



NWT OFFICE OF THE REGULATOR OF OIL AND GAS OPERATIONS

Office of the Regulator of Oil and Gas Operations

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February 21, 2024

Dear Dara Schmidt and Megan Boutin:

**Decision:**

**Change in Suspended Well Compliance Assessment for the Tweed Lake M-47 (WID1476), Tweed Lake A-67 (WID1555), and Bele O-35 (WID1600) Wells (OA-2021-003-SUN)**

On January 31, 2024, the Office of the Regulator of Oil and Gas Operations (OROGO) received a request from Suncor Energy Inc. (Suncor) to change the suspended well compliance assessment for Suncor's three wells in the Sahtu Settlement Area: Tweed Lake M-47 (WID1476), Tweed Lake A-67 (WID1555), and Bele O-35 (WID1600). Suncor requests the Regulator remove the requirement for remedial isolation of the uncemented portions of the wellbores.

Attached to this request was a Geology Memorandum (Memorandum) prepared by Sedimentary Geology Consultants on behalf of Suncor.

The Northwest Territories Geological Survey (NTGS) reviewed the Memorandum and provided its assessment, which informed my analysis and decision.

OROGO staff, NTGS staff, and I also met with Suncor and Sedimentary Geology Consultants on January 23, 2024, to discuss a draft of the Memorandum before it was finalized and submitted to OROGO.

This letter contains:

- Context for the decision.
- My consideration of Suncor's arguments.
- My decision on Suncor's request.

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## Context

The three Suncor wells in question have uncemented intervals above the base of the surface casing, as shown in Table 1.

**Table 1: Uncemented Intervals and Surface Casing Depth in Suncor Wells**

	<b>Tweed Lake M-47</b>	<b>Tweed Lake A-67</b>	<b>Bele O-35</b>
<b>Uncemented Interval</b>	64 – 370 mKB	61.5 – 420 mKB	63 – 625 mKB
<b>Surface Casing Depth</b>	760 mKB	754 mKB	777 mKB

Section 56(a) of the *Oil and Gas Drilling and Production Regulations* requires that all abandoned wells are left in a condition that isolates potable water zones.

The *Well Suspension and Abandonment Guidelines and Interpretation Notes* (Guidelines) interpret potable water to mean non-saline groundwater and define non-saline groundwater as water that has total dissolved solids less than or equal to 4,000 mg/L (approximately 4,000 ppm). The Guidelines state:

- If no data is available on the salinity of the groundwater, protection must extend to 600 meters below the surface.
- If non-saline groundwater is not already isolated, the operator must conduct remedial cementing operations to isolate the non-saline groundwater during abandonment operations.

As the three Suncor wells listed in Table 1 have uncemented intervals that fall within the groundwater protection zone (above 600 meters below the surface), remedial cementing operations are required under the Guidelines unless Suncor demonstrates the requirement to isolate non-saline groundwater zones has already been met or is unnecessary.

## Consideration of Suncor's arguments

Suncor makes the following arguments in support of its request:

1. The non-saline groundwater bearing formations intersected by the wells are already isolated from the saline groundwater bearing formations.
2. The non-saline groundwater bearing formations intersected by the wells are naturally in communication with each other and therefore no isolation is required between them.

*Isolation of saline groundwater from non-saline groundwater*

The Memorandum submitted by Suncor on January 31, 2024, states the wells intersect saline groundwater (salinity > 200,000 ppm) when they reach the Saline River formation. All groundwater in formations above the Saline River is non-saline (salinity ~ 150-200 ppm). The Memorandum states “there is no evidence that the saline waters have ever mixed with the overlying fresh water through geological time” and “the Saline River Formation acts like a regional seal throughout the area in the subsurface”.

The NTGS review supports Suncor’s argument with respect to the isolation of saline groundwater from non-saline groundwater.

Table 2 compares the uncemented interval to the location of the Saline River formation for each well.

**Table 2: Uncemented Intervals and Saline River Formation in Suncor Wells**

	<b>Tweed Lake M-47</b>	<b>Tweed Lake A-67</b>	<b>Bele O-35</b>
<b>Uncemented Interval</b>	64 – 370 mKB	61.5 – 420 mKB	63 – 625 mKB
<b>Saline River Formation</b>	723 – 1,003 mKB	727 – 1,073 mKB	765 – 1,121 mKB

The Saline River is not present in the uncemented interval in any of the wells. Therefore, the existing cement, should it prove competent, isolates the saline groundwater from the non-saline groundwater in all three wellbores.

