation, research, and interpretation. Under the *Wildlife Area Regulations* ECCC has the ability to authorize some activities within a NWA as long as these are consistent with the management plan goals for the NWA and the activities would not interfere with the conservation of wildlife. There are four (4) NWAs that occur in or near the Area of Focus: Ninginganiq, Akpait, Qaulluit, and Nirjutiqarvik NWAs (see Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)).

Ninginganiq NWA supports the largest known concentrations of bowhead whales in Canada and provides habitat for ringed seals, narwhals, polar bears, and various seabirds. Akpait NWA supports one of the largest thick-billed murre colonies in Canada and provides breeding sites for northern fulmars, black-legged kittiwakes, glaucous gulls, and black guillemots, and provides habitat for marine mammals, such as polar bears, walrus, and several seal species. Qaulluit NWA (also called Cape Searle) supports large numbers of seabirds including northern fulmars, black guillemots, glaucous gulls, and Iceland gulls, and is important area for marine mammals such as walrus and ringed seals.

Lastly, Nirjutiqarvik NWA is located off the southern tip of Ellesmere Island and includes Coburg Island, Princess Charlotte Monument, and the surrounding marine waters within a 10-kilometre radius of a recurrent polynya. Nirjutiqarvik supports large numbers of seabirds, including thick-billed murre and black-legged kittiwakes. The NWA is one of the few known Atlantic puffin breeding sites in the Arctic as well as an important feeding area for a variety of marine mammals including polar bears, walrus, belugas, narwhal, and both ringed and bearded seals.

Territorial Parks

Territorial Parks are established in Nunavut under the Umbrella Inuit Impact and Benefit Agreement for Territorial Parks by Nunavut Parks. Nunavut Territorial Parks are selected to protect significant areas identified by, and with, Nunavummiut as areas to escape, places for reflection, places of power, and places that celebrate Inuit culture and natural heritage. The Government of Nunavut manages activities within the park boundaries. There are eight (8) territorial parks within the Qikiqtani region, which are located in or near the Area of Focus: Katannilik, Kekerten, Qammaarviit, Sylvia Grinnell, Pisuktinu Tunngavik, Tamaarvik, Taqaiqsirvik, and Tupirvik (see Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)).

Katannilik Territorial Park stretches across Baffin Island's Meta Incognita Peninsula from Frobisher Bay to the Hudson Strait and encompasses the Soper River, a Canadian Heritage River which runs through the park. The park supports other wildlife such as caribou, Arctic fox, Arctic hare, wolves, lemmings and multiple species of birds, and is a prime hunting ground for Inuit. Kekerten Territorial Park is located on Kekerten Island and is a place of national historic importance as it was established to preserve the historic remains from 19th and 20th century whaling activities. The Kekerten Territorial Park is also known as a good place for observing marine mammals and birds.

Located near Iqaluit, Qammaarviit and Sylvia Grinnell Territorial Parks were created to preserve archeological sites of the Thule, and other artifacts from the older Dorset culture, and many bird species have since been recorded in each. The remaining four (4) Territorial Parks (Pisuktinu Tunngavik, Tamaarvik, Taqaiqsirvik, and Tupirvik), which are located within or near the Area of Focus, are campgrounds located within local Inuit communities.

Migratory Bird Sanctuaries

Migratory Bird Sanctuaries (MBS) are selected and managed by Canadian Wildlife Service under the *Migratory Birds Convention Act* and are intended to provide safe refuge for migratory birds in both the terrestrial and marine environment. MBS are managed through the *Migratory Bird*

Sanctuary Regulations and Environment and Climate Change Canada's protected areas permitting policy. There are two (2) Migratory Bird Sanctuaries (MBS) that occur in or near the Area of Focus: Bylot Island MBS and Prince Leopold Island MBS (see Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)).

Bylot Island MBS is located off northeastern Baffin Island and protects the nesting grounds of thick-billed murre, black-legged kittiwake, and snow geese; many other terrestrial and marine species have also been found in and around the Bylot Island MBS. Prince Leopold Island MBS is in Lancaster Sound and provides ideal nesting habitat for thousands of seabirds due to the sheer cliffs. It supports large numbers of nesting thick-billed murre, northern fulmar, black-legged kittiwake, and black guillemot. A variety of marine mammals are also present in the area, including beluga, bowhead whale, narwhal, walrus, ringed seal, bearded seal, and polar bear.

Marine Refuges (including Conservation Areas)

Marine Refuges (which are different than Marine Protected Areas) are established by Fisheries and Oceans Canada under the *Fisheries Act* to help protect important species and their habitats, including unique and significant aggregations of coral and sponges. Marine Refuges can be established through either a condition of a licence, or a variation order, and all bottom-contact fishing activities and human activities that are incompatible with the conservation of the ecological components of interest in the area are prohibited. There are three (3) marine refuges in or near the Area of Focus: the Davis Strait, Disko Fan, and Hatton Basin Conservation Areas (see Figure 23: Special and Sensitive Areas (Source: Nunami Stantec, 2018a)).

Davis Strait Conservation Area is located within the Hatton Basin-Labrador Sea-Davis Strait Ecologically and Biologically Significant Area (EBSA). This conservation area is intended to protect significant concentrations of sponges and cold-water corals, including large gorgonians, small gorgonians, and sea pens. The Hatton Basin Conservation Area also overlaps with the Hatton Basin/Labrador Sea/Davis Strait EBSA, and the Outer Shelf Saglek Bank EBSA. Like the Davis Strait Conservation Area, the marine refuge was established to protect significant concentrations of small gorgonians, large gorgonians, and sponges, as well as non-aggregating species such as black corals (*Antipatharia*), Scleractinia cup corals, and hydrocorals.

Disko Fan Conservation Area was established to protect significant concentrations of cold-water corals and to minimize the potential for impacts on food sources used by narwhals in the winter. There are significant concentrations of large gorgonians, including large tracts of globally unique, high-density bamboo corals (*Keratoisis* sp.) found within its borders. Along with the Disko Fan Conservation area, a narwhal Overwintering and Coldwater Coral Zone was established to reduce impacts on the winter food source and overwintering habitat for narwhal, and to conserve cold-water coral concentrations. This zone is currently closed to the Greenland halibut fishery, but fisheries for northern shrimp operate within the closure area.

Important Bird and Biodiversity Areas

Important Bird and Biodiversity Areas (IBA) are identified conservation areas that are discrete sites which support specific groups of birds: threatened birds, large groups of birds, and birds restricted by range or by habitat. IBAs are not legally protected in their own right; however, in

Canada they often overlap with other national, provincial, and local conservation designations. There are twelve (12) IBAs located within the Area of Focus:

- Inglefield Mountains, Southeastern Ellesmere Island (NU014)
- Cambridge Point, Coburg Island (NU010)
- Eastern Devon Island Nunataks, Eastern Devon Island (NU057)
- Hobhouse Inlet, Devon Island (NU060)
- Lancaster Sound Polynya, Nanisivik (NU058)
- Cape Hay, Bylot Island (NU004, NU013)
- Cape Graham Moore, Bylot Island (NU068)
- Buchan Gulf, Eastern Baffin Island (NU069)
- Scott Inlet, Eastern Baffin Island (NU070)
- Cape Searle, Eastern Baffin Island (NU003)
- Reid Bay, Eastern Baffin Island (NU072)
- Hantzsch Island, Resolution Island Group (NU025)

Environmentally and Biologically Significant Areas

Environmentally and Biologically Significant Areas (EBSA) are areas within Canada's oceans that have been identified through formal scientific assessments as having special biological or ecological significance as compared to the surrounding area identified by Fisheries and Oceans Canada. An EBSA is a tool to highlight an area that has particularly high ecological or biological significance and assists with planning projects in Canada's oceans. There are 21 EBSA's identified in the Area of Focus:

- North Water Polynya
- Eastern Jones Sound
- Northern Baffin Bay
- Cardigan Strait/Hell Gate
- Lancaster Sound
- Prince Leopold Island
- Admiralty Inlet
- Eclipse Sound/Navy Board Inlet
- Eastern Baffin Island Coastline
- Baffin Bay Shelf Break
- Scott Inlet
- Isabella Bay
- Southern Baffin Bay
- Cape Searle
- Hatton Basin-Labrador Sea-Davis Strait
- Eastern Cumberland Sound
- Clearwater Fiord
- Cunningham Inlet
- Eastern Hudson Strait
- Ungava Bay
- Wellington Channel

Views of Interested Parties

Within its final written submission, the Government of Nunavut (GN) noted that the Area of Focus has many sensitive habitats and conservation areas for both terrestrial and marine species. Environment and Climate Change Canada (ECCC, 2019) and Fisheries and Oceans Canada (DFO, 2018b) observed that not all areas were correctly identified, and recommended publications be reviewed for any future work conducted (see Volume 3, Appendix C: Recommended Documents). In addition, Oceans North Canada noted in its final written submission that the *Environmental*

Setting Potential Effects Report did not identify any additional areas that may require conservation management in the future (e.g., narwhal overwintering habitat, shelf break at confluence of Davis Strait). The GN recommended that information and maps of sensitive habitats, including where these habitats are located in the Area of Focus, should be available online and layered so proponents and decision makers can look at the region and easily see the location of sensitive areas. These maps should also be updated regularly. The GN further recommended that additional research should be undertaken to understand the potential impacts and risks to sensitive areas in the Area of Focus, including polynyas and areas with ice cover. This research should indicate how these areas are expected to change over time with oil and gas exploration and development activities, and under different climate change conditions/models.

DFO recommended in its public written comments that sensitive or (critical) habitat for Species at Risk should be identified, and that oil and gas activities should be limited, restricted, or prevented from occurring in these areas. DFO also indicated that the establishment of Marine Protected Areas may be required to protect areas that are extremely important to species at risk. DFO also noted that Disko Fan Conservation Area (formerly known as narwhal Overwintering and Coldwater Coral Zone) is comprised of three (3) fishing closures, and where these closures overlap the area is considered to be a Marine Refuge that contributes to Canada's Marine Conservation Targets.

Parks Canada (PC) commented in its final written submission that, in general, its major concern was related to possible impacts of hydrocarbon-related activities operating in close proximity to the boundary of Tallurutiup Imanga (Lancaster Sound) National Marine Conservation Area (NMCA). PC noted its preference that any exploration or extractive activities in these adjacent areas be prohibited. Further, any risks of impact from potential oil and gas projects around the Tallurutiup Imanga NMCA (such as spill impacts) should be assessed as high risk and emergency response planning should reflect this. Further discussion on the potential for effects from oil spill related accidents on the marine environment generally, including special and sensitive areas, are included in Volume 3, Chapter 8: Accidents and Malfunction. During the Final Public Meeting, the World Wildlife Fund (WWF) asked PC whether concerns were expressed by communities in the region about past seismic and oil and gas exploration activities, and whether these concerns contributed to the Tallurutiup Imanga area becoming a national marine conservation area. In response, PC indicated that the area had been an area of interest for many years because it is a special area and communities have expressed interest generally (irrespective of oil and gas developments) in the area's protection.¹⁵⁴

PC also noted that the figures within the Nunami Stantec reports (specifically Figure 2.1: Spatial Boundaries of the Strategic Environmental Assessment in Nunami Stantec 2018a) used an older GIS layer and several of the park boundaries are not quite correct and required correction. Specifically, PC noted that the Ukkusiksalik National Park layer incorrectly excludes what used to be IOL RE-32/56H from the park area; Qausuittuq National Park is incorrectly labelled as Eqausuittuq and did not include Young and May Inlets within the park boundaries; and Sirmilik National Park did not include Baillarge Bay portion within the park boundaries. PC recommended

¹⁵⁴ Exchange between M. Brooks, World Wildlife Fund and J. Chisholm, Parks Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, pp. 579-580, lines 17-21 and 24-26, 1-11.

that the most current shapefiles for these parks should be used and PC made these shapefiles available.

Arctic Fisheries Alliance (AFA), Oceans North, and WWF remarked in their respective final written submissions that oil and gas operations for Baffin Bay and Davis Strait would generate concern, as there are multiple ecological and biological significant areas present in the region. All three (3) parties emphasized the ecological significance of Baffin Bay and Davis Strait for the Arctic marine environment. These parties indicated that there are many slow-growing, long-living species in Hatton Basin Conservation Area, the Disko Fan Conservation Area and Davis Strait Conservation Area, with Hatton Basin and Disko Fan identified as highly biologically productive areas that are important to marine mammals, sea birds, and fish.

These parties indicated that the potential impacts on these marine refuges from oil and gas exploration could also result in these areas being removed from Canada's Marine Conservation Targets, undermining the conservation initiatives of the commercial fishing industry in the region. For example, the AFA negotiated with DFO and environmental non-governmental agencies to establish the areas identified in the region as closed to fisheries. From AFA's perspective, the oil and gas industry poses at least a comparable risk to these Significant Benthic Areas as commercial harvesting, and therefore, AFA would expect that oil and gas development activities should also be excluded from operating near these conservation areas.

WWF provided figures in its final written submission that identified species diversity "hot spots" within Baffin Bay and Davis Strait for marine mammal usage, sea bird usage, and polar bear usage. WWF also recommended that offshore oil and gas activities in Baffin Bay and Davis Strait must avoid areas of heightened ecological significance. WWF further recommended that no drilling activities or seismic testing should occur in any of these 'red zone' species diversity areas or the EBSA areas.

Similar to WWF, Oceans North recommended that consideration should be given to measures to ensure the habitat protections required for the Hatton Basin Conservation Area, the Disko Fan Conservation Area and Davis Strait Conservation Area remain in place, including any protections from oil and gas development. Oceans North also noted that jurisdictional borders do not always coincide with environmental ecoregions and recommended that the Labrador Shelf SEA be considered in decision-making and planning for future oil and gas activities in Baffin Bay and Davis Strait. Oceans North further recommended that the following three (3) processes be undertaken prior to the completion of this SEA:

1. The Pikialasoruaq Commission's conservation planning for the *Pikialasoruaq* (North Water Polynya);
2. Development of the Nunavut Land Use Plan by the Nunavut Planning Commission; and
3. The Dec 20, 2016 United States-Canada Joint Arctic Leaders' Statement commitment to work with northern partners to co-develop the scope and governance framework for a science-based, life-cycle impact assessment on Arctic oil and gas.

