

FINAL

**Flemish Pass Exploration Drilling Project
Marine Mammal and Sea Turtle Monitoring and Mitigation Report
Document No. ME2183401-1**

Submitted to:

CNOOC Petroleum North America ULC

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14 December 2021

Wood Project #: ME2183401

IMPORTANT NOTICE

This report was prepared exclusively for CNOOC by Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood). The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in Wood's services and based on: i) information available at the time of preparation, ii) data supplied by outside sources and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by CNOOC only, subject to the terms and conditions of its contract with Wood. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

Rev. No.	Purpose	Prepared By	Reviewed By	Date
1.0	Client Review	LLM	KB	June 28, 2021
2.0	Client Review	LLM	<i>Kevin Bakker</i>	July 21, 2021
3.0	Use	LLM	<i>Kevin Bakker</i>	Aug 13, 2021
4.0	Use	LLM	<i>Justin So</i>	Aug 16, 2021
5.0	Use	JS	<i>Kevin Bakker</i>	Dec 14, 2021

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1.0 INTRODUCTION

CNOOC Petroleum North America ULC (CNOOC) (formerly Nexen) contracted Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), to conduct marine mammal and sea turtle monitoring and mitigation as part of the 2021 EL1144 Vertical Seismic Profile (VSP) Program. The project area is in the Flemish Pass approximately 400 km east of St. John's, Newfoundland and Labrador (Figure 1-1). As detailed in the "Flemish Pass Exploration Drilling Project (2018-2028) Environmental Impact Statement" (EIS) (Nexen 2018), the waters off Eastern Newfoundland support a diverse assemblage of marine megafauna. Several marine mammal and sea turtle species have been reported in or near the Project Area. As stated in the EIS, some of these species are considered to be at risk or of special conservation concern.

Monitoring activities were conducted to fulfill requirements issued under Section 54 Conditions 3.8 and 3.9 of the *Canadian Environmental Assessment Act* (ECCC 2019), and protocols outlined in the "Geophysical, Geological, Environmental and Geotechnical Program Guidelines" and "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment" (SoCP). In consultation with the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and Fisheries and Oceans Canada (DFO), a marine mammal and sea turtle mitigation plan for VSP (the Plan) was approved for this program (Wood 2021).

The scope of work included monitoring for marine mammals and sea turtles inside the 500-metre radius safety zone around the seismic source during VSP activities by visual observation and passive acoustic monitoring. Mitigation protocols were implemented by qualified marine mammal observers (MMO) and passive acoustic monitors (PAM). VSP was conducted from the *Stena Forth* at the Pelles A-71 well site between June 23, 2021 and June 24, 2021. All marine mammal and sea turtle mitigation was conducted aboard the supply vessel, *MV Siem Pilot*. The VSP program lasted 8.5 hours, during which time three marine mammals were detected by the PAM operator outside of the 500m safety zone (See Section 6.1). No delays or shutdowns were required during the program. The following summarizes events and sightings during the Flemish Pass Marine Mammal and Sea Turtle (MMST) Monitoring and Mitigation Program.

