

Manitoba Environment Act Proposal Riverdale Municipality

May 2015

Dee Genaille, P.Eng



Environment Act Proposal Form



Name of the development: Riverdale Municipality Water Treatment Plant Upgrade	
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Class 1- Waste Disposal	
Legal name of the applicant: Riverdale Municipality	
Mailing address of the applicant: Box 520	
Contact Person: Kat Bridgeman - CAO	
City: Rivers	Province: MB Postal Code: R0K 1X0
Phone Number: 204 328-5300	Fax: 204 328-5374 email: rivers@mymts.net
Location of the development: Riverdale Municipality	
Contact Person: Kat Bridgeman - CAO	
Street Address: 305 1st Avenue	
Legal Description: NE 23-12-21 W and SE 23-12-21 W	
City/Town: Rivers	Province: MB Postal Code: R0K 1X0
Phone Number: 204 328-5300	Fax: 204 328-5374 email: rivers@mymts.net
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Date: <i>May 13, 2015</i>	Signature of proponent, or corporate principal of corporate proponent: <i>D. M. Genaille</i> Printed name: D. M. Genaille

A complete **Environment Act Proposal (EAP)** consists of the following components:

- **Cover letter**
- **Environment Act Proposal Form**
- **Reports/plans supporting the EAP** (see "Information Bulletin - Environment Act Proposal Report Guidelines" for required information and number of copies)
- **Application fee** (Cheque, payable to Minister of Finance, for the appropriate fee)

Per Environment Act Fees Regulation (Manitoba Regulation 168/96):	
Class 1 Developments	\$1,000
Class 2 Developments	\$7,500
Class 3 Developments:	
Transportation and Transmission Lines ..	\$10,000
Water Developments	\$60,000
Energy and Mining.....	\$120,000

Submit the complete EAP to:

Director
Environmental Approvals Branch
Manitoba Conservation and Water Stewardship
Suite 160, 123 Main Street
Winnipeg, Manitoba R3C 1A5

For more information:

Phone: (204) 945-8321

Fax: (204) 945-5229

<http://www.gov.mb.ca/conservation/eal>

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Executive Summary

The Riverdale Municipality requested The Manitoba Water Services Board (MWSB) to prepare an Environment Act Proposal (EAP) for a Class 1 Development License under the Manitoba Environment Act for the construction of a new water treatment plant (WTP) in the Community of Rivers. This Environment Act proposal includes components for a WTP and discharge of membrane concentrate.

Currently, the Rivers WTP provides treatment and disinfection for approximately 1189 people within the Community of Rivers. Raw water is supplied from Lake Wahtopannah and flows by gravity approximately 2.5 km to the existing WTP that was built in 1959. The water treatment process consists of pre-treatment which takes place at the pumphouse near the lake intake followed by coagulation, flocculation, clarification, filtration and disinfection at the WTP. Aging equipment is unable to treat water to meet current regulatory standards which has resulted in a Boil Water Advisory being issued for the Community. The storage capacity consisting of a concrete reservoir and water tower is insufficient to meet current and future water demands for Rivers.

The proposed development includes the construction of a new 16.8 L/s membrane WTP that will service the Community of Rivers and potential rural customers in the surrounding Municipality. It will be located next to the existing Rivers WTP. The potassium permanganate and activated carbon pre-treatment process will remain in use with the new treatment process including ultrafiltration, reverse osmosis (RO) filtration, ultraviolet (UV) disinfection and chlorine disinfection. An existing pipe once used as an intake for the Community's water supply is proposed to be used to discharge highly mineralized concentrate to the Little Saskatchewan River located south of Rivers.

List of Acronyms

AO	Aesthetic Objective
DBP	Disinfection By-Product
DWSA	Drinking Water Safety Act
EAP	Environment Act Proposal
GCDWQ	Guidelines for Canadian Drinking Water Quality
GUDI	Groundwater Under Direct Influence of Surface Water
MWSB	Manitoba Water Services Board
ODW	Office of Drinking Water
RM	Rural Municipality
RO	Reverse Osmosis
TDS	Total Dissolved Solids
THM	Trihalomethane
TOC	Total Organic Carbon
UV	Ultraviolet
WTP	Water Treatment Plant

1.0 Introduction

The Riverdale Municipality requested The Manitoba Water Services Board (MWSB) to prepare an Environment Act Proposal (EAP) for a Class 1 Development License under the Manitoba Environment Act for the construction of a new water treatment plant (WTP) in the Community of Rivers. This document provides the compiled information required on Manitoba Conservation and Water Stewardship's Environment Act Proposal Report Guidelines and Supplementary Guidelines for Municipal Water Supply Systems. This Environment Act proposal includes components for a new WTP and discharge of membrane concentrate.

1.1 Background Information

The Community of Rivers is located in the southwestern portion of the province of Manitoba approximately 40 km northwest of the City of Brandon. In January 2015 Rivers amalgamated with the Rural Municipality of Daly to become the Riverdale Municipality.

The existing WTP was built in 1959 and services 514 customers within the Community. Originally the raw water source was from an impoundment on the Little Saskatchewan River but due to increasing water demands the supply was changed to Lake Wahtopanah in 1991. Water from the Lake intake flows by gravity into a wet well and then travels approximately 2.5 km to the WTP via a 200 mm pipeline. The water treatment process currently consists of pre-treatment with potassium permanganate and powdered activated carbon, which are added at the pumphouse located near the Lake, followed by treatment at the WTP which includes coagulation, flocculation, clarification, filtration and disinfection. Treated water is stored in a 226 m³ reservoir located beneath the WTP building and a 363 m³ water tower prior to distribution.

Elevated levels of aluminum, hardness, total organic carbon (TOC), total dissolved solids (TDS) and trihalomethanes (THMs) are close to exceeding limits set by the Guidelines for Canadian Drinking Water Quality (GCDWQ) which has raised concerns with the current treatment process. In March 2014 high turbidity levels resulted in a Boil Water Advisory being placed on the Community that was later lifted in August 2014. However again due to high turbidity another Boil Water Advisory was issued on April 20, 2015 and currently remains in effect.

1.1.1 Previous Studies

A Water Infrastructure Study was prepared by Poetker Engineering Consultants for the Town of Rivers in 1988. The study identified infrastructure problem areas, investigated upgrading alternatives and recommended appropriate actions.

Genivar completed a Water System Study for the Town of Rivers in 2013. It was determined that due to aging treatment components and stricter drinking water regulations that the WTP required significant upgrades and increased storage capacity to meet current and future demands.

In December 2014 JR Cousin Consultants prepared a Water Treatment Plant Functional Design Report that identified design works for a WTP, reservoir and pumping system for the Town of Rivers.

1.1.2 Population

Based on 2011 Census data, the Community of Rivers has an estimated population of 1189 (Figure 1.1). Although the population has remained constant over the past 40 years allowance for future growth has been considered for the design of the water treatment system. Assuming a 0.5% minimal growth rate the projected 20 year population in 2034 would be 1344 people.

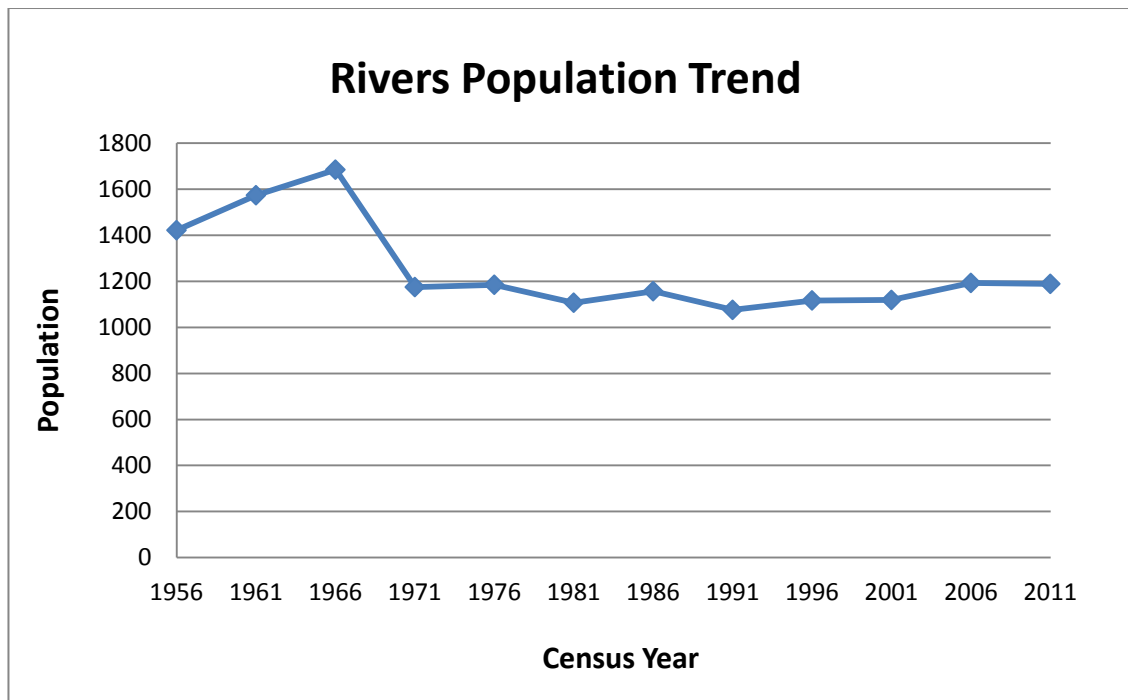


Figure 1.1 Population Trend

Students and staff that travel from outside of Rivers to attend the two schools within the Community contribute to the population. Assuming an occupancy equivalent to 1/3 of the population the combined total of 121 bussed in students and 34 staff members that commute would be 52 people. A projected growth rate of 0.5% would result in a 20 year population of 57 people.

The rural area outside of the Community limits is currently not serviced by the WTP but it is a future possibility. An estimated population of 298 people was used to account for these potential connections. Current and projected populations are summarized in Table 1.1.

Table 1.1 Population Summary

	Current Population	Projected 20 Year Population (2034)
Community of Rivers	1207	1334
Schools (equivalent)	52	57
Rural	298	298
TOTAL:	1557	1689

1.1.3 Current and Projected Water Use

A WTP is designed based on peak-day demand. Using 2013 and 2014 water meter data collected for the Community of Rivers, an average water usage of 420 L/capita/day and a peak-day factor of 1.76 were determined. With no meter readings available for the rural area an average day demand of 300 L/capita/day and a peak-day factor of 2.0 were assumed based on typical water consumption values.