Following DFO's presentation at the Final Public Meeting, the Qikiqtani Inuit Association requested that DFO provide more information on the importance of the wintering areas (e.g.,

polynyas), including what might be found there, and what studies have been completed to date, recognizing that this was one of the gaps identified.¹⁵⁵ DFO noted that the designation of a marine protected area or a marine refuge area is accomplished through DFO's fisheries management program and that additional information can be provided about each of the ecologically sensitive areas.¹⁵⁶ The WWF requested clarification from DFO whether oil and gas activities should avoid ecologically and biologically sensitive areas (EBSAs) as these areas are selected as EBSAs because the following characteristics have been identified in the area "...vulnerability, fragility, sensitivity, and slow recovery."¹⁵⁷ In response, DFO noted that these areas do not have legal standing like a marine refuge noting that:

*The ecologically and biologically sensitive areas are -- it's a tool to call attention to areas that have a particularly high ecological or biological significance to facilitate provision of a greater than usual degree of risk aversion in the -- in the management of activities in those areas. They don't have a legal standing like a marine refuge or a marine protected area, but it allows review of any activities going on in those areas a higher degree of scrutiny...it would probably be in the best interest of anybody looking to explore within those areas to avoid those areas, but there is no legal protection that says no...*¹⁵⁸

A Community Representative from Iqaluit noted concern with respect to marine species found within Baffin Bay and Davis Strait stressing that there are several sanctuaries and fishery hatcheries.¹⁵⁹

A Community Representative from Pangnirtung noted concern that activities are currently occurring in no-go zones and stressed that these areas are to protect wildlife habitats and that activities should be avoided within these areas.¹⁶⁰

A Community Representative from Resolute noted that the information on sensitive areas may need to be updated, as recently there seem to be more marine wildlife located near Grise Fiord.¹⁶¹

During the closing remarks at the Final Public Meeting, a Community Representative from Pangnirtung noted the importance of parks and stated:

When I was negotiating during parks, as to what we want to see in our parks -- and we totally believed that we could accomplish anything. We didn't want to see -- we

¹⁵⁵ S. Lonsdale, Qikiqtani Inuit Association, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 400-401, lines 17-26 and 1-3.

¹⁵⁶ A. Doherty, Fisheries and Oceans Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 401, lines 6-21.

¹⁵⁷ M. Brooks, World Wildlife Fund, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp.406-407, lines 20-26 and 1-10.

¹⁵⁸ A. Doherty, Fisheries and Oceans Canada, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 407, lines 13-25.

¹⁵⁹ B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, p. 93, lines 1-11.

¹⁶⁰ H. Oshutapik, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 351, lines 2-20.

¹⁶¹ J. Amagoalik, Resolute, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 725, lines 23-26.

*didn't want to see people polluting our parks. We need to make -- ensure that our parks are pristine. We are part of the land. And I think we need to maybe be a role model for the rest of our country to -- that we are one of the good stewards of keeping our land clean. That is going to be there, and there's going to changes. We are going to see changes. We're going to see changes in the people sitting on the Nunavut Impact Review Board. And, again, we are part of the land, and we do not want to be affected by pollutants.*¹⁶²

5.2.1.9. *Areas of Concern or Importance*

Background Information

The following is a summary of the *Environmental Setting and Potential Effects Report* – Section 4.9: Areas of Concern or Importance (Nunami Stantec, 2018a). Please refer to this section and report for additional information. The information was identified through Inuit Qaujimaningit and Inuit Qaujimaningit shared by Inuit knowledge holders, information provided from academia, non-governmental organizations, local communities, and commercial fish harvesters. This Chapter also takes into account in [5.3.1.8 Traditional Activity & Knowledge and Community Knowledge](#) of this report.

Within the Area of Focus, traditional use areas include coastal shorelines extending to the floe edge, with usages including harvesting, habitation, and travelling for cultural and spiritual purposes. Any alteration to coastlines, sea ice, or floe edge may affect these species, as well as the ability of communities to harvest and consume many marine species. During discussions at the SEA Public Scoping Sessions, Inuit participants expressed concern about effects to sea ice and harvested species as a result of previous (historic) oil and gas activities. Participants also indicated that additional baseline studies should be conducted prior to any further oil and gas activities and that these studies should include consideration of Inuit Qaujimajatuqangit and Inuit Qaujimaningit.

North Water Polynya–Pikialasorsuaq

In 2017, after consultation with local communities, the Pikialasorsuaq Commission proposed that the North Water polynya be protected and that a larger management zone associated with the polynya be defined, as the polynya affects a larger area and is depended on for sustenance, livelihoods, culture, health and well-being, and noting the importance of the travel routes used to access the polynya and the presence of historical special sites like food caches along the travel routes. For additional discussions see [5.3.1.8 Traditional Activity & Knowledge and Community Knowledge](#).

Areas of Academic Interest

The Marine Expert Working Group of the Circumpolar Biodiversity Monitoring Program has identified Baffin Bay and Davis Strait as an Arctic Marine Area designated for biodiversity monitoring by the biodiversity working group of the Arctic Council.

¹⁶² H. Oshutapik, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 22, 2019, p. 894, lines 4-18.

Views of Interested Parties

In its final written submission, Oceans North Canada noted that no consideration was given in the *Environmental Setting and Potential Effects Report* to the potential for the development of new conservations areas in Baffin Bay and Davis Strait. Accordingly, it recommended that consideration be given to the establishment of new conservations as required to protect areas of concern and importance.

5.2.2 Views of the Board

The Board notes that there are identified gaps in available information on the biological environment as highlighted above that should be addressed prior to any decisions to lift the current moratorium on offshore oil and gas activity and/or should be addressed as applicable by any project-specific assessments. Each of these gaps are discussed further below.

With so many gaps in the existing environment, the Board finds it difficult to plan for or make recommendations related to offshore oil and gas activities. Pursuant to the rules of Inuit Qaujimagatuqangit, the Board would like to emphasize that an understanding of current conditions is needed before any decisions are made. This information should be collected from both Inuit Qaujimagatuqangit and Inuit Qaujimaningit and science, and should be specific to communities, regions, and projects/initiatives. Communities must be involved in both the collection and analysis of information.

The Board would also like to emphasize the importance of planning in respect of the marine environment as is done for the terrestrial environment. The marine environment comprises an essential life source for Inuit, with communities whose harvesting and culture is dependent on healthy populations of marine wildlife remaining available. Protection of areas that are important to marine species for survival is essential to maintaining a healthy ecosystem that can continue to support communities. To change one ecosystem pathway will eventually affect the whole of the food web. It is important to leave the environment for the future generations to enjoy what Inuit today have grown up with, not only for piece of mind but to maintain culture and the local food security.

The Board agrees with the information presented by parties indicating the size and diversity of the Area of Focus. The Board emphasizes that both the similarities and variability throughout the region should be highlighted when considering the information and when collecting new information to address data gaps and assist decision-making moving forward.

5.2.2.1 Coast and Shoreline Environment

As noted in [5.1.1.8 Coastal Landforms](#), the Board agrees with parties that additional information is required on the sensitivity of coastal environments in the Area of Focus. This habitat sensitivity information could be used to support future development decisions and the understanding of potential effects of an oil spill. Recommendations related to coast and shoreline environments can be found in [5.1.1.8 Coastal Landforms](#). The current lack of available information in this area makes effects predictions and decision-making more difficult. The Board emphasises the

importance of understanding the existing environment and encourages the consideration of this information when planning for project specific requirements, if the moratorium is lifted in future.

5.2.2.2. *Plankton*

The Board acknowledges the gaps identified within *Environmental Setting and Potential Effects Report* and recognizes that further research is required on prey abundance and distribution (e.g., of plankton and fishes) to understand the current status of and potential impacts to important waterbird populations, marine mammals and sensitive habitats. Marine plankton are key elements of the marine ecosystems as they serve as the foundation of marine food webs. A better understanding of the current marine plankton diversity and biomass in both Baffin Bay and Davis Strait is required to characterize and reduce the risk from oil and gas exploration and production activities. The Board encourages government, industry, and researchers to continue to work together to improve the understanding of the health of the Arctic marine environment and the potential impacts of climate change and pollution, and encourages the consideration of this information when planning for project specific requirements, if the moratorium is lifted in future.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to plankton and benthic flora and fauna, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address irrespective of the current moratorium:

- Conduct research in the Area of Focus to improve understanding of:
 - marine plankton, including abundance, diversity and biomass; and
 - benthic flora and fauna, including their respective biologies and ecologies (# 24).

5.2.2.3. *Benthic Flora and Fauna*

Like Fisheries and Oceans Canada (DFO) and Oceans North, the Board acknowledges the lack of information currently available related to corals, sponges, and sea pens and recognizes that a better understanding of their biology and/or ecology is necessary to determine the potential for impacts related to oil and gas activities. Further, the Board recognizes DFO's comments during the Final Public Meeting that studies are currently being conducted by the agency to better understand the benthic communities in the Arctic Ocean as this is a largely unstudied area, and also that these studies will be ongoing for several years. As above, the current lack of available information in this area makes effects predictions and decision-making more difficult. The Board emphasises the importance of understanding the existing environment and encourages the consideration of this information when planning for project specific requirements, if the moratorium is lifted in future

For Board recommendations addressing the need for additional baseline research related to benthic flora and fauna see [5.2.1.2 Plankton](#).

5.2.2.4. *Fish and Fish Habitat*

As noted in [5.2.1.4 Fish and Fish Habitat](#) and by commenting parties, the Board recognizes that sampling effort in the Canadian Arctic has not been sufficient to allow for a precise assessment of fish diversity and that there is a need to develop systematic surveys moving forward.

The Board also acknowledges Fisheries and Oceans Canada's (DFO) concern that linkages of the focal fish in the Area of Focus to higher levels in the trophic system need to be considered to fully appreciate the potential consequences of development activities on species or habitats of interest and how impacts are transmitted along the ecosystem pathways. Effects at one (1) trophic level in an ecosystem, for example, can substantively impact other trophic levels. Better recognition of this is required overall and in specific detail for key 'priority' taxa. As acknowledged by DFO, habitat information provided for the focal fish species in the Area of Focus was very general and the specifics on habitats used by different fish and potential consequences of hydrocarbon development need further development. This greater level of detail in potential causal linkages and pathways of effects is necessary to effectively evaluate possible effects from development and weigh the risks appropriately. The current lack of available information in this area makes effects predictions and decision-making more difficult. The Board emphasises the importance of understanding the existing environment and encourages the consideration of this information when planning for project specific requirements, if the moratorium is lifted in future.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to fish and fish habitat, marine mammals, and waterbirds as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address irrespective of the current moratorium:

- Collect additional baseline data and undertake research in Baffin Bay and Davis Strait on:
 - fish and fish habitat (including spawning grounds, nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly to carry out their life processes);
 - waterbirds; and
 - marine mammals.

This research should be designed to improve the understanding of current status and potential for development activities to impact important populations and sensitive habitats. Research efforts should also include consideration for the effects of climate change and pollution and should focus on: population densities, distribution, abundance, and breeding success; monitoring of seasonal migration patterns and key habitat use; sensitive breeding and foraging habitat, including habitat used during winter conditions (e.g., polynyas); productivity; and prey

abundance and distribution, include connections between species and other trophic levels (e.g., connections between plankton, fish, water birds, and marine mammals) (#25).

5.2.2.5. *Waterbirds*

The Board acknowledges the gaps identified within *Environmental Setting and Potential Effects Report* and recognizes that waterbird distribution (i.e., migration patterns and seasonal distribution) and abundance, as well as sea ice biota in the Area of Focus (particularly in southeastern Baffin Bay) requires further investigation prior to the moratorium being lifted. To better understand the current status of, and potential impacts to, important waterbird populations and sensitive habitats, further research is needed on: waterbird population densities and breeding success, monitoring of seasonal waterbird migration patterns, sensitive waterbird breeding and foraging habitat, oceanographic data, productivity, and prey abundance and distribution (e.g., of plankton and fishes).

Further, the Board recognizes the lack of information on certain waterbird species as identified by commenting parties. This information would be needed to understand the existing environment and inform planning for project specific requirements and to assess potential effects of oil and gas developments, if allowed to proceed. Further, this information should also be used to inform decisions related to the moratorium.

For Board recommendations related to waterbirds addressing baseline research see [5.2.1.4 Fish and Fish Habitat](#).

5.2.2.6. *Marine Mammals*

In reviewing the information and predictions made within the *Environmental Setting and Potential Effects Report*, as well as input by interested parties, the Board finds there is limited information available on marine species in the Area of Focus. Addressing this lack of information and improving the understanding of prey and predator species abundance and specific habitats required to maintain healthy populations that can be harvested sustainably is of utmost importance. Further investigation into the distribution, abundance, migratory patterns, and key habitat availability and quality is needed for many marine species in the Area of Focus before there will be confidence in assessing the potential effects of development in these areas. This is particularly the case for ice-associated species that are considered the most vulnerable to loss of habitat through sea ice loss associated with climate change.

Improving available information on the presence and distribution of marine mammals in and near the Area of Focus is an important prerequisite for future planning and decision-making regarding potential offshore oil and gas activities in the region. The lack of information as identified by Nunami Stantec in the *Environmental Setting and Potential Effects Report* and by parties in this area makes effects predictions and decision-making difficult at present. The Board emphasises the importance of understanding the existing environment and encourages the consideration of this information when planning for project specific requirements, if the moratorium is lifted in future.

Like the Government of Nunavut and Environment and Climate Change Canada, the Board also acknowledges that there was insufficient information for the Area of Focus on marine wildlife, including available *Inuit Qaujimagajatuqangit*, community and scientific knowledge. Additional data (including distribution and migratory routes) is required to develop a baseline and support a comprehensive understanding of marine wildlife use of the Area of Focus. Further, the Board recognizes the lack of information on certain marine mammals as identified by commenting parties. This information is needed to understand the existing environment and inform planning for project-specific requirements for oil and gas development proposals, should the moratorium be lifted in future.

For Board recommendations related to marine mammals addressing baseline research see [5.2.1.4 Fish and Fish Habitat](#).

5.2.2.7. *Species at Risk*

As noted above, in reviewing the information and predictions made within the *Environmental Setting and Potential Effects Report*, as well as input by interested parties, the Board finds there is limited information available for marine species listed under the *Species at Risk Act* (SARA) as well as for other species discussed in the report. The Board reiterates that improving the understanding of wildlife and the environment including the specific habitats needed to maintain healthy populations is of utmost importance.

The NIRB further heard from numerous parties on the desire and need for ensuring that species are protected to maintain stable populations into the future irrespective of oil and gas development. The Board agrees with parties that prior to decisions being made on whether the moratorium on offshore oil and gas development should be lifted in the Area of Focus, additional information on SARA listed species is needed.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to species at risk, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address prior to lifting the current moratorium:

- Baseline data should be used to identify sensitive (or critical) habitat for Species at Risk for incorporation into marine planning for the Area of Focus (#37).

5.2.2.8. *Special and Sensitive Areas and Areas of Concern and Importance*

The Board supports an emphasis on protecting special and sensitive areas to ensure the enjoyment of these areas in the future and to protect the habitat that they provide for wildlife. While acknowledging the national and territorial parks, national marine conservation area, National Wildlife Areas, bird sanctuaries and marine refuges that have been established, but the Board notes

that there is still much that is not understood regarding the marine environment and there may be insufficient protection in place to ensure that the continued availability of these critical areas. The Board also notes that when identifying special and sensitive areas, it is essential that up-to-date data, including shapefiles are used with the correct boundaries of these areas accurately defined.

