From:	Tim Morton
To:	Erica Janes; Heather Scott; Alexandra Schmalz
Cc:	Nahum Lee
Subject:	RE: SNP Change Request
Date:	Monday, January 6, 2025 9:42:40 AM
Attachments:	image001.png image002.png image003.png image004.png image005.png DOCS-#785225-v1-SNP_Change_Request_-_Letter_to_MVLWB_-_Requesting_Removal_of_Flow_Measurement_Requirements_-_December_2024.PDF

Good Morning Erica,

Attached is the PDF copy of the request.

Madison's last day was December 31st. Alex Schmalz just started with as her replacement. Once she is settled in we will set up a meeting to introduce everyone. Please include Alex in all future communications.

Mársı | Kinanāskomitin | Thank you | Merci | Hąį' | Quana | ᖁᔭᓐᓇᒦᒃ | Quyanainni | Máhsı | Máhsı | Mahsì

Tim Morton
Manager – Environmental Impact and Regulatory Affairs
Public Works and Engineering
City of Yellowknife
T: 867.920.5677
F: 867.920-5649
yellowknife.ca

I acknowledge that I reside and work in Chief Drygeese territory.

From: Erica Janes <ejanes@mvlwb.com>
Sent: January 6, 2025 9:31 AM
To: Madison Warren <mwarren@yellowknife.ca>; Heather Scott <heather.scott@mvlwb.com>
Cc: Nahum Lee <Nahum_Lee@gov.nt.ca>; Tim Morton <tmorton@yellowknife.ca>
Subject: RE: SNP Change Request

recognize the sender and know the content is safe.

Hi all and happy new year!

Thanks for this, Madison – however, I cannot open it. Could you please resend as just a plain old PDF?

Cheers,
Erica

From: Madison Warren <mwarren@yellowknife.ca>
Sent: Monday, December 23, 2024 9:24 PM
To: Erica Janes <ejanes@mvlwb.com>; Heather Scott <heather.scott@mvlwb.com>
Cc: Nahum Lee <Nahum_Lee@gov.nt.ca>; Tim Morton <tmorton@yellowknife.ca>
Subject: SNP Change Request

Hi everyone,

Please see attached the City's formal request to change the SNP of Water Licence MV2021L3-0003. Please contact Tim Morton with any questions or concerns you may have.

Thank you,

Mársı | Kinanāskomitin | Thank you | Merci | Hą̨i' | Quana | ᖁᔭᓐᓇᒦᒃ | Quyanainni | Máhsı | Máhsı | Mahsì

Madison Warren, EIT.
Municipal Engineer
Environment Division
Public Works & Engineering
City of Yellowknife
Tel: 867-920-5639
yellowknife.ca

I acknowledge that I reside and work in Chief Drygeese territory.

CITY OF YELLOWKNIFE

December 23, 2024

Mackenzie Valley Land and Water Board
Box 2130, 7th Floor - 4910 50th Avenue
Yellowknife, NT X1A 2P6

Attention: Erica Janes, Regulatory Officer

Dear Ms. Janes,

RE: Water Licence MV2021L3-0003 - SNP Change Request

The City of Yellowknife (the City) operates under Water Licence MV2021L3-0003. Within the SNP requirements of this Licence, the City is expected to collect monthly flow measurements during decant at stations 0032-10 and 0032-F1, commencing in 2025. The City writes this letter to formally request that the Mackenzie Valley Land and Water Board (MVLWB) change the SNP requirements of the Licence to remove the requirement for flow measurements at the aforementioned locations.

Reason for Request:
During the Public Hearing for the current Water Licence, consultants representing the MVLWB brought the possibility of the requirement for flow measurements at 0032-10 and 0032-F1 forward. During the public hearing, the City clearly identified that the feasibility of these flow measurements was unknown. The SNP stations of interest are both along the Fiddler's Lake Treatment System (FLTS). There are many concerns with accessibility including but not limited to occupational health and safety (wastewater), limited access (0032-F1 is only accessible by helicopter), marshy wetland characteristics (not a single flow channel). The City was open to pursuing a feasibility investigation of measuring flow at these locations, but strongly recommended that the requirement to measure the flow at these locations not be put into the Licence until the feasibility was established. Other reviewer parties also showed concern for the feasibility and value of this requirement during the time of the public hearing, with the Government of the Northwest Territories stating the following when asked their position on the requirement:

"Yeah, I don't think we have a strong position on that. You know, it would really be based on the value and the logistics and the cost and everything that might be related to that versus the data. So I don't think we're in a position to say one way or another, and we haven't really considered cost/benefit of data versus what that might cost for the City and how that might -- how that might relate to some of the other components. So, I don't think we have a strong opinion either way on the need for any flow -- or an installation of flow meters through that system. Thank you"

Over the past two years, the City has worked with a consultant to investigate the feasibility of implementing flow meters at 0032-10 and 0032-F1. The consultant has raised many concerns in regard to the value of a single point-in-time flow value relative the extreme financial costs of the equipment required to collect this data, as well as the physical and occupational health and safety challenges in collecting the data. The City connected with Environment and Climate Change Canada's Water Survey of Canada (ECCC) to request that ECCC could collect the required data on behalf of the City. The request was denied due to the occupational health and safety concerns identified by the ECCC team. Due to the expert advice the City has received from consultants, the occupation health and safety concerns raised by Water Survey of Canada, and the imbalance of resources required versus value added by this requirement- the City feels strongly that the flow measurement requirements for 0032-10 and 0032-F1 should be removed from the Licence.

Limitations of 0032-10

Station 0032-10 is at the outlet of Fiddler's Lagoon. Due to the fluctuations in flow at this location, the equipment that can be used here is limited. The channel has steep access slopes and the material being measured is wastewater discharged from a lagoon. When formed, the ice is unsafe to work on, limiting any flow measurements from taking place between October and May each year as well the City normally only decants between July and December; therefore, only three or four flow measurements would be possibly collected assuming suitable conditions in those three or four months. The high financial costs and level of training required to secure and use the equipment have been identified as concerns.

Limitations of 0032-F1

Station 0032-F1 is accessible only by helicopter, and the helicopter landing areas within a reasonable distance are extremely limited. The body of water is marshy with difficult access to the shoreline. The water does not flow in a clear, singular channel. Only one location between SNP station 0032-F1 and the discharge to Great Slave Lake was determined to be appropriate for measuring flow. It is important to note that this one location may not be accessible as the water levels were extremely low during the field assessment by the consultant. Wading into this body of water could be extremely dangerous due to the soft, uneven bottom, and rate of flow within the water. Similar to 0032-10, equipment costs and training requirements were identified as a concern.

Implications of Removing Requirement

The intended use of this flow data is to establish loading in the Fiddler's Lake Treatment System Adaptive Management Plan due for submission in 2033. The City argues that 3-4 point-in-time flow measurements per year do not necessarily provide an accurate representation of flow in the system. The City currently measures all flow to the lagoon and intends to use this volume along with precipitation data to estimate the loading into the system and the receiving environment. Although this will be an estimation, the measured data points would also require estimation and extrapolation to determine loading. The City still intends to meet the requirements outlined in the Licence for the Fiddler's Lake Treatment System Adaptive Management Plan with approximated loading values.

For further information the City has on the matter, please see the appended memo provided by Associated Environmental discussing the investigation into the flow at 0032-10 and 0032-F1. Should you have questions or concerns, please contact Tim Morton at tmorton@yellowknife.ca or at 867-920-5677.

Regards,

Tim Morton
Manager of Environmental Impact and Regulatory Affairs

Associated Environmental

MEMO

Date:	November 20, 2024	Reference/Project No.:	2022-8206.000
To:	Tim Morton; Madison Warren, EIT	Page:	1 of 9
From:	Drew Lejbak, M.Sc., Senior Hydrologist		
Project:	Yellowknife Wetland Delineation Study and Great Slave Lake Monitoring		
Subject:	Flow Measurement Options at SNP Stations 0032-10 and 0032-F1		

1 INTRODUCTION

The City of Yellowknife's (the City) water and waste management operations are regulated by the Mackenzie Valley Land and Water Board (MVLWB) under water licence no. MV2021L3-0003 (the water licence). Part F and Schedule 3 of the water licence outline requirements related to water and waste management and one of those requirements is to begin monitoring monthly water flow volumes at two of the City's current surveillance network program monitoring sites: SNP 0032-10 and 0032-F1. To start this process, the City retained Associated Environmental Consultants Inc. (Associated) to assess available flow measurement options at these sites and provide recommended monitoring approaches for the City to implement. This memorandum summarizes the City's treatment system, a summary of visits to the SNP sites in June 2023 and September 2024, and the final identified flow monitoring options for each site.

