

Amendment to the Environmental Assessment of MKI's Southern Grand Banks Seismic Program, 2014–2018

Prepared by



for

Multi Klient Invest AS

&

TGS-NOPEC Geophysical Company ASA

**January 2015
Project No. FA0038**

Amendment to the Environmental Assessment of MKI's Southern Grand Banks Seismic Program, 2014–2018

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1.0 Introduction

This document serves as an Amendment to the Environmental Assessment (EA) prepared by LGL Limited (LGL) for Multi Klient Invest AS (MKI) and TGS-NOPEC Geophysical Company ASA (TGS)'s proposed 2014–2018 2-Dimensional (2D) and/or 3-Dimensional (3D) marine seismic program in the Southern Grand Banks area, Newfoundland and Labrador (LGL 2014). The Determination Report associated with this EA (C-NLOPB 2014) indicated that 3D seismic surveys had not been included in the environmental assessment of this Project and therefore was considered to be outside the scope of the Project. The C-NLOPB concluded that any 3D seismic surveys planned for the 2015-2018 period would require a separate assessment. This Amendment provides the assessment of 3D seismic surveying.

The Project and Study Areas associated with this Project are shown in Figure 1.

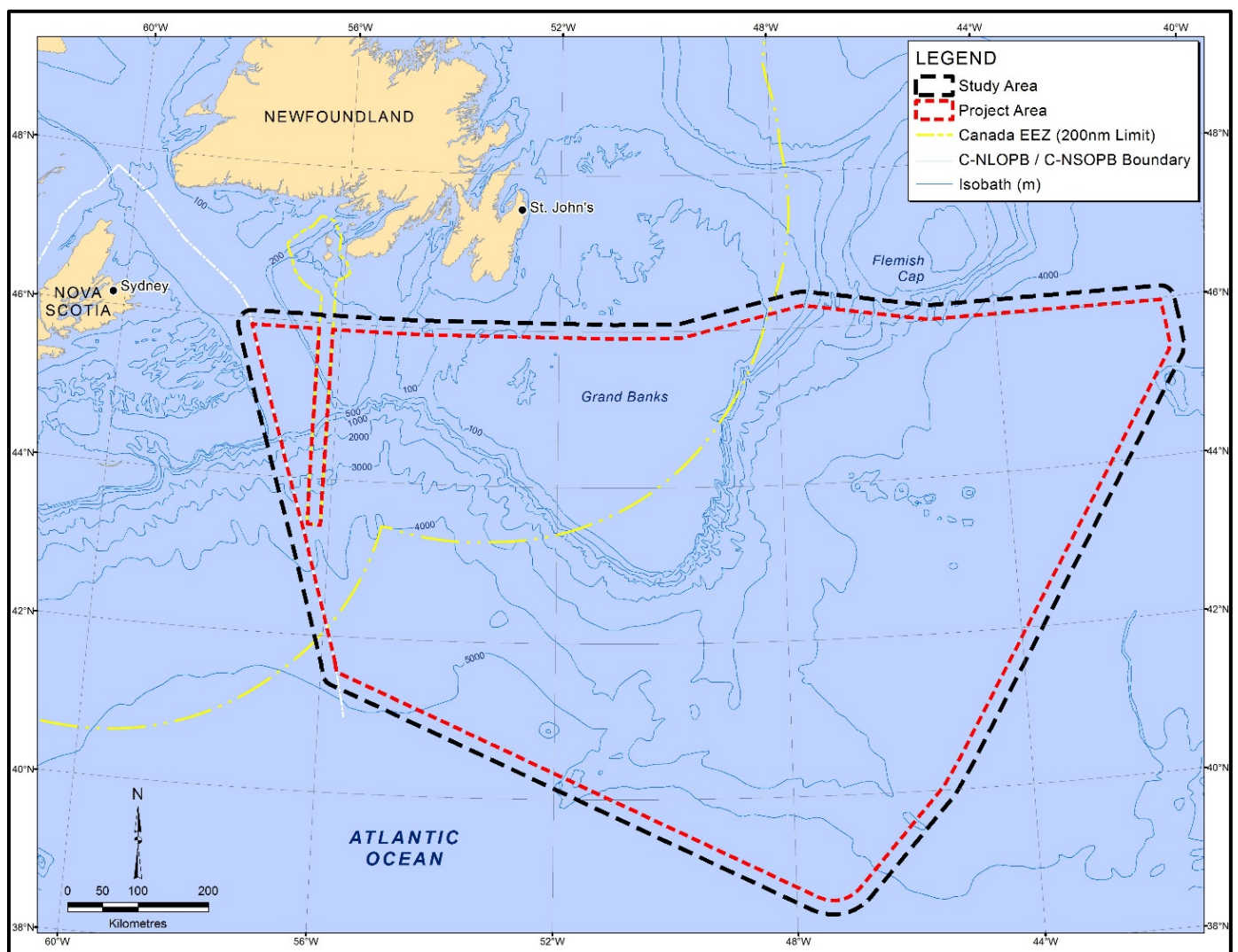


Figure 1. Locations of the Project Area and Study Area for Proposed 3D Seismic Surveying in the Southern Grand Banks, 2015 to 2018.

1.1 The Proponents: MKI and TGS

The Operator, MKI, is a wholly owned subsidiary of Petroleum Geo-Services ASA (PGS), headquartered in Oslo, Norway. MKI has entered into a cooperation agreement with TGS, headquartered in Houston, Texas, to conduct this seismic program. PGS is a leading provider of seismic and electromagnetic survey services, data acquisition, processing, and reservoir analysis for the global oil and gas industry. PGS was founded in Norway in 1991 and currently has a presence in over 25 countries with regional centers in London, Houston, and Singapore.

TGS provides multi-client geoscience data to oil and gas exploration and production companies worldwide. In addition to extensive global geophysical and geological data libraries that include multi-client seismic data, magnetic and gravity data, digital well logs, production data and directional surveys, TGS also offers advanced processing and imaging services, interpretation products, permanent reservoir monitoring and data integration solutions.

1.2 Contacts