In reviewing the information and predictions made within the *Environmental Setting and Potential Effects Report*, as well as input by interested parties, the Board finds that there remains much to learn regarding special and sensitive areas and for areas of concern or importance. The NIRB also heard from numerous parties on the desire for ensuring that species are protected to ensure stable populations into the future irrespective of oil and gas development. The Board agrees with parties that prior to decisions being made on whether the current moratorium on offshore oil and gas development should be lifted for the Area of Focus, additional information on the marine environment is needed to comprehensively address these data gaps.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to special and sensitive areas and areas of concern and importance, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing impact modelling, mapping, and predictions; and baseline research:

Recommendations to address irrespective of the current moratorium:

- Reflecting up to date information, including additional baseline gathered under Recommendations #27 and #50, produce up-to-date online maps of sensitive habitats for the Area of Focus with layers of information for relevant species and factors considered to identify sensitive habitats (#69).

Recommendations to address prior to lifting the current moratorium:

- Conduct further research to assess:
 - the resiliency of sensitive areas; and
 - whether these areas would return to natural conditions following cessation of oil and gas development (#50).
- Identify sensitive/critical habitat for Species at Risk where oil and gas activities should be limited, restricted, or prevented from occurring and/or where establishment of Marine Protected Areas may be appropriate (#71).

5.3. HUMAN ENVIRONMENT

This section summarizes the existing conditions of the human environments for the Area of Focus in Baffin Bay and Davis Strait. This summary is based on the following information provided to the NIRB:

- Environmental Setting and Review of Potential Effects of Oil and Gas Activities Report, referred to as “*Environmental Setting and Potential Effects*” (Nunami Stantec, 2018a)

- Qikiqtaaluk Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut for the Baffin Bay and Davis Strait Marine Environment Report, referred to as “*Inuit Qaujimajatuqangit Report* (QIA, 2018a)
- Evaluating the Role of Marine-Based Harvesting in Food Security in the Eastern Arctic, referred to as “*Food Security Report*” (QIA, 2018a);
- Information gathered during the NIRB’s public engagement sessions; and
- Information provided by parties as applicable.

The following sections provide an overview of valued socio-economic components as identified in the SEA Final Scope List (NIRB, 2018; Appendix D). Unless indicated otherwise, the information, statistics, and monetary values provided are representative of the ten (10) potentially interested communities: Grise Fiord, Resolute, Arctic Bay, Pond Inlet, Clyde River, Qikiqtarjuaq, Pangnirtung, Iqaluit, Cape Dorset, and Kimmirut. Statistics and comparisons between the Qikiqtani region, Nunavut, and Canada as a whole are provided in the proceeding sections to give an understanding of the unique realities and issues within Nunavut, including the experiences of Nunavut Inuit.

5.3.1 *Background*

5.3.1.1. *Potentially Interested Communities and Population Demographics*

Background Information

The following summary is based on information provided in Section 5.1 of the Nunami Stantec *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a). This section can be referred to for additional details on population demographics, including population statistics and breakdown by gender, age, and migration.

The total population in the Qikiqtani region is approximately 19,000 people, with the majority being Inuit. Approximately 50% of Nunavut’s population resides in the region and the potentially interested communities are small and isolated. Like trends observed throughout Nunavut, the populations of most communities in the region are increasing; between 2011 and 2016 the region increased approximately 12.1%, from 16,939 to 18,988 people. However, these trends are not consistent throughout the communities, and according to Statistics Canada information, the populations of Kimmirut, Resolute, and Grise Fiord decreased between 2011 and 2016.

The population throughout the region is defined as “young and growing”; the median age in the Qikiqtani region is 26.3, which is below the Canadian average of 41.2 years. Migration rates were identified as being lower in Nunavut than in other areas of Canada, which was potentially attributed to the high percentage of Indigenous residents in Nunavut and their strong ties to their home communities. Figure 24: Fertility and Dependency Rates in Canada (Source: QIA, 2018a), provided in the *Food Security Report*, illustrates both the high fertility rates in Nunavut compared to the rest of Canada, as well as dependency rates, which the QIA noted could cause increased financial stress on those earning an income.

Identified Gaps

Gaps identified in the *Environmental Setting and Potential Effects Report* included: outdated statistics and differences in statistics between sources. For example, labour force statistics from the Government of Nunavut Bureau of Statistics were different from those reported by Statistics Canada.

5.3.1.2. *Economic Development and Opportunities*

Background Information

Nunami Stantec highlighted Nunavut's mixed reliance on wage-based and traditional economies. Greater detail on Nunavut's gross domestic product (GDP), consumer price index, main contributing industries, and sectors of importance to the territory and region, as well as overviews of the economies of the 10 potentially interested communities, is available in Section 5.2 – Economic Development Opportunities of the Nunami Stantec *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a).

The greatest contributors to Nunavut's GDP between 2012 and 2016 are, in descending order:

- *Public sector* (infrastructure, environment, justice, education, health and social services): 19.8% of the GDP in 2016, totalling approximately \$403 million;
- *Mining, quarrying, and oil and gas extraction*: 18.5% of the GDP in 2016, totalling approximately \$377.8 million; and
- *Construction*: 10.2% of the GDP in 2016, totalling approximately \$207.8 million.

Traditional Hunting and Harvesting

Hunting, fishing, and harvesting of other renewable resources has always been an important contributor to Nunavut's economy. Animals not only provide meat for food and fur, but skin and bones for clothing, tools, games, and art. A recent study estimated traditional harvesting in Nunavut – which includes polar bears, caribou, birds, and marine mammals – is currently worth approximately \$40 million annually. Economic values of seal and polar bear meat and products were also included, and commercial and recreational polar bear hunts result in approximately \$700,000 of annual revenue for Nunavut.

The value of hunting, harvesting, and fishing in the Qikiqtani region is not restricted to, or based solely on, monetary valuation. Traditional hunting and harvesting are also extremely important to food security, cultural transmission, and a sense of self for Inuit. While it is understood that from an Inuit worldview these components are intrinsically interconnected, for the purpose of the SEA and resulting report, background information on these topics are discussed further in Chapters 5.9.6: Well-being and Health of Coastal Communities and 5.9.8: Traditional Activity and Knowledge and Community Knowledge.

Commercial Fishing

Offshore commercial fisheries exist for Greenland halibut (often referred to as 'turbot') and shrimp in Baffin Bay, and onshore fisheries for Arctic char throughout the territory. There is also potential for expansion of existing offshore and inshore fisheries and development of new fisheries. Additional information is available in [5.3.1.10 Commercial harvesting](#).

Tourism

Tourism is becoming a more prominent industry for Nunavut as access for tourists becomes easier. According to one (1) study, tourists spent approximately \$37.88 million in Nunavut in 2015, excluding the cost of airfare and cruise ship passage. The tourism sector could further increase

and provide greater economic contributions to Nunavut as access through the Northwest Passage becomes easier with reducing summer ice cover.

Traditional Arts and Crafts

Arts and crafts production are an important part of the Nunavut economy and the GN has estimated that the sector contributes approximately \$33 million to the territory's economy annually and an estimated \$50 million in direct economic contributions. In 2010 it was estimated that approximately 3,000 Nunavut residents experience indirect or induced economic effects from traditional arts and crafts.

Views of Interested Parties

Within its public written comments, Fisheries and Oceans Canada discussed the lack of quantitative information on the economic sectors at the community level. Oceans North Canada noted in its final written submission that information on potential economic benefits from creating new conservations areas and other marine developments, including infrastructure supporting renewable resource development, was lacking.

5.3.1.3. *Employment*

Background Information

Nunami Stantec provided an overview of Canadian Census and GN employment characteristics and income, as well as local businesses in each of the 10 potentially interested communities using 2017 information provided by the GN. Additional information is available in Section 5.2 and 5.3 – Economic Development Opportunities of the Nunami Stantec *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a).

The Canadian Census for 2016 indicated that Nunavut's total unemployment rate was approximately 21.5 percent (%), significantly above the national unemployment rate of 7.7%. The unemployment rate in the Qikiqtani region was approximately 17.3% in 2016. Within the region, Clyde River had the highest unemployment rate (40.2%), while Iqaluit had the lowest unemployment rate (9.6%). The GN-Department of Family Services estimated that 60% of those employed in Nunavut work in the Public Sector, which consists of infrastructure, environment, justice, education, health, and social services. Private industry such as "manufacturing and utilities" and "natural resources, agriculture, and related products" had the lowest levels of employment at 1.3% and 1.8%, respectfully.

Iqaluit has the highest total and employment income in the Qikiqtani region and is the centre of commercial and government activity in the region. Comparatively, Qikiqtarjuaq, Clyde River, and Cape Dorset ranked the lowest in terms of total and employment income and Cape Dorset and Clyde River received the highest percentage of government transfers (21.6% each). The region also receives high levels of government social assistance; between 2005 and 2013 between 40 and 50% of recipients receiving social assistance in Nunavut resided in the Qikiqtani region.

Within the *Food Security Report*, the QIA indicated that high unemployment rates, combined with high dependency ratios, high costs of living and relatively low wages mean financial poverty in Inuit households is a central issue, stating as follows:

The Income Support Program in Nunavut exists to help those unable to access a minimum standard of living. In Nunavut, half of the population needs this help for at least a portion of the year, and almost 60 percent of the population live in public housing. Nearly 70 percent of Nunavut's children live in households rated as food insecure and 15 percent of children will experience at least one day in the year when they do not eat. In Nunavut, poverty is not a fringe or special interest issue. It is the issue (p. 25).

The individual economies of the 10 potentially interested communities differ and each has unique opportunities and circumstances. The following includes a high-level overview of key employment sectors for the 10 communities. As the capital city of Nunavut, Iqaluit has the largest and most diverse economy. Many territorial and federal offices are located in the city, which also has the territories only hospital, the largest campus of Nunavut Arctic College, the only planned deep-water port, and a hub for air travel. Tourism is a large part of the economy in Pangnirtung due to its proximity to Auyuittuq National Park and other parks. Nearby parks also bring tourists to communities such as Kimmirut, Qikiqtarjuaq, and Pond Inlet. Tourism is high in Cape Dorset, which has a thriving and world-renowned arts and crafts community, and arts and crafts are also important to the economies of Qikiqtarjuaq, Kimmirut, and other communities. Limited guide outfitting services are provided in many communities, and the commercial recreational polar bear hunt is important to Resolute and Grise Fiord. Resolute is also a research, transportation, and logistics hub and has an Arctic military training centre. Baffinland's Mary River Iron Ore Project employs residents from Arctic Bay, Pond Inlet, and Clyde River. There are commercial fishing operations in Pangnirtung and Qikiqtarjuaq. The presence of public service opportunities differs by community. People in all communities still participate in the traditional economy and rely on subsistence hunting and fishing.

5.3.1.4. *Contracting and Business Development*

Background Information

Nunami Stantec provided a high-level overview of current contracting and business opportunities in Section 5.4 of the Nunami Stantec *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Inuit and Nunavut businesses typically win contract work for major and minor construction projects, maintenance services, air charters, and purchase orders. The report further found that sole source contracts between \$25,000 and \$100,000 were primarily awarded to non-Inuit and non-Nunavut businesses and predominantly involved specialized service contracts. In addition to government contracts, other developments within the Qikiqtani region have also provided contracting opportunities. In 2016, the Baffinland Iron Mines Corporation awarded nine (9) contracts for its Mary River Iron Ore Project to Inuit-owned businesses and joint ventures. These contracts were worth approximately \$64.4 million; a total of \$431.9 million in contracts have been awarded to Inuit-owned businesses and joint ventures since the project began.

Identified Gaps

Gaps identified in the *Environmental Setting and Potential Effects Report* included difficulties acquiring publicly available business investment information, as well as information related to contracting and business development, at a community, or regional, level for Nunavut.

Views of Interested Parties

Within its public written comments, the Government of Nunavut noted that it agreed with the conclusion that a gap exists regarding available information on business development.

5.3.1.5. *Education and Training*

Background Information

Nunami Stantec highlighted education and training opportunities available in the 10 potentially interested communities and Nunavut as a whole. Additional information on educational attainment; educational requirements of in-demand occupations in Nunavut; early childhood education; and post-secondary education is available in Section 5.5 of the Nunami Stantec *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a).

While early childhood and post-secondary education are available in each of the 10 potentially interested communities, education levels are low across the Area of Focus. Compared to Nunavut as a whole, the Qikiqtani region has a much higher percentage of residents with a high school diploma, apprenticeship, trades certificate, and non-university certificates/diplomas, as well as a university certificate, diploma, or degree at the bachelor level or higher. High school diplomas are becoming a basic requirement for most wage-based employment opportunities. Many residents have been engaged in training and upgrading through the Nunavut Arctic College and through various specialized programs.

The Nunavut Arctic College has five (5) campuses across Nunavut, including Piquisilirivvik in Clyde River and the Nunavut Research Institute Science Campus in Iqaluit. The College also has Community Learning Centres in all 25 communities of Nunavut and offers a variety of trades, certificate and diploma, degree, and non-certificate/diploma programs. Although the GN has several initiatives to assist students with post-secondary education and training, financial and other barriers remain a challenge for many Nunavummiut wanting to undertake additional training and education opportunities.

5.3.1.6. *Well-being and Health of Coastal Communities*

Background Information

The importance of linkages between health, food security, and quality of life were consistently highlighted by participants throughout the SEA. Recognizing the significance of these important components, it was decided during the development and planning stages of the SEA that the QIA would undertake a food security study to inform the SEA. The following is a summary of

information provided within the Nunami Stantec *Environmental Setting and Potential Effects Report – Section 5.6: Health and Well-being* (Nunami Stantec, 2018a) and the QIA *Food Security Report* (QIA, 2018a). While the topics (and many sources, particularly as relates to statistics) are similar within both reports, the two (2) reports focus on different communities. The *Environmental Setting and Potential Effects Report* encompasses the 10 potentially interested communities of Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung. The QIA *Food Security Report* focused on the six (6) communities of Arctic Bay, Clyde River, Grise Fiord, Pangnirtung, Pond Inlet, and Qikiqtarjuaq. While differences in statistics and other details provided in these reports will be highlighted as required, the overall conclusions in the *Food Security Report* are considered representative of the broader SEA Area of Focus. The NIRB received many comments throughout the SEA and during the Final Public Meeting on the importance of food security and consumption of marine-based foods to communities; emphasis has been placed on this topic and space devoted to it accordingly within this report.

