JACK RIVER SCHOOL

ENVIRONMENT ACT PROPOSAL

SEMI-PUBLIC WATER SYSTEM

WATER TREATMENT PLANT REPLACEMENT

May 2014

Alliance
ENGINEERING SERVICES INC

Alliance
ENGINEERING SERVICES INC

PROVINCE OF MANITOBA
A.F.G.
GOSSEN
09-May-16
REGISTERED PROFESSIONAL ENGINEER

APEGM
Certificate of Authorization
Alliance Engineering Services Inc.
No. 2906 Date:_____

Environment Act Proposal Form

Manitoba
Conservation and Water Stewardship

Name of the development: Jack River School, Semi-Public Water System - Water Treatment Plant Replacement		
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Class 1		
Legal name of the applicant: Frontier School Division		
Mailing address of the applicant: 30 Speers Road, WInnipeg, MB R2J 1L9		
Contact Person: Doug Nicholson, (Wpg.), Edgar Throop (Norway House)		
City: Winnipeg	Province: Manitoba	Postal Code: R2J 1L9
Phone Number: 204-258-2741	Fax: 204-258-2069	email: doug.nicholson@froı
Location of the development: Jack River School Norway House		
Contact Person: Doug Nicholson, (Wpg.), Edgar Throop (Norway House)		
Street Address: Fort Island, Norway House MB, R0B 1B0		
Legal Description: Lot DES, Section 63, Block 129, Role 0188400.000		
City/Town: Norway House	Province: Manitoba	Postal Code: R2J 1L9
Phone Number: 204-359-6365	Fax: 204-359-6975	email: edgar.throop@fronti
Name of proponent contact person for purposes of the environmental assessment: Art Gossen P. Eng., Alliance Engineering Services Inc		
Phone: 204 774 7859 Fax:	Mailing address: 1035 Logan Avenue Winnipeg, MB R3E 1P6	
Email address: art@allianceengservices.com		
Webpage address: http://www.allianceengservices.com/		
Date: 09-May-14	Signature of proponent, or corporate principal of corporate proponent: A Gossen P.Eng. Printed name: A Gossen	

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Executive Summary

Frontier School Division has requested that Alliance Engineering prepare an Environment Act Proposal for a Class 1 Development Licence under the Manitoba Environment Act for a replacement Water Treatment Plant (WTP) located at Jack River School in Norway House, Manitoba. This document contains all of the relevant information required in Manitoba Conservation's Environment Act Proposal Report Guidelines and Supplementary Guidelines for Municipal Water Supply Systems.

The existing Jack River School WTP was established in the early 1970's, and has been operated by Frontier School Division since that time. The water supply infrastructure at the school site including the WTP is a dedicated system that only serves the school site. Due to the age of the existing WTP equipment and growing student population, Frontier School Division has recognized an immediate need to replace, the existing WTP, a raw water fire pump also located in the existing WTP and the sites buried water distribution piping. The raw water source and rejects water receiving stream for this development is the Jack River.

The process treatment train of the replacement WTP includes a seasonal coagulant dosing and flocculation system, a multimedia filtration system, anti-scalant dosing system, a nano-filtration membrane system, ultraviolet disinfection, a liquid sodium hypochlorite dosing/post-chlorination system, tank storage of treated water and treated water distribution pumps. Nominal treated water capacity of the new WTP is 117 m^3/day. Frontier School Division will operate the new WTP.

Certain components of the existing WTP infrastructure will be retained and re-used including, the raw water intake line, the rejects water discharge line, and the existing WTP raw well structure. The raw water intake line will be fitted with an intake screen to comply with the Department of Fisheries and Oceans guidelines.

The existing and new WTP equipment and treated water storage tanks will be housed in a new WTP building addition. The WTP building addition will be constructed adjacent to the existing WTP.

Commencement of construction for this development is expected in the summer/fall of 2014 pending the receipt of all necessary regulatory approvals with project completion expected in late 2014.

1.0 Background Information

Jack River School (the School), in the community of Norway House, Manitoba is a Kindergarten to Grade 6 School operated by Frontier School Division in the division's Area 5 catchment. Sewer and water services for, the School, the on-site teacherages and a church are provided from on-site infrastructure that was established at the site in the early 1970's. The water supply infrastructure also provides water to the site fire suppression systems, (school sprinkler & standpipe and hose systems and a yard hydrant).

Student populations at the School are presently in the range of 425-students, plus staff. Student populations are expected to at least remain stable and will more likely increase in the foreseeable future. Frontier School Division has recognized the present and future educational importance of the school to the Area 5 catchment and is committed to the replacing the site sewer and water infrastructure to ensure the on-going viability of the School.

1.1 Previous Studies

Previous studies have provided condition assessments of the above grade infrastructure specifically for the site's water and sewage treatment plants. These studies recommended that both facilities be replaced. The recommendation for replacement was largely based on equipment age and the difficulty in maintaining the antiquated equipment while at the same time meeting drinking water quality standards and effluent discharge limits.

1.2 Site information

Jack River School is located immediately north of Jack River in the community of Norway House, Manitoba. The Jack River represents the surface, raw-water supply source to the Water Treatment Plant, (WTP).

The proposed Water Treatment Plant building will be located immediately north and east of the existing WTP. The existing WTP building will be stripped of existing equipment, but will be retained to house a new fire pump and new raw water feed pumps. The existing WTP raw well and raw water intake line will also be retained as part of the new WTP infrastructure.

1.3 Population

The population in Norway House as per the 2011 census is 4,758. This population has grown at a rate of 16% during the years 2006-2011. The population is represented in the 73 km^2 area in and around Norway House. The student and staff population at Jack River School is presently around 425, and is expected to increase with the growing population of Norway House. The largest population age group in Norway House is ages 0-4, with a population of 620. The second largest population group in Norway House is ages 5-9 with a population of 525. With the population demographic of Norway House being large in the lower cohorts, there will be a consistent increase in educational services.

1.4 Existing and Projected Water Use

The design for the proposed replacement WTP is based on the future demand of treated water at Jack River School. The current average daily use of treated water is 0.86 MLD, (mega-litres per day). The average daily use is based on a student population of 425, with staff and family members being an additional 25 people. The projected student population growth is expected to reach 600 students in the future, with staff and family members remaining the same. The capacity for the proposed WTP is 0.117MLD, which will meet the demand of the future student population. It is noted that the existing WTP has a maximum original rated capacity of 0.109 MLD. A summary of the treated water projected use calculations is shown in Table 1.

Table 1. Projected Treated Water Use

	Existing	Future
Number of Students	425	600
Student Per Capita Daily Water Use, LPCPD	180	180
Number of Staff & Family Members on Site, persons	25	25
Staff Per Capita Daily Water Use, LPCPD	340	340
Treated Water Treatment Capacity, MLD	**0.86**	**0.117**

* LPCPD – litres per capita per day

1.5 Raw Water Source

The Jack River School is located immediately adjacent to the Jack River. The required raw water flow from the river to the WTP, at design conditions, for domestic water purposes, is 2.0 L/s, (assumes a permeate yield of 68% from nano-membranes). This flow will be provided through an existing river intake line that will be fitted with a new intake screen. Original project documentation indicates that the existing intake screen does not meet current Federal Department of Fisheries and Oceans (DFO) guidelines for river intakes. The existing river intake line terminates in the existing WTP raw water well. The diameter of the existing river intake line is 250-mm, it has hydraulic capacity to satisfy the WTP domestic demands. The supply of raw water from the raw well to the WTP treatment train will be provided by new submersible raw water pumps also located in the existing WTP raw well.

The existing river intake line and WTP raw water well also serve as the raw water source for the site's fire-pump. The fire pump provides raw water to the School's fire suppression systems, (school sprinkler and standpipe and hose system and yard hydrant). The anticipated design flow for the intake line with the fire pump activated is 31.5 L/s. The existing 250-mm diameter intake line has hydraulic capacity to satisfy the fire flow demands.

1.6 Water Rights Act

The existing WTP is operated under current licence SPWS-11-0063 A as a semi-public water supply. The existing WTP does not have a surface water rights licence, a water rights licence application for the replacement WTP and water distribution system infrastructure is in progress.

1.7 Water Quality

The raw water intake for the proposed WTP is surface water from Jack River. The existing raw water, and treated water characteristics are displayed in Table 2.

The existing water treatment system presently cannot meet the current GCDWQ for turbidity.

Table 2. Existing Raw and Treated Water General Characteristics

Parameters	Units	Raw Water Values	Treated Water Values	GCDWQ
Transmittance	%	58	87	---
Turbidity	NTU	11.3	2.9	≤1
pH	Standard Units	8	8	---
Hardness	mg CaCO3/l	150	122	≤ 200
Iron	mg/l	0.22	0.01	≤ 0.3
Manganese	mg/l	0.011	0.005	≤ 0.05
TOC	mg/l	8.9	6.2	---
Barium	mg/l	0.0441	0.028	1
Sodium	mg/l	27.6	28.7	---
Chloride	mg/l	28.3	37	≤ 250
Calcium	mg/l	38.9	28.4	---
TDS	mg/l	346	203	≤ 500

- GCDWQ – Guidelines for Canadian Drinking Water QUality

Raw and treated water characteristic are based on operating records and test results compiled under the terms of the existing WTP operating licence.

