Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Associated Engineering (Sask.) Ltd.
410 - 5 Donald Street
Winnipeg, MB R3L 2T4 Canada
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TEL: 204.942.6391

October 31, 2025
Reference/Project No.: 2021.4670.00

Jay Mak, M.Sc., P.Eng.
Senior Environmental Engineer
Land Use, Waste Management, and Energy Section Environmental Approvals Branch

Box 35, 14 Fultz Blvd
Winnipeg, MB R3Y 0L6

Re: RM OF SPRINGFIELD, DUGALD OAKBANK PUBLIC WATER SYSTEM
FILE 6219.00/6013.10 - REQUEST FOR ADDITIONAL INFORMATION

Dear Jay:

The following is provided in response to your request for additional information to support our Environment Act Proposal for the file numbers noted above, received via email on July 31, 2025.

Request:
Please provide a single lay out map that shows the existing infrastructure and the new components being proposed in both proposals.

Response:
See attached site plan dated October 31, 2025.

Request:
Please provide an estimate of greenhouse gases generated by the proposed development.

Response:
Greenhouse gas (GHG) emissions will primarily be generated from fossil fuel use, producing carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Using guidelines developed by Environment Canada, Infrastructure Canada, and the United Nations, emissions were calculated based on equipment efficiency and emission factors. Applying the 100-year Global Warming Potential to express all gases as CO_2e, the estimated total GHG emissions for this project are 920.94 tCO_2e.
This estimate does not include emissions from manufacturing or fabrication.

Request:
Please provide a summary of the alternative water treatment technologies considered.

Response:
The main options that were evaluated were greensand filtration, biological filtration, and membrane treatment using reverse osmosis (RO).

Greensand filtration is commonly used in Manitoba for removing iron and manganese, relying on chemical oxidation and specialized media to capture contaminants. It is highly reliable and relatively simple to operate and maintain. The Municipality has direct experience with greensand filtration as it is currently in use at their Anola WTP.

Biological filtration is not as common in Manitoba, with only two plants utilizing this technology. It uses naturally occurring bacteria to remove iron, manganese and ammonia, without the need for chemical oxidants, which results in lower chemical use and reduced backwash waste. It is, however, highly sensitive to operational disruptions that can affect the water quality.

Membrane treatment, specifically RO, was assessed as a polishing step to remove fluoride, sodium, and total dissolved solids—parameters not addressed by filtration alone. Although it can be expensive to operate and maintain, it is commonly used in Manitoba to treat otherwise difficult water.

The recommended strategy ultimately chose greensand filtration for primary treatment with 20% of the raw water being sent to RO for the reduction of fluoride and sodium. This blended approach was selected for its ability to meet regulatory guidelines, adapt to future changes in raw water quality, and balance operational efficiency with cost-effectiveness.

Request:
Please provide a summary of the assumptions and data used to calculate the population growth or projected water use estimates in Section 1.1.2 or 1.1.3.

Response:
The population and water demand projections included in our proposal were developed through a combination of historical analysis and future planning.

First, census data from 2006, 2011, and 2016 was reviewed to establish growth trends in Dugald and Oakbank, revealing rapid population increases equivalent to an annualized growth rate of 6.1%. To forecast future growth, the Municipality's Future Development Report was used, which identifies proposed developments in terms of Residential Equivalency Units (REUs). Each REU represents 2.9 persons and accounts for both residential and commercial expansion. These REUs were distributed evenly over a 20-year period to estimate annual growth.

For water demand, historical meter data from 2019 to 2021 was analyzed to determine average and maximum daily usage, as well as per capita consumption and the ratio of maximum to average day demand (Max Day Factor). Although Dugald's historical per capita water use was below the Canadian average, a standard rate of 200 litres per capita per day was adopted for future projections to align with national norms. The Max Day Factor, which was historically high, was scaled down to 2.0 over five years to account for anticipated conservation efforts and system upgrades.

By multiplying projected populations by the standardized per capita usage and applying the adjusted Max Day Factor, future water demand was calculated for each community. These projections, summarized in Table 1-1 on page 4 this letter, provided the design basis for sizing the new water treatment plant, ensuring the system will meet long-term needs while mitigating the risk of oversizing due to aggressive growth assumptions:

We trust that you'll find the foregoing information satisfactory. If there are any other questions or concerns, please reach out.

