

**OFFICE OF THE REGULATOR OF OIL AND GAS OPERATIONS
(OROGO)**

**INFORMATION REQUEST No. 1 - PROOF OF FINANCIAL RESPONSIBILITY
WORST-CASE SCENARIO DESCRIPTIONS AND COST ESTIMATES**

TATHLINA N-18 WELL
TWEED LAKE M-47
TWEED LAKE A-67
BELE O-35

Prepared For:

Suncor Energy Inc.
150 – 6th Avenue S.W.
Calgary, Alberta. T2P 3E3

June 29, 2021

File No. 2021-1344



EXECUTIVE SUMMARY

Suncor Energy Inc. (Suncor) is currently working through the application process with the Office of the Regulator of Oil and Gas Operations (OROGO) for Operations Authorizations (OAs) for the abandonment of four hydrocarbon wells in the Northwest Territories. The wells are located in two separate regions of the NT, and as such, are captured under two different OROGO OA files as listed below:

- 1) OA-2021-002-SUN**
 - Tathlina N-18 Well

- 2) OA-2021-003-SUN**
 - Tweed Lake M-47
 - Tweed Lake A-67
 - Bele O-35

Suncor has received Information Requests for both OA files requesting more detail to the information regarding Proof of Financial Responsibility (PFR). The PFR requires the proponent to complete a study of a potential 'worst case scenario' and costs associated, pursuant to Section 64 of the Oil and Gas Operations Act (OGOA).

Bowron Environmental Group was engaged by Suncor, to conduct a third-party review of the current scenario and security deposit amount (usually in the form of a standby letter of credit) for each of the OAs. This includes providing further detail or different options regarding a 'worst case scenario' and the potential cost the scenario may incur.

Because there are two OA applications and the abandonment operations are quite different in scope, OROGO has requested a descriptive scenario based on each OA. Please see below for each well scope and associated 'worst case scenario' both regarding releases on site, and the clean-up costs required to get the site back to pre-disturbed equivalent capability.



TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
1.0 INTRODUCTION	3
1.1 OBJECTIVE	3
1.2 DEVELOPMENT OF SCENARIOS AND POTENTIAL COST ESTIMATES.....	3
2.0 OA-2021-002-SUN – TATHLINA N-18 WELL	3
2.1 SCENARIO No. 1: JET A DRUM FUEL RELEASE, 208 LITRES.....	4
3.0 OA-2021-003-SUN – TWEED LAKE / BELE WELLS	5
3.1 SCENARIO No. 2: BELE O-35 DIESEL FUEL RELEASE, 30 M3 TANK, WINTER OPERATIONS 2022-2023	6
4.0 POTENTIAL IMPACTS ON INDIGENOUS LANDS AND OTHER LAND USE	8
5.0 BOWRON QUALITY MANAGEMENT PROGRAM.....	9

LIST OF APPENDICES

APPENDIX A	OA-2021-002-SUN TATHLINA N-18 COST ESTIMATE
APPENDIX B	OA-2021-003-SUN TWEED LAKE & BELE COST ESTIMATE



1.0 INTRODUCTION

Suncor has received Supplemental Information Requests for both OA files requesting more detail to the information regarding Proof of Financial Responsibility (PFR). The PFR requires the proponent to complete a study of a potential ‘worst case scenario’ and costs associated, pursuant to Section 64 of the Oil and Gas Operations Act (OGOA). The following information has been compiled on behalf of Suncor Energy utilizing historical industry costs.

1.1 OBJECTIVE

Suncor Energy Inc. (Suncor) is currently working through the application process with the Office of the Regulator of Oil and Gas Operations (OROGO) for Operations Authorizations (OAs) for the abandonment of four hydrocarbon wells in the Northwest Territories. The wells are located in two separate regions of the NT, and as such, are captured under two different OROGO OA files as listed below:

- 1) **OA-2021-002-SUN**
 - Tathlina N-18 Well

- 2) **OA-2021-003-SUN**
 - Tweed Lake M-47
 - Tweed Lake A-67
 - Bele O-35

1.2 DEVELOPMENT OF SCENARIOS AND POTENTIAL COST ESTIMATES

Personnel included in the development of these estimates include Chris Salewich, B.Sc., AAg, of Salewich Consulting Inc., who has experience working in the Northwest Territories since 2004.

