Project Description

2017–2026 Multiklient Invest Newfoundland and Labrador Offshore Seismic Program

Prepared by

LGL LIMITED
environmental research associates

Prepared for

Multiklient Invest AS

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TGS-NOPEC Geophysical Company ASA

November 2016
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1.0 INTRODUCTION

Multiklient Invest AS (MKI), a wholly-owned subsidiary of Petroleum Geo-Services ASA (PGS), and TGS-NOPEC Geophysical Company ASA (TGS) are proposing to conduct two dimensional (2D), three dimensional (3D), and/or four dimensional (4D) seismic surveys in offshore Newfoundland and Labrador (the Project). MKI will serve as operator. The Project Area identified in Figure 1 includes Northern and Southern Grand Banks, the Flemish Cap and the shelf region off NE Newfoundland and Labrador, as well as offshore slope and deep water regions associated with the shelf (e.g., Flemish Pass, Orphan Basin, parts of the Labrador and Newfoundland basins). MKI and TGS are proposing to conduct seismic surveys, sometimes two or more operations, during one or more years within the 2017–2026 timeframe.

This document is the Project Description (PD), the first step in the Canada-Newfoundland and Labrador Offshore Petroleum Board's (C-NLOPB) environmental assessment (EA) process. This PD, combined with the technical and scoping advice received from the C-NLOPB, other federal agencies, and stakeholders consulted by MKI and TGS, will guide the preparation of an EA.

1.1 Relevant Legislation and Regulatory Approvals

An Authorization to Conduct a Geophysical Program will be required from the C-NLOPB. The C-NLOPB is mandated in this matter by the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act*. The *Canadian Environmental Assessment Act, 2012* (*CEAA, 2012*) came into force on 6 July 2012. The "Regulations Designating Physical Activities" lists physical activities which fall under the new Act. Marine seismic surveys are not included on the list and therefore do not require an EA under the Canadian Environmental Assessment Agency (CEAA).

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

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

One of the specific guidelines issued by the C-NLOPB, the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2016), is directly relevant to the proposed undertaking.

Authorizations for the kinds of activities described in this PD will be issued under the *Atlantic Accord Implementation Act* at the discretion of the C-NLOPB.