Table 1.2 outlines 20 year future day water demands. The combined average day demand for Rivers including the schools and the rural area is 7.8 L/s with a peak-day demand of 14.0 L/s. Since a WTP treatment capacity must meet the peak demand, the plant must be designed to meet a minimum treatment capacity of 14.0 L/s.

Table 1.2 Future 20 Year Water Demands

	Unit	Community of Rivers and Schools	Rural
Population		1391	298
Consumption	L/capita/day	420	300
Average Day Demand	L/day	584,220	89,400
Average Day Demand	L/s	6.8	1.0
Peak Day Factor		1.76	2.0
Peak Day Demand	L/day	1,028,227	178,800
Peak Day Demand	L/s	11.9	2.1

1.1.4 Raw Water Source

The water source for the Community of Rivers is Lake Wahtopanah which is a man-made reservoir constructed on the Little Saskatchewan River in 1960 by the Prairie Farm Rehabilitation Administration (PFRA). The Lake is 0.6 km wide and 10 km long with its depths ranging from 2 to 15 m. The drainage area for the Lake is approximately 3300 km². Like most prairie lakes, Lake Wahtopanah is prone to algae development during summer months.

1.1.5 Water Rights Act

Water Rights Act Licence No. 2000-044 was issued to the Town of Rivers for the diversion of water from the Little Saskatchewan River at Lake Wahtopanah for municipal use. The intake, wet well and pumphouse are located on the north bank of the Lake in NW 19-12-20 W. The rate at which water shall be drawn from the Lake shall not exceed 0.07 m³/sec and the total quantity diverted annually shall not exceed 598.235 cubic decameters.

Based on projected average water use, Rivers would require a raw water pump rate of 0.02 L/s and an annual withdrawal of 351 cubic decameters. As both the pump rate and annual consumption are within the limits of the current licence no change is required to the licence. A copy of the Water Rights Act Licence can be found in Appendix C.

1.1.6 Water Quality

The Office of Drinking Water (ODW) currently conducts annual audits of all public water systems which includes sampling and chemistry analysis once per year for surface water and GUDI supply systems. Parameters of concern in the raw and treated water for Rivers include hardness, manganese, color and turbidity as shown in Table 1.3. As well TOC levels are high in both the raw and treated water resulting in the presence of high THMs in the treated water.

Hardness in both the raw and the treated water are below the GCDWQ aesthetic objective of 500 mg/L CaCO₃ but would still be considered moderate to high.

Manganese levels in the raw water ranged from 0.0224 – 0.0707 mg/L and at times exceed the GCDWQ aesthetic objective of 0.05 mg/L though do not pose as a health risk. Treated water levels were below the GCDWQ aesthetic objectives.

Controlling color and turbidity in public drinking water supplies is important for health and aesthetic reasons as both can interfere with the disinfection process. Turbidity, particularly those associated with organic matters can serve as a food source for bacteria, viruses and protozoa and can cause serious health problems. Unacceptable taste and odours can also be associated with these parameters. Turbidity standards apply to surface water and GUDI supplies. The standard indicates where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters are:

1. For **chemically assisted filtration**, shall be less than or equal to **0.3 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 1.0 NTU at any time.
2. For **slow sand or diatomaceous earth filtration**, shall be less than or equal to **1.0 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 3.0 NTU at any time.
3. For **membrane filtration**, shall be less than or equal to **0.1 NTU** in at least 99% of the measurements made, or at least 99% of the time each calendar month, and shall not exceed 0.3 NTU at any time. If membrane filtration is the sole treatment technology employed, some form of virus inactivation should follow the filtration process.

Color and turbidity are consistently above the standard in the raw water. Following the treatment process color is reduced to below GCDWQ limits. However turbidity levels in the treated water ranged from 0.24 – 0.51 NTU so at times exceeded GCDWQ guidelines. High turbidity levels resulted in a Boil Water Advisory being issued to Rivers in March 2014 which was later rescinded in August 2014. Another Boil Water Advisory was issued on April 20, 2015 again due to high turbidity levels and currently remains in effect.

Raw water quality data indicates high concentrations of TOC up to 20.4 mg/L. Treated TOC levels remain high at 12.6 mg/L as the current treatment process is ineffective in reducing TOC concentrations. When disinfectants such as sodium hypochlorite react with organics they form disinfection by-products (DBPs) which may pose health risks. Common compounds formed are THMs and haloacetic acids. Trihalomethanes are carcinogenic and short term exposure can lead to dizziness, headaches as well as problems related to the central nervous system. To ensure THM levels of less than 100 µg/L based on a quarterly sample average are met, total TOC levels in treated water prior to chlorination need to be reduced to less than 2.0 mg/L. Samples collected in 2014 indicate that the treatment system is incapable of meeting regulated THM levels.

Table 1.3 Water Quality Results (2012, 2013 & 2014 Samples)

Parameter	Unit	Raw Water	Treated Water	GCDWQ
Hardness (Total) as CaCO ₃	mg/L	281 - 356	279 - 303	≤ 200/500 ^a
Iron	mg/L	<0.10 - 0.014	< 0.01	≤ 0.3
Manganese	mg/L	0.0224 - 0.0707	0.0058 - 0.0168	≤ 0.05
Total Dissolved Solids (TDS)	mg/L	382 - 412	412 - 485	≤ 500
Total Organic Carbon (TOC)	mg/L	15.6 – 20.4	12.6 – 16.8	
Trihalomethanes (THM)	µg/L	-	214 – 357^b	100 ^c
True Colour	CU	27.3 – 47.7	6.1 - 6.3	≤ 15
Turbidity	NTU	0.77 – 4.55	0.24 – 0.51	≤ 0.3

^a Hardness levels greater than 200 are considered poor but tolerable. Hardness levels greater than 500 are generally considered unacceptable.

^b THM results from 2014 only.

^c THM limit is expressed as a running annual average of quarterly samples

1.1.7 Compliance Plan

The ODW has requested that the Community of Rivers provide a Compliance Plan to address water quality issues and treatment standards associated with the Rivers public water system. The Plan would indicate how and when compliance for turbidity, THMs and 3-log reduction of Cryptosporidium and Giardia would be achieved.

2.0 Description of Proposed Development

2.1 Project Description

The proposed development includes the construction of a new 16.8 L/s membrane WTP located next to the existing WTP in the Community of Rivers on the northeast side of the intersection of First Avenue and Edward Street. The construction site is an open area with grass cover and trees along the north and south sides. The site plan for the proposed location of the new WTP and a preliminary floor plan are included in Appendix A.

The new treatment process will consist of ultrafiltration, RO filtration, UV disinfection and chlorine disinfection. The current potassium permanganate and activated carbon pre-treatment process will remain in use. A proposed treatment process schematic is found in Appendix B.

A below ground concrete reservoir will be constructed that will serve as the foundation of the new WTP. The storage capacity of the new reservoir will be 918 m³ and will meet both current and future water demands and fire flow requirements.

The existing WTP will be abandoned including the storage reservoir. The water tower will also not be used once the new reservoir is constructed.

Originally Rivers was supplied water from an impoundment on the Little Saskatchewan River located approximately one kilometer south of the Community. Water travelled via a cast iron pipe that ran from the impoundment to the WTP. In 1991 Rivers changed their water supply from the Little Saskatchewan River to Lake Wahtopannah so the river intake pipeline was no longer in use but remained in the ground. It is proposed to use this pipeline to discharge the highly mineralized concentrate from the membrane treatment process to the Little Saskatchewan River. The concentrate discharge will be approximately 350 m downstream of the municipal lagoon discharge. Use of existing infrastructure will eliminate the need to install a new pipeline to the River. However in the event that this pipeline proves to be unusable a new discharge line will be constructed.

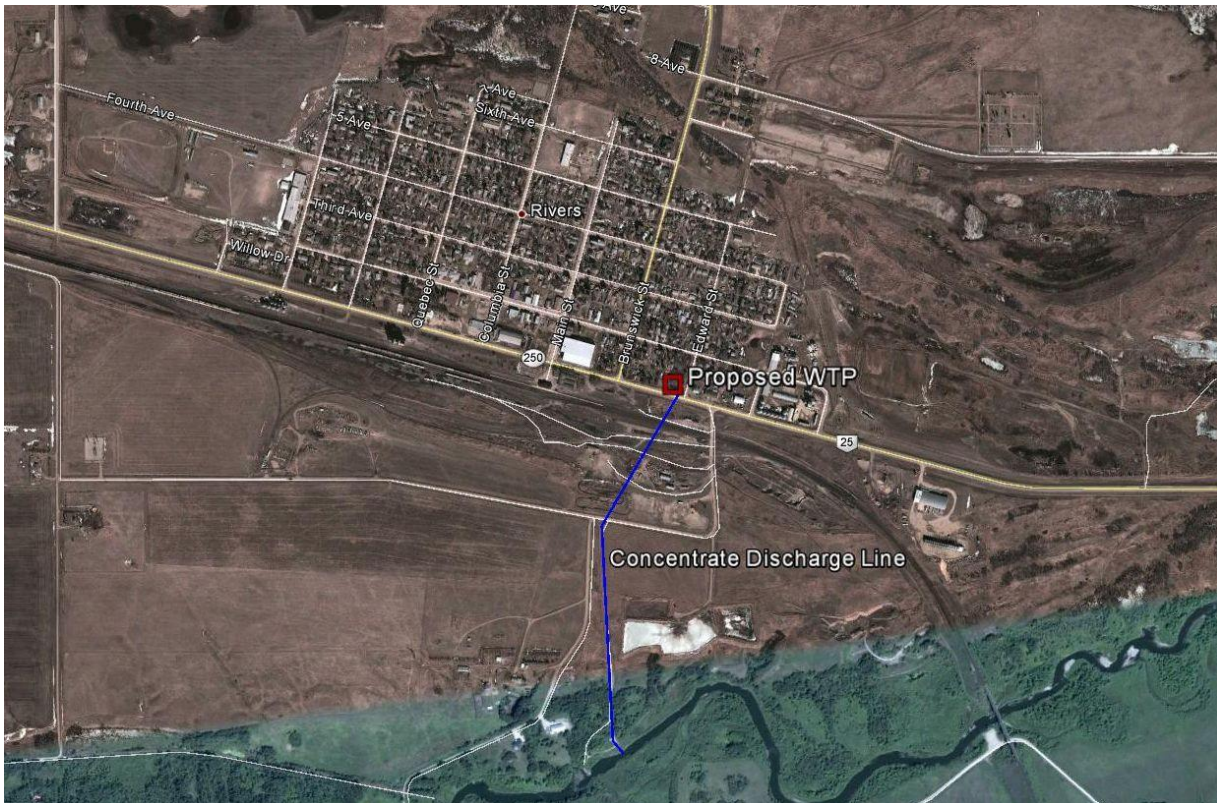


Figure 2.1 Location of Proposed WTP and Concentrate Discharge Pipeline

2.1.1 Operation and Maintenance

The Riverdale Municipality will be responsible for the operation and maintenance of the WTP and distribution pipelines. The existing WTP in Rivers is classified as a Class II facility. An application for classification will be filled out for the new WTP to determine the class of facility which is expected to be a Class III. The Municipality must ensure that all WTP operators are certified with the appropriate classification level.