1.8 Compliance Plan

An engineering assessment was completed by Alliance Engineering Services Inc. in January of 2010. The assessment concluded that many of the components of the existing WTP were corroded, replacement parts are largely unavailable and many are in need of replacement. An inspection by Manitoba Conservation and Water Stewardship found that some aspects of the existing WTP were not in compliance with the Operating Licence Compliance requirements. The required compliance measures not being met are; turbidity of treated water did not meet GCDWQ, chlorine residuals in treated water not being met, and microbial samples for analysis have been missed. It is also expected that screens on the raw water intake do not meet Federal Department of Fisheries and Oceans guidelines.

The compliance plan will address the required actions made by Manitoba Conservation and Water Stewardship, as well as address the issues discovered in the engineering assessment.

2.0 Project Description

2.1 Water Treatment Plant

The proposed WTP treatment train will utilize a multi-barrier approach to meeting treatment objectives including, a seasonal coagulant dosing and flocculation system, a multimedia filtration system, an anti-scalant dosing system, a nano-filtration membrane system, ultraviolet disinfection and a post chlorination disinfection system using liquid sodium hypochlorite. These systems will be housed in new WTP building located immediately north and east of the existing WTP as shown in Figure 1. The new WTP building will be built above grade, and the existing WTP building raw well will be retained to house a new vertical turbine fire pump.

The existing raw water intake line and raw water well will also be retained; however the raw water intake will be fitted with new fish screen to comply with DFO guidelines. A replacement water reject line will be constructed from the WTP back to the surface water source. The water rejection flow rate projection is approximately 1.36 L/s, (rejected concentrate from nano-filtration membranes). The multimedia filters are also subject to periodic backwash requirements with reject to the surface water source; (2.5-L/s for 25-minutes per backwash cycle). The reject water projections are as supplied by H_20 Innovation (selected equipment Vendor).

The proposed WTP will also house treated water storage tanks (1x Maximum Day Supply), a post chlorination disinfection chemical dosing system including chemical storage (liquid sodium hypochlorite in 18.9-L totes) and treated water distribution pumps.

The WTP plant replacement project will be carried out in conjunction with a project that sees all the buried pipe, treated water distribution system replaced.

2.1.1 Operation and Maintenance

Frontier School Division will be responsible for the operation and general maintenance of the WTP. As part of the terms of sale H_20 Innovation for two years after commission of the WTP they will conduct two yearly system checks to ensure proper function of the system.

Frontier School Division will provide a licensed operator for the plant. The plant is fully automated and does not require a full-time operator at the site. Daily operational inspections and water sampling and testing will however be performed. The WTP is expected to carry a Class 2 Water Treatment Facility Classification as defined by Manitoba Conservation.

Figure 1. WTP Proposed Site

2.2 Certificate of Title

The proposed WTP will be constructed on municipal land. The WTP will be located at the existing Jack River School site. Legal Description,

> *Certificate No. 145546*
>
> *The most North Easterly Seven Hundred and Fifteen feet in perpendicular width of Lot Sixty-three, in the Settlement of Norway House, in Manitoba, as shown on a Plan registered in the Neepawa Land Titles Office as No. 1259*

The copy of the certificate of title for the WTP is provided in Appendix E.

2.3 Existing and Adjacent Land Use

The proposed land for the development will be on Frontier School Division owned land at the existing Jack River School in the community of Norway House. The adjacent land is Norway House Cree Nation reserve. Adjacent land use will not be changed as a result of this development.

2.4 Land Use Designation and Zoning

Zoning designation for this project is not applicable.

2.5 Project Schedule

The project is scheduled to commence and be complete in the summer/fall of 2014 construction year depending on receipt of all regulatory agency approvals

2.6 Project Funding

The project is being funded through the Frontier School Division. Frontier School Division will receive primary project funding (93.5%) from Aboriginal Affairs and Northern Development Canada (AANDC) based on a shared cost formula ratio between treaty and non-treaty students, secondary funding (6.5%) will be provided by the provincial Public Schools Finance Board (PSFB).

2.7 Regulatory Approvals

The following branches/departments will be provided with final copies of plans and specifications for the purpose of approvals and agreements.

Manitoba Conservation and Water Stewardship

Office of Drinking Water

Manitoba Hydro will be contacted for utility upgrades, locations and approvals.

2.8 Public Consultation

The community of Norway House and Norway House Cree Nation welcome this project as it is a needed infrastructure upgrade for the Jack River School. This project will not be met with major concerns regarding the replacement of the WTP.

3.0 Physiographic Setting

Jack River School is located in the community of Norway House, which is located on the east channel of the Nelson River, 29km north of Lake Winnipeg. The longitudinal and latitudinal coordinates of Norway House are 53° N, and 97° W. It is accessed by PR # 373, which acts as an all season road connecting Norway House to Jenpeg hydroelectric station. The population of Norway House Cree Nation as of the 2011 census data is 4,758. The population of Norway House non-treaty community as of the 2006 census data is 521. (Statistics Canada, 2012)

3.1 Climate

Norway House is located in the High Boreal Eco-climatic Region in Manitoba. It has short cool summers and long cold winters. Based on Environment Canada data the average mean temperature of Norway House from 1971-2000 is -1.0 ^{0}C, with below zero average temperature from November to April. The average growing season in Norway House is about 160 days, with the growing degree days being around 1400. (Smith, et al., 1998) The mean annual precipitation recorded for Norway House is 522.7mm, with the majority of precipitation coming in the months of June to August. The climate data for Norway House is drawn from the climate station located in the community. (Environment Canada, 2014) A summary of historical average temperatures are displayed in Table 3.

Table 3. Environment Canada Historical Weather Data for Norway House, Manitoba

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
													Average
Temperature:													
Daily Average (°C)	-22.4	-17.9	-10.5	-0.2	8.2	14	17.6	16	9.2	2.1	-8.9	-18.9	-1
Daily Maximum (°C)	-16.7	-11.6	-3.8	6.1	14.4	20	23.3	21.6	14.3	6.2	-4.7	-13.8	4.6
Daily Minimum (°C)	-28	-24.1	-17.2	-6.4	2.1	8.1	11.8	10.3	4.1	-1.9	-13.1	-24	-6.5
													Total
Precipitation													
Precipitation (mm)	22.2	22.4	26	22.5	45.4	68.7	76	74.6	56.9	46.3	32.4	29.5	522.7

3.2 Physiography

The area of Norway House contains three physiographic features. These features are, undulating peat-covered clayey glaciolacustrine, hummocky granite outcrops, and sandy glacial till. The peatlands in this area consist of bogs and fens. The permafrost in this area is only present in the peatlands. Due to diminishing permafrost the bogs and fens within the peatlands are known to collapse.

The elevation of Norway House is 221 metres above sea level (masl). The drainage of the Norway House region is northeastward at a rate of 0.5m per km. (Smith, et al., 1998) The local relief in this area is provided by a few rocky highs along rivers and lake shorelines, these can range from a few metres to 20m.

3.3 Wildlife Habitat and Vegetation

The terrestrial ecosystem in the area around Norway House is consistent with black spruce, jack pine, and paper birch in drier areas. In the moister soils alongside rivers and lakes white spruce, balsam fir, and aspen are more dominant. Understory species in this area are feather moss, rock cranberry, blueberry, Labrador tea, and lichen. Soils in this ecozone are typically thin, cool, acidic, and have low nutrient availability. Wet, oxygen poor, organic soils underlie wetland areas. (Smith et al. 1998; Environment Canada) This area contains peatlands, which consist of deep horizontal fens and patterned fens. The peatlands face sporadic permafrost due to their thermokarst nature. This has caused this area to appear hummocky. The mammals that live in this region include wolf, lynx, otter, marten, beaver, moose, black bear, woodland caribou, snowshoe hare, red squirrel, short-tailed weasel, red-backed vole, and chipmunks. The avian species that live in this area include spruce grouse, sharp-tailed grouse, willow ptarmigan,

common nighthawk, raven, gray jay, bald eagle, hawk owl, and numerous migratory waterfowl species.

3.4 Hydrology

The Nelson River east channel, Jack River, and Opitanow channel flow through the community of Norway House. The lakes in the area of Norway House are Playgreen Lake to the south, and Little Playgreen Lake to the north. The proposed site is located on the shoreline of Jack River, adjacent to Norway House Cree Nation.