Yours truly,

Desiree Pastorin
Project Manager

DLP

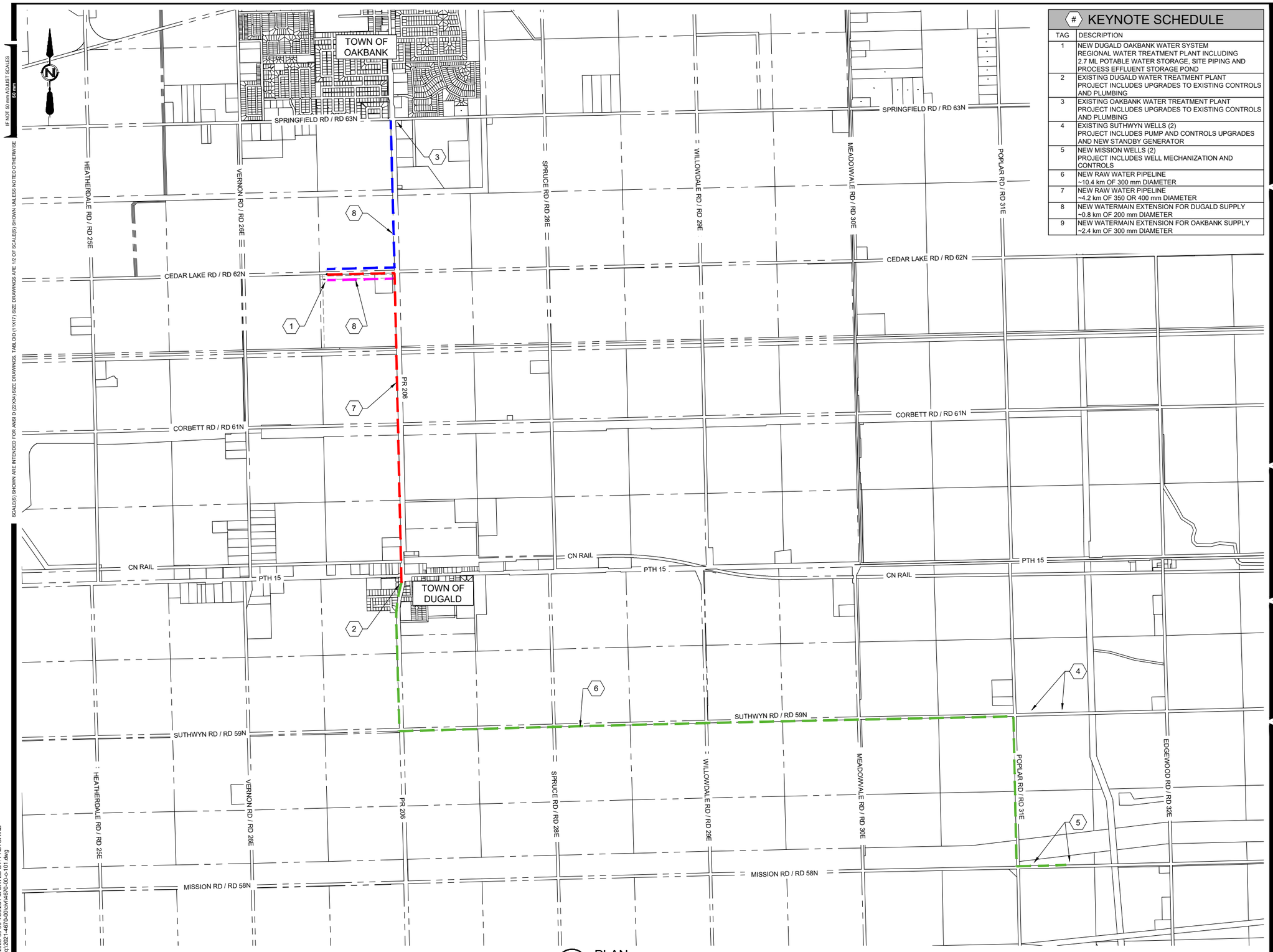
Attachment: Overall Site Plan

Table 1-1
Summary of Population and Water Demand Projections

Year	Dugald		Oakbank		Combined Total	
	Equiv. Pop.	Max Day Demand (m^3/day)	Equiv. Pop.	Max Day Demand (m^3/day)	Max Day Demand (m^3/day)	Max Demand Over 20 hr Day (L/s)
2021	1,035	665	3,538	2,154	2,496	35
2022	1,187	735	4,231	2,478	2,822	39
2023	1,338	798	4,924	2,769	3,090	43
2024	1,489	853	5,617	3,029	3,297	46
2025	1,640	902	6,310	3,256	3,441	48
2026	1,791	944	7,004	3,451	3,518	49
2027	1,943	978	7,697	3,614	3,856	54
2028	2,094	1,006	8,390	3,745	4,193	58
2029	2,245	1,026	9,083	3,844	4,531	63
2030	2,396	1,040	9,776	3,910	4,869	68
2031	2,548	1,019	10,469	4,188	5,207	72
2032	2,699	1,080	11,162	4,465	5,544	77
2033	2,850	1,140	11,855	4,742	5,882	82
2034	3,001	1,201	12,548	5,019	6,220	86
2035	3,153	1,261	13,241	5,297	6,558	91
2036	3,304	1,322	13,935	5,574	6,895	96
2037	3,455	1,382	14,628	5,851	7,233	100
2038	3,606	1,443	15,321	6,128	7,571	105
2039	3,758	1,503	16,014	6,406	7,909	110
2040	3,909	1,564	16,707	6,683	8,246	115
2041	4,060	1,624	17,400	6,960	8,584	119

IF NOT 50 mm ADJUST SCALES
50 mm

SCALE(S) SHOWN ARE INTENDED FOR ANSI D (22X34) SIZE DRAWINGS. TABLOID (11X17) SIZE DRAWINGS ARE 1/2 OF SCALE(S) SHOWN UNLESS NOTED OTHERWISE



#	KEYNOTE SCHEDULE
TAG	DESCRIPTION
1	NEW DUGALD OAKBANK WATER SYSTEM REGIONAL WATER TREATMENT PLANT INCLUDING 2.7 ML POTABLE WATER STORAGE, SITE PIPING AND PROCESS EFFLUENT STORAGE POND
2	EXISTING DUGALD WATER TREATMENT PLANT PROJECT INCLUDES UPGRADES TO EXISTING CONTROLS AND PLUMBING
3	EXISTING OAKBANK WATER TREATMENT PLANT PROJECT INCLUDES UPGRADES TO EXISTING CONTROLS AND PLUMBING
4	EXISTING SUTHWYN WELLS (2) PROJECT INCLUDES PUMP AND CONTROLS UPGRADES AND NEW STANDBY GENERATOR
5	NEW MISSION WELLS (2) PROJECT INCLUDES WELL MECHANIZATION AND CONTROLS
6	NEW RAW WATER PIPELINE ~10.4 km OF 300 mm DIAMETER
7	NEW RAW WATER PIPELINE ~4.2 km OF 350 OR 400 mm DIAMETER
8	NEW WATERMAIN EXTENSION FOR DUGALD SUPPLY ~0.8 km OF 200 mm DIAMETER
9	NEW WATERMAIN EXTENSION FOR OAKBANK SUPPLY ~2.4 km OF 300 mm DIAMETER