Nunami Stantec discussed results of a survey conducted by Statistics Canada and the Canadian Institute for Health Information between 2010 and 2014 that provided a general overview of health indicators of residents over 12 years of age in Nunavut compared to the rest of Canada. While Nunavummiut reported a higher overall sense of belonging to their local community and area and had less average perceived life stress than the Canadian average, the perceived health conditions of ‘very good’ or ‘excellent’ were much lower. The *Environmental Setting and Potential Effects Report* elaborated on the following social and economic indicators of perceived mental, physical, and psychological well-being: education and employment, housing, employment, and nutrition and nutritional requirements (country foods, market food, and food security).

Food Security/Insecurity

While it is understood that from an Inuit worldview these components are intrinsically interconnected, the NIRB’s Final SEA Scope (see Volume 3, Appendix D: Final SEA Scope List) identified baseline information (and associated effects assessment) related to food security as being associated with both ‘well-being and health of coastal communities’ and ‘traditional activity and knowledge and community knowledge.’ As the components of food security are so interrelated, the majority of the baseline information related to these components will be discussed in this chapter.

It was noted that the *Food Security Report* was developed to provide evidence of the contribution made by marine-based harvesting to food security to inform future decisions on how offshore oil and gas development should be managed:

... one must start with a basic understanding of food security and the role of marine-based harvesting in providing food to the residents of these communities. It is understood that the original inhabitants of the Study Area are reliant on this food source. The question is how reliant are they? Can this reliance be quantified? And, could monetary gains from industrial activity offset losses in local food production? The answers require that we think not only about the value of food being produced, but also its distribution. Inuit have a strong culture of sharing that revolves around food, and this sharing does not transcend into labour income to the same degree. Also, even if harvesting is marginal from a financial perspective, it

is a productive activity for hundreds of Inuit living in communities without many opportunities for employment (QIA, 2018a, p. 9).

It was further highlighted that food security is a function of inadequate income and not the high price of food. The following two (2) factors were identified as preventing rampant destitution in Nunavut:

- The almost universal approach to public housing that provides state-sponsored shelter to more than half of the population; and
- The subsistence economy – hunting and fishing for the purpose of providing food that would otherwise be unaffordable.

Market Food Costs

Food costs are much higher in Nunavut than in southern Canada and consuming country foods helps offset the cost of food purchased in stores. Both reports compared market food costs in Nunavut communities to the south and found that costs in Nunavut were significantly higher. From a comparison of 20 everyday store-bought items through the Nunavut Bureau of Statistics, it was noted that all 20 items would cost approximately \$144 in the QIA's six (6) selected communities, compared to \$77 by the average Canadian (QIA, 2018a). Despite this, it was identified that consumption of market foods is becoming more common, especially among the younger population.

The high prices do not tell the complete story of food insecurity. The bigger story involves family income levels and why, for too many Nunavummiut, food is unaffordable. Understanding why family incomes are so low is more complicated than looking at food prices, and require an investigation into economic, social, and historical factors including demographics, fertility rates, dependency ratio, employment growth, economic opportunities, non-market communities, minimum wage, and income inequality.

QIA, Food Security Report, p. 14

Country Foods

Hunting, harvesting, and sharing of traditional/country foods play an essential role in Nunavut society, and is both an important cultural and economic component. The QIA's *Food Security Report* devoted considerable effort in understanding the economic contribution of marine-based harvesting of fish, seal, and whale, and thus the remainder of this sub-section will focus primarily on information provided within the *Food Security Report*.

Within the *Environmental Setting and Potential Effects Report*, it was noted that rates of country food consumption vary according to a wide variety of factors, including age, gender, level of education, community size, and region. According to the Nunavut Food Security Coalition, the percentage of Inuit receiving daily energy from traditional foods dropped from 23% in 1999 to 16% in 2008; and that 80% of Inuit prefer a mix of store-bought and traditional food. According to one (1) study, women in Nunavut consume less country food than men, while children's diets had the lowest percentage of calories derived from country food sources. The *Food Security Report* identified that over 90% of Inuit in the Qikiqtani region consume country foods. It has been reported that traditional foods are more nutrient dense than store-bought foods with higher densities of protein, vitamins, minerals; higher omega fatty acid ratio; and lower densities of

carbohydrates, saturated fats, and sugar. Both reports indicated that limited participation in harvesting and traditional ways of living could potentially result in adverse changes in well-being.

The *Food Security Report* identified the following limitations to country food intake: hunters have less time and money, and as a group, their skills are suffering; environmental factors are affecting wildlife stocks and access to the land and sea ice; and expanding Inuit population and changing tastes and interests. These limitations and conclusions were presented in Figure 25: Food Insecurity Cycle (Source: QIA, 2018a) (developed for the *Food Security Report*).

Three (3) key questions raised in the *Food Security Report* were how much marine-based country food is produced annually, and what is the value and cost of production? Using results from the Nunavut Wildlife Harvesting Study and academic and government reports, the minimum, maximum, and average weights, as well as the edible rates, of Arctic char, ringed seal, narwhal, and beluga were identified for the six (6) communities – Arctic Bay, Clyde River, Grise Fiord, Pangnirtung, Pond Inlet, and Qikiqtarjuaq. The value of the marine-based harvest was considered a function of output, edible weight, and an assigned monetary value. The monetary value was assigned based on GN published food prices at local grocery stores and what foods a family could purchase if country food was not available. The *Report* further viewed the food harvested in terms of the portions of food it represents. It was calculated that the harvest volume represented 587,000 individual portions, which would be enough to provide every Inuit man, woman, and child in the six (6) communities with at least 100 portions per year. Portions were further calculated for households living below the low-income measures to marine-based country food as a way to address food security exclusively.

For the annual harvest, the substitute monetary value and total edible weight for the six (6) communities was calculated to be

- \$3.3 million (or \$580 of food per person each year) and
- 117,409 kilograms for a population of 5,700.

QIA, 2018a

The costs associated with harvesting were identified in the *Food Security Report* to include basic expenditures such as fuel and other supplies, maintenance and repairs to machinery, and depreciation of capital. It was noted that a comprehensive survey of production costs in the subsistence economy has not been conducted to date and without these expenditures it would not be possible to determine the net benefit of marine-based harvesting. As a result, the QIA conducted a harvest survey across 40 households (250 Inuit residents participated in the survey) in five (5) communities to collect data on country food collection, sharing, and costs. Available government subsidies were then measured against these costs. It was stated that the low sample sizes increased the margin of error and should not be the basis for policy design or decisions. Drawing from conclusions on whether the financial costs would outweigh the monetary value of marine-based harvesting for occasional, part time, and intensive hunters, it was hypothesized that overall, the ‘profitability’ of harvesting would likely be marginal for the traditional economy.

Food Security/Insecurity

There are multiple definitions of food security, and in the *Food Security Report* it was “noted that some have questioned the definitions and measures of food security [as] inadequate for the Arctic context ..., in part because they fail to give appropriate weight to country food and sharing”. Within the *Environmental Setting and Potential Effects Report*, food security was defined as “when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” Similar definitions were provided in the *Food Security Report*. It was noted that people who are food insecure are more susceptible to a range of physical and psychological issues, including, but not limited to: malnutrition, chronic health problems (e.g., obesity, anemia, cardiovascular disease, diabetes, stress, and child developmental issues), as well as mental health problems such as depression and social exclusion (QIA, 2018a).

There are limited, and differing, statistics provided related to socio-economic components in Nunavut and the Qikiqtani region, including those related to food security. Results from one (1) study in the *Environmental Setting and Potential Effects Report* found that Nunavut had the highest documented rate of food insecurity for any Indigenous population living in a developed country. A Statistics Canada study found that in 2012, 56% of Inuit in Nunavut lived in households that experienced food insecurity. A study in the *Food Security Report* found that 31.9% of Nunavut households indicated compromised food quality and/or quantity compared to 7.7% of Canadians as a whole. This study further found that lone-parent families, across Canada, experienced the highest incidence of food insecurity.

The subsistence economy remains a vital part of the survival of Inuit in the region—providing a substantial amount of food to a wide network of people throughout the community including those that need it most

QIA, 2018b, p. 44, *Food Security Report*

The QIA's food security study identified that harvesting and food sharing continues to be an important factor in offsetting high food costs and is a large part of the culture. According to surveys completed by the QIA, only one (1) household indicated they did not share country food while 60% of country food is shared beyond the harvesters' household, with many respondents indicating they gave country food to anyone in need. It was highlighted in the *Food Security Report* that:

Given the volume of food produced and the system of distribution, country food finds its way into the households that need it most. ... we have also learned that the sharing culture extends beyond food and includes sharing of tools and equipment needed to harvest. ... The culture of sharing means that equipment is used more, lowering its cost relative to its contribution, and allows more labour into the industry, resulting in more production (p. 35).

Climate change was also identified as a contributing factor affecting food security, such as unpredictable weather patterns affecting the ability to successfully hunt; changes in ice levels affecting the ability to access wildlife; longer travel times to hunt and increased cost; and potential effects on species movements and migrations. These all can potentially affect the ability of Inuit residents to successfully harvest country foods which, in turn, can affect mental and physical well-being. There also is a cost implication if Inuit residents have to purchase more packaged food.

Identified Gaps

Within the *Food Security Report*, it was noted that to identify potential mitigation measures for possible offshore oil and gas development, the cost of disrupting marine-based harvesting would need to be assessed. As stated previously, it was further identified that there is a lack of information available on the cost of marine based harvesting.

Within the *Environmental Setting and Potential Effects Report*, it was recognized that the information collected by Nunami Stantec on perceived health and well-being, such as Statistics Canada, academic journals, and government reports, may not provide an accurate representation of perceived health and well-being of a community or residents. It was recommended that

information from public information sessions would improve the understanding of perceived health and well-being that can be interpreted differently by region, community, and individuals.

Some of the limitations the QIA listed for its study were: lack of an actual project; lack of statistical evidence of the economic contribution of marine-based harvesting; outdated harvest information; and harvest production costs.

Views of Interested Parties

The QIA clarified during the Final Public Meeting that “...one of the goals of that research and those surveys was to show that you can't just replace country food with groceries bought in a grocery store. Country food is shared differently. It's shared wider within a community. And the importance of that country food is much greater than the importance of food from a grocery store.”¹⁶³ In response to a Board question during the Final Public Meeting, the QIA clarified that while its Food Security Study did not include financial compensation of clothing being made from harvested wildlife, this could be considered in future study.¹⁶⁴

Within its public written comments, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) identified further information relevant to the health status and health system challenges faced by Inuit, including those residing on Baffin Island, within the Inuit Tapiirit Kanatami (2014) report “Social Determinants of Inuit Health in Canada”. This report provided information on the challenges faced by Inuit and key positive efforts in addressing those challenges for the following social determinants of Inuit Health:

- Quality of early childhood development
- Culture and language
- Livelihoods
- Income distribution
- Housing
- Personal safety and security
- Education
- Food security
- Availability of health services
- Mental wellness
- The environment

During the Final Public Meeting, a Community Representative from Cape Dorset discussed food security and community:

But in our community that we utilize, my wife works in hospital, nursing station; and she -- young mother -- she teaches young mothers about healthy foods, food security, and are teaching about our traditional ways of supplying food and teaches them to our young woman that have children. And it's good. And when we have -- when we -- we get supply of food, we give them to the elders, and they cook the fish for the elders by the young women. They

¹⁶³ R. D’Orazio, Qikiqtani Inuit Association, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, pp. 123-124, lines 25-26 and 1-5.

¹⁶⁴ Exchange between K. Kaluraq, NIRB Board, and S. Lonsdale, Qikiqtani Inuit Association, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, pp. 355-356, lines 1-26 and 1-10.

*were cooked in our community for the young mothers. And this is our lifestyle from time immemorial when the Inuit were unaffected.*¹⁶⁵

5.3.1.7. *Community Infrastructure and Services*

Background Information

The information below is a summary of Section 5.7 of the *Environmental Setting and Potential Effects Report* (Nunami Stantec, 2018a). Please refer to this section and report for additional information on current infrastructure and services available in the Qikiqtani region, including road infrastructure, air transportation, marine infrastructure, waste management, potable water and wastewater, and electricity.

There are no roads connecting communities in Nunavut and travel by plane is the most common, and only, year-round mode of travel to all communities in Nunavut. Although each of the potentially affected communities has an airport, the smaller communities (such as Grise Fiord and Kimmirut) are limited in the numbers and size of aircraft they can accommodate. The Iqaluit Airport is an operational base for specialized activities such as medical evacuations, aerial surveillance, cold weather testing, and military servicing and refueling.

There are currently no deep-water ports in Nunavut, however, one is planned for Iqaluit and is expected to be operational in 2020. There is a dock facility at Nanisivik, which is being upgraded as a seasonal naval refuelling facility, a small craft harbour in Pangnirtung, and another small craft harbour planned for Pond Inlet. The limited marine infrastructure was noted to hinder the territory's ability to expand the economy and strengthen self-reliance and also leads to safety and efficiency issues. For example, community re-supply ships, unable to dock once they reach a community, must rely on barges to bring cargo to shore.

Nunami Stantec noted that the information provided in the Nunavut Housing Needs Survey conducted in 2009 and 2010, while valuable to provide a good overview of the housing situation in Nunavut and the Baffin Region, this information becoming out of date. Since the survey was conducted there has been additional economic activity and growth in Nunavut and it was suggested that more recent housing information in the Baffin Region may help provide a clearer picture of the current housing situation in the Baffin Region.

Views of Interested Parties

Throughout the SEA, there was a general consensus from parties that there is a lack of available infrastructure in the region, specifically transportation and communication infrastructure, to support possible offshore oil and gas activities. Discussions were predominantly related to emergency preparedness and response; for more information please see Volume 3, Chapter 8: Accidents and Malfunctions.

¹⁶⁵ M. Savearjuk Jaw, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 539, lines 1-12.

Within the *Uqausirisimajavut Report*, the Qikiqtani Inuit Association identified infrastructure needs within the region and recommended that prior to decisions to lift the Moratorium, a study be completed to determine what kind of infrastructure might be needed to serve the oil and gas industry, and if this infrastructure might also benefit Nunavut. The Government of Nunavut (GN) similarly recommended that an inventory of necessary infrastructure and capacity requirements be conducted to manage the oil and gas industry's implementation of mitigation measures prior to development.

5.3.1.8. *Traditional Activity & Knowledge and Community Knowledge*

Background Information

Connection to the land, its resources, and the environment is essential for the maintenance of traditional use and practices for Inuit in the Area of Focus. This section will discuss cultural values, land use, harvesting, changes to harvesting and limits or interference with existing uses, and food security (see also [5.3.1.6 Well-being and Health of Coastal Communities](#)). While descriptions of specific activities and the importance of cultural and traditional activities are elaborated on below, the resulting knowledge collected over time and shared with the NIRB has been provided throughout this report. Although information has been divided by topics for the purpose of the SEA, it needs to be understood that from an Inuit worldview, these components are intrinsically interconnected and even interdependent.