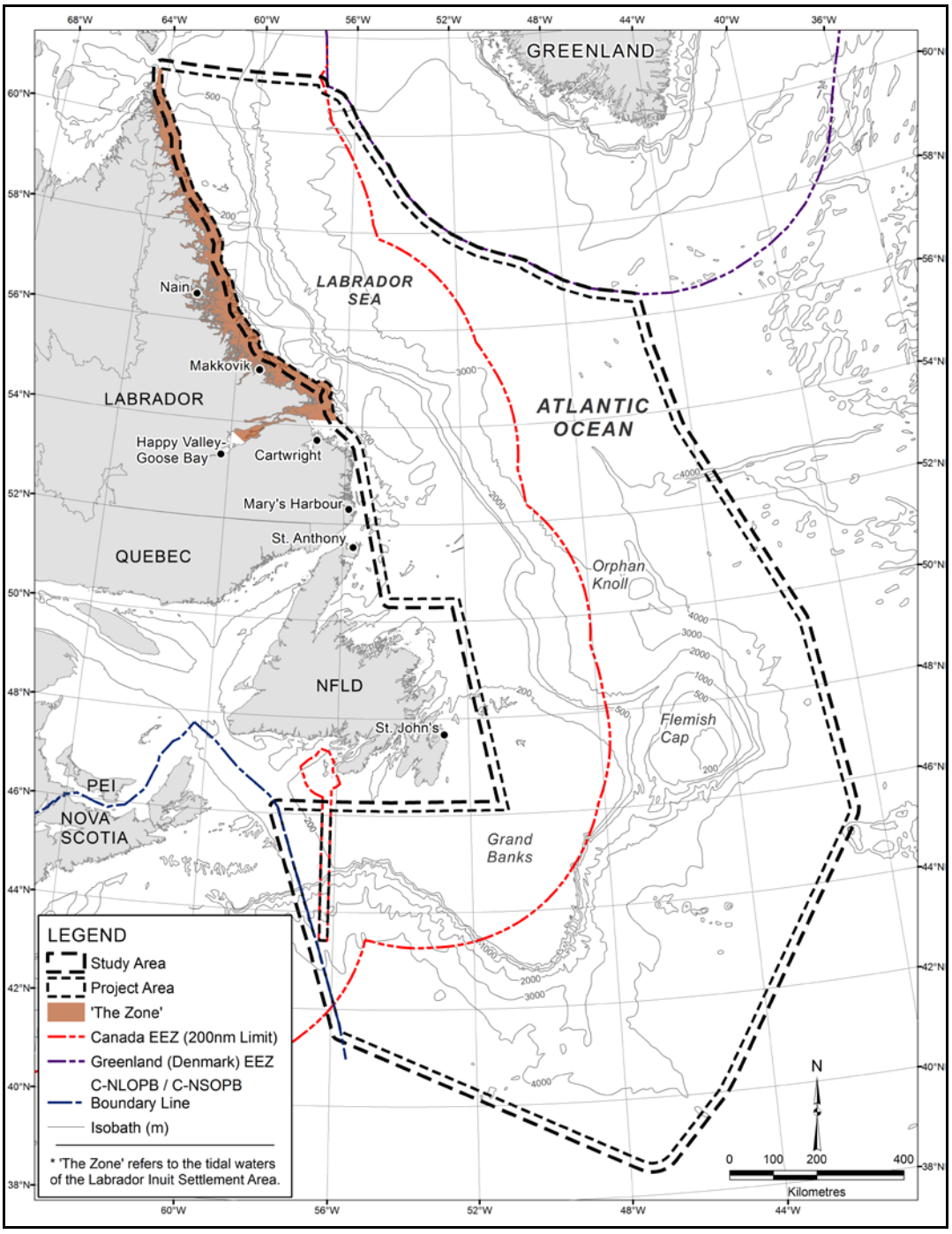

Figure 1. Locations of Project Area and Study Area for MKI's Proposed Offshore Newfoundland and Labrador Seismic Program, 2017–2026.

1.2 The Operator

The Operator, Multiklient Invest AS (MKI), is a wholly owned subsidiary of Petroleum Geo-Services ASA (PGS). MKI has entered into a cooperation agreement with TGS-NOPEC Geophysical Company AS, to conduct this work.

1.3 Canada-Newfoundland and Labrador Benefits

In full appreciation of the requirements of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act*, MKI are committed to providing maximum benefits associated with East Coast operations to Canadians, and in particular, to Newfoundland and Labrador individuals and companies where they are commercially competitive in accordance with MKI's requirements.

MKI will manage the seismic operations from St. John's, Newfoundland and Labrador. MKI agrees that first consideration will be given to personnel, support and other services that can be provided from within Newfoundland and Labrador, and to goods manufactured in Newfoundland and Labrador as long as the goods and services can be delivered at a high standard of Health, Safety and Environmental competency, are of high quality, and are competitive in terms of fair market price. All contractors and subcontractors working for MKI in Newfoundland and Labrador must also apply these principles in their operations.

1.4 Contacts

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2.0 PROJECT DESCRIPTION

The official name of the Project is 2017–2026 Multiklient Invest Newfoundland and Labrador Offshore Seismic Program. MKI is proposing to conduct one or more 2D, 3D and/or 4D seismic surveys within its proposed Project Area (see Figure 1) between 2017 and 2026, starting as early as May 2017. There is the possibility that MKI will concurrently conduct two or more 2D and/or 3D surveys in any given year. The timing of the surveys is subject to MKI priorities and circumstances, weather conditions, contractor availability, and regulatory approvals.

2.1 Spatial and Temporal Boundaries

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 proposed Project Area includes space to account for ship turning and streamer deployment. The areal extents of the Project Area and the Study Area are 1,898,806 km^2 and 2,053,781 km^2, respectively. As indicated in Figure 1, larger proportions of the Project Area and Study Area lie outside of Canada's Exclusive Economic Zone (EEZ) (~58%) than inside the EEZ (~42%). Water depths within the Project Area range from <100 m to >4,000 m (see Figure 1).