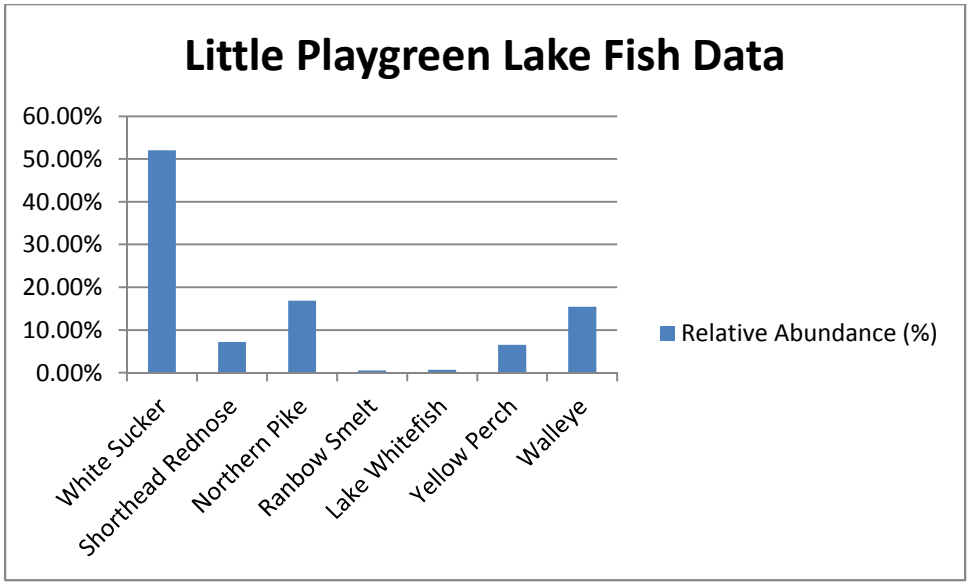
3.5 Fish and Fish Habitat

Potential fish habitat for the project area includes Jack River and to a lesser extent Little Playgreen Lake.

3.6 Fish Species

The fish species within Jack River and Little Playgreen Lake are White Sucker, Shorthead Redhorse, Northern Pike, Ranbow Smelt, Lake Whitefish, Yellow Perch, and Walleye. The relative abundance of species for Little Playgreen Lake is provided in Figure 2. Data regarding relative abundance for Jack River does not exist therefore only information regarding Little Playgreen Lake is provided.

Figure 2. Little Playgreen Lake Fish Data



3.7 Benthic Invertebrates

The mean number of invertebrates on Little Playgreen Lake was 7816 per kicknet. Of these invertebrates, 4941 were non-insecta, and 2875 were insect. These numbers are reflective of near shore sampling in 2010. In these samples the following phyla were found; Oligochaeta, Amphipoda, Gastropoda, Chironomidae, Ephemeroptera, and Trichptera. The relative abundance of these samples is reflected in Figure 3. The mean Simpsons diversity index for near shore invertebrates is 0.78, and the evenness index of 0.27. The mean number of invertebrates per m^2 offshore on Little Playgreen Lake was 3916. In these samples the following phyla were found; Amphipoda, Bivalvia, Gastropoda, Chironomidae, Ephemeroptrea, and Trichoptera. The relative abundance of these samples is reflected in Figure 4. The mean Simpson's diversity index for offshore invertebrates is 0.55, and the evenness index is 0.2.

Figure 3. Benthic Invertebrates (Near Shore)

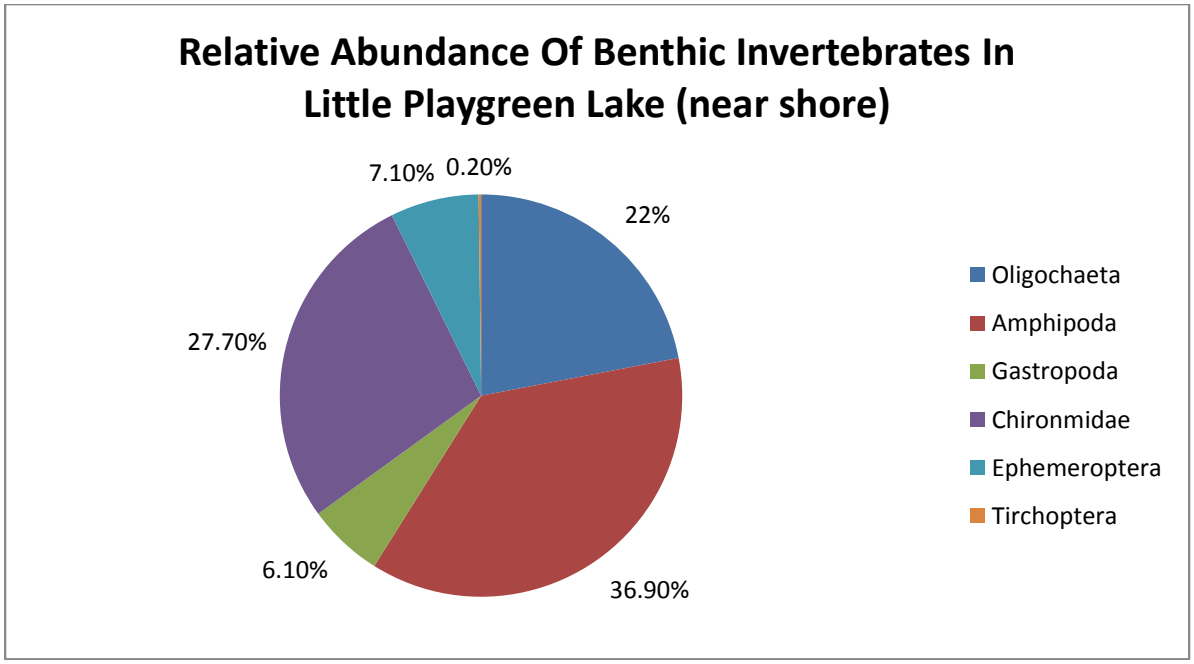
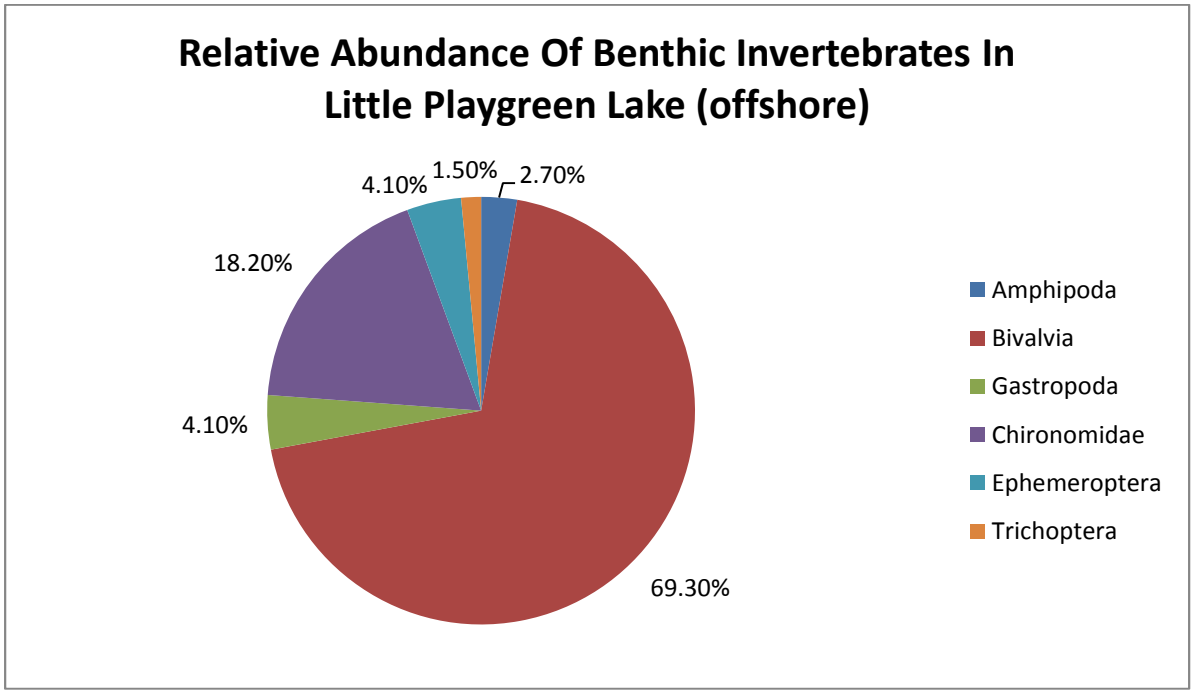


Figure 4. Benthic Invertebrates (offshore)



3.8 Socio-economic environment.

3.8.1 Economy

Due to the granite based terrain and little soil profile, Norway House has limited economic opportunities available. Some opportunities that exist are: commercial fishing, trapping, wild rice harvesting, and service based business. The commercial fishing industry is persistent throughout the year, with fish stations located at Playgreen Point and Tait Island. The trapping industry exists in the Norway House Registered Trap Line Zone, and offers financial opportunity for the local community. The harvesting of wild rice exists east of Norway House in shallow lakebeds, and offer traditional food sources and economic opportunity for local residents. As Norway House is a northern regional centre it offers many services like transportation, accommodations, and services for local residents. The largest service employer in this area is Frontier School Division up to 200 local jobs.