*Isolation of different non-saline groundwater zones*

The Memorandum submitted by Suncor on January 31, 2024, states the wells intersect up to three formations containing non-saline groundwater between the surface and the Saline River formation: the Bear Rock, Mount Kindle, and Franklin Mountain formations. The NTGS confirmed this information.

Table 3 compares the uncemented interval to the location of the non-saline groundwater bearing formations for each well.

**Table 3: Uncemented Intervals and Non-Saline Groundwater Bearing Formations in Suncor Wells**

	<b>Tweed Lake M-47</b>	<b>Tweed Lake A-67</b>	<b>Bele O-35</b>
<b>Uncemented Interval</b>	64 – 370 mKB	61.5 – 420 mKB	63 – 625 mKB
<b>Bear Rock Formation</b>	Not present	0 – 9 mKB	0 – 120 mKB
<b>Mount Kindle Formation</b>	0 – 20 mKB	9 – 76 mKB	Not present
<b>Franklin Mountain Formation</b>	20 – 723 mKB	76 – 727 mKB	120 – 765 mKB

More than one non-saline groundwater bearing zone is exposed by the uncemented interval in all three wells, which would suggest that remedial cementing to isolate the individual formations is required. However, the Memorandum presents evidence that the Bear Rock, Mount Kindle, and Franklin Mountain formations are likely to be in communication through natural fractures and that the non-saline groundwater moves between these formations. This evidence includes:

- Outcrop geology and petrophysical analyses, which suggest “there are many fractures in the subsurface Mount Kindle and Franklin Mountain Formations”.
- Cuttings analyses, which found prismatic calcite crystals that suggest the “formations are fractured and very likely partially open”.

The NTGS confirmed this analysis.

If the three non-saline groundwater bearing formations intersected by the wells are naturally in communication (not isolated from each other), then remedial cementing to isolate them at the wellbore is not necessary.

### **Decision**

Based on my consideration of Suncor’s arguments and NTGS’s review, I find that Suncor has made a reasonable case for removing the requirement for remedial isolation of the uncemented portion of the wellbore for the Tweed Lake M-47, Tweed Lake A-67, and Bele O-35 wells.

I have attached a revised Suspended Well Compliance Assessment for these wells.

If Suncor wishes to request variations to its approved well abandonment programs for these three wells, I recommend arranging a pre-application meeting with Mike Martin, Senior Technical Advisor, and Brandon Bradbury, Technical Specialist, to discuss OROGO’s technical requirements before designing and submitting an alternative program for approval.

Sincerely,



Pauline de Jong  
Regulator

**Suncor Energy Inc. Suspended Well Compliance Assessment – February 21, 2024**

WID	Well Name	Risk Level	Downhole Barriers Compliant (Y/N)	Zonal Abandonment Complete (Y/N)	Well Inspection (Y/N)	Gas Migration Testing (Y/N)	OA Approved (Y/N)	ACW Approved (Y/N)	Observations	Abandonment Operations Deadline
1476	Tweed Lake M-47	II	Yes	No	Yes <sup>1</sup>	Yes	Yes	Yes	<p><b>Downhole Barriers:</b> Zonal abandonment of Mount Clark perforations (1222.5 mKB) in 2015. Bridge Plug placed at 1187.8 mKB with 8m of cement on top. Total Depth 1418 mKB</p> <p><b>Last Well Inspection:</b> August 10, 2019</p>	March 31, 2025 <sup>2</sup>
1555	Tweed Lake A-67	II	Yes	No	Yes <sup>1</sup>	Yes	Yes	Yes	<p><b>Downhole Barriers:</b> Zonal abandonment of Upper and Lower Mount Clark perforations in 1986. Bridge Plug placed at 1,260 mKB with 9.3m of cement on top. Total Depth 1347 mKB</p> <p><b>Last Well Inspection:</b> August 11, 2019</p>	March 31, 2025 <sup>2</sup>
1600	Bele O-35	II	Yes	No	Yes <sup>1</sup>	Yes	Yes	Yes	<p><b>Downhole Barriers:</b> Suspended cased wellbore with no perforations completed in 1986. Total Depth 1384 mKB</p> <p><b>Last Well Inspection:</b> August 10, 2019</p>	March 31, 2025 <sup>2</sup>

**Action Required**

1. As per section 5D of the Guidelines, the well must be inspected every five years or prior to abandonment of the well, whichever comes first.
2. On December 19, 2022, OROGO extended the deadline for abandoning this well to March 31, 2025.