The coordinates that delineate the Project Area (decimal degrees, WGS84 Datum) are as follow:

- 61.000°N, 64.253°W (western extreme);
- 61.003°N, 57.587°W (northern extreme);
- 60.700°N, 56.743°W;
- 57.818°N, 52.301°W;
- 56.307°N, 45.504°W;
- 53.644°N, 44.547°W;
- 49.374°N, 41.468°W;
- 45.417°N, 40.887°W (eastern extreme);
- 40.042°N, 45.501°W;
- 38.658°N, 47.365°W; (southern extreme);
- 41.546°N, 55.727°W;
- 46.093°N, 57.716°W;
- 46.099°N, 56.404°W; (Saint-Pierre et Miquelon (SPM) Exclusion)
- 43.418°N, 56.383°W; (SPM Exclusion)
- 43.411°N, 56.156°W; (SPM Exclusion)
- 46.100°N, 56.151°W; (SPM Exclusion)
- 46.091°N, 50.869°W;
- 50.473°N, 52.199°W;
- 50.481°N, 54.424°W;

- 53.601°N, 55.428°W;
- 54.601°N, 56.623°W;
- 55.614°N, 59.281°W;
- 57.254°N, 60.938°W; and
- 59.421°N, 63.041°W.

The large Project Area is essentially the sum of the Project Areas associated with previous MKI seismic programs offshore Newfoundland and Labrador. These are the Labrador Sea Seismic Program, 2014–2018 (LGL 2014a and associated documents), the Northeast Newfoundland Slope Seismic Program, 2012–2017 (YOLO and RPS 2012 and associated documents), and the Southern Grand Banks Seismic Program, 2014–2018 (LGL 2014b and associated documents). MKI has been conducting 2D and 3D seismic surveys in each of these Project Areas during recent years.

The coordinates that delineate the Study Area (decimal degrees, WGS84 Datum) are as follow:

- 61.108°N, 64.546°W (western extreme);
- 61.128°N, 57.321°W (northern extreme);
- 60.835°N, 56.501°W;
- 57.970°N, 52.121°W;
- 56.426°N, 45.262°W;
- 53.703°N, 44.260°W;
- 49.415°N, 41.201°W;
- 45.395°N, 40.636°W (eastern extreme);
- 39.934°N, 45.315°W;
- 38.478°N, 47.410°W; (southern extreme);
- 41.445°N, 55.925°W;
- 46.205°N, 57.917°W;
- 46.274°N, 51.184°W;
- 50.294°N, 52.427°W;
- 50.345°N, 54.608°W;
- 53.681°N, 55.852°W;
- 54.543°N, 56.919°W;
- 55.584°N, 59.593°W;
- 57.220°N, 61.262°W; and
- 59.380°N, 63.382°W.

The temporal boundaries of the Project are 1 May to 30 November during 2017–2026. The approximate durations of proposed 3D and 2D seismic surveying in 2017 are 90–150 days and 150 days, respectively.

2.2 Project Overview

The proposed Project is a ship-borne geophysical program that may include as much as 20,000 km^2 of 3D seismic survey and 20,000 km of 2D seismic survey lines in 2017. Specific data acquisition plans for 2D, 3D and/or 4D surveys during 2018–2026 are not yet determined.

For the proposed 3D surveying in 2017, the seismic survey vessel(s) would be the PGS vessel *Ramform Atlas* and/or a similar vessel. Depending on the final program plans for 2017, there is the possibility that a second seismic vessel will also be conducting 3D surveying. The proposed 2D seismic surveying in 2017 will be acquired by either the PGS vessel *Atlantic Explorer* or a similar vessel. The seismic survey vessel(s) used during subsequent 2D/3D/4D surveys are currently unknown but will be approved for operation in Canadian waters and will be typical of the worldwide fleet. Details on airgun arrays and streamers are provided in Sections 2.2.6 and 2.2.7, respectively.

The C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2016) will be used as the basis for the marine mammal monitoring and mitigation program for the seismic surveys. Dedicated Marine Mammal Observers (MMOs) will monitor for marine mammals and sea turtles and implement mitigation measures as appropriate. The airgun array will be ramped up, and ramp ups will be delayed if a marine mammal or sea turtle is detected within the appropriate safety zone (minimum of 500 m as noted in Fisheries and Oceans Canada *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment*). The airgun array will be shut down any time an *endangered* or *threatened* (as listed on Schedule 1 of *SARA*) marine mammal or sea turtle is detected within the safety zone. These measures are designed to minimize disturbance to marine life, particularly marine mammals and species considered at risk under the *SARA*. In addition, the MMOs will conduct a monitoring and release program for seabirds which may strand on board project vessels. A Fisheries Liaison Officer (FLO) will be on board the seismic vessel to ensure implementation of communication procedures intended to minimize conflict with the commercial fishery.