3.8.2 Land and Resource Use

The land use for Norway House is very limited due to a short growing season of about 160 days, and poor soil structure and low soil temperatures. (Smith 1998 et. al) The land and resource uses that exist are forestry, commercial and sport fishing, trapping, agriculture. The market for forestry in Norway House is limited due to regular forest fires, and slow growing seasons. Commercial fishing takes place in the Norway House region, with fish stations located at Playgreen Point, and Tait Island. Trapping occurs in the Norway House Registered Trapline Zone. Shallow lakebeds located east of Norway House are used for growing and harvesting wild rice.

3.8.3 Community Life

Norway House consists of two communities, Norway House Cree Nation (NHCN), and the non-treaty community located adjacent to NHCN. The community of Norway House has two schools operated by Frontier School Division. These schools are Jack River School and Helen Betty Osborne School. Both schools are not separated by treaty and non-treaty status. The recreational facilities that exist in Norway House are the Fort Island Arena, base-ball field, and a playground. These facilities are open to both the non-treaty and treaty communities of Norway House. Norway House also has a community gardening program that encourages homeowners to grow gardens on their property as a way to promote healthy living. The annual events that Norway House hosts are a Fishing Derby in March, and York Boat Days in August.

4.0 Environmental Effects

4.1 Air Quality

During the projects construction phase there is a possibility dust will be raised, and there will be gaseous particulate emissions through operation of construction equipment. To mitigate the raised dust, water spraying will be applied as necessary to alleviate potential dust concerns. Emissions of gases and particulates will be mitigated through ensuring construction equipment is in good working order. The effects will be local, and only persist during the construction phase. The effects will be insignificant to the existing land.

4.2 Soil

During the projects construction phase there is a risk of fuel or lubricant spills from the construction equipment. To lower the risk associated with this project, storage of fuel and lubricants will take place at a location away from the water supply. By storing fuel and lubricants away from the water the risk of contamination is minimized. If any fuel or lubricants are spilled standard construction spill clean-up procedures will take place. This includes removal of impacted soil, as to prevent further impacts to the site.

There is possibility of soil erosion during the construction phase due to the removal of vegetation by equipment operations. By re-introducing vegetation to the exposed soil the risk of soil erosion will be minimized.

During the operation of the project, regular maintenance and monitoring will take place to realize any malfunctions as they occur. By proper maintenance and monitoring any risk of malfunction can be averted.

4.3 Surface Water, Fish and Fish Habitat

Minor and short term impacts on surface water may occur as a result of construction activity on the WTP during runoff events. The impact of surface water would include sediment that maybe erodes from the construction site, potential leaks from construction equipment, and fuel spills. Impacts to fisheries and fish habitat are considered minor.

Potential fish and fish habitat effects may occur as a result of a new raw water intake being constructed. These effects are considered minor due to the raw water intake components only being replaced.

During the operation of the WTP water reject from the filtration system will be drained into Jack River. This water will be more concentrated then the surrounding surface water. Impacts that result from the drainage of water reject from the filtration system into surface water are considered minor.

4.4 Water Quality

During the projects construction phase the surface water can be impacted by surface and subsurface construction activities. Mitigation measures are necessary to protect water quality during construction activities. These activities are unlikely to result in adverse changes in water quality after the project is complete.

4.5 Vegetation

Construction of the project will occur on previously disturbed land as the project is a replacement of an old facility. The disturbed area will consist mainly of grass, and is unlikely to contain any rare plant species. The amount of disturbance is expected to be minimal.

4.6 Wildlife Habitat

During the projects construction and operation only areas that were previously developed are utilized. This is due to the project being a replacement of existing facilities. The potential for adverse effects to wildlife habitat of loss of wildlife habitat is expected to be negligible.

4.7 Noise and Vibration

During the projects construction phase there will be several sources of noise and vibrations caused by the construction equipment. These noises are considered to be a short term impact,

and will persist only through the construction phase. There will also be an increase in noise by vehicles coming to the project site, but this is considered to be minor.

To mitigate the level of noise and vibrations from the construction equipment scheduling of site activities can take place. This would include limiting construction to day-time hours to avoid disturbances to people in the vicinity of the project site.

4.8 Employment and Economy

There are no socio-economic impacts expected as a result of any environmental impacts. Economic implications will not exist for the community of Norway House as the funding for the project will not come directly from the community. It is expected that there may be some local economic benefit during the construction phase.

The potential effects from the proposed project on employment and local economy are expected to be positive.

4.9 Human Health and Well Being

During the projects construction phase the potential human health concerns include potential accidents, equipment malfunction, noise, and dust. These concerns will be mitigated by ensuring equipment is in proper working order, and all safety precautions take place.

The operation of the project has a positive effect as Jack River School will have a water treatment plant and water distribution system that will meet current drinking water quality standards.

4.10 Climate Change

This project will have no predicted impacts to the climate.

5.0 Environmental Mitigation Measures

Environmental practices proposed to prevent or mitigate environmental effects that were deemed adverse are identified and described in this section.

5.1 Air Quality

Impacts resulting from raised dust may be mitigated by spraying down dry gravel, limiting construction during periods of high winds, and restoring vegetation to exposed soil as soon as possible.

Impacts resulting from emissions may be mitigated by ensuring equipment is well maintained, and reducing the idling of vehicles.

5.2 Soil

Impacts resulting from contamination of soil from petroleum products include devising a response plan to manage potential spills, ensuring maintained equipment, using appropriate methods for transport of petroleum products, and the use of spill clean-up equipment materials.

Impacts resulting from soil erosion will be minimized by quickly establishing re-growth of any vegetation removed rom the construction site. Once vegetation covers the exposed soil the risk of soil erosion will be extinguished with regards to the project.

5.3 Surface Water

The potent impacts from surface runoff will be minimized by ensuring all mechanical equipment is in good working order, ground burden from the excavation site is located away from the watercourse, and use of spill clean-up equipment is used in the event of a fuel spill. A setback of 100-m from any watercourses will be undertaken for fuelling activities to ensure no contamination as a result of surface runoff. To prevent surface runoff post construction, re-establishment of vegetation in disturbed areas will take place as soon as possible.

An emergency response plan can be implemented in the event of a significant spill. In the event of a significant spill, Manitoba Conservation and Water Stewardship will be notified by their emergency response line. Appropriate measures will be taken in accordance with Manitoba Conservation and Water Stewardship requirements.

5.4 Vegetation and Wildlife Habitat

Impacts resulting from removed vegetation and effects to habitat will be rectified by re-vegetating disturbed areas as soon as possible. These impacts will be low due to this project being a replacement of an existing facility.

5.5 Fisheries

Mitigation measures to prevent impacts to fish and fish habitat will be achieved through measures discussed in sections 5.2 and 5.3. Measures to avoid impacts on fisheries include provision for a new fish screens on the raw water intake. The fish screen size will be in accordance with the guidelines set forth by the Federal Department of Fisheries and Oceans.

5.6 Noise and Vibration

Impacts resulting from noise and vibrations will be mitigated by scheduling construction activities to normal working hours, ensuring regular maintenance of construction equipment, and limiting idling of vehicles to decrease noise and vibrational effects.

5.7 Water Conservation

Water conservation measures will include regular maintenance and monitoring of the WTP to ensure there are no leaks in the system. A recommendation is provided to Frontier School Division to install water conserving plumbing fixtures in the school as well as the teacherages when existing fixture replacement is required.

