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Opapiskaw Campground

ENVIRONMENT ACT PROPOSAL

Manitoba Water Services Board & Parks and Protected Spaces

Opapiskaw Campground Water Treatment Plant Upgrades

February 2017

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March 30, 2017

File: 2014-4504.000.A..01

Ms. Tracey Braun, M. Sc.
Director, Environmental Approvals
Sustainable Development
123 Main Street, Suite 160
Winnipeg Manitoba, R3C 1A5

**Re: MANITOBA SUSTAINABLE DEVELOPMENT - PARKS AND PROTECTED SPACES
OPAPISKAW CAMPGROUND WATER TREATMENT PLANT UPGRADES
ENVIRONMENT ACT PROPOSAL SUBMISSION FOR A CLASS 1 DEVELOPMENT**

Dear Ms. Braun:

On behalf of Parks and Protected Spaces and The Manitoba Water Services Board, please find attached our Environment Act Proposal submission for the above-mentioned project.

This application is for the seasonal surface discharge of residuals from the upgraded water treatment plant in the campground. The existing facility was not operating under any Environment Act Licence, thus one is being applied for as part of the upgrades.

We trust that the enclosed application contains sufficient information for your staff to complete the new Licence. Should the reviewer require any additional information or require any clarifications, please do not hesitate to contact myself.

Yours truly,


A handwritten signature in blue ink, appearing to read 'Ken Anderson'.

Ken Anderson, P.Eng.
Manager, Water

KA

Environment Act Proposal Form



Name of the development: Opapiskaw Campground Water Treatment Plant Upgrades	
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Class 1 Development - Waste Treatment and Disposal from a Water Treatment Plant	
Legal name of the applicant: Manitoba Sustainable Development - Parks and Protected Spaces Branch	
Mailing address of the applicant: 200 Saulteaux Cres., Winnipeg, MB R3J 3W3	
Contact Person: Rebecca Lauhn-Jensen, CSLA	
City: Winnipeg	Province: MB Postal Code: R3J 3W3
Phone Number: 204-945-4410	Fax: 204-945-0012 email: rebecca.lauhn-jensen@gov.mb.ca
Location of the development: Opapiskaw Campground - Whiteshell Provincial Park	
Contact Person: Rebecca Lauhn-Jensen, CSLA	
Street Address: 200 Saulteaux Cres., Winnipeg, MB R3J 3W3	
Legal Description: Section 12 - Twp 14 - Rge 13E	
City/Town: Winnipeg	Province: Manitoba Postal Code: R3J 3W3
Phone Number: 204-945-4410	Fax: 204-945-0012 email: rebecca.lauhn-jensen@gov.mb.ca
Name of proponent contact person for purposes of the environmental assessment: Ken Anderson - Associated Engineering (Sask) Ltd.	
Phone: 204-942-6391	Mailing address: 203 - Five Donald Street Winnipeg, MB R3L 2T4
Fax:	
Email address: andersonk@ae.ca	
Webpage address:	
Date: February 15, 2017	Signature of proponent, or corporate principal of corporate proponent:  Printed name: Ken Anderson

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>

Executive Summary

The following Environment Act Proposal (EAP) is submitted on behalf of Sustainable Development Parks and Protected Spaces (Parks) and The Manitoba Water Services Board (MWSB). The EAP is for a Class 1 Development License under the Manitoba's *Environment Act* for the upgrading of a water treatment plant (WTP) at the Opapiskaw Campground. This document provides the information required from Sustainable Development's Environment Act Proposal Report Guidelines and Supplementary Guidelines for Municipal Water Supply Systems.

This EAP describes the components of an upgrade to an existing WTP at the Opapiskaw Campground, which includes the installation of a new Lake intake, a residuals sedimentation tank, and the re-use of the existing filter backwash line to Nutimik Lake. The major scope of the project was to remove the old treatment equipment from the existing WTP building and install new treatment equipment.

Opapiskaw Campground can be found within Whiteshell Provincial Park located approximately 95 km east of Winnipeg, MB. The campground consists of 88 campsites, twenty of which have electrical service. None of the sites, however, have water or sewer hook ups and the campground is currently serviced with one non-modern washroom, two modern washroom facilities, and a shower building with modern washrooms. The campground office is also serviced with water. Treated water is provided to the modern washrooms and showers as well as eleven standpipes throughout the campground. The WTP will be in operation seasonally from May to September.

The original Opapiskaw WTP was constructed in the 1990s and consisted of a concrete block structure overtop a cast in place concrete reservoir foundation. The original treatment system used Nutimik Lake as the source and consisted of pressure filters and chlorination. The filter backwash was discharged back to Nutimik Lake. The proposed Project is to replace all the original equipment with new equipment. The new WTP consists of a new lake intake, multimedia sand filtration, staged cartridge filtration, granular activated carbon (GAC) contactor, ion exchange, UV and chlorination. The plant also includes treated storage and distribution pumping.

The plant obtains water from Nutimik Lake and the new treatment process targets turbidity, pathogens, and organics. The cartridge filtration will achieve the 1.0 micron absolute filtration, and chlorine provides primary disinfection. UV disinfection will provide the remaining necessary log credits for a surface water plant. Ion change will provide organics reduction and will also increase UVT levels for UV operation.

The project also includes a new sedimentation tank to collect the ion exchange regeneration water and pump it to the campground's wastewater lift station for disposal at the campground's wastewater lagoon. The multimedia sand filters will continue to use the existing discharge line to the Lake for their backwash water.


This assessment of the potential environmental impacts of the proposed Project concludes that standard construction best management practices are effective to mitigate any potential long-term adverse environmental effects. During construction, work near sensitive features of the environment (e.g. fish and fish habitat in and around Nutimik Lake) was avoided to minimize potential impacts near surface water bodies and disturbed areas near the existing WTP will be re-vegetated as soon as practically possible. Minimizing laydown areas and construction activities also reduced disturbance to soils and vegetation.

The continuation of the pre-existing discharging of the filter backwash water to Nutimik Lake is also not anticipated to have any significant long-term adverse effects. The seasonal use and relatively low volume filter backwash water compared to the large volume of Nutimik Lake and its tributaries, is expected to have a significant dilution factor.

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1 Introduction

On behalf of the Manitoba Water Services Board, Associated Engineering (Sask.) Ltd. (AE) has prepared the following Environmental Act Proposal (EAP) for the Opapiskaw Campground Water Treatment Plant (WTP) Project (the Project). The EAP is based on detailed design prepared by AE.

The final user of the system is Manitoba Sustainable Development's department of Parks and Protected Spaces (The Parks).

This application is for the continuation of disposing of the filter backwash water to Nutimik Lake from the new water treatment plant process in the campground.

1.1 BACKGROUND INFORMATION

The Opapiskaw Campground can be found within Whiteshell Provincial Park located approximately 95 km east of Winnipeg, MB. The campground consists of 88 campsites, twenty of which have electrical service. None of the sites, however, have water or sewer hook ups and the campground is currently serviced with one non-modern washroom, two modern washroom facilities, and a shower building with modern washrooms. The campground office is also serviced with water.

Treated water is provided to the modern washrooms and showers as well as eleven standpipes throughout the campground. With the original filtration system non-functional, the only treatment was chlorination and as a result, the system was on a Boil Water Advisory. Without filtration, the system could not meet its turbidity objectives. As well, the system is also challenged to meet total trihalomethanes (TTHM) guidelines due to the high organics in the source water. It is our intent to replace the treatment process with new equipment that can meet the current drinking water quality regulations. The intent is to fit the new equipment into the existing WTP facility with some minor modifications.

The Opapiskaw Campground is located in a developed region, as such, it has its own wastewater lagoon. Therefore, a small investment was made in the new design to split the plant residuals stream; sending the new ion exchange regeneration water to the lagoon and the filter backwash water along the existing discharge line to the Lake. This maintains the existing status-quo of the plant's residuals management. Although the original WTP discharged its filter backwash water back to Nutimik Lake, it did not have an Environmental Act Licence.

1.1.1 Previous Studies

A predesign study for the new water system was completed by AE in 2015. The study reviewed historic and projected water use as well as the raw water quality from Winnipeg River/Nutimik Lake. The report provides a summary of design considerations, water quality objectives, and options for upgrades.

1.1.2 Population

The Opapiskaw Campground consists of 88 camp sites as well as an allocation for three staff in a Park Office. For design purposes, the serviced population is 355 individuals assuming there is an average of 4.0 people per campsite. There are two nearby campgrounds (Dorothy Lake having 33 seasonal campsites and Nutimik Lake at 142 campsites) along with numerous lots and private subdivisions along the south shore of Winnipeg River/Nutimik Lake. The largest and nearest community is Pinawa, MB being located approximately 12 km with a population of 1,416 people in 2011 (Statistics Canada, 2012).

The Opapiskaw Campground operates annually from May to September.

1.1.3 Projected Water Use

The new WTP is designed based on meeting the peak day demand in the campground. Based on an assessment of water use in the campground, it was determined that peak water use can be upwards of 11,000 Litres per day. Assuming a peak population of 355 users, this results in an average per capita use of nearly 30 L/c/day.

For the purpose of design, we are assuming an increase in demand with the higher quality water and some allowance for the historical peak use. Thus our recommendation was to size the new treatment process to produce up to **15,000 Litres** in an eight hour period. Thus, the treatment flow rate is designed to be **0.50 L/sec**.

1.1.4 Raw Water Source

The Opapiskaw Campground obtains their water from the Winnipeg River/ Nutimik Lake. The original system had a pair of submersible pumps placed in the lake ~30 m from shore at a depth of 7 – 8 m.

The WTP upgrades included the installation of a new lake intake, along the same alignment of the original, but the pumps are now accessible from shore. The new intake pipe was fitted with a DFO compliant screen.

1.1.5 Water Rights Act

Opapiskaw Campground will not require a Water Right Act licence as its annual average water use is below the Licencing threshold of 25,000 L/day.

1.1.6 Water Quality

The Office of Drinking Water (ODW) performs annual audits of all public water systems which include sampling and chemistry analysis of raw/treated water once every year or so for surface water sources. A raw/treated water quality sample from 2005 - 2013 are summarized in the following Table along with the water quality objectives set forth in Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, 2014).

Since the only treatment is chlorination, the water quality shown is assumed to be indicative of the raw water quality (with the exception of the disinfection by-products.). The sample data shows that the lake water is relatively soft with high organics and some moderate turbidity (high flows in the River can result in suspended matter). The elevated concentrations of organics (TOC) in the treated supply react with the chlorine and form disinfection by-products (THMs) that exceed the current guidelines.

Ultraviolet transmittance (UVT) is of concern as it can impact the operation of UV system. Typically, when the UVT is below 70%, many UV systems tend to alarm as full dosage cannot be guaranteed. The low UVT in the sample is expected to be the result of the elevated TOC concentrations in the source water, as well as some colour from tannins.

Table 1-1: Raw Water Quality Summary

Parameter	Units	Value Range	Current Limits (GCDWQ)	Treatment Objective
pH		6.93 - 7.97	6.5 – 8.5 (AO)	6.5 – 8.5
Alkalinity	mg/L	39 - 46		
Hardness (CaCO ₃)	mg/L	41 - 52	200 (PO)	
TDS	mg/L	45 – 111	500 (AO)	< 500
UV Transmittance	%T	50 - 63%		> 75%
Total Organic Carbon (TOC)	mg/L	7.2 - 14		< 4.0
Aluminium	mg/L	0.2 – 0.4	0.1 (PO)	
Arsenic	ug/L	0.6 – 0.9	10	
Chloride – dissolved	mg/L	1.4 – 10.4	250 (AO)	
Colour	TCU	9 – 43	< 15 TCU	< 5
Fluoride	mg/L	0.05 – 0.1	1.5	< 0.80
Iron	mg/L	0.13 - 0.41	< 0.3 (AO)	< 0.10
Manganese	mg/l	0.0 – 0.015	< 0.05 (AO)	< 0.05
Turbidity	NTU	3 – 10	< 0.3 95 % of the time	< 0.3 95% of the time
Total Trihalomethanes	ug/L	200 - 400	100	80

Abbreviations:

AO = aesthetic objective
 IMAC = interim maximum acceptable concentration
 MAC = maximum acceptable concentration
 SMCL = secondary maximum contaminant level

BDCM = bromodichloromethane
 GCDWQ = guidelines for Canadian drinking water quality
 PO = practical objective

2 Description of Proposed Development

2.1 PROJECT DESCRIPTION

The proposed project was to upgrade the existing Water Treatment Plant (WTP) to meet the current drinking water regulations and be capable of producing 0.50 L/sec of treated water.

The project included the following scope of works:

- The removal of all the existing equipment from the WTP building;
- The installation of a new lake intake that consists of two new pumps and an intake screen;
- Installation of new treatment equipment and distribution pumps;
- Installation of a new regeneration water sedimentation tank and pumping system for discharging the regeneration stream to the nearby wastewater lift station that then pumps to the waste water lagoon.

2.1.1 Proposed Water Treatment Process

The proposed treatment process is as follows:

- Two Ø400mm x 1500mm multimedia pressure filters;
- Three Ø300mm x 1200mm cartridge filtration units (10 micron > 0.35 micron > 1.0 micron abs.)
- One Ø300mm x 1200mm cartridge filtration unit with carbon block for taste and odour;
- Two Ø450mm x 1500mm ion exchange vessel for organics removal;
- Two UV reactors for primary disinfection;
- One chlorination system using sodium hypochlorite for secondary disinfection; and
- Potable water storage tank and distribution pumps.

The ion exchange (IX) units are also known as Organic Colour Removal (OCR) filters and Tannin Filters. The Purolite® strong base anionic resin specifically targets organics for TOC and colour removal.

2.1.2 Filter Backwash and Regeneration Stream Disposal

As previously mentioned, the original WTP discharged its filter backwash water back to Nutimik Lake. It is proposed that the new WTP connects to the existing discharge pipe to discharge the backwash water from the new multimedia sand filters. The multimedia filter backwash uses approximately 500 L of treated water per cycle; there are two filters that will alternate backwashing every second day.

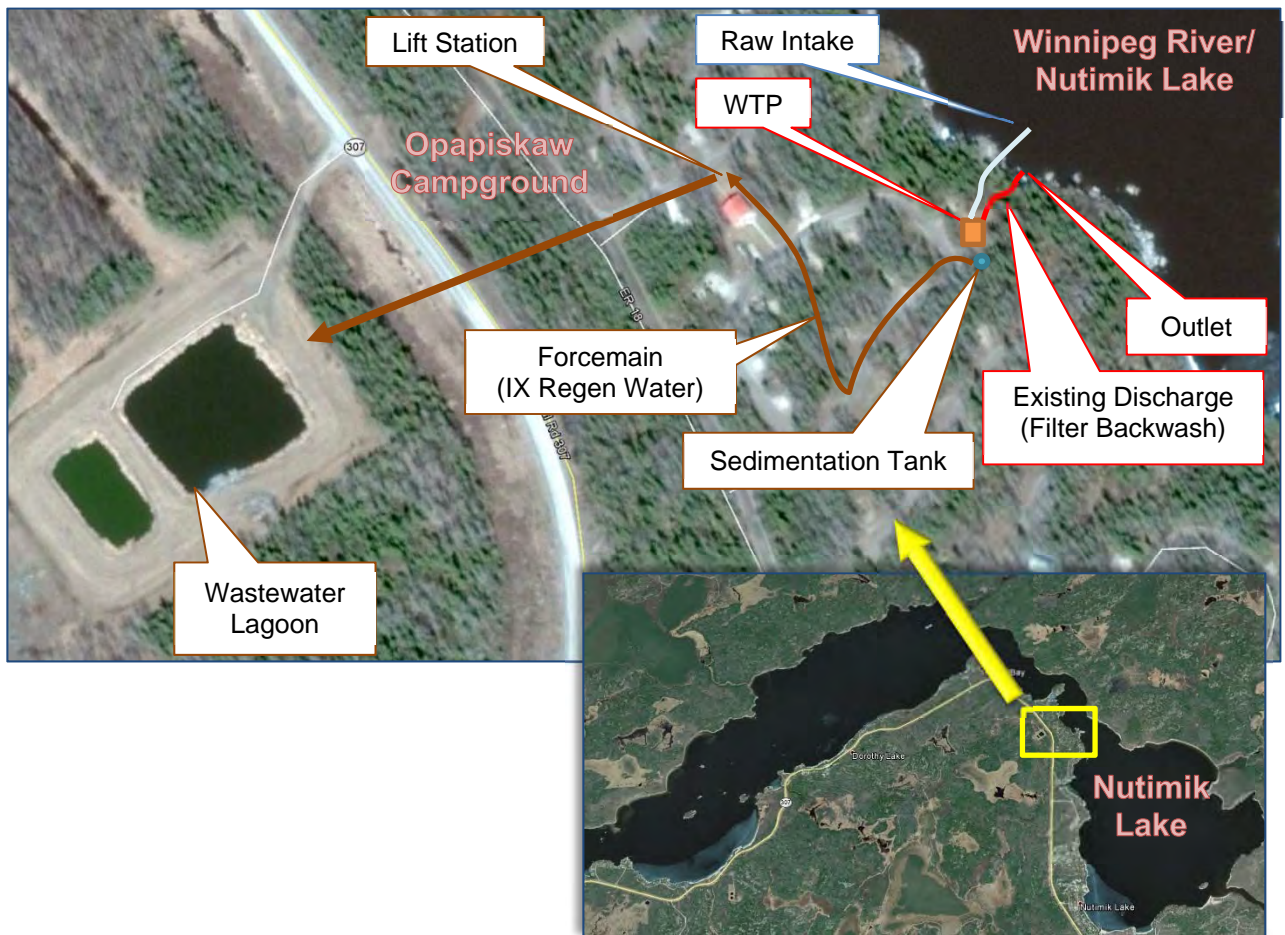
The regeneration water from the new ion exchange units will be directed to a sedimentation tank and then pumped to the campground lift station, from there it will be directed to the campground lagoon. The ion exchange units will regenerate on a volume basis: for every 10,000 L of treated flow, there is a 350 L regeneration cycle. There are two vessels that will alternate regenerations as required.

Currently, the operational set point of the new multimedia filters is to backwash a filter by time basis: every second day. Thus, every day there will be a filter backwash cycle regardless of water use volume. This is due to the unpredictable flows in the Lake, where rapid plugging could occur if the cycles are left too long.

Therefore, the anticipated volume of backwash water returned to the Lake can be estimated to be 500 L/day from mid-May to mid-September. This is a total of 62 m³/year that could be returned to the Lake. This number will likely decline as the operators learn to predict raw water quality and adjust the backwash frequency. It is estimated that upwards of 30 m³/year of regeneration water is direct to the campground's wastewater lagoon.

Figure 2-1 is a map of the discharge and drainage route for the pumped discharged.

Figure 2-1: Discharge and Drainage Routes



Since the filter backwash discharge occurs seasonally, and its volume is relatively small compared to the flows through the Winnipeg River/Nutimik Lake, there is an expected large dilution factor. The filter backwash water quality is typical to most treatment plants, and those types of plants regularly discharge to surface water bodies without having significant adverse effects. Thus, it is anticipated that the continued practice of discharging filter backwash from this new facility to the Lake will have no long term adverse effects on the water quality in the Lake and River.

2.1.3 Operations and Maintenance

Manitoba Sustainable Development, Parks and Protected Spaces will be responsible for operation and maintenance of the WTP. Opapiskaw Campground has a water treatment plant operator who will be responsible for plant operation in accordance with their Licence and Regulations.

2.2 CERTIFICATE OF TITLE

The WTP will be located on provincially owned Crown land within the Opapiskaw Campground. The land is registered under Her Majesty The Queen.

2.3 EXISTING AND ADJACENT LAND USE

The WTP is located within the camping area. No significant changes to the existing and adjacent lands is planned to occur as a result of this project. The existing lands are used for camping and recreational activities.

2.4 LAND USE DESIGNATION AND ZONING

All of the land comprising the Opapiskaw Campground has been categorized as a Recreational Development. The main purpose of this land use category is to accommodate recreational development. Zoning for water pipelines on municipal owned land does not apply.

2.5 PROJECT SCHEDULE

The WTP project was generally completed through 2016, and will be in full operation at the start of 2017.

2.6 PROJECT FUNDING

The project is funded by Manitoba Sustainable Development, and managed through the Manitoba Water Services Board.

2.7 REGULATORY APPROVALS

The following departments will receive copies of the specifications and plans, for review and approval:

- Office of Drinking Water

2.8 PUBLIC CONSULTATION

Public consultation will not be required as the project does not involve private funding or property.

2.9 STORAGE OF PETROLEUM PRODUCTS AND OTHER CHEMICALS

The contractors will be required to ensure all equipment is to be maintained free of fluid leaks, and in proper operating condition. The contractor shall wash, refuel and service machinery, store fuel and other materials for the equipment away from the water to prevent deleterious substances from entering the water. No fuelling of equipment shall occur within 100 m of the watercourse during construction. If fuelling of large equipment does occur onsite, fuel should be provided by fueling trucks. Logs of refueling volumes should be recorded and spill kits and an emergency response plan shall be prepared for the site which involves spill prevention, notification and response procedures.

During operation of the WTP, no petroleum products are planned to be stored within the building. Sodium hypochlorite and salt will be required to be onsite for the water treatment process and will be stored in a designated area with suitable spill containment.

3 Physical Environment

3.1 PHYSIOGRAPHIC SETTING AND CLIMATE

The Opapiskaw Campground is located along Provincial Highway 307, within of Whiteshell Provincial Park and is a part of the Precambrian Shield physiographic region. The Precambrian Shield stretches from northwestern to southeastern Manitoba and consists of a hummocky terrain of eroded crystalline bedrock, partly to mostly covered by Quaternary deposits (National Ecological Framework for Canada, 2013). Surface elevation generally does not exceed 350 m above sea level with relief seldom exceeding 30 m. Much of the land surface is occupied by swamp and muskeg as drainage is generally poor.

More specifically, the area is underlain by massive, crystalline, acidic, Archean bedrock, forming hummocky, broadly sloping uplands and lowlands (National Ecological Framework for Canada, 2013). Lowlands have lacustrine deposits forming level to undulating clay plains. The area is also interspersed with areas of fluvio-glacial outwash deposits. Bare rock outcrops are common, and Dystric Brunisols are the dominant soil on sandy morainal veneers and blankets. Mesisolic and Fibrisolic Organic soils can dominate areas while Gray Luvisolic soils are found on exposed clay deposits.

The climatic data was summarized for the years 2000 to 2007 from an Environment Canada Weather Station (2014) located in Rennie, MB. This station appears to be the closest active station to the Opapiskaw Campground with complete information.

Table 3-1: Climatic Averages for the Region (2000-2007)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Yearly Average
TEMPERATURE (°C)													
Monthly Average	-8.9	-6.5	0.5	11.2	16.7	22.4	26.4	23.8	18.9	10.1	0.4	-6.6	2.5
Monthly Max	-23.3	-22.0	-13.6	-3.0	3.7	9.9	12.7	11.2	6.2	-1.4	-8.6	-18.8	n/a
Monthly Min	-16.4	-14.2	-7.0	4.1	10.2	16.2	19.6	17.5	12.6	4.1	-4.3	-12.8	n/a
PRECIPITATION (mm)													
Precipitation	25.4	14.7	27.1	26.6	90.7	118.3	65.0	89.5	65.1	56.8	31.2	25.1	53.0

3.2 HYDROGEOLOGY

A summary of the hydrogeology in the Precambrian Shield has been completed by Betcher, Groove and Pupp (1995). They have noted that hydraulic conductivity is typically very low in unfractured crystalline igneous and metamorphic rock. Most ground water movement occurs through secondary features consisting of joints, shears, or faults. There are large variations in the frequency of these secondary features on both a local and a regional scale, making a prediction of their location very difficult. In general, groundwater development from Precambrian rocks is quite limited in Manitoba, because of the small

demand for groundwater in this region and the uncertainty, low yield and considerable expense of drilling into igneous and metamorphic rocks.

Most groundwater development in the Precambrian Shield has occurred in cottage areas of southeastern Manitoba, where sand and gravel aquifers are sparsely distributed (Betcher, Groove and Pupp, 1995). Several hundred wells have been completed into these units in this area with reported well yields ranging from “dry” holes to more than 14 L/s. Generally, though, well yields are low, often below 1.0 L/s and ranging from 0.01 to 0.001 L/s/m. Water producing zones can be found at depths in excess of 60 m and often depths of 100 m or more below the bedrock surface.