2.2.1 Objectives and Rationale

The primary objective of the Project is to determine the presence and likely locations of geological structures that might contain hydrocarbon deposits. Existing seismic data in the area do not provide sufficient detail or coverage to serve the needs of the energy companies in their exploration, development and production activities. Acquisition of more 2D, 3D and/or 4D seismic data is required to provide images of higher resolution and quality that will reduce the possibility of unnecessary drilling activity.

2.2.2 Project Scheduling

As already indicated in Section 2.1, the seismic surveys will be conducted between 1 May and 30 November of any given year from 2017–2026.

2.2.3 Site Plans

In 2017, it is possible that there will be ~18,000 km^2 of 3D survey lines and 20,000 km of 2D survey lines. The 2D seismic survey lines will be primarily orientated ESE-WNW or SSW-NNE with an approximate 5–50 km separation between adjacent lines. The survey line lengths are estimated to vary between 100–500 km.

2.2.4 Personnel

A typical seismic vessel can accommodate ~55–60 personnel. Personnel on a seismic vessel include ship's officers and marine crew as well as technical and scientific personnel. The seismic vessel will also have MMOs and a FLO on board. All project personnel will have the required certifications as specified by the relevant Canadian legislation and the C-NLOPB.

2.2.5 Seismic Vessel

In 2017, MKI will use either the *MV Ramform Atlas* or a similar vessel for the 3D seismic surveying, and the *MV Atlantic Explorer* or a similar vessel for the 2D surveying. There is the possibility that MKI will also use a second vessel for 3D seismic surveying.

The *MV Ramform Atlas*, launched in 2014, represents an enormously stable platform with the flexibility to encompass virtually any acquisition design (Figure 2). This vessel takes safety, efficiency and productivity to a new level. For clients, this can mean completing an exploration program safely in one season whereas other vessels might require two seasons. The 70 meter-wide back deck houses the industry's largest seismic spread as well as workboats to maintain it. Power, capacity and redundancy are the keys to maximizing seismic data production. Three variable pitch propellers provide 1.8 Megawatts of power, more than sufficient to tow her ultra-wide spread of dual-sensor recording equipment. The propulsion system permits full operations with just two propellers and one of the fully-separated, dual engine rooms. Two stern-launched work boats permit streamer maintenance also in marginal weather. Maintenance can increasingly be carried out at sea without impairing operations.

Figure 2. ***MV Ramform Atlas.***

The Titan class has 24 streamer reels; 16 abreast with a further 8 in a second row, and 22 tow points. The back deck layout is augmented by six independent source array handling booms. Together these enable faster deployment and recovery with increased flexibility and safety, making it possible to fully utilize the operational weather window. Steerable sources and streamers, combined with automated gear-handling systems increase flexibility and efficiency.

The *MV Atlantic Explorer*, which has been used to conduct 2D surveys in the NL offshore during 2014–2016, will again be used for 2D surveys in 2017.

For seismic surveys during 2018–2026, vessel specifics will be provided once the vessel(s) has been identified.

2.2.6 Seismic Energy Source Parameters

The sound sources for the proposed 2D/3D/4D survey program will consist of one, two or three airgun arrays. For any sound source that consists of either two or three airgun arrays, the arrays will be discharged alternately (i.e., multiple airgun arrays will not be discharged simultaneously. The total volume of an airgun array will range from 3,000–6,000 in^3. The airgun array(s) will be deployed at depths ranging from 6–15 m. The airguns will be operated with compressed air at pressures ranging from of 2,000–2,500 psi. The peak-to-peak sound source level will be ~100–200 bar-m (~260–266 dB re 1 $\mu Pa \cdot m_{pp}$). Detailed specifications of the airgun array will be provided once the 2017 project design is completed and parameters are selected.

2.2.7 Seismic Streamers

If seismic surveying is conducted in 2017, the 2D survey vessel will tow one streamer and the 3D vessels will tow as many as 16 solid streamers, each ranging in length from 6–12 km at depths ranging from 9–25 m. Beyond 2017 it is possible that a 3D vessel may tow more than 16 streamers but this will be detailed in future updates.