The following is a summary of information provided within the Nunami Stantec *Environmental Setting and Potential Effects Report – Section 5.8: Traditional Use and Practices* (Nunami Stantec, 2018a),¹⁶⁶ the *QIA Inuit Qaujimajatuqangit Report* (QIA, 2018b),¹⁶⁷ and information shared during the NIRB's Public Scoping Sessions and highlights:

Historically, the survival of the Inuit depended solely on the land and waters and the wildlife that they provide. The relationship between the Inuit and the land was one, like a newborn baby to her mother...It is evident that Inuit are still connected to their roots though. When the opportunity arises, Inuit leave their communities and live out on the land for a time

Aglukark n.d., as cited in Nunami Stantec, 2018b

- *Inuit Qaujimajatuqangit*, described by the NIRB as referring to traditional values, beliefs, and principles;
- *Inuit Qaujimajatuqangit*, described by the QIA as the ancient knowledge; the original knowledge. Knowledge older than present day Elders. It is the core on which Inuit culture was built;
- *Inuit Qaujimaningit*, described by the NIRB as encompassing Inuit traditional knowledge (and variations thereof) as well as Inuit epistemology as it relates to Inuit societal values and Inuit knowledge (both contemporary and traditional); and

¹⁶⁶ Encompasses Clyde River, Arctic Bay, Resolute, Grise Fiord, Pond Inlet, Qikiqtarjuaq, Cape Dorset, Kimmirut, Iqaluit, and Pangnirtung.

¹⁶⁷ Encompasses Arctic Bay, Clyde River, Grise Fiord, Pangnirtung, Pond Inlet, and Qikiqtarjuaq.

- *Inuit Qaujimajangit Iliqqusingitigut*, described by the QIA as what Inuit are familiar with in their culture. It is how Inuit see their culture, their customs, and their practices.

The QIA emphasizes that Inuit Qaujimajatuqangit cannot be separated from Inuit. Additional information on cultural values, traditional practices, hunting, historical and current techniques, resource use, ancestral sites and travel ways, cultural transmissions, and current trends affecting traditional use and/or practices in communities is provided in these reports. While all of the communities participate in cultural and traditional activities, particularly harvesting, factors such as the extent, reliance, travel routes, species harvested, and even timing, can differ by community.

Cultural Values

Inuit values and knowledge are intimately connected to their relationship with the environment. As noted within the QIA *Inuit Qaujimajatuqangit Report*:

Inuit values and worldviews arise from the Arctic environment. The Inuit culture is born from the need to survive in the cold, harsh environment with long winters and short summers. This intimate relationship led to rules for successful hunts, inter-personal relationships, sharing, and child rearing. Maligait, piqujait, and tirigususiit are all terms referring to what had to be followed, what had to be done, or what should not be done. Today, Inuit continue to operate with these specific rules of behaviour. For example, hard work ethic is key to keeping a healthy society (p. 25).

Seasonal travel was part of life ... [Inuit] followed a specific seasonal pattern, taking advantage of seasonal conditions, animal migrations, and cultural exchanges. In order to survive, an intimate knowledge of the land and seasons was needed.

QIA, 2018a

The two (2) reports, as well as feedback heard by the NIRB during the public scoping sessions, and during the Final Public Meeting, highlighted the interconnection between Inuit and wildlife and the need to harvest with respect. Respect can be shown in different ways, including, but not limited to: not arguing, talking disrespectfully, mistreating animals, or bragging about a hunt; limiting the harvest to what is needed; limiting disturbance to the environment; disposing of bones according to the animal's habitat;

sharing; understanding the environment; and using all parts of the animal (both for consumption and everyday items). The following passage from the *Inuit Qaujimajatuqangit Report* highlights this relationship between Inuit and marine wildlife:

Inuit still practice ilagiit nunagivaktangat and travel to the same places for hunting, fishing, or gathering as earlier generations. According to Inuit, everything has a soul, its "inua". Inuit understood that in order to eat, a soul needed to be taken. Hunting had to be done respectfully, otherwise animals would take their revenge and choose not to share themselves with humans, and report to others the ill treatment at the hand of humans. For humans showing disrespect, hunting would be impossible. Thus, hunting required collaboration between humans and animals. Animals were not only a source of food, but they were part of the common world. Exercising silatunig, or Inuit wisdom was critical. Being in "the respectful state with the world" meant not taking more than you need, and not disrupting animal lives to ensure there would be something for next year. Inuit society did not

function on the principle of profit, but on the principles of balanced supply and demand (25).

Knowledge of traditional navigation; building snow shelters; predicting weather; reacting to dangerous situations; manufacture, repair and use of equipment; and appropriate attire have historically been acquired through cultural transmission. The QIA noted that the importance and knowledge of the environment are reflected in the numerous words describing the weather, seasons, and environmental conditions, including those specific to snow, ice, navigation, and life. Both reports and community members during the Public Scoping Sessions and Final Public Meeting identified the ability to transmit knowledge between generations as key to Inuit traditional practices and use. Inuit Qaujimagatuqangit interviews recorded that older Inuit still try to instruct youth on the right way to hunt and there are programs to teach youth how to hunt in all communities.

Sites and Travel

Inuit are a marine people, and for centuries travelled the Arctic throughout all seasons. It has only been in the last few decades that Inuit have lived in permanent communities, and were, until recently, semi-nomadic. The QIA noted in the *Inuit Qaujimagatuqangit Report* that these movements were not random. They followed a specific seasonal pattern, taking advantage of seasonal conditions, animal migrations, and cultural exchanges. Much of the land and marine use in the Area of Focus is focused in the coastal lowlands, along shores, and into adjacent and surrounding marine areas. Archaeological sites indicate long histories of use, particularly along the ice edge. Polynyas (open water surrounded by ice) are high in biodiversity and can act as critical resources and habitat for sea life. Polynyas can be essential wintertime harvesting areas according to the *Inuit Qaujimagatuqangit Report* and community members attending the Public Scoping Sessions. The QIA noted that:

Polynyas, and other winter time open water areas were favoured ... Access to *sinaaq* [flow edge] was critical to winter time hunting. It is at *sinaaq* where harvesters compared conditions year-after-year and could evaluate changing states across the seasons. *Sinaaq* is an important aid to navigation. Traditional trails cover the Baffin coastline and sea ice ... Travel on ice required special knowledge. Its constancy could be counted on for winter travel. Distance to the floe edge was determined by *tunnguniq* or water sky, where the fog rises from the floe edge in the winter time (p. 33).

While there are several known polynyas, the *Pikialasorsuaq* (North Water Polynya) – also discussed through the Chapters [5.1](#) and [5.2](#): Existing Environment and Physical and Biological Environments – is a recurrent polynya located between Canada and Greenland in northern Baffin Bay is the largest. The *Pikialasorsuaq* is considered a highly productive area and has been emphasized by Inuit during the NIRB community scoping sessions and the QIA's Inuit Qaujimagatuqangit study as a critical resource and habitat for key marine mammals, fish, and seabirds upon which communities depend upon. Due to its biological diversity, the polynya has been an important hunting ground, providing Inuit with food and resources for making clothes and tools, and thus, deemed invaluable for cultural and spiritual well-being. According to the *QIA Inuit Qaujimagatuqangit Report*, archeological studies have shown that Inuit have been living and

camping along the ice edge for centuries, and polynyas and other wintertime open water areas were favoured.

The *Inuit Qaujimagatuqangit Report* noted that seasonal travel was supported by place names, trails, and inuksuit, which were used for many reasons, including navigation and identifying sacred places and trails, hunting, or gathering places. It was further highlighted that while “there is no possession of the land *per se*, ... due to the intimate and invested knowledge of a particular region, individual family groups were often approached by others for guidance about the safest travel routes ... and even today, respect for someone’s knowledge of an area still exists” (p. 24). Maps and tables of Inuit travel routes are included in both reports. Documented Inuit places and travel routes in the Area of Focus are available in Figure 26: Inuit Places and Travel Routes (Source: QIA, 2019).

Figure 26: Inuit Places and Travel Routes (Source: QIA, 2019)



Figure 3 Inuit places and travel routes (Adapted from IHTI 2014)

Traditional Harvesting

Harvesting occurs year-round in terrestrial lowlands, along the shores, on landfast ice, at the floe edge, and in open water. It was stated in the *Inuit Qaujimagatuqangit Report* that “*sinaaq* [the flow edge], *piqalujat* [icebergs], and *aukkarniit* [polynyas] facilitates life in the Arctic” and that sea ice was “essential wildlife habitat whether floe edge, landfast ice, or icebergs” (pp. 30-31). Not only does the sea ice and open water support sealife, with the ice edge being rich in marine life, but Inuit use the ice edge for navigation, harvesting, camping, and socializing. Wildlife behaviour associated with different types of ice was documented by the QIA in Table 13: Wildlife Behaviour and Ice Conditions (*Inuit Qaujimagatuqangit Report, QIA 2018b*).

Table 13: Wildlife Behaviour and Ice Conditions (*Inuit Qaujimagatuqangit Report, QIA 2018b*)

Type of Ice		Wildlife
Aukkarniit	Polynyas (areas of the ocean that do not freeze over)	Ringed and bearded seals over-wintering areas. Beluga and narwhal over-wintering area.
Aulajuq	Moving ice	Walrus and polar bear moving between ice pans. Whales travel in moving ice.
Nagguti	Tidal cracks	Seal breathing holes; open leads in the spring.
Sinaaq	Floe edge	Ringed, bearded, harp, harbour seals, walrus, polar bears, beluga, narwhal, and bowhead whales hunting, feeding, birthing and breeding. Migratory ducks feeding and stopping.
Tuvaq	Landfast ice	Ringed seals on ice or at breathing holes.

Community members shared information on harvesting during the Public Scoping Sessions, including hunting areas and differences in wildlife distribution and availability. Using information obtained between 1976 and 2004, the *Environmental Setting and Potential Effects Report* included comprehensive information for each of the 10 communities, including the species harvested and locations and seasons and months of harvest. The *Inuit Qaujimagatuqangit Report* provided detailed information on marine mammal seasonal distribution, the Inuit calendar, and hunting methods, such as: using killer whales, who are generally not harvested, to help drive smaller mammals to shore that Inuit would then hunt; paying attention to the health of whales; and not hunting the leaders in a whale pod. The importance of these species in Inuit life are also documented in myths, legends, and origin stories. Ringed seal were recognized to be especially critical, as they can be found year-round and Inuit Qaujimagatuqangit shows that ringed seal formed the basis for food sharing and food sharing rules.

Depending on the location and time of year, large numbers of ringed seal, Arctic char, geese, Eider ducks, and clams are harvested throughout the Area of Focus and polar bears, beluga whales, narwhal, walrus, and other types of seals and waterbirds are also harvested. As noted in the *Environmental Setting and Potential Effects Report*, Arctic char is a culturally, nutritionally, and economically important species to northern communities. Community members from Arctic Bay, Clyde River, Grise Fiord, Iqaluit, Kimmirut, Pangnirtung, Pond Inlet, Qikiqtarjuaq and Resolute report harvesting Arctic char as a main staple of their diet year-round. Arctic cod are fished locally in subsistence fisheries; however, there are very few fisheries for Arctic cod and this species is of

little importance for commercial and subsistence use (Nunami Stantec 2018a; QIA, 2018b). In comparison to Arctic cod, polar cod are fished locally in subsistence fisheries.

The Qikiqtani Inuit Association's *Inuit Qaujimajatuqangit Report* noted that seals have been and continue to be critical to Inuit survival and culture. Seals have traditionally been used for food for humans and dogs, as well as, supplying oil for heat, skins for clothing and building materials and medicines. For some communities, stomach contents of seals are considered a delicacy depending on the contents and degree of digestion. Seals continue to be critical as a food source for humans and dogs and used as clothing material (e.g., boots, coats, and mittens).

Traditionally, whales were harvested for food, as well as for the skin to supply oil for heat skins for clothing, bones and other parts for building materials, kayak frames and sled runners. Blubber from whales were used for medicines (sore throats or to protect deep cuts). Whales, especially beluga and narwhal are still actively harvested with a strong preference for narwhal as the tusks from narwhal are an important trade item.

Beluga are a valued as a food source and as a source for oil, leather, tools and materials by the Inuit. Subsistence hunts typically involve cooperative efforts with several hunters and vessels, and proceeds are often shared among the hunters and other community members. As with narwhal, beluga *maktak* is very important source of vitamin C intake.

Both the *Environmental Setting and Potential Effects Report* and the *Inuit Qaujimajatuqangit Report* provide many recorded examples of how harvested wildlife were traditionally used by Inuit (and in many cases still are), including but certainly not limited to oil for the qulliq (lamp), constructing harpoons, fueling stoves and other motors, creating rope, thread, art, clothing, and dog food. It was noted that both understanding animal behaviour as well as adhering to Inuit Qaujimajatuqangit were essential to a successful hunt.

The *Inuit Qaujimajatuqangit Report* included the following specific harvesting information:

- *Walrus* were hunted in each of the six (6) studied communities for food, ivory, and dog food.
- *Polar bears* are not only hunted in each of the six (6) studied communities for their skins and meats, but a trophy hunt could “bring in \$25,000 or more per bear”.
- *Fish* are harvested in addition to wildlife, with Arctic char being harvested year-round. While the technology used in fishing has changed, the patterns of harvesting by the seasons have not.
- *Sea plants* provide flavour and salt in each of the six (6) communities and some have been used medically.
- *Geese and duck eggs* are collected throughout the six (6) communities studied, and collection is a task usually undertaken by women and children. While many birds are harvested for food, some, like black guillemot and thick-billed murre are preferred for consumption only if other food is not available.

The NIRB repeatedly heard from community members during the Public Scoping Sessions and the Final Public Meeting that access to country food has changed and that consumption has decreased in many cases. For example, in Clyde River it was noted that in the past people fed marine mammals to their dogs, including seals and narwhal, and that it has been years since they have been able to feed themselves and their dogs country food. In Arctic Bay, a community member voiced concerns, shared by many, that Inuit do not have farms or gardens, and that meat from the store is expensive and does not smell or taste good. It was emphasized that country food sustains people, who share it with the community.

Changes to Traditional Harvesting

It was clearly acknowledged by community members during the NIRB's Public Scoping Sessions and the Final Public Meeting, as well as in both reports, that there have been, in some cases, significant changes to traditional harvesting by community members. These changes included the number of community members participating in harvesting activities, timing and location of activities, and distribution and availability of marine wildlife, fish, and birds. Reasons for these changes include decreases in cultural transmission, advancements in technology, quotas, non-traditional activities, and climate change.