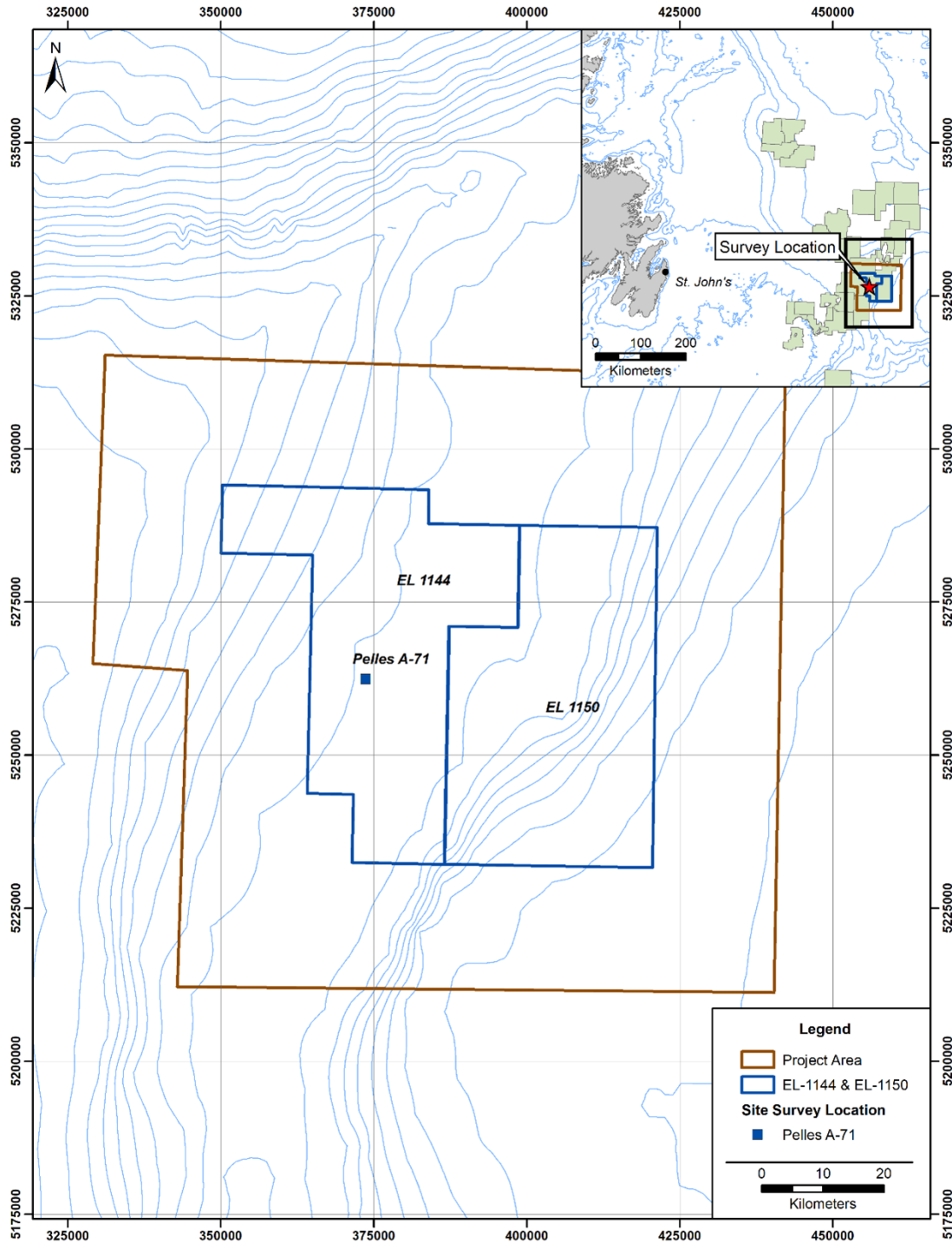


Figure 1-1 Area map of the 2021 VSP program in EL1144

2.0 PERSONNEL

The mitigation team comprised Wood biologists, Edgewise MMOs, and a JASCO PAM technician. Personnel aboard the *MV Siem Pilot* for the Flemish Pass MMST Mitigation Program are presented below.

Wood

- Lara Miles –Team Lead- Biologist (Lead MMO)
- Daniel Windeler – Biologist (PAM)

Edgewise

- Holly Hogan – MMO
- Jackie McCormack – MMO

JASCO Applied Sciences

- Katie Kowarski – Lead PAM

Schlumberger Oilfield Services (onboard the *Stena Forth*)

- Joshua Ross - Wireline Professional Field Engineer
- Frank Hinchey - Wireline Engineer

The following shore personnel were involved in support, mobilization, and demobilization of the 2021 Marine Mammal and Sea Turtle Mitigation Program:

CNOOC

- Derek Sullivan
- Mark White
- Sean Hemeon
- Eddie Frampton
- Neil Osmond
- Ryan Miller

Wood

- Kevin Baldwin – Project Manager
- Justin So – Project Manager
- Andrew Peddle - HSE Support

The crew of the *MV Siem Pilot* were responsible for vessel operations and the deployment and retrieval of the PAM equipment, including hydrophones. The Captain had authority in matters of safety and the duty officer ensured the vessel was travelling within the mitigation team's specifications. Wood personnel were responsible for the overall implementation of the Plan under direction of Field Lead, Lara Miles. Ms. Miles also acted as the Health and Safety Lead and provided CNOOC with daily updates on the progress of the monitoring and mitigation program.