No specific information about the hydrogeology for the Opapiskaw Campground was readily available.

3.3 HYDROLOGY

The Opapiskaw Campground is located next to Nutimik Lake which is a part of the Winnipeg River System. Nutimik Lake is known to occupy approximately 637 ha and have an average depth of 11.9 m with a maximum depth of 32.3 m (Manitoba Conservation, 2015). The Winnipeg River flows from Lake of the Woods (on the American and Ontario borders) to Lake Winnipeg, travelling 235 km from Norman Dam near Kenora, ON.

This river route was used by natives for thousands of years and became a major fur trade route for hundreds of years. It is the only major water route between southern Manitoba and Ontario that allowed natives to easily canoe back and forth.

In Manitoba, the Winnipeg River is broken up by six hydroelectric dams: The Pointe du Bois Generating Station at Pointe du Bois, Slave Falls just a few kilometres downstream, Seven Sisters Falls Generating Station at Seven Sisters, MacArthur Falls Generating Station, the Great Falls Generating Station, and the Pine Falls Generating Station at Powerview, Manitoba.

3.4 FISH AND FISH HABITAT

Fish habitat in the project area includes Nutimik Lake, which is part of the Winnipeg River System. This lake is known to contain the following sport fish: lake whitefish (*Coregonus clupeaformis*), lake sturgeon (*Acipenser fulvescens*), northern pike (*Esox lucius*), sauger (*Stizostedion canadense*), walleye (*Stizostedion vitreum*), yellow perch (*Perca flavescens*) (Manitoba Conservation, 2015). Other species of fish include bluntnose minnow (*Pimephales notatus*), emerald shiner (*Notropis atherinoides*), fathead minnow (*Pimephales promelas*), Iowa darter, Johnny darter (*Etheostoma nigrum*), logperch (*Percina caprodes*), mimic shiner (*Notropis volucellus*), spottail shiner (*Notropis hudsonius*).

3.5 VEGETATION AND WILDLIFE

The Opapiskaw Campground is within the Lake of the Woods Ecoregion of the Boreal Shield Ecozone (National Ecological Framework for Canada, 2013). Characteristic vegetation in the ecoregion includes trembling aspen (*Populus tremuloides*) with some balsam poplar (*Populus balsamifera*), an understory of tall shrubs and a ground cover of mixed herbs. White spruce (*Picea glauca*) and balsam fir (*Abies balsamea*) are often not well represented. Poorly drained sites are occupied by sedges (*Carex* spp.), willow (*Salix* spp.), some black spruce (*Picea mariana*), and tamarack (*Larix laricina*).

Wildlife found within the ecoregion includes white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), moose (*Alces americanus*), ruffed grouse (*Bonasa umbellus*), beaver (*Castor canadensis*), coyote (*Canis latrans*), and rabbit. Lower elevations are capable producing spring wheat, other cereals, oilseeds, and hay crops due to the growing season length, available heat, and precipitation (National Ecological Framework for Canada, 2013).

3.6 SOCIOECONOMIC

The project is located within the Whiteshell Provincial Park. The park is funded by the Province of Manitoba and provides recreation, camping, and day use areas to the public. As previously stated, the campground can have a peak of 335 individuals with campground staff when it is operation from May to September. Fluctuations on the number of people staying at the campground throughout its operation are unknown at this time.

3.7 HERITAGE RESOURCES

The project activities all occur within the Whiteshell Provincial Park and primarily occur within previously disturbed or developed areas. The owner would work with Heritage Resources Branch to mitigate any concerns as required.

4 Potential Environmental Effects

An environmental effect includes a change that a project or development may cause to the environment. They may include, but are not limited to effects to:

- Air Quality;
- Soils;
- Surface Water, Fish and Fish Habitat;
- Water Quality;
- Ground Water Levels;
- Vegetation;
- Wildlife Habitat and Vegetation; and
- Socioeconomics aspects of the area.

4.1 AIR QUALITY

Construction activities will create dust and emissions from construction machinery. Dust suppression using water sprays or mists will be used to alleviate potential dust from being raised. Air quality effects from any dust generation during construction would be localized and temporary and is considered to have a low or negligible environmental effect. Emissions from construction equipment will be temporary and minimized by having machinery operating within normal limits and outfitted with mufflers (where application) to reduce air emissions. It is anticipated that during the operation of the WTP there would not be any release of pollutants to the air.

4.2 SOILS

A risk exists, during the construction of the facility, for a spill to occur from construction machinery and vehicle equipment. To reduce this risk storage of fuel, other petroleum products and lubricants will not be permitted within the area of the water supply. Therefore, the risk of occurrence is small based and additionally standard construction best practices for managing clean-up and removal of any impacted soils will be used to prevent any impacts.

During WTP operation activities are limited to regular maintenance activities. Daily checks of the WTP would involve recording readings, making minor adjustments to the plant treatment process, such as regeneration rates and disinfection dosing rates. These activities would have a minimal impact to soils in the area. Potential adverse impacts to soil quality are assessed to be minor.

4.3 SURFACE WATER AND FISH HABITAT

Potential environmental impacts to surface water and fish habitat were expected to be minor and short term during construction. The majority of the work occurred in a the existing WTP structure which will house the

new water treatment equipment. The existing discharge line to the Lake will be re-utilized, as well as the existing raw and treated pipelines into and around the WTP building.

The installation of the ion exchange residuals sedimentation tank will occur away from Nutimik Lake near the WTP and it is expected that no sediment will enter this water body.

Due to the prevalence of bedrock along the shore, all work on the new intake was surface installation, no excavations were done. The installation of the new Lake intake consisted of floating out a prefabricated intake pipe and screen and lowering it to the Lake bottom. Connections to the raw piping were surface connections. The new intake was designed with DFO complaint screening.

The continued practice of discharging the filter backwash to the Lake is not expected to have any significant long term adverse effects on the Lake or general fish habitat, due to the large dilution factor.

4.4 WATER QUALITY

Impacts to the water quality of Nutimik Lake were reduced during construction by using the proper mitigation measures (e.g. following best practices), as previously described.

The continued practice of discharging the filter backwash to Nutimik Lake is not expected to have any significant long term adverse effects on water quality, due to the large dilution factor. Nutimik Lake has an approximate surface area of 637 ha [MB Conservation, 2015], and is connected to a large river system (Winnipeg River).

4.5 GROUNDWATER LEVELS

This project is not expected to affect groundwater levels within the region therefore the potential environmental effects are negligible.

4.6 VEGETATION

The proposed project area at the Opapiskaw Campground has previously been disturbed and is regularly managed. Best management practices were utilized for the installation of the discharge pipeline and the majority of the intake pipeline. Measures were taken to manage sedimentation and erosion control by the contractor. The area of disturbance for the installation of the discharge and intake lines was minimal. Any areas which were disturbed have been restored to their natural state.

The operating and maintenance activities of the proposed development are minimal and will be restricted to established areas within the park. Potential impacts to vegetation are considered to be negligible.

4.7 WILDLIFE HABITAT AND VEGETATION

The potential effects to wildlife habitat loss were assessed to be negligible as all activities are occurring in areas previously developed.

4.8 NOISE AND VIBRATION

The noise emissions created by construction equipment were minimized by proper noise reducing systems (mufflers etc.). The predominate machinery onsite are powered hand tools. This noise is in addition to regular maintenance and park activities, and were short term and are considered to be minor.

4.9 HUMAN HEALTH AND WELL BEING

Potential adverse effects on the overall human health are considered to be negligible to minor. During construction short term increases to dust and noise will occur. Vehicular traffic to the site increased during construction.

The construction and operation of the water treatment plant designed to produce treated water to meet current water quality standards is considered to have a positive effect on human health and wellbeing.

4.10 CLIMATE CHANGE

No climate change impacts are expected from the proposed development.

5 Environmental Management Measures

5.1 AIR QUALITY

Well maintained vehicles and equipment and reduction of unnecessarily transportation and idling of vehicles will assist in mitigating air quality impacts.

The control of dust with water sprays or an approved dust suppressant will limit the impact of dust to the air quality. Prompt re-establishment of vegetation disturbed during construction and also limiting certain work to periods of low winds will also help mitigate air quality impacts.

5.2 SOILS

Preparation of an emergency response plan to mitigate potential impacts to soil by contaminants from petroleum products as well as use and availability of on-site spill clean-up equipment and materials, using properly maintained equipment and fuelling procedures.

Minimal ground disturbance is anticipated during the construction phase. The reestablishment of vegetation and backfill of any short trenches or excavations will occur as soon as possible after any disturbance to reduce the loss of soil due to wind or water erosion.

5.3 SURFACE WATER

Surface water issues may be mitigated during construction by redirecting surface run-off, pumping accumulated water to adjacent ditches and installing proper erosion control practices such as silt fences and erosion control blankets.

Properly maintained, operated and fueled equipment will assist with the mitigation of potential fuel or petroleum spills. Regulatory authorities will be notified through the emergency response line and appropriate measures will be taken according to Provincial requirements.

Setback distances of 100m will be used for fueling and refueling purposes from any water courses. Vehicles will stay on established roads and not unnecessarily disturb riparian zones. Any disturbed vegetation will be re-established as soon as possible.

Chlorinated water used to disinfect the water treatment plant or distribution system will be neutralized prior to discharge.

5.4 GROUNDWATER

The same mitigation efforts as described for surface water can be applied to as mitigation measures to reduce potential impact to any groundwater

5.5 VEGETATION AND WILDLIFE

The establishment of re-vegetation will occur as soon as practically possible for disturbed areas. Minimizing laydown areas and construction activities will act as a measure to reduce disturbance to soils, and vegetation. Proper noise control and dust control as previously discussed will be implemented to mitigate potential impacts.

5.6 FISHERIES

Fisheries impacts will be mitigated by controlling run-off and any construction related discharge to the watercourse to reduce potential harmful effects. The work area will be set back from riparian zones. Proper erosion and sedimentation control measures for working near water will be implemented. These measures will limit any short term temporary impact to fisheries.

5.7 NOISE AND VIBRATION

Unnecessary operation of equipment, properly muffled vehicles and equipment on site and properly maintained equipment will be assist in mitigating noise and vibration issues.

5.8 WATER CONSERVATION

Coin operated showers and low flush fixtures will assist in water conservation measures related to the treatment and production of water at Opapiskaw Campground.

5.9 RESIDUAL ENVIRONMENTAL EFFECTS

Long-term residual effects are not anticipated, but short term residual effects are considered local, minor in magnitude, short term in duration, and reversible over time after environmental protection and mitigation measures are applied.

6 References

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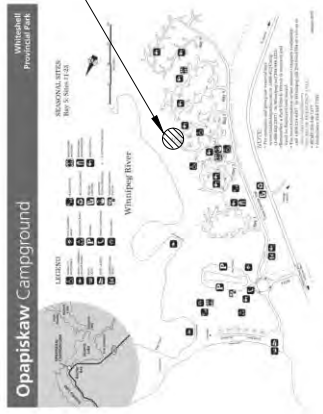
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“Statistics Canada. 2012. Pinawa, Manitoba (Code 0645) and Manitoba (Code 46) (table).” Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. <http://www12.statcan.gc.ca/census-recensement/2011/dp-prof/details/page.cfm?Lang=E&Geo1=POPC&Code1=0645&Geo2=PR&Code2=46&Data=Count&SearchText=pinawa&SearchType=Begin&SearchPR=01&B1=All&Custom=&TABID=1>

Appendix A – Drawings



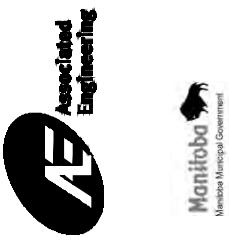
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GENERAL			
1	4504-00-G-101	0	DRAWING INDEX AND COVER SHEET
SITE			
2	4504-00-C-101	0	PLAN AND LEGEND
3	4504-00-C-102	0	SITE PLAN AND PROCESS WASTE TANK
4	4504-00-C-103	0	SITE PLAN AND FORCERMAIN ALIGNMENT
ARCHITECTURAL			
5	4504-00-A-101	0	CODE ANALYSIS AND SCHEDULES
6	4504-00-A-102	0	CONSTRUCTION DETAILS
7	4504-00-A-103	0	EXTERIOR ELEVATIONS
PROCESS			
8	4504-00-D-100	0	LEGEND
9	4504-00-D-101	0	NEW PROCESS FLOW DIAGRAM
10	4504-00-D-102	0	EXISTING PROCESS FLOW DIAGRAM
11	4504-00-D-103	0	EXISTING INTERIOR ELEVATIONS
12	4504-00-D-104	0	NEW WATER TREATMENT PLANT LAYOUT
13	4504-00-D-105	0	DRAIN PIPING PLAN
14	4504-00-D-106	0	DISTRIBUTION PIPING PLAN
15	4504-00-D-107	0	NEW WASTE TREATMENT TANK DETAILS
16	4504-00-D-108	0	30 SOMER TRC
17	4504-00-D-109	0	30 SOMER TRC
MECHANICAL			
18	4504-00-M-101	0	MAIN FLOOR PLAN
ELECTRICAL			
19	4504-00-E-101	0	SITE PLAN
20	4504-00-E-102	0	MAIN FLOOR PLAN LIGHTING
21	4504-00-E-103	0	MAIN FLOOR PLAN POWER AND SYSTEMS
22	4504-00-E-104	0	SCHEDULES
23	4504-00-E-105	0	CONTROL PANELS

MANITOBA CONSERVATION PARKS MANITOBA WATER SERVICES BOARD

OPAPISKAW CAMPGROUND WATER TREATMENT PLANT UPGRADE

MWSB PROJECT # 1210
ISSUED FOR TENDER MARCH 2015

DRAWING
REDUCED TO
HALF SIZE



The Manitoba Water Services Board
 MANITOBA CONSERVATION
 PARKS AND NATURAL AREAS
 OPAPISKAW WTP UPGRADES
 2014-4504-00

APPROVED BY	DATE	FUNCTION	DATE
MANAGER			

REV	DATE	DESIGN	DRAWN	DESCRIPTION
1	2015-03-04	J. ANDERSON	S. BERNARD	ISSUED FOR TENDERS

DRAWING	REVISION	SHEET
4504-00-G-101	0	1 / 23

DRAWING
 REDUCED TO
 HALF SIZE

REV	DATE	DESIGN	DRAWN	DESCRIPTION
0	2014-08-08	A. KADONIA	A. KADONIA	ISSUED FOR TENDER



The Manitoba Water Services Board
 MANITOBA CONSERVATION
 PARKS AND NATURAL AREAS

OPAPISKAW WTP UPGRADES

2014-4504-00

SCALE: AS SHOWN

CIVIL
 PLAN AND LEGEND

DRAWING	REVISION	SHEET
4504-00-C-101	0	2 / 23

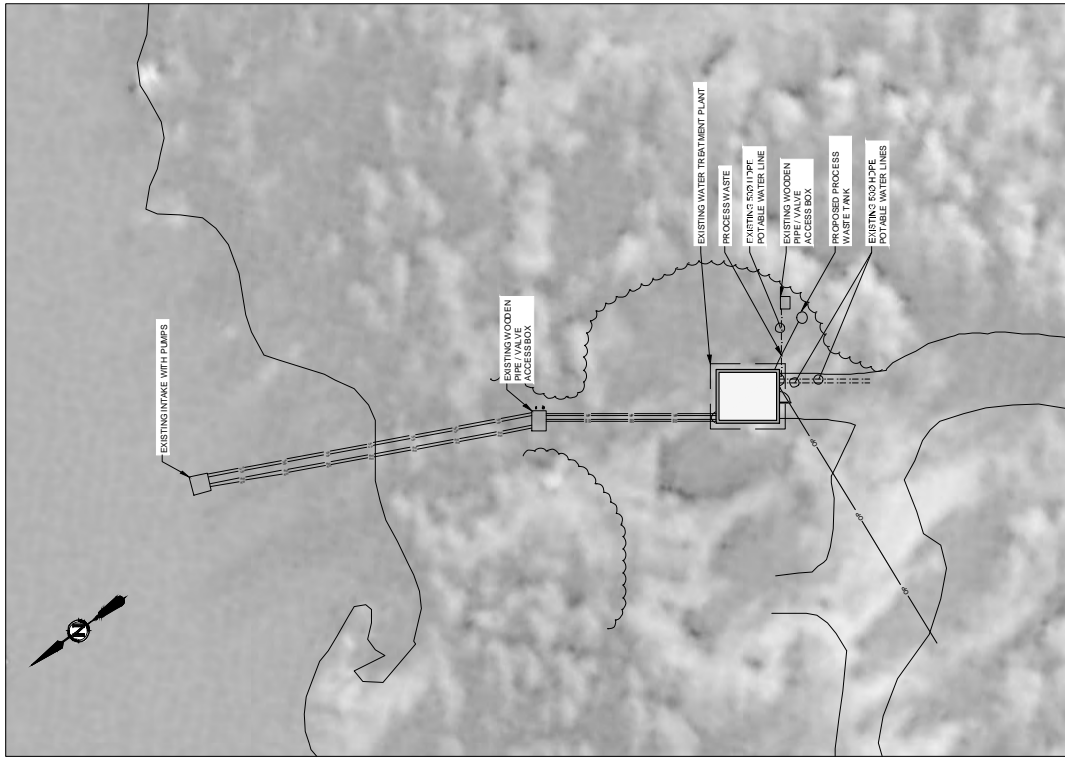
LEGEND

WATER

	EXISTING	PROPOSED
Vault Box	⊖	⊖
Meter Chamber	⊙	⊙
Cross Flange	⊕	⊕
Tee Flange	⊕	⊕
End Cap / Plug	⊖	⊖
Gate Valve	⊖	⊖
Thrust Block	▲	▲
45 Degree Elbow	∟	∟
90 Degree Elbow	∟	∟
Wye	∟	∟
Encasement	⊖	⊖
Water Level	∇	∇
Coupling	⊕	⊕
Reducer	⊖	⊖
Overhead Power	—OP—	—OP—
Underground Power	—UP—	—UP—
Fore Drain	—FD—	—FD—
Process Waste	—PW—	—PW—
Raw Water	—RW—	—RW—
Potable Water	—PW—	—PW—

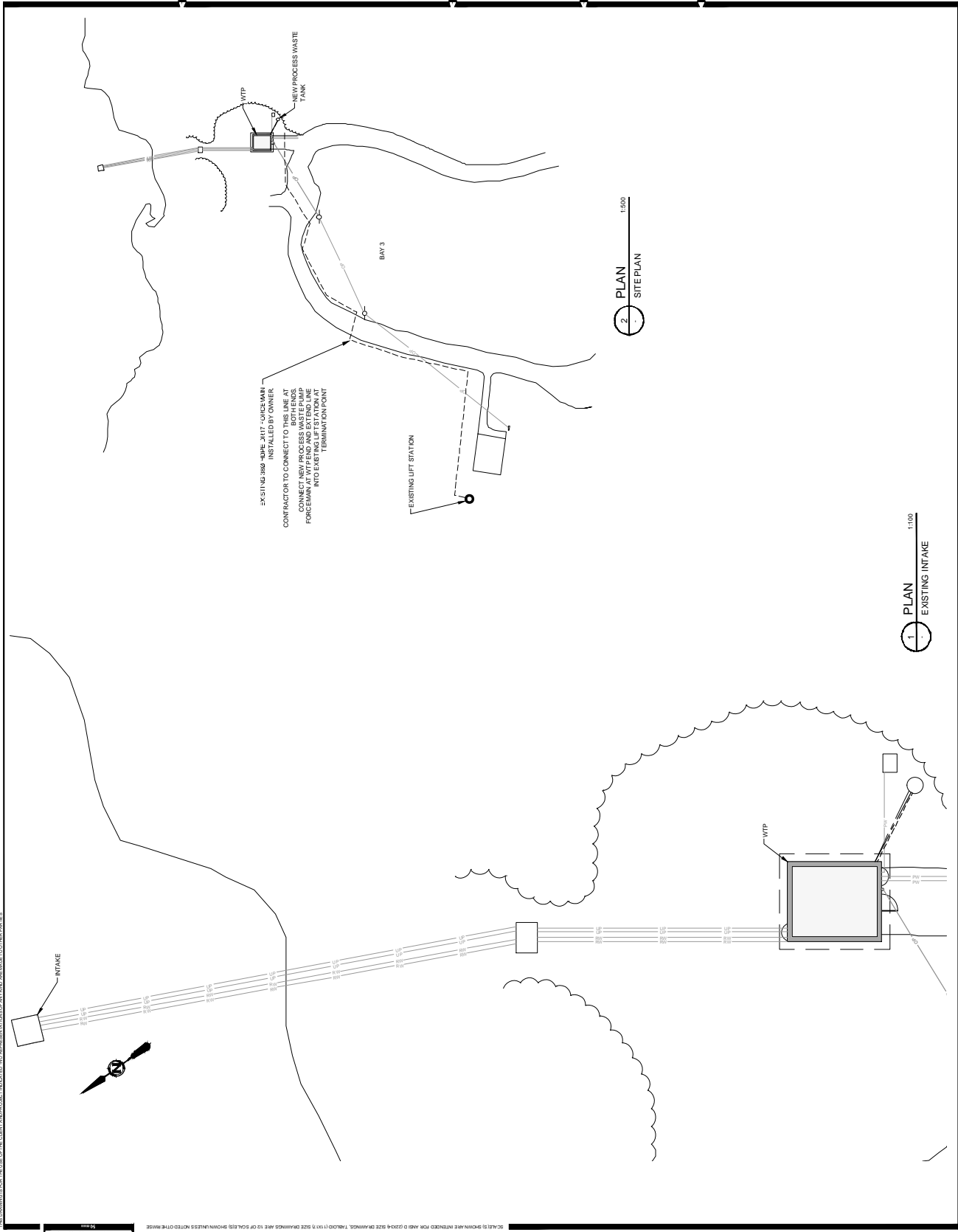
MISCELLANEOUS

	EXISTING	PROPOSED
Building	[Rectangular symbol]	[Rectangular symbol]
Hedge	[Wavy line symbol]	[Wavy line symbol]
Edge of Water	—EOW—	—EOW—
Spot Elevation	⓪	⓪
Slope	1:2	1:2
Bottom of Bank	—BOB—	—BOB—
Top of Bank	—TOB—	—TOB—
Bedrock (Symbol for Profiles)	[Hatched symbol]	[Hatched symbol]



1 PLAN
 OVERALL SITE PLAN
 1:200

THE DRAWINGS FOR THE USE OF THE CLIENT AND/OR PROJECT INDICATED, AND REPRESENTATIONS OF ANY KIND, ARE MADE BY OTHER PARTIES.



DRAWING
 REDUCED TO
 HALF SIZE

REV	DATE	DESIGN	DRAWN	DESCRIPTION
0	2014-04-03	A. JACOBSON	S. BERNARD	ISSUED FOR BIDDING



MANITOBA CONSERVATION
 PARKS AND NATURAL AREAS

OPAPISKAW WTP UPGRADES
 2014-4504-00

SCALE: AS SHOWN
 CIVIL
 SITE PLAN AND FORCE MAIN ALIGNMENT

DRAWING	REVISION	SHEET
4504-00-C-103	0	4 / 23

IT IS THE RESPONSIBILITY OF THE CLIENT AND/OR PROJECT ARCHITECT AND REPRESENTATIVE OF ANY OTHER PARTY TO PROVIDE ALL NECESSARY INFORMATION AND DATA FOR THE DESIGN OF THIS PROJECT. THE DESIGNER SHALL BE RESPONSIBLE FOR THE DESIGN OF THIS PROJECT. THE DESIGNER SHALL NOT BE RESPONSIBLE FOR THE DESIGN OF THIS PROJECT. THE DESIGNER SHALL NOT BE RESPONSIBLE FOR THE DESIGN OF THIS PROJECT.