The operator(s) will be required to operate the WTP and distribution system in a safe and efficient manner in accordance with relevant operations manuals and Drinking Water Safety Act (DWSA) regulations. Operation requirements will include measurements, monitoring, sampling, testing, record-keeping and reporting. The operator(s) must ensure the equipment is inspected and properly maintained. The operator(s) will receive training during the commissioning phase. As currently required, periodic inspection, maintenance, bacteriological sampling and chlorine residual testing of the distribution pipelines will be necessary. Additional sampling for turbidity and trihalomethanes (THMs) of the treated water will be required by the DWSA regulations for surface water systems.

2.2 Certificate of Title

The proposed WTP will be located adjacent to the existing WTP on land owned by the Municipality at NE 23-12-21 W.

It is proposed to use an existing 300 mm pipeline that runs from the current WTP to the Little Saskatchewan River. This pipe was the original supply line that brought water from the River to the plant for treatment. The pipeline is within municipal and provincial road right-of-ways which are owned by the Crown as well as municipal owned land and private easements.

The Certificates of Title are provided in Appendix F.

2.3 Existing and Adjacent Land Use

The proposed land for the development will be on municipal owned land adjacent to the west side of the existing WTP. Land to the north, west and east of the new WTP is residential while the land to the south is a rail yard, municipal lagoon and grassland extending approximately one kilometer to the Little Saskatchewan River. Existing and adjacent land use will not change as a result of this development.

2.4 Land Use Designation and Zoning

Zoning designation for the pipeline on municipal owned land is not applicable.

2.5 Project Schedule

The project is scheduled to commence in Fall 2015 and be completed in 2016 depending on the receipt of all approvals.

2.6 Project Funding

This project is eligible for cost sharing between the MWSB and the Riverdale Municipality subject to all approvals in place and availability of funding.

2.7 Regulatory Approvals

The following branches/departments will be provided with copies of plans and specifications for information purposes and for the purposes of approvals and agreements:

Manitoba Conservation and Water Stewardship
Manitoba Infrastructure and Transportation
Office of Drinking Water
CN Railway
Little Saskatchewan Conservation District

The contractor will be required to contact MTS, Hydro and gas utilities for utility locations and approvals.

2.8 Public Consultation

A public municipal Borrowing By-law hearing is scheduled in June 2015 regarding the proposed WTP upgrade.

2.9 Storage of Petroleum Products and Other Chemicals

Fuel will be supplied by fuelling trucks which are regulated under The Storage and Handling of Petroleum Products and Allied Products Regulation. Records of fuel volumes and an emergency response plan which includes spill prevention, notification and response will be implemented. No fuelling activities will be permitted within 100 m of watercourses during construction. During construction, the contractors will be required to ensure that all equipment is properly maintained to prevent leaks of fuel and motor fluids.

There will be no storage of petroleum products or other chemicals within 100 m of watercourse during operation of the proposed development. Chemicals associated with the operation of the plant will be stored in designated areas within the plant complete with spill containment. General household cleaning products will also be stored at this site.

3.0 Physical Environment

3.1 Physiographic Setting and Climate

The Community of Rivers is located in southwest Manitoba in the Riverdale Municipality and is approximately 40 km northwest of Brandon, Manitoba. Topography surrounding Rivers varies with elevations near 500 m decreasing to 450 m to the south at the Little Saskatchewan River. The elevation at the WTP project site is approximately 470 m.

Based on Environment Canada climatic data from 1984 to 1991, the mean annual temperature in the area is 3.1°C with below zero average daily temperatures from November through March. The mean annual precipitation is 426.5 mm.

3.2 Hydrogeology

Hydrogeology investigations identified that the Odanah forms the uppermost bedrock unit beneath most of the Little Saskatchewan watershed. Fractures in this layer can store and transmit water. The soft Millwood shale aquitard underlies the Odanah forming the uppermost bedrock unit in the areas where the Odanah has eroded. The Community of Rivers and surrounding project area are underlain by the Millwood shale aquitard. Below the Millwood the groundwater is saline and non-potable.

Sand and gravel aquifers within the watershed consist of buried lenses of sand and or gravel. Unconfined sand aquifers are found in the Rivers area. The uppermost boundary of sand and gravel aquifers range from a few metres below ground up to 100 m in depth. Well yield from these aquifers is variable with an average reported well yield of 1.6 L/s which is generally adequate for individual domestic use but inadequate for a municipal supply.

3.3 Hydrology

The Little Saskatchewan River watershed covers an area of approximately 4100 km² along southwestern Manitoba. As part of this watershed the Little Saskatchewan River flows from Riding Mountain National Park in the north to where it joins the Assiniboine River in the south 10 km west of Brandon. There are three major dams located on the Little Saskatchewan River that create reservoirs at the Communities of Rivers, Rapid City and Minnedosa. Lake Wahtopanah (Figure 3.1) also known as the Rivers Reservoir was constructed by PFRA in 1960 and is the largest of the three reservoirs covering an area of 6400 km².

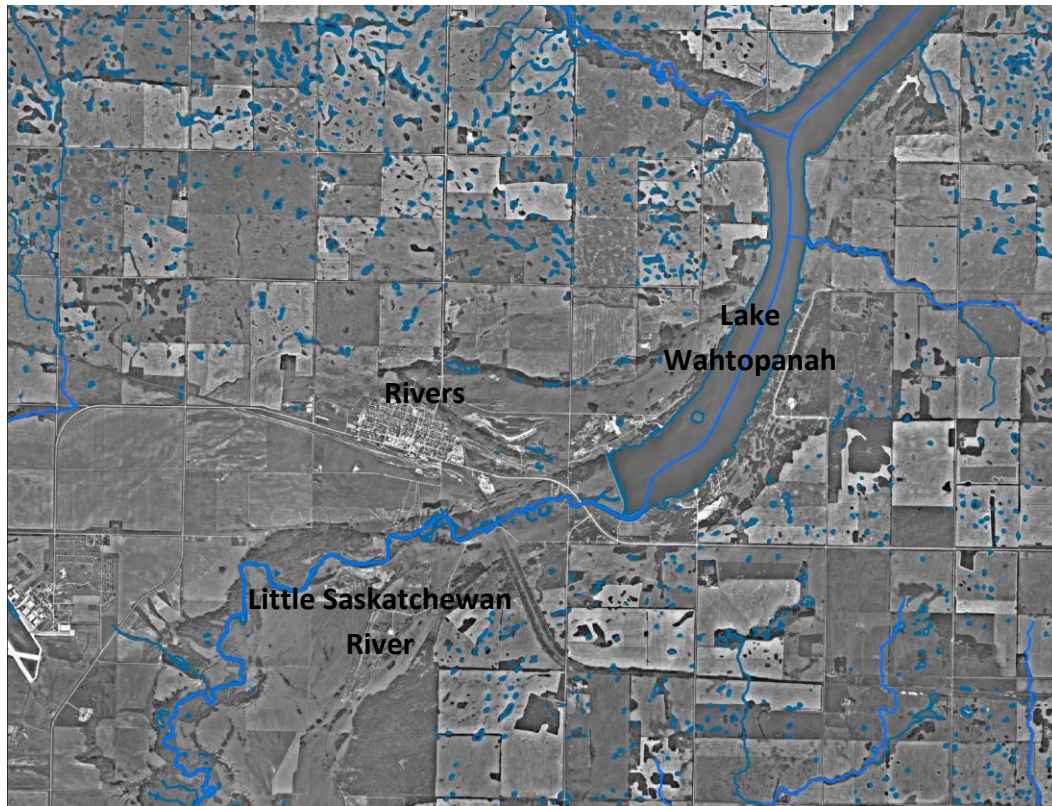


Figure 3.1 Hydrology Features near the Proposed Development

3.4 Fish and Fish Habitat

Potential fish habitat in the project area includes the Little Saskatchewan River, Lake Wahtopanah and associated tributaries. A list of fish species available for the Little Saskatchewan River and Lake Wahtopanah is included in Appendix D.

3.5 Wildlife Habitat and Vegetation

The project area is located within the Aspen Parkland Ecozone of the Prairies Ecozone (Agriculture and Agri-Food Canada). The ecozone is classified as having a transitional grassland ecoclimate. Most of the ecozone is now farmland but in its native state, the landscape was characterized by trembling aspen, oak groves, mixed tall shrubs and intermittent fescue grasslands. The ecozone provides a major breeding habitat for waterfowl and includes habitat for white-tailed deer, coyote, snowshoe hare, cottontail, red fox, northern pocket gopher, Franklin's ground squirrel and bird species like sharp-tailed grouse and black-billed magpie. It produces a wide diversity of crops, including spring wheat and other cereals, oilseeds, as well as forages and several specialty crops. The project area has been developed for agricultural resulting in reduction of habitat for several of these species.

The proposed WTP site is located on land classified as 6 by the Canada Land Inventory (CLI) Land Capability for Waterfowl classification system. This classification of land has severe limitations to the production of waterfowl. The effluent discharge route will be in an area classified as CLI 3 to 7 which has slight to severe limitations to the production of waterfowl (Agriculture and Agri-Food Canada).

3.6 Socioeconomic

The project area is located within the Riverdale Municipality which resulted from the amalgamation of the Rural Municipality of Daly and the Town of Rivers in January 2015. The project will be located in and service the Community of Rivers with the potential to supply treated water to rural connections. The Community, which covers a land area of 7.97 km², has a population of approximately 1189 and 526 private dwellings (2011 Census). There are two schools in Rivers as well as a hospital and personal care home. Businesses include a credit union, hardware store, grocery store, service station and restaurants. The main economic base for the Community is agriculture.