3.0 MOBILIZATION

The *MV Maersk Mobilizer* mobilized on June 14, 2021 to provide visual and acoustic monitoring during VSP operations on the *Stena Forth*. Mobilization involved the transport and secure installation of all equipment and supplies needed for monitoring onto the vessel. Due to operational requirements, all personnel and equipment identified earlier subsequently transferred to and conducted MMO and PAM activities onboard the *MV Siem Pilot*.

4.0 HEALTH AND SAFETY

A hazard assessment and Health and Safety Plan were developed for the Flemish Pass MMST Monitoring and Mitigation Program. These documents identified potential hazards associated with project activities, mitigation measures, and any residual risk. The Health and Safety Plan, which included all work instructions and safe operating procedures, was reviewed by all personnel from Wood (including subcontractors). Deck safety meetings, during which potential safety issues were discussed, were also conducted by Wood and JASCO personnel and the crews of the *MV Siem Pilot* and *MV Maersk Mobilizer*.

5.0 COMMUNICATIONS

The *MV Siem Pilot* maintained scheduled communications with onshore personnel via e-mail. Daily status updates were sent outlining departure and return dates, cruise progress, projected timelines, and sea state conditions. Updates were sent to the following personnel:

CNOOC

- Derek Sullivan
- Mark White
- Sean Hemeon
- Eddie Frampton
- Neil Osmond
- Ryan Miller

Wood

- Kevin Baldwin – Project Manager
- Justin So – Project Manager

6.0 VERTICAL SEISMIC PROFILE MITIGATION PROGRAM

The mitigation program consisted of both visual and acoustic monitoring for marine mammals and sea turtles during VSP operations. Wood and JASCO personnel directed the ship’s crew on the installation and retrieval of the PAM equipment and hydrophones. VSP operations took place from June 23, 2021 to June 24, 2021 and lasted approximately 8.5 hours. The weather during VSP operations consisted of calm seas and thick fog with limited visibility (<100m from the *MV Siem Pilot*).

Following is a summarization of activities onboard the vessel as they pertain to the mitigation program.

Table 6.1 Timeline of activities related to the mitigation program onboard *MV Siem Pilot*

Date	Description
1 June 2021	JASCO PAM equipment dry-tested in Wood warehouse;
14 June 2021	<i>MV Maersk Mobilizer</i> mobilization and departure from St. John’s, NL
15 June 2021	Arrive at <i>Stena Forth</i>
18 June 2021	JASCO PAM equipment wet-tested
20 June 2021	Communications set up with the Schlumberger wireline engineers for VSP operations
20 June 2021	VSP array testing and marine mammal and sea turtle monitoring (<1 hr of testing)
20 June 2021	Transfer from the <i>MV Maersk Mobilizer</i> to <i>MV Siem Pilot</i>
23 June 2021	JASCO Personnel transfer from the <i>MV Maersk Clipper</i> to <i>MV Siem Pilot</i>
23 June 2021	VSP commences and marine mammal and sea turtle monitoring begins
24 June 2021	VSP and marine mammal and sea turtle monitoring concludes
25 June 2021	Vessel departs for St. John’s, NL
26 June 2021	Vessel arrives in St. John’s Harbour; Demobilization

The PAM equipment wet test included:

- 1) Crew introduction to and familiarization with the gear;
- 2) Gathering a baseline understanding of the soundscape in the VSP area; and
- 3) Optimization of the equipment setup including deployment, towing, and retrieval.

During the wet test, PAM operators detected static that masked audio detections. Detections were visible in the spectrogram. The issue was narrowed down to interference from the shipboard power source. The PAM deck box and laptop computer were switched to battery power and headphones replaced. The cable connections were inspected, strengthened, and raised on the vessel to eliminate any cable-to-vessel contact. PAMLab software (JASCO’s PAM software) settings were revised to highlight marine mammal sounds in the area. All adjustments contributed to a successful monitoring program during VSP array testing.