2 FIDDLER'S LAKE TREATMENT SYSTEM AND FLOW MONITORING REQUIREMENTS

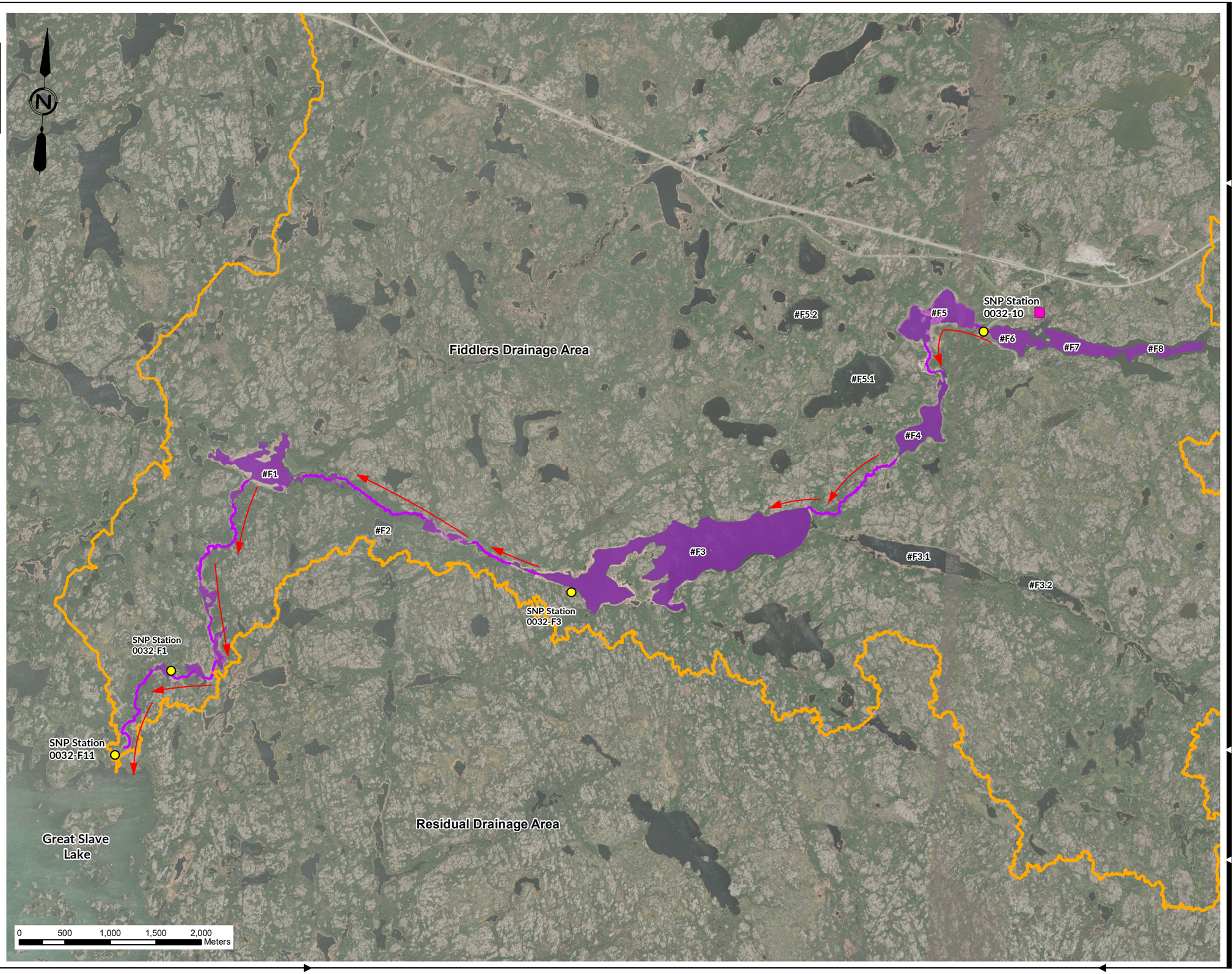
The City's wastewater treatment system, referred to as the Fiddler's Lake Treatment System (FLTS), comprises approximately 13.5 km of stream channels and wetlands that carry and further treat effluent on its way to Great Slave Lake. The main treatment lagoon encompasses Lakes #F8, #F7, and #F6 (collectively known as Fiddler's Lagoon) (Figure 2-1). Fiddler's Lagoon, which provides wastewater storage and pre-treatment, is approximately 3.2 km long with an estimated total volume of 2.5 ML.[1] Lift stations No. 5 and 6 receive wastewater from all other City lift stations (14 in total), and discharge effluent to Fiddler's Lagoon. All lift stations are metered. Some wastewater is received by the FLTS via truck-hauling to either Lift station No. 1 or 5 or directly into Fiddler's Lagoon in case of emergencies. Additional inflows to FLTS include seepage from honey bags and animal waste and storm sewer catch basin material, which are disposed on the ground on the north and east sides of Fiddler's Lagoon, respectively; and sewer system flushing water, which is collected by vacuum trucks and discharged into Fiddler's Lagoon.[1]