3.7 Heritage Resources

Most project activities will occur on previously disturbed lands. The proponent will work with Heritage Resources Branch to mitigate any concerns as required.

4.0 Potential Environmental Effects

An environmental effect includes any change that the project may cause to the environment. Environmental effects were identified from interactions between proposed project activities and environmental components. Mitigation measures and follow-up activities were identified for environmental effects determined to be adverse.

4.1 Air Quality

During construction, dust will be raised by construction equipment and there will be gaseous and particulate emissions from the construction equipment. Water spraying is an important, common and practical procedure that would be applied as required to alleviate potential dust problems. Emissions of gases and particulates would be minimized by keeping machinery in good working order. Any effects would be localized, temporary and insignificant. During operation of the development there will be no releases of pollutants to the air.

4.2 Soils

During construction, there is a risk of fuel or lubricant spills from heavy equipment and vehicle operation. The storage of fuel or lubricants at the construction site will not be allowed. Therefore, the potential spills will be very small in size and standard construction spill clean-up procedures, including the removal of any impacted soil, will be used to prevent impact.

During operation, project activities are limited to regular monitoring and maintenance activities that have a negligible effect on soil disturbance and compaction because of low vehicle traffic and the use of established routes to access the discharge pipeline and WTP. Regular monitoring and maintenance activities will have a negligible effect on soil contamination since fuel trucks and other hazardous substances will not be brought on-site on a regular basis. The potential adverse effect on soil quality is assessed to be minor.

4.3 Surface Water, Fish and Fish Habitat

Monthly average flow data collected from hydrometric flow station (05MF018) located on the Little Saskatchewan River at Rivers, MB (Environment Canada) is summarized in Table 4.1.

Table 4.1 Monthly Mean Discharges for Little Saskatchewan River (m³/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1984	0.88	0.30	0.10	0.25	4.15	3.59	2.39	1.19	0.66	0.54	0.75	0.78
1985	0.73	0.70	1.43	7.56	6.54	2.53	1.60	2.86	3.63	4.43	4.97	0.99
1986	0.84	0.84	0.99	23.00	30.00	8.15	3.97	2.33	1.14	2.78	1.89	0.85
1987	0.92	1.33	2.03	32.20	9.09	2.29	1.11	0.80	0.88	1.60	0.93	0.74
1988	0.75	0.72	0.69	3.66	11.20	1.94	0.48	0.25	0.03	0.01	0.12	0.36
1989	0.25	0.23	0.21	2.12	1.83	3.25	1.97	1.28	1.25	0.57	0.66	0.62
1990	0.54	0.51	0.56	7.22	18.20	9.70	3.38	0.94	2.43	2.42	1.07	0.99
1991	0.87	0.67	0.62	0.42	5.90	4.05	5.75	3.72	0.36	1.26	0.66	0.62
1992	0.66	0.83	2.64	13.90	22.30	6.78	2.23	2.18	1.09	2.31	0.76	1.02
1993	1.17	1.18	1.01	1.85	2.99	2.66	8.43	3.62	2.18	3.55	1.91	1.05
1994	0.88	0.88	0.85	3.72	3.86	3.67	6.88	11.70	9.27	4.74	5.10	2.74
1995	1.77	1.78	1.80	36.00	55.00	17.10	5.26	3.04	2.14	2.61	2.57	1.87
1996	0.58	0.77	0.77	8.43	20.70	14.80	4.75	3.41	1.12	1.01	2.38	2.96
2013	-	-	0.71	1.11	23.70	15.00	21.60	5.84	2.09	3.48	-	-
2014	-	-	1.31	23.90	59.10	37.30	60.70	13.90	22.80	10.00	-	-

The proposed concentrate discharge location on the Little Saskatchewan River is shown below in Figure 4.1. Discharge of the concentrate to the River will be located approximately one kilometer south of the WTP and 350 m downstream of the municipal lagoon discharge. Surface water quality samples were collected from this location on April 15, 2015. Summarized results are shown in Table 4.2 while the complete list of results is attached in Appendix H.

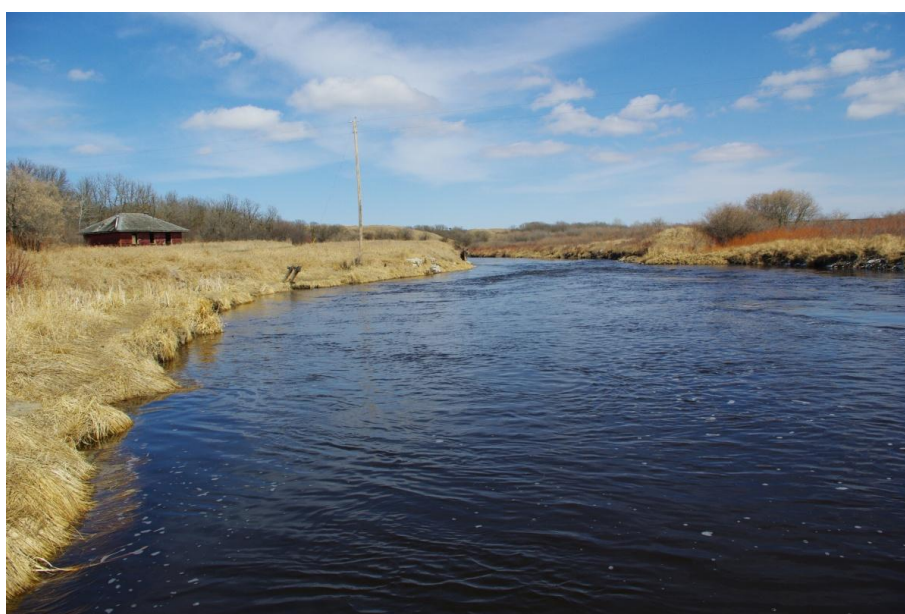


Figure 4.1 Little Saskatchewan River South of Rivers, MB – April 15, 2015

The combined volume of reject discharged annually to the Little Saskatchewan River is estimated to be 110 dam³. The UF backwash and RO membrane concentrate contain hardness causing minerals such as calcium and magnesium. The impact of the RO membrane concentrate disposal on the Little Saskatchewan River based on monthly averages over a 15 year period are shown in Table 4.2. During high flow conditions, the impact of concentrate disposal is negligible. During low and average flow conditions there is a small measurable impact. For example, TDS is increased approximately by 7%. The significant flow rate of the Little Saskatchewan River, even at times of low flow, compared to the rate of reject discharge accounts for the minimal impact of the concentrate on the River. Reject from similar systems has been discharged to surface water bodies in other locations across Manitoba without significant adverse effects on water quality. The Riverdale Municipality will perform long-term sampling of the river water to verify water quality impacts. A complete list of projected concentrate levels are displayed in Appendix G.

Impacts to fisheries and fish habitat are expected to be minor.

Minor and short term impacts on surface water may occur as a result of construction activity in road allowance ditches during runoff events. The impact on surface water would include sediment that may be eroded from excavation activities, minor engine leaks and potential fuel spills, should runoff events occur during construction.

No disturbance of the riverbank is expected as an existing pipeline previously used as a raw water intake is proposed to be used for the membrane concentrate discharge.

Table 4.2 Effects of Membrane Reject on River Quality

Parameter	Concentrate	Little Saskatchewan River	Combined Low Flow	Combined High Flow	Combined Average Flow
	(L/s)		(L/s)	(L/s)	(L/s)
Flow Rate	7.2		833	18311	5130
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Hardness	2168	303	319	304	306
TDS	3818	408	437	409	413
Chloride	194	11	13	11	11
Sodium	142	28	29	28	28
Sulphate	811	140	146	140	141

4.4 Groundwater Quality

Groundwater quality can be impacted by surface activities and surface water quality. Mitigation measures are necessary to protect groundwater quality during construction activities.

4.5 Groundwater Levels

The Rivers WTP treats surface water supplied from Lake Wahtopanah. Therefore the proposed project is unlikely to impact or result in adverse changes to groundwater levels.

4.6 Vegetation

Construction will occur primarily on Municipal owned property or within municipal right-of-ways that were previously disturbed, regularly managed and comprised primarily of grasses. As these areas are already disturbed, they are unlikely to contain rare plant species. The amount of vegetation disturbance is expected to be minimal.

During operation, monitoring and maintenance activities potential effects to vegetation are considered to be negligible.

4.7 Wildlife Habitat and Vegetation

The construction and operation activities associated with the construction of the WTP will be limited to an area already developed for urban use. Should existing infrastructure not be suitable for the use as a discharge route, construction will take place in provincial and municipal right-of-ways or on previously disturbed land within one kilometer of the Community of Rivers. The potential adverse effects of wildlife habitat loss were assessed to be negligible to minor.

4.8 Species at Risk

A search of existing data known to the Manitoba Conservation Data Centre database found that the Barn Swallow (*Hirundo rustica*), which is a threatened species as per the Committee of the Status of Endangered Wildlife in Canada (COSEWIC), may exist in the proposed project area.

Based only on existing data known to the Manitoba Conservation Data Centre no occurrences of rare plant species exist in the project area at the time the request for information was made (Friesen, Chris. Personal communication. 14 April 2015).

4.9 Noise and Vibration

During the construction phase of the project, there will be several sources of sound emissions including equipment used for construction. The types of noises heard due to construction are dominated by equipment engines. However, miscellaneous short term impact noises (ie: dump truck gates, back hoe buckets) are often heard. The noise will be in addition to regular community and highway activities, and the effects are considered minor.

Scheduling of various site activities can minimize the impact of noise. This would include scheduling construction for day-time hours to avoid sleep disturbance and the disruption of evening domestic activities. All equipment used on site will be fitted with appropriate mufflers and will be maintained in good working order to minimize noise levels.

4.10 Employment/Economy

Socio-economic implications are not expected as a result of environmental impacts as impacts are considered minor and short-term. Some economic implications may exist for the Municipality due to the cost of developing the water system. However, the Municipality will have a sustainable potable water supply to meet future demands that will promote economic growth. There may be some local economic benefit during construction.

The proposed project will address a chronic issue of poor water quality which has had an effect on employment opportunities and the economy. The potential effects of the project on employment and the economy were assessed to be positive.