6.1 Monitoring and Mitigation Program Results

Prior to VSP operations, the PAM operators conducted a wet test of the PAM hydrophones (June 18th, 2021) and the seismic operators conducted a seismic array wet test (aka bubble test) on June 20th, 2021. During these tests the mitigation team was stationed on the *MV Maersk Mobilizer*. The PAM gear wet test was conducted to ensure

all equipment was working properly and the vessel could test the planned track designed for during VSP operations. Four marine mammals were visually observed during the PAM gear wet test by the MMOs stationed on the bridge. A seismic array test was conducted on June 20th for less than 30 mins of firing time. PAM and MMOs monitored the area for 30 minutes (pre-watch) prior to the array testing. There were no marine mammals detected during the array testing. Upon the completion of this testing, the mitigation team transferred to the *MV Siem Pilot* for the remainder of the VSP program.

All monitoring and mitigation during VSP were conducted from the *MV Siem Pilot*. The vessel track was modified to enhance the ability of the observers to detect a marine mammal or sea turtle. During VSP/monitoring activities the *MV Siem Pilot* travelled at less than 3 knots in a "figure-8" pattern along the starboard-side (relative to *Stena Forth*) half of the 500m safety zone radius. VSP was deployed from the port-side of the *Stena Forth*. The *MV Siem Pilot* did not travel on the port-side of the *Stena Forth* due to the presence of a long-term monitoring buoy moored within 750 m. Both visual and acoustic monitoring were conducted on the bridge of the vessel. Monitors had a direct line of communications with the VSP wireline operators and gunners during VSP operations through vessel's very high frequency (VHF) radio.

There were no detections (acoustically or visually) of any marine mammals or sea turtles during the 30-minute pre-watch or during ramp-up within the 500m safety zone, so VSP was not delayed. There were no marine mammals or sea turtles detected within the 500m safety zone during VSP operations. No shut-down, delays, or mitigations were necessary during the 8.5 hours of sound source being active.

Sperm whale clicks and an unidentified dolphin were acoustically detected outside of the 500-m safety zone during VSP operations. The marine mammals were determined to be more than 1000 m from the area and the detections did not require a delay, shutdown, or modification of VSP operations.

Visual and acoustic observations are detailed below (Figure 6.1).

Table 6.2 Marine mammal and sea turtle sightings during PAM/MMO Operations

Species	Date	Number of Sightings	Number of Individuals	Range of animal to VSP (metres)	Mitigation Required	Notes
PAM Gear Wet Test						
FW	18-06-21	3	3	VSP not active	NONE	Observed during PAM Gear Wet Test
UW	18-06-21	1	1	VSP not active	NONE	Observed during PAM Gear Wet Test
VSP Operations						
SP	24-06-21	2	1-3	>1000	NONE	Continuous clicks during VSP firing
UD	24-06-21	1	>1	>1000	NONE	Very faint
FW-Fin Whale, UW- Unknown Whale. SP- Sperm Whale, UD- Unknown dolphin, HW-Humpback Whale, MW-Minke Whale						

7.0 DEMOBILIZATION

The *MV Siem Pilot* arrived back in St. John's on the evening of Friday, June 26, 2021. JASCO, Edgewise, and Wood personnel disembarked, and equipment was removed from the vessel.

8.0 CLOSURE

This report on the Flemish Pass MMST Monitoring and Mitigation Program has been prepared for the exclusive use of CNOOC. The project was conducted using standard practices by qualified Wood staff and in accordance with verbal and written requests from the client.

Yours sincerely,

**Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited**

Prepared by:



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Reviewed by:



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Project Manager

9.0 REFERENCES

- C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2019. Geophysical, Geological, Environmental and Geotechnical Program Guidelines.
- CEA Agency (Canadian Environmental Assessment Agency). 2019. Decision statement issued under Section 5.4 of the Canadian Environmental Assessment Act, 2012
- DFO (Fisheries and Oceans Canada), Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment. Accessed September 2020.
- Nexen (Nexen Energy ULC). 2018. Flemish Pass Exploration Drilling Project (2018-2028) Environmental Impact Statement (Canadian Environmental Registry Reference Number 80117, document Number 17).
- Wood. 2021. Flemish Pass Exploration Drilling Project: Marine Mammal and Sea Turtle Monitoring and Mitigation during Vertical Seismic Profiling Plan. Submitted to CNOOC Petroleum North America ULC. Wood Project # TA2083404

APPENDIX A: OBSERVATION DECK SHEETS

