Project Description:

Multiklient Invest Newfoundland Offshore Seismic Program, 2024–2028

Prepared by

Prepared for

Multiklient Invest AS

and

TGS-NOPEC Geophysical Company ASA

13 October 2023
LGL Project No. FA0281

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Multiklient Invest Newfoundland Offshore Seismic Program, 2024–2028

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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 offshore Newfoundland (the Project). The Project Area is identified in Figure 1.1. MKI is proposing to conduct seismic surveys, sometimes two or more operations, during one or more years within the 2024–2028 timeframe.

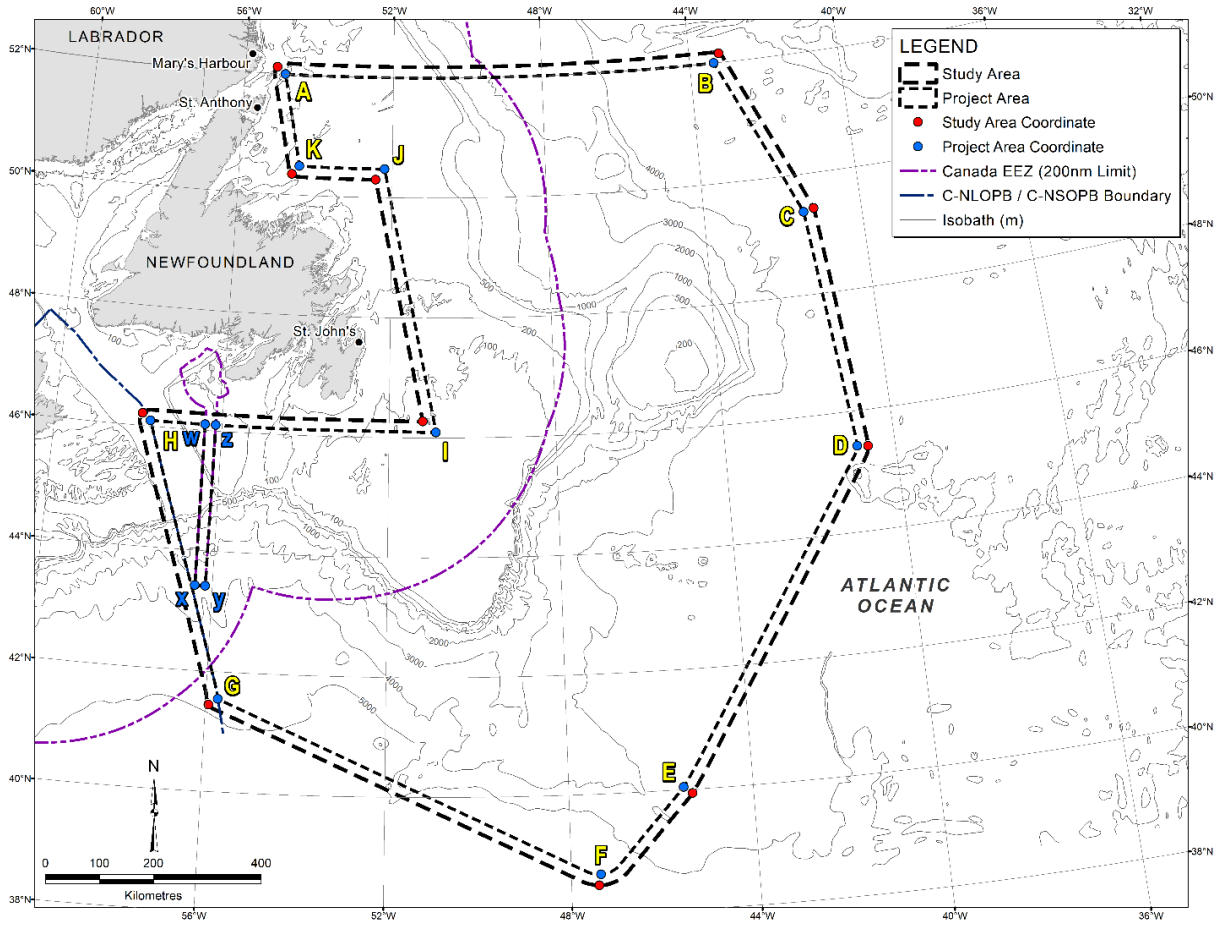

Figure 1.1. Locations of Project Area and Study Area for MKI`s proposed offshore Newfoundland seismic program, 2024–2028.

