Project Description of Statoil's Waverley 3D Seismic Survey of EL 2435 and EL 2436

Prepared by

With assistance from

18 July 2017
LGL Project Ref: FA0134-1

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1.0 Introduction

Statoil Canada Ltd. (Statoil) proposes to conduct a three-dimensional (3D) seismic survey over its 100% owned Exploration Licences, EL 2435 and EL 2436, located ~350 km southwest of Halifax, Nova Scotia (Figure 1.1). EL 2435 and EL 2436, awarded to Statoil by the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) on 15 January 2016, cover areas of 3677 km^2 and 2842 km^2, respectively. This Project Description (PD) document constitutes the initial step in the CNSOPB's environmental assessment (EA) process.

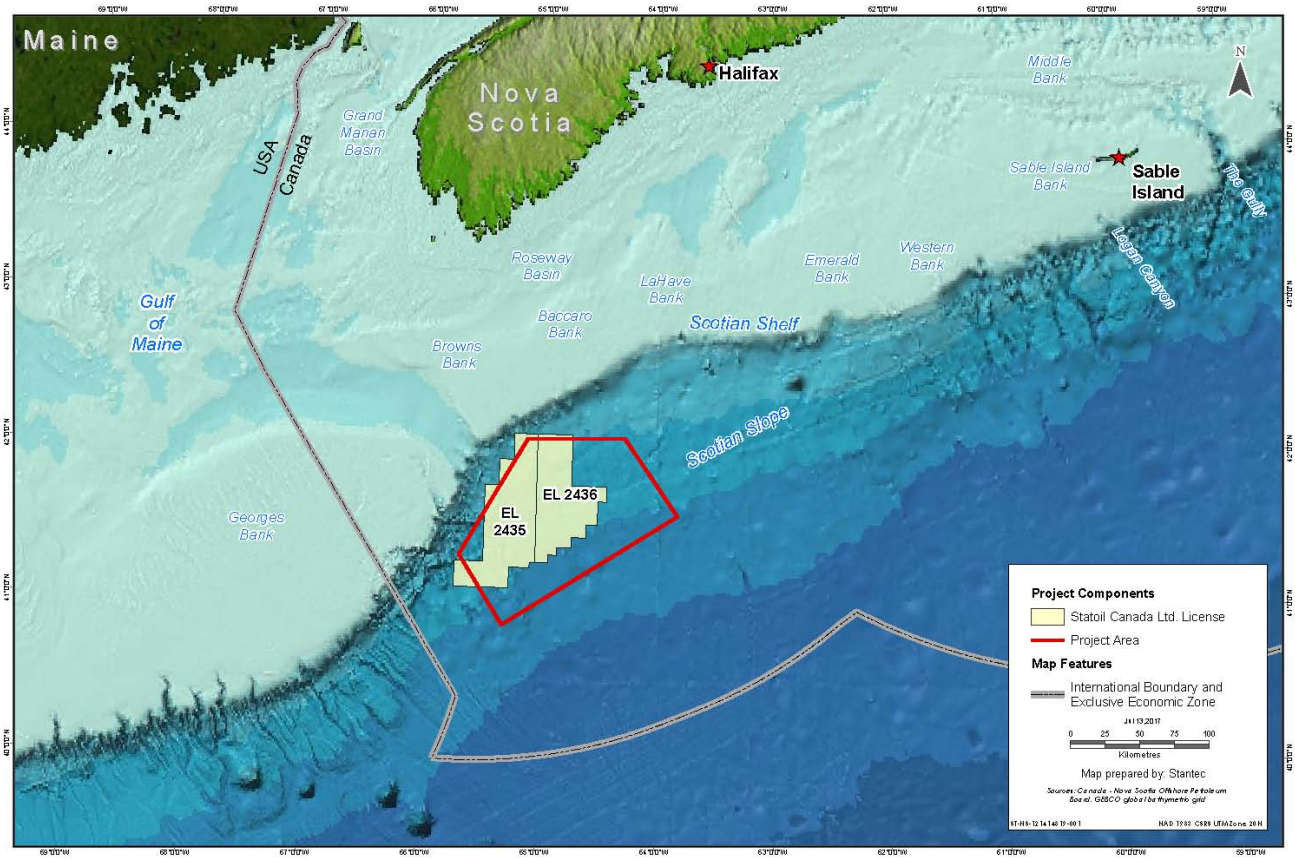

FIGURE 1.1. Statoil's Exploration Licences and Project Area offshore Nova Scotia.