References

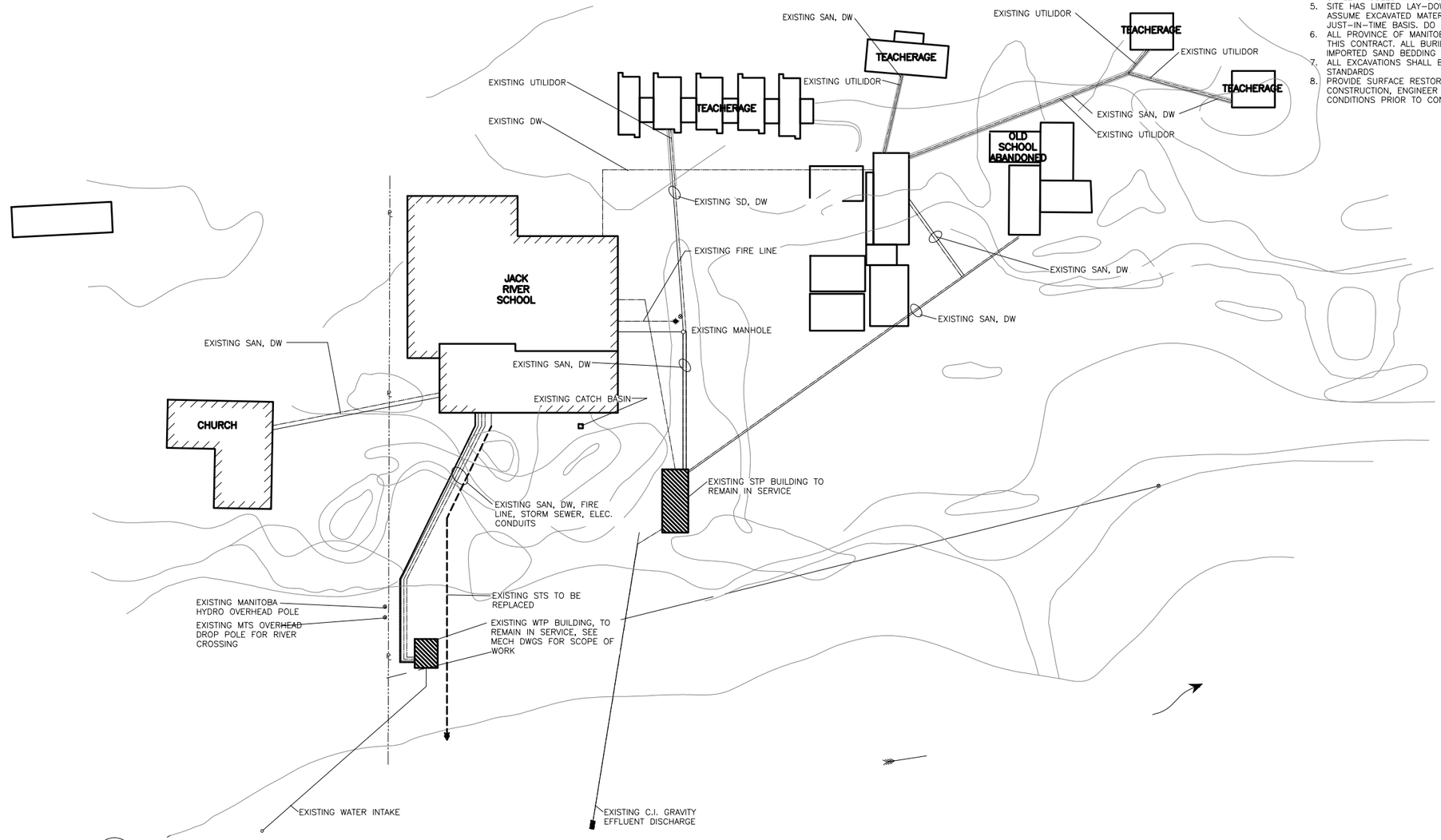
Environment Canada. (2014, February 13). *Norway House Climate Station*. Retrieved from Climate Data: http://climate.weather.gc.ca/climateData/monthlydata_e.html?timeframe=3&Prov=MAN&StationID=3868&mlyRange=1973-01-01|2005-09-01&Year=2000&Month=1&Day=1

Smith, R., Velghuis, H., Mills, G., Eilers, R., Fraser, W., & Lelyk, G. (1998). *Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba An Ecological Stratification of Manitoba's Natural Landscapes.* Winnipeg: Agriculture and Agri-Food Canada.

Statistics Canada. (2012, October 24). *Norway House 17, Manitoba*. Retrieved from Census Profile: http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=4622058&Geo2=PR&Code2=11&Data=Count&SearchText=&SearchType=Begins&SearchPR=01&B1=All&Custom=&TABID=1

Appendix

- Site Plans,
- Preliminary Building & Equipment General Arrangements
- Raw Water Quality Data
- Title Certificate



A — SITE PLAN – EXISTING CONDITIONS

SCALE 1:500 559x864 A1 SHEET
SCALE 1:1000 279x434 B1SHEET

GENERAL NOTES:

1. CO–ORDINATE ALL WORKS WITH JACK RIVER WTP & STP STAFF STAFF TO ENSURE CONTINUITY OF OPERATIONS.
2. PROVIDE SCHEDULE OF TIE–INS MINIMUM OF 2 WEEKS PRIOR TO PERFORMING THESE WORKS. CO–ORDINATE WITH WTP & STP STAFF. FINAL DECISION ON TIE–IN SCHEDULES RESTS SOLELY WITH THE STAFF.
3. MAINTAIN TRUCK ACCESS TO SITE, AS INSTRUCTED BY STAFF
4. UNDERGROUND STRUCTURES AS INDICATED ON DRAWINGS ARE BASED ON BEST AVAILABLE FILE INFORMATION. THE ACCURACY OF THIS INFORMATION CANNOT BE GUARANTEED. ALL EXCAVATIONS SHALL PROCEED WITH CAUTION. OBTAIN ALL REQUIRED UTILITY CLEARANCES.
5. SITE HAS LIMITED LAY–DOWN AREA FOR PIPE, BEDDING & BACKFILL & EXCAVATED MATERIALS. ASSUME EXCAVATED MATERIALS REQUIRE OFF–SITE DISPOSAL. SUPPLY MATERIALS TO SITE ON A JUST–IN–TIME BASIS. DO NOT UNNECESSARILY ENCUMBER SITE
6. ALL PROVINCE OF MANITOBA STANDARD CONSTRUCTION SPECIFICATIONS APPLY TO THE WORKS OF THIS CONTRACT. ALL BURIED PIPE INSTALLATION SHALL PROCEED ON THE BASIS OF CLASS B IMPORTED SAND BEDDING & GRANULAR BACKFILL.
7. ALL EXCAVATIONS SHALL BE PERFORMED IN ACCORDANCE TO PROVINCE OF MANITOBA CONSTRUCTION STANDARDS
8. PROVIDE SURFACE RESTORATION TO ALL AREAS AFFECTED BY CONSTRUCTION. PRIOR TO CONSTRUCTION, ENGINEER AND CONTRACTOR TOGETHER SHALL COMPILE A PHOTOCOPY RECORD OF CONDITIONS PRIOR TO CONSTRUCTION.

REFERENCE DRAWINGS:

WATER TREATMENT PLANT SITE PLAN & OUTSIDE SERVICES, DWG. NO. 73016–07–G1 REV1, WARDROP ENGINEERING, DEC. 1973

0m 5m 10m 15m 20m
SCALE 1:500
0m 10m 20m 30m 40m
SCALE 1:1000

APEGM Certificate of Authorization
Alliance Engineering Services Inc.
No.2906 Date: _____

REV	DESCRIPTION	Date	APPROVED
C	ISSUED FOR ENVIRONMENTAL APPROVAL	2014/05/06	AFG
B	ISSUED FOR FINAL REPPORT	2014/01/17	AFG
A	COMMENTS ISSUE SCOPE STUDY	2013/12/11	AFG

REVISIONS

EXISTING	LEGEND – PLAN	PROPOSED	EXISTING	LEGEND – PLAN	PROPOSED	EXISTING	LEGEND – PROFILE	PROPOSED	EXISTING	LEGEND – PROFILE	PROPOSED
150 W.M.	WATERMAIN	150 W.M.		HYDRO		150 XSL	WATERMAIN	150 XSL		NORTH OR WEST DITCH	
	HYDRANT			M.T.S.			HYDRANT , VALVE			SOUTH OR EAST DITCH	
	VALVE			TELEGRAPH			STORM SEWER				
	VALVE PIT			TRAFFIC SIGNAL			DOMESTIC SEWER				
	STORM SEWER			CURB		×	℄ PROFILE				
	DOMESTIC SEWER			SIDEWALK			NORTH OR WEST GUTTER				
	MANHOLE			EDGE OF PAVEMENT			SOUTH OR EAST GUTTER				
	CATCH BASIN			PROPERTY LINE			NORTH OR WEST SWK.				
	CULVERT			DITCH			SOUTH OR EAST SWK.				
	GAS			SURVEY BAR			NORTH OR WEST ℄				
			386.123	ELEVATION	386.123		SOUTH OR EAST ℄				

NOTE:–
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE AT THIS TIME, BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