1 / - PLAN 1:20000
OVERALL PROJECT SITE KEY

Associated Engineering

BEST MANAGED COMPANIES
Platinum member

MWSB

PRELIMINARY/
FOR DISCUSSION
NOT FOR CONSTRUCTION

DRAFT

REV	DATE	DESIGN	DRAWN	DESCRIPTION
A	2025OCT31	D. PASTORIN	D. PASTORIN	ISSUED FOR INFORMATION

MUNICIPALITY OF SPRINGFIELD · MANITOBA · CA

RM OF SPRINGFIELD

DUGALD OAKBANK WATER SYSTEM
WATER TREATMENT PLANT AND
SYSTEM EXPANSION
6219.00 / 6013.10

SCALE: AS SHOWN

CIVIL
OVERALL PROJECT SITE KEY PLAN

DRAWING	REVISION	SHEET
4670-00-EAP	A	1

PLOT DATE: 2025-10-31 10:51:34 AM
SAVE DATE: 2025-09-03 4:59:25 PM SAVED BY: PASTORIND
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Jay Mak, M.Sc., P.Eng.
Senior Environmental Engineer
Land Use, Waste Management, and Energy Section Environmental Approvals Branch

Box 35, 14 Fultz Blvd
Winnipeg, MB R3Y 0L6

Re: RM OF SPRINGFIELD, DUGALD OAKBANK PUBLIC WATER SYSTEM
FILE 6219.00/6013.10 - PUBLIC COMMENT RESPONSE

Dear Jay:

The following information is provided in response to the public comments received from the Environmental Approvals Branch regarding the file numbers noted above. A copy of the compiled public comments is included as an attachment and numbered for reference against these responses.

Public Comment #1 Response:
Decisions regarding where to develop the well field were made prior to Associated Engineering's involvement with the water treatment plant project.

Blending with the existing Heatherdale wells was reviewed but ultimately excluded due to the risk of contamination from the nearby gravel quarry.

RO treatment was selected for its effective removal of fluoride and is being used to treat only 20% of the raw water volume.

Potential environmental effects and management plans are outlined in the EAP submission, dated March 2024.

Public Comment #2:
Decisions regarding where to develop the well field were made prior to Associated Engineering's involvement with the water treatment plant project. That said, a cursory review of the water quality between TH-03 and TH-03 suggests treatment beyond chlorination would have still been required to reduce the high (>1.5 mg/L) iron content.

Public Comment #3:
Repeat of previous comments/statements or addressed by Friesen Drillers Limited.

Public Comment #4:
Repeat of previous comments/statements.

Public Comment #5:
Repeat of previous comments/statements or addressed by Friesen Drillers Limited.

Public Comment #6:
Repeat of previous comments/statements.

Public Comment #7:
Repeat of previous comments/statements.

Public Comment #8:
Additional information has been provided regarding greenhouse gas emissions caused by construction of the proposed project.

Public Comment #9:
Repeat of previous comments/statements.

Public Comment #10:
Reverse osmosis (RO) was selected due to its reliability in removing fluoride from the source water. RO is a proven treatment technology used in dozens of treatment plants in Manitoba and across Canada. The equipment specifically chosen for this project will treat only 20% of the raw water volume. The equipment will be capable of at least 80% recovery, meaning for every 10 L/s of raw water being treated, 8 L/s will become potable water. Further optimization of the system has the potential to increase the recovery rate to 90%.

Public Comment #11:
Repeat of previous comments/statements.

Public Comment #12:
Repeat of previous comments/statements.

Public Comment #13:
Repeat of previous comments/statements.

Public Comment #14:

Mainly a repeat of previous comments/statements or addressed by Friesen Drillers Limited.

Quoted Comment: *"Only 20% of the water from the Dugald/Oakbank well field site is proposed for RO treatment. *With the proposed extensive pumping, will water quality changes result in more than 20% of water requiring treatment? Less?"*

Response: Fluoride levels in the source water would have to rise by ~15% (to 1.85 mg/L) before the treated water quality would exceed federal guidelines. With the potential to optimize the RO recovery to 90% (from 80%), fluoride levels could rise another 5% (to 1.9 mg/L) and still be within federal guidelines. Fluoride in groundwater is usually quite stable, so it is not expected to rise enough to require significant changes to the treatment process.

Quoted Comment: *"*Provide analysis for the potential of 50% and 100% of water requiring RO treatment. Include analysis of resultant concentrate volumes, management, storage requirements and discharge to environment."*

Response: Fluoride levels in the source water would have to double and quadruple before treating 50% or 100% of the water with RO became a necessity. To our knowledge, there have been no reported cases of that happening locally.

Public Comment #15:

Repeat of previous comments/statements.

Public Comment #16:

Repeat of previous comments/statements.

Public Comment #17:

Repeat of previous comments/statements.

Public Comment #18:

Repeat of previous comments/statements or addressed by Friesen Drillers Limited.
Others are not related to the technical aspects of this project.

Public Comment #19:

Repeat of previous comments/statements.

Public Comment #20:

Repeat of previous comments/statements.

Public Comment #21:

Repeat of previous comments/statements.
Attachment document does not apply to this project.

Public Comment #22:
Repeat of previous comments/statements.

Public Comment #23:
Repeat of previous comments/statements.

Public Comment #24
Repeat of previous comments/statements.

Public Comment #25
Repeat of previous comments/statements.

Public Comment #26
Repeat of previous comments/statements.

Public Comment #27
Repeat of previous comments/statements.

Public Comment #28
Repeat of previous comments/statements or addressed by Friesen Drillers Limited.

We trust that you'll find the foregoing information satisfactory. If there are any other questions or concerns, please reach out.