1.1 Operator

Statoil ASA is a technology oriented oil and gas producer, focused on upstream exploration and production activities. It is a Norwegian-based company with business operations in 33 countries and territories. Headquartered in Stavanger, Norway, Statoil ASA has more than 20,000 employees worldwide. Statoil ASA is a globally active company involved in exploration and development of crude oil and natural gas, as well as development of renewable energy and other low-carbon solutions, and is committed to maximizing returns to stakeholders in an ethical, socially responsible, and environmentally responsible way.

Statoil Canada Ltd. (Statoil) has operations in Canada and is headquartered in Calgary, Alberta, with a local office in St. John's, Newfoundland and Labrador (NL). In the Grand Banks area, Statoil is a partner in the Hibernia, Hibernia South Extension, and Terra Nova producing oilfields. Statoil is also a partner in

the Hebron Project. In the NL offshore, Statoil is operator of five Significant Discovery Licences (SDLs) and 10 ELs, and has interests in 31 SDLs and one EL. Statoil's offshore Newfoundland operations are managed from its office in St. John's, NL.

Statoil is committed to conducting its operations in a manner that respects regional conditions. Statoil's Sustainability Strategy is focused on:

- balancing reliable energy supply and climate impact,
- aiming for outstanding resource efficiency,
- preventing harm to local environments,
- creating local opportunities,
- respecting human and labour rights, and
- being open and transparent.

Statoil will comply with applicable laws and regulations, and adhere to the requirements of guidelines and Project commitments made during the EA process for which this PD is submitted.

1.1.1 Roles and Contact Information

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2.0 Regulatory Context

The CNSOPB has confirmed that an EA is required before a geophysical authorization can be issued under paragraph 142(1)(b) of the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act*. As with recent seismic EAs undertaken for projects offshore Nova Scotia (i.e., Shell: LGL 2013; BP: LGL 2014), the EA for the proposed Project will follow a process that is like a screening level EA previously undertaken under the former *Canadian Environmental Assessment Act* (CEAA).

Other legislation that is relevant to the environmental aspects of this project include:

- *Species at Risk Act (SARA)*
- *Migratory Birds Convention Act*
- *Oceans Act*
- *Fisheries Act*
- *Navigable Waters Protection Act*
- *Canada Shipping Act*

This PD is intended to assist the CNSOPB in identifying the appropriate government departments or agencies that possess expert environmental or fishery-related knowledge relevant to the evaluation of potential Project effects. This PD will also assist the CNSOPB in developing the Scoping Document for the EA. The Department of National Defence will be contacted to acquire information on the locations of shipwrecks and unexploded munitions as well as plans for naval training exercises in and near the Project Area.

2.1 Canada-Nova Scotia Benefits Plan

Statoil is committed to the industrial and employment benefits objectives of the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* and CNSOPB guidelines including full and fair opportunity and first consideration for companies from Canada and Nova Scotia in particular.

Statoil actively seeks to enhance the participation of individuals and organizations from Nova Scotia and elsewhere in Canada in offshore oil and gas activity on the East Coast. In addition, Statoil encourages its suppliers and service providers to implement these principles.

A Benefits Plan has been submitted for review by the Benefits Review Committee of which the CNSOPB is a member.

2.2 Stakeholder Engagement

Statoil's values of Openness, Caring, Collaborating and Courageous are the core of Statoil's Management System. It is how business is conducted. Statoil is committed to delivering a transparent and respectful engagement program, and strives to develop and maintain constructive dialogue with

relevant stakeholders including Indigenous groups that may be affected by our Project. The engagement process is designed to be ongoing from initial planning through operation and follow-up after completion of the Project. Statoil aims to be sensitive to community's needs, understand differences, and develop effective ways to work together.

Statoil understands the importance and benefit of meaningful engagement with interested and potentially affected stakeholders; including relevant communities, Indigenous people, organizations and the general public. Indeed, early and ongoing stakeholder engagement comprises a key aspect of the planning and implementation of the company's oil and gas exploration and other activities.