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, 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* (Section 138(1)(b)) and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* (Section 134(1)(b)).

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 2019), is directly relevant to the proposed undertaking.

1.2 The Operator

The Operator, MKI, is a wholly owned subsidiary of PGS. MKI has entered into a Joint Venture 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

Contact information for MKI (Table 1.1) and TGS (Table 1.2) personnel overseeing the Project are provided below.

Table 1.1. MKI contact information.

Name	Position	Address	Company	Phone	Email
Executive Contact					
Mr. Neil Paddy	Vice President, Business Development, North America	15375 Memorial Drive, Suite 100 Houston, Texas 77079	Petroleum Geo-Services Inc.	1-713-257-0791	neil.paddy@pgs.com
Mr. Sriram Arasanipalai	Business Development Manager, North America	15375 Memorial Drive, Suite 100 Houston, Texas 77079	Petroleum Geo-Services Inc.	1-979-450-5792	sriram.arasanipalai@pgs.com
Environment Contact					
Mr. Roger Honningdal	Vice President, HSE	P.O. Box 251 Lilleaker, 0216 Oslo, Norway	Petroleum Geo-Services Inc.	+47 922 52 405	Roger.Honningdal@pgs.com

Table 1.2. TGS contact information.

Name	Position	Address	Company	Phone	Email
Executive Contact					
Mr. Steve Whidden	Project Development Manager, Offshore North America Arctic	2100, 250—5th Street S.W. Calgary, Alberta T2P 0R4	TGS-NOPEC Geophysical Company ASA	1-403-852-6115	Steve.Whidden@tgs.com

2.0 Project Description

The official name of the Project is Multiklient Invest Newfoundland Offshore Seismic Program, 2024–2028. MKI is proposing to conduct 2D, 3D and/or 4D seismic surveys within its proposed Project Area (see Figure 1.1) between 2024 and 2028, starting as early as May 2024. The EA will consider a maximum of four simultaneous seismic surveys within a given year: three 3D/4D surveys and one 2D survey. However, in most survey years, there would typically be no more than two simultaneous seismic surveys. In addition, MKI is proposing to test a modified activation procedure of the airguns called eSeismic. 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 1.1; Table 2.1). The proposed Project Area includes space to account for ship turning and streamer

Table 2.1. Geographic coordinates (decimal degrees, WGS84 Datum) delineating the Project and Study areas.

Coordinate Point [a]	Project Area		Study Area	
	Longitude	Latitude	Longitude	Latitude
A	52	-54.913	52.114	-55.138
B	52	-43.348	52.151	-43.189
C	49.374	-41.468	49.415	-41.201
D	45.417	-40.887	45.395	-40.636
E	40.042	-45.501	39.934	-45.315
F	38.658	-47.365	38.478	-47.41
G	41.546	-55.727	41.445	-55.925
H	46.093	-57.716	46.205	-57.917
w	46.099	-56.404	-----	-----
x	43.418	-56.398	-----	-----
y	43.416	-56.157	-----	-----
z	46.1	-56.151	-----	-----
I	46.091	-50.869	46.274	-51.184
J	50.473	-52.199	50.294	-52.427
K	50.481	-54.424	50.345	-54.608

[a] See Figure 1.1 for location of coordinate points.

deployment. The areal extents of the Project Area and the Study Area are 1,244,143 km^2 and 1,354,951 km^2, respectively. Larger proportions of the Project Area and Study Area lie outside of Canada's Exclusive Economic Zone (EEZ) (~68%) than inside the EEZ (~32%; see Figure 1.1). Water depths within the Project Area range from approximately 100 m to 4000 m.

The temporal boundaries of the Project are 1 May to 30 November during 2024–2028. The duration of individual seismic surveys will vary from year to year but will remain within the May to November timeframe. The approximate durations of proposed 3D/4D and 2D seismic surveying in any given year 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 a given year. Specific data acquisition plans for 2D, 3D and/or 4D surveys during 2024–2028 are not yet determined.

The specific seismic survey vessel(s) and supporting vessels to be used during 2D/3D/4D surveys are currently unknown but will be approved for operation in Canadian waters and will be typical of the worldwide fleet. Information on representative seismic and support vessels are provided in Sections 2.2.5 and 2.2.9.1, respectively. It is possible that MKI will use Ocean Bottom Nodes (OBNs; Section 2.2.7) and test the eSeismic technology (Section 2.2.8).