Chris has recently managed project planning, budget development, and execution of operations for Husky Oil Operations Limited 2018 – 2019 Winter Abandonment and Summer Reclamation Projects, which included both winter access and heli-supported well abandonments and site reclamation.

2.0 OA-2021-002-SUN – TATHLINA N-18 WELL

The abandonment program activities and timeline for Tathlina N-18 Well are as follows:

- **Heli-Support Field Scouting, Vegetation Clearing and Gas Migration Testing:** Summer 2021
- **Heli-Support Downhole Abandonment, Cut and Cap, Reclamation Activities:** Summer 2022

The objective of the program is to clear vegetation around well centre and on the well site to set up a helicopter landing pad. Gas migration and surface vent flow will be monitored at this time.

In the Summer of 2022, the well is proposed to be abandoned, and cut and cap operations are to be completed via water jet cutting technology. Final reclamation of the site will be completed once the well head, the casing bowl and the cut casing is removed from site, utilizing heli-support.



After a review of the proposed scope of work associated with the abandonment activities, a range of possible scenarios were reviewed to determine what could be considered the most likely event to occur with the highest consequence.

Per discussions with completions personnel at the initial meeting between Bowron and Suncor, a well control issue would be highly unlikely for this type of well and abandonment operation, so the scenario was not included.

As this project will require heli-support and long-lining of loads utilizing the helicopter, Jet A Fuel will be consumed over the duration of the operation. This means that fueling on the well site landing pad will be required and that drums of Jet A will be stored at the well site.

2.1 SCENARIO NO. 1: JET A DRUM FUEL RELEASE, 208 LITRES

While working through regular operations, drums of Jet A Fuel are usually stored within secondary containment on site. While one of the drums were long-lined and dropped off at the site, one of the seams on the drum was damaged and the contents of the 208 litre drums emptied onto the ground, soaking into the soils on the well site.

If this scenario were to occur, once the spill source was identified, the Suncor Emergency Response Plan will commence, and immediate actions to control the spill will include:

- Shut down of long-lining and abandonment operations;
- Don the appropriate Personal Protective Equipment (PPE) per the Emergency Response Plan (ERP) and Spill Contingency Plan (SCP) and review the Safety Data Sheets (SDS);
- Ensure the drum is placed upright and no further fluid is leaking from the drum;
- Report the spill to the appropriate Suncor Personnel and Regulator per ERP notification process; and
- Proceed to use spill kit contents and contain the spill using shovels, booms and pads to dike and berm the area.

The cost of these operations would be consistent with normal daily operating costs for the helicopter, and crew on the project. Environmental support personnel, and both labourers and the mini excavator operator would need to be added to support the cleanup and reclamation of the spill site.

Once the source of the release is controlled, spill containment and cleanup procedures would be followed, including:

- Diking, trenching and berming of the area to contain as much free fluid at surface as possible;
- Spill contingency equipment would be utilized in the form of shovels, pads, and booms to extract free fluids from the ground surface and topsoils;
- Mobilize the mini-excavator and a labour to fill plastic lined one cubic meter soil tote bags until contaminated soil and vegetation is sufficiently cleaned up (potentially estimated up to 4.0 m³ depending on the spread of fluid);
- Flag and GPS the spill area for ongoing clean up and reclamation; and
- Sample soils from the spill area and obtain confirmatory samples outside of the subjected area to determine success of the spill cleanup.

Once initial cleanup operations have been achieved, the area will be fenced off, and samples will be rushed to one of the nearest third party approved labs to determine if the hydrocarbon contamination has been fully remediated.



In the 'worst case scenario' there would be further soil contamination, but would be minor, and achievable to clean up in late summer of 2022. Activities that may be required include, but are not limited to:

- Helicopter access to site;
- Vegetative assessment of the GPS area where the spill occurred;
- Soil sampling of the spill area to determine if hydrocarbons are still present at the site;
- Assessment of the samples;
- Reporting of analysis to the NT regulatory agencies including OROGO;
- Removal of any remaining contaminated soils via labourers and soil containment totes via helicopter support;
- Source appropriate replacement soils and replace soils as required; and
- Use regulatory approved grass seed mix and straw matting to repair the affected area.