Yours truly,

Desiree Pastorin
Project Manager

DLP

Attachment: Numbered Public Comments Document

Note: Please click the following link to see the original comments posted on the public registry. The public comment/article number referenced will correspond with the received date and time shown in the table below.

Comment #	Received Date and Time
1	May 9, 2025 11:04 AM
2	May 9, 2025 11:11 AM
3	May 9, 2025 3:42 PM
4	May 9, 2025 7:31 PM
5	May 10, 2025 6:07 PM
6	May 10, 2025 11:20 AM
7	May 10, 2025 11:39 AM
8	May 10, 2025 7:18 PM
9	May 10, 2025 11:44 AM
10	May 11, 2025 8:32 AM
11	May 11, 2025 9:49 AM
12	May 11, 2025 2:22 PM
13	May 11, 2025 9:06 AM
14	May 12, 2025 11:14 AM
15	May 12, 2025 3:24 PM
16	May 12, 2025 1:32 PM
17	May 12, 2025 2:54 PM (Page 44)
18	May 12, 2025 2:54 PM (Page 46)
19	May 12, 2025 7:50 PM
20	May 12, 2025 11:04 PM
21	May 12, 2025 3:57 PM
22	May 12, 2025 4:40 PM
23	May 12, 2025 7:41 PM
24	May 12, 2025 3:48 PM
25	May 12, 2025 2:53 PM
26	May 12, 2025 4:06 PM
27	May 12, 2025 8:24 PM
28	Stamped May 13, 2025 (next day)

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Land Use, Waste Management, and Energy Section
Environmental Approvals Branch

Box 35, 14 Fultz Blvd
Winnipeg, MB R3Y 0L6

Re: RM OF SPRINGFIELD, DUGALD OAKBANK PUBLIC WATER SYSTEM
FILE 6219.00/6013.10 - WATER QUALITY RESPONSE

Dear Jay:

The following information is provided in response to the public comments received from the Environmental Approvals Branch concerning comments from the Water Quality Management Section, for file numbers noted above.

Comment:

In the Oct 3, 2024 Technical Memorandum for Tables:

- *3-1 Projected Process Waste Concentrations,*
- *4-1 Estimated Downstream Concentrations During Average Flow in Cooks Creek Diversion Compared to Tier II Water Quality Objectives Greensand Backwash and RO Concentrate @ 80% Recovery,*
- *4-2 Estimated Downstream Concentrations During Average Flow in Cooks Creek Diversion Compared to Tier II Water Quality Objectives Greensand Backwash and RO Concentrate @ 90% Recovery,*
- *4-3 Estimated Downstream Concentrations During LOW Flow in Cooks Creek Diversion Compared to Tier II Water Quality Objectives Greensand Backwash and RO Concentrate @ 80% Recovery,*
- *4-4 Estimated Downstream Concentrations During LOW Flow in Cooks Creek Diversion Compared to Tier II Water Quality Objectives Greensand Backwash and RO Concentrate @ 90% Recovery,*
- *4-5 Estimated Downstream Concentrations in the Red River Compared to Tier II Water Quality Objectives Greensand Backwash and RO Concentrate @ 80% Recovery,*
- *4-6 Estimated Downstream Concentrations in the Red River Compared to Tier II Water Quality Objectives Greensand Backwash and RO Concentrate @ 90% Recovery)*

It is requested the proponent be required to provide the proposed facility's maximum projected waste concentration(s) from the onsite retention pond at the final discharge point.

Response:
Please refer to the attached tables accompanying this letter for details on the proposed facility's maximum projected waste concentrations. Tables attached to this letter are meant to replace those listed above. Tables include information on receiving body concentrations, maximum projected waste concentrations, and anticipated concentrations in receiving waters after mixing with the discharge.

Comment:
For Tables, the proponent established the Environment Act Proposal (EAP) water quality baseline on two (2) years of data. Water Quality Management Section recommends a recalculation of a seasonal baseline at Cook's Creek Diversion (MB05OJS007) and a seasonal baseline for Red River (MB05OCS004) for each water quality parameter, using the attached water quality data (2001 – current).

Response:
Please refer to the attached tables accompanying this letter, representing the updated calculated seasonal baseline parameters for Cook's Creek Diversion (MB05OJS007) and the Red River (MB05OCS004). They are based on a more extensive water quality data set provided by the Province on September 2, 2025. The Cook's Creek Diversion and Red River parameters in these tables represent seasonal averages for the period April through November (2001 – current).

Comment:
For Tables, in addition to each of the previously examined water quality parameters please include projected waste, river baseline, and combined concentrations downstream for pH, conductivity (µS/cm), total calcium (mg/L), total magnesium (mg/L), total aluminum (mg/L), total nickel (mg/L), hexavalent chromium (mg/L), total suspended solids (mg/L), total residual chlorine (mg/L), and sodium absorption ratio (SAR).

Response:
Please refer to the tables attached to this letter, which include both the previously examined water quality parameters and the additional parameters requested. The tables provide projected waste concentrations, upstream concentrations in receiving waters, and downstream receiving water concentrations after mixing with the discharge for all parameters, where data allowed it.

Note that sodium absorption ratio (SAR) is a calculated parameter, using the Equation listed in Manitoba Water Quality Standards, Objectives, and Guidelines. Equation is based on concentrations of sodium, calcium and magnesium concentration, expressed in mg/L. Equation used is as follows:

$$Sodium\ Adsorption\ Ratio\ (SAR) = \frac{0.044\ \times [Sodium]}{\sqrt{(0.025 \times [Calcium]) + (0.041 \times [Magnesium])}}$$

Comment:
Where river baseline water quality metals data are total metals (contrast dissolved metals), please ensure the conversion factors within the calculator spreadsheet available https://www.gov.mb.ca/sd/water/lakes-beaches-rivers/guidelines/index.html are utilised to generate a total metals (ug/L) Water Quality Objectives Tier II and Water Quality Guideline Tier III, if available.

