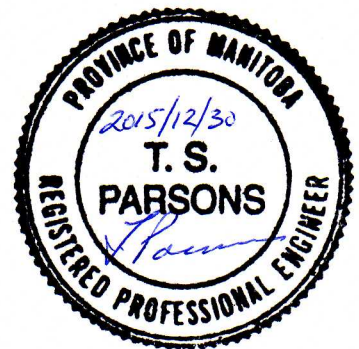


Manitoba Environment Act Proposal RM of Hanover Rural Water Supply System

December 2015



The Manitoba Water Services Board

Executive Summary

The RM of Hanover requested the Manitoba Water Services Board (MWSB) to prepare an Environment Act Proposal for a Class 2 Development Licence under the Manitoba Environment Act to develop a rural water supply system to service the community of Kleefeld and surrounding area from the Grunthal Water Treatment facility. This EAP is submitted for the installation of 11.5 km of distribution pipeline extending from the reservoir in the community of Grunthal to the community of Kleefeld and surrounding area along provincial road (PR) 216.

The RM of Hanover is located southeast of Winnipeg. Both the communities of Grunthal and Kleefeld are in the RM along PR 216. Currently the community of Kleefeld has a public water system and the water treatment plant was completed in the Spring of 2011. The community of Grunthal has a public water system that was commissioned in 1976 with recent upgrades being completed in October 2011. It consists of a groundwater supply and WTP that doses Clearhib5 and sodium hypochlorite to the pumped supply, a 1,227 m³ storage reservoir and distribution pipelines that service the community. Kleefeld's groundwater supply and treated water has elevated barium concentrations exceeding the Guidelines for Canadian Drinking Water Quality maximum acceptable concentration. In addition, elevated groundwater ammonia is not removed whereby chlorination is producing chloramines for disinfection which is not acceptable as a primary disinfectant.

An assessment study on the Kleefeld system was conducted by Associated Engineering Ltd. in 2012 which identified issues with the Kleefeld treated water and recommended piping water from the Grunthal reservoir north along PR 216 to service both Kleefeld and Grunthal. The proposed installation of 11.5 km of 150 mm pipeline will deliver treated water to approximately 281 connections in Kleefeld and a potential 165 additional connections in the surrounding area.

By using treated water from the Grunthal treatment supply, the Kleefeld water system will still require re-chlorination prior to community distribution. The existing Kleefeld reservoir and pumphouse will be utilized in the community of Kleefeld to provide chlorination and 755 m³ storage.

The RM of Hanover will be responsible for operating and maintaining the water treatment and distribution systems. The combined system will result in a Class II Water Treatment and Class II Water Distribution certified operator to ensure system operation and monitoring is maintained.

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List of Acronyms

AO	Aesthetic Objective
DBP	Disinfection By-Product
DWSA	Drinking Water Safety Act
EAP	Environment Act Proposal
GCDWQ	Guidelines for Canadian Drinking Water Quality
GUDI	Groundwater Under Direct Influence of Surface Water
HDPE	High Density Polyethylene
MAC	Maximum Acceptable Concentration
MWSB	Manitoba Water Services Board
ODW	Office of Drinking Water
RM	Rural Municipality
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
UV	Ultraviolet
WTP	Water Treatment Plant

1.0 Introduction

The RM of Hanover requested the Manitoba Water Services Board (MWSB) to prepare an Environment Act Proposal for a Class 2 Development License under the Manitoba Environment Act for the construction of a water distribution system to supply treated water to the community of Kleefeld and surrounding area located in the RM of Hanover. This document provides the compiled information required by Manitoba Conservation's Environment Act Proposal Report Guidelines and Supplementary Guidelines for Municipal Water Supply Systems.

1.1 Background Information

The RM of Hanover is located about 20 km southeast of Winnipeg. The Municipality is seeking to construct a water distribution system to service Kleefeld and surrounding area with treated water from the Water Treatment Plant (WTP) reservoir located at Grunthal. Both communities are located along PR 216. The proposed water system would service a combined population of approximately 1650 people.

1.1.1 Previous Studies

Public Water System Assessment studies were completed by the Associated Engineering Ltd. for the Grunthal and Kleefeld water systems in 2012. The studies review existing infrastructure, areas of deficiency and options for treated water sources. The studies were used in preparation of this EAP. These studies indicated that while Grunthal is in compliance with the Drinking Water Safety Act (DWSA) and the Guidelines for Canadian Drinking Water Quality (GCDWQ), Kleefeld is not in compliance.

Kleefeld's treated water exceeds the maximum acceptable concentration (MAC) of barium set forth in the GCDWQ and has a lack of primary disinfection. The MAC for barium is 1.0 mg/L and Kleefeld's 2011 and 2015 treated water quality results were 1.72 mg/L and 1.88 mg/L respectively. Health Canada indicates that the basis of the barium MAC is it is suspected to cause increases in blood pressure and cardiovascular disease.

Raw and treated water quality results for 2011 indicate elevated ammonia levels. When sodium hypochlorite is used as a disinfectant, a free chlorine residual is generally produced which is acceptable as a primary disinfectant to kill bacteria at the source (reservoir) and as a secondary disinfectant to maintain a bacteria free distribution system. Due to the elevated ammonia concentration in Kleefeld, the ammonia interferes with producing free chlorine residuals and as a result only chloramines are produced as a disinfectant. Chloramines are acceptable as a secondary disinfectant but are ineffective and unacceptable as a primary disinfectant.