DRAWING
REDUCED TO
HALF SIZE

REV	DATE	DESIGN	DRAWN	DESCRIPTION
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The Manitoba Water
Services Board

MANITOBA CONSERVATION
PARKS AND NATURAL AREAS

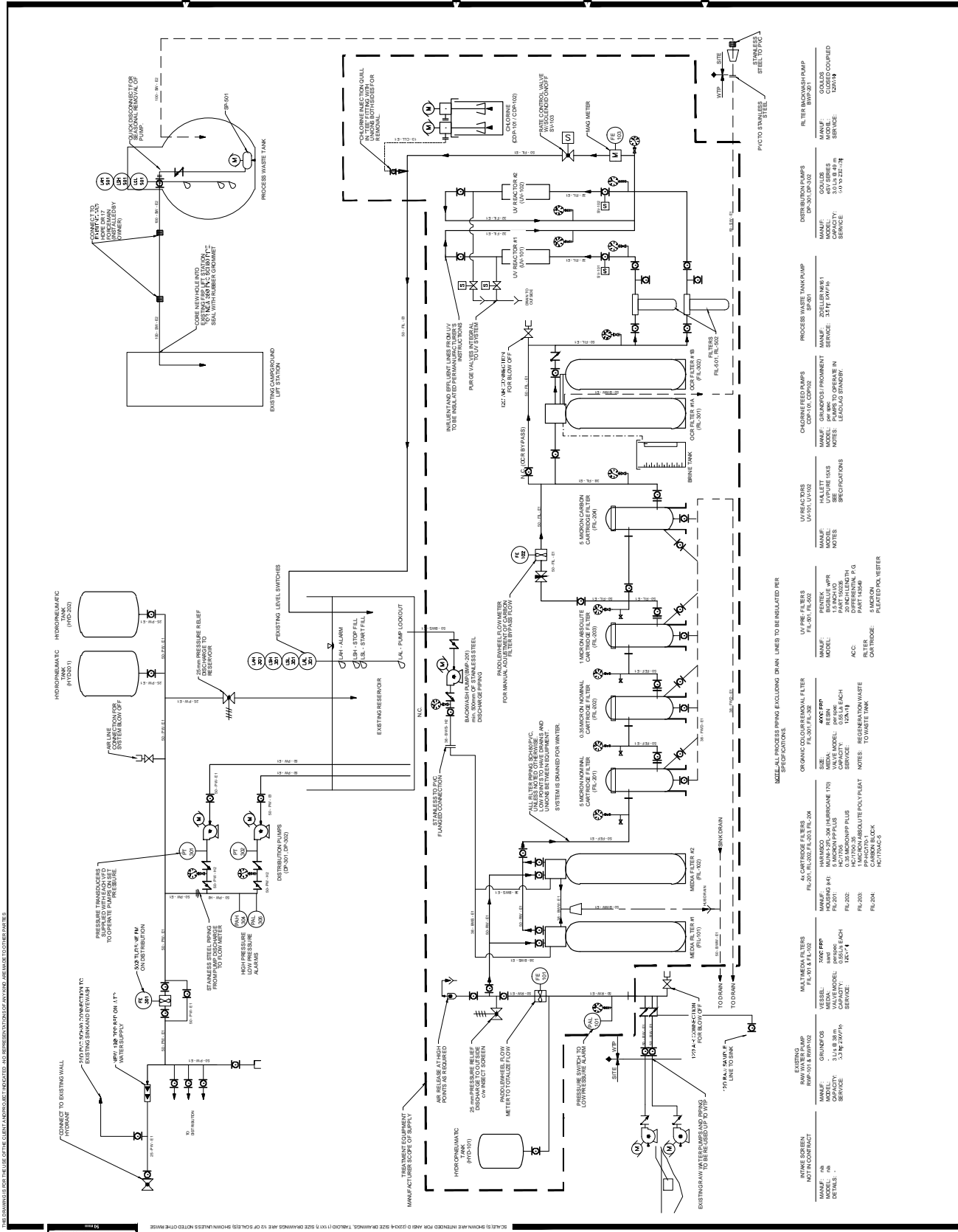
OPAPISKAW WTP UPGRADES

2014-4504-00

SCALE: AS SHOWN

PROCESS
NEW PROCESS FLOW DIAGRAM

DRAWING	REVISION	SHEET
4504-00-D-101	0	9 / 23



ITEM	MANUFACTURER	MODEL	SIZE	NOTE
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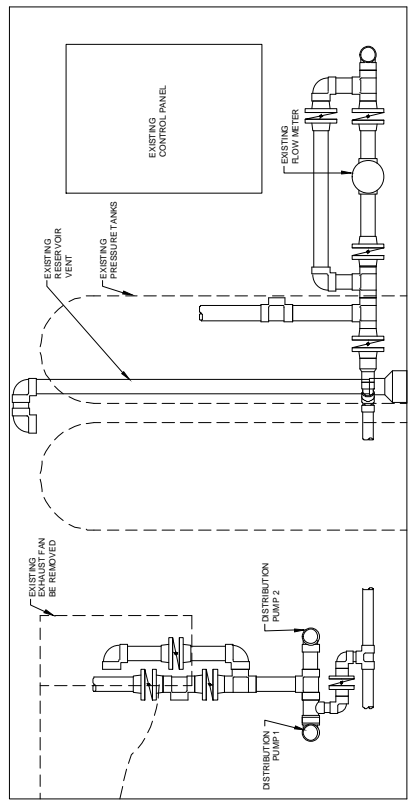
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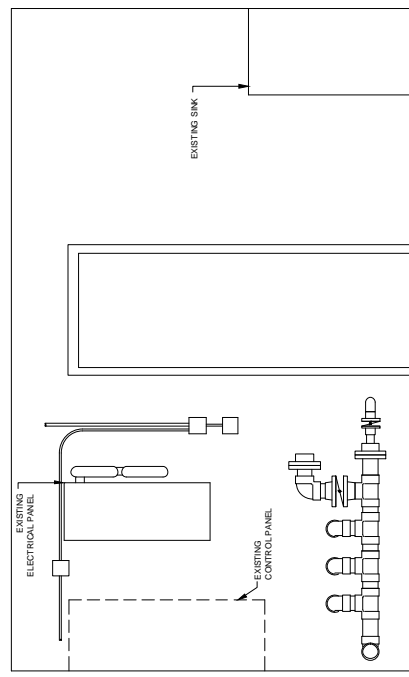
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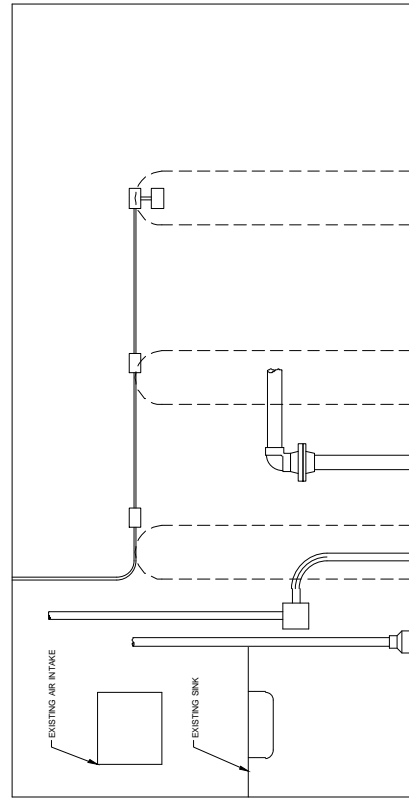
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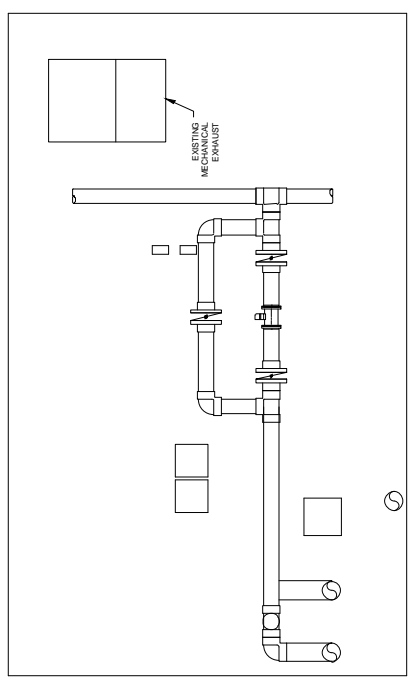
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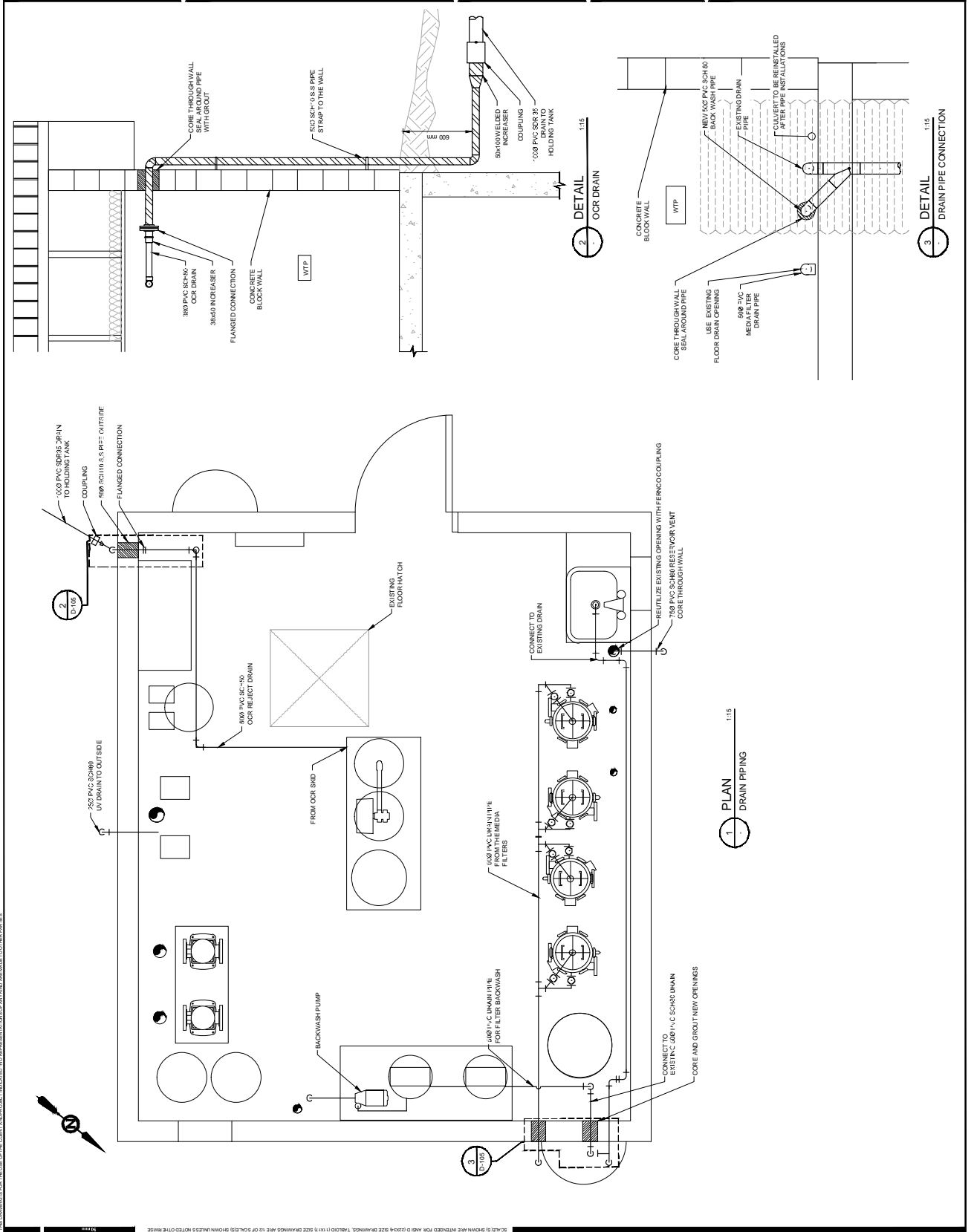
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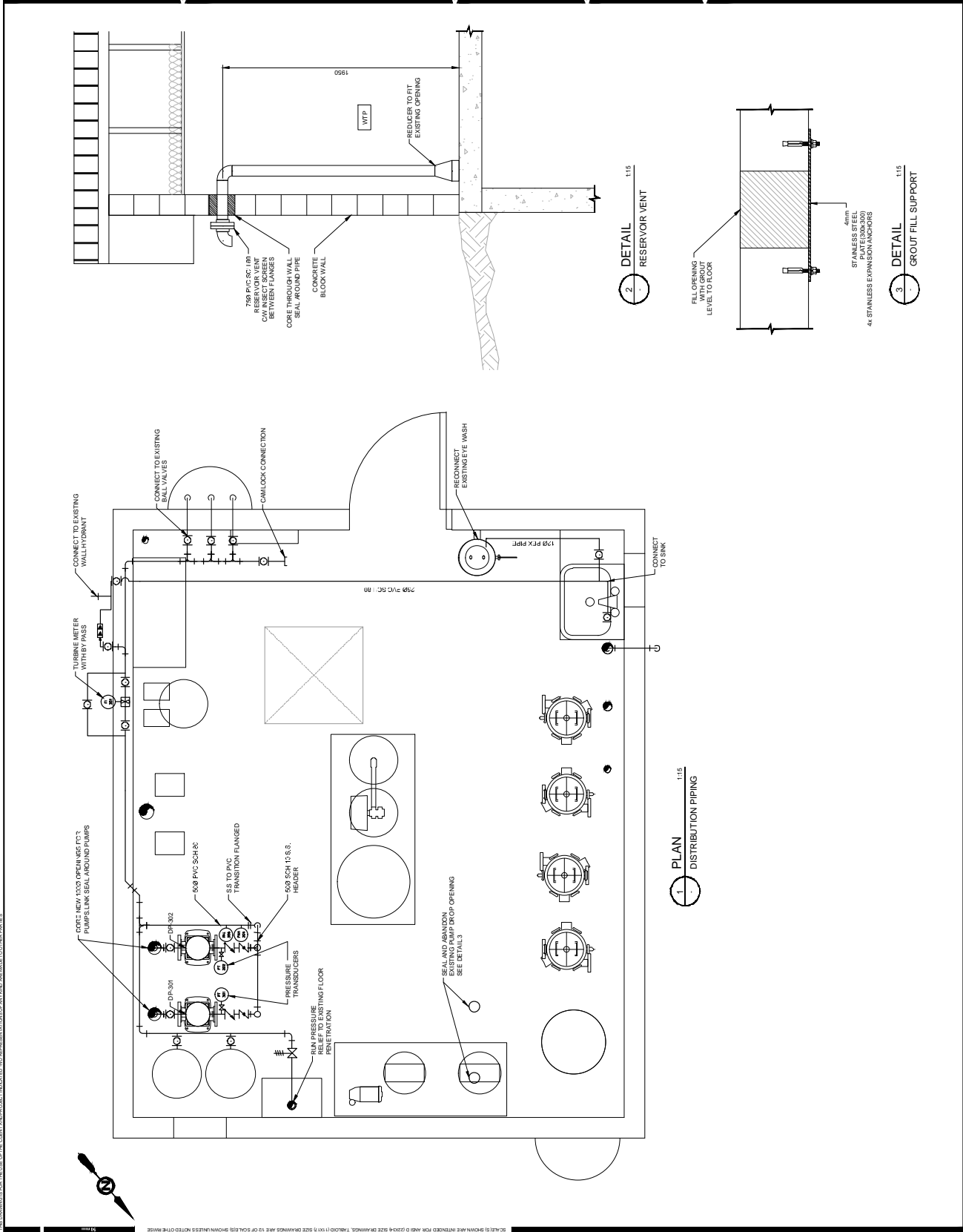
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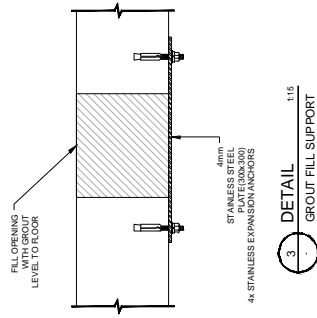
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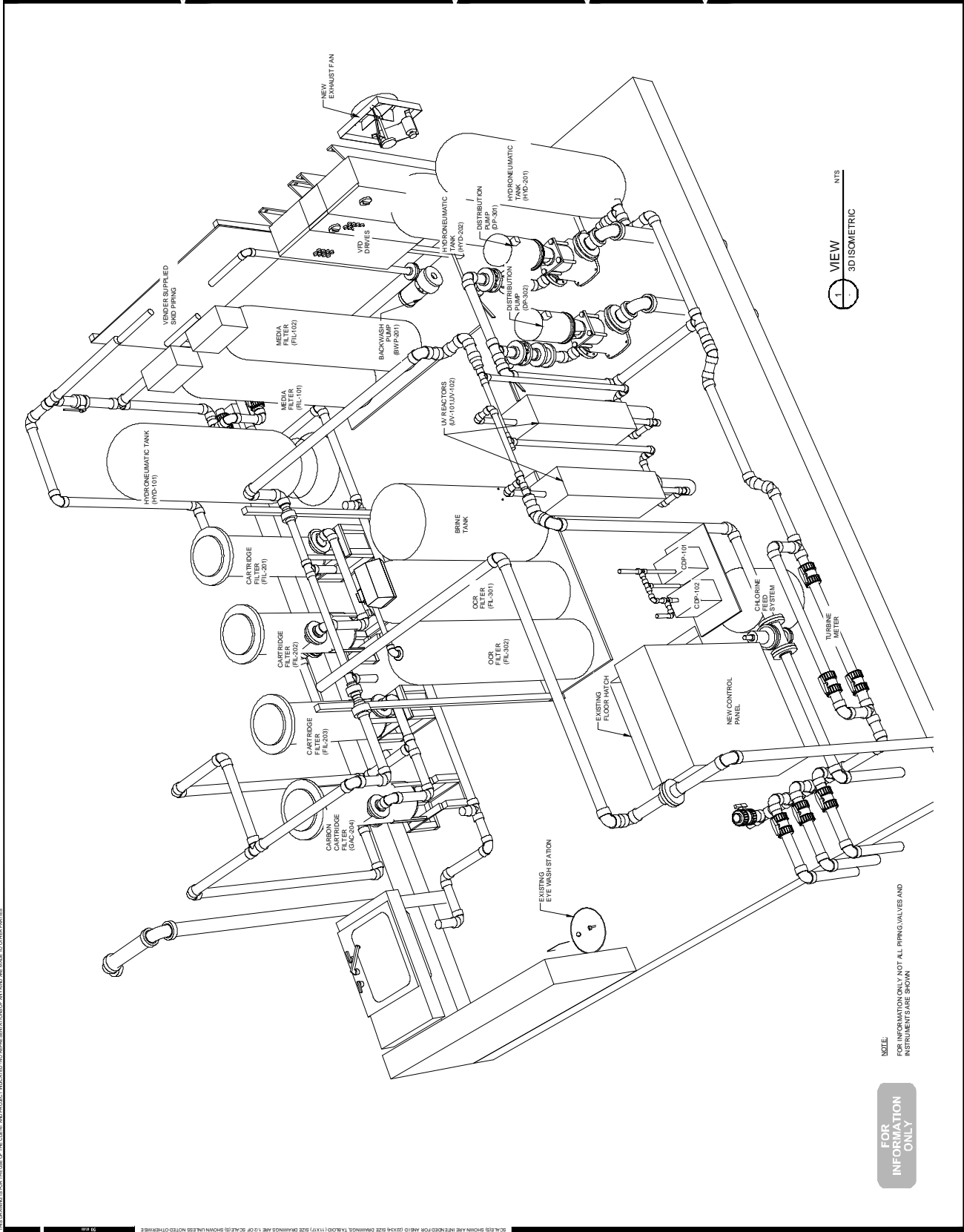
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1 VIEW
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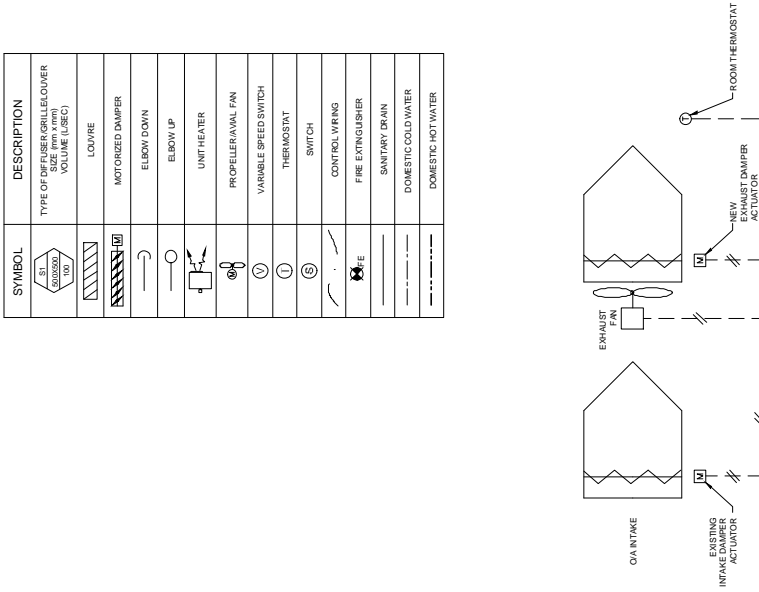
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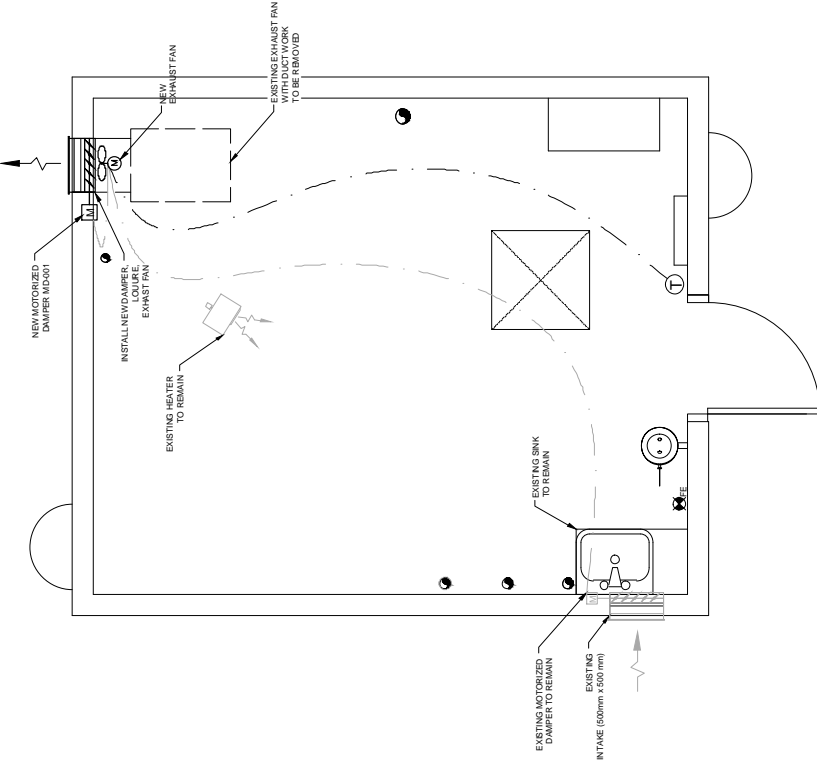
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 MAIN FLOOR PLAN

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SYMBOL	DESCRIPTION
	TYPE OF DRIVE GRILLE/CLOUVER
	LOUVRE
	MOTORIZED DAMPER
	ELBOW DOWN
	ELBOW UP
	UNIT HEATER
	PROPELLER/FAN
	VARIABLE SPEED SWITCH
	THERMOSTAT
	SWITCH
	CONTROL WIRING
	FIRE EXTINGUISHER
	SANITARY DRAIN
	DOMESTIC COLD WATER
	DOMESTIC HOT WATER



2 SCHEMATIC
 EXHAUST FAN CONTROL



1 PLAN
 1:20

HEATING & VENTILATION EQUIPMENT SCHEDULE							
TAG	DESCRIPTION	LOCATION	DESIGN BASIS MAKE/MODEL	TYPE	hp	V/Hz/φ	NOTES
EF-001	EXHAUST FAN	WTP ROOM	SE L-03-440E	WALL PROPELLOR	65	FRAC	DIRECT DRIVE - MOTOR GUARD
UH-001	ELECTRIC UNIT HEATER	WTP ROOM	EXISTING	ELECTRIC	150W/1	FRAC	MOTORPOWER RATED COILING, TRITAT & INTERLOCKED DAMPERS

LOUVRE, DAMPER & GRILLE SCHEDULE						
TAG	DESCRIPTION	LOCATION	DESIGN BASIS MAKE/MODEL	TYPE	WH	NOTES
MD-001	MOTORIZED DAMPER	WTP ROOM	TAMCO 3000 BF	INSUL PARALLEL	3000/300	MOTORIZED DAMPER