- *Where hardness is used in the total metals objectives calculator, please use the hardness of the receiving water bodies. Please document the hardness value used in the calculator as a footnote to the tables).*

Response:
Please refer to the tables attached to this letter. Where the receiving body's baseline water quality metals data are reported as total metals, conversion factors within the regulatory calculator spreadsheet were applied to determine total metals concentrations objectives (µg/L). The hardness of the receiving body was used in the total metals objectives calculator and is noted in the footnote of the previously referenced tables.

Comment:
For Tables (4-1, 4-2, 4-3, 4-4, 4-5, 4-6) in the Oct 3, 2024 Technical Memorandum, Please compare the final combined concentration of the river(s) and wastewater stream with Water Quality Objectives Tier II and Water Quality Guidelines Tier III. To assist in the review, please highlight any exceedances of the Water Quality Objectives and Guidelines.

Response:
Please refer to the tables attached to this letter. Aligning with previous request, only the maximum projected waste scenarios have been considered.

Comment:
For review of the final combined concentrations in each Cook's Creek Diversion and Red River, please utilise the same units as the published guidelines in Manitoba Water Quality Standards, Objectives, and Guidelines. While license limits are usually established on a case by case basis in Manitoba, for protecting intermittent streams please note end-of-pipe limits at irrigation objectives or guidelines may be needed.

Response:
Please refer to the tables attached to this letter. Units have been updated to align with the published guidelines in *Manitoba Water Quality Standards, Objectives, and Guidelines*. Based on current projections, it is unlikely that this development can meet irrigation objectives or guidelines at the end-of-pipe limits.

If meeting these objectives at end-of-pipe limits were to become a requirement for the proposed development, it would significantly impact the design, cost and feasibility of the overall project.

Comment:
The Water Quality Management Section recommends that total dissolve solids (TDS) in mg/L not exceed the upstream Red River TDS mg/L average between June – Nov.

Response:
We seek clarification on whether the reference to TDS concentration pertains to the process waste discharge from the retention pond or to the concentration in the Red River after mixing with the discharge.
Reducing TDS at the point of discharge is not feasible without heavy dilution from other sources post-entry into the Red River. Receiving water impact assessments typically account for natural dilution that occurs in the receiving body, which is a critical factor in evaluating environmental impact. If maintaining upstream concentrations in the Red River was the goal, then the discharge would have to equal Red River TDS concentrations. This, as stated above, would significantly impact the design, cost and feasibility of the overall project.

Comment:
The fluoride levels in the process waste streams appear very high (5090 – 8440 ug/L). While there is no fluoride water quality data available for Cook's Creek Diversion or Red River, please estimate the concentration for fluoride after the confluence of the Water Treatment Plant (WTP) discharge pipe into Cook's Creek Diversion and in the Red River. In addition, utilize the Canadian Council of Ministers of the Environment (CCME) protection of aquatic life, long term concentration for fluoride of 120 µg/L in all Tables (column 5).

Response:
We would like to clarify that the fluoride concentration in the process waste stream is directly influenced by the naturally elevated fluoride levels in the source (raw) water in the aquifer. The primary contributor of fluoride in the waste stream is the concentrate from the reverse osmosis (RO) system, which treats approximately 20% of the total flow through the water treatment plant. This treatment proportion is necessary to ensure compliance with federal drinking water quality standards for the treated water.

Comment:
Can the proponent confirm the maximum daily flow for the proposed discharge rate (m^3/S) from the onsite retention pond to Cook's Creek Diversion?

Response:
As outlined on page 20 of our Environment Act Proposal (March 2024), the proposed spring discharge rate is 29 L/s (0.029 m^3/s), representing the maximum daily flow from the onsite retention pond to the Cooks Creek Diversion.

Comment:
As per the Manitoba Water Quality Standards, Objectives and Guidelines Regulation (196/2011) the minimum design flows should be verified by professional hydrologists within the Government of Manitoba. Where the legal description of the location of the discharge pipe is SE-9-11-5e1, the attached flow information, are from professional hydrologists within the Government of Manitoba. The minimum design flows at the Cook`s Creek Diversion are <0.003 m^3/S, and when discharge within intermittent streams is <0.003 m^3/S, minimum levels of quality should be maintained in order to not exceed Tier II – Water Quality Objectives within downstream water bodies to which the intermittent stream is tributary.

Response:
Please refer to the attached tables for supporting data. Consistent with the previous Environmental Assessment Proposal (EAP) submission and Supplementary Documentation, the flow rate used for mixing calculations in Cooks Creek Diversion under typical low flows was derived from Historical Hydrometric Monthly Data for Station 05OJ020, Cooks Creek Diversion at Inlet. This dataset, collected by the Government of Canada's Water Survey of Canada, provides comprehensive records from 1990 to 2022.

For these calculations, the available monthly mean flow during the anticipated discharge period was considered. The minimum average of these monthly mean flows over the 1990–2022 period, 438.06 L/s, was applied as a reasonable estimate of typical low flows.

As requested, and in recognition that Cooks Creek Diversion is an intermittent stream with 7Q10 flows close to zero, we have also reviewed the concentrations in the Red River (the downstream receiving water body) after mixing with the discharge against the Manitoba Water Quality Standards, Objectives, and Guidelines Regulation, consistent with previous submissions.