MKI will adhere to required and established mitigation measures and monitoring for marine mammals, sea turtles, and seabirds (see Section 2.3 for further details). A Fisheries Liaison

Officer (FLO) will be on board the seismic vessel(s) 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. Availability of such modern seismic data has triggered recent exploration interest, particularly in Orphan Basin and Flemish Pass. Acquisition of additional 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 indicated in Section 2.1, the seismic surveys will be conducted between 1 May and 30 November of any given year from 2024–2028.

In 2024, it is anticipated that seismic surveys would occur from mid-May through September.

2.2.3 Site Plans

In any given year from 2024–2028, it is possible that there will be ~20,000 km^2 of 3D and 4D survey lines and 20,000 km of 2D survey lines. The specific location, orientation, length, and spacing of seismic survey lines will be determined prior to each survey year. For 3D and 4D seismic surveys a racetrack survey design is used and for 2D seismic surveys, lines can be separated by approximately 5–50 km with variable lengths.

In 2024, it is anticipated that MKI will acquire approximately 5000–10,000 km^2 of seismic data in the Orphan Basin.

2.2.4 Personnel

A typical seismic vessel can accommodate ~55–75 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 Marine Mammal Observers (MMOs), Passive Acoustic Monitoring (PAM) Operators, and a FLO on board. All project personnel will have the required certifications (safety, medical) as specified by the relevant Canadian legislation and the C-NLOPB.

2.2.5 Seismic Vessel

MKI will use seismic vessels from the PGS fleet (see https://www.pgs.com/marine-acquisition/the-fleet). The MV *Ramform Atlas* or a similar vessel(s) will be used for the 3D and 4D seismic surveying,

and the MV *Sanco Swift* or a similar vessel for 2D surveying. Seismic vessels will typically travel at a speed of ~8.2–9 km/h (4.4–4.9 knots) while conducting 3D, 4D and 2D seismic surveying.

The MV *Ramform Atlas* was built in 2013 and is flagged in Norway (Figure 2.1). It is 104.2 m long, with a beam of 70 m and a draft of about 6.4 m. The *Ramform Atlas* has six diesel electric engines that have 20,400 kW of total power. The *Ramform Atlas* and its sister ships (*Ramform Titan, Ramform Tethys*) have previously been used by MKI for 3D seismic surveying in the Project Area.

Figure 2.1. A representative 3D/4D seismic vessel: MV *Ramform Atlas*.

For 2D seismic surveying or a source vessel for undershoots, the MV *Sanco Swift* or similar vessel will be used (Figure 2.2). The MV *Sanco Swift* was built in 2013 and is flagged in Gibraltar. It is 96.15 m long, with a beam of 23 m and a draft of about 7 m. The *Sanco Swift* has four 4000 kW diesel engines.

Figure 2.2. A representative 2D seismic vessel or source vessel for undershoots: MV *Sanco Swift*.

For seismic surveys during 2024, vessel specifics will be provided once the vessel(s) has been identified.

2.2.6 Seismic Energy Source Parameters

For surveying, 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 3000–6000 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 2000–2500 psi. The peak-to-peak sound source level will be ~100–200 bar-m (~260–266 dB re 1 µPa ·m_{p-p}). A typical shotpoint interval will be one array pulse every 12.5 m, 18.75 m or 25 m.

Detailed specifications of the airgun array for the 2024 seismic program will be provided once the project design is completed and parameters are selected.

2.2.7 Seismic Streamers and Ocean Bottom Nodes

For 3D and 4D seismic surveys, vessels will tow as many as 16 solid streamers, ranging in length from 6–14 km at depths ranging from 9–25 m. The streamers are typically spaced 100 m apart. For 2D seismic surveys, vessels will tow one solid streamer that may range from 8–12 km in length.