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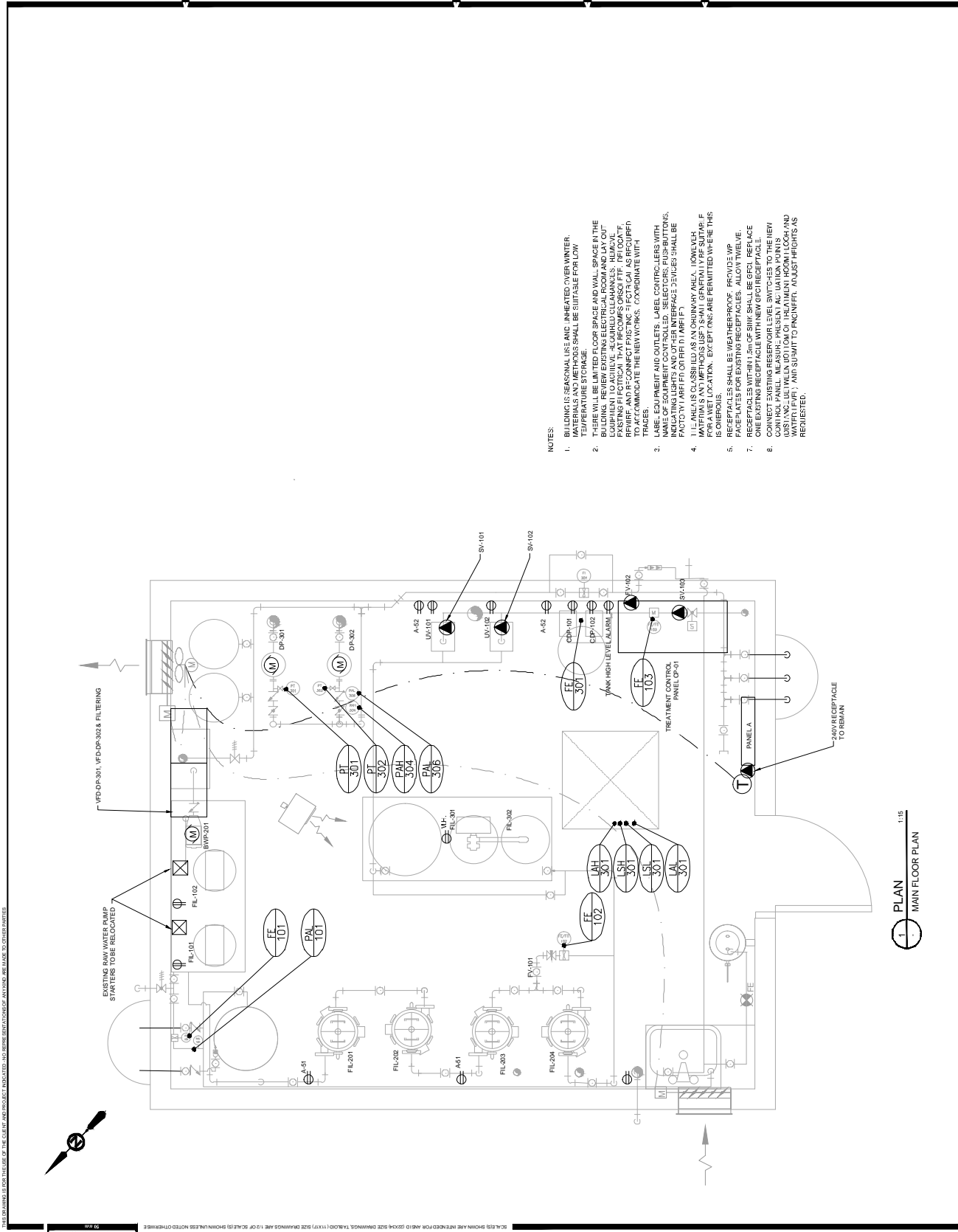
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 POWER AND SYSTEMS

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- NOTES:
- BUILDING IS RECREATIONAL USE AND VENTILATED OVER WINTER. MATERIALS AND METHODS SHALL BE SUITABLE FOR LEAK TEMPERATURE STORAGE.
 - THERE WILL BE LIMITED FLOOR SPACE AND WALL SPACE IN THE BUILDING. REVIEW EXISTING ELECTRICAL ROOM AND LAY OUT EXISTING ELECTRICAL PANELS TO BE MAINTAINED. REVIEW EXISTING FLOOR PLAN FOR ELECTRICAL PANELS TO BE MAINTAINED. REVIEW EXISTING FLOOR PLAN FOR ELECTRICAL PANELS TO BE MAINTAINED. REVIEW EXISTING FLOOR PLAN FOR ELECTRICAL PANELS TO BE MAINTAINED.
 - REVIEW AND RE-CONNECT EXISTING ELECTRICAL PANELS TO BE MAINTAINED. COORDINATE WITH TRADES.
 - LABEL EQUIPMENT AND OUTLETS. LABEL CONTROLLERS WITH NAME OF EQUIPMENT CONTROLLED. SELECTORS, PUSH-BUTTONS, INDICATING LIGHTS AND OTHER INTERFERENCE DEVICES SHALL BE IDENTIFIED WITH THE NAME OF THE EQUIPMENT THEY CONTROL.
 - ALL PANELS SHALL BE CLASSIFIED AS AN OVERCOURT PANEL. LOW VOLTAGE PANELS SHALL BE CLASSIFIED AS AN OVERCOURT PANEL. LOW VOLTAGE PANELS SHALL BE CLASSIFIED AS AN OVERCOURT PANEL.
 - RECEPTACLES SHALL BE WEATHERPROOF. PROVIDE VIP FACEPLATES FOR EXISTING RECEPTACLES. ALLOW TWELVE (12) RECEPTACLES WITHIN 1.5m OF SINK SHALL BE REQ'D. REPLACE ONE EXISTING RECEPTACLE WITH NEW GFCI RECEPTACLE.
 - CONNECT EXISTING RESERVOIR LEVEL SWITCHES TO THE NEW TREATMENT CONTROL PANEL. PROVIDE NEW 240V RECEPTACLES (INCLUDING LOW VOLTAGE ILLUMINATION LIGHTS AND WATER TAP) AND SURVIVIT TO FACINFER. ADJUST HEIGHTS AS REQUIRED.

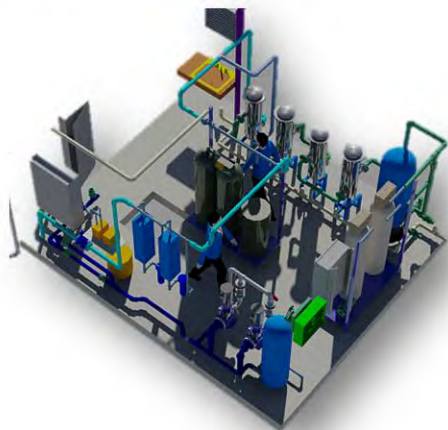


1 PLAN MAIN FLOOR PLAN 1:15

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Appendix B – WTP Predesign Report

Predesign Report



MB Conservation
& Manitoba Water Services Board

**Opapiskaw Campground
Water Treatment Plant Upgrade**

February 2015



Associated
Engineering

GLOBAL PERSPECTIVE.
LOCAL FOCUS.

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Appendix A – CONCEPT RENDERING OF NEW EQUIPMENT LAYOUT

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1 Introduction

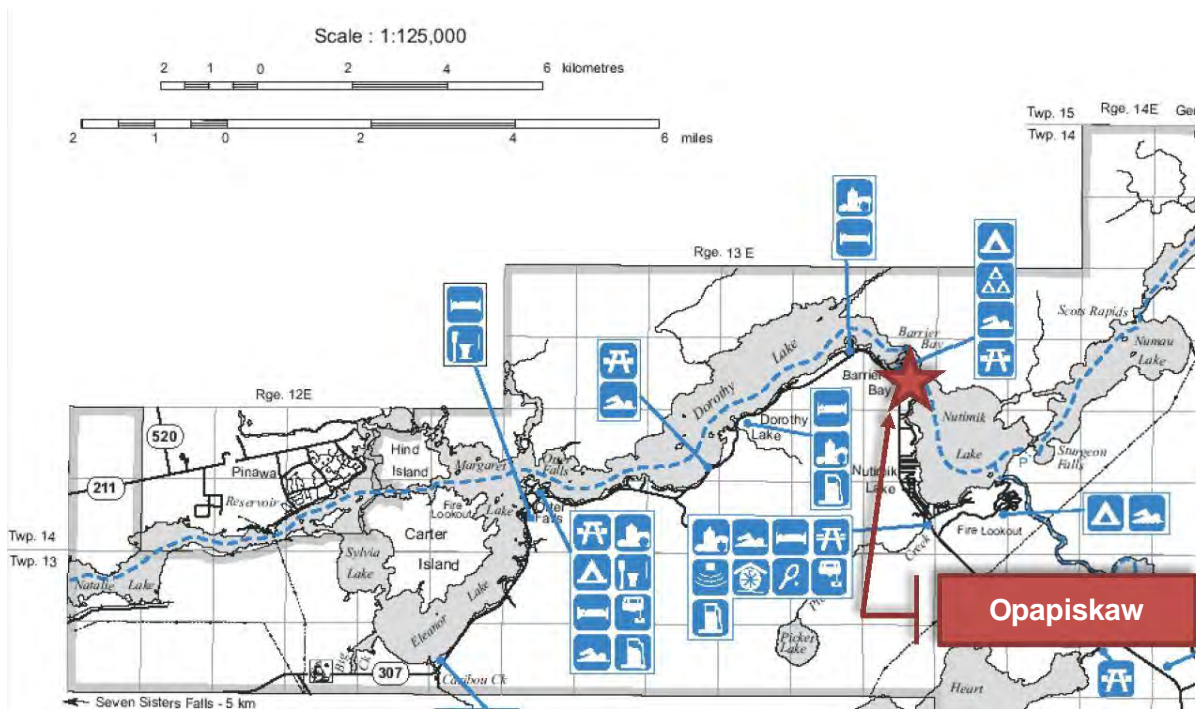
The Opapiskaw Campground is located just off Hwy 307 next to Barrier Bay. The campground consists of 88 campsites, twenty of which have electrical service. None of the sites, however, have water or sewer hook ups. The campground is currently serviced with one non-modern washroom, two modern washroom facilities, and a shower building with modern washrooms. The campground office is serviced with water.

Treated water is provided to the modern washrooms and showers as well as eleven standpipes throughout the campground. With the current filtration system offline, the only treatment is chlorination. As a result, the system is currently on a Boil Water Advisory.

Without filtration, the system cannot meet its turbidity objectives. As well, the system is also challenged to meet the TTHM guidelines due to the high organics in the source water. MB Conservation's intent is to replace the treatment process with new equipment that can meet the drinking water quality regulations.

The intent is to fit the new equipment into the existing WTP facility with some minor modifications.

Figure 1-1 – Opapiskaw Campground Location Map



2 Design Considerations

2.1 DESIGN POPULATION AND WATER DEMAND

The Opapiskaw campground population will be based on the 88 basic sites and an allocation for three staff. In discussions with MB Conservation, there are no immediate plans to expand the campground and add more sites. Water demand will be based on the current serviced population.

Treated water will be provided to two modern washroom facilities, a shower facility with modern washrooms, and eleven stand pipes located throughout the campground.

The existing WTP has a flow meter on distribution and the operator logs the daily consumption. Figure 2-1 shows the 2005-2014 monthly usage in cubic metres per month. Note that there is a considerable reduction in use from 2009 to 2011. In talking with the Parks, the most likely reason behind the change is the installation of new shower facilities in the surrounding area. In the past campers from Nutimik and local cottages would line up at Opapiskaw to shower, resulting in heavy shower use and water consumption. With shower facilities now at Nutimik and a coin op system at Opapiskaw, the showers now see much reduced usage.

For the purpose of design, the more recent water consumption data will be taken as more relevant.

Figure 2-1 – Opapiskaw Campground Water Meter Records (2005-2014)

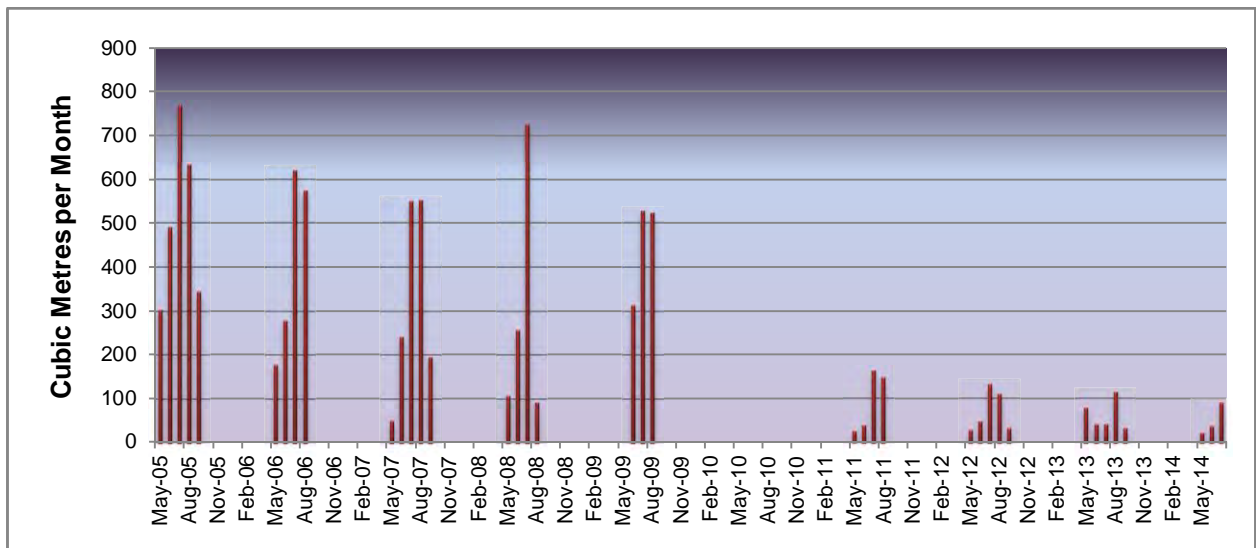


Figure 2-2 is a summary of daily demands from 2011 to 2014. The data shows a typical seasonal campground trend with monthly peaks in July-August, and daily peaks on the weekends. With 2012 showing as the higher consumption year, Figure 2-3 is a daily flow summary of 2012.

Figure 2-2 – Opapiskaw Campground Water Meter Records (2011-2014)

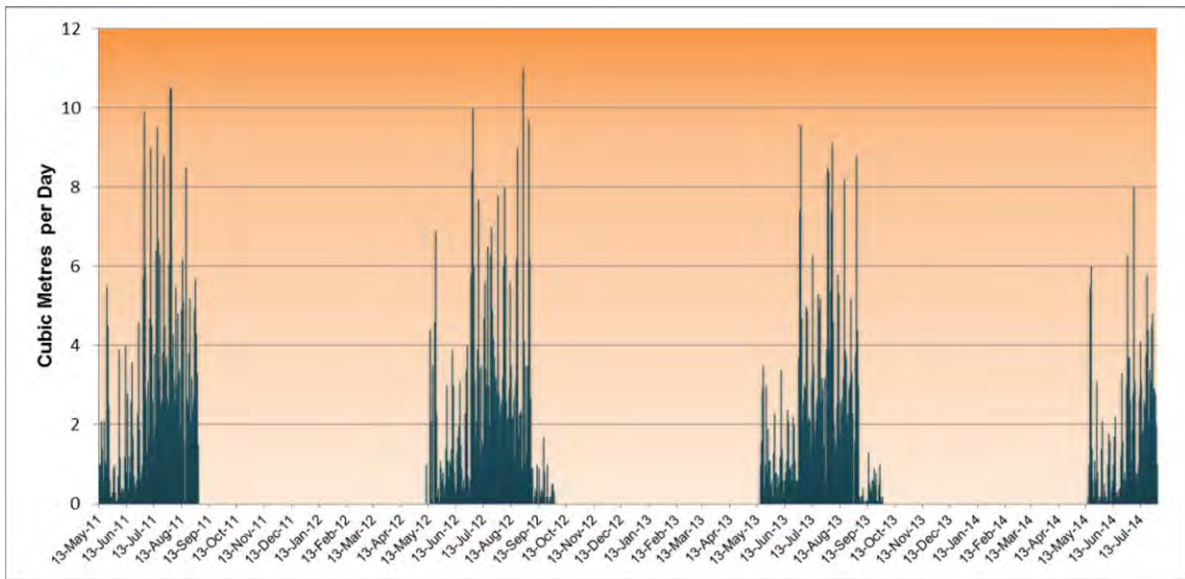
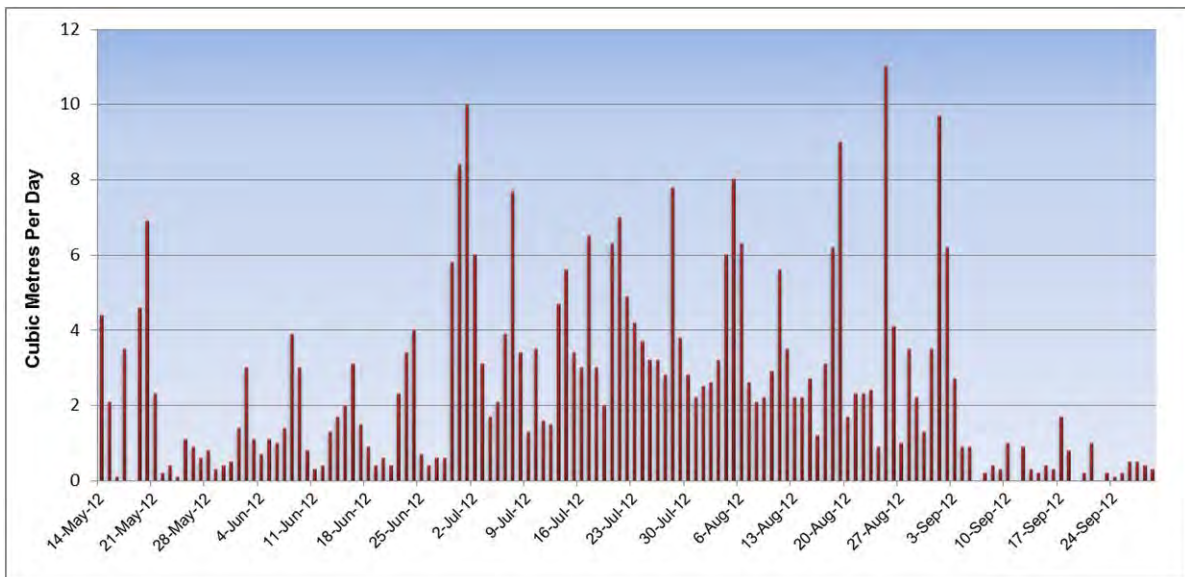


Figure 2-3 – Daily Water Consumption for 2012



From the 2012 water use data, it is shown that the peak day use can be upwards of 10.5 cubic metres (2,800 USG) per day. Assuming that during peak use, the campground is at capacity with four campers per site on average; the equivalent per capita use is approximately 30 litres per person. However, historical water consumption prior to 2011 shows much higher use. In discussions with the Parks, this can likely be attributed to very heavy shower and facility use from surrounding campgrounds and cottages that did not have their own facilities at the time. Since 2010, Nutimik had shower facilities installed and the Opapiskaw showers also installed a coin-op shower system; the Boil Water Advisory could also have caused some reduction in use as well.

With no future expansions planned, it is proposed that the new system be able to meet a reasonable peak day demand of 15 cubic metres/day. The system would also have some ability to meet higher future demands as required.

2.1.1 2014 Water Use Monitoring

With such a significant change in water consumption from pre-2010 to post-2010; AE spent the August long weekend on site to monitor the water use to confirm that the recent flow data is accurate.

This was accomplished by monitoring the water meter and pump hours from 4pm Friday, August 29th to 4pm Monday, August 31st. A timed draw down/fill of the reservoir was also performed.

Table 2.1 – Calculated Daily Water Consumption

Measurement	Saturday Water Use	Sunday Water Use	Monday Water Use
Based on the distribution water meter	6.3 m ³	7.5 m ³	
Based on distribution pump hours*	5.3 m ³	6.5 m ³	
Based on raw water pump hours*	5.9 m ³	6.6 m ³	
Weather	Sunny	Rain	Rain / Sunny

* based on estimated pumping capacity from draw down test

Thus from Table 2.1, the amount of water use in a day was relatively constant from three independent ways to calculate the flow. The water use data presented in Figure 2.3 is therefore likely reliable.

We also worked with the Park staff to track shower usage over this long weekend. Table 2.2 is a summary of the shower statistics for the August 29-31 long weekend. Surprisingly the calculated amount of water used for showering is relatively low compared to the total water use.

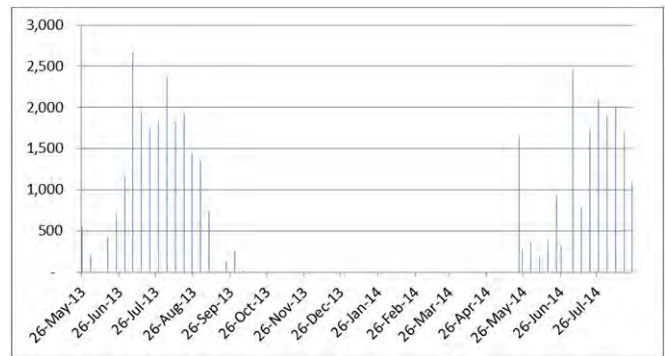
Table 2.2 – Shower Use Data

Measurement	Saturday	Sunday	Monday
Campsites (# campers)	51 sites (284)	65 sites (264)	-
Shower use*	1.5 m ³	0.8 m ³	-

*calculated from water meters

Based on meter data from the last few years, a peak day for shower use appears close to 2.5 m³ per day. Assuming a peaking factor of 2.0 from average day use.

Based on the coin-op rate of \$3.00/minute, the comparison of water meter use to coins collected seems to equate to \$0.25/igal, or 18 L per dollar.



2.2 PROPOSED WATER TREATMENT PLANT CAPACITY

The proposed treatment rate should be design to meet the historical peak day shown in Figure 2.2, as well as make some allowance for increased use when the Boil Water Advisory is lifted. Based on seeing upwards of 11,000 m³ on a peak day in the historical records since 2011, our recommendation is that the treatment equipment should then be able to produce at least **15,000 L** in a day.

The design will also be based on being able to produce this volume over an **eight hour** period. Implementing an eight hour production day will allow the Park staff to more easily monitor the equipment during regular hours, it also allows for future peaking factor. During the weekdays, the system would likely operate for less than 4 hours to meet most daily demands.

Production rate: 15,000 L ÷ 8 hours x (3,600 seconds per hour) = ~0.50 L/s (8 USGPM)

At this treatment rate, the system would be able to meet an assumed peak campsite demand of 720 L/campsite/day. This is equivalent to an average demand of 180 L/campsite/per day with a peaking factor of 4.0. Assuming four campers per site, this equates to an average date consumption of 45 L/c/d. This should be a reasonable expectation for a seasonal campground with modern facilities.

Also, at this flow rate, the system should be able to meet the flow demand of all four shower heads in operation.

2.3 DISTRIBUTION PUMPING

2.3.1 Existing Pumping System

The existing pumps are both 5.0 HP Goulds 5AB1-5.75” on 10HP variable speed drives. The drives are used to convert the single phase power source to three phase for the pump motors. They are not used to control the speed of the pumps. The system currently relies on a series of large hydro pneumatic tanks to control pressure and prevent excessive pump starts. It is proposed to replace these pumps with newer more efficient pumps that will use the VFDs to operate on constant pressure. This will allow the large tanks to be removed providing valuable floor space.

2.3.2 Design Considerations for New Distribution Pumps

Table 2.3 is a summary of the existing major fixtures in campground that are supplied with the treated supply.

Based on this fixtures count, the maximum potential flow rate could be upwards of 3.0 L/s. Although it is statistically unlikely that all the fixtures would be in use at one time, 3.0 L/s should be the target flow rate on distribution.