Every year, stored effluent is released (i.e., decanted) from Fiddler's Lagoon to the downstream wetland system, which starts with Lake #F5. Effluent release normally occurs over five to six months every year, starting in June or early July and ending in early winter (November or December). Effluent needs to be released from Fiddler's Lagoon when the water elevation on the staff gauge next to the control structure at site SNP 0032-10 is 186.8 meters above sea level (masl) to maintain the dam's 1 m required freeboard.[1]

[1] Dillon Consulting Ltd. (Dillon). 2014. Fiddler's Lake Treatment System Plan. Prepared for the City of Yellowknife. September 2014.

IF NOT 25 mm ADJUST SCALES 25 mm

SCALE (S) SHOWN ARE INTENDED FOR TABLOID (11X17) SIZE DRAWINGS UNLESS NOTED OTHERWISE



Associated Environmental

Legend:

- SNP Sampling Location
- Honey Bag Pit
- Flow Path
- Flow Direction
- Fiddler's Drainage Area

FIGURE 2-1

CITY OF YELLOWKNIFE

FIDDLERS DRAINAGE AREA AND FLOW PATH

AE PROJECT No.	2022-8206
SCALE	1:40,000
APPROVED	
DATE	2023AUG25
REV	
DESCRIPTION	ISSUED FOR FINAL

SAVE DATE: 8/23/2023 11:46:25 AM SAVED BY:
DRAWING PATH: C:\2022-8206_Yellowknife\Wetland Delineation\WetlandAreas\fig1_FiddlersDrainge_v2.mxd
DATA SOURCE: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community.

Under Table 2 of the water licence, the City is required to start collecting flow measurements monthly during decant (in addition to water quality, which is already tested) at the following two sites (Figure 2-1):

- SNP 0032-10: Located at the control structure of Fiddler's Lagoon; represents the last point where the City has control over the quality of the effluent before it is released to the polishing wetlands.
- SNP 0032-F1: Located downstream of Lake #F1, approximately 1.5 km upstream of where the flow reaches Great Slave Lake. This site represents the beginning of the receiving environment (as defined in the water licence) and provides an indication of the effectiveness of the FLTS before effluent is discharged into Great Slave Lake.

As outlined within the water licence, the flow information is supposed to be used by the City to ultimately report the 'monthly and annual flow volume, in cubic metres' at both sites as part of their annual operations and maintenance plan.

3 SITE VISITS

Associated conducted site visits to SNP 0032-10 and 0032-F1 on June 28-29, 2023, and September 18, 2024. Site SNP 0032-F1 was accessed via helicopter, while site SNP 0032-10 was visited by vehicle. During the site visits, we documented site conditions, existing and nearby infrastructure (e.g., valves, chambers, power/electricity), effluent release constraints, other access and flow monitoring equipment installation limitations. We also measured streamflows at both sites in September 2024. A summary of the site visits is provided in the following sections.

3.1 Site SNP 0032-10

Site SNP 0032-10 is located at the downstream end of Fiddler's Lagoon, situated off Highway 3, approximately 12 km west of the City. It consists of a control structure at the downstream (western) end of Lake #F6, which includes a dam and three release valves. The main (central) outflow valve can be lifted or lowered to control effluent release during decant. The two smaller valves are opened when Fiddler's Lagoon levels are below the main valve's elevation. There are no buildings, power/electricity, or infrastructure nearby.

The channel width downstream of the release valves is 7-10 m and decreases to approximately 5 m downstream and narrowing towards Lake #F5. The channel banks are very steep (near vertical) bedrock before reducing to gentle slopes with vegetation near Lake #F5. Backwater effects from Lake #F5 have been observed in the past.[2] A beaver house was reported at the mouth of the channel upstream of Lake #F5 but was not observed in September 2024. City staff reported that when the beaver house was present, it did not interfere with effluent release during decant.