4.11 Human Health and Well Being

The potential adverse effects of the project on human health are assessed to be negligible to minor. Short term temporary increases in noise and dust emissions will occur during construction that are considered to be minor effects. During operation, there will be a minor increase in vehicular traffic associated with monitoring and maintenance activities. The potential effects are considered minor.

The project will result in the construction of a WTP designed and operated to produce a treated water supply to meet current water quality standards. The effects of this on human health and well being are considered positive.

4.12 Climate Change

There are no predicted impacts to climate as a result of the project activities.

5.0 Environmental Management Measures

Environmental management practices proposed to prevent or mitigate environmental effects that were determined to be adverse are identified and described below.

5.1 Air Quality

Emissions resulting from construction and transportation equipment may be mitigated by the utilization of well maintained and operating vehicles while reducing unnecessary vehicle idling.

The impact of dust may be mitigated by the use of an approved dust suppressant, limiting construction during high wind periods and re-establishment of vegetation as soon as possible.

5.2 Soils

Mitigation to potential impacts to soil by contamination from petroleum products include preparation of an emergency response plan for potential spills, use of spill clean-up equipment and materials, using properly maintained equipment, and using appropriate fuelling equipment.

Re-establishment of vegetation as soon as possible after disturbance will limit loss of soil due to wind or water erosion. Backfilling with soil stockpiles as soon as possible and minimizing the amount of soil disturbance can be implemented.

5.3 Surface Water

Mitigation of surface water issues will be achieved by redirecting surface water runoff and employing erosion control practices and silt fencing as required.

Petroleum leaks or spills will be mitigated by use of properly maintained equipment, use of spill clean-up equipment and materials, and use of appropriate fuelling equipment. A prepared emergency response plan can be implemented in the event of a significant spill. In the event of a reportable spill, Manitoba Conservation and Water Stewardship will be notified through the emergency response line and appropriate measures will be taken according to Manitoba Conservation and Water Stewardship requirements.

A 100 m setback to watercourses will be maintained for fuelling activities. Horizontal directional drilling will be implemented at watercourse crossings. Vehicles will avoid entering the riparian zones. Re-establishment of vegetation will occur as soon as possible on areas of disturbed soil.

The reject pipeline will not require disinfection or de-chlorination when flushing.

5.4 Groundwater

No impacts to groundwater or environmental measures are anticipated.

5.5 Vegetation and Wildlife

Re-establishment of vegetation will occur as soon as possible on disturbed areas. Impacts to wildlife habitat can be limited by minimizing the area of construction, soil disturbance and vegetation disturbance. Other impacts resulting from dust or smoke will be minimized as previously indicated. Noise disturbance will be limited by use of muffling vehicles and equipment, limiting idling and limiting the construction area.

5.6 Species at Risk

It is proposed that existing infrastructure be used for the discharge line from the new WTP to the Little Saskatchewan River which would eliminate the need for construction and would not disturb the natural habitat of the Barn Swallow. In the event that construction be required regarding the discharge line it will occur outside of the critical nesting period from April to August.

5.7 Fisheries

Fisheries impacts will be minimized by implementing practices to reduce soil and contaminate runoff as previously mentioned in Sections 5.3 and 5.5. In addition, horizontal directional drilling will occur under all watercourses containing water. The required excavation needed to introduce the drilling equipment will be maintained outside watercourse riparian zones.

5.8 Noise and Vibration

Limiting any noise-creating activities, including regular maintenance and monitoring activities to normal working hours, and limiting unnecessary long-term idling can mitigate any potential increased noise and vibration effects

5.9 Water Conservation

Water conservation measures include metering and pricing of water. Water conservation information in water bill mailings can be implemented. Leak detection will consist of reconciling on a quarterly basis the volume of water pumped and charged to ratepayers. Since these services are metered, abnormalities can be identified and rectified.

5.10 Socio-Economic Implications

There are no known negative environmental socio-economic impacts that need mitigation. Since the proposed development would provide a reliable healthy drinking water supply, it would be expected to enhance quality of life and economic viability for the Municipality. The

proposed project may provide some economic benefits to the area for local businesses and employment opportunities during construction phase.

6.0 References

Agriculture and Agri-Food Canada. A National Ecological Framework for Canada. 26 Feb 2015
<<http://sis.agr.gc.ca/cansis/publications/ecostrat/index.html>>

Agriculture and Agri-Food Canada. Canada Land Inventory. Waterfowl Capability Class. 26 Feb 2015
<<http://sis.agr.gc.ca/cansis/publications/maps/cli/250k/wat/index.html>>

Environment Canada Wateroffice. Daily Discharge Data for Little Saskatchewan River Near Rivers (05MF018). 30 April 2015
<http://wateroffice.ec.gc.ca/report/report_e.html?mode=Table&type=h2oArc&stn=05MF018&dataType=Daily¶meterType=Flow&year=2013&y1Max=1&y1Min=1>

Environment Canada Historical Climate Data, Rivers. 22 April 2015
<http://weather.gc.ca/index_e.html>

Little Saskatchewan Conservation District. *Little Saskatchewan River State of the Watershed Report*. July 2008.

Manitoba Water Stewardship. *Little Saskatchewan River (05MF) Integrated Watershed Management Plan: State of Watershed Report Groundwater Sources*. March 2008.


Statistics Canada, 2011 Census Profiles, Town of Rivers, Manitoba. 26 Feb 2015
<<http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=4607077&Geo2=CD&Code2=4607&Data=Couunt&SearchText=rivers&SearchType=Begins&SearchPR=01&B1=All&Custom=&TABID=1>>

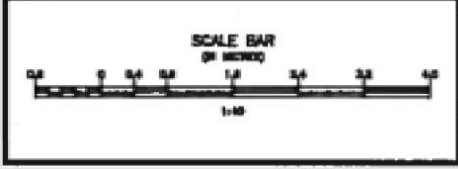
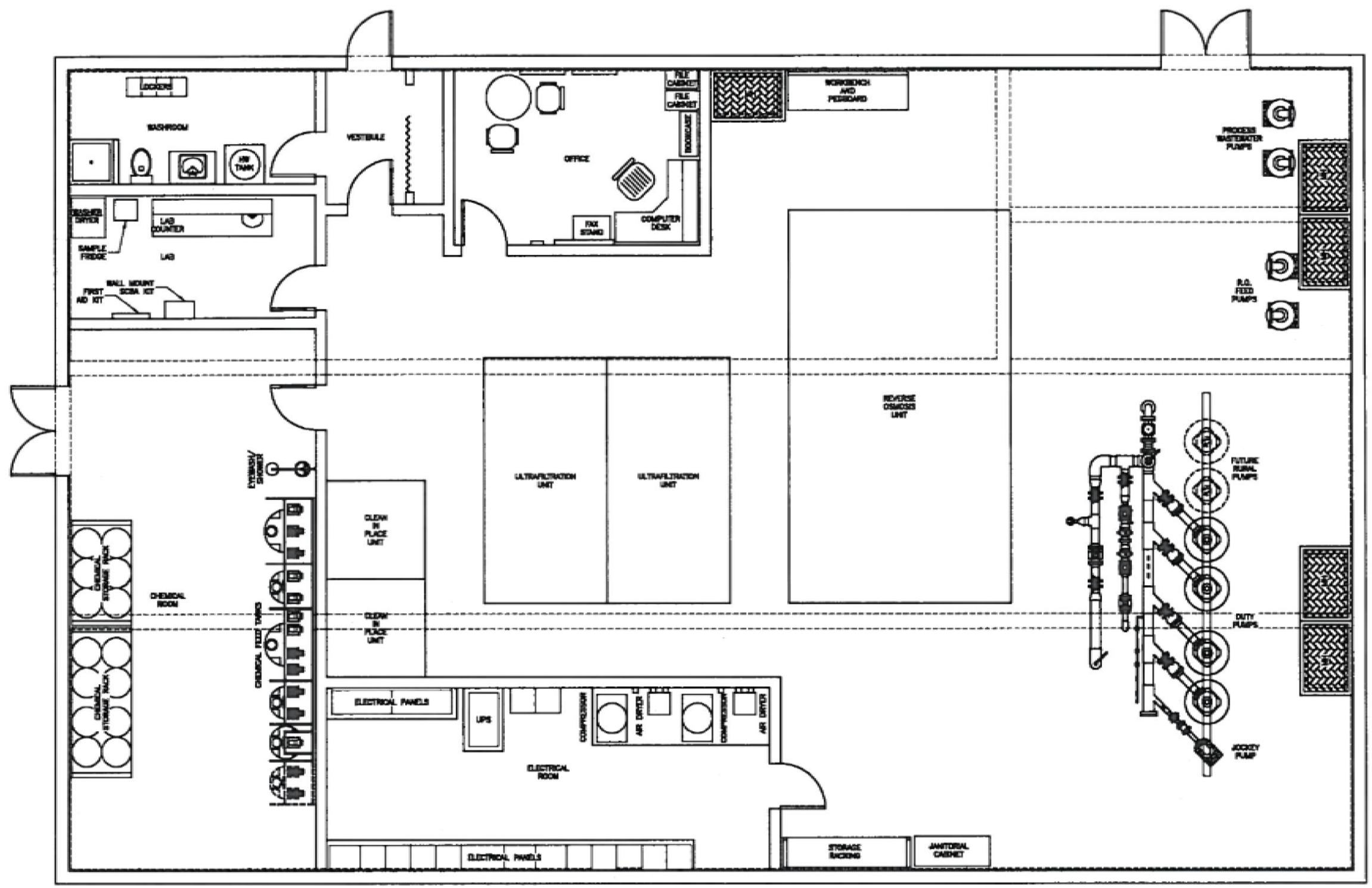
Statistics Canada, 2011 Census Profiles, RM of Daly, Manitoba. 26 Feb 2015
<<http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/details/Page.cfm?Lang=E&Geo1=CSD&Code1=4607075&Geo2=PR&Code2=46&Data=Couunt&SearchText=daly&SearchType=Begins&SearchPR=01&B1=All&Custom=>>>

Appendix A

Preliminary Site Plan and WTP Floor Plan



CLIENT LOGO		CLIENT J.R. COUSIN CONSULTANTS LTD.		DWN BY: MD	GEOTECHNICAL INVESTIGATION TOWN OF RIVERS WATER TREATMENT PLANT EDWARD STREET & FIRST STREET RIVERS, MANITOBA	REV. NO.: A
AMEC Environment & Infrastructure 440 DOVERCOURT DRIVE WINNIPEG, MANITOBA R3Y 1N4 PHONE: 204.488.2997 FAX: 204.489.8261				CHKD BY: WKW		DATE: OCTOBER 2014
				DATUM: NAD83		PROJECT NO.: WX17493
				PROJECTION: UTM Zone 14 U		FIGURE No. FIGURE 2
				SCALE: AS SHOWN	TEST PIT LOCATION PLAN	



No.	REVISIONS	DATE	DETAILS	S.M. CL.