Table 2.3 – Water Consumption Rate Comparison

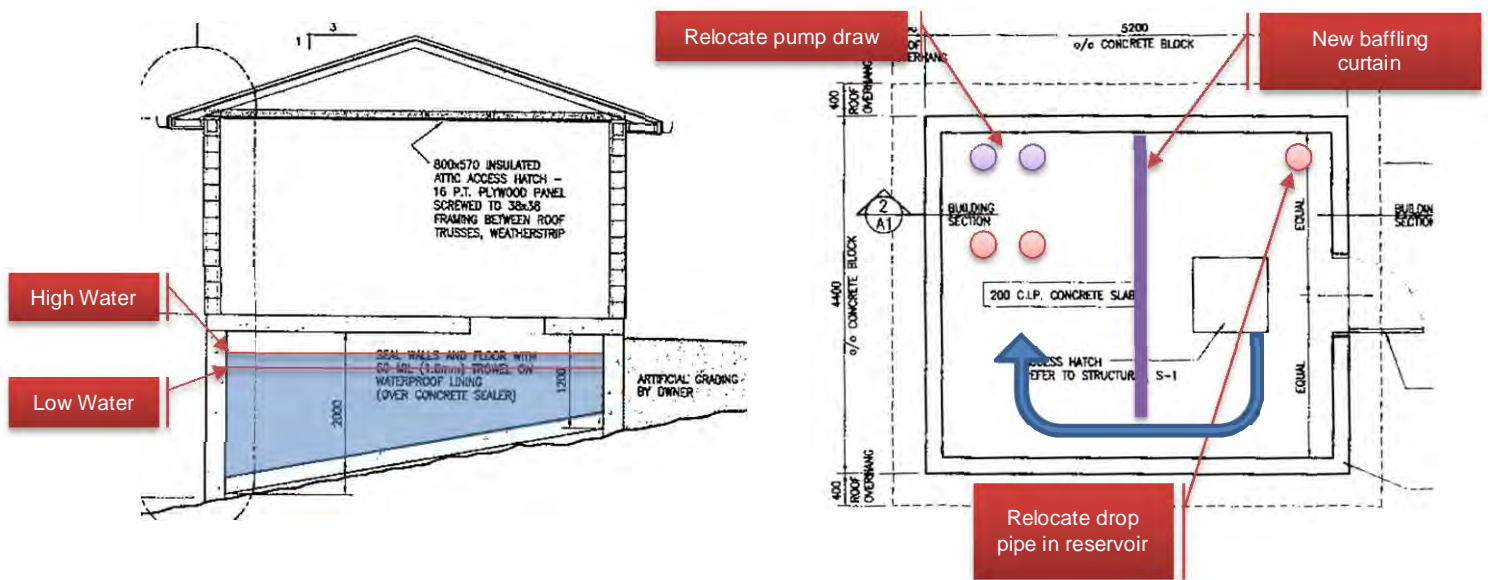
Proposed Equipment Treatment Rate	0.50 L/s	8 usgpm
<u>SHOWER/WASHROOM BLDG.</u>		
Four (4) showers operating at 7.6 litres per minute each	0.50 L/s	8 usgpm
Four (4) toilets and one waterless urinal	0.50 L/s*	8 usgpm
<u>SOUTH MODERN WASHROOM</u>		
Four (4) toilets and two waterless urinals	0.25 L/s*	4 usgpm
<u>NORTH MODERN WASHROOM</u>		
Four (4) toilets and two waterless urinals	0.25 L/s*	4 usgpm
Eleven (11) Standpipes at 7.5 litres per minute	1.5 L/s	24 usgpm
TOTAL:	3.0 L/s	48 usgpm

* Based on 6 L per flush and filling at 60 seconds for half of the fixtures

2.4 DISINFECTION STORAGE REQUIREMENTS

As a seasonal system on surface water, the minimum storage requirements would be to provide at least 20 minutes contact time (considering a baffle factor) for giardia disinfection, as well as 4 log reduction for viruses at the equivalent CT.

It is proposed to reutilize the existing concrete reservoir below the WTP. Based on construction drawings, the reservoir is approximately 18,600 L at high water level and 13,300 L at low water level. Note the irregular shape of the cell; the floor follows the bedrock profile.



There is no baffling in the reservoir and the locations of the fill pipe and pump draw creates a short-circuiting potential. Thus, the existing baffling factor is considered poor at 0.1. The layout also promotes dead zones with areas of poor flow.

As part of the upgrades we propose to relocate the treated water drop to a far corner and add a baffle curtain to improve contact time and chlorine dispersal. In order to improve space usage, we are also proposing to relocate the pump draws that should also improve contact time. The intent will be to improve the baffle factor to at least 0.3.

Table 2.4 summarizes the calculated peak hour flows and the available contact time based on reservoir size and the proposed new piping and baffling.

Table 2.4 – Contact Time during Calculated Peak Hour

Parameter	Value
Average Campsite Demand	180 Litres/campsite/day
Campsites	88 sites
Average Day Demand	15,840 Litres per day
Average Day Demand	10.8 L/min
Peak Hour Factor	4.00
Peak Hour Flow	43.2 L/min
Storage Volume at low level	12,700 L
Baffle Factor (improved)	0.3
Factored Volume	3,810 L
Contact Time	87 minutes

During peak times, there could be short periods of time where many of the fixtures are in use at the same time. Using the assumption that up to 80% of the major fixtures are in use at the same time, this is equivalent to a peak instantaneous flow of $(0.80 \times 3.0 \text{ L/s} = 2.4 \text{ L/s}$ or 144 L/min). Table 2.5 shows that under this flow condition the 20 minutes contact time can be met, assuming an improved baffle factor

Table 2.5 – Contact Time during Peak Fixture Use

Parameter	Value
Peak Instantaneous Flow	144 L/min
Storage Volume at low level	12,700 L
Baffle Factor (improved)	0.3
Factored Volume	3,810 L
Contact Time	26 minutes

With being on a surface water source, the system should be able to provide a minimum **4.0 log** inactivation for viruses at 5°C, pH 7.75 and minimum chlorine free chlorine residual at 0.5 mg/L.

Based on 26 minutes contact time, at these parameters, the minimum chlorine dose to achieve 4.0 log inactivation is 0.5mg/L. With Provincial regulations requiring a minimum chlorine residual of 0.5 mg/L, the system can meet the virus disinfection requirements.

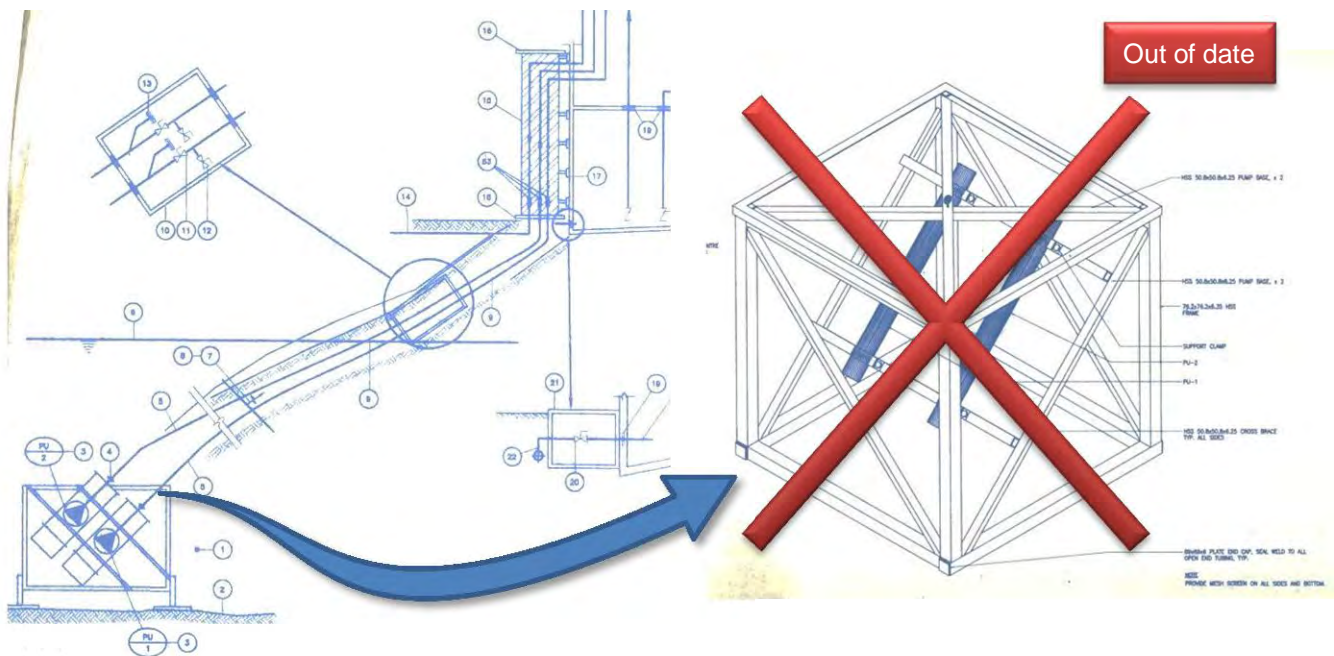
2.5 LAKE INTAKE PUMPING

The existing lake intake is functional, but is very difficult and can be dangerous to maintain. Divers are required to access the intake and perform any repairs or bring to surface.

Figure 2-4 is a sketch of the original intake from the 1999 design drawings by the Province of Manitoba. Apparently since then the intake has been modified/replaced with a difference design. The cage has been replaced with a tripod for the two pumps.

The intake is estimated to be in roughly 7.0m of water on a bedrock shelf. The exact location how far out it is, is unknown at this time.

Figure 2-4 – Lake Intake (Original)



There are many notable design challenges with this intake for this facility:

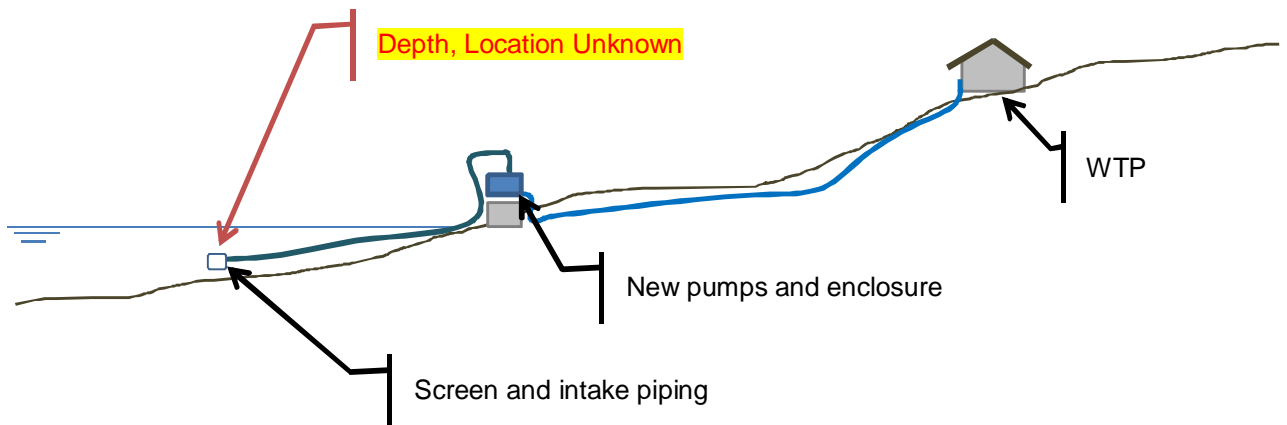
- **There is a very fast and strong current in this location.** Thus, a floating intake or a manually positioned intake can be infeasible.
- **There can be a large fluctuation in water levels (3.0-4.0 metres) at this location.** If the shore is gently sloping, this can result in the intake going far out to gain depth.
- **The intake should be deep to obtain good water quality.** The rapid flow and floating debris can make for turbid water and changing water quality.
- **The lake shore and bed is bedrock.** This means the piping and wiring cannot be feasibly buried, it has to be laid on the ground surface exposed to ice and debris.

The typical design we would propose for a seasonal system is to have the pumps located on the shore and the long intake line with a screen located out into the Lake. This provides for easy maintenance and ease for removal of the pumps for the season

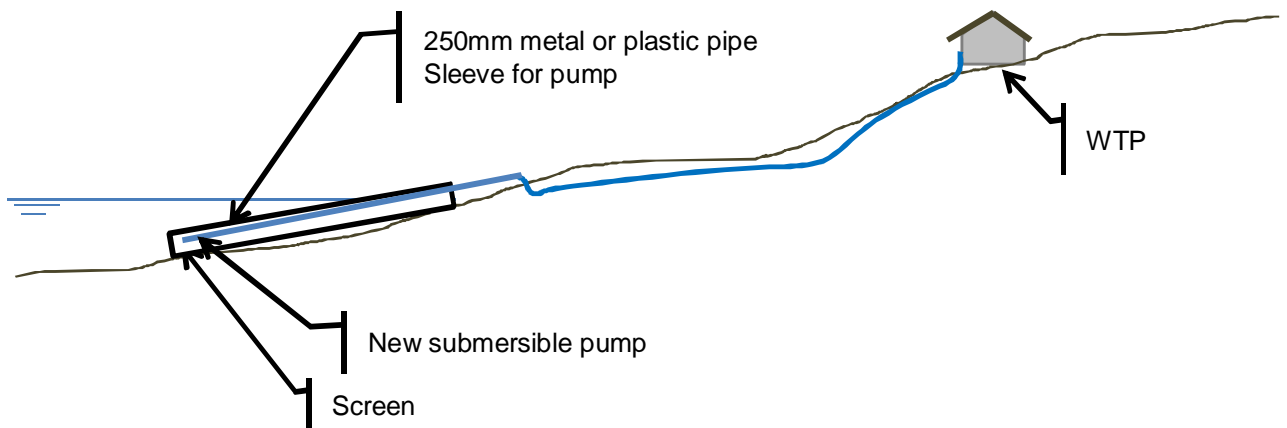
The pumps would be located in a concrete or fibreglass enclosure to keep them out the elements. The pumps would be closed coupled a self-priming style used for drawing water from a deep well.

The limitation will be the design of the new intake piping and screen; how it will be anchored, serviced and located.

Figure 2-5 – New Lake Intake Concepts



- OR -



In the spring of 2015 we will arrange for a bathymetric survey of the shoreline and intake location to determine the profile and depth for a new intake location.

If the profile transition is smooth, then a pump sleeve (250mm pipe) can be extended into the lake as a type of inclined pump shaft. The submersible and piping can then be slid into the shaft from the shore. This design allows access from shore, and allows the intake to draw from a deeper location in the lake.

If the profile is too aggressive for an inclined shaft, then a sunken intake screen and piping will be considered with high lift pumps on the shore.

During the initial Kick-off Meeting, the Opapiskaw Park Staff requested that we include the design of a new raw water intake into the WTP upgrade project. We agreed to see what we can develop into the design package.

Subsequently, we have found that there is very little information available on what this intake is (it seems to have been replaced since 1999) or where exactly it is.

In order to properly design the intake piping we should have a good understanding of what the lake bed profile is.

Since this work is not part of the original RFP or scope of work, we recommend that this part of the design not delay tendering the remainder of the work. We can increase the extra work allowance in the tender and try to do a contract change to do the new intake once the design is finalized with more information on lake profile is collected in the spring/summer.

2.6 PROCESS WASTE

Currently the facility discharges its filter backwash and sink drain back to the environment (surface to Lake). It is proposed to maintain this system for filter backwash and sink drain.

However, it is proposed that the new system incorporate an anionic-exchange system (organic colour removal process). This resin will require a brine solution for regeneration. This brine process waste should not be discharged to the environment given that there is local hauling available to remove it from site.

It is proposed that we install a new 4,500 L (1,000 gal) holding tank and pump to collect the brine waste and pump it to the campgrounds main lift station up the road.

2.7 WATER RIGHTS LICENCING

Since water consumption does not exceed 25,000 litres per day, a Water Rights Licence is not required.

2.8 ENVIRONMENT ACT LICENCE

A full Environment Act Licence will be required based on the size of the system. However, a simplified application will be made to account for the surface disposal of the process wastewater.

This will be submitted to MB Conservation in early 2015.

2.9 INTAKE APPROVAL

Currently it is proposed to maintain the existing intake system. When the new intake is designed, an application to DFO and Navigable Waters will be made.

2.10 OFFICE OF DRINKING WATER

A submission for a Permit to Construct or Alter will be made to ODW when the final design drawings are sealed.

2.11 EXISTING HVAC

The design will incorporate the existing intake louver and motorized dampener; however, we propose to replace the exhaust fan with a newer smaller space-saving model to gain room in the WTP for new equipment. *We had considered an exterior sidewall fan to free up more plant area, but with the proximity of the nearby campsite we would recommend the fan be indoors to lessen the motor noise.*

The existing unit heater appears in good condition and it will be reutilized.

2.12 EXISTING ELECTRICAL



The existing electrical service will be maintained (single phase 200A). It appears to have sufficient capacity for the new equipment. The main breaker and panel board will be replaced with a larger unit with more circuits to accommodate the increased amount of new equipment.

The existing lighting will be removed and replaced with vapour-tight T8 fluorescent fixtures. The existing exterior light will also be replaced with a new LED downward illuminating fixture. This will reduce glare to nearby campsites.

The exiting control panel with VFDs will be removed and replaced with new systems.

Given the small footprint of the facility and the design of the proposed new equipment, it is not feasible to construct a separate electrical room as is typically required by MB Hydro. With no separate room, we will need to specify panels with a higher degree of water resistance (Nema 4) as well as insulate all water lines to minimize condensation and pipe sweat. We will also provide a portable dehumidifier for the plant. These steps should allow us to avoid the requirement for a separate electrical room.

2.13 EXISTING BUILDING STRUCTURE

In general, the existing building is in very good shape. The steep grade around the facility makes any additions challenging and costly. Thus, it is our intent to fit all the new equipment into the existing footprint. A few minor building repairs/upgrades are proposed to be included in the WTP tender:

1. Install new door without louver
2. Install snow guards on roof
3. Replace fascia and gutters
4. Install baffle in reservoir to improve mixing
5. Extend reservoir vent to outside with insect screen
6. Upgrade floor hatch with gaskets and seal holes
7. Install FRP panels over wood sheathing on ceiling



2.14 DESIGN SUMMARY

The following is a summary of the current system demands, the projected demands, and the capacities of the proposed new equipment.

Table 2.6 – System Summary

<u>Equipment</u>	<u>Details</u>	<u>Flow Rate</u>
Design Daily Production	<u>15,000 L in 8 hours</u>	<u>0.50 L/s</u>
Proposed Treatment Rate		<u>0.50 L/s</u>
Peak Instantaneous Flow	<u>Showers and taps running</u>	<u>3.0 L/s</u>
Lake Intake Pumps	<u>Two existing submersibles</u>	<u>3.5 L/s @ 28 m</u>
Distribution Pumps - Two New Pumps	<u>2 x 5.0-HP, 1Ø on VFD</u>	<u>3.0 L/s each</u>
Hydro pneumatic Tank on Distribution	Two (2) New – 40gal FRP	
Existing Reservoir Storage	18,700 L high water 12,700 L low water	

3 Water Quality

3.1 RAW WATER QUALITY

The Raw Water Quality from 2005 - 2013 samples is summarized in the Table below along with the water quality objectives set forth in the Guidelines for Canadian Drinking Water Quality.

Table 3.1 – Raw Water Quality Summary

Parameter	Units	Value Range	Current Limits (2012 GCDWQ)	Treatment Objective
pH		6.93 - 7.97	6.5-8.5(AO)	6.5 - 8.5
Alkalinity	mg/L	39 - 46		
Hardness (CaCO ₃)	mg/L	41 - 52	200 (PO)	
TDS	mg/L	45 - 111	500 (AO)	< 500
UV Transmittance	%T	50%-63%		> 75%
Nitrate +Nitrite	mg/L	<	45	
Total Organic Carbon (TOC)	mg/L	7.2 - 14		< 4.0
Aluminium	mg/L	0.2 - 0.4	0.1 (PO)	
Arsenic	µg/L	0.6 - 0.9	10	
Chloride - dissolved	mg/L	1.4 - 10.4	250 (AO)	
Colour	TCU	9 - 43	< 15 TCU	< 5
Fluoride	mg/L	0.05 - 0.1	1.5	-
Iron	mg/L	0.13 - 0.41	< 0.3 (AO)	< 0.10
Manganese	mg/L	0.0 – 0.015	< 0.05 (AO)	< 0.05
Turbidity	NTU	3 - 10	< 0.3 95% of the time	< 0.3 95% of the time
Total Trihalomethanes	µg/L	200 - 400	100	80

Abbreviations:

AO = aesthetic objective

SMCL = secondary maximum contaminant level

PO = practical objective

MAC = maximum acceptable concentration

IMAC = interim maximum acceptable concentration

The test data shows that the Lake water is very soft with some turbidity spikes and notable colour (likely from tannins).

The elevated organics in the treated supply react with the chlorine and form disinfection by products that well exceed the current guidelines. The prevalent form of the Total Trihalomethanes (TTHM) is Chloroform, which likely related to the high TOC levels.

UV transmittance is of concern as it can impact the operation of the UV system. Typically, when the UVT is below 70%, many UV systems tend to alarm as full dosage cannot be guaranteed. UVT tests to date have shown the UVT to be consistently below 65%. The low UVT is expected to be the result of the elevated TOC in the source water, as well as the high colour from tannins. Not only are the elevated TOC levels impacting UV performance, they are also causing elevated levels of Total Trihalomethanes in the distribution.

The new treatment process will need to target turbidity reduction with primary and secondary disinfection (egg. UV and Chlorine). It should also target organics reduction to improve UVT and remove the precursors to the disinfection by-products.

3.2 TREATED WATER QUALITY OBJECTIVES

Based on the water quality data, it is recommended that the proposed treatment system address turbidity reduction, pathogen inactivation, and organics reduction.

As it is a surface water source, the system will need to achieve the minimum 3-log credit for Giardia and Cryptosporidium inactivation. The process will target organics reduction prior to UV in order to increase UVT to at least 75% and to reduce the precursors to disinfection by products.

Table 3.2 summarizes the treatment objectives for the proposed new process equipment.

Table 3.2 – Treatment Objectives

Parameter	Units	Raw Water	Treatment Objective
pH		7.5	7.5
TOC	mg/L	~14.0	< 4.0
Turbidity	NTU	3 -10	<0.3 95% of the time
UV Disinfection		65% UVT	40 mJ/cm2 RED @ 0.26 L/s UVT objective > 75%

4 Treatment Plant Technologies

4.1 TURBIDITY REDUCTION & PATHOGEN BARRIER

The main objective of the treatment system will be to produce a filtrate that has less than 0.3 NTU 95% of the time on a monthly basis. The treatment process must achieve 3.0-log inactivation for both Giardia and Cryptosporidium and 4.0-log inactivation of viruses.

The following is a list of the most common filtration processes that are typically applied to surface waters. Each technology has a brief description and based on their strengths and weaknesses, we make a recommendation if it is suitable for application at Opapiskaw. Our main objective is to keep the plant simple, small, and robust.

Table 4.1 – Filtration Treatment Technologies

Technology	Details	Recommended
Slow Sand Filtration	Slow sand is a proven conventional technology. Its key feature is a biological layer of organisms on top of the sand that enhances treatment performance. In the right applications it is a simple to operate plant that can minimize chemical use and operator adjustments. It could require additional pre-treatment and post treatment processes for Opapiskaw to address the algae loading and high organics.	No
		<ul style="list-style-type: none"> • Very large footprint. • Not well-suited for seasonal use. • Can lead to a multi-process treatment train that can complicate operations. • Difficult operations at other locations.
Conventional Treatment	Conventional treatment is the standard practice on many surface waters. It is <i>coagulation-flocculation-clarification-filtration</i> . Typically provided in a small self-contained package plant. It typically requires operators to adjust chemical dosages, mixing rates, and backwashes with changing water quality.	No
		<ul style="list-style-type: none"> • Very large footprint. • High operator involvement for chemical adjustments • Can lead to a multi-process treatment train that can complicate operations.