The contamination at this point of the cleanup and reclamation process would be negligible, and the well site would be monitored over two growing seasons to assess vegetative success. Further samples would only be taken for confirmatory purposes if vegetation stress indicators were noted. The site would then move towards closure after Summer of 2024.

This spill clean-up includes a multi-year program and cost to ensure pre-disturbance equivalent land capabilities (satisfactory to the Regulator) and is estimated at approximately \$497,260.00. Please see Appendix A for a breakdown outlining the cost estimate of this program.

3.0 OA-2021-003-SUN – TWEED LAKE / BELE WELLS

The objective is to construct the required access and lease ice pads during winter months, to allow for the downhole abandonment, and subsequently a surface abandonment of the wells, per OROGO Well Suspension and Abandonment Guidelines.

After a review of the proposed scope of work associated with the abandonment activities, a range of possible scenarios were reviewed to determine what could be considered the most likely event to occur with the highest consequence.

Bele O-35, which is approximately 79 km South of Colville Lake, requiring winter access or heli-support in the Summer, is noted as having the furthest distance to travel, requiring more logistical planning. This well would have the highest potential costs for worst-case scenario operational cleanup and reclamation.

Two potential contaminants were noted for the operations at Bele O-35 which included:

- 10% NaCl inhibited water solution topped up with 1.6 m³ of diesel left in the casing of the well to prevent freezing; and
- 30.0 m³ diesel tank onsite to support operations, with diesel transport via tanker to site as required.

Per discussions with Suncor completions personnel, a well control issue would be highly unlikely for this type of well and abandonment operation, so the scenario was not included.



Through review of the operations, a scenario based on the amount of diesel being transported and stored, if released from the largest tank, will have the most effect on the well site and potentially on the adjacent land.

3.1 SCENARIO NO. 2: BELE O-35 DIESEL FUEL RELEASE, 30 M³ TANK, WINTER OPERATIONS 2022-2023

Tank valves, hose breaks, secondary containment liner breaks, and human error are common problems when dealing with large fuel tanks and tank trucks. While inspections of equipment are usually part of fueling operations, there is potential for parts to break, human error or complacency during inspections.

A tanker truck will be bringing in loads of fuel to support operations, between 16.0 – 28.0 m³ and can empty in about 20 – 30 minutes. If any hoses or valves were damaged or left open on the tank or on the truck during unloading operations, there is enough movement of fluid for up to 10.0 – 12.0 m³ of diesel to release onsite. Coupled with any heavy winds and/or snow activity during the scenario, there is potential for the release to remain hidden for 10 or more minutes if there is sufficient snow on the well site. It is also possible for the diesel release to travel along the ice-pad off site, undetected under any deep layers of snow.

If this scenario occurred, once the spill source was identified, the Suncor Emergency Response Plan would be activated, and immediate actions to control the spill will include but is not limited to:

- Shut down the truck pump operations;
- Close all valves to and from the truck and from the tank;
- Report spill to the appropriate Suncor Personnel and Regulator per ERP notification process;
- Review Safety Data Sheet (SDS) to ensure all personnel dealing with the release have appropriate PPE to deal with the diesel cleanup; and
- Dispatch an on-site vacuum truck for collection of any free fluid.

The cost of these operations would be consistent with normal daily operating costs for service rig and abandonment personnel. Construction and environmental personnel already on the project would immediately be diverted to help with the spill control and contain operations.

Once the source of the release is controlled, spill containment procedures would be followed, including:

- Snow or ice diking, trenching and berming to contain as much free fluid at surface as possible;
- Spill contingency equipment would be utilized as required (e.g. spill kit equipment, slop tanks, excavator, loader with bucket, labourers with shovels); and
- Flag and GPS the spill area for ongoing clean up and reclamation.

