Memo

To: Usman Mirza, Project Manager, GN-TIN

From: Sarah Collins, Dillon Consulting Limited

Date: May 8, 2026

Subject: Regulatory Submissions Supporting Documentation

Our File: 24-8525

Dillon Consulting Limited (Dillon) is pleased to provide the enclosed package to the Government of Nunavut (GN) Department of Transportation and Infrastructure Nunavut (TIN) to support the regulatory submission to the Nunavut Impact Review Board (NIRB) and the Nunavut Water Board (NWB) for the amendment and renewal of Water Licence 3BM-SAN2025. The following information has been included within this package:

1. Creek Technical Assessment Memo: Hydrology, Fish Habitat, and Culvert Upgrade Recommendation;
2. Archaeological Impact Assessment;
3. Drawings:
    a. Site layout showing fuel and waste tanks distance from water source;
    b. Intake profile;
    c. Fish screen;
    d. Brine discharge line profile and headwall structure;
    e. Trucked discharge chute for winter brine discharge; and
    f. Construction plans for the WTP, including:
        i. Heavy equipment uses and how it will be fueled;
        ii. Estimated excavation quantities; and
        iii. Estimated granular quantities.
4. Estimate of annual wastewater generated by WTP;
5. Total annual withdrawal from Water Lake at year 20 (2047);
6. Maximum daily withdrawal from Sanikiluaq Lake at year 20 (2047);
7. Estimated annual recharge to Sanikiluaq Lake (Source Water Capacity Assessment, 2021);
8. Treated water storage capacity;
9. Wastewater storage capacity;
10. Brine storage capacity;
11. Fuel tank storage capacity;
12. Withdrawal assessment from Water Lake;
13. Truck discharge system assessment; and
14. Requested Licence amendments.

Design Detail Summary

Table 1 summarizes the facility design information requested as part of the Licence renewal/ amendment, supported by the attached documents.

Table 1: Regulatory Information Summary

Item	Project Information
Minimum distance from waste/fuel to water source	54.18 m, shown on C-2
Heavy equipment	Medium excavator – CAT 317 or Equal Tandem Axel Dump Truck (X2) 10T Vibratory Roller Rubber Tire Front end Loader Pickup Trucks Small Diesel Plant Tampers Hydraulic Hammer
Fish Screen	See C-7
Estimated excavation quantities[1]	2,921 m^3
Estimated granular quantities[1]	3,770 m^3
Estimate of annual wastewater generated by WTP at year 20	34,961 m^3
Maximum daily withdrawal from Sanikiluaq Lake at year 20	462 m^3/day
Annual withdrawal from Sanikiluaq Lake at year 20	103,695m^3
Estimated Annual Recharge of Sanikiluaq Lake	111,000 m^3 (50 -year low) 399,000 m^3 (2-year low)
Treated water storage capacity	350 m^3
Wastewater storage capacity	337 m^3
Brine storage capacity	260 m^3
Fuel tank storage capacity	31,000 L

Water Licence Amendment Requests

The amendments to water withdrawal that are required for 3BM-SAN2025 are detailed in Table 2 below.

Table 2: Water Withdrawal Amendments

	3BM-SAN2025	Amendment Requested
Total annual withdrawal from Sanikiluaq Lake	55,000 m^3	110,000 m^3
Daily withdrawal from Sanikiluaq Lake	299 m^3/day	465 m^3/day

Water Lake Withdrawal Assessment

A hydrology and water balance study was completed in 2021 to assess the expected annual recharge of Water Lake. The analysis revealed that Water Lake receives adequate recharge on an annual basis to sustain the withdrawal requirements for the new Water Treatment Plant (WTP) and the future demands of the community. Even during the statistically derived 50-year low, the anticipated recharge of the lake is 111,000 m3, which is higher than the projected annual water demand at the 20-year design horizon (2047).

Winter withdrawal requirements from Water Lake were assessed based on the DFO *Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut*. To accurately calculate the available under-ice water volume, three strategies for determining the appropriate ice thickness were evaluated:

1. DFO Default Protocol (2.0 m): The standard DFO protocol applies a default ice thickness of 2.0 m for Nunavut. However, Sanikiluaq is Nunavut's southernmost community, positioned further south than Deh Cho, NWT, where the maximum protocol ice thickness is indicated as only 1.0 m. As part of this assessment, organizations such as the Hunters and Trappers Association, Arctic Eider Society, and the Municipality were contacted to request historical ice thickness data for local lakes. While no formal data was available at this time, anecdotal evidence indicated that the maximum ice thickness is less than 2.0 m.
2. Freezing Degree Days Estimation: An ice growth estimation using Freezing Degree Days was calculated using climate data from 2022 to 2025. Because this theoretical calculation did not incorporate the insulating properties of snow cover, it resulted in ice-thickness estimations exceeding 3.0 m. This result is considered inaccurate and unrepresentative of Sanikiluaq based on local geographical and climatic realities.
3. 2026 Field Measurements: Field measurements were conducted on April 16, 2026. These late-season measurements confirmed an actual maximum ice thickness of approximately 1.36 m. Conducting this assessment in mid-April captures the ice at the tail-end of the continuous winter freezing season, immediately prior to the onset of the spring melt. Given the regional climate, this timing provides a highly reliable representation of the absolute peak annual ice accumulation.