Decreases in Cultural Transmission

Both reports indicated changes to the level of Inuit Qaujimagatuqangit being transmitted to the younger generations. The *Inuit Qaujimagatuqangit Report* further noted that

Living by *silatunig* [Inuit wisdom] is not as common as it used to be. Older Inuit have identified present day practices can run counter to their concept of *silatunig*. Elders will say that today Inuit do not have the same understanding of animals and how to show them respect. The example frequently provided to the QIA by Elders is the present day practice of hunting of the lead whales when they return in the spring. In the past, the whale leaders were allowed to pass because if their migration was disrupted, the other whales would then disperse. However, today, they mention that the quota system has changed Inuit harvesting practice. It is becoming individualistic, 'First come. First served'. The quota system only allows hunting during a fixed period, and hunting has changed to match the requirements of the quota system. It is no longer the practice of allowing the lead whale to pass without attempting to harvest them. Today, as soon as the season opens, it is a far more rushed hunt. It is 'get what you can' (p. 27).

Quotas

Quotas are government restrictions on the number of species that can be harvested, and include, but are not limited to, polar bear, beluga, and narwhal. It was indicated in both reports, as well as from community members during the Public Scoping Sessions, that quotas have negatively affected traditional harvest. Some hunters have changed their techniques to not accidentally surpass quotas and "hunts also have a new sense of urgency that was not present previously. The rush to bring in a whale before the quota is filled has resulted in more scarred whales and has increased the safety risk to hunters" (NWMB, 1998, as cited in Nunami Stantec, 2018b, p. 6.59). It was noted that bans and restrictions on hunting are resulting in changes in intergenerational knowledge exchange, and also affecting local wildlife population numbers and resident safety. For example, increased numbers of polar bears were cited as providing a risk to humans.

Concerns were further expressed that bans, such as on hunting bowhead whales, would lead to the loss of Inuit Qaujimajatuqangit of the whale and harvesting the whale. The QIA also identified that activities such as tagging of wildlife, tourist activities such as whale watching, and resource development are contrary to silatunig (Inuit wisdom) and do not demonstrate adequate respect for wildlife.

Advancements in Technology

While mechanized equipment allows hunters increased mobility and ability to chase wildlife, Inuit have reported that the sound produced by boat motors has resulted in changes to marine mammal behaviour, including acting aggressively and changing their travel routes. The *Inuit Qaujimajatuqangit Report* noted that whales move offshore in response to the noise of boats or snow machines.

Climate Change

Changing climate has changed traditional practices, including type, timing, and location, in response to factors such as: increased danger from changing ice conditions, and particularly thinner ice earlier than in the past; changing wildlife and fish migration patterns; and making Inuit Qaujimajatuqangit less dependable due to rapid changes.

Food Security and Traditional Foods

As discussed in detail [5.3.1.6 Well-being and Health of Coastal Communities](#), harvesting and consumption of country foods play a significant and important role in the health and wellness of Inuit as well as the continuation of Inuit Qaujimajatuqangit. It was identified in the *Qaujimajatuqangit Report* that over 90% of Inuit in the Qikiqtani region still consume country foods, and that Arctic char, ringed seal, and narwhal comprise a predominant part of marine mammal consumption. As discussed throughout this chapter, knowledge of the environment and reliable equipment are important components to a successful hunt.

Food security is not only dependant on access to country foods, but on the health of wildlife, birds, and fish. Differences in the health, appearance, and taste of marine wildlife, birds, and fish were identified in the *Environmental Setting and Potential Effects, Inuit Qaujimajatuqangit* reports, and by community members at the Public Scoping Sessions and the Final Public Meeting.

Limitations in respect of the information provided within the *Environmental Setting and Potential Effects Report* related to Inuit Qaujimanigut were identified by Nunami Stantec as it was noted that the literature reviewed for the Report was primarily the result of work already conducted by the government, academic, and Inuit organizations to further regional policies and initiatives, and this information was not specific to hypothetical scenarios of the SEA. The information in the literature review conducted for the SEA reflects traditional use and practices dating from approximately 1913 to 2013, and much of this information broadly conveys use and practices at the territory level, and may not accurately reflect the specific needs and current interests of residents in the Area of Focus. Nunami Stantec further expressed difficulties sourcing shapefiles or mapped information on land use, occupation, or resources that could have contributed to a more fulsome understanding of traditional use and practices from the Nunavut Atlas, Nunavut Land Use

Plan Community Priorities and Values, Nunavut Climate Change, and Pikialasorsuaq Commission—Pikialasorsuaq pillugu Isumalioqatigiissitat websites.

Similar to discussions related to perceived health and well-being, it was noted that the subjectivity of discussing and assessing intangible values that relate to beliefs, perceptions, values, and qualitative experience, including experiential values such as cultural transmission, create challenges to assessing these factors generally. It was highlighted that intangible values can only be meaningfully assessed by individuals and communities experiencing these values in their cultural context and cannot be assessed from a Western scientific perspective.

Views of Interested Parties

Within its public written comments, Fisheries and Oceans Canada (DFO) noted that while the significance of subsistence harvests has been well documented, there is a lack of quantitative information on the economic values of subsistence harvests from the Area of Focus. DFO further noted that updated personal accounts and anecdotal information could better reflect potential changes in traditional harvesting practices from factors such as climate change and increased vessel traffic. It was recommended that further research be conducted on the economic values of subsistence harvests in the Area of Focus.

The Inuit Circumpolar Council Canada (ICC) provided information to the NIRB on the ICC's Pikialasorsuaq Commission to understand, monitor, and manage changes to safeguard the health of the Pikialasorsuaq, which means "Great Upwelling" for future generations. The ICC discussed the importance of the Pikialasorsuaq and provided feedback and Indigenous knowledge shared by communities in Nunavut and Greenland to guide recommendations for an Inuit management strategy. In addition to discussions on the interdependence and relationship between Inuit and the land and the *Pikialasorsuaq* and food security and physical, cultural, and mental health, the Commission heard of impacts from climate change, including reduced travel between the two (2) countries; concern that development, including commercial fisheries, shipping, or oil and gas development, would have negative impacts; and that contamination from military activities has been observed. The commission has developed the following three (3) recommendations: establish an Inuit Management Authority; Inuit Management Zone; and establish a free travel zone.

During the Final Public Meeting, Community Representatives discussed the importance of marine based harvesting, as well as changes identified over the years, and conveyed Inuit Qaujimagatuaqangit:

And sometimes it's hard for us to go out hunting when there are pack of ice in summertime because we get locked in. We have no access to go out hunting. We tend to get hungry because of that ... But up here, where we come from, where we live, and it's -- at different times, it does happen. There's some summers -- seasons we have no water -- no access to go hunting ... I find it hard to go back backwards to our old, old traditional values by surviving from heating from seal -- seal

*blubber, and we're losing this time to live -- to live in the back like we used to. But we need oil. We need gas to -- for heating for -- for our survival.*¹⁶⁸

*We live off our country food. That is our strength. We have nothing that we strive for more than -- than -- other than hunting. ... That's our way of survival.*¹⁶⁹

*As hunter -- as hunters, we -- we go all over the place, and we move around a lot. I've been trying to figure some things out. I've been watching wildlife -- change in the wildlife, their behaviour, their movement. Through our knowledge, Inuit Qaujimajatuqangit, you said before about Inuit Qaujimajatuqangit it would be part of the -- each -- it's included. We -- we live in -- we live through our daily lives in Inuit Qaujimajatuqangit.*¹⁷⁰

And I will be listening to different speakers and because I'm Inuk, and I don't have any strength or for what decisions you make, but I want you to understand how we are as Inuit, how the Inuit ways are -- do practices in the communities, what kind of people are we. You need to understand who we are and what we want. And you need to understand our desires.

[M. Savearjuk Jaw, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 539, lines 13-19]

*In our livelihood, at the time, we strive hard. You just heard that. And then today it's so different now in -- our lifestyles has changed. And the wildlife, we grew up with just wildlife animals around us for consumption and in the land. When it was still used as a child, I know what -- what went on. The wildlife are very important to us. We want to protect them with all our hearts, and we mean it.*¹⁷¹

*... in our community the young people under the year -- under 20 years of age are actively hunting. They are actively hunting in the community. This will continue in our community as we are a hunting society and we eat our catch of the land.*¹⁷²

Even spring, we usually do spring hunt for seal pups around -- starting around mid-June because Arctic Bay is in a High Arctic place. That's when the seal pups, natsiq, are easy to hunt and are food for our family. My father hunted in that area. His father hunted in that area. I hunted there, but I look no longer hunt. I'm hoping

¹⁶⁸ A. Alasuaq, Cape Dorset, NIRB Final Public Meeting File No. 17SN034 Transcript, March 18, 2019, pp. 106-107, lines 8-26 and 1-4.

¹⁶⁹ B. Kovic, Iqaluit, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 195, lines 10-12 and 19.

¹⁷⁰ L. Ishulutaq, Pangnirtung, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 218, lines 1-10.

¹⁷¹ L. Ningiuk, Grise Fiord, NIRB Final Public Meeting File No. 17SN034 Transcript, March 20, 2019, p. 541, lines 3-10.

¹⁷² J. Akavak, Kimmirut, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, p. 821, lines 15-20.

*my children will be hunting there too in that area as well as I'm hoping their children will be hunting there too.*¹⁷³

*I'd like to invite you to come to Grise Fiord, and I will show you that there are there are four non-hunters. Two -- three of which are because of their medical condition, and one is an elder.*¹⁷⁴

5.3.1.9. *Non-traditional, recreation, and tourism activities*

Background Information

The information below is a summary of Section 5.12: Non-Traditional Use in the *Environmental Setting and Potential Effects Report* prepared for the NIRB by Nunami Stantec (2018a). Please refer to this section and report for additional information on tourism activities by community, including individual outfitters and tour operators.

Tourism has been a growing industry for Nunavut and presents an economic development opportunity for the Qikiqtani region. The 2015 Nunavut Visitor Exits Survey estimated that approximately 14,572 non-residents visited the Qikiqtani region between May and October 2015, which constituted 87% of the total visitors to Nunavut. Cruise ships and pleasure crafts are increasingly common in Nunavut because of thinner ice and longer ice-free seasons. The number of ships passing through the Northwest Passage are increasing and the number of marine vessels passing by Pond Inlet nearly tripled between 1990 and 2015 due to an increase in tourism, along with traffic related to the Mary River Iron Ore Project. During that same time, the number of ships in Resolute and Arctic Bay decreased, likely due to closures of the Polaris and Nanisivik Mines.

Cultural experiences, birdwatching or wildlife viewing, and cruise or boat tours were listed in the top 10 activities for visitors to the Qikiqtani region, with other activities including floe edge tours, canoeing and kayaking, and fishing. The cruise-based travelling sector was the one sector that saw a measurable increase, bringing approximately 2,750 passengers to Nunavut in 2015, up from 1,890 in 2011. During the Nunavut Coastal Resource Inventory for Qikiqtarjuaq, interviewees expressed some interest in creating local tourism opportunities through bird sanctuaries for thick-billed murre and northern fulmars. However, the majority of visitors to Nunavut are business travelers, making up approximately 76% of those travelling to the Qikiqtani region. Hotels and bed and breakfast establishments are the primary form of accommodation for visitors and tourists.

¹⁷³ J. Akuala, Member of the Public, NIRB Final Public Meeting File No. 17SN034 Transcript, March 21, 2019, pp. 843-844, lines 26 and 1-8.

¹⁷⁴ L. Audlaluk, Grise Fiord, NIRB Final Public Meeting File No. 17SN034 Transcript, March 19, 2019, p. 344, lines 22-25.

5.3.1.10. *Commercial harvesting*

Background Information

The information below is a summary of Section 5.13 – Commercial Harvest – of the *Environmental Setting and Potential Effects Report* prepared for the NIRB by Nunami Stantec (Nunami Stantec, 2018a). Please refer to this section and report for additional information.

Commercial fishing and fish harvesting activity in Nunavut is monitored and managed through a co-management agreement legislated through the *Nunavut Agreement*. The final decision regarding quota allocations lies with the Minister of Fisheries and Oceans Canada, and the Canadian Coast Guard. However, the Nunavut Wildlife Management Board (NWMB) and Fisheries and Oceans Canada (DFO) have an agreement in place to make management decisions in the absence of fisheries regulations specific to Nunavut. Input into this process is provided by: fish harvesters to their respective hunters and trappers organizations (HTOs); the Regional Wildlife Organization for the Qikiqtani region, the Government of Nunavut (GN); and Nunavut Tunngavik Incorporated.

Turbot and shrimp are the primary species commercially fished in the offshore waters of the Area of Focus. DFO noted within its public written comments and final written submission that shrimp are being allocated to inshore fishers as well. The Baffin Bay and Davis Strait Area falls within North Atlantic Fisheries Organization (NAFO) Subareas 0A and 0B (see [Figure 27](#)), and within Shrimp Fishing Areas (SFA) 0,1, and 2 (See [Figure 28](#)). There is a year-round fishery for northern shrimp (including striped pink shrimp) off the east coast of Baffin Island and in Hudson Strait and includes striped pink shrimp. According to the *QIA Inuit Qaujimajatuqangit Report*, shrimp is also becoming a popular food source in the communities. Where shrimp pots are available, community members actively harvest them. Partially digested shrimp and other small invertebrates in the stomachs of seals is considered a delicacy in Pond Inlet.

Within its public written comments and final written submission, DFO provided clarification on the shrimp management units and noted that Davis Strait East is an exploratory fishery. Both the turbot and shrimp fisheries have overlapping jurisdictions and agreements exist between Canada and Greenland. While quota information and landings statistics for turbot and shrimp is limited for Nunavut, in 2015 the total allowable catch market value for turbot and shrimp for Nunavut was valued at approximately \$78 million and \$6.5 million, respectively (GN-DOES, 2016 as cited in Nunami Stantec, 2018b). Within its public written comments, DFO noted that the market value for Greenland halibut in 2015 was \$54,598,000. In 2016 the federal government announced an increase in quotas for shrimp to Nunavut harvesters, and in 2017, Nunavut was allocated additional quotas for turbot in both Subareas 0A and 0B. While there is limited public information on commercial fishing activity, including quotas, for Arctic char outside of the Cambridge Bay area, there is a processing facility for Arctic char and turbot in Pangnirtung.