Technology	Details	Recommended
<p>Direct Filtration</p>	<p>Conventional treatment for surface waters with low turbidities (less than 15 NTU). This is shortened version of Conventional Treatment with only the <i>coagulation-filtration</i> steps.</p> <p>Many small systems similar to the one in use at Opapiskaw attempt to do just filtration without coagulation; and as shown at Opapiskaw, most of these systems cannot achieve their turbidity objectives. The system has to create a pin floc with coagulation in order to effectively remove turbidity below the objectives. The most common reason coagulation is not employed is that it can be operator intensive to maintain the correct coagulant dose that maintains a pin floc. Without proper dosing, the filters can plug or experience break-through.</p>	
		<p style="text-align: center;">No</p> <ul style="list-style-type: none"> • Smaller footprint than conventional treatment. • High operator involvement to ensure correct coagulant dose based on raw water quality. Incorrect dosing can result in filter blinding or elevated final turbidities.
<p>Membrane Filtration</p>	<p>Membrane filtration such as ultrafiltration (UF) has been successfully used on surface waters for almost 20 years. Only in the last 10 years have they become price competitive and tailored for specific applications.</p> <p>UF is an absolute barrier, thus there is no turbidity breakthrough. The filtered water quality is consistent and predicable. The robustness of the system can handle turbidities up to 30 NTU without any need for operator adjustments.</p> <p>Tubular Nano filtration (Fyne) could also be an option but can be cost prohibitive.</p>	
		<p style="text-align: center;">Yes</p> <ul style="list-style-type: none"> • Smaller footprint. Minimal equipment. • Easy to operate and maintain when packaged as a complete system. • Skid mounted and self-contained for easy relocation during winter.
<p>Cartridge Filtration</p>	<p>Cartridge filters are rigid cores with surrounding deep-pleated filter media. It is a technology that can be suitable for removing microbes and reducing turbidity. In <i>low turbidity water</i>, these filters are easy to operate and maintain, however, they are not automated and can require relatively large operating budgets. They can become fouled relatively quickly and must be replaced with new units.</p>	
		<p style="text-align: center;">Yes</p> <ul style="list-style-type: none"> • Elevated maintenance costs associated with cartridge replacement but very simple to operate and shut down for the season.

Based on Table 4.1, there are two technologies we will obtain equipment quotes on; **membrane filtration** and **cartridge filtration** systems.

4.1.1 Membrane Filtration (Ultrafiltration or tubular nanofiltration)

Membrane filtration is an attractive technology for these small systems with limited operational resources; where the Parks have limited staff that are not dedicated to WTP operations, but must also perform many other duties throughout the day. They should be capable of operating with minimal operator involvement and adjustment.

Another advantage to membranes is that they can be considered an absolute barrier for turbidity and pathogens, unlike conventional filters that can experience turbidity upsets. The final water quality will always meet the turbidity standard (foregoing any catastrophic failure). If the raw water becomes challenging, the membrane will initiate more frequent self-cleaning procedures which results in higher waste volumes and increased chemical use.

We have researched the ultrafiltration and microfiltration technology in other projects for these small micro systems, and we have found that the more reliable municipal systems are much too large and costly. The smaller packaged systems that are usually meant for construction camps are not common in the Province, and not locally available. Those installations that we have found have proven to be challenging for operations, thus we could not recommend them.

They are also not easily placed out of service for long periods of time such as winter storage. They require a “preservation” procedure that would need to be performed at the end of the season for winter storage. The preservation procedure is quite simple though; drain the equipment and fill with a sodium metabisulfite solution (lasts 6 months), in the spring the system is flushed and placed back in to service. The equipment would need to be kept in a heated area during storage.

It is not anticipated that the system will present any chemical or material cost savings over conventional treatment. However, it is anticipated that it can significantly reduce operator time in the plant and provide a more consistent and predictable water quality. The unit can tolerate the range of turbidity as seen in the Lake and require minimal operator adjustments to chemical feed or equipment operation.

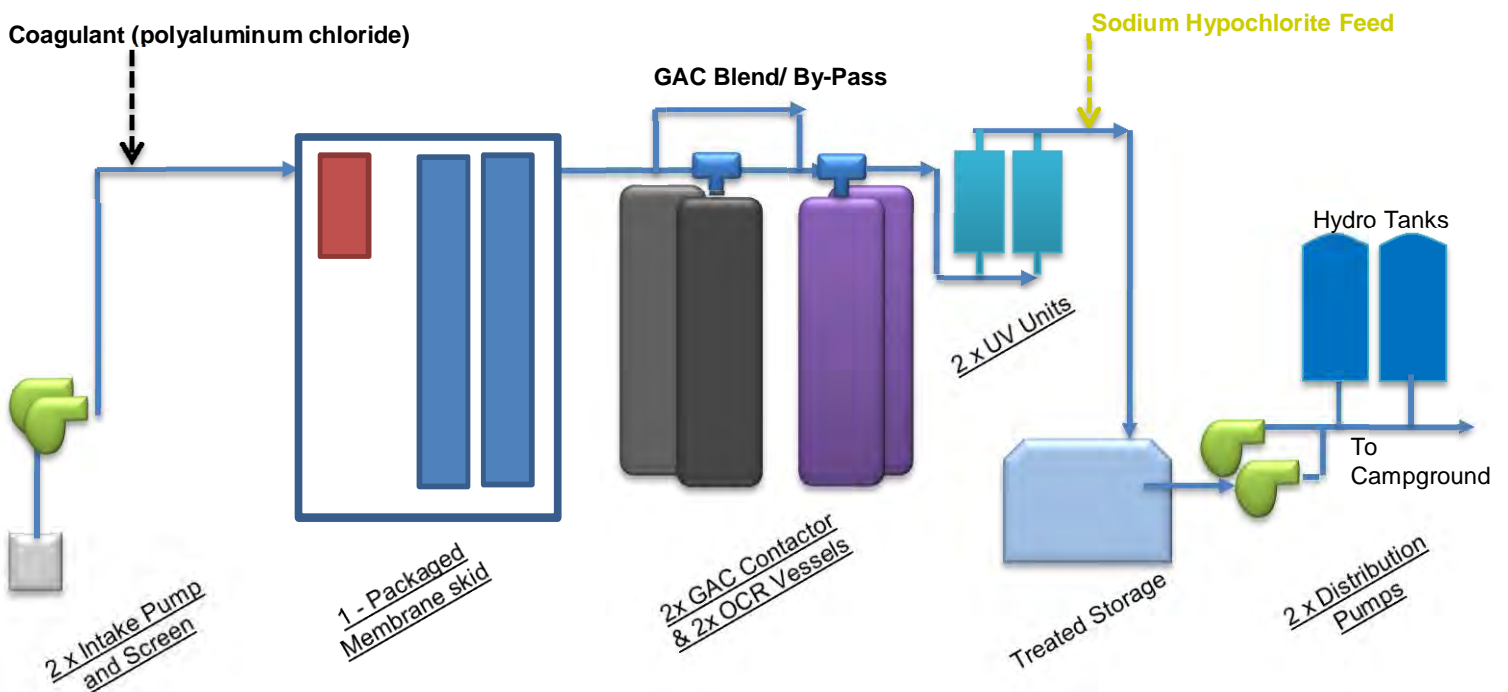
Similarly to direct filtration, this process will not target dissolved organics reduction; GAC contactors are still required after filtration for organics. UV is also still recommended as a primary disinfection process.

One of the typical drawbacks of a packaged automated system is in its redundancy. If the controls or a piece of equipment fails on the skid, the operator cannot produce water. On larger systems, the solution is to have two trains of operation for redundancy. Two skids are not economical on the scale at Opapiskaw; replacement parts for key pieces of equipment are more typical.

When referring to the system as an absolute barrier, it assumes that the system has proven its integrity. Integrity Testing on the filter modules confirms that there are no pathways around the system for

pathogens, such as broken fibres or end seals. Typical integrity testing is accomplished by a sustained pressure test on the modules to test for leaks or breaks. This is done regularly to prove the system's integrity.

Figure 4-1 – Membrane Filtration (Ultrafiltration) Schematic



A quotation was received for a Fyne Tubular nanofiltration system, at nearly \$150,000 for the unit, it was deemed to be cost prohibitive. Membrane cleaning and maintenance would also be somewhat more costly and more labour intensive than a more conventional style of plant.

4.1.2 Cartridge Filtration

Cartridge Filtration would consist of a series of stainless steel vessels that would stage micron size down to 1.0µm absolute in order to obtain the 3-log removal credit.

The staging of the cartridge filtration will be set up to increase the service life of the 1.0µm absolute filter cartridge. Basic media filtration (sand roughing filters) would be placed upstream to address large particles and silt loading.

A GAC contactor will be incorporated (also as a cartridge filter) for organics reduction. No coagulant will be used in this arrangement.

A pair of OCR (organic color removal) units will be placed ahead of the UV units to improve UVT by reducing color and tannins.

Figure 4.2 is a schematic of the cartridge filtration process.

Figure 4-2 – Cartridge Filtration Schematic

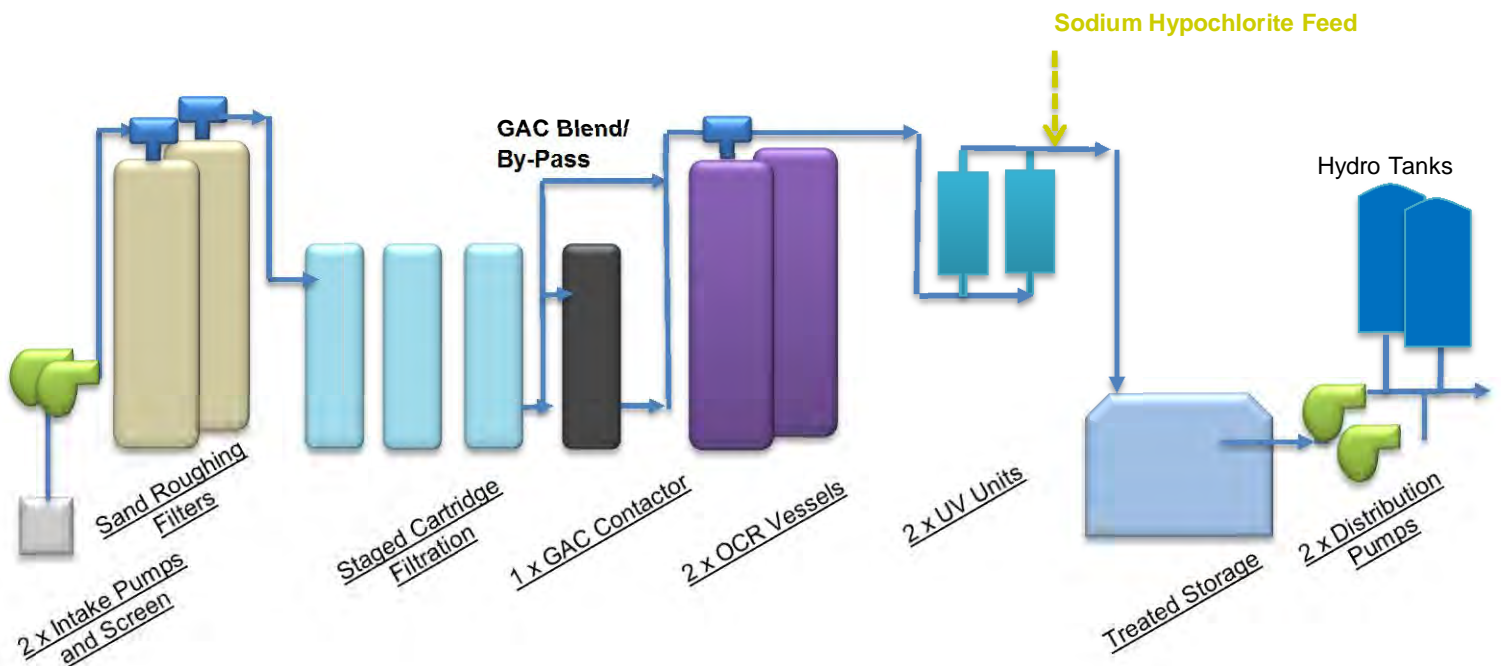


Table 4.2 – Filtration Comparison

Parameter	Membrane Filtration (Tubular Nanofiltration)	Cartridge Filtration
Capital Cost:	<p style="text-align: center;">Moderate to High</p> <p>Because the system has more controls and is a newer technology, its capital costs can be nearly double that of cartridge filtration.</p> <p>Packaged skid costs: ~\$150,000+</p> <p>Replaceable equipment specific to the process would include the on skid booster pump. The membrane modules can last 3-5 years when properly maintained.</p> <p>Chemical costs for cleaning and winter storage need to be associated with this technology.</p>	<p style="text-align: center;">Low to Moderate</p> <p>Cartridge Filtration can result in higher operational costs if the cartridges need frequent replacement. However, the trade-off is that it is very simple to operate.</p> <p>There is moderate capital cost for the equipment as most of the equipment are the smallest models available, yet are rated for much higher flows.</p> <p>Equipment package costs: ~\$125,000.00</p>
Water Quality:	<p style="text-align: center;">Excellent</p> <p>Filtered water quality is very predictable at less than 0.1 NTU at all times. Turbidity spikes do not impact treated water quality.</p>	<p style="text-align: center;">Very Good</p> <p>Absolute barrier with cartridges (if not torn or damaged). But a major turbidity spike could result in quick blinding of the cartridge units.</p>

Parameter	Membrane Filtration (Tubular Nanofiltration)	Cartridge Filtration
<p>Operations:</p>	<p style="text-align: center;">Low Effort</p> <p>When the system is operating at its design parameters, the operator has minimal input to the process. However, the operator has to become familiar with the more complicated controls and programming on this type of system. There can be a larger learning curve involved.</p> <p>More complicated controls can result in more efforts to troubleshoot and work with set points.</p> <p>Some extra time required for periodic chemical cleans and winter storage procedures.</p>	<p style="text-align: center;">Low to Moderate Effort</p> <p>For Cartridge Filtration, pressure gages on the vessels will indicate replacement of units. No coagulation is required for cartridge filtration.</p> <p>Need to periodically monitor regeneration rate on OCR units to ensure UVT remains over 75%.</p>
<p>Maintenance:</p>	<p style="text-align: center;">Low to Moderate</p> <p>The packaged systems are typically designed with low maintenance and minimal operations in mind. Some of the on skid equipment like the booster pump and screening will need some regular maintenance, in general the system tries to be as automated as possible.</p> <p>The added controls and programming will require some additional effort to learn and understand. They may also require some scheduled servicing from the manufacturer.</p>	<p style="text-align: center;">Low to Moderate</p> <p>The filter heads and backwash controls will need maintenance and replaced when they fail or wear out. The media in the roughing filters may also need to be replaced every five years.</p> <p>Maintenance of the cartridge filtration vessels is minimal. The units can easily be drained and stored over the winter shut-down. The design intent is that the cartridges last for most of the season without replacement.</p>

Parameter	Membrane Filtration (Tubular Nanofiltration)	Cartridge Filtration
Winter Storage:	<p style="text-align: center;">Moderate</p> <p>The package system is anticipated to be relatively easy to disconnect and relocate to a winter location.</p> <p>The nature of the membranes do require them to be properly preserved in a sodium metabisulfite solution over the winter. After six months of storage, the solution should be replaced if continued storage is required.</p>	<p style="text-align: center;">Low</p> <p>Some manufacturers may recommend annual replacement of the filter media; others may suggest a preservation step similar to the membrane option.</p> <p>If the filter media is removed from the vessels and any electronics are removed from the unheated location, the equipment may remain on site.</p> <p>Maintenance of the cartridge filtration vessels is minimal. The units can easily be drained and stored over the winter shut-down.</p> <p>The OCR units can be stopped mid-regeneration to keep the resin in a high brine solution. This should allow them to hibernate over winter.</p>
Classification: (Class 1: 0-30 points Class 2: 31-55 points)	<p style="text-align: center;">41 points</p> <p style="text-align: center;">Class 2</p>	<p style="text-align: center;">34 points</p> <p style="text-align: center;">Class 2</p>

Based on the needs of the client, we are recommending that the cartridge filtration system be used for the Opapiskaw campground. The technology is more robust and common in the industry than membranes. The high capital cost of membrane filtration is also prohibitive.

4.2 ORGANICS REMOVAL

Following the filtration step there will be a granular activated carbon (GAC) contactor for organic carbon adsorption. Some organics (20% - 30%) may be removed during the filtration process; however there could still be sufficient organics in the filtrate to create elevated disinfection by products after chlorination.

The GAC equipment will be equipped with a by-pass and pressure regulation in order to provide the ability to send a portion of the water stream through the GAC. Having the flexibility to pass only a portion of the flow (50%-70%) through the GAC may extend the life of the carbon block.

Due to the high levels of organics in the source water, it is anticipated that the GAC carbon block would require replacement at the end of each season, or mid-way through the season under poor conditions. Extra cartridges will be provided in the contract to allow three to four change outs. The frequency of

replacement will be dictated by the blend rate through the contactors, where the blend rate itself will be dictated by the final UVT levels and the TTHM formation potential in the treated water.

Due to the elevated colour (high tannins) the finished water from the GAC units may still have sufficiently low UVT for the UV reactor to function. It is recommended that a pair of anionic exchange vessels (OCR units) be provided ahead of the UV system to improve UVT.

4.3 ULTRAVIOLET DISINFECTION

Since the source is surface water, the treatment process will include UV for primary disinfection. There are other options for primary disinfection like chlorine dioxide and ozone, but these are more complicated systems than UV and can be more costly and labour intensive to operate. UV is preferred provided that organics can be sufficiently reduced to achieve a minimum UVT of 75% for reliable operation and proper dosage.

The reactor will be rated to achieve 3-log inactivation of *Giardia* and *Cryptosporidium*; minimum 40 mJ/cm² RED @ 0.26 L/s.

4.4 FINAL CHLORINATION

Following UV disinfection, the treated water will then be dosed with chlorine for residual disinfection. Two chemical feed pumps will be provided, one duty and one standby.

4.5 TREATMENT PROCESS RECOMMENDATIONS

Table 4.3 is a summary of the proposed treatment system. It is similar to what is in place at Wellman Lake and recently installed at William Lake. Figure 4.3 is a schematic of the proposed process.

Figure 4-3 – Cartridge Filtration Schematic

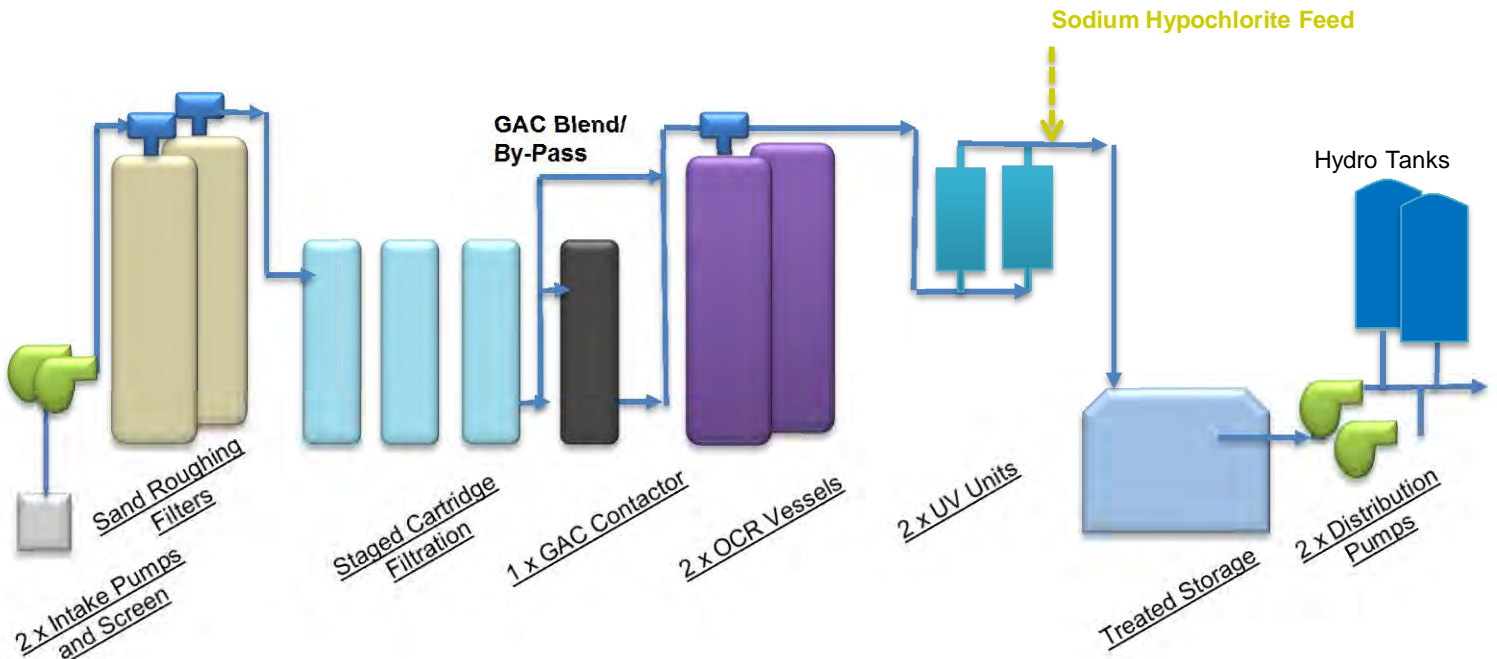


Table 4.3 – Treatment Equipment Summary

Process	Treatment System	Comments
Cartridge Filtration	2x Multimedia pressure filters	2 x 350 mm diameter pressure vessels
	Cartridge filtration (3 vessels)	3 x Harmsco Hurricane 170 Vessels
	GAC Cartridge (1 Vessel)	1 x Harmsco Hurricane 170 Vessel
	OCR Units (increase UVT)	2 x 400 mm diameter pressure vessels
Primary Disinfection	UV Hallett 15x Crossfire	Two units with spare lamps.
Secondary Disinfection	Chlorine (Sodium Hypochlorite)	Two pumps with degassing heads.

4.6 EQUIPMENT SELECTION

The proposed treatment rate is quite small; it is very close to a large residential system, or a small commercial system. As a result, the proposed equipment will be “off the shelf” components that will be assembled by the contractor. All the equipment will be NSF Certified.

4.6.1 Multimedia Roughing Filters

The proposed filters will be structural poly glass vessels. The vessels will be 350 mm diameter x 1.40 m tall.

Each tank will have a top mounted control valve for feed and backwash control. Backwashing will be automated and can also be manually initiated by the operator. The specified valves will be from a reputable supplier like Culligan, Fleck, or Clack, where spare parts will not become obsolete.

The filter will be equipped with a self- contained backwash pump to provide the proper flows for effective backwashing.



4.6.2 Cartridge Filtration with GAC

Cartridge filtration units will be based on the Harmsco Hurricane 170 units. The intent of the larger units is to provide more surface area in order to prolong the filter life and reduce replacement frequency.

The final cartridge will be 1.0µm absolute in order to obtain the 3-log credits. There will be three cartridge filters in sequence in order to prolong the life of the more expensive 1.0µm absolute cartridge.

The typical arrangement will be 10 micron -> 0.35 micron -> 1.0µm absolute.



Following the 1.0µm absolute, another Hurricane 170 cartridge vessel will be installed and fitted with a carbon block targeting organics removal. A GAC by-pass blend line with a paddlewheel flow meter will be installed to balance the flow through the GAC to optimize TTHM reduction. If 100% of the flow through the GAC is not required, then the cartridge life can be extended.

4.6.3 OCR Vessels (Organic Color Removal)

The Lake has notable discoloration due to tannins. These tannins can cause much of the elevated UVT values. Thus an anionic exchange filter is proposed in order to maximize the UVT levels prior to the UV reactors.

The most likely OCR resin that will be used is a polyacrylic based product called Purolite® A 860. Typical design is to size the resin volume on 12 Bed Volumes (BV) at the design flow rate. At 0.5 L/s, this equates to

The vessels will be similar to larger home water softeners. Each tank will have a top mounted control valve for feed and regeneration control. Regeneration will be automated and can also be manually initiated by the operator. The specified valves will be from a reputable supplier like Culligan, Fleck, or Clack, where spare parts will not become obsolete.



4.6.4 Chlorine Feed Pumps

The proposed chemical feed pumps will be Prominent Delta or Grundfos DDA diaphragm dosing pumps. The selection of the pump is based on the low feed rates, simplicity of operation and local support from suppliers. These models of pumps also have more inbuilt intelligence in order to mitigate against gas locking and loss of prime, and are also able to communicate with each to function in lead-lag-alternating duty.

Two pumps will be provided for full standby capability. They will be shelf mounted with a panel backboard with valve control.

A short 80 L poly tank will be provided to batch chlorine to the required concentration. The tank will sit on a plastic spill containment pallet.