Based on the evaluation of these methods, a design thickness of 1.5 m is recommended to be utilized for the final assessment. This incorporates the measured 1.36 m thickness alongside a 10% factor of safety

to account for annual variability, providing a conservative and region-specific baseline. Additionally, this 1.5 m design thickness establishes a well-correlated approximation between the 1.0 m thickness recommended for other communities located north of Sanikiluaq and the default 2.0 m requirement, which is more appropriate for High Arctic environments.

Based on consumption projections over a 20-year horizon, the average monthly consumption is estimated to be 8,641 m3 in the year 2047. Climate data indicates that the lake is ice-covered between the months of November and May, equating to seven months of withdrawal underneath the ice for a total of 60,488 m3. Therefore, utilizing the 1.5 m ice thickness design, the winter water taking is estimated to be approximately 7.9% of the available under-ice volume.

Table 3 provides a summary of the requested information from the DFO Protocol for year 2047.

Table 3: DFO Protocol for Winter Water Withdrawal from Water Lake, Sanikiluaq

Parameter	Data
Lake ID	Water Lake, Sanikiluaq
Coordinates	56º32' 26.82" N; 79º13' 26.21W
Surface Area	1,611,451 m^2
Total Lake Volume	3,813,551
Under Ice Volume	769,766 m^3
Max Expected Ice Thickness Used	1.5 m
Calculated 10% Withdrawal Volume Under Ice[1]	76,977 m^3
Total Required Water Volume Extracted during Ice Covered Season (year 2047)	60,488 m^3 (7.9% of volume under ice)
Aerial Photos of Waterbody	See attached.
Bathymetric Map of Water Body	See attached.

[1] Water Lake features high ridges that create sections that are isolated and inaccessible to the water treatment plant intake. To produce a conservative assessment, the water volume within these sections was excluded from the available under-ice calculations. If this isolated volume were included, the estimated winter water extraction would decrease to 3.5% of the total under-ice volume v.

Trucked Brine Discharge Assessment

The concentrated brine solution produced by the reverse osmosis treatment process will be discharged to the adjacent creek during non-frozen months through a buried pipeline. The analysis of this system and impact to the creek is included in the appended in the Creek Technical Assessments report. During winter months when the adjacent creek is frozen and unable to accept flow without causing ice buildup, the brine water will be trucked to the ocean for disposal. This serves as the backup disposal method to the primary buried pipeline discharge to the creek. A dedicated vacuum truck will be acquired as part of

this project to collect and transport the brine from the storage tank at the WTP to the marine environment.

After investigating three potential locations for the truck discharge chute, a location west of the community, along the existing road to the solid waste and wastewater disposal sites was selected by the GN-TIN and supported by the Municipality for the ocean discharge point. The location was selected based on the following factors:

- Least impact on residents due to furthest distance from homes and community buildings;
- Least impact of potential ice buildup due to the natural relief along the discharge path; and
- Proximity to other waste management areas.

A new 121-meter road will be constructed on the exposed bedrock leading to a gate and discharge chute at this location. As the area consists of exposed bedrock, only minimal preparation is required for the road and discharge point, inherently limiting the impact on vegetation given its scarce presence.

To mitigate potential erosion at the discharge point, the discharge chute will be equipped with riprap that extends down the slope. This solution is designed to protect the immediate area from the erosive force of the discharged brine, preventing the washout of any natural substrate and maintaining the stability of the slope. Riprap, which consists of a layer of large, angular stones, effectively disperses the energy of the flowing water, allowing it to flow harmlessly to the marine environment.

When the creek begins to melt during the early freshet, the brine discharge pipeline can be initiated again. This comprehensive approach ensures that brine disposal continues safely and responsibly even during periods of ice cover, with careful consideration for the receiving environment.

Closure

This memo and attached documentation are intended to outline the information required to support the Water Licence applications. Further details on design and project decisions are outlined in the Design Development Report and design drawing and specification package.

Sincerely,

DILLON CONSULTING LIMITED



Sarah Collins, P.Eng.
Water, Wastewater Engineer