Figure 27: North Atlantic Fisheries Organization Subareas Around Baffin Island and Davis Strait (Source: Nunami Stantec, 2018a)

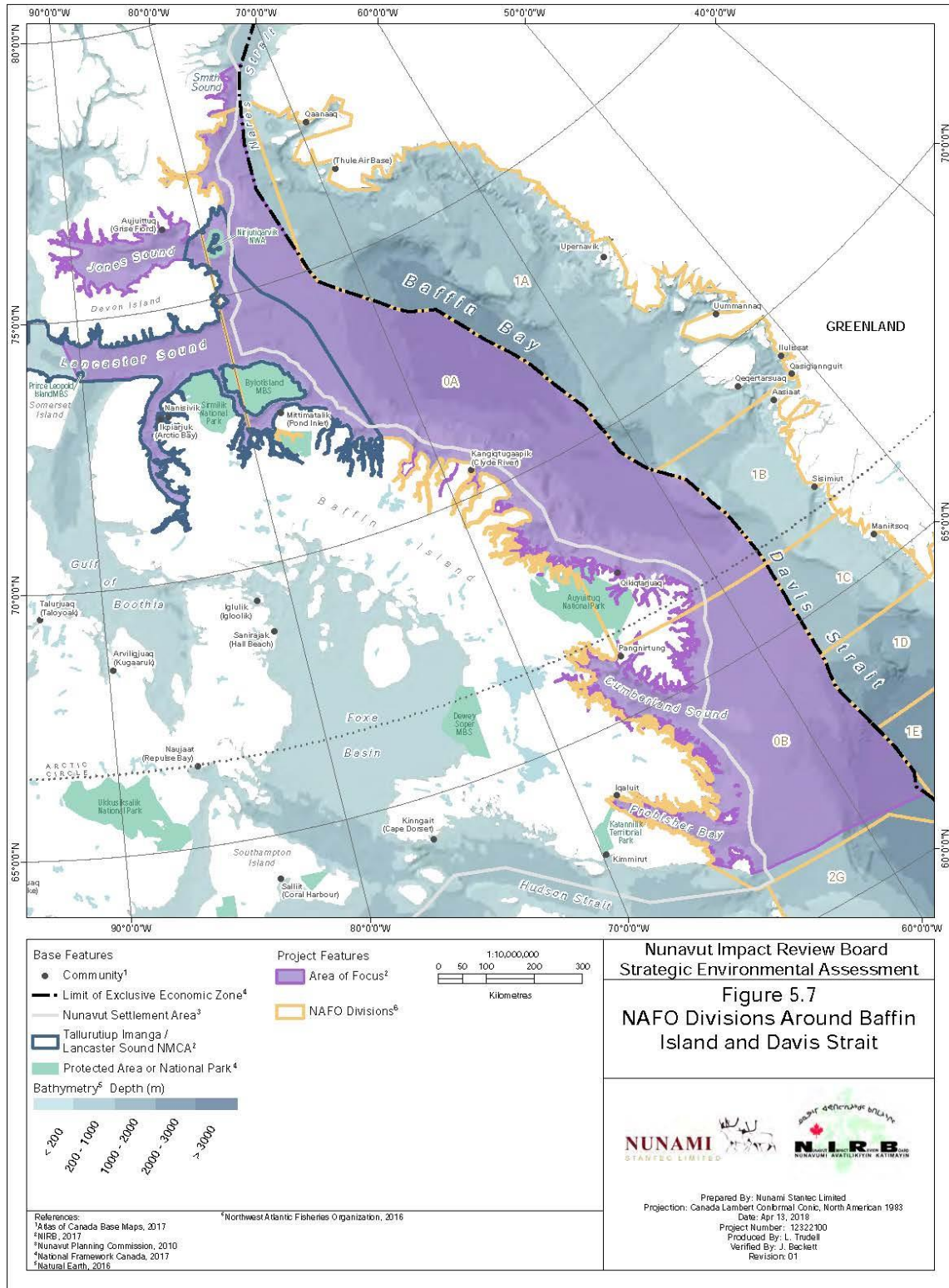
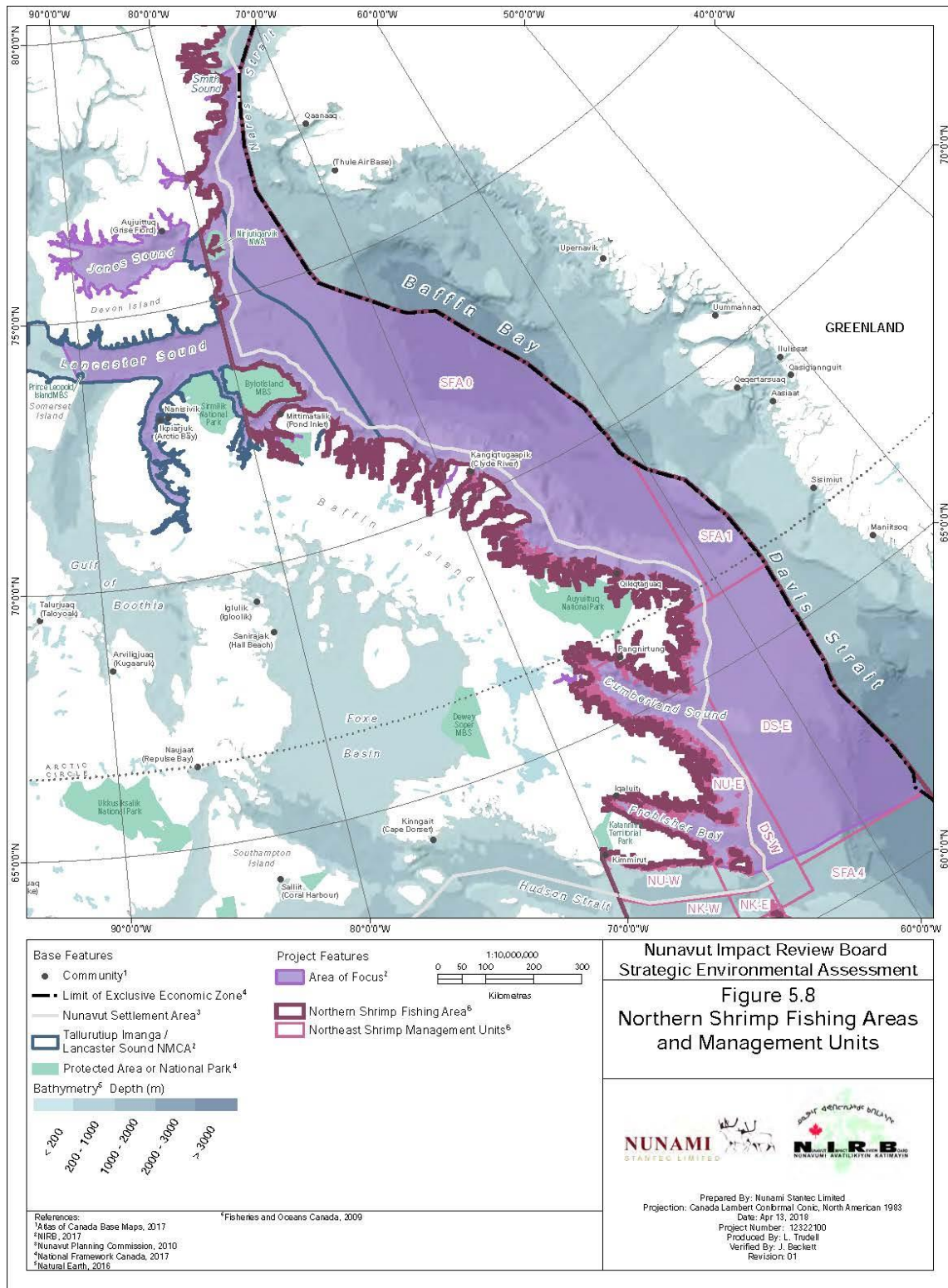


Figure 28: Northern Shrimp Fishing Units and Management Units (Source: Nunami Stantec, 2018a)



The regulation of future commercial fishing in Nunavut is based primarily on the issuance of licences for exploratory fisheries from DFO to local HTOs.

Atlantic wolffish have little-known economic value. There is a limited commercial fishery for Atlantic cod and Greenland cod in the Area of Focus, but Atlantic cod species is of very high commercial importance elsewhere in eastern Canada. Greenland shark are not commercially important in the Area of Focus.

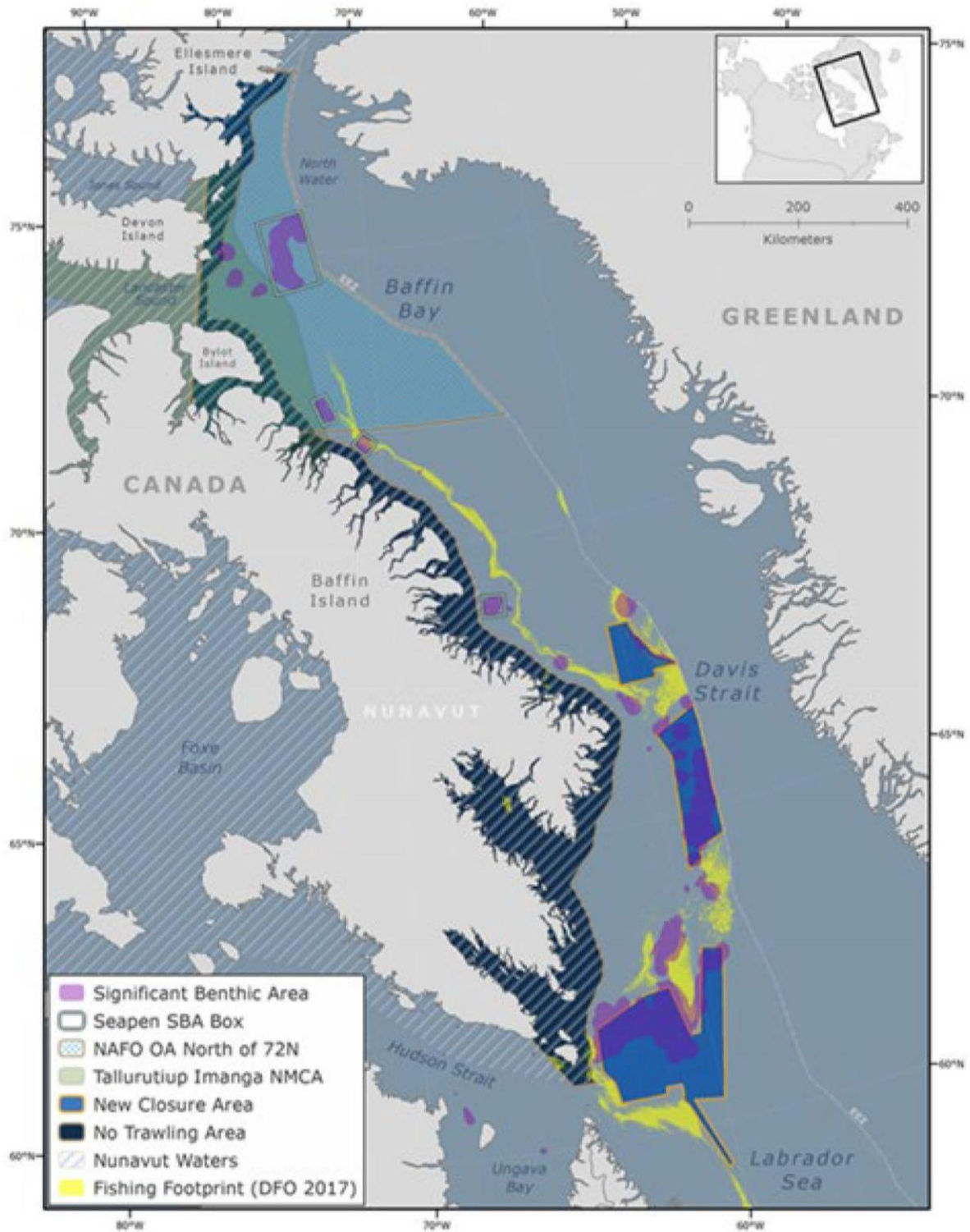
Views of Interested Parties

Within their respective final written submissions, Fisheries and Oceans Canada (DFO), the Nunavut Fisheries Association (NFA), the Arctic Fishery Alliance (AFA) and the World Wildlife Fund (WWF) provided information on the current Nunavut fishery and the associated importance to the Nunavut economy. The NFA is comprised of the Arctic Fishery Alliance, Baffin Fisheries, Pangnirtung Fisheries/Cumberland Sound Fisheries Partnership, and the Qikqitaluk Corporation. The AFA is comprised of hunters and trappers associations and community trusts in Arctic Bay, Grise Fiord, Qikiqtarjuaq, and Resolute.

DFO provided updated information on the landed values of Greenland halibut fished by Nunavut fisheries from 2010-2016 and noted that additional information on the fisheries and stocks is available through DFO and the Canadian Science Advisory Secretariat.

The NFA and AFA further identified the commercial fishery as a significant economic driver in the Qikiqtani region and noted the potential for significant growth and impact in both offshore and inshore areas, and identified information gaps. The AFA noted that commercial fishing takes place when ice conditions permit, generally from mid-May to November. The NFA provided a map illustrating current fishing activity taking place as well as areas currently closed to fishing to support Canada's Marine Conservation Targets, areas being considered for further protection, and significant benthic areas identified (Figure 29: Nunavut Fishery Footprint, Current and Proposed Closure Areas and Significant Benthic Areas (Source: NFA, 2019)).

Figure 29: Nunavut Fishery Footprint, Current and Proposed Closure Areas and Significant Benthic Areas (Source: NFA, 2019)



Both the NFA and the AFA discussed the current benefits of the fisheries to the residents of its owner communities, including: providing Inuit employment; conducting fisheries research; providing financial support and capacity to socio-economic development projects; and improving food security by actions such as delivering supplies and enabling community hunts and feasts. Potential opportunities for increases in Inuit employment with NFA members over the next several years from fisheries expansion and training was projected.

The NFA members hold 100% of the commercial allocations for both turbot and shrimp managed through the Nunavut Wildlife Management Board, and the AFA is the second-largest allocation holder for Greenland halibut (turbot) in Nunavut. The NFA further explained efforts to increase the share of the AFA organizations for turbot and shrimp in adjacent waters from just over half to approximately 90-100%, which it noted would be more consistent with levels of adjacent resources held by more southern jurisdictions. The NFA projected that with the additional allocation of adjacent resources, the value of Nunavut's offshore fishery could increase from the current amount of approximately \$100 million per year to closer to \$200 million (not accounting for potential greater inshore fisheries development and/or the expansion of offshore commercial operations into additional species).

The WWF discussed steps taken by the offshore commercial fishery towards greater sustainability and noted that the northern shrimp fishery received the Marine Stewardship Council sustainability certification in 2011 and has maintained it since. During the Final Public Meeting, the Board heard that there is a high level of community interest in the additional development of commercial fisheries in the Area of Focus, even raising the issue as a potential economic driver that could be an alternative to potential oil and gas development.

Identified Gaps

The NFA and AFA noted that research is being conducted to address information gaps, including:

- Collecting baseline information of fisheries and ecosystem data and evaluating the potential for species development;
- Potential new or expansion of existing inshore and offshore fisheries, including clams in the inshore and additional species such as Porcupine crab and redfish in the offshore; and
- Turbot migratory patterns, including spawning grounds, and stock connectivity with both the inshore in Nunavut as well as Greenland fisheries.