3.0 Project Description

The Project is designated the Waverley 3D Seismic Survey of EL 2435 and EL 2436. Statoil is proposing to conduct a 3D seismic survey in and near ELs 2435 and 2436, which are located ~350 km southwest of Halifax (see Figure 1.1). The 3D seismic survey is planned for 2018 and is currently designed to acquire ~2500–5000 km^2 of 3D seismic data. Given that survey planning is ongoing the amount of data acquisition may change.

The survey design, seismic contractor, and details on equipment and vessels for the seismic survey have not yet been determined. It is anticipated that specific details will be provided in the EA. Statoil may also conduct geohazard surveys in future years depending on the analysis of existing 2D seismic data and the proposed 3D seismic survey data.

3.1 Spatial and Temporal Boundaries

Statoil has identified a Project Area as shown in Figure 3.1. Project activities, including seismic surveying and vessel turning, will occur in the Project Area (Figure 3.1). Water depths within the Project Area range from ~1500–3500 m. At this stage, the survey area(s), i.e., areas where seismic (and geohazard) data will be acquired have not been determined. The exact location of survey areas will be delineated in the coming months as details about the Project are refined and will be presented in the EA. The Study Area will be presented in the EA and will consider the propagation of seismic survey sound that could potentially affect marine biota. Statoil will not conduct Project activities within the George's Bank Oil and Gas Moratorium area or the North Atlantic right whale (*Eubalaena glacialis*) critical habitat in the Roseway Basin (Figure 3.1).

The temporal boundaries of the Project include the 1 April–31 October period in each year of Statoil's EL term (which expires in 2025). At present, Statoil is working towards acquisition of the proposed Waverley 3D seismic survey between April and October of 2018. The duration of the survey will depend on the acquisition methodology, survey size and design and is anticipated to take between 1 and 3 months. The survey will run continuously, subject to weather and equipment delays. The actual timing of acquisition will depend on many factors, including ongoing interpretation of results, procurement and contracting issues.