DESIGN OF UNDERGROUND STRUCTURES OR OTHER ARE DESIGNED BY ENGINEER REGISTERED IN THE PROVINCE OF ONTARIO OR A PROVINCE OF CANADA. THE ENGINEER'S SIGNATURE AND SEAL ARE SHOWN ON THIS PLAN TO INDICATE THE ENGINEER'S RESPONSIBILITY FOR THE DESIGN AND CONSTRUCTION OF ALL UNDERGROUND STRUCTURES. THE ENGINEER'S SIGNATURE AND SEAL ARE SHOWN ON THIS PLAN TO INDICATE THE ENGINEER'S RESPONSIBILITY FOR THE DESIGN AND CONSTRUCTION OF ALL UNDERGROUND STRUCTURES. THE ENGINEER'S SIGNATURE AND SEAL ARE SHOWN ON THIS PLAN TO INDICATE THE ENGINEER'S RESPONSIBILITY FOR THE DESIGN AND CONSTRUCTION OF ALL UNDERGROUND STRUCTURES.

ENGINEER'S SEAL
PRELIMINARY

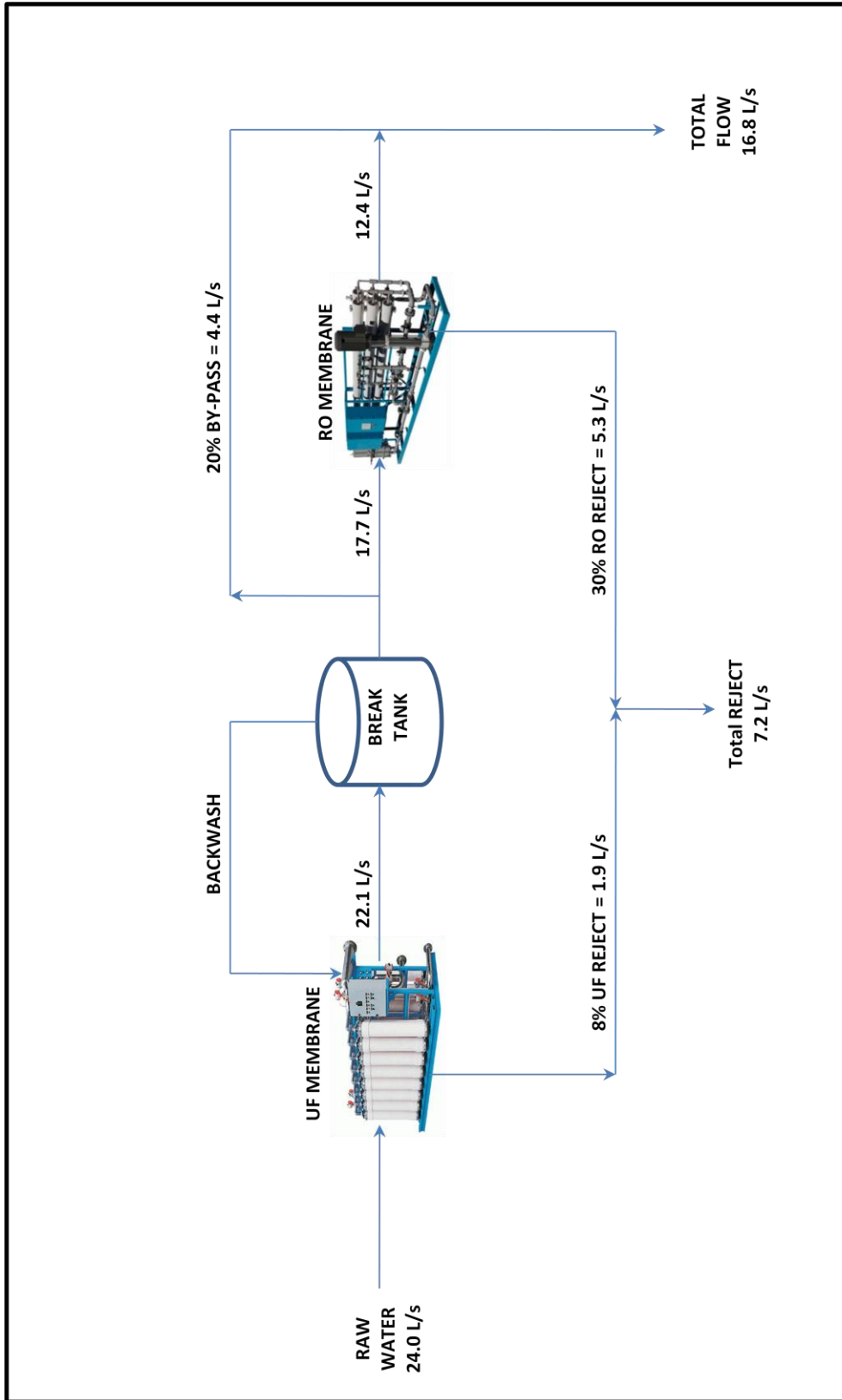
JR Cousin Consultants Ltd.
 111 South Hill Blvd. Wexford ON K7Y 1G4
 P. (204) 489-0424
 F. (204) 489-0487
 www.jrc.ca
 ENGINEERING EXCELLENCE SINCE 1981

NO.	REVISIONS	DATE	DETAILS	S.M. CL.

PROJECT: TOWN OF RIVERS WATER TREATMENT PLANT UPGRADE
 SHEET NO: 02
 TITLE: PROPOSED BUILDING LAYOUT
 SCALE: 1:40
 DATE: 14/12/22
 PLAN: 02
 SHEET: 02 OF 02

Appendix B

Membrane Flow Diagram



Rivers WTP Proposed Treatment Process – Flow Schematic

Appendix C

Water Rights Licence

MG-14853 (English)

**Licence to Use Water for
Municipal
Purposes**



Manitoba
Conservation and Water Stewardship
200 Saulteaux Cresc.
Winnipeg, Manitoba
R3J 3W3

Project: Rivers Dam Reservoir

Issued in accordance with the provisions of
The Water Rights Act and regulations made thereunder.

Licence No.: **2000-044**

U.T.M.: Zone 14 413892 E
5542649 N

Know all men by these presents that in consideration of and subject to the provisoes, conditions and restrictions hereinafter contained, the Minister of Conservation for the Province of Manitoba does by these presents give full right and liberty, leave and licence to **The Town of Rivers** in the Province of Manitoba (hereinafter called "the LICENSEE") to divert water from the **Little Saskatchewan River** at Lake Wahtopannah for **municipal** purposes by means of a raw water Little Saskatchewan River at Lake Wahtopannah (Rivers Dam Reservoir) intake pipeline and wet well pumping installation and chemical feed building constructed in the north bank of Lake Wahtopannah, (Rivers Dam Reservoir), immediately upstream of the Rivers Dam located across the Little Saskatchewan River in:

NW 19-12-20W

and connecting to the pumping installation and chemical feed building, a raw water conveyance pipeline constructed westerly to a water treatment plant located in the Town of Rivers, the said intake water pipeline, pumping installation, chemical feed building and raw water conveyance pipelines all, (hereinafter collectively called the "WORKS").

This licence is issued upon the express condition that it shall be subject to the provisions of the Water Rights Act and Regulations and all amendments thereto and, without limiting the generality of the aforesaid, to the following terms and conditions, namely:

1. The raw Little Saskatchewan River at Lake Wahtopannah water shall be used solely for **municipal** purposes.
2. The collective WORKS shall be operated in accordance with the terms herein contained.
3. The rate at which water shall be diverted pursuant hereto shall not exceed **0.07 cubic metres per second (2.5 cubic feet per second)** and the total quantity diverted in any one year shall not exceed **598.235 cubic decametres (485.00 acre feet)**.
4. The LICENSEE does hereby remise, release and forever discharge Her Majesty the Queen in Right of the Province of Manitoba, of and from all manner of action, causes of action, claims and demands whatsoever which against Her Majesty the LICENSEE ever had, now has or may hereafter have, resulting from the use of water for **municipal** purposes.
5. In the event that the rights of others are infringed upon and/or damage to the property of others is sustained as a result of the operation or maintenance of the collective WORKS and the rights herein granted, the LICENSEE shall be solely responsible and shall save harmless and fully indemnify Her Majesty the Queen in Right of the Province of Manitoba, from and against any liability to which Her Majesty may become liable by virtue of the issue of this Licence and anything done pursuant hereto.
6. This Licence is not assignable or transferable by the LICENSEE and when no longer required by the LICENSEE this Licence shall be returned to the said Minister for cancellation.
7. Upon the execution of this Licence the LICENSEE hereby grants the said Minister and/or his Agents the right of ingress and egress to and from the said lands for the purpose of inspection of the WORKS and the LICENSEE shall at all times comply with such directions and/or orders that may be given by the Minister or his Agents in writing from time to time with regard to the operation and maintenance of the WORKS and appurtenances.
8. If for any reason whatsoever the Minister deems it advisable to cancel this Licence, he may do so by letter addressed to the LICENSEE at **Box 520, Rivers, MB, R0K 1X0, Canada** and thereafter this Licence shall be determined and at an end.
9. This Licence shall be effective for a term of **twenty (20) years** beginning from the date it is signed by the Director, Water Branch, on behalf of the Minister. The LICENSEE may apply for renewal of this Licence not more than 365 days and not less than 90 days prior to the expiry date.
10. Records of daily and annual water use must be kept by the LICENSEE for each calendar year, and a copy of such records shall be furnished to the Director, Water Branch, and/or his agents not later than February 1st of the following year.
11. For the purpose of recording water use, as noted in Term No. 10, the LICENSEE will be required to install on the pumping WORKS, a water measuring device, acceptable to the Director, Water Branch, that will accurately calculate the instantaneous water flow and the accumulated annual water quantity, withdrawn from the water source.
12. The LICENSEE must hold valid and subsisting approvals from all regulatory agencies that may be required, for the establishment, or construction, or operation and maintenance of the water diversion works and the diversion and use of water from Lake Wahtopannah.
13. The LICENSEE shall, at all times, comply with all regulatory requirements of Fisheries and Oceans Canada in respect to fish habitat protection provisions of Canada's Fisheries and Oceans Act, with respect to the establishment, or construction, or operation and maintenance of the water diversion works and the diversion and use of water from Lake Wahtopannah.