5.3.1.11. ***Marine Commercial Traffic***

Background Information

The information below is a summary of Section 5.14: Marine Transportation in the *Environmental Setting and Potential Effects Report* prepared for the NIRB by Nunami Stantec (Nunami Stantec, 2018a). Please refer to this section and report for additional information on transit statistics and individual suppliers.

Nunavut is highly dependent on marine transportation for community re-supply, construction, local economic activities, and cultural livelihoods. The growth in marine transportation in recent

decades is related to both the changes in ice cover that have resulted in greater access to Nunavut waters as well as increases in population and economic activity. Thinner ice and longer ice-free seasons have allowed for ships to travel more frequently, making the region more accessible. For example, the total annual kilometres traveled by all vessel types in Nunavut has more than doubled over the past 25 years, increasing from 345,567 km in 1990 to 793,684 km in 2015 (Dawson et al., 2017 as cited in Nunami Stantec, 2018b).

Vessel types that constitute the greatest proportion of traffic in Nunavut include general cargo (re-supply vessels), government icebreakers, pleasure crafts, fishing vessels, and tanker ships and tug and barge activity related to community re-supply. Between 2011–2015 the distribution of tanker ships, fishing vessels, and pleasure crafts has increased to 16%, 16% and 6% respectively, while the distribution of general cargo, government ice breaking, and bulk carriers has declined to 24%, 18% and 9% respectively. Pond Inlet experienced the largest increase in annual traffic of any Nunavut community from 1990 to 2015, almost tripling vessel traffic activity in this period (Dawson et al., 2017, as cited in Nunami Stantec, 2018b). This increase has been attributed primarily to an increase in tourism vessels, along with bulk carrier and tanker traffic related to the Mary River Iron Ore Mine. Resolute and Arctic Bay both experienced declines in ship traffic from 1990-2015, which is likely related to the closures of the Polaris and Nanisivik Mines (Dawson et al., 2017 as cited in Nunami Stantec, 2018b).

Views of Interested Parties

Public comments on shipping are predominantly discussed in Volume 3, Chapter 8: Accidents and Malfunctions and Volume 3, Chapter 7.5: Cumulative Effects along with discussions on shipping as relates to specific valued ecosystem components.

5.3.1.12. *Other Reasonably Foreseeable Future Activities*

Background Information

Reasonably foreseeable activities are known and planned future activities and developments that are either already occurring, likely to continue to expand, and/or publicly announced. Reasonably foreseeable future activities are used in the assessment of cumulative effects to address how potential effects from one project or activity may interact cumulatively with residual effects from other projects and activities conducted or expected to be conducted in or adjacent to the SEA Area of Focus. A list of applicable past, present, and reasonably foreseeable activities identified by Nunami Stantec within Section 2.3.6: Cumulative Effects of the *Environmental Setting and Potential Effects Report* are available in Table 14: Past, Present, and Reasonably Foreseeable Activities.

Table 14: Past, Present, and Reasonably Foreseeable Activities

Past and Present Physical Activities and Resource Use	
Mining – Baffinland Mary River Iron More Mine (marine	transportation)
Commercial Shipping	
Commercial Fishing	
Tourism (cruise ships)	
Research (Military, Academic)	
Traditional Use and Practices, Traditional Harvest, Traditional Foods	
Oil and Gas—Greenland	
Oil and Gas—Atlantic Canada	
Future Physical Activities	
Mining – (marine transportation)	
Deepwater Port (Iqaluit)	
Commercial Shipping	
Commercial Fishing	
Tourism (cruise ships)	
Research (Military, Academic)	
Traditional Use and Practices, Traditional Harvest, Traditional Foods	
Oil and Gas – Greenland	
Oil and Gas – Atlantic Canada	
Oil and Gas – Baffin Bay and Davis Strait (Scenario A, B, and C)	

5.3.1.13. *Heritage Resources*

Background Information

The information below is a summary of Section 5.11: Heritage Resources in the *Environmental Setting and Potential Effects Report* prepared for the NIRB by Nunami Stantec (2018a). Please refer to this section and report for additional information on the regulatory setting for heritage resources as well as a high-level overview of habitation in the Area of Focus.

Pursuant to the *Nunavut Archaeological and Palaeontological Sites Regulations*,¹⁷⁵ administered by the Government of Nunavut Department of Culture and Heritage, heritage resources are identified as archaeological artifacts more than 50 years old and paleontological fossils. Heritage resources, which also include cultural landscapes (natural or man-made features important to a society’s sense of place), are non-renewable and susceptible to alteration, damage, and destruction from development, changing sea levels, and melting permafrost. Heritage Resources within the Nunavut Settlement Area (NSA) are protected under the *Nunavut Act*¹⁷⁶ and include prehistoric archaeological site, historic sites, and contemporary land use.

¹⁷⁵ SOR/2001-220.

¹⁷⁶ S.C. 1993, c. 23.

Nunami Stantec emphasized that the value of heritage resources lies in not just the individual artifacts or biological specimens themselves, but in their specific features, how and where they were found, spatial relationships, and contextual situations. It was noted that removing or mixing cultural or fossil bearing sediments could result in the permanent loss of information essential to understanding these resources. As a result, Nunami Stantec concluded that heritage resources are susceptible to destruction and depletion through disturbance.

The Area of Focus has a long history of habitation, beginning with the migration of the Paleoskimos to Baffin, Devon, and Ellesmere islands, which was part of a larger migration from Alaska to Greenland reported to have occurred approximately 5,000 years ago. The Dorset people then inhabited the Arctic approximately 2,500 to 600 years ago, followed by the Thule people – the ancestors of modern day Inuit – approximately 1,000 years ago. Although a comprehensive search of the Nunavut Archaeological Sites Database was not conducted as part of the SEA, in general it is known that the way of life for these groups of inhabitants of Baffin Bay and Davis Strait was centrally focused on marine and coastal use; archaeological sites, both recorded and not yet documented, but expected, are present along the coastlines.

Archaeological and paleontological investigation along Baffin, Devon, and Ellesmere Island coastlines has been relatively minimal in terms of coverage, and any potential development along the coast would require pre-impact heritage resource investigations to identify and assess heritage resources sites and develop mitigative options to eliminate or reduce adverse effects to identified sites. In addition, given the long history and numerous expeditions that extended through this region in the search for the Northwest Passage, as well as other expeditions, shipwrecks located within Baffin Bay and David Strait could also be subject to impact depending on the location of the vessel and the type of development proposed in the vicinity.

5.3.2 Views of the Board

The Board notes that there are identified gaps in available information on the human environment as highlighted above that should be addressed prior to any decisions to lift the current moratorium on offshore oil and gas activity and/or should be addressed as applicable by any project-specific assessments. These gaps are discussed further below.

With so many gaps in the existing conditions, the Board finds it difficult to plan for or make recommendations related to offshore oil and gas activities. Pursuant to the rules of Inuit Qaujimajatuqangit, the Board would like to emphasize that an understanding of current conditions is needed before any decisions are made. This information should be collected from both Inuit Qaujimajatuqangit and science, and should be specific to communities, regions, and projects/initiatives. Communities must be involved in both the collection and analysis of information.

The Board notes that the information currently available speaks to the size and diversity of the human environment throughout Area of Focus. Both the similarities and the variability amongst the communities should be considered when viewing, collecting, and assessing new information to address data gaps prior to decisions being made to lift the moratorium or not, or within project-specific assessments, if the moratorium should be lifted in future.

5.3.2.1. *Economy, Development, and Employment*

As indicated within the respective reports submitted by Nunami Stantec and the Qikiqtani Inuit Association and comments provided by the Government of Nunavut and Fisheries and Oceans Canada, there are gaps in data related to the economy, economic development, and employment and training opportunities. The Board recommends that additional information be collected associated with these specific topics through collaboration between responsible parties.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to the economy, development, and employment, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address prior to lifting the current moratorium:

- In collaboration with communities and responsible parties, update statistical data for key socio-economic indicators in the Area of Focus, including business investment data and contributions of economic sectors at the community level (#38).

5.3.2.2. *Well-being and Health*

The Board agrees with the conclusions and gaps identified within the *Environmental Setting and Potential Effects Report*, specifically that the information collected from government sources and existing reports may not provide an accurate representation of perceived health and well-being of a community or its residents. It cannot be emphasized enough that the health and well-being of Nunavut communities cannot be accurately determined without the active input of the members of those communities. Community members in the Area of Focus should not only be engaged by parties attempting to determine and assess well-being and health, but should be involved in the development of criteria and analysis of results for these studies. It is further noted that this information should not only be conducted in the context of offshore oil and gas development in the region, but irrespective of oil and gas development.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to well-being and health, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing consultation, coordination, and public engagement:

Recommendations to address irrespective of the current moratorium:

- Work with communities to develop the criteria and indicators that should be relied upon to assess community health and well-being, which respect Inuit Qaujimajatuqangit and Inuit Qaujimaningit (#2).

Food insecurity is a significant and pressing issue throughout the region, as well as through the whole of Nunavut. The Board again acknowledges the work undertaken by the QIA and the Inuit Qaujimagatuqangit committee members in the comprehensive consideration of food security and its applicability for this assessment. The Board appreciates that the importance of country food to Inuit identity and culture was highlighted as well as its importance to fulfilling nutritional requirements for Nunavut communities. It is also evident that marine-based harvesting, and the sharing of the harvested food throughout communities is not only a strong component of cultural expression but also an important aspect of addressing food security. The Board appreciates the identification and focus on the cultural aspect of food security, including food sharing, which is often unrecognized in discussions of this issue. The Board acknowledges the limitations identified within the *Food Security Report* regarding sample sizes, lack of information available on the costs of marine-based harvesting, and lack of a specific project with more concrete details to build upon.

The potential for work on the indirect financial compensation from marine based harvesting, such as through the sale of clothing, jewelry, and art was also highlighted through this assessment. The Board notes comments from Fisheries and Oceans Canada (DFO) regarding the lack of quantitative information on the economic values of subsistence harvests and their associated recommendations for additional studies to be undertaken. The Board concurs with the concerns raised by parties, including the QIA, GN, DFO, and Community Representatives on the importance of considering food security in future assessments as well as the additional information needed for this topic.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to marine-based harvesting and food security, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address irrespective of lifting the current moratorium:

- With the direction and participation of the Qikiqtani Inuit Association and the 10 communities in the region, support further research into the role of harvesting in the marine environment, including:
 - the importance of harvesting on food security in communities;
 - community-specific food security vulnerability;
 - the costs of harvesting; and
 - importance of country food sharing in communities (#26).

5.3.2.3. Community Infrastructure

The lack of basic transportation and communication infrastructure required to address everyday needs for the communities in the Area of Focus is clear. The Board agrees with the recommendations and statements by the Qikiqtani Inuit Association, Government of Nunavut, and Community Representatives that more information is required on the state of current infrastructure and, particularly, on the identified needs for additional infrastructure.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to community infrastructure, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address prior to lifting the current moratorium:

- Prepare an inventory of the existing communication and transportation infrastructure in the Area of Focus. Assess the adequacy of the current inventory and determine requirements for additional capacity that would be necessary to serve the development of the offshore oil and gas industry (#39).

5.3.2.4. ***Commercial Harvesting***

The Board agrees with parties, including Fisheries and Oceans Canada (DFO), the Nunavut Fisheries Association (NFA), the Arctic Fishery Alliance (AFA), the World Wildlife Fund (WWF), and Community Representatives on the importance and contributions of the existing fisheries to the Nunavut economy. The Board acknowledges the opportunities for growth in many sectors, including the commercial fisheries. The Board understands that research is currently being conducted to support potential expansions of the fishing industry as well as to determine the specific benefits flowing to Qikiqtani communities from the industry.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to commercial harvesting and fish and fish habitat, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address irrespective of the current moratorium:

- Collect baseline fisheries and ecosystem data to assess the commercial and ecosystemic viability of existing and potential expansions to the commercial fisheries in Baffin Bay and Davis Strait, including consideration of:
 - turbot migratory patterns, spawning grounds, and stock connectivity with inshore waters in Nunavut and Greenlandic waters;
 - the viability of harvesting additional species (e.g., clams, Porcupine crab, redfish, etc.);
 - required investments in technology; and
 - increases to local quotas (#27).

5.3.2.5. *Traditional Activity and Knowledge*

The connection and interdependence of physical and psychological health, food security, and quality of life for Inuit in relation to the access to and use of the marine environment is indisputable. The Board appreciates the Inuit Qaujimajatuqangit and Inuit Qaujimaningit shared for the SEA, having heard how the transfer of knowledge is changing and also that the effects of a rapidly changing environment and specifically, climate change, is also impacting the Inuit Qaujimajatuqangit shared by communities. The Board believes the SEA has helped to illustrate the importance of the offshore to Nunavut Inuit, highlighting the necessity of involving Inuit in decision-making regarding this area.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to Inuit Qaujimajatuqangit, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendations to address irrespective of the current moratorium:

- Ensure that all baseline research, data collection, effects assessment, and updating conducted in the Area of Focus includes consultations with Inuit knowledge and rights holders and consideration of Inuit Qaujimajatuqangit and Inuit Qaujimaningit (#20); and
- In consultation with the Qikiqtani Inuit Organization and communities in the Area of Focus, ongoing research programs should be prioritized to continue the gathering of Inuit Qaujimajatuqangit and Inuit Qaujimaningit regarding the marine environment and offshore areas in Baffin Bay and Davis Strait from Inuit knowledge holders in the communities in the Area of Focus (#21).

5.3.2.6. *Heritage Resources*

While the focus of the SEA is on the offshore waters of Baffin Bay and Davis Strait, as expressed throughout this Report, Inuit have had a long history of utilizing the whole of the marine environment and coastlines connected to the offshore. As identified by Nunami Stantec, a critical gap identified through the SEA is that archaeological and paleontological investigation along Baffin, Devon, and Ellesmere Island coastlines has been relatively minimal in terms of coverage. Any potential development along the coast would therefore require pre-impact heritage resource investigations to identify and assess heritage resources sites and develop mitigative options to eliminate or reduce adverse effects to identified sites.

The Board has carefully considered the identified information gaps and areas of uncertainty relating to heritage resources, as well as the recommendations of participants and the comments, concerns, and knowledge shared by community members throughout the SEA, including at the Final Public Meeting. Having assessed what feasible and practical actions can be taken over time, the Board offers the following recommendations addressing baseline research:

Recommendation to address irrespective of the current moratorium

- Conduct a baseline assessment of heritage resources along the coastlines of eastern Baffin Island, Ellesmere Island, and associated islands to identify archaeological and paleontological resources that could be impacted by potential effects from offshore development activities (#28).