4.6.5 UV Reactor

The proposed UV system would be two Hallett 15xs units arranged in an alternating duty-stand-by operation.

The units are rated for 55 mJ/cm² at 1.0 L/s and 70% UVT. They are NSF certified and simple to maintain and operate. Spare parts will be provided with the contract.

A design consideration for these units is that they will run 24 hours per day, even when the plant is not producing water. As frequent start stops would dramatically shorten the ballasts and lamps. The units are designed for this; however, provisions will need to be made for periodic purging of the units if the water temperature in the reactors get over 24°C. Each purge is approximately 8L of water; a hydro pneumatic tank on the raw water side of the process will provide this purge water while the treatment system is in stand-by mode.

The selection of this unit is also based on providing a model standard similar to what is installed in other Parks campgrounds. The Hallett is relatively cost effective and supported locally in Winnipeg.



4.6.6 Distribution Pumps

The proposed distribution pumps are two (2) Goulds vertical multistage centrifugal pumps; Model 10SV, 5 HP 208-230/3/60. Each pump is rated for 3.0 L/s at 450 kPa (65 psi). The pumps are sized for 100% redundancy; one duty and one standby in alternating operation.

Each pump will have an Aquavar variable frequency drive with a pressure transducer on the distribution line. The drives will not only modulate flow maintaining a set system pressure, but they are also required to convert the single phase power source to the pumps.

Two smaller hydro pneumatic tanks will be provided on the distribution to accommodate some night time flows and reduce pump starts.

We are recommending VFD operation on pressure at this facility (as opposed to high and low pressure switch cut off) in order to reduce the floor space requirement for hydro pneumatic tanks. It is also advantageous that VFDs are already required to convert the single phase power to three phase.

Each VFD drive is anticipated to be 250W x 650H x 260D. It is recommended that the enclosures be NEMA 4X rated for the environment.



4.7 HOLDING TANK

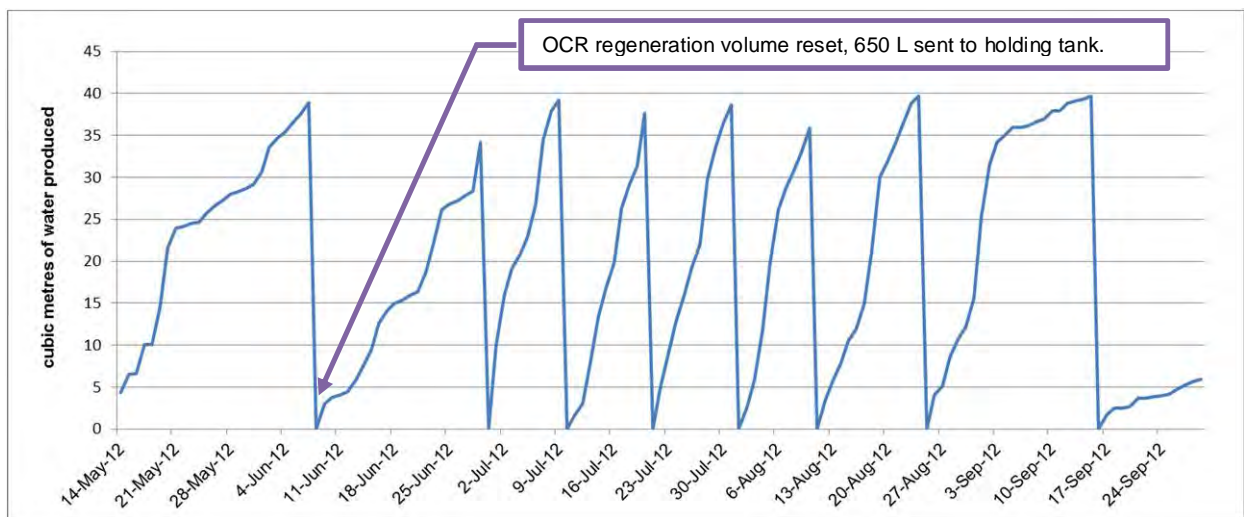
The process waste from the OCR anionic exchange is a highly brine solution. It is not recommended to send this directly back to the environment. In discussion with the Parks, it was agreed that this waste stream will be pumped from the new holding tank to the campground’s main lift station up the road.



The proposed holding tank will be a 4,500L ball shaped fibreglass tank. The proposed for the tank to the east of the WTP just into the tree line. The 100mm PVC drain line from the WTP will be shallow bury at ~600mm.

Figure 4-4 is a projection of the regeneration frequency of the OCR units based on the 2012 (peak year) water usage. The projection assumes that after 24 hours of operation, equivalent to ~40,000 L of treated water, the units are regenerated producing 650L of waste. Under this best case scenario, the tank will be pumped out about twice per year. If the conditions are poor and the system needs to regenerate twice as frequently, then the 4,500 L tank may have to be emptied monthly.

Figure 4-4 – OCR Regeneration Cycle Projection



4.8 FILTER BACKWASH

The roughing filter backwash will roughly follow a similar pattern, wasting about 750 L for every 10,000 L produced under moderate turbidity conditions. However, it is proposed that this water be rejected back to the Lake as it is currently set up with the existing filters.

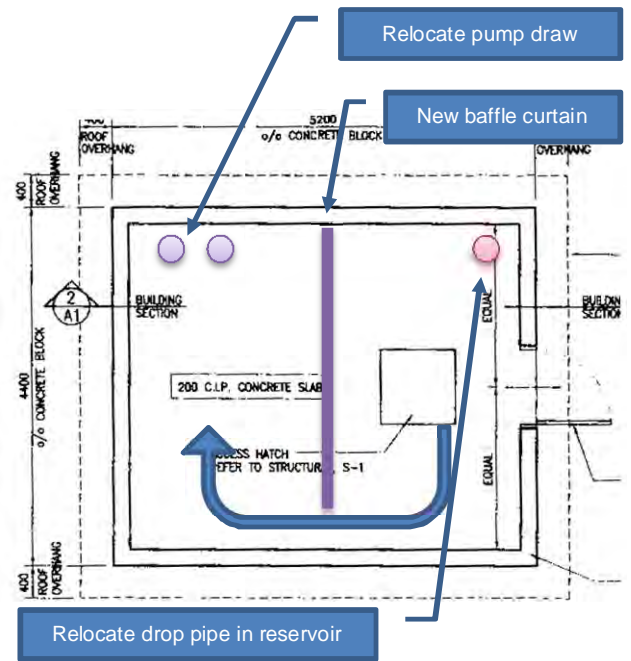
The Harmsco filters do not require any backwashes, but will be drained for servicing. These drain lines will be tied into the existing drain system as well.

4.9 RESERVOIR BAFFLE CURTAIN

Currently the existing below grade reservoir is a single cell concrete box. The shape of the cell and the location of the fill and draw lines do not promote good mixing and as a result the cell has a poor baffling factor. In order to achieve at least 20 minutes of contact time at peak design flows, the reservoir will need to be baffled to improve mixing and contact time.

It is proposed that a baffle curtain based on the design parameters of a **Director III by Environetics** be installed as shown in the figure to the right.

The curtain is a flexible geomembrane attached with a stainless steel anchoring system.



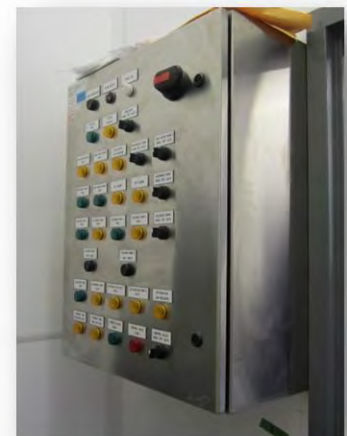
4.10 CONTROLS AND INSTRUMENTATION

In general the control strategy will be kept simple. The treatment equipment will start and stop based on water levels in the reservoir. The existing float switches will be re-utilized. A flow control valve will be placed on the process piping to control the treatment rate to 0.5 L/s, and a magnetic flow meter will be installed to monitor flow rate for chemical dosing. Flows to distribution will be monitored by a turbine meter for totalizing.

As typical practice in these small Provincial Campgrounds, the system will NOT dial out to an operator when it is in alarm. It will NOT sound an alarm or flash a strobe outside the building as this is a nuisance to the nearby campers. The system will however, have alarm lights on the treatment control panel, and it will have a general red light beacon inside the WTP to notify any alarms.

At minimum the system will monitor and locally display:

- Low distribution pressure
- Low water level in reservoir
- High water level in reservoir
- UV alarm / Low UVT
- Chlorine pump fault
- Holding tank high level alarm
- Low pressure in raw water supply
- High pressure in raw water supply
- Equipment Fault (pumps)



The system should also have robustness for winter storage at low temperatures. However, some minimal winter heat is recommended.

4.10.1 New Lake Intake

The new intake at the lake is anticipated to be a single submersible pump placed in an inclined pump shaft out into the lake. Due to the nature of this intake style, two intake pumps would require two pump sleeves. Depending on the cost of installation, only one pump shaft may be installed with a shelf spare intake pump ready to replace the main pump in the event of a failure.



If a pump shaft is not a viable intake (if the lake profile is too aggressive) then a pair of closed couple pumps on shore could be more suitable. The pumps would sit in a small weather enclosure next to the Lake and be removed for winter storage.

Both designs would incorporate a DFO compliant screen on the intake end.

5 Opinion of Probable Costs

The following is a preliminary opinion of probable construction costs based on budget pricing from the suppliers and contractor discussions.

Item	Budget
New Treatment Equipment Supply (sand filters, cartridge filters, OCR, UV, chlorine, controls)	\$125,000
New Distribution Pumping (pumps, VFDs, Harmonic guards, reactors)	\$25,000
Mechanical Demolition of Existing Equipment and Installation of New Equipment	\$140,000
Mechanical HVAC	\$5,000
Electrical Connections and Instruments	\$25,000
Civil Piping and Holding Tank	\$20,000
Misc. Building (new door, fascia & eaves, ceiling panels, hatch cover)	\$15,000
Baffle Curtain (supply, install, clean and disinfect reservoir)	\$20,000
Sub-total	\$375,000.00
Contingency	\$50,000
TOTAL	\$425,000

The intent is to use a large part of the contingency allowance for the supply and install of a new intake system complete with piping and pumps.

The following is a preliminary opinion of annual operational costs based on selected equipment and usage rates. It is considered that the treatment equipment will operate only five to six months of the year.

Item	Annual Budget
<u>Media Replacement for Filters</u>	
Sand filter media typically replaced every five years at ~\$250.	
Annual filter cartridge allowance at ~\$900	
OCR resin replaced every five years at ~\$500	<u>\$750</u>
<u>Treatment Chemicals</u>	
Sodium Hypochlorite	<u>\$100</u>
<u>Miscellaneous Consumables</u>	
UV Lamps	
Pump maintenance kits	
Chemical feed pump maintenance kits	<u>\$250</u>
Sub-total	<u>\$1100.00</u>

Typical cartridge filtration prices for Hurricane 170 Housing:

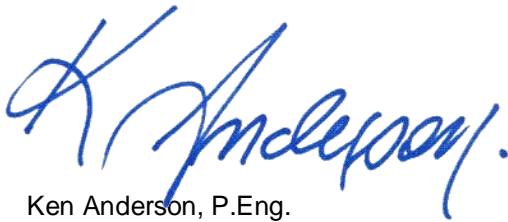
<u>Cartridge Type</u>	<u>Model #</u>	<u>Price</u>
Polyleat 1 Micron Absolute Filter	PP-HC-170-1	\$350
Carbon Filter with 5 Micron Prefilter	HC/170-AC-5	\$300
0.35 Micron - Pleated Polyester Cartridge	HC/170-0.35	\$200
1 Micron - Pleated Polyester Cartridge	HC/170-1	\$175
10-150 Micron - Pleated Polyester Cartridge	HC/170-(10-150)	\$150

6 Closure

This report was prepared for the MB Conservation and The Manitoba Water Services Board to provide a design summary for upgrades to their existing WTP facility.

The services provided by Associated Engineering (Sask.) Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

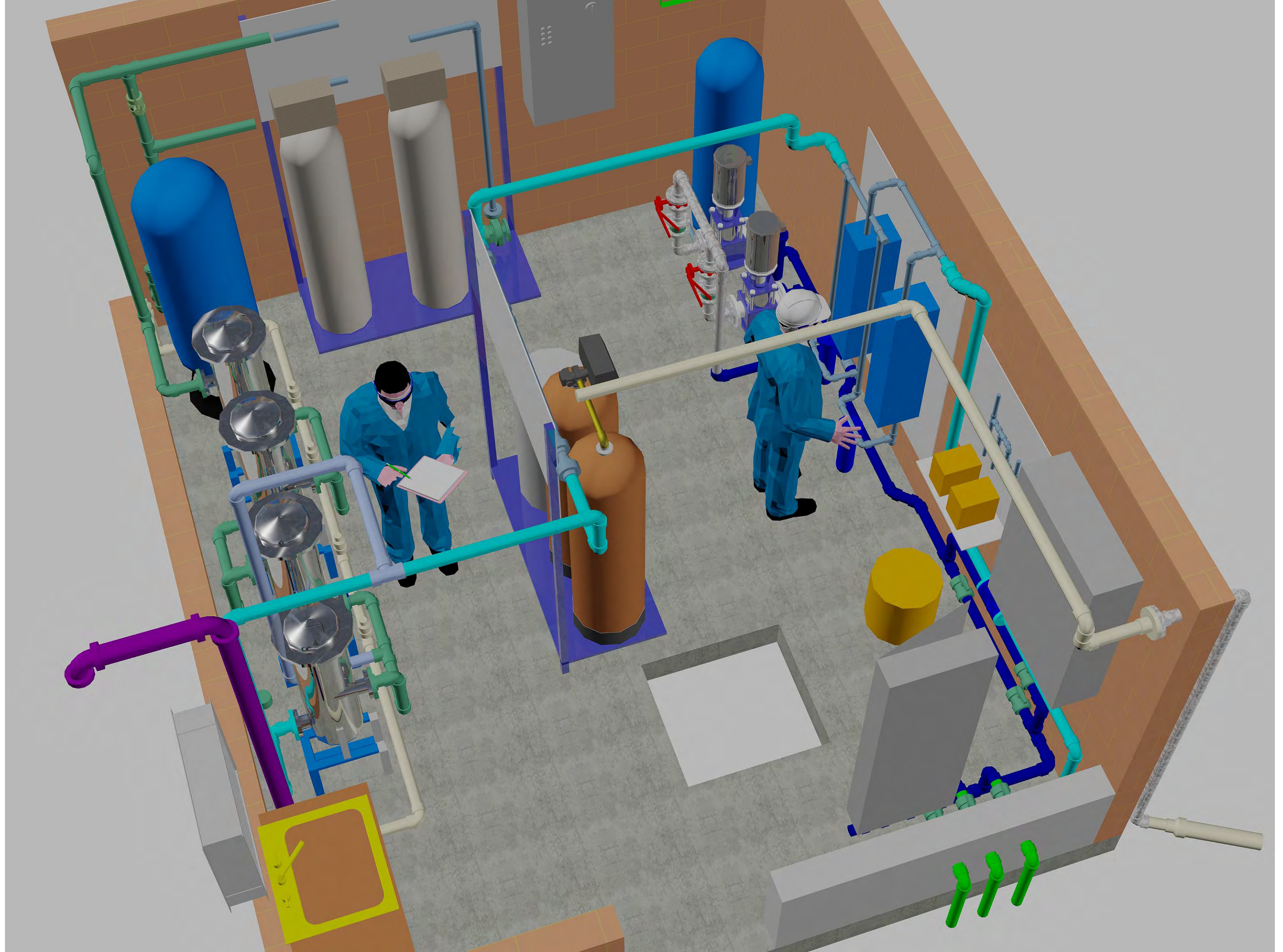
Respectfully submitted,
Associated Engineering (Sask.) Ltd.



Ken Anderson, P.Eng.
Group Manager – Water

A

Appendix A – CONCEPT RENDERING OF NEW EQUIPMENT LAYOUT



Opapiskaw Campground

Whiteshell Provincial Park

Campground Tips

- Be sure matches are extinguished. Break them in half before discarding.
- Build no fires except in a designated firepit or use a camp stove. Before leaving make sure your fire is completely out.
- Be careful with your cigarettes, cigars and pipe ashes. Crush them thoroughly before discarding. Never toss them from a vehicle.
- Please! Do not litter.
- Be sensitive to wildlife. Bears can be dangerous and should not be fed. Food must be stored away from your campsite, preferably in a locked vehicle, to avoid attracting hungry animals. Do not store food in your tent.
- Warm clothing is needed for cool nights.
- The use of insect repellent will add to your comfort.
- Learn to recognize and avoid poisonous plants such as poison ivy.
- In case of injury or illness contact a Campground Attendant or Park Patrol Officer. They can assist you to reach medical help.
- Canoeists and hikers travelling in backcountry areas should advise a friend of their intended destination and anticipated length of trip.
- Backcountry camping is only allowed at designated campsites.
- It is illegal to use or transport elm firewood.
- Out of Province Firewood can spread harmful pests and destroy our forests - buy it locally, burn it locally.

Whiteshell

- In the heart of Canadian Shield country



Opapiskaw campground is located adjacent to PR 307 in Whiteshell Provincial Park, in the heart of Canadian Shield country. From archaeological excavations along the Winnipeg River, human presence in the Whiteshell area has been traced back to at least 8000 years ago. Artifacts have been found verifying that early travellers visited to harvest resources and conduct religious ceremonies. Members of the La Vérendrye expedition arrived here in the spring of 1733 and found a Cree settlement at “La Barrière”. The Cree had built a weir to trap spawning sturgeon near the site of what is today Opapiskaw campground. The Whiteshell River, known as “la rivière Pichikoka”, was used by La Vérendrye as an alternative route. The French fur traders’ and explorers’ journey down the Winnipeg River was an important event in the development of the West.

Interpretive programs are available within short driving distance from the campground. Let the interpreters take you on a guided tour of the petroforms or nearby hiking trails. They will teach you about the natural wonders of the area and later put on a nighttime performance at the amphitheatre. Campground talks, family programs, and guest speakers will entertain and inform visitors.

Within the huge base of rock that covers the park and beyond, find rushing rivers, placid lakes, and lush forests full of boreal plants and wildlife.

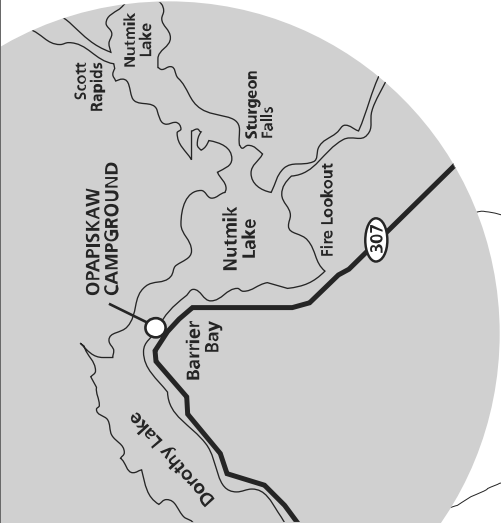
The campground offers two beaches, beautifully surrounded by natural rock landscape, and a peninsula with a footpath leading to rushing waters. In addition to its beautiful scenic location, these waters also provide good fishing opportunities. Activities in the area include volleyball, tennis, boating, hiking, and mountain biking. A store, playground, group use area, and boat launch are located within a convenient distance from the campground.

Rock formations or petroforms, have been attributed to Algonkian-speaking natives of whom the present-day Anishinabe (Ojibwe) are descendants. Although petroforms can be found within various locations throughout the Whiteshell, there is a concentration of them close to the campground. Each summer, interpreters from the Whiteshell Natural History Museum lead tours throughout the area and explain the petroforms’ significance. If you visit the log-constructed museum at Nutimik Lake, be sure to view the displays of the Winnipeg River, First Nations peoples, petroforms, wild rice, lake sturgeon, and wildlife of the boreal forest.

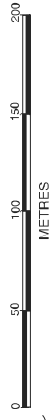
More information on Opapiskaw Campground and Whiteshell Provincial Park is available on request from the park office.

Opapiskaw Campground

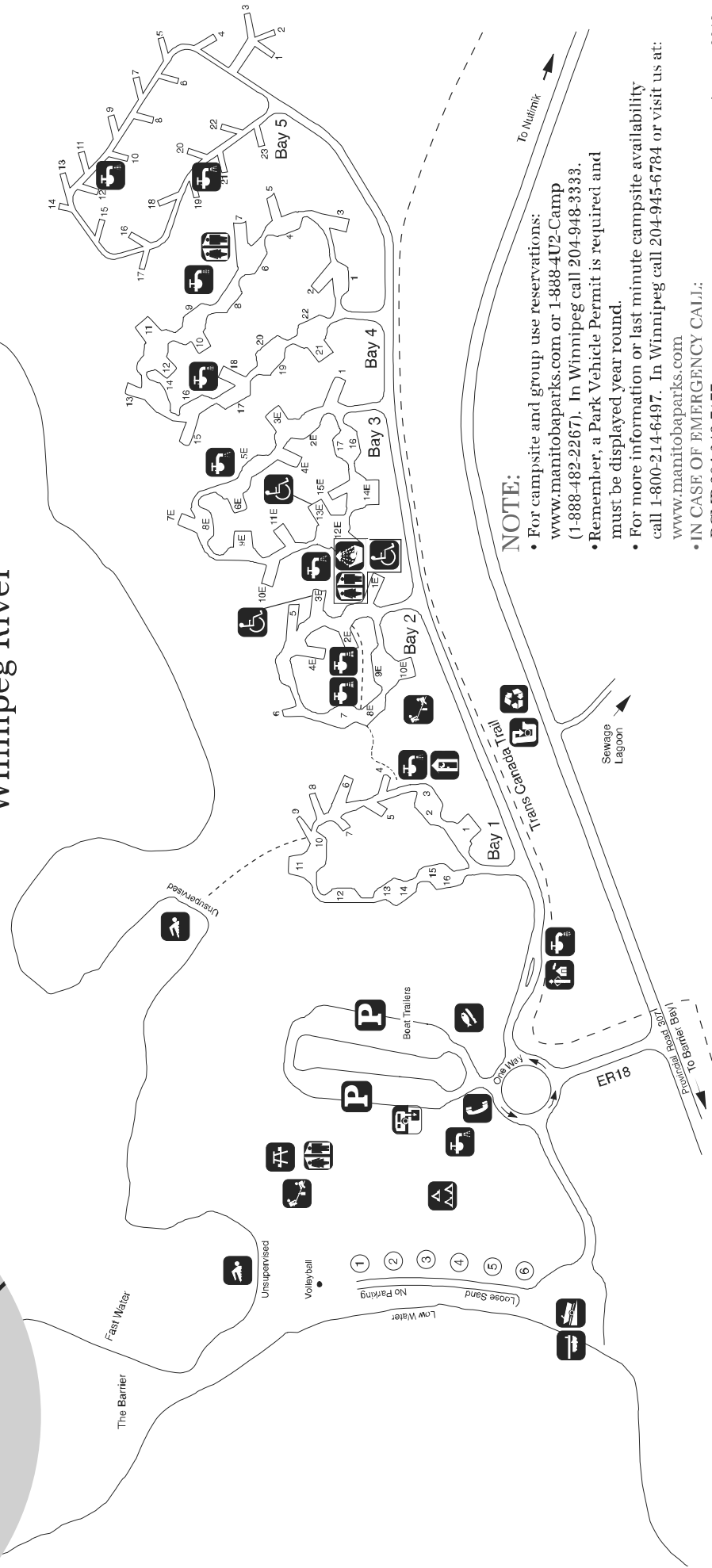
Whiteshell Provincial Park



LEGEND



Winnipeg River



NOTE:

- For campsite and group use reservations: www.manitobaparks.com or 1-888-4U2-Camp (1-888-482-2267). In Winnipeg call 204-948-3333.
- Remember, a Park Vehicle Permit is required and must be displayed year round.
- For more information or last minute campsite availability call 1-800-214-6497. In Winnipeg call 204-945-6784 or visit us at: www.manitobaparks.com
- IN CASE OF EMERGENCY CALL:
 - RCMP 204-348-7177
 - Ambulance 204-348-7700

Appendix C – Raw Water Quality



Office of Drinking Water
ATTN: Greg Wojcikowski
Unit B - 284 Reimer Ave.
Steinbach MB R5G 0R5