During the September 2024 visit, effluent release flow was measured approximately 50 m downstream of the release valves. A flow rate of 0.201 m^3/s was measured using an Acoustic Doppler Current Profile (ADCP).

[2] Personal communications with City staff during site visit, June 2023.

3.2 Site SNP 0032-F1

Site SNP 0032-F1 is located approximately 1.5 km upstream of where the streamflow reaches Great Slave Lake, downstream of Lake #F1. Access to this site is only by helicopter and there are no buildings, power/electricity, or infrastructure nearby.

The natural channel immediately upstream of SNP 0032-F1, as observed in June 2023, was approximately 100 m long and connects two small (unnamed) ponds. The active channel was approximately 5 m wide at the time of the visit. The channel was well defined during the first 40 m; however, closer to Lake #1 the channel splits. A beaver dam was also present in the channel upstream of Lake #F1 resulting in increased water levels and possibly altering streamflow paths.

During the September 2024 visit, the channel downstream of Lake #F1 was observed to search for a location where a flow measurement could be collected. A channel approximately 75-100 m long was observed that connected Lake #F1 to a downstream pond. Channel widths were 5-10 m and Associated conducted a streamflow measurement approximately 50 m downstream from the outlet of Lake #F1 using a FlowTracker2 Acoustic Doppler Velocimeter. The measured streamflow was 0.215 m^3/s.

4 FLOW MONITORING OPTIONS

Using the information gathered during the site visits, this section outlines the possible flow monitoring strategies for SNP 0032-10 and 0032-F1. These findings build upon previous options presented to the City by Associated (2023)[3].

4.1 SNP 0032-10

To date, Associated has investigated and ruled out numerous options for flow monitoring at site SNP 0032-10, as summarized in Associated (2023).[3] Major limitations at this site include access limitations to the release valve infrastructure, steep (bedrock) channel banks, and health and safety concerns about staff entering the treated effluent water. One option that was initially investigated, as it would prevent the need for City staff to enter the water, was the installation of a non-contact radar flow meter.[3] However, the equipment requires a minimum depth of 1 m to operate, and during the September 2024 site visit, the channel depth was in the range of 0.1 to 0.8 m. Subsequent discussions with the equipment provided have confirmed this option will not work.

Given these most recent findings, there are two remaining options presented here for the City to consider.

4.1.1 Option 1 – Contracting ADCP and/or FlowTracker2 measurements

Due to the health and safety concerns for entering the channel, a single flow measurement could be conducted using an ADCP unit, which does not require personnel to enter the water. This is consistent with the method used in September

[3] Associated Environmental Consultants Inc. (Associated). 2023. Flow Measurement Options at SNP Stations 0032-10 and 0032-F1: Items for Further Discussion. Prepared for the City, November 2023.

2024. However, ADCP units are specialized and expensive equipment to rent (typically rental fees are in the order of ~$3,000 per week, and shipping equipment to/from Yellowknife would need to be incorporated as it is unlikely a unit could be sourced locally).

As a secondary option, a FlowTracker2 handheld unit could also possibly be used during low flow releases but would require a 10 m cable and rod extension so the unit could be lowered from the top of the release chamber into the channel. This would likely work during low flows, but when the main release is open, the velocity and turbulence may be too much for application.

This option overall would require a contractor/consultant to be hired for each monthly measurement. To support this option, the City could rent an ADCP or FlowTracker2 from Hoskin Scientific for a contractor, or a contractor may have their own. However, with the FlowTracker2 option, the 10 m cable and rod extensions would likely need to be purchased by the City as these are specialized items and not commonly used or available for rent.

Overall, this option (however decided) would result in manual flow measurements conducted each month to meet water licencing needs but requires a contractor to complete, resulting in ongoing costs that would likely increase each year as contractor and equipment rental rates change.

4.1.2 Option 2 – Lagoon Water Balance

Given the limitations with collecting physical flow measurements in the channel, another option previously outlined in Associated (2023)[3] is to develop a water balance of Fiddler's Lagoon and estimate effluent outflows. This would require installing a water level sensor within the lagoon to monitor water levels and changes in storage. By installing the sensor and understanding the change in storage, an estimate of how much effluent is released on daily, weekly, or monthly standpoint could be calculated using a water balance approach. The water balance would require the bathymetry of the lagoon, the change in storage, rainfall and evaporation estimates on to and from the lagoon, and the amount of effluent pumped into the lagoon. The effluent release would be an estimate due to some of the assumptions needed to estimate evaporation, rainfall, change in storage, and other water balance components. There would be some upfront costs to support implement this option, but once implemented, ongoing annual costs should be a lower compared to Option 1.