Manitoba Environment Act Proposal
Riverdale Municipality Water Treatment Plant Upgrade

May 2015

In witness whereof I the undersigned hereby agree to accept the aforesaid Licence on the terms and conditions set forth therein and hereby set my hand and seal this _____ day of _____ A.D. 20 ____ .

SIGNED, SEALED AND DELIVERED
in the presence of

_____ } _____ (Seal)
Witness Licensee

Canada, PROVINCE OF MANITOBA To Wit:

I, _____ of the _____
of _____ in the Province of Manitoba, MAKE OATH AND SAY:

1. That I was personally present and did see _____ ,
the within named party, execute the within Instrument.
2. That I know the said _____
and am satisfied that he/she is of the full age of eighteen years.
3. That the said Instrument was executed at _____
aforesaid and that I am subscribing witness thereto.

SWORN BEFORE me at the _____
in the Province of Manitoba this _____ day of _____ A.D. 20 ____ .

_____ } _____
A COMMISSIONER FOR OATHS Witness
in and for the Province of Manitoba

My Commission expires _____

Issued at the City of Winnipeg, in the Province of Manitoba, this ____ day of _____ A.D. 20 ____ .

The Honourable the Minister of Conservation and Water Stewardship (or her/his designate)

Appendix D

Fish Species for Lake Wahtopanah and Little Saskatchewan River

Genaille, Dee (MMG)

From: Bruederlin, Bruno (CWS)
Sent: March-09-15 11:15 AM
To: Genaille, Dee (MMG)
Subject: RE: Rivers WTP

Good Morning Dee,

The list of small and large bodied fish species inhabiting Lake Wahtopanah and the Little Saskatchewan River is surprisingly quite extensive.

The following fish species have been found:

Walleye
Northern pike
Yellow perch
White sucker
Shorthead Redhorse sucker
Burbot
Chestnut lamprey
Rock bass
Black bullhead
Stonecat
Bigmouth shiner
Sand shiner
River shiner
Emerald shiner
Common shiner
Common carp
Spottail shiner
Longnose dace
Western Blacknose dace
Fathead minnow
Creek chub
Quillback
Silver Redhorse sucker
Blackside darter
Johnny darter
River darter
Trout perch
Brook stickleback
Ninespine stickleback
Mooneye

And

Possible Lake Sturgeon in the reach downstream from Lake Wahtopanah

Bruno Bruederlin
Regional Fisheries Biologist
Conservation and Water Stewardship
Fisheries Branch
Room 128 Box 13
1129 Queens Avenue
Brandon MB R7A 1L9
cellular 724-4116, fax 726-6301

Appendix E

MWSB Guidelines for Watercourse Crossings

WATERCOURSE CROSSINGS

Mitigation Measure

1. All watercourse crossings will be directionally drilled.
2. A minimum undisturbed buffer zone of 15 metre will be maintained between directional drill entry/exit areas and banks of watercourse.
3. Heavy equipment (caterpillars, tractors) shall not be allowed within the buffer zone.
4. Enforce measures regarding fuelling or servicing equipment within 100 metre of watercourse.
5. Waste drill mud and cuttings will be prevented from entering surface water.
6. Should erosion control measures be implemented, post construction monitoring shall be conducted to ensure effectiveness.
7. Further erosion control measures will be implemented as necessary.

Reclamation

1. Restore all disturbed areas to original contours.
2. Install erosion control measures, if warranted, and maintain until vegetation becomes established.

Pressure Loss/Fluid Loss Response

To avoid or minimize the potential for drilling fluids and drill cuttings from entering watercourses because of a frac-out, the following monitoring and response plan will be followed:

1. A record of drilling progress will be maintained to always know the location of the drill head relative to the point of entry.
2. A record of drilling component usage (type and quantity) will be maintained throughout each drilling operation.
3. A record of drilling fluid volume used and returned will be maintained to detect any significant fluid losses. Drilling fluid pump pressure will be continuously monitored. Abnormal loss of returned fluids or loss of fluid pressure that may be indicative of a frac-out will be reported immediately to MWSB/PFRA construction field supervisor.
4. At watercourse crossings where water clarity permits, a view of the stream bottom, an observer will continuously check for signs of mud escapement to the watercourse.

Loss of Fluid and Frac-out Response Plan

1. If an abnormal loss of fluid, drop in pressure or visible plume is observed indicating a frac-out or possible frac-out, drilling is to stop immediately.
2. The contractor will notify the MWSB/PFRA construction field supervisor of the frac-out condition or potential condition and decide on the appropriate action as follows:
 - a) Assign a person to visually monitor for the presence of muddy plume.

- b) Make adjustments to the mud mixture; add lost circulation material (LCM) to the drilling fluid in an attempt to prevent further loss of fluid to the ground formation and/or watercourse.
- c) Where conditions warrant and permit (i.e., shallow depth, clear water, low water velocity, potentially sensitive habitat) and where a frac-out has been visually detected, attempt to isolate the fluid release using a large diameter short piece of culvert.
- d) Under circumstances where a frac-out has occurred, and where conditions do not permit containment and the prevention of drilling fluids release to the watercourse, attempts to plug the fracture by pumping LCM are not to continue for more than 10 minutes of pumping time.
- e) If the frac-out is not contained within this time, MWSB/PFRA construction supervisor will halt any further attempts until a course of action (either abandon directional drilling or further consultation with MWSB engineers) is decided upon.

Appendix F

Certificates of Title

STATUS OF TITLE

Title Number **2265610/2**
Title Status **Accepted**
Client File **May 4, 2017**

The Property Registry

A Service Provider for the Province of Manitoba



<p>1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION</p> <p>TOWN OF RIVERS</p> <p>IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND</p> <p>PARCEL ONE: ALL MINES AND MINERALS IN THE FOLLOWING DESCRIBED LAND AS SET FORTH IN TRANSFER R40674: LOTS 12 AND 13 BLOCK 2 PLAN 236 BLTO IN NE 1/4 23-12-21 WPM</p> <p>PARCEL TWO: LOTS 19 AND 20 BLOCK 2 PLAN 236 BLTO IN NE 1/4 23-12-21 WPM</p> <p>PARCEL THREE: ALL MINES AND MINERALS IN THE FOLLOWING DESCRIBED LAND AS SET FORTH IN TRANSFER 114025: LOT 31 BLOCK 2 PLAN 236 BLTO IN NE 1/4 23-12-21 WPM</p> <p>The land in this title is, unless the contrary is expressly declared, deemed to be subject to the reservations and restrictions set out in section 58 of <i>The Real Property Act</i>.</p>
<p>2. ACTIVE INSTRUMENTS</p> <p>No active instruments</p>
<p>3. ADDRESSES FOR SERVICE</p> <p>TOWN OF RIVERS PO BOX 520 RIVERS MB ROK 1X0</p>
<p>4. TITLE NOTES</p> <p>No title notes</p>
<p>5. LAND TITLES DISTRICT</p> <p>Brandon</p>
<p>6. DUPLICATE TITLE INFORMATION</p> <p>Duplicate not produced</p>

7. FROM TITLE NUMBERS 189247/2 Balance
8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS No real property application or grant information
9. ORIGINATING INSTRUMENTS Instrument Type: Request To Issue Title Registration Number: 1211923/2 Registration Date: 2007-11-21 From/By: BLTO To: Amount:
10. LAND INDEX Lot 12 Block 2 Plan 236 ALL M&M NE 1/4 23-12-21W Lot 13 Block 2 Plan 236 ALL M&M NE 1/4 23-12-21W Lot 19 Block 2 Plan 236 NE 1/4 23-12-21W Lot 20 Block 2 Plan 236 NE 1/4 23-12-21W Lot 31 Block 2 Plan 236 ALL M&M NE 1/4 23-12-21W

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE
SYSTEM OF TITLE NUMBER 2265610/2

STATUS OF TITLE

Title Number **1758518/2**
Title Status **Accepted**
Client File **May 4, 2017**

The Property Registry

A Service Provider for the Province of Manitoba



1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION

THE TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES
RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND

PARCEL 2 PLAN 1063 BLTO EXC ALL MINES AND MINERALS, MINERAL OILS,
PETROLEUM, GAS, COAL, GRAVEL, AND VALUABLE STONE
AS SET FORTH IN TRANSFER NO R26707
IN SE 23-12-21 WPM

The land in this title is, unless the contrary is expressly declared, deemed to be subject to the reservations and restrictions set out in section 58 of *The Real Property Act*.

2. ACTIVE INSTRUMENTS

Instrument Type: **Caveat**
Registration Number: **R26819/2**
Instrument Status: **Accepted**

Registration Date: **1962-09-13**
From/By: **CANADIAN NATIONAL RAILWAY COMPANY**
To:

Amount:
Notes: **WLY 20 FT**
Description: **No description**

3. ADDRESSES FOR SERVICE

THE TOWN OF RIVERS
BOX 520
RIVERS MB
R0K 1X0

4. TITLE NOTES

No title notes

5. LAND TITLES DISTRICT Brandon
6. DUPLICATE TITLE INFORMATION Duplicate not produced
7. FROM TITLE NUMBERS 93763/2 Balance
8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS No real property application or grant information
9. ORIGINATING INSTRUMENTS Instrument Type: Request To Issue Title - Internal Registration Number: 1087567/2 Registration Date: 2000-11-07 From/By: BLTO To: Amount:
10. LAND INDEX Lot 2 Plan 1063 IN SE 23-12-21 WPM EXC M&M ETC

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE
SYSTEM OF TITLE NUMBER 1758518/2

STATUS OF TITLE

Title Number **2698005/2**
 Title Status **Accepted**
 Client File **May 4, 2017**