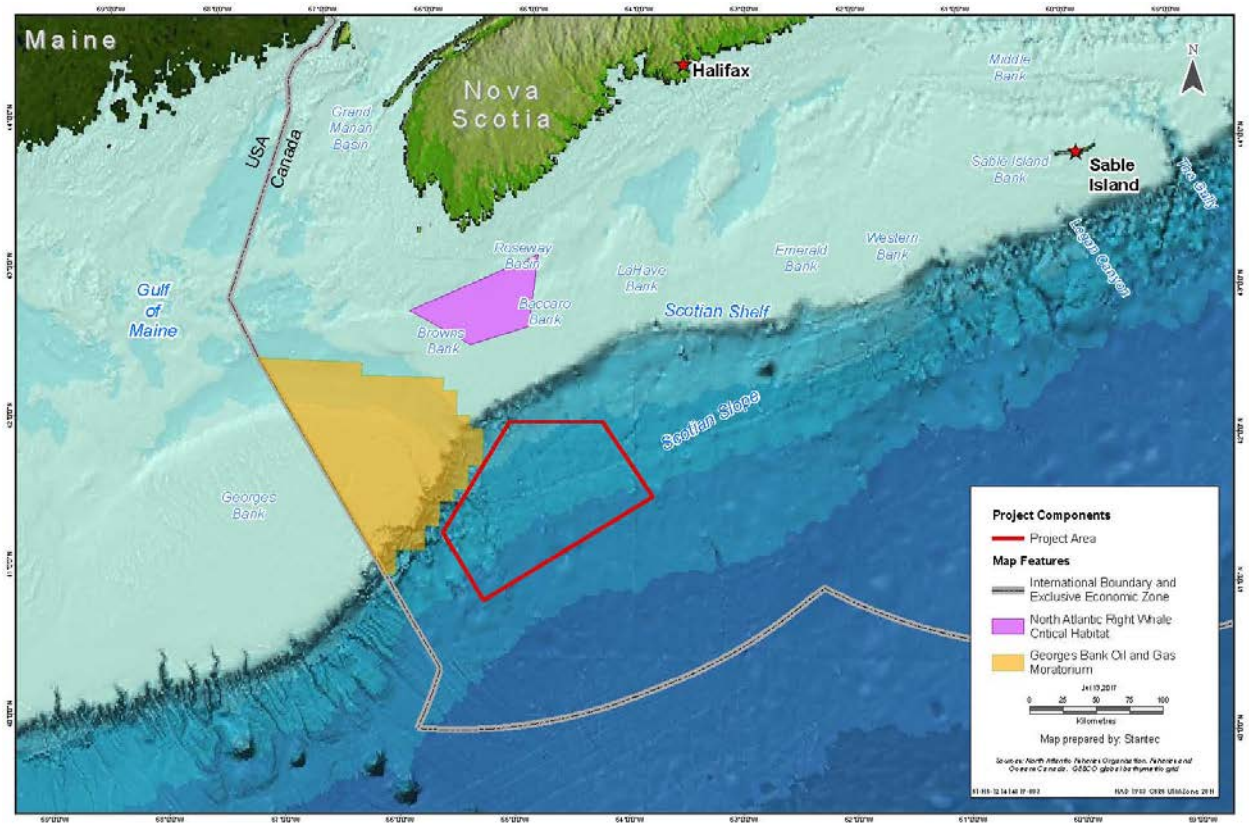

FIGURE 3.1. Location of Statoil's Project Area relative to the George's Bank Oil and Gas Moratorium area and North Atlantic right whale critical habitat (Roseway Basin).

3.2 Objective and Rationale of the Survey

The objective of the proposed 3D seismic survey is to allow Statoil to gain a better understanding of the subsurface in and around EL 2435 and EL 2436, to decide whether to continue exploration activities in the area. The primary focus of our current activities is in the southern portion of EL 2436, where water depths are >2000 m.

At present, the only seismic data covering the Statoil ELs are 2D seismic lines acquired by a variety of seismic contractors between the 1970s and early 2000s. Modern seismic acquisition and processing methods can provide much better resolution and imaging of the subsurface than those available in the early 2000s, and hence provide much more information necessary to decide upon future exploration activities. As is standard industry practise, acquiring a 3D seismic survey is the optimal method for understanding the subsurface in deep water settings. This has been the approach taken by other offshore operators in Nova Scotia since the early 2000s.

A geohazard survey is standard offshore industry procedure, to identify, and thus avoid during potential exploration drilling, any potential shallow hazards such as steep and/or unstable substrates or pockets of "shallow gas".

3.3 Seismic Surveys

Currently, Statoil intends to use a Narrow Azimuth (NAZ) acquisition method, which has been standard practise for industry and academic seismic surveys for more than 30 years and involves a single seismic vessel towing both the source (airgun array) and receivers (seismic cables or streamers). However, there is a possibility that a multi-vessel acquisition method (e.g., Wide Azimuth, WAZ) may be selected prior to finalising the survey design (see § 3.3.5).

Statoil may also acquire gravity and/or magnetic data (both collected passively, i.e., without using a source) using equipment on board and/or towed by the seismic vessel. The collection of gravity and magnetic data is a standard industry and academic methodology that has been safely practised in offshore surveys for more than 50 years. Gravity data are collected with instrumentation on board the seismic ship. Magnetic data are measured using a tow fish that is typically deployed behind the seismic vessel (i.e., between the stern of the vessel and the airgun arrays at a depth of ~5 m).

3.3.1 Narrow Azimuth Acquisition

The majority of 3D seismic surveys conducted offshore Nova Scotia have been NAZ surveys. A single seismic vessel is used to tow the source and multiple receiver cables in a Narrow Azimuth configuration. Additional vessels and helicopters are used for re-supply, crew changes and other logistical reasons and are described in § 3.4. Typically, the seismic vessel acquires seismic data in straight, parallel lines over the pre-defined seismic survey area at a constant speed of 7.8–9.3 km/h, and turns on a radius of 4–6 km at the end of each survey line. Statoil may continue to collect seismic data (i.e., operate the full airgun array) during line turns to maximize data collection in the survey area without increasing the overall footprint of the survey area.

3.3.2 Seismic Vessel

For a NAZ program there will be one seismic vessel that will tow both the seismic source array and the receiver cables. The vessel will have the necessary equipment, crew, and spare parts to conduct the program without having to go to port during the program. Crew change and re-supply will be carried out offshore, most likely using a supply vessel. The exact characteristics of the vessels will be determined after a procurement process is carried out, but the seismic vessel is anticipated to be typical of the world-wide seismic fleet. The seismic vessel will be around 80–110 m long and 30–40 m wide, have an at-sea endurance of 40–80 days, and a crew of 50–60 individuals. All personnel will have the required certifications as specified by relevant Canadian legislation and the CNSOPB.