Relevant contacts at MKI and TGS for the proposed seismic program are provided below.

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2.0 Project Description

One or more 3D seismic surveys are anticipated to occur within the Project Area (see Figure 1) during the 2015 to 2018 period. As indicated in the original EA (LGL 2014), the annual temporal window for these surveys is 1 May to 30 November.

2.1 Spatial and Temporal Boundaries

The spatial boundaries of the Project Area are shown in Figure 1. The Study Area includes the Project Area plus a 20 km buffer around the Project Area to account for the propagation of seismic survey sound that could potentially affect marine biota (see Figure 1). The areas of the Study Area and Project Area are 800,805 km² and 722,291 km², respectively. The Study Area extends slightly into both Nova Scotia waters and St. Pierre et Miquelon waters. Most of the Study Area and Project Area is located outside of Canada's Exclusive Economic Zone (EEZ) (200 nm limit).

The “corner” coordinates (decimal degrees, WGS84 projection) of the extents of the Project Area are as follow:

- Northwest: 45.914°N, 57.631°W;
- Northeast: 45.979°N, 40.960°W;
- Southeast: 38.657°N, 47.274°W; and
- Southwest: 41.546°N, 55.727°W

The temporal boundaries of the proposed Project, as defined in the EA, are between 1 May and 30 November during 2014-2018. The duration of a seismic survey is estimated at 60 to <120 days in a given year.

2.2 Project Overview

Data acquisition plans for 3D surveys for 2015 and beyond are not yet determined and will be driven to a large extent by the location of Sectors nominated by industry through the Land Tenure System.

Proposed 3D programs could be designed to cover an area of as much as 6,000 km² in one season. Acquisition would be carried out by a Ramform design seismic vessel (e.g., the M/V *Ramform Valiant* or a similar vessel) which will tow the sound source (airgun array) and multiple streamers (10 to 16) containing receiving hydrophones. Two support vessels will be required for a 3D seismic survey; one to serve as a picket vessel (e.g., the M/V *Blain M.* or a similar vessel), and the other to serve as a supply and crew change vessel. The specific seismic survey and support vessels that would be used during 3D surveys are unknown at present but will be approved for operation in Canadian waters by Transport Canada and C-NLOPB and will be typical of the worldwide fleet.