The Property Registry

A Service Provider for the Province of Manitoba



<p>1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION</p> <p>TOWN OF RIVERS</p> <p>IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND</p> <p>PARCELS 8 AND 9 PLAN 392 BLTO EXC ALL MINES AND MINERALS AS SET FORTH IN TRANSFER 1350498 IN SE 1/4 23-12-21 WPM</p> <p>The land in this title is, unless the contrary is expressly declared, deemed to be subject to the reservations and restrictions set out in section 58 of <i>The Real Property Act</i>.</p>
<p>2. ACTIVE INSTRUMENTS</p> <p>No active instruments</p>
<p>3. ADDRESSES FOR SERVICE</p> <p>TOWN OF RIVERS BOX 520 RIVERS, MB R0K 1X0</p>
<p>4. TITLE NOTES</p> <p>No title notes</p>
<p>5. LAND TITLES DISTRICT</p> <p>Brandon</p>
<p>6. DUPLICATE TITLE INFORMATION</p> <p>Duplicate not produced</p>
<p>7. FROM TITLE NUMBERS</p> <p>2494360/2 Partial</p>
<p>8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS</p> <p>4417</p>

9. ORIGINATING INSTRUMENTS	
Instrument Type:	Transfer Of Land
Registration Number:	1350498/2
Registration Date:	2013-12-02
From/By:	CANADIAN NATIONAL RAILWAY COMPANY
To:	TOWN OF RIVERS
Consideration:	\$37,500.00
10. LAND INDEX	
Lot 8 Plan 392 SE 23-12-21W EXC M&M	
Lot 9 Plan 392 SE 23-12-21W EXC M&M	
SE 23-12-21W PCLS 8 & 9 PL 392 EXC M&M	

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE
SYSTEM OF TITLE NUMBER 2698005/2

Appendix G

Projected Reject Quality

BASIC DESIGN

RO program licensed to: *delcowerwater
 Calculation created by: *Grant
 Project name: Rivers
 HP Pump flow: 194.1 gpm
 Feed pressure: 143.1 psi
 Feedwater Temperature: 0.0 C(32F)
 Feed water pH: 8.68
 Chem dose, ppm (100%): 0.0 H2SO4
 Permeate flow: 165.00 gpm
 Raw water flow: 194.1 gpm
 Permeate recovery: 85.0 %
 Element age: 5.0 years
 Flux decline % per year: 7.0
 Fouling Factor: 0.70
 Salt passage increase, %/yr: 10.0
 Average flux rate: 12.1 gfd
 Feed type: Well Water

Stage	Perm. Flow gpm	Flow/Vessel Feed gpm	Conc gpm	Flux gfd	Beta	Conc.&Throt. Pressures psi	Element Type	Elem. No.	Array
1-1	99.8	48.5	23.6	12.8	1.13	130.4 0.0	ESPA4 LD	28	4x7
1-2	47.5	47.2	23.4	12.2	1.12	112.0 0.0	ESNA1-LF2-LD	14	2x7
1-3	17.7	46.8	29.1	9.1	1.06	92.1 0.0	ESNA1-LF2-LD	7	1x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm TDS	Conc osm pres	Ca	Cumulative Mg	Perm Ion levels Cl	B	SiO2
1-1	1	143.1	2.6	3.8	13.6	1.08	12.4	4.7	0.20	0.13	0	0.05	0.14
1-1	2	140.5	2.3	3.7	13.3	1.10	11.7	5.1	0.21	0.14	0	0.05	0.15
1-1	3	138.2	2.0	3.6	13.0	1.09	12.0	5.6	0.23	0.15	0	0.05	0.16
1-1	4	136.1	1.8	3.6	12.8	1.09	12.6	6.2	0.24	0.16	0	0.05	0.17
1-1	5	134.3	1.5	3.5	12.6	1.10	13.4	6.9	0.26	0.17	0	0.05	0.19
1-1	6	132.8	1.3	3.4	12.3	1.11	14.4	7.7	0.28	0.18	0	0.06	0.20
1-1	7	131.5	1.1	3.4	12.1	1.13	15.6	8.8	0.31	0.20	0	0.06	0.22
1-2	1	127.4	3.1	3.7	13.4	1.08	22.1	9.6	3.91	1.48	5	0.09	2.24
1-2	2	124.2	2.8	3.6	12.9	1.10	29.5	10.4	4.13	1.56	5	0.09	2.35
1-2	3	121.4	2.5	3.5	12.5	1.09	36.8	11.2	4.36	1.65	5	0.09	2.47
1-2	4	119.0	2.2	3.4	12.2	1.09	44.0	12.3	4.61	1.75	6	0.09	2.61
1-2	5	116.8	1.9	3.3	11.8	1.10	51.3	13.4	4.89	1.86	6	0.09	2.75
1-2	6	114.9	1.6	3.2	11.4	1.11	59.0	14.8	5.20	1.98	6	0.09	2.91
1-2	7	113.3	1.4	3.1	11.1	1.12	67.0	16.5	5.55	2.12	7	0.09	3.10
1-3	1	109.0	3.2	2.9	10.3	1.06	71.4	18.9	6.65	2.50	8	0.09	3.69
1-3	2	105.8	2.9	2.7	9.7	1.10	76.6	19.9	7.09	2.66	9	0.10	3.87
1-3	3	102.9	2.6	2.6	9.3	1.10	81.9	21.1	7.48	2.80	9	0.10	4.05
1-3	4	100.3	2.4	2.5	8.8	1.10	87.6	22.2	7.88	2.96	10	0.10	4.25
1-3	5	97.9	2.2	2.3	8.4	1.10	93.4	23.5	8.31	3.12	10	0.10	4.46
1-3	6	95.7	2.0	2.2	8.0	1.10	99.6	24.9	8.77	3.30	11	0.10	4.68
1-3	7	93.6	1.8	2.1	7.7	1.06	106.0	23.8	9.27	3.50	11	0.10	4.93

Stage	NDP psi
1-1	130.5
1-2	109.3
1-3	83.0

Product performance calculations are based on nominal element performance when operated on a feed water of acceptable quality. The results shown on the printouts produced by this program are estimates of product performance. No guarantee of product or system performance is expressed or implied unless provided in a separate warranty statement signed by an authorized Hydranautics representative. Calculations for chemical consumption are provided for convenience and are based on various assumptions concerning water quality and composition. As the actual amount of chemical needed for pH adjustment is feedwater dependent and not membrane dependent, Hydranautics does not warrant chemical consumption. If a product or system warranty is required, please contact your Hydranautics representative. Non-standard or extended warranties may result in different pricing than previously quoted.
 (8/63)

BASIC DESIGN

RO program licensed to:	*delcowater	Permeate flow:	165.00 gpm
Calculation created by:	*Grant	Raw water flow:	194.1 gpm
Project name:	Rivers	Permeate recovery:	85.0 %
HP Pump flow:	194.1 gpm	Element age:	5.0 years
Feed pressure:	143.1 psi	Flux decline % per year:	7.0
Feedwater Temperature:	0.0 C(32F)	Fouling Factor	0.70
Feed water pH:	8.68	Salt passage increase, %/yr:	10.0
Chem dose, ppm (100%):	0.0 H2SO4	Feed type:	Well Water
Average flux rate:	12.1 gfd		

 **** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***

Concentrate Langelier Saturation Index too high (3.09)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor. Without scale inhibitor, concentrate saturation should not exceed 100%.

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 (8/63)

Appendix H

Water Quality Results



Manitoba Water Services Board
ATTN: DEE GENAILLE
Box 22080, 2010 Currie Blvd
Brandon MB R7A6Y9

Date Received: 08-APR-15
Report Date: 15-APR-15 08:33 (MT)
Version: FINAL

Client Phone: 204-726-6080

Certificate of Analysis

Lab Work Order #: L1595907
Project P.O. #: NOT SUBMITTED
Job Reference: RIVERS EAP
C of C Numbers:
Legal Site Desc:

Chantal Bouchard

Chantal Bouchard
Account Manager

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ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721
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RIVERS EAP

L1595907 CONTD....
PAGE 2 of 4
Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1595907-1 LITTLE SASKATCHEWAN RIVER Sampled By: DG on 06-APR-15 @ 14:30 Matrix: SURFACE WATER							
Miscellaneous Parameters							
Total Dissolved Solids	408		6.0	mg/L		13-APR-15	R3173880
Municipal Water Supplies #50							
Alkalinity							
Alkalinity, Total (as CaCO3)	193		20	mg/L		10-APR-15	R3172252
Bicarbonate (HCO3)	236		24	mg/L		10-APR-15	R3172252
Carbonate (CO3)	<12		12	mg/L		10-APR-15	R3172252
Hydroxide (OH)	<6.8		6.8	mg/L		10-APR-15	R3172252
Chloride in Water by IC							
Chloride (Cl)	10.5		0.50	mg/L		08-APR-15	R3171036
Colour, True							
Colour, True	59.0		5.0	CU		08-APR-15	R3171791
Conductivity							
Conductivity	655		20	umhos/cm		10-APR-15	R3172252
Fluoride in Water by IC							
Fluoride (F)	0.108		0.020	mg/L		08-APR-15	R3171036
Hardness Calculated							
Hardness (as CaCO3)	303		0.30	mg/L		13-APR-15	
Langelier Index 4C							
Langelier Index (4 C)	0.32					13-APR-15	
Langelier Index 60C							
Langelier Index (60 C)	1.1					13-APR-15	
Nitrate in Water by IC							
Nitrate (as N)	1.35		0.020	mg/L		08-APR-15	R3171036
Nitrate+Nitrite							
Nitrate and Nitrite as N	1.40		0.070	mg/L		09-APR-15	
Nitrite in Water by IC							
Nitrite (as N)	0.046		0.010	mg/L		08-APR-15	R3171036
Sodium Adsorption Ratio							
Sodium Adsorption Ratio	0.69		0.030			13-APR-15	
Sulfate in Water by IC							
Sulfate (SO4)	140		0.30	mg/L		08-APR-15	R3171036
Total Metals by ICP-MS							
Calcium (Ca)-Total	59.2		0.20	mg/L	10-APR-15	10-APR-15	R3172507
Iron (Fe)-Total	0.39		0.10	mg/L	10-APR-15	10-APR-15	R3172507
Magnesium (Mg)-Total	37.8		0.050	mg/L	10-APR-15	10-APR-15	R3172507
Manganese (Mn)-Total	0.195		0.0010	mg/L	10-APR-15	10-APR-15	R3172507
Potassium (K)-Total	15.2		0.10	mg/L	10-APR-15	10-APR-15	R3172507
Sodium (Na)-Total	27.5		0.050	mg/L	10-APR-15	10-APR-15	R3172507
Turbidity							
Turbidity	6.88		0.10	NTU		08-APR-15	R3171191
pH							
pH	7.97		0.10	pH units		10-APR-15	R3172252

* Refer to Referenced Information for Qualifiers (if any) and Methodology.