MKI may use Ocean Bottom Nodes (OBNs) in conjunction with streamers to acquire seismic data. In an OBN survey, the nodes are placed on the seafloor in an orderly grid enabling recording of cleaner, high-fidelity data without gaps in coverage. OBN surveys also improve repeatability in 4D seismic surveying. Each OBN will have a footprint of about 0.1 m^2 and will contain a hydrophone and geophones. The OBNs are deployed over an area by a node installation vessel and then recovered and re-deployed again in new area within the larger survey area. A Remotely Operated Vehicle (ROV) may also be used for OBN deployment and recovery; otherwise nodes are lowered and retrieved by a cable ('node on a rope'). The OBN spacing is typically 300–500 m on the ocean floor, and approximately 1000–3000 OBNs may be used in total depending on the size of the seismic survey. These units are completely autonomous to operate on the seabed until retrieved and can be left unattended for up to 100–150 days.

Detailed specifications of the streamers (and potential OBNs) for the 2024 seismic program will be provided once the project design is completed and parameters are selected.

2.2.8 Testing of Modified Airgun Activation Procedure

In one or more years, MKI is proposing to test a modified activation procedure of the airguns called eSeismic. This technology involves the activation of individual airguns in a pseudo-random pattern every 200 ms or every 1–2 m along a seismic survey line. As such, only one airgun is activated at a time, but the airguns are activated on a near continuous basis versus every 10–12 seconds in a

conventional seismic survey. The sound pressure level (SPL) of the source is reduced due to smaller airgun volumes being activated at once. Details will be provided in the EA. Other parameters of the seismic procedures and equipment remain unchanged. In any given year, MKI may test eSeismic in an area ranging from 50–200 km^2, which is estimated to require 7–21 days to conduct.

2.2.9 Logistics/Support

2.2.9.1 Vessels

MKI's primary support and supply will be provided by either the PGS vessel MV *Thor Magni* or a similar vessel. The operational objective is to have one escort vessel available with each 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. Resupply will be provided by *Thor Magni*.

It is anticipated that a node installation vessel will be used to deploy and retrieve OBNs. Vessel specifics will be provided once the vessel has been identified.

2.2.9.2 Crew Changes

Crew changes will be conducted by either ship-to-ship transfer or ship-to-shore transfer.

2.2.9.3 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.

2.2.10 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.

2.2.11 Air Emissions

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

2.2.12 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 for Marine Mammals, Sea Turtles and Seabirds

Project mitigation measures will be detailed in the EA. The C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2019) will be used as the basis for the marine mammal and sea turtle monitoring and mitigation program for the seismic surveys. MMOs will monitor for marine mammals and sea turtles and implement mitigation measures as appropriate. PAM Operators will also monitor for marine mammals. 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 the *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 (as well as a beaked whale) is detected within the safety zone. These measures are designed to minimize the potential for effects (e.g., auditory, disturbance) on 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 Project vessels. Seabird monitoring will include systematic counts based on protocols issued by the Environment and Climate Change Canada-Canadian Wildlife Service (ECCC-CWS). Likewise, mitigation measures and monitoring for stranded birds will follow established ECCC-CWS procedures.

3.0 Environmental Assessment

The EA will closely follow previous assessments of seismic programs in the Newfoundland and Labrador offshore (e.g., LGL 2018). The primary issue of concern relates to the potential effects of underwater noise from the airgun arrays on marine fauna and the effects of the seismic survey on fisheries.

3.1 Physical and Biological Environment

The Eastern Newfoundland Strategic Environmental Assessment (SEA; C-NLOPB 2014), Southern Newfoundland SEA (C-NLOPB 2010), and the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador (Bangay et al. 2020) provide descriptions of the biophysical environment 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 and other ocean users, marine birds, marine mammals, sea turtles, species at risk and sensitive areas using the most recent literature and data sources.

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 and Regional Assessment (C-NLOPB 2010, 2014; Bangay et al. 2020),

will be included in the EA. This information will be supplemented with more recent literature and data sources available for the Study Area.

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. The EA will also examine potential effects of OBNs on benthic habitat. 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 monitoring 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 municipal, provincial, and federal agencies, fisheries groups, and other stakeholders, including but not limited to:

- Fisheries and Oceans Canada (DFO);
- ECCC;
- Department of National Defense (DND);
- One Ocean;
- Fish, Food and Allied Workers (FFAW)-Unifor;
- Study Area fishers;
- Indigenous groups;
- Nature Newfoundland and Labrador (NNL);
- Various fish processors; and
- Other identified Newfoundland and Labrador fisheries industry stakeholders.

In-person consultations will be held in St. John's. MKI will distribute an annual Newsletter describing the seismic survey plans for a given year to over 60 stakeholders (see Appendix B in LGL 2022).

4.0 References

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