3.3.3 Seismic Energy Source

The seismic energy source is comprised of several airguns, canisters that release pressurized air bubbles at 5 to 15 second intervals. The airguns are arranged in arrays and are typically towed 300–400 m behind the seismic vessel and at depths of 6–15 m. Airguns generally operate at 2000 psi (pounds per square inch). The airguns do not fire a projectile or use explosives. Airgun array specifics (e.g., volume, source level) will be provided in the EA.

3.3.4 Seismic Cables

Receiver cables (or streamers) are typically between 6–12 km in length, with around 6 to 16 cables laid out in parallel lines behind the seismic vessel with a distance between each cable of 50–125 m. The forward end of the cable is weighted to submerge the cable to the required depth, and the aft end of the

cable is marked with a tail buoy. Cables are towed under the water, at depths between 5–30 m below the sea surface, depending on the sea state, and desired outcome, although usually they are towed at depths between 12–20 m below sea surface. The data collected by the receivers is transmitted to the seismic vessel for quality control and initial processing of the seismic image. Seismic cable specifics (e.g., length, number, overall spread) will be provided in the EA. Statoil anticipates using solid streamers.

3.3.5 Multi-Vessel Acquisition

Wide azimuth and multi-azimuth acquisition of 3D seismic data use between two to six seismic vessels to image a broader area of the subsurface. Commonly, there are one or two ships towing seismic cables (§ 3.3.4), and two to four vessels towing seismic energy sources (§ 3.3.3). The exact configuration depends on the subsurface objectives. WAZ acquisition methodologies were used for the recent Shelburne and Tangier 3D surveys offshore Nova Scotia in 2013 and 2014 (see LGL 2013, 2014). As noted above, there is a possibility that Statoil may conduct a multi-vessel acquisition survey but currently Statoil is planning for a NAZ survey. Regardless of the survey technique, details on survey methods and design will be provided and assessed in the EA.

3.4 Logistics and Support

Several vessels and helicopters are typically used to support a seismic program, as described below.

3.4.1 Supply Vessels

A fit-for-purpose supply vessel that can safely and efficiently re-supply the seismic vessel with fuel, food, and equipment/spare parts will be utilized throughout the seismic program. In addition, Statoil plans to use a supply vessel to conduct crew changes given that the survey area is ~350 km from shore. This means that the supply vessel will be capable of safely carrying 30–40 passengers from port and transfer them to/from the seismic vessel offshore.

3.4.2 Scout Vessel

The main purpose of the scout vessel (also referred to as a picket or guard vessel) is to monitor the area ahead of the seismic vessel, and to ensure that there are no hazardous obstructions in the way that could cause a risk to the seismic vessel or the seismic equipment. The scout vessel would also be used as an additional method of acquiring information on commercial fishing activity in the area. In addition, the scout vessel will assist with emergency towing if the seismic vessel has engine problems.

3.4.3 Helicopters

As the survey area is in a remote location it will probably not be efficient to plan on using helicopters for crew change. Statoil's current plan is to conduct crew changes via the supply vessel. However, helicopters will be available for Medevac, and Search and Rescue (SAR) missions if necessary. The helideck on the seismic vessel will typically be rated for Sikorsky S-92 helicopters or equivalent (this will be confirmed after the procurement process for seismic contractors is completed).

3.4.4 Shore Base, Support and Staging

It is anticipated that vessel mobilization/demobilization and resupply will occur in Halifax. No new shore base facilities will be established as part of the Project.

3.5 Geohazard Survey

Statoil may conduct a geohazard survey(s) during the Project. These surveys typically involve acquisition of high resolution seismic, side scan sonar, sub-bottom profile, and bathymetric data over defined area(s). Geohazard surveys use closer line spacing, smaller equipment with lower sound levels (and typically at higher frequencies), and occur over a shorter time (i.e., several days) compared to 3D seismic programs. Statoil anticipates that the earliest a geohazard survey would occur would be in 2019.

The equipment and procedures used during a typical geohazard survey are summarized below.

- Surficial data are collected using a broad band (i.e., 500 Hz to 6 kHz) sparker or boomer as a sound source which provides data as deep as 100 m into the substrate.
- Seabed imagery is acquired with a digital, dual frequency side scan sonar system.
- High-resolution multichannel seismic data are acquired with a seismic source which typically consists of four or more separate airguns.
- A single and/or multi-beam echo sounder is used to collect bathymetry data.
- Seabed video and/or grab samples are used to provide ground-truthing information on the character of the seabed and sediments.
- If potential seabed debris is identified by the side scan or multi-beam systems, a proton magnetometer is utilized.