2.2.8 Logistics/Support

2.2.8.1 Vessels

MKI's primary support and supply will be provided by either the PGS vessel *MV Thor Magni* or a similar vessel. It is anticipated that at least one local escort vessel will accompany each operating seismic vessel. When necessary, escort vessels will be used to scout ahead of the seismic vessels for fishing vessels and gear, as well as for hazards such as ice and floating debris.

2.2.8.2 Crew Changes

The *MV Ramform Atlas* and the *MV Atlantic Explorer* are equipped with a helicopter deck. Crew changes will be conducted either by helicopter, ship-to-ship transfer, or ship-to-shore transfer.

2.2.8.3 Shore Base, Support and Staging

MKI will have a shore representative based in St. John's for the duration of the seismic program. No new shore base facilities will be established as part of the Project.

2.2.9 Waste Management

Waste management will be consistent with industry best practices in offshore Newfoundland and Labrador. MKI follows MARPOL 73/78 Annex IV: Pollution by Sewage from Ships, and Annex V: Pollution by Garbage from Ships.

2.2.10 Air Emissions

Air emissions will be those associated with standard operations for marine vessels, including the seismic vessel, the support vessel and the picket vessel. MKI follows MARPOL 73/78 Annex VI: Regulations for the Prevention of Air Pollution from Ships.

2.2.11 Accidental Events

In the unlikely event of the accidental release of hydrocarbons during the Project, the measures outlined in MKI's oil spill response plan will be implemented. The oil spill response plan will be filed with the C-NLOPB. In addition, MKI will have an emergency response plan in place.

2.3 Mitigation and Monitoring

Project mitigation measures will be detailed in the EA, some of which will follow the guidelines outlined in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*. Mitigation procedures will include ramp-ups, implementation of ramp-up delays and airgun array shutdowns for designated marine mammal and sea turtle species, use of dedicated MMOs and FLOs, and a fisheries compensation program. In addition, the MMOs will conduct a monitoring and release program for seabirds which may strand on Project vessels. Seabird monitoring will include systematic counts based on protocols issued by the Canadian Wildlife Service.

3.0 ENVIRONMENTAL ASSESSMENT

The EA will closely follow previous assessments of seismic programs in the Newfoundland and Labrador offshore. The primary issue of concern relates to the potential effects of exposure to underwater airgun sound on marine fauna and fisheries.

3.1 Physical and Biological Environment

The Eastern Newfoundland Strategic Environmental Assessment (SEA; C-NLOPB 2014), Southern Newfoundland SEA (C-NLOPB 2010), and Labrador Shelf SEA (C-NLOPB 2008) provide descriptions of the physical and biological environments in much of the Study Area. A description of the physical and biological environments will be provided in the EA for this Project. Background information will be provided for the anticipated Valued Environmental Components (VECs): fish and fish habitat, fisheries, marine birds, marine mammals, sea turtles, species at risk and sensitive areas.

3.2 Effects of the Environment on the Project

A discussion of expected effects of the physical environment on the Project, based partly on information in the relevant SEAs (C-NLOPB 2008, 2010, 2014), will be included in the EA.

3.3 Effects of the Project on VECs

The effects of Project activities on VECs, most notably the underwater sound from airgun arrays, will be assessed in detail. Information on the known effects of Project activities on the VECs, with emphasis on the effects of underwater sound on marine fauna, will be reviewed and used to predict residual effects on VECs. Input received during consultations will be considered when determining the mitigation and monitoring procedures that will be included in the EA.

Accidental events associated with Project activities, such as an unplanned hydrocarbon release, will also be assessed in the EA. The EA will also include an analysis of cumulative environmental effects.

3.4 Consultations

As part of the EA process, MKI will consult with stakeholders who have an interest in the Project. This will assist in scoping the effects assessment and mitigation plan. The results of the consultations (i.e., issues of concern) will be presented and addressed in the EA.

MKI will undertake a consultation program with various consultees including:

- Fisheries and Oceans Canada (DFO);
- Environment Canada (EC);
- One Ocean;
- FFAW-Unifor;
- Study Area fishers;
- Various indigenous groups (e.g., Nunatsiavut Government);
- Nature Newfoundland and Labrador (NNL);
- Various fish processors; and
- Other identified Newfoundland and Labrador fisheries industry stakeholders.

Note that consultations will be held in St. John's and at various locations in Labrador.

4.0 REFERENCES

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