Immediate cleanup operations would continue and include, but are not limited to:

- Dispatch of additional vacuum trucks as required, and combo steam/vac trucks if available from vendors in surrounding communities (e.g. Norman Wells);
- Dispatch additional vacuum and combo trucks from outside of the NT as required;
- Vacuum free fluids and place into a slop tank and if melted using boiler heat, use any free space in the 400 barrel (bbl) tanks on location for temporary storage;
- Heavy equipment would be utilized for diking, berming and trenching (including cats, excavator, loader, and grader) to stockpile the residual contaminated snow in the slop tank or bermed and lined area;



- Contaminated snow/water would be loaded into semi-vacs or vac trucks and pups, while any contaminated soil/snow may need transport via tarped and sealed end dump to appropriate third-party disposal facilities in Alberta;
- Source and transport clean fill out to site, and store in a lined and bermed area for summer operations reclamation; and
- Sampling of soils on and off site to determine if diesel hydrocarbon contamination is still present.

It is anticipated that approximately 80.0 m³ of contaminated water / fluid and two sealed end dump truckloads of approximately 30.0 m³ of contaminated soil / snow would be trucked to a third-party facility in Alberta for treatment and disposal.

Once appropriate cleanup during winter operations has been achieved, the area could be fenced off, and monitoring of the area will be required to assess vegetative growth during the Summer Operations Period of 2023. Activities that may be required include but are not limited to:

- Helicopter access to site;
- Vegetative assessment of the GPS area where the spill occurred;
- Soil sampling of the spill area to determine if hydrocarbons are still present at the site;
- Assessment of samples;
- Reporting of analysis to the NT regulatory agencies including OROGO; and
- Plan further reclamation based on the outcome of the samples if required.

In the 'worst case scenario' if hydrocarbons are still present and the vegetation is struggling to grow in the area of the spill, further activity may be required but is not limited to:

- Full delineation of the hydrocarbon affected area using GPS data, sample points and cues from any areas of struggling vegetation;
- The use of heli-portable tracked equipment (e.g. mini-loader, mini-excavator) and labourers, shovels and heli portable tote bags to haul out any further contaminated soils to the appropriate soil treatment or disposal facility;
- Utilizing mini-excavator and tracked mini-loader material to move and fix any areas of excavation;
- Recontour replaced soils, and re-seed using a regulator approved grass seed mix and straw matting to stabilize the area; and
- Monitor the site for vegetative growth for two growing seasons.

Costs estimates associated with the cleanup of the described diesel spill are detailed in Appendix 2 and total **\$1,315,255.00**. The estimate was developed assuming the released diesel travelled through the snow, and along the ice pad, with some of the hydrocarbon fluids being released off location. This spill clean-up and monitoring estimate includes a multi-year program and cost to ensure pre-disturbance equivalent land capabilities (satisfactory to the Regulator).



4.0 POTENTIAL IMPACTS ON INDIGENOUS LANDS AND OTHER LAND USE

Due to the nature of Scenario No. 1 and No. 2 being relatively small releases in size and located in very remote areas, it is not anticipated that third-party entities will be directly affected from the theoretical releases described in this document. Local vegetation and wildlife within the immediate area of the release may be temporarily affected, but areas of concern can be fenced off until reclamation is completed. Impacts on Land Use are noted as minimal.



5.0 BOWRON QUALITY MANAGEMENT PROGRAM

Bowron Environmental Group Ltd. (Bowron) prepared the following report for the exclusive use of Suncor Energy Inc. The material presented in this report reflects Bowron's judgement based on information that was available at the time of report preparation. Incorporated third-party information is assumed to be complete and correct; and Bowron does not assume any responsibility for deficiencies, misinterpretation, or incompleteness of information prepared by a third party. No investigative method can eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level. Professional judgement was exercised in data gathering and analysis, however, it is believed that the level of detail is appropriate to meet the project objectives.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibility of such third parties. Bowron accepts no responsibility for damages, if any, suffered by a third party resulting from decisions and actions made based on this report.

Prepared by:

Chris Salewich, B.Sc., AAg

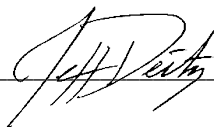
Salewich Consulting Inc.