Date Received: 06-JUL-11
Report Date: 20-JUL-11 11:45 (MT)
Version: FINAL

Client Phone: 204-346-6346

Certificate of Analysis

Lab Work Order #: L1027669
Project P.O. #: 26911
Job Reference: OPAPISKAW CG - PWS 158.00
Legal Site Desc:
C of C Numbers:

Paul Nicolas
Account Manager

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ANALYTICAL REPORT

Physical Tests (WATER)

		ALS ID		L1027669-1	L1027669-2
		Sampled Date		06-JUL-11	06-JUL-11
		Sampled Time		11:55	12:15
		Sample ID		OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Colour, True	CU	15	-	33.6	9.4
Conductivity	umhos/cm	-	-	97.1	133
Langelier Index (4 C)	No Unit	-	-	-0.99	-1.0
Langelier Index (60 C)	No Unit	-	-	-0.21	-0.25
pH	pH units	6.5-8.5	-	7.85	7.79
Total Dissolved Solids	mg/L	500	-	100	98.0
Turbidity	NTU	-	-	3.61	3.84

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

Anions and Nutrients (WATER)

		ALS ID		L1027669-1	L1027669-2
		Sampled Date		06-JUL-11	06-JUL-11
		Sampled Time		11:55	12:15
		Sample ID		OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Alkalinity, Total (as CaCO3)	mg/L	-	-	42.4	44.1
Ammonia as N	mg/L	-	-	<0.010	0.022
Bicarbonate (HCO3)	mg/L	-	-	51.8	53.8
Carbonate (CO3)	mg/L	-	-	<0.60	<0.60
Chloride	mg/L	250	-	1.72	13.1
Fluoride	mg/L	-	1.5	0.043	0.063
Hardness (as CaCO3)	mg/L	-	-	44.0	44.9
Hydroxide (OH)	mg/L	-	-	<0.40	<0.40
Ion Balance	%	-	-	Low EC	103
Nitrate and Nitrite as N	mg/L	-	10	<0.050	<0.050
Total Kjeldahl Nitrogen	mg/L	-	-	0.55	0.31
TDS (Calculated)	mg/L	500	-	49.7	70.7
Sulfate	mg/L	500	-	3.63	3.65

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

Organic / Inorganic Carbon (WATER)

		ALS ID		L1027669-1	L1027669-2
		Sampled Date		06-JUL-11	06-JUL-11
		Sampled Time		11:55	12:15
		Sample ID		OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Total Carbon	mg/L	-	-	17.9	18.5
Total Inorganic Carbon	mg/L	-	-	7.8	8.2
Total Organic Carbon	mg/L	-	-	10.1	10.3

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	ALS ID		L1027669-1	L1027669-2
		Guide Limit #1	Guide Limit #2	OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TREATED
Aluminum (Al)-Total	mg/L	0.1	-	0.251	0.192
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00072	0.00074
Barium (Ba)-Total	mg/L	-	1	0.0112	0.0113
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	12.7	13.0
Cesium (Cs)-Total	mg/L	-	-	<0.00010	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010	<0.0010
Cobalt (Co)-Total	mg/L	-	-	<0.00020	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.00248	0.0290
Iron (Fe)-Total	mg/L	0.3	-	0.26	0.25
Lead (Pb)-Total	mg/L	-	0.01	0.000175	0.000752
Lithium (Li)-Total	mg/L	-	-	0.0025	<0.0020
Magnesium (Mg)-Total	mg/L	-	-	2.98	3.02
Manganese (Mn)-Total	mg/L	0.05	-	0.0104	0.00757
Molybdenum (Mo)-Total	mg/L	-	-	<0.00020	<0.00020
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.20	<0.20
Potassium (K)-Total	mg/L	-	-	0.923	0.980
Rubidium (Rb)-Total	mg/L	-	-	0.00171	0.00171
Selenium (Se)-Total	mg/L	-	0.01	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	1.12	1.11
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	2.29	10.4
Strontium (Sr)-Total	mg/L	-	-	0.0271	0.0272
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010	<0.00010
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	0.00701	0.00547

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1027669-1	L1027669-2
		Sampled Date		06-JUL-11	06-JUL-11
		Sampled Time		11:55	12:15
		Sample ID		OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Tungsten (W)-Total	mg/L	-	-	<0.0010	<0.0010
Uranium (U)-Total	mg/L	-	0.02	<0.00010	<0.00010
Vanadium (V)-Total	mg/L	-	-	0.00086	0.00072
Zinc (Zn)-Total	mg/L	5	-	<0.0050	0.0521
Zirconium (Zr)-Total	mg/L	-	-	<0.00040	<0.00040

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

Trihalomethanes (WATER)

		ALS ID		L1027669-3
		Sampled Date		06-JUL-11
		Sampled Time		13:00
		Sample ID		OPAPISKAW CG - 3 DISTRIBUTION
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Bromodichloromethane	mg/L	-	0.016	0.00514
Bromoform	mg/L	-	-	<0.00050
Chlorodibromomethane	mg/L	-	-	<0.00050
Chloroform	mg/L	-	-	0.289 ^{DLA}
Total THMs	mg/L	-	0.1	0.294
Surrogate: Toluene-d8 (SURR)	%	-	-	126

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.



Office of Drinking Water
ATTN: GREG WOJCIKOWSKI
Unit B - 284 Reimer Avenue
Steinbach MB R5G 0R5

Date Received: 18-JUL-12
Report Date: 04-AUG-12 14:38 (MT)
Version: FINAL

Client Phone: 204-346-6346

Certificate of Analysis

Lab Work Order #: L1180674
Project P.O. #: 26911
Job Reference: OPAPISKAW CG - PWS 158.00
C of C Numbers:
Legal Site Desc:

Gail Hill
Account Manager

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Physical Tests (WATER)

		ALS ID		L1180674-1	L1180674-2
		Sampled Date		18-JUL-12	18-JUL-12
		Sampled Time		12:00	12:15
		Sample ID		OPAPISKAW CG	OPAPISKAW CG
Analyte	Unit	Guide Limit #1	Guide Limit #2	- 1 RAW	- 2 TTD
Colour, True	CU	15	-	24.4	6.8
Conductivity	umhos/cm	-	-	100	147
Langelier Index (4 C)	No Unit	-	-	-0.86	-0.93
Langelier Index (60 C)	No Unit	-	-	-0.083	-0.16
pH	pH units	6.5-8.5	-	7.97	7.90
Total Dissolved Solids	mg/L	500	-	59.0	116
Transmittance, UV (254 nm)	% T	-	-	50.2	61.1
Turbidity	NTU	-	-	8.44	5.23

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients (WATER)

		ALS ID		L1180674-1	L1180674-2
		Sampled Date		18-JUL-12	18-JUL-12
		Sampled Time		12:00	12:15
		Sample ID		OPAPISKAW CG	OPAPISKAW CG
Analyte	Unit	Guide Limit #1	Guide Limit #2	- 1 RAW	- 2 TTD
Alkalinity, Total (as CaCO3)	mg/L	-	-	41	43
Ammonia, Total (as N)	mg/L	-	-	0.017	0.018
Bicarbonate (HCO3)	mg/L	-	-	50	53
Bromide (Br)	mg/L	-	-	<0.10	<0.10
Carbonate (CO3)	mg/L	-	-	<12	<12
Chloride	mg/L	250	-	1.81	14.3
Computed Conductivity	uS/cm	-	-	95.3	138
Conductivity % Difference	%	-	-	-4.8	-6.1
Fluoride	mg/L	-	1.5	0.043	0.039
Hardness (as CaCO3)	mg/L	-	-	43.0	42.9
Hydroxide (OH)	mg/L	-	-	<6.8	<6.8
Iodide (I)	mg/L	-	-	<2.0	<2.0
Ion Balance	%	-	-	105	102
Langelier Index	No Unit	-	-	-0.7	-0.7
Nitrate and Nitrite as N	mg/L	-	10	0.0080	0.0396
Nitrate-N	mg/L	-	10	0.0069	0.0386
Nitrite-N	mg/L	-	1	0.0011	0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	0.43	0.31
Total Nitrogen	mg/L	-	-	0.44	0.35
Saturation pH	pH	-	-	8.63	8.62
TDS (Calculated)	mg/L	500	-	48.8	71.5
Sulfate	mg/L	500	-	3.68	3.71
Anion Sum	me/L	-	-	0.95	1.35
Cation Sum	me/L	-	-	1.00	1.38
Cation - Anion Balance	%	-	-	2.6	1.0

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Organic / Inorganic Carbon (WATER)

		ALS ID		L1180674-1	L1180674-2
		Sampled Date		18-JUL-12	18-JUL-12
		Sampled Time		12:00	12:15
		Sample ID		OPAPISKAW CG	OPAPISKAW CG
Analyte	Unit	Guide Limit #1	Guide Limit #2	- 1 RAW	- 2 TTD
Dissolved Organic Carbon	mg/L	-	-	9.2	8.9
Total Inorganic Carbon	mg/L	-	-	9.9	10.5
Total Organic Carbon	mg/L	-	-	9.4	9.4

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests (WATER)

				ALS ID	L1180674-1	L1180674-2
				Sampled Date	18-JUL-12	18-JUL-12
				Sampled Time	12:00	12:15
				Sample ID	OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TTD
Analyte	Unit	Guide Limit #1	Guide Limit #2			
Escherichia Coli	MPN/100mL	-	0	4	0	
Total Coliforms	MPN/100mL	-	0	>200	0	

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1180674-1	L1180674-2
		Sampled Date		18-JUL-12	18-JUL-12
		Sampled Time		12:00	12:15
		Sample ID		OPAPISKAW CG	OPAPISKAW CG
Analyte	Unit	Guide Limit #1	Guide Limit #2	- 1 RAW	- 2 TTD
Aluminum (Al)-Total	mg/L	0.1	-	0.420	0.180
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00098	0.00084
Barium (Ba)-Total	mg/L	-	1	0.0137	0.0116
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	13.6	13.1
Cesium (Cs)-Total	mg/L	-	-	<0.00010	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010	<0.0010
Cobalt (Co)-Total	mg/L	-	-	0.00020	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.00408	0.0166
Iron (Fe)-Total	mg/L	0.3	-	0.41	0.23
Lead (Pb)-Total	mg/L	-	0.01	0.000399	0.000665
Lithium (Li)-Total	mg/L	-	-	0.00129 <0.00020	0.00130 <0.00020
Magnesium (Mg)-Total	mg/L	-	-	4.42	4.30
Manganese (Mn)-Total	mg/L	0.05	-	0.0195	0.0102
Molybdenum (Mo)-Total	mg/L	-	-	<0.00020	0.00020
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.10	<0.10
Potassium (K)-Total	mg/L	-	-	0.997	0.969
Rubidium (Rb)-Total	mg/L	-	-	0.00211	0.00171
Selenium (Se)-Total	mg/L	-	0.01	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	2.12	1.61
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	3.35	14.1
Strontium (Sr)-Total	mg/L	-	-	0.0261	0.0252
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010	<0.00010
Thorium (Th)-Total	mg/L	-	-	0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	0.0165	0.00863

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1180674-1	L1180674-2
		Sampled Date		18-JUL-12	18-JUL-12
		Sampled Time		12:00	12:15
		Sample ID		OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TTD
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Tungsten (W)-Total	mg/L	-	-	<0.00010	<0.00010
Uranium (U)-Total	mg/L	-	0.02	0.00012	0.00011
Vanadium (V)-Total	mg/L	-	-	0.00138	0.00095
Zinc (Zn)-Total	mg/L	5	-	0.0058	0.0314
Zirconium (Zr)-Total	mg/L	-	-	<0.00040	<0.00040

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Dissolved Metals (WATER)

		ALS ID		L1180674-1	L1180674-2
		Sampled Date		18-JUL-12	18-JUL-12
		Sampled Time		12:00	12:15
		Sample ID		OPAPISKAW CG - 1 RAW	OPAPISKAW CG - 2 TTD
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.103	0.136

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Trihalomethanes (WATER)

		ALS ID		L1180674-3
		Sampled Date		18-JUL-12
		Sampled Time		11:15
		Sample ID		OPAPISKAW CG - 3 DIST
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Bromodichloromethane	mg/L	-	-	0.00656
Bromoform	mg/L	-	-	<0.00050
Chlorodibromomethane	mg/L	-	-	<0.00050
Chloroform	mg/L	-	-	0.349 ^{DLA}
Surrogate: Toluene-d8 (SURR)	%	-	-	108.4

Federal Guidelines for Canadian Drinking Water Quality (JAN, 2011)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.



Office of Drinking Water
ATTN: AMANDA CRAWLEY
Unit B - 284 Reimer Avenue
Steinbach MB R5G 0R5

Date Received: 12-JUN-13
Report Date: 28-JUN-13 15:05 (MT)
Version: FINAL

Client Phone: 204-371-3885

Certificate of Analysis

Lab Work Order #: L1315999
Project P.O. #: 26911
Job Reference: OPAPISKAW - PWS 158.00
C of C Numbers:
Legal Site Desc:

Paul Nicolas
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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ANALYTICAL REPORT

Physical Tests (WATER)

		ALS ID		L1315999-1
		Sampled Date		12-JUN-13
		Sampled Time		-
		Sample ID		OPAPISKAW 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Colour, True	CU	15	-	8.7
Conductivity	umhos/cm	-	-	156
Hardness (as CaCO3)	mg/L	-	-	51.9
Langelier Index (4 C)	No Unit	-	-	-0.83
Langelier Index (60 C)	No Unit	-	-	-0.059
pH	pH units	6.5-8.5	-	7.92
Total Dissolved Solids	mg/L	500	-	111
Transmittance, UV (254 nm)	% T	-	-	63.2
Turbidity	NTU	-	-	3.40

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Anions and Nutrients (WATER)

		ALS ID		L1315999-1
		Sampled Date		12-JUN-13
		Sampled Time		-
		Sample ID		OPAPISKAW 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Alkalinity, Total (as CaCO3)	mg/L	-	-	49
Ammonia, Total (as N)	mg/L	-	-	<0.010
Bicarbonate (HCO3)	mg/L	-	-	60
Bromide (Br)	mg/L	-	-	<0.10
Carbonate (CO3)	mg/L	-	-	<12
Chloride	mg/L	250	-	15.5
Fluoride	mg/L	-	1.5	0.042
Hydroxide (OH)	mg/L	-	-	<6.8
Iodide (I)	mg/L	-	-	<2.0
Nitrate and Nitrite as N	mg/L	-	10	0.0206
Nitrate-N	mg/L	-	10	0.0206
Nitrite-N	mg/L	-	1	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	0.22
Total Nitrogen	mg/L	-	-	0.24
Sulfate	mg/L	500	-	3.52
Anion Sum	me/L	-	-	1.50
Cation Sum	me/L	-	-	1.47
Cation - Anion Balance	%	-	-	-0.9

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

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 Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic / Inorganic Carbon (WATER)

		ALS ID	L1315999-1	
		Sampled Date	12-JUN-13	
		Sampled Time	-	
		Sample ID	-	
		OPAPISKAW 2 - TREATED		
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Dissolved Organic Carbon	mg/L	-	-	1.5
Total Inorganic Carbon	mg/L	-	-	59.6
Total Organic Carbon	mg/L	-	-	<1.0

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1315999-1
		Sampled Date		12-JUN-13
		Sampled Time		-
		Sample ID		OPAPISKAW 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Aluminum (Al)-Total	mg/L	0.1	-	0.204
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00084
Barium (Ba)-Total	mg/L	-	1	0.0103
Beryllium (Be)-Total	mg/L	-	-	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020
Boron (B)-Total	mg/L	-	5	0.012
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010
Calcium (Ca)-Total	mg/L	-	-	13.9
Cesium (Cs)-Total	mg/L	-	-	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010
Cobalt (Co)-Total	mg/L	-	-	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.0209
Iron (Fe)-Total	mg/L	0.3	-	0.22
Lead (Pb)-Total	mg/L	-	0.01	0.000613
Lithium (Li)-Total	mg/L	-	-	0.00131
Magnesium (Mg)-Total	mg/L	-	-	4.18
Manganese (Mn)-Total	mg/L	0.05	-	0.00751
Molybdenum (Mo)-Total	mg/L	-	-	<0.00020
Nickel (Ni)-Total	mg/L	-	-	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.10
Potassium (K)-Total	mg/L	-	-	0.989
Rubidium (Rb)-Total	mg/L	-	-	0.00166
Selenium (Se)-Total	mg/L	-	0.01	<0.0010
Silicon (Si)-Total	mg/L	-	-	1.73
Silver (Ag)-Total	mg/L	-	-	<0.00010
Sodium (Na)-Total	mg/L	200	-	14.2
Strontium (Sr)-Total	mg/L	-	-	0.0245
Tellurium (Te)-Total	mg/L	-	-	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010
Thorium (Th)-Total	mg/L	-	-	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020
Titanium (Ti)-Total	mg/L	-	-	0.00650

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1315999-1
		Sampled Date		12-JUN-13
		Sampled Time		-
		Sample ID		OPAPISKAW 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Tungsten (W)-Total	mg/L	-	-	<0.00010
Uranium (U)-Total	mg/L	-	0.02	0.00011
Vanadium (V)-Total	mg/L	-	-	0.00085
Zinc (Zn)-Total	mg/L	5	-	0.0182
Zirconium (Zr)-Total	mg/L	-	-	<0.00040

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Dissolved Metals (WATER)

		ALS ID		L1315999-1
		Sampled Date		12-JUN-13
		Sampled Time		-
		Sample ID		OPAPISKAW 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.0601

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Trihalomethanes (WATER)

		ALS ID		L1315999-2
		Sampled Date		12-JUN-13
		Sampled Time		-
		Sample ID		OPAPISKAW 3 - DISTRIBUTED
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Bromodichloromethane	mg/L	-	-	0.00731
Bromoform	mg/L	-	-	<0.00050
Chlorodibromomethane	mg/L	-	-	<0.00050
Chloroform	mg/L	-	-	0.404 ^{DLA}
Total THMs	mg/L	-	0.1	0.412
Surrogate: Toluene-d8 (SURR)	%	-	-	96.3

Federal Guidelines for Canadian Drinking Water Quality (AUG, 2012)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Appendix D – Backwash/Regeneration Water Quality



Associated Engineering (Sask) Ltd.
ATTN: KEN ANDERSON
203 - Number Five Donald Street
Winnipeg MB R3L 2T4

Date Received: 03-AUG-16
Report Date: 15-AUG-16 07:24 (MT)
Version: FINAL

Client Phone: 204-942-6391

Certificate of Analysis

Lab Work Order #: L1807891
Project P.O. #: NOT SUBMITTED
Job Reference: OPAPISKAW 2016-PROCESS WASTE
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory 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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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1807891-1 OPAP-1 PROCESS WASTE TANK							
Sampled By: CLIENT on 03-AUG-16							
Matrix:							
MB Chemistry for PWS							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	59.7		1.2	mg/L		09-AUG-16	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		09-AUG-16	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		09-AUG-16	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	48.9		1.0	mg/L		08-AUG-16	R3522161
Ammonia by colour							
Ammonia, Total (as N)	0.078		0.010	mg/L		10-AUG-16	R3523684
Bromide in Water by IC (Low Level)							
Bromide (Br)	<1.0	DLM	1.0	mg/L		05-AUG-16	R3521184
Chloride in Water by IC (Low Level)							
Chloride (Cl)	9830		10	mg/L		05-AUG-16	R3521184
Colour, True							
Colour, True	23.4		5.0	CU		05-AUG-16	R3519631
Conductivity							
Conductivity	>12900		1.0	umhos/cm		08-AUG-16	R3522161
Dissolved Organic Carbon by Combustion							
Dissolved Organic Carbon	12.0		0.50	mg/L		08-AUG-16	R3521773
Fluoride in Water by IC							
Fluoride (F)	<2.0	DLM	2.0	mg/L		05-AUG-16	R3521184
Hardness Calculated							
Hardness (as CaCO3)	1430		0.30	mg/L		11-AUG-16	
Langelier Index 4C							
Langelier Index (4 C)	-0.56					11-AUG-16	
Langelier Index 60C							
Langelier Index (60 C)	0.16					11-AUG-16	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.50	DLM	0.50	mg/L		05-AUG-16	R3521184
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.10	DLM	0.10	mg/L		05-AUG-16	R3521184
Sulfate in Water by IC							
Sulfate (SO4)	<30	DLM	30	mg/L		05-AUG-16	R3521184
Total Dissolved Solids (TDS)							
Total Dissolved Solids	16200		80	mg/L		09-AUG-16	R3522806
Total Metals by ICP-MS							
Aluminum (Al)-Total	0.107		0.0050	mg/L	10-AUG-16	10-AUG-16	R3523357
Antimony (Sb)-Total	<0.00020		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Arsenic (As)-Total	0.00087		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Barium (Ba)-Total	0.0169		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Beryllium (Be)-Total	<0.00020		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Bismuth (Bi)-Total	<0.00020		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Boron (B)-Total	<0.010		0.010	mg/L	10-AUG-16	10-AUG-16	R3523357
Cadmium (Cd)-Total	0.000031		0.000010	mg/L	10-AUG-16	10-AUG-16	R3523357
Calcium (Ca)-Total	351		0.10	mg/L	10-AUG-16	10-AUG-16	R3523357
Cesium (Cs)-Total	0.00011		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Chromium (Cr)-Total	<0.0010		0.0010	mg/L	10-AUG-16	10-AUG-16	R3523357
Cobalt (Co)-Total	0.00114		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Copper (Cu)-Total	0.0475		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Iron (Fe)-Total	1.83		0.010	mg/L	10-AUG-16	10-AUG-16	R3523357
Lead (Pb)-Total	0.000183		0.000090	mg/L	10-AUG-16	10-AUG-16	R3523357

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1807891-1 OPAP-1 PROCESS WASTE TANK							
Sampled By: CLIENT on 03-AUG-16							
Matrix:							
Total Metals by ICP-MS							
Lithium (Li)-Total	0.0202		0.0020	mg/L	10-AUG-16	10-AUG-16	R3523357
Magnesium (Mg)-Total	134		0.010	mg/L	10-AUG-16	10-AUG-16	R3523357
Manganese (Mn)-Total	0.337		0.00030	mg/L	10-AUG-16	10-AUG-16	R3523357
Molybdenum (Mo)-Total	0.00022		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Nickel (Ni)-Total	0.0048		0.0020	mg/L	10-AUG-16	10-AUG-16	R3523357
Phosphorus (P)-Total	<0.10		0.10	mg/L	10-AUG-16	10-AUG-16	R3523357
Potassium (K)-Total	97.3		0.020	mg/L	10-AUG-16	10-AUG-16	R3523357
Rubidium (Rb)-Total	0.0513		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Selenium (Se)-Total	<0.0010		0.0010	mg/L	10-AUG-16	10-AUG-16	R3523357
Silicon (Si)-Total	2.33		0.10	mg/L	10-AUG-16	10-AUG-16	R3523357
Silver (Ag)-Total	<0.00010		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Sodium (Na)-Total	5980		3.0	mg/L	10-AUG-16	10-AUG-16	R3523357
Strontium (Sr)-Total	0.225		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Thallium (Tl)-Total	<0.00010		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Thorium (Th)-Total	<0.00010		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Tin (Sn)-Total	<0.00020		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Titanium (Ti)-Total	0.00345		0.00050	mg/L	10-AUG-16	10-AUG-16	R3523357
Tungsten (W)-Total	<0.00010		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Uranium (U)-Total	<0.00010		0.00010	mg/L	10-AUG-16	10-AUG-16	R3523357
Vanadium (V)-Total	0.00053		0.00020	mg/L	10-AUG-16	10-AUG-16	R3523357
Zinc (Zn)-Total	0.0985		0.0020	mg/L	10-AUG-16	10-AUG-16	R3523357
Zirconium (Zr)-Total	<0.00040		0.00040	mg/L	10-AUG-16	10-AUG-16	R3523357
Total Organic Carbon by Combustion							
Total Organic Carbon	11.9		0.50	mg/L		08-AUG-16	R3521781
Turbidity							
Turbidity	9.23		0.10	NTU		05-AUG-16	R3523496
UV Transmittance (Calculated)							
Transmittance, UV (254 nm)	52.0		1.0	%T/cm		05-AUG-16	R3524024
pH							
pH	7.34		0.10	pH units		08-AUG-16	R3522161

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