Proposed mitigation procedures intended to minimize the potential effects of the project activities associated with 3D seismic surveying are discussed in detail in MKI's EA of the Southern Grand Banks

Seismic Program (LGL 2014) (see Sections 5.6 and 5.10). Table 1 summarizes the proposed primary mitigation measures for each anticipated potential effect.

Table 1. Summary of Mitigations Measures.

Potential Effects	Primary Mitigations
Interference with fishing vessels	<ul style="list-style-type: none"> • Upfront planning to avoid high concentrations of fishing vessels to the greatest extent possible • SPOC • Advisories and communications • FLO for 3D seismic surveys • Planned transit route to and between Survey Areas (if required)
Fishing gear damage	<ul style="list-style-type: none"> • Upfront planning to avoid high concentrations of fishing gear to the greatest extent possible • SPOC • Advisories and communications • FLO for 3D seismic surveying • Compensation program
Interference with shipping	<ul style="list-style-type: none"> • SPOC • Advisories and communications • FLO for 3D seismic surveying
Interference with DFO/FFAW research vessels	<ul style="list-style-type: none"> • Communications and scheduling; avoidance to the greatest extent possible
Temporary or permanent hearing damage/disturbance to marine animals	<ul style="list-style-type: none"> • Delay start-up if marine mammals or sea turtles are within 500 m • Ramp up of airguns over 30 min-period • Shutdown of airgun arrays for <i>endangered</i> or <i>threatened</i> marine mammals and sea turtles within 500 m • Use of qualified MMO(s) to monitor for marine mammals and sea turtles during daylight seismic operations
Temporary or permanent hearing damage/disturbance to Species at Risk or other key habitats	<ul style="list-style-type: none"> • Delay start-up if any marine mammals or sea turtles are within 500 m • Ramp up of airguns • Shutdown of airgun arrays for <i>endangered</i> or <i>threatened</i> marine mammals and sea turtles • Use of qualified MMO(s) to monitor for marine mammals and sea turtles during daylight seismic operations
Injury (mortality) to stranded seabirds	<ul style="list-style-type: none"> • Daily monitoring of vessel • Handling and release protocols • Minimize unnecessary lighting when practical and safe to do so
Exposure to hydrocarbons	<ul style="list-style-type: none"> • Adherence to International Convention for the Prevention of Pollution from Ships (MARPOL) • Spill contingency plans; bunkering at sea procedures • Use of solid streamer when feasible

3.0 Effects of the Project Activities on the Environment

The assessment of the potential effects of seismic surveying on marine biota presented in MKI's EA of the Southern Grand Banks Seismic Program (LGL 2014) is directly applicable to the assessment of the potential effects of 3D seismic surveying on marine biota. The principal differences between 2D and 3D seismic surveying are as follow: (1) 3D seismic surveying includes multiple streamers compared to single streamers for 2D seismic surveying (i.e., wider streamer swath in 3D seismic), resulting in greater potential for physical conflict between seismic vessel/equipment and fishing vessels/gear; and (2) the survey lines in 3D seismic surveying are typically closer to one another (i.e., less distance between adjacent lines), resulting in possible higher cumulative exposures of biota to seismic energy at any particular location within the survey area. All project activities and their potential interactions with the various Valued Environmental Components (VECs) described in MKI's EA of the Southern Grand Banks Seismic Program (LGL 2014) are applicable to 3D seismic surveying.

The relevant assessment tables in MKI's EA of the Southern Grand Banks Seismic Program (LGL 2014) are indicated in Table 2.

Table 2. Assessment Tables for each VEC in the Original EA (LGL 2014) Applicable to Assessment of 3D Seismic Surveying.

VEC	Interactions Tables	Assessment Tables	Significance Tables
Fish and Fish Habitat	Table 5.3	Table 5.4	Table 5.5
Fisheries	Table 5.6	Table 5.7	Table 5.8
Seabird	Table 5.9	Table 5.10	Table 5.11
Marine Mammals and Sea Turtles	Table 5.12	Tables 5.13 and 5.15	Tables 5.14 and 5.16
Species at Risk	Table 5.17	Table 5.18	Table 5.19
Sensitive Areas	Refers to tables for other VECs	Refers to tables for other VECs	Refers to tables for other VECs

3.1 Residual Effects Assessment Summary

All predictions made in MKI's EA of the Southern Grand Banks Seismic Program (LGL 2014) relating to the 'significance' of the residual effects of Project activities on the various VECs remain the same for the residual effects of 3D seismic surveying activities on the various VECs.