This report was reviewed and approved for transmittal by:

Jeff Deitz

Bowron Environmental Group Ltd.





APPENDIX A
OA-2021-002-SUN TATHLINA N-18 COST ESTIMATE



	TOTAL	PRICE / UNIT	UNITS	ESTIMATED COST
Initial Control, Containment and Cleanup Operations, Tathlina N-18, 2022				
Onsite Personnel - Crew (6)	18.0	\$1,000.00	Day	\$18,000.00
Additional Crew (4)	12.0	\$1,000.00	Day	\$12,000.00
Environmental Ops - incl. assessment, sampling, reporting during and post initial operations	10.0	\$2,000.00	Day	\$20,000.00
Lab Analysis Rush - Including Courier Costs	1.0	\$3,500.00	Total	\$3,500.00
Heli-Support Operations - Bell 212S, additional operational days due to release including fuel	3.0	\$25,000.00	Day	\$75,000.00
Transport and Disposal of Soil, Rainbow Lake TRD Facility approximately 4.0m ³	1.0	\$4,000.00	Total	\$4,000.00
Site Stabilization and Fencing	1.0	\$4,500.00	Total	\$4,500.00
Accommodations and Food	30.0	\$325.00	Day	\$9,750.00
Personnel Logistics	2.0	\$2,000.00	Per Person	\$4,000.00
Indirect Costs - Project Management, Regulatory Approvals / Field Modifications and Overhead	1.0	--	15% of overall cost	\$22,612.50
SUBTOTAL				\$173,362.50
Secondary Trip, Late Summer 2022, Finalize Cleanup Operations and Reclamation				
Onsite Personnel - Crew (5)	35.0	\$1,000.00	Day	\$35,000.00
Additional Crew (1) at Laydown Yard	7.0	\$1,000.00	Day	\$7,000.00
Environmental Operations - including assessment, sampling, reporting	10.0	\$1,200.00	Day	\$12,000.00
Lab Analysis Rush - Including Courier Costs	1.0	\$3,500.00	Total	\$3,500.00
Heli-Support Operations - A-Star or Bell 407 including fuel	7.0	\$8,000.00	Day	\$56,000.00
Transport and Disposal of Soil, Rainbow Lake TRD Facility approximately 1.0m ³	1.0	\$1,500.00	Total	\$1,500.00
Site Stabilization and Soil Placement using mini-excavator / mini-loader	1.0	\$5,000.00	Total	\$5,000.00
Accommodations and Food	42.0	\$325.00	Day	\$13,650.00
Personnel Logistics	6.0	\$2,000.00	Per Person	\$12,000.00
Indirect Costs - Project Management, Regulatory Approvals / Field Modifications and Overhead	1.0	--	15% of overall cost	\$21,847.50
SUBTOTAL				\$167,497.50
Reclamation, Stabilization, and Monitoring (Summer 2023 & 2024)				
Onsite Personnel - Crew (3)	12.0	\$1,000.00	Day	\$12,000.00
Additional Crew (1) at Laydown Yard	4.0	\$1,000.00	Day	\$4,000.00
Environmental Operations - including assessment, sampling, reporting	8.0	\$850.00	Day	\$6,800.00
Heli-Support Operations - A-Star or Bell 407 including fuel	4.0	\$8,000.00	Day	\$32,000.00
Accommodations and Food	16.0	\$325.00	Day	\$5,200.00
Personnel Logistics	4.0	\$2,000.00	Per Person	\$8,000.00
Indirect Costs - Project Management, Regulatory Approvals / Field Modifications and Overhead	1.0	--	15% of overall cost	\$10,200.00
SUBTOTAL (2023)				\$78,200.00
SUBTOTAL (2024)				\$78,200.00