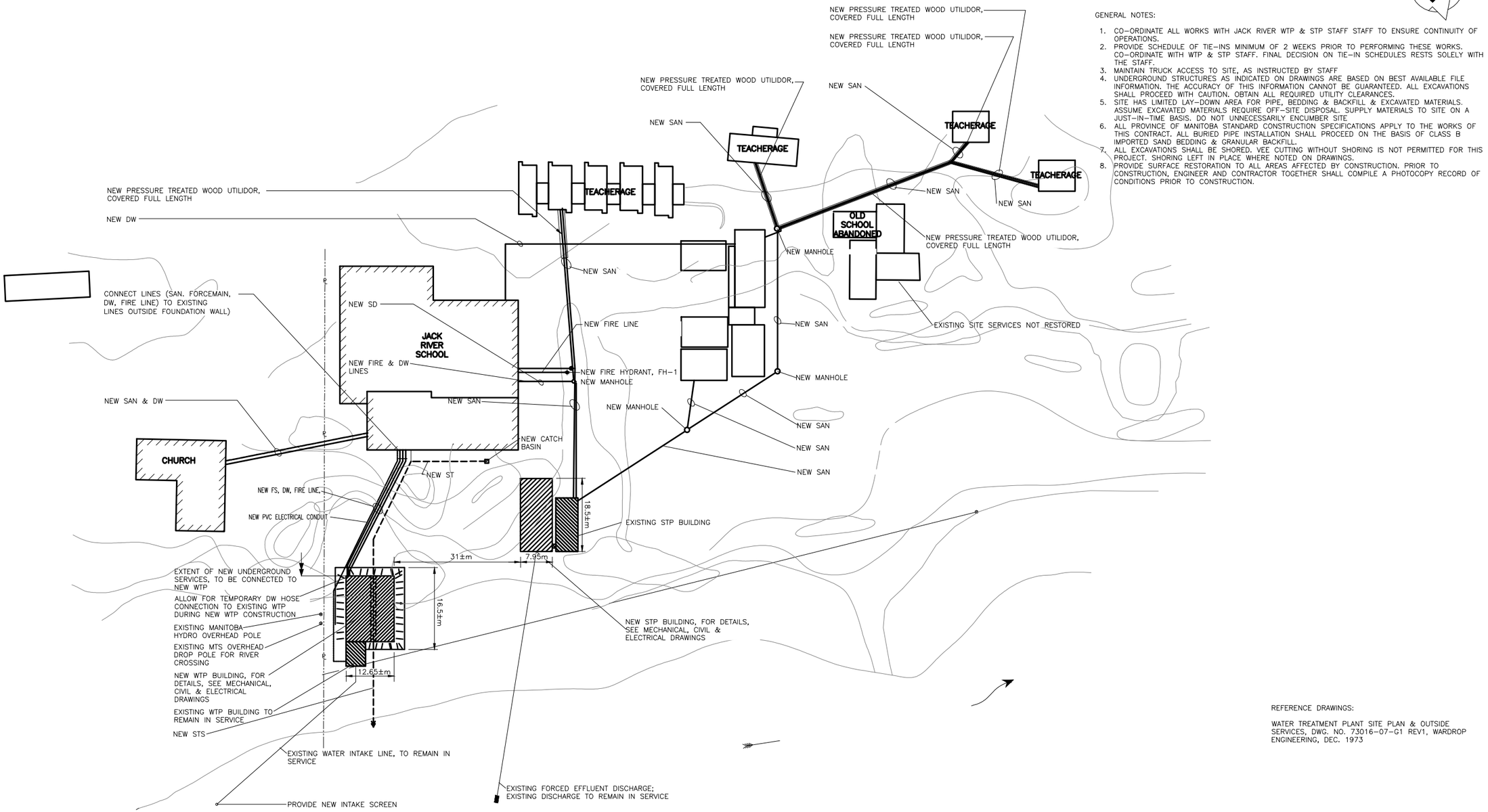
B.M.
ELEV.

Alliance ENGINEERING SERVICES INC

FRONTIER SCHOOL DIVISION

JACK RIVER SCHOOL – NORWAY HOUSE
SITE PLAN
EXISTING CONDITIONS

Design	Checked	SIZE	FSCM NO.	DWG NO.	REV
Drawn	Approved			SITE1	C
		Scale		Sheet 1 of 1	



GENERAL NOTES:

1. CO-ORDINATE ALL WORKS WITH JACK RIVER WTP & STP STAFF STAFF TO ENSURE CONTINUITY OF OPERATIONS.
2. PROVIDE SCHEDULE OF TIE-INS MINIMUM OF 2 WEEKS PRIOR TO PERFORMING THESE WORKS. CO-ORDINATE WITH WTP & STP STAFF. FINAL DECISION ON TIE-IN SCHEDULES RESTS SOLELY WITH THE STAFF.
3. MAINTAIN TRUCK ACCESS TO SITE, AS INSTRUCTED BY STAFF
4. UNDERGROUND STRUCTURES AS INDICATED ON DRAWINGS ARE BASED ON BEST AVAILABLE FILE INFORMATION. THE ACCURACY OF THIS INFORMATION CANNOT BE GUARANTEED. ALL EXCAVATIONS SHALL PROCEED WITH CAUTION. OBTAIN ALL REQUIRED UTILITY CLEARANCES.
5. SITE HAS LIMITED LAY-DOWN AREA FOR PIPE, BEDDING & BACKFILL & EXCAVATED MATERIALS. ASSUME EXCAVATED MATERIALS REQUIRE OFF-SITE DISPOSAL. SUPPLY MATERIALS TO SITE ON A JUST-IN-TIME BASIS. DO NOT UNNECESSARILY ENCUMBER SITE
6. ALL PROVINCE OF MANITOBA STANDARD CONSTRUCTION SPECIFICATIONS APPLY TO THE WORKS OF THIS CONTRACT. ALL BURIED PIPE INSTALLATION SHALL PROCEED ON THE BASIS OF CLASS B IMPORTED SAND BEDDING & GRANULAR BACKFILL.
7. ALL EXCAVATIONS SHALL BE SHORED. VEE CUTTING WITHOUT SHORING IS NOT PERMITTED FOR THIS PROJECT. SHORING LEFT IN PLACE WHERE NOTED ON DRAWINGS.
8. PROVIDE SURFACE RESTORATION TO ALL AREAS AFFECTED BY CONSTRUCTION. PRIOR TO CONSTRUCTION, ENGINEER AND CONTRACTOR TOGETHER SHALL COMPILE A PHOTOCOPY RECORD OF CONDITIONS PRIOR TO CONSTRUCTION.

REFERENCE DRAWINGS:

WATER TREATMENT PLANT SITE PLAN & OUTSIDE SERVICES, DWG. NO. 73016-07-G1 REV1, WARDROP ENGINEERING, DEC. 1973

A — SITE PLAN – NEW CONDITIONS

SCALE 1:500 559x864 A1 SHEET
SCALE 1:1000 279x434 B1SHEET

0m 5m 10m 15m 20m
SCALE 1:500

0m 10m 20m 30m 40m
SCALE 1:1000

APEGM Certificate of Authorization
Alliance Engineering Services Inc.
No.2906 Date: _____

REV	DESCRIPTION	Date	APPROVED
C	ISSUED FOR ENVIRONMENTAL APPROVAL	2014/05/06	AFG
B	ISSUED FOR FINAL REPPORT	2014/01/17	AFG
A	COMMENTS ISSUE SCOPE STUDY	2013/12/11	AFG

REVISIONS

EXISTING	LEGEND – PLAN	PROPOSED	EXISTING	LEGEND – PLAN	PROPOSED	EXISTING	LEGEND – PROFILE	PROPOSED	EXISTING	LEGEND – PROFILE	PROPOSED
150 W.M.	WATERMAIN	150 W.M.		HYDRO		150 W.M.	WATERMAIN	150 W.M.		NORTH OR WEST DITCH	
	HYDRANT			M.T.S.			HYDRANT , VALVE			SOUTH OR EAST DITCH	
	VALVE			TELEGRAPH			STORM SEWER				
Ovh.	VALVE PIT			TRAFFIC SIGNAL			DOMESTIC SEWER				
	STORM SEWER			CURB		×	℄ PROFILE				
	DOMESTIC SEWER			SIDEWALK			NORTH OR WEST GUTTER				
	MANHOLE			EDGE OF PAVEMENT			SOUTH OR EAST GUTTER				
	CATCH BASIN			PROPERTY LINE			NORTH OR WEST SWK.				
	CULVERT			DITCH			SOUTH OR EAST SWK.				
	GAS			SURVEY BAR			NORTH OR WEST ℄				
			396.123	ELEVATION	384.123		SOUTH OR EAST ℄				

NOTE:-
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE AT THIS TIME, BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

B.M.
ELEV.

APEGM Certificate of Authorization
Alliance Engineering Services Inc.
No.2906 Date: _____