1.1.2 Population

Statistics Canada population data for the RM indicates an average household density of 3.6 people per household while the adjacent City of Steinbach has population density of 2.65 people per household. An assumed density of 3 people per household will be assumed for the communities of Grunthal and Kleefeld. Historical data from Statistics Canada shows that the RM of Hanover has not maintained a constant population from 2006 to 2014. The current population of Grunthal (as of December 31, 2014) with 584 connections is approximated to be 1750 people while Kleefeld with 281 connections is approximated to be 845 people (L. Lahaie, personal communication, December 7, 2015). Due to the proximity of Grunthal and Kleefeld to Winnipeg and compared to communities located in a similar area, a 2.0 % annual growth-rate has been assumed for population growth over the next 20 years. Based on these rates the projected population for Grunthal is 2600 and 1255 people in Kleefeld.

1.1.3 Water Consumption

Previous Public Water System studies by Associated Engineering in 2012 for both Kleefeld and Grunthal indicate quite different average per capita consumption between the two communities. Kleefeld can be approximated as about 165 L/c/day while Grunthal is about 300 L/c/day. A consumption of 165 L/c/day would be considered quite low for Manitoba communities and 300 L/c/day is typical. Examining 2015 consumption data for Kleefeld indicated an increase in consumption when compared to the 2012 report however this can be attributed to an increase in population in 2015. The low water demand may be partly attributed to water quality standards that do not meet the GCDWQ. An assumed 200 L/c/day will be assumed for future water demand at Kleefeld. Consumption data indicates a peak day factor of approximately 2.0.

Table 1.1 summarizes future water demands. Since Kleefeld has a reservoir which can be used to meet peak hour flows, the pipeline from Grunthal to Keefeld must be able to convey approximately 8 L/s (5.8 + 2.2) in order to meet Kleefeld's peak day future demands.

TABLE 1.1 – FUTURE TREATED WATER CONSUMPTION

	Units	Kleefeld	Kleefeld Area	Grunthal	TOTAL
Connections:		281	165	584	1030
2014 Population		845		1750	2595
2034 Population		1255	495	2600	4350
Consumption/capita/day	L/c/day	200	200	300	
Future Avg. Day Consumption	L/day	251,000	99,000	780,000	1,113,000
	L/s	2.9	1.1	9.0	13.1
Peak Day factor		2.0	2.0	2.0	
Future Peak Day Consumption	L/day	502,000	198,000	1,560,000	2,260,000
	L/s	5.8	2.2	18	26.2

1.1.4 Storage Reservoir

The reservoir in the Community of Kleefeld is a 755 m³ underground concrete chamber that has the capacity to provide fire protection. Using the MWSB minimum fire flow of 60 L/s for two hours (Class 3) and the Ontario Ministry of Environment (MOE) water storage sizing guideline, the recommended reservoir capacity for Kleefeld is 759 m³.

$$\text{Total Storage Requirement} = A + B + C$$

Where A = Fire Storage

B = Equalization Storage (25 % of Max Day Demand)

C = Emergency Storage (25 % of "A" + "B")

$$A = 60 \text{ L/s} \times 60 \text{ s/min} \times 60 \text{ min/hr} \times 2 \text{ hr} = 432 \text{ m}^3$$

$$B = 25\% \times 700 \text{ m}^3/\text{day} = 175 \text{ m}^3$$

$$C = 25\% \times (432 + 175) = 152 \text{ m}^3$$

$$\text{Total Storage} = 432 + 175 + 152 = 759 \text{ m}^3$$

Grunthal should be able to provide a peak day flow but not fire flow to Kleefeld since Kleefeld has an adequate size reservoir. Grunthal has a total reservoir of 1,277 m³ from the combined 227 m³ in-ground concrete structure located beneath the pumphouse and a 1,000 m³ concrete structure located at the WTP site. Grunthal would require a minimum Class 4 fire protection.

$$A = 120 \text{ L/s} \times 60 \text{ s/min} \times 60 \text{ min/hr} \times 2 \text{ hr} = 864 \text{ m}^3$$

$$B = 25\% \times 2260 \text{ m}^3/\text{day} = 565 \text{ m}^3$$

$$C = 25\% \times (864 + 565) = 357 \text{ m}^3$$

$$\text{Total Storage} = 864 + 565 + 357 = 1,786 \text{ m}^3$$

The reservoir is undersized by 509 m³ for fire protection based on future population projections and a Class 4 fire protection. Future considerations on reservoir expansion should be considered should population growth continue as projected. However, It is unlikely that the current fire pumping capacity provides 120 L/s for Class 4 fire protection. However Grunthal’s reservoir will provide a minimum Class 3 fire protection for the projected future demands.

1.1.5 Raw and Treated Water Supplies

Schematics of both Grunthal’s and Kleefeld’s water supply systems are shown in Figure 1.1 and 1.2 respectively. Treatment consists of chemical addition with no physical filtration or other treatment processes.