The following tasks would be required to complete the water balance for the lagoon:

Fiddler's Lagoon Water Levels

- Install a pressure transducer in the lagoon to collect continuous water level data at sub-daily intervals.
- Continuous water level data from the pressure transducer could be manually downloaded by City staff during their regularly scheduled site visits. Alternatively, the pressure transducer could be installed with real-time capability allowing for recorded information to be transmitted on a user specified interval based on a monthly data plan. Given that AC power is not available at this location, real-time capability would require the installation of a solar panel and battery.

- All recorded water level data would have to be checked for quality assurance and quality control (QA/QC) purposes periodically, including applying sensor drift corrections based on surveyed water levels.

Change in Storage

- Conduct an updated bathymetric survey of Fiddler's Lagoon, which would consist of collecting lagoon bottom elevations at various point locations.
- Develop a stage-storage curve of Fiddler's Lagoon based on the updated lagoon bathymetry.

Effluent Inflows

- Compile inflow data from pump stations No. 5 and 6 to estimate daily or monthly inflows to the lagoon.
- Estimate any additional effluent inflows from haul trucks based on number of trips and truck volumes.

Surface Water Inflows

- Conduct a background review to confirm the presence of surface water inflows to the lagoon.
- If the presence of surface water inflows is confirmed, obtain regional hydrometric data to estimate surface water inflows.

Precipitation and Evaporation

- Obtain climate data (i.e., air temperature and precipitation data) from the Yellowknife Airport station (No. 2204108) to summarize total precipitation on the lagoon and estimate total evaporation from the lagoon.

Effluent Outflows (Water Balance Calculations)

- Conduct water balance calculations to estimate daily, monthly, or annual effluent outflows.

Notable advantages and disadvantages in estimating effluent releases using the water balance method include the following:

Advantages:

- Despite the initial high costs expected to update the bathymetric survey and purchase water level monitoring equipment, this option would provide a simple and reliable way to continuously estimate lagoon effluent release volumes without the need to install any sensors in the channel downstream of the control structure.
- Installation of a pressure transducer in the lagoon would provide the City with real-time lagoon levels information, aiding in decant timing decision making.
- This option would provide the City with an estimate of the total volume entering and existing the lagoon each year, compared to Option 1 (monthly instantaneous flow measurements during decant), which would only provide the flow volume in the channel on the date it was measured.

Disadvantages:

- An updated lagoon bathymetric survey would be required. The most recent lagoon bathymetric survey was conducted in 2011 (Dillon 2014)[4]. However, solids were last removed ("desludged") from the lagoon in 1987 (City of Yellowknife 2021)[5]. Recent field surveys conducted by Hydrasurvey estimated that the in-situ solids layer occupies a volume of approximately 226,000 m^3, which equates to about 10% of the lagoon working volume (City of Yellowknife 2021). Due to solids accumulation, the City commissioned the Fiddler's Lagoon Desludging and Recommendations study (Dillon 2019)[6] to develop options for removal and processing of the material. It is anticipated that desludging may be completed soon, and that sludge monitoring will be conducted annually to assess whether desludging is required. Therefore, any consideration of this option as an effluent monitoring approach would have to be coordinated with lagoon desludging plans.
- Estimating additional lagoon inflows and outflows, such as precipitation and evaporation, would depend on availability and quality of nearby climate data. At the time of writing this memorandum, hourly climate data are available from the Yellowknife Airport weather station (Climate ID 2204108). This option would assume that climate data from Yellowknife Airport are representative of the lagoon area. Alternatively, a weather station can also be installed at the site (for an additional cost) to ensure the availability of climate data.

4.2 SNP 0032-F1

The most common approach to monitoring streamflow in natural open channels consists of installing a hydrometric station with a pressure transducer to measure water levels. Recorded water levels can then be converted to discharge based on a stage-discharge relationship (i.e., a rating curve) using surveyed water levels and manual discharge measurements. However, due to the remoteness of SNP 0032-F1, channel widths and depths, wetland characteristics of the channel, documented presence of beaver dams, and the presence of ice through the late fall to early spring months, developing a stable rating-curve would be very difficult.