PROJECT COST ESTIMATE \$497,260.00



APPENDIX B
OA-2021-003-SUN TWEED LAKE & BELE COST ESTIMATE



	TOTAL	PRICE / UNIT	UNITS	ESTIMATED COST
Initial Control, Containment and Cleanup Operations, Bele O-35, Winter 2023				
Onsite Personnel - Crew (12)	60.0	\$1,000.00	Day	\$60,000.00
Additional Construction, Labour and Environment - Crew (8)	56.0	\$1,000.00	Day	\$56,000.00
Environmental Operations - including assessment, sampling, reporting during and post initial operations	10.0	\$2,000.00	Day	\$20,000.00
Lab Analysis Rush - Including Courier Costs	1.0	\$10,000.00	Total	\$10,000.00
Civil Construction Equipment - Snow Cat, Grader, Excavator	5.0	\$11,000.00	Day	\$55,000.00
Spill Containment trucks, Vac / Steam Combo, Vac Truck onsite	3.0	\$15,000.00	Day	\$45,000.00
Transport Trucks to approved disposal facility (Rainbow Lake & High Level, based on tankers)	4.0	\$35,000.00	Unit	\$140,000.00
Transport & Disposal of contaminated materials to approved disposal facility (Rainbow Lake, AB)	2.0	\$30,000.00	Unit	\$60,000.00
Site Stabilization and Fencing, transport load of soil to location for recontouring in the summer	1.0	\$30,000.00	Total	\$30,000.00
Accommodations and Food, added to program in man days	116.0	\$325.00	Day	\$37,700.00
Personnel Logistics - mobilization of personnel not already active on the response	4.0	\$2,000.00	Per person	\$8,000.00
Indirect Costs - Project Management, Regulatory Approvals / Field Modifications and Overhead	1.0	--	15% of sub-total	\$78,255.00
SUBTOTAL				\$599,955.00
Monitoring and Ongoing Reclamation, Bele O-35, Summer 2023				
Construction, Labour and Environment - Crew (6)	72.0	\$1,000.00	Day	\$72,000.00
Environmental Operations - including assessment, sampling, reporting for operations	24.0	\$1,200.00	Day	\$28,800.00
Lab Analysis Rush - Including Courier Costs	1.0	\$4,000.00	Total	\$4,000.00
Civil Construction Equipment - Mini Excavator / Mini Loader	1.0	\$5,000.00	Month (Rental)	\$5,000.00
Helicopter Costs & Engineer, using A-Star / Bell 407 including Fuel	10.0	\$10,000.00	Day	\$100,000.00
Transport additional soil totes as required - 8 m ³ totes, from suitable source	1.0	\$10,000.00	Total	\$10,000.00
Transport and Disposal of remaining contaminated soil (Rainbow Lake, AB or KBL Yellowknife) - 4.0m ³ , tote bags	1.0	\$3,500.00	Total	\$3,500.00
Site Stabilization and Erosion Control Equipment	1.0	\$5,000.00	Total	\$5,000.00
Accommodations and Food, added to program in man days	72.0	\$325.00	Day	\$23,400.00
Personnel Logistics - mobilization of personnel	6.0	\$2,000.00	Per Person	\$12,000.00
Indirect Costs - Project Management, Regulatory Approvals / Field Modifications and Overhead	1.0	--	15% of sub-total	\$39,555.00
SUBTOTAL				\$303,255.00
Monitoring, Reporting and Risk Assessment Reporting, Bele O-35 (Summer 2024 & 2025)				
Construction, Labour and Environment - Crew (5)	50.0	\$1,000.00	Day	\$50,000.00
Environmental Operations - including assessment, reporting for operations	24.0	\$850.00	Day	\$20,400.00
Helicopter Costs & Engineer, using A-Star / Bell 407 including Fuel	8.0	\$10,000.00	Day	\$80,000.00
Site Stabilization and Erosion Control Equipment, Seed	1.0	\$2,500.00	Total	\$2,500.00
Accommodations and Food, added to program in man days	50.0	\$325.00	Day	\$16,250.00
Personnel Logistics - mobilization of personnel	5.0	\$2,000.00	Per Person	\$10,000.00
Indirect Costs - Project Management, Regulatory Approvals / Field Modifications and Overhead	1.0	--	15% of sub-total	\$26,872.50
SUBTOTAL (2024)				\$206,022.50
SUBTOTAL (2025)				\$206,022.50

PROJECT COST ESTIMATE \$1,315,255.00