Alliance ENGINEERING SERVICES INC

FRONTIER SCHOOL DIVISION

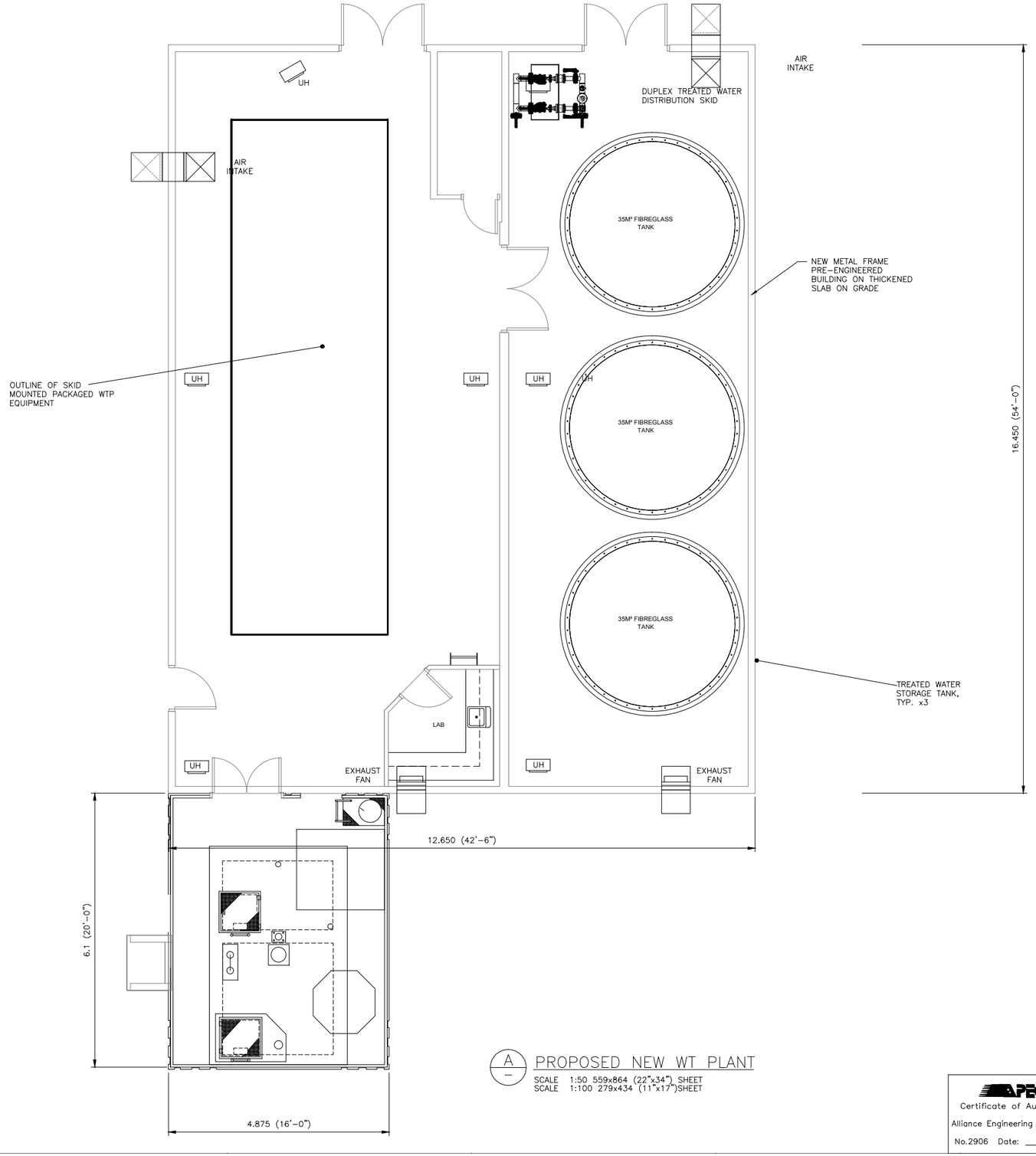
JACK RIVER SCHOOL – NORWAY HOUSE
SITE PLAN – NEW WORKS
NEW CONDITIONS

Design	Checked
Drawn	Approved

SIZE	FSCM NO.	DWG NO.	REV
		SITE2	C

Scale | Sheet 1 of 1

REVISIONS			
REV	DESCRIPTION	Date	APPROVED
A	COMMENTS ISSUE SCOPE STUDY	13/12/11	AFG
B	ISSUED FOR FINAL REPORT	14/01/17	AFG
C	ISSUED FOR FOR ENVIRONMENTAL APPROVAL	14/05/08	AFG



A — PROPOSED NEW WT PLANT

SCALE 1:50 559x864 (22"x34") SHEET
SCALE 1:100 279x434 (11"x17")SHEET

EXISTING WTP SCOPE

1. REMOVE EXIISTING WTP EQUIPMENT
2. INSTALL NEW FIRE PUMP & RELATING PIPING
3. RECLAD EXISTING BUILDING WITH NEW INSULATED METAL CLADDING
4. NEW DUPLEX RAW WATER PUMPS & PIPING TO NEW WTP

APEGM Certificate of Authorization
Alliance Engineering Services Inc.
No.2906 Date: _____

Alliance ENGINEERING SERVICES INC

Design | Checked
Drawn | Approved

FRONTIER SCHOOL DIVISION

JACK RIVER SCHOOL – NORWAY HOUSE
NEW WATER TREATMENT PLAN
PROPOSED CONDITIONS

SIZE	FSCM NO.	DWG NO.	REV
		M5	C

Scale | Sheet 1 of 1

Alliance Engineering Services
ATTN: ART GOSSEN
1035 Logan Avenue
Winnipeg MB R3E 1P6

Date Received: 21-JAN-14
Report Date: 27-JAN-14 08:13 (MT)
Version: FINAL

Client Phone: 204-774-7859

Certificate of Analysis

Lab Work Order #: L1413891

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Paul Nicolas
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1413891-1 SAMPLE							
Sampled By: Edgar Throop							
Matrix: water							
MB Conservation test 72D							
Alkalinity							
Alkalinity, Total (as CaCO3)	144		20	mg/L		22-JAN-14	R2777724
Bicarbonate (HCO3)	175		24	mg/L		22-JAN-14	R2777724
Carbonate (CO3)	<12		12	mg/L		22-JAN-14	R2777724
Hydroxide (OH)	<6.8		6.8	mg/L		22-JAN-14	R2777724
Ammonia by colour							
Ammonia, Total (as N)	0.018		0.010	mg/L		22-JAN-14	R2778287
Carbons							
Total Carbon	39.8		1.0	mg/L		22-JAN-14	R2778217
Total Inorganic Carbon	30.9		1.0	mg/L		22-JAN-14	R2778217
Total Organic Carbon	8.9		1.0	mg/L		22-JAN-14	R2778217
Chloride by Ion Chromatography							
Chloride	28.3		0.50	mg/L		21-JAN-14	R2778025
Colour, True							
Colour, True	13.5		5.0	CU		24-JAN-14	R2779503
Conductivity							
Conductivity	422		20	umhos/cm		22-JAN-14	R2777724
Fluoride by Ion Chromatography							
Fluoride	<0.10		0.10	mg/L		21-JAN-14	R2778025
Hardness Calculated							
Hardness (as CaCO3)	166		0.30	mg/L		23-JAN-14	
Ion Balance Calculation							
Cation - Anion Balance	-0.6			%		23-JAN-14	
Anion Sum	4.67			me/L		23-JAN-14	
Cation Sum	4.62			me/L		23-JAN-14	
Langelier Index 4C							
Langelier Index (4 C)	-0.13					23-JAN-14	
Langelier Index 60C							
Langelier Index (60 C)	0.64					23-JAN-14	
Nitrate as N by Ion Chromatography							
Nitrate-N	0.127		0.050	mg/L		21-JAN-14	R2778025
Nitrate+Nitrite							
Nitrate and Nitrite as N	0.127		0.071	mg/L		23-JAN-14	
Nitrite as N by Ion Chromatography							
Nitrite-N	<0.050		0.050	mg/L		21-JAN-14	R2778025
Sulfate by Ion Chromatography							
Sulfate	48.0		0.50	mg/L		21-JAN-14	R2778025
Total Dissolved Solids							
Total Dissolved Solids	254		5.0	mg/L		22-JAN-14	R2778265
Total Kjeldahl Nitrogen							
Total Kjeldahl Nitrogen	0.52		0.20	mg/L	22-JAN-14	23-JAN-14	R2778340
Total Metals by ICP-MS							
Aluminum (Al)-Total	0.365		0.0050	mg/L	22-JAN-14	22-JAN-14	R2778123
Antimony (Sb)-Total	<0.00020		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Arsenic (As)-Total	0.00152		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Barium (Ba)-Total	0.0441		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Beryllium (Be)-Total	<0.00020		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Bismuth (Bi)-Total	<0.00020		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Boron (B)-Total	0.032		0.010	mg/L	22-JAN-14	22-JAN-14	R2778123
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	22-JAN-14	22-JAN-14	R2778123
Calcium (Ca)-Total	38.9		0.10	mg/L	22-JAN-14	22-JAN-14	R2778123