4.0 Health, Safety and Environment

Statoil will always aim for safeguarding our people, environment and assets from accidents. Our ambition is to be recognized as an industry leader in Safety. We believe that Safety prevention is founded on:

- compliance with rules and regulations;
- execution of safety leadership;
- risk awareness in everything we do;
- always effective, and efficient barriers are in place; and
- constantly improving safety performance together with our suppliers.

The overall goal of Statoil's Health, Safety and Environment Policy is Zero Harm, which is premised on the following:

- We understand and manage risk
- We can prevent all accidents
- We stop unsafe acts and operations
- We minimize our impact on the environment and climate
- We care about each other
- We create a safe and health work environment
- We work together with our partners to improve HSE results
- We have an open dialogue with society

4.1 Waste Management

Waste management will be handled consistent with industry best practices for offshore Nova Scotia seismic projects, with consideration given to Statoil experience in other jurisdictions around the world.

4.2 Accidental Events

There is potential for accidental events to occur during the proposed Project, including damage to the source and receiver gear, entanglement with fishing gear, spills of fluids (e.g., fuel), collision with other vessels and potential ship strikes of marine mammals. These potential events will have response plans outlined in more detail in the EA. Response plans will be reviewed and will require approval by the CNSOPB.

4.3 Environmental Features and Species at Risk

A Strategic Environmental Assessment (SEA) was completed in April 2014 for exploration activities along the Western Scotian Slope (Phase 3B; Stantec 2014). This SEA corresponds with the land blocks associated with EL 2435 and 2436, and the Project Area. Of note is the proximity to Georges Bank and critical habitat for the North Atlantic right whale (see Figure 3.1). The SEA addresses the physical and biological conditions of Statoil's Project Area and provides an overview of the effects of seismic surveys on the marine environment. Statoil's EA will draw upon the SEA to the extent possible but will also provide a detailed assessment that addresses the Scoping Document, which will be issued by the CNSOPB.

Marine species listed on Schedule 1 of SARA that have a reasonable likelihood of occurring in and near the Project Area are provided in Table 4.1.

TABLE 4.1. *SARA* Schedule 1-marine species with reasonable likelihood of occurrence in and near the Project Area.

Species		*SARA* Schedule 1[a]		
Common Name	**Scientific Name**	***Endangered***	***Threatened***	***Special Concern***
Blue Whale (Atlantic population)	*Balaenoptera musculus*	X		
North Atlantic Right Whale	*Eubalaena glacialis*	X		
Northern Bottlenose Whale (Scotian Shelf population)	*Hyperoodon ampullatus*	X		
Leatherback Sea Turtle (Atlantic population)	*Dermochelys coriacea*	X		
Loggerhead Sea Turtle	*Caretta caretta*	X		
Roseate Tern	*Sterna dougallii*	X		
Red Knot *rufa* subspecies	*Calidris canutus rufa*	X		
White Shark (Atlantic population)	*Carcharodon carcharias*	X		
Northern Wolffish	*Anarhichas denticulatus*		X	
Spotted Wolffish	*Anarhichas minor*		X	
Fin Whale (Atlantic population)	*Balaenoptera physalus*			X
Sowerby's Beaked Whale	*Mesoplodon bidens*			X
Atlantic Wolffish	*Anarhichas lupus*			X

Source: [a] *SARA* website (https://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1) (as of 17 July 2017).

4.4 Mitigation and Monitoring

Statoil is committed to minimizing the effects of the Project on the environment, including other offshore users in the area. All mitigation and monitoring that will be conducted during the seismic survey will be clearly outlined in the EA. Some key mitigation measures and monitoring that will be implemented are noted here. Statoil will follow the requirements as outlined in the *"Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment".* Dedicated and qualified Marine Mammal Observers (MMOs) and Seabird Observers (SBOs) will be on board the seismic vessel throughout the survey to monitor effects and implement mitigation measures for marine mammals, sea turtles, and birds. A Fisheries Liaison Officer (FLO) will be onboard the seismic vessel to assist if fisheries concerns arise during the seismic surveys. A FLO will assist with communication between parties operating in the Project Area and help to avoid interactions between the seismic survey and fishing activity.

5.0 Literature Cited

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