Sub-Comment to the Previous Item:

- *In the Oct 3, 2024 memo, the proponent has utilized 25% of the 7Q10 flow of the Red River to calculate the downstream concentrations in the Red River. However, 25% is considered a maximum amount and the mixing zone can be determined in a case by case basis. Given the proximity to other discharges in the Red River it is recommended the proponent utilize 25% of 7Q10 flow Red River during the month of November (20.41 m^3/s) to calculate downstream concentrations in the Red River.*

Response:

Please refer to the attached tables for updated downstream concentration calculations in the Red River. In accordance with the regulator's request, 25% of the November 7Q10 flow provided by the province (20.41 m³/s) was applied in these calculations. Actual flow used in mixing calculations is 20,410 L/s, calculated using the equation below:

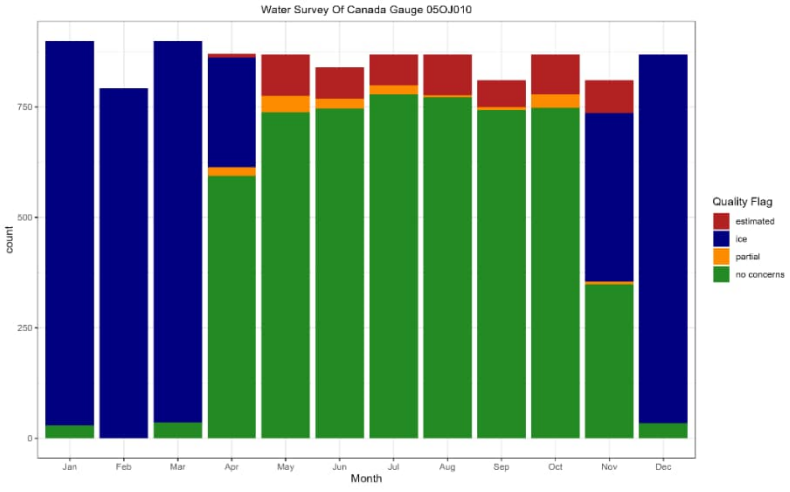
$$Using: 1\ m^3 = 1000\ L$$

$$20.41\ \frac{m^3}{s} \times \frac{1000\ L}{1\ m^3} = 20{,}410\ L/s$$

For comparison, our analysis conducted by a qualified professional, determined a November 7Q10 flow of 25.94 m³/s, based on an extended historical dataset and detailed quality review.

Associated's water resources engineer reviewed the November 7Q10 flow and associated assumptions. While the provincial value was used as directed in our calculations and the derivation of the attached table, the assumptions behind its derivation were not specified. The review noted that November flows are typically ice-affected, based on Water Survey of Canada quality flags (see Figure 1: Flow Data Quality Check by Month), which can influence low-flow statistics and may not accurately represent open-water mixing conditions commonly used for dilution assessments.

Figure 1: Flow Data Quality Check by Month



To provide context, Associated examined historical hydrometric data for Station 05OJ005 (active from 2008–2025) and supplemented it with records from upstream Station 05OJ010 (1962–2008) to create a longer dataset. Data quality was assessed using Water Survey of Canada flags, identifying January–March and November–December as largely ice-affected and with April and October partially impacted. In prairie regions, the most reliable data typically occurs between May and September; however, April–October is generally recognized as the open-water period in Canada.

A Pearson Type III distribution was fitted to the annual low-flow data, and the fit was satisfactory, so alternative distributions were not applied. While open-water and annual 7Q10 values are broadly consistent, slight variations were observed. Minor differences from provincial results were also noted, likely due to differences in data adjustments, distribution selection, or analysis periods. Overall, the November 7Q10 value provided by the province is conservative and consistent with guidance, but may reflect ice-affected conditions, which differ from open-water-based calculations.

Comment:
The Water Quality Management Section recommends the discharge period from the onsite retention pond occur between June 15 and Nov 15.

Response:
We would appreciate the opportunity to further discuss this point. Reducing the proposed retention period may necessitate an increase in the maximum discharge rate and could result in missing the spring runoff period, which is typically characterized by higher receiving water flows and accordingly, higher beneficial dilution in the receiving environment than conditions during summer and fall.

Comment:
The Water Quality Management Section defers to the Groundwater Management Section regarding questions of groundwater movement.

Response:
Noted.

Comment:
The Water Quality Management Section is concerned with any discharges that have the potential to impact the aquatic environment and/or restrict present and future uses of the water. Therefore it is recommended that the license require the proponent to actively participate in any future watershed based management study, plan/or nutrient reduction program, approved by the Director.

Response:
Noted.

We trust that you'll find the foregoing information satisfactory. If there are any other questions or concerns, please reach out.

Yours truly,

Desiree Pastorin
Project Manager

DLP

Table 1-1 Revised Mixing Assessment and Comparison to Guidelines – Red River

Parameter	Unit	Red River Water Quality	Process Waste Stream Quality	Final Combined Quality	Discharge Regulation Limit	Note	Applicable Discharge Regulation
Total Alkalinity	mg/L (as CaCO3)	152.44	1374.79	159.35			
Total Ammonia (as N)	mg/L	0.07	2.97	0.09	2.04 mg/L Total as N	1	Tier II Water Quality Objective
Antimony	mg/L	0.00013	0.0004	0.0001			
Arsenic (Total)	µg /L	1.38	0.56	1.37	150 µg/L as Dissolved	2	Tier II Water Quality Objective
Barium	mg/L	0.03	0.11	0.03			
Boron	mg/L	0.03	6.93	0.07			
Cadmium (Total)	µg /L	0.03	0.02	0.03	0.41 µg /L Total	3	Tier II Water Quality Objective
Chloride	mg/L	18.55	575.19	21.69			
Chlorine	µg /L (as Total Residual)	0.00	0.00	0.00	11 µg /L as Total Residual		Tier II Water Quality Objective
Chromium (III)	µg /L	0.27	0.60	0.27	137.19 µg /L Total	3, 4	Tier II Water Quality Objective
Copper	µg /L	1.36	3.13	1.37	15.15 µg /L Total	3	Tier II Water Quality Objective
Fluoride	µg /L	0.00	8436.40	47.68	120 µg /L	5	CCME, Protection of Aquatic Life, Long Term Concentration
Hardness	mg/L (as CaCO3)	176.42	163.46	176.35			