* 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
L1413891-1 SAMPLE							
Sampled By: Edgar Throop							
Matrix: water							
Total Metals by ICP-MS							
Cesium (Cs)-Total	<0.00010		0.00010	mg/L	22-JAN-14	22-JAN-14	R2778123
Chromium (Cr)-Total	<0.0010		0.0010	mg/L	22-JAN-14	22-JAN-14	R2778123
Cobalt (Co)-Total	<0.00020		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Copper (Cu)-Total	0.00403		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Iron (Fe)-Total	0.22		0.10	mg/L	22-JAN-14	22-JAN-14	R2778123
Lead (Pb)-Total	0.000285		0.000090	mg/L	22-JAN-14	22-JAN-14	R2778123
Lithium (Li)-Total	0.0138		0.0020	mg/L	22-JAN-14	22-JAN-14	R2778123
Magnesium (Mg)-Total	16.7		0.010	mg/L	22-JAN-14	22-JAN-14	R2778123
Manganese (Mn)-Total	0.0110		0.00030	mg/L	22-JAN-14	22-JAN-14	R2778123
Molybdenum (Mo)-Total	0.00091		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Nickel (Ni)-Total	<0.0020		0.0020	mg/L	22-JAN-14	22-JAN-14	R2778123
Phosphorus (P)-Total	<0.20		0.20	mg/L	22-JAN-14	22-JAN-14	R2778123
Potassium (K)-Total	3.82		0.020	mg/L	22-JAN-14	22-JAN-14	R2778123
Rubidium (Rb)-Total	0.00208		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Selenium (Se)-Total	<0.0010		0.0010	mg/L	22-JAN-14	22-JAN-14	R2778123
Silicon (Si)-Total	2.49		0.10	mg/L	22-JAN-14	22-JAN-14	R2778123
Silver (Ag)-Total	<0.00010		0.00010	mg/L	22-JAN-14	22-JAN-14	R2778123
Sodium (Na)-Total	27.6		0.030	mg/L	22-JAN-14	22-JAN-14	R2778123
Strontium (Sr)-Total	0.156		0.00010	mg/L	22-JAN-14	22-JAN-14	R2778123
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Thallium (Tl)-Total	<0.00010		0.00010	mg/L	22-JAN-14	22-JAN-14	R2778123
Thorium (Th)-Total	<0.00010		0.00010	mg/L	22-JAN-14	22-JAN-14	R2778123
Tin (Sn)-Total	<0.00020		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Titanium (Ti)-Total	0.0119		0.00050	mg/L	22-JAN-14	22-JAN-14	R2778123
Tungsten (W)-Total	<0.0010		0.0010	mg/L	22-JAN-14	22-JAN-14	R2778123
Uranium (U)-Total	0.00110		0.00010	mg/L	22-JAN-14	22-JAN-14	R2778123
Vanadium (V)-Total	0.00135		0.00020	mg/L	22-JAN-14	22-JAN-14	R2778123
Zinc (Zn)-Total	0.0207		0.0050	mg/L	22-JAN-14	22-JAN-14	R2778123
Zirconium (Zr)-Total	<0.00040		0.00040	mg/L	22-JAN-14	22-JAN-14	R2778123
Transmittance, UV (254 nm)							
Transmittance, UV (254 nm)	58.3		1.0	% T	23-JAN-14	23-JAN-14	R2778486
Turbidity							
Turbidity	5.60		0.10	NTU		21-JAN-14	R2777603
pH							
pH	7.78		0.10	pH units		22-JAN-14	R2777724

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

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-WP	Water	Alkalinity	APHA 2320B

Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. It is determined by titration with a standard solution of strong mineral acid to the successive HCO3- and H2CO3 endpoints indicated electrometrically.

C-TC,TIC,TOC-WP	Water	Carbons	APHA 5310 B-INSTRUMENTAL

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-WP	Water	Chloride by Ion Chromatography	EPA 300.1 (modified)

Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.

COLOUR-TRUE-WP	Water	Colour, True	APHA 2120C

True colour in water is analyzed by discrete analyzer using the platinum-cobalt colourimetric method. Colour is pH dependant; unless otherwise indicated, reported colour results pertain to the pH of the sample as received to within +/- 1 pH unit.

EC-WP	Water	Conductivity	APHA 2510B

Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.

ETL-HARDNESS-TOT-WP	Water	Hardness Calculated	HARDNESS CALCULATED
ETL-LANGELIER-4-WP	Water	Langelier Index 4C	Calculated
ETL-LANGELIER-60-WP	Water	Langelier Index 60C	Calculated
F-IC-WP	Water	Fluoride by Ion Chromatography	EPA 300.1 (modified)

Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.

IONBALANCE-CALC-WP	Water	Ion Balance Calculation	APHA 1030E
MET-T-L-MS-WP	Water	Total Metals by ICP-MS	U.S. EPA 200.8-TL

Total Metals by ICP-MS: This analysis is carried out using sample preparation procedures adapted from Standard Methods for the examination of Water and Wastewater Method 3030E and analytical procedures adapted from U.S EPA Method 200.8 for analyis of metals by inductively coupled-mass spectrometery.

N-TOTKJ-WP	Water	Total Kjeldahl Nitrogen	Quickchem method 10-107-06-2-E Lachat

Samples are digested with a sulphuric acid solution, cooled, diluted with water, and analyzed for ammonia. Total Kjeldahl nitrogen is the sum of free-ammonia and organic nitrogen compounds which are converted to ammonium sulphate through this digestion process. Analysis is performed by Flow Injection
Analysis (FIA). The pH of the digested sample is raised to a known, basic pH by neutralization with a concentrated buffer solution. This neutralization converts the ammonium cation to ammonia. The ammonia produced is heated with saliclyate and hypochlorite to produce blue colour which is proportional to the ammonia concentration.

NH3-COL-WP	Water	Ammonia by colour	APHA 4500 NH3 F

Ammonia in water samples forms indophenol when reacted with hypochlorite and phenol. The intensity is amplified by the addition of sodium nitroprusside and measured colourmetrically.

NO2+NO3-CALC-WP	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-WP	Water	Nitrite as N by Ion Chromatography	EPA 300.1 (modified)

Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.

NO3-IC-WP	Water	Nitrate as N by Ion Chromatography	EPA 300.1 (modified)

Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
PH-WP	Water	pH	APHA 4500H
The pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.			
SO4-IC-WP	Water	Sulfate by Ion Chromatography	EPA 300.1 (modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
SOLIDS-TDS-WP	Water	Total Dissolved Solids	APHA 2540 C (modified)
Total dissolved solids in aqueous matrices is determined gravimetrically after evaporation of the filtrate at 180°C.			
TRANSM-UV-WT	Water	Transmittance, UV (254 nm)	APHA 5910 B-Spectrophotometer
TURBIDITY-WP	Water	Turbidity	APHA 2130B (modified)
Turbidity in aqueous matrices is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

10- 309726

ALS Environmental

L1413891-COFC

Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

L1413891

Page ___ of ___

Report To		Report Format / Distribution		Service Request: (Rush subject to availability - Contact ALS to confirm TAT)	
Company:	ALLIANCE ENGINEERING SERVICES INC	Standard:	Other (specify): E-MAIL		Regular (Standard Turnaround Times - Business Days)
Contact:	ART GOSSEN	Select: PDF	Excel Digital Fax	✓	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address:	1035 LORAN AVENUE	Email 1:	ART@ALLIANCEENG SERVICES.COM		Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
	WINNIPEG, MB R3E 1P6	Email 2:	edgar.mccoy@frontiersand.ca		Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone:	1-204 774 7859 Fax:				

Invoice To	Same as Report ? (circle) Yes or No (if No, provide details)	Client / Project Information	
	Copy of Invoice with Report? (circle) Yes or No	Job #:	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	

Lab Work Order # (lab use only)		ALS Contact:	Sampler: EDGAR MCCOY

Analysis Request
(Indicate Filtered or Preserved, F/P)

RUSH

Sample #	Sample Identification (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Number of Containers
	GENERAL CHEMISTRY	TOTAL INORGANIC CARBON				
	72 D	TOTAL CARBON				
	CHLORIDE	COLOUR				
	ELECTRIC CONDUCTIVITY	LANGELIER INDEX 4C				
	TOTAL METALS ALUMINUM	LANGELIER INDEX 60				
	NITRITE'S	TOTAL KJELDAHL NITROGEN				
	PH	AMMONIA				
	SULPHATE	TOTAL DISSOLVED SOLIDS				
	ALKALINITY	UV TRANSMITTANCE				
	ION BALANCE					
	TURBIDITY					
	TOTAL ORGANIC CARBON					

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
EDGAR MCCOY	JAN 16/14	8:30AM	SQN	21 JAN 14	10:20	4.1 °C				

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY — GENF 18.01 Front

MANITOBA

Cert. No. 145546

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

THE FRONTIER SCHOOL DIVISION NO. 48

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows,

The most North Easterly Seven Hundred and Fifteen feet in perpendicular width of Lot Sixty-three, in the Settlement of Norway House, in Manitoba, as shown on a Plan registered in the Neepawa Land Titles Office as No. 1259.

SUBJECT TO SPECIAL RESERVATIONS AS TO MINES, MINERALS AND OTHER MATTERS AS PARTICULARLY DEFINED IN THE ORIGINAL GRANT OF SAID LAND FROM THE CROWN.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Thirteenth day of May One thousand nine hundred and SEVENTY.

Signed in the presence of

DEPUTY District Registrar

for Neepawa, Man.

(FACT)

September 1973

at 9:46

No. 6624

Mortgage for $	The day of 19 at	TO	No.
Mortgage for $	The day of 19 at	TO	No.
Mortgage for $	The day of 19 at	TO	No.
Mortgage for $	The day of 19 at	TO	No.

Deputy District Registrar

No. 43823 - Mech. Lien Reg'd 22 July 1972

RELEASED

Scriptel Industries (Western) Ltd.

VS. The Frontier School Division

[illegible] District Registrar

DISCHARGE of Mechanic's Lien No. 43823 by D. B. 374444 Reg'd 12 March 1973 at 9:34

DISTRICT REGISTRAR

No. 48601 CAVEAT Filed 25 Oct 1973 @ 9:24

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA

DEPUTY DISTRICT REGISTRAR