Based on the results of our site visits, the only feasible option for measuring flow at SNP 0032-F1 would be to conduct manual discharge measurements, coinciding with the water quality sampling already done by the City to capitalize on helicopter access. Our September 2024 visit identified a spot to conduct a discharge measurement downstream of Lake #F1. The streamflow conditions at the time were very low; however, during the spring, wading in the channel may not be possible from a safety and logistical perspective, due to the presence of ice and/or high-water. Accordingly, specialized monitoring equipment would be needed to measure streamflow under ice (i.e., auger and ice rod adapter) or during high water (i.e., ADCP). This would require City staff to be trained on the specific methods or a contractor/consultant would need to be hired. Also, during high water periods, access to both sides of the channel would not be available since there are no helicopter landing options beyond where Lake #F1 is currently accessed. This results in an ADCP application requiring a remote-controlled boat or a bank-operated pulley system constructed during low water conditions the previous season – this would require additional training for City staff or a contractor/consultant.

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[4] Dillon Consulting Ltd. (Dillon). 2014. Fiddler's Lake Treatment System. Prepared for the City of Yellowknife, September 2014.

[5] City of Yellowknife. 2021. Yellowknife Fiddler's Lake Treatment System Management Plan. January 2021.

[6] Dillon Consulting Ltd. (Dillon). 2019. Fiddler's Lagoon Desludging and Recommendations – Preliminary Design Report. Version 1.1. Prepared for the City of Yellowknife, October 2019.

Due to the complexity of conducting flow measurements at this site and the need for City staff to be trained in different measurement techniques, two options are presented here for consideration.

4.2.1 Option 1 – Contracting Flow Measurements

If a contractor/consultant is hired to conduct flow measurements at SNP 0032-10 (Section 4.1.1), then this option would have the same contractor conduct measurements at SNP 0032-F1 during the City's water quality site visits.

4.2.2 Option 2 – Intermittent Flow Measurements by the City or Contractor

As defined in the water licence, SNP 0032-F1 represents the beginning of the receiving environment and provides an indication of the effectiveness of the FLTS before effluent is discharged into Great Slave Lake. However, between the effluent release point at SNP 0032-10 and SNP 0032-F1 (at Lake #F1), the contributing drainage area of Fiddler's Creek is 113 km^2 (Figure 2-1) or approximately 87% of the entire watershed. In addition, the effluent is released into Lake #5, but prior to reaching Lake #F1, outflow from Lake #F5 travels through approximately 8.5 km of stream channel, multiple small ponds and wetland areas, and Lakes #F4 and #F3. Accordingly, streamflows between SNP sites would regularly be different due to added natural tributary and baseflows and because of pond and lake storage and attenuation. Furthermore, manual monthly measurements at SNP 0032-F1 would only provide an indication of streamflows through the system at that point in time and would not allow for the determination of monthly or annual flow volumes.

Because of the limited flow monitoring options at SNP 0032-F1, we recommend that the City discuss the MVLWB's request of flow monitoring at this site and outline the challenges with site access, health and safety risks, and the resultant application of the measurement. The risk to the receiving environment from the FLTS would be assessed through water quality testing at SNP 0032-F1 and as part of the future Great Slave Lake monitoring program.

If some form of flow measurement is still ultimately required by the MVLWB, as an alternative to Option 1 (Section 4.2.1), the City could propose to measure streamflows only during low flow conditions and when the channel is deemed safe to enter and wade. These measurements could be conducted by City staff or a contractor/consultant. During high flow periods, it is expected that water quality is diluted and not reflective of the effectiveness of the FLTS and more a result of natural system dilution. Low flows would better highlight the effectiveness of FLTS since storage and attenuation of effluent through the system would be better represented.

This option is like Option 1 but requires approval from the MVLWB. If approved, this option would result in lower annual costs since measurements would not be conducted during every site visit and either the City would be conducting the measurements or less measurements would be completed by a contractor/consultant.

5 CLOSURE

We look forward to discussing our recommendations further with you. Please contact Drew Lejbak at 250-826-9486 if you require any additional information.

Yours truly,
Associated Environmental Consultants Inc.

Prepared by:

Drew Lejbak, M.Sc.
Senior Hydrologist

Reviewed by:

Nicole Penner, B.Sc., P.Ag.
Project Manager