Parameter	Unit	Red River Water Quality	Process Waste Stream Quality	Final Combined Quality	Discharge Regulation Limit	Note	Applicable Discharge Regulation
Iron	µg /L	604.02	99.35	601.17	300 µg /L	9	Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Lead	µg /L	0.41	1.43	0.42	6.55 µg /L Total	3	Tier II Water Quality Objective
Nitrate	mg/L (as N)	0.20	0.0026	0.20	13 mg/L		Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Manganese	mg/L	0.09	0.03	0.09			
Selenium	µg /L	0.24	0.28	0.24	1.0 µg /L		Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Sodium	mg/L	16.30	1187.17	22.92			
Total Dissolved Solids	mg/L	378.62	4148.03	399.92	500-3500 mg/L		Tier II Water Quality Objective
Uranium	µg /L	1.12	0.24	1.11	15 µg /L		Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Zinc (Total)	µg /L	2.84	17.55	2.92	193.83 µg /L Total	3	Tier II Water Quality Objective
pH	-	7.82	8 - 10	-	6.5-9.0	6	Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life

Parameter	Unit	Red River Water Quality	Process Waste Stream Quality	Final Combined Quality	Discharge Regulation Limit	Note	Applicable Discharge Regulation
Conductivity	uS/cm	696.63	-	-	1500 uS/cm	7	Tier II Water Quality Objective
Total Calcium	mg/L	26.02	50.99	26.16			
Total Magnesium	mg/L	13.87	23.21	13.92			
Total Aluminum	µg /L	417.70	26.03	415.48	100 µg /L	8,9	Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Total Nickel (Total)	µg /L	1.68	2.22	1.68	84.32 µg /L Total	3	Tier II Water Quality Objective
Chromium (VI)	µg /L	1.63	0.60	1.62	11 µg /L as Dissolved	4	Tier II Water Quality Objective
Turbidity	NTU	32.72	4.53	32.56	2 NTU Increase from Background	10	CCME, Protection of Aquatic Life, Long Term Concentration
Sodium Adsorption Ratio[11]	SAR	0.65	35.01	0.91	4		Tier II Water Quality Objective

Notes:

1 Ammonia (mg/L Total Ammonia as N) regulation limited calculated based on the receiving body, Red River, pH (average between April and November, from 2001 – current) and temperature (75th percentile between April and November, from 2001 – current). The pH used to determine this regulation is 7.82 and the water temperature used is 21°C. The strictest cool water regulation is used.

2 The Tier II Water Quality Objective for Arsenic is for its dissolved form. Dissolved Arsenic concentrations not available for Red River or Process Waste. Total Arsenic has been used in both cases and used to calculate final combined concentration. This is a conservative approach, since the Total Arsenic concentration is higher than the Dissolved Arsenic concentration, therefore, Total Arsenic will be below the Objective in both scenarios.

3 Total Metals regulations determined using the provincial regulation calculator spreadsheet based on hardness of the receiving body. Hardness value used in the calculator is based on the average Red River quality between April and November, from 2001 – current. Hardness used is 176.42 mg/L as CaCO3.

4 For both Chromium (III) and Chromium (IV), Total Chromium has been used for the Process Waste concentration. This is because Chromium (III) and Chromium (IV) data is not available. This is a conservative approach, and actual concentrations of Chromium (III) and Chromium (IV) will be lower than the Total Chromium concentration listed.

5 Since no fluoride water quality data available for the Red River, it has been assumed to be 0 ug/L.

6 The final combined pH has not been determined, since pH is a physical parameter and cannot be calculated using a mass balance.

7 Process Waste data is not available for conductivity; therefore, the impacts of salinity and osmotic stress will be determined solely by the assessment of TDS. Tier II Water Quality Objectives indicate that TDS can be used as a substitute for conductivity.

8 Total Aluminum Tier III Numerical Water Quality Guideline is dependent on pH. Guideline is 5 ug/L if pH <6.5 or 100 ug/L if pH is ≥ 6.5. For this scenario, the guideline of 100 ug/L is used, because pH in receiving waters is above 6.5.

9 Upstream receiving water aluminum and iron levels exceed Tier III Water Quality Guideline for Surface water: Freshwater Aquatic Life

10 Instead of TSS, due to available data, Turbidity is being considered in this review. Since Turbidity is an optical parameter, there is some error when calculating with a mass balance, however it has been used to gain an understanding of the final combined concentration.

11 Sodium Absorption Ratio is a calculated parameter based on respective sodium, calcium and magnesium, expressed in mg/L. The equation is provided in the Manitoba Water Quality Standards, Objectives, and Guidelines.

Table 1-2 Revised Mixing Assessment and Comparison to Guidelines – Cooks Creek

Parameter	Unit	Cooks Creek Water Quality	Process Waste Stream Quality	Final Combined Quality	Discharge Regulation Limit	Note	Applicable Discharge Regulation
Total Alkalinity	mg/L (as CaCO3)	190.43	1374.79	263.97			
Total Ammonia (as N)	mg/L	0.02	2.97	0.21	3.1 mg/L Total as N	1	Tier II Water Quality Objective
Antimony	mg/L	0.00012	0.00	0.0001			
Arsenic (Total)	µg /L	0.80	0.56	0.78	150 µg /L as Dissolved	2	Tier II Water Quality Objective
Barium	mg/L	0.02	0.11	0.03			
Boron	mg/L	0.04	6.93	0.47			
Cadmium (Total)	µg /L	0.0036	0.02	0.005	0.38 µg /L Total	3	Tier II Water Quality Objective
Chloride	mg/L	5.91	575.19	41.26			
Chlorine	µg /L (as Total Residual)	0.00	0.00	0.00	11 µg /L as Total Residual		Tier II Water Quality Objective
Chromium (III)	µg /L	0.18	0.60	0.21	125.10 µg /L Total	3, 4	Tier II Water Quality Objective
Copper	µg /L	0.45	3.13	0.61	13.76 µg /L Total	3	Tier II Water Quality Objective
Fluoride	µg /L	0.00	8436.40	523.82	120 µg /L	5, 12	CCME, Protection of Aquatic Life, Long Term Concentration
Hardness	mg/L (as CaCO3)	157.62	163.46	157.98			
Iron	µg /L	137.41	99.35	135.05	300 µg /L		Tier III Water Quality Guideline, Surface

Parameter	Unit	Cooks Creek Water Quality	Process Waste Stream Quality	Final Combined Quality	Discharge Regulation Limit	Note	Applicable Discharge Regulation
							water: Freshwater Aquatic Life
Lead (Total)	µg /L	0.09	1.43	0.17	5.68 µg /L Total	3	Tier II Water Quality Objective
Nitrate	mg/L (as N)	0.14	0.0026	0.14	13 mg/L		Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Manganese	mg/L	0.02	0.03	0.02			
Selenium	µg /L	0.04	0.28	0.06	1.0 µg /L		Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Sodium	mg/L	7.39	1187.17	80.65			
Total Dissolved Solids	mg/L	270.19	4148.03	510.97	500-3500 mg/L		Tier II Water Quality Objective
Uranium	µg /L	0.40	0.24	0.39	15 µg /L		Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Zinc (Total)	µg /L	1.07	17.55	2.09	176.18 µg /L Total	3	Tier II Water Quality Objective
pH	-	7.57	8 - 10	-	6.5-9.0	6	Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Conductivity	uS/cm	453.92	0.00	-	1500 uS/cm	7	Tier II Water Quality Objective
Total Calcium	mg/L	30.67	50.99	31.93			

Parameter	Unit	Cooks Creek Water Quality	Process Waste Stream Quality	Final Combined Quality	Discharge Regulation Limit	Note	Applicable Discharge Regulation
Total Magnesium	mg/L	14.35	23.21	14.90			
Total Aluminum	µg /L	101.48	26.03	96.80	100 µg /L	8,9	Tier III Water Quality Guideline, Surface water: Freshwater Aquatic Life
Nickel (Total)	µg /L	0.64	2.22	0.74	76.66 µg /L Total	3	Tier II Water Quality Objective
Chromium (VI)	µg /L	2.87	0.60	2.73	11 µg /L as Dissolved	4	Tier II Water Quality Objective
Turbidity	NTU	21.12	4.53	20.09	2 NTU Increase from Background	10	CCME, Protection of Aquatic Life, Long Term Concentration
Sodium Adsorption Ratio[11]	SAR	0.28	35.01	2.99	4		Tier II Water Quality Objective

Notes:

1 Ammonia (mg/L Total Ammonia as N) regulation limited calculated based on the receiving body, Cooks Creek, pH (average between April and November, from 2001 – current) and temperature (75th percentile between April and November, from 2001 – current). The pH used to determine this regulation is 7.57 and the water temperature used is 18.8°C. The strictest cool water regulation is used.

2 The Tier II Water Quality Objective for Arsenic is for its dissolved form. Dissolved Arsenic concentrations not available for Cooks Creek or Process Waste. Total Arsenic has been used in both cases and used to calculate final combined concentration. This is a conservative approach, since the Total Arsenic concentration is higher than the Dissolved Arsenic concentration, therefore, Total Arsenic will be below the Objective in both scenarios.

3 Total Metals regulations determined using the provincial regulation calculator spreadsheet based on hardness of the receiving body. Hardness value used in the calculator is based on the average Cooks Creek quality between April and November, from 2001 – current. Hardness used is 157.62 mg/L as CaCO3.

4 For both Chromium (III) and Chromium (IV), Total Chromium has been used for the Process Waste concentration. This is because Chromium (III) and Chromium (IV) data is not available. This is a conservative approach, and actual concentrations of Chromium (III) and Chromium (IV) will be lower than the Total Chromium concentration listed. For Cooks Creek, Chromium (III), Total Chromium has been used because Chromium (III) is not available in the dataset.

5 Since no fluoride water quality data available for Cooks Creek, it has been assumed to be 0 ug/L.

6 The final combined pH has not been determined, since pH is a physical parameter and cannot be calculated using a mass balance.

7 Process Waste data is not available for conductivity; therefore, the impacts of salinity and osmotic stress will be determined solely by the assessment of TDS. Tier II Water Quality Objectives indicate that TDS can be used as a substitute for conductivity.

8 Total Aluminum Tier III Numerical Water Quality Guideline is dependent on pH of the receiving body. Guideline is 5 ug/L if pH <6.5 or 100 ug/L if pH is ≥ 6.5. For this scenario, the guideline of 100 ug/L is used, because the pH of the receiving waters is above 6.5.

9 Upstream receiving water aluminum levels exceed Tier III Water Quality Guideline for Surface water: Freshwater Aquatic Life.

10 Instead of TSS, due to available data, Turbidity is being considered in this review. Since Turbidity is an optical parameter, there is some error when calculating with a mass balance, however it has been used to gain an understanding of the final combined concentration.

11 Sodium Absorption Ratio is a calculated parameter based on respective sodium, calcium and magnesium, expressed in mg/L. The equation is provided in the Manitoba Water Quality Standards, Objectives, and Guidelines.

12 Where final combined quality is red and bold, this indicates that the final combined quality exceeds the discharge regulation limit.