A summary of the Project's residual effects on the environment are shown in Table 3. All activities associated with MKI's proposed 3D seismic surveying are predicted to have *no significant* effects on any of the VECs.

Table 3. Significance of Potential Residual Environmental Effects of MKI's Proposed 3D Seismic Surveying on VECs Occurring within the Study Area.

Valued Environmental Component: Fish and Fish Habitat, Fisheries, Birds, Marine Mammals, Turtles, Species at Risk, Sensitive Areas				
Project Activity	Significance Rating	Level of Confidence	Likelihood ^a	
	Significance of Predicted Residual Environmental Effects		Probability of Occurrence	Scientific Certainty
Underwater Sound				
3D airgun arrays	NS	2-3	-	-
Seismic vessel	NS	3	-	-
Support vessel	NS	3	-	-
Supply vessel	NS	3	-	-
Echo sounder	NS	3	-	-
Helicopter				
Vessel Presence				
Seismic vessel, including airgun arrays and multiple streamers	NS	3	-	-
Support vessel	NS	3	-	-
Supply vessel	NS	3	-	-
Vessel Lights				
Helicopter Presence				
Sanitary/Domestic Wastes				
Atmospheric Emissions				
Accidental Releases				
<p>Key:</p> <p>Significance is defined as either a high magnitude, or a medium magnitude with duration greater than 1 year and a geographic extent >100 km²</p> <p>Residual Environmental Effect Rating: S = Significant Negative Environmental Effect NS = Not-significant Negative Environmental Effect P = Positive Environmental Effect</p> <p>Level of Confidence: based on professional judgment: 1= Low 2=Medium 3= High</p> <p>Probability of Occurrence: based on professional judgment: 1= Low 2= Medium 3= High</p> <p>Scientific Certainty: based on scientific information and statistical analysis or professional judgment: 1= Low 2= Medium 3= High</p> <p>^a Considered only in the case where 'significant negative effect' is predicted.</p>				

3.2 Cumulative Effects

MKI's EA of the Southern Grand Banks Seismic Program (LGL 2014) assessed cumulative effects within the Project and thus, the residual effects described in preceding sections include any potential cumulative effects from the MKI geophysical program activities in the Project Area. The original EA also assessed cumulative effects from other non-Project activities that are either occurring or are planned for the Regional Area. These activities may include:

- fisheries (commercial and research);
- marine transportation; and
- other oil and gas activities.

As indicated in Section 5.9.3 of MKI's EA of the Southern Grand Banks Seismic Program (LGL 2014):

“there is potential for cumulative effects with other seismic programs proposed for 2014-2018 (e.g., GXT, Statoil, Husky, MKI). Different seismic programs could potentially be operating in close proximity. During these periods, marine mammals may be exposed to noise from each of the seismic survey programs. It will be in the interests of the different parties for good coordination between programs in order to provide sufficient buffers and to minimize acoustic interference.”

Therefore, should MKI decide to conduct two concurrent seismic surveys within the Project Area during 2015-2018, sufficient spatial buffers will be employed to minimize acoustic interference and the potential effects on biota of exposure to airgun sound from both surveys.

The EA predictions that between-project cumulative effects will be *not significant* remain valid for the 3D seismic surveying assessment.

4.0 Literature Cited

- C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2014. Determination Report for Environmental Assessment of MKI Southern Grand Banks Seismic Program, 2014-2018. 13 p.
- LGL Limited. 2014. Environmental Assessment MKI Southern Grand Banks Seismic Program, 2014-2018. LGL Rep. SA1250. Rep. by LGL Limited, St. John's, NL for Multi Klient Invest AS, Oslo, Norway, and TGS-NOPEC Geophysical Company ASA, Houston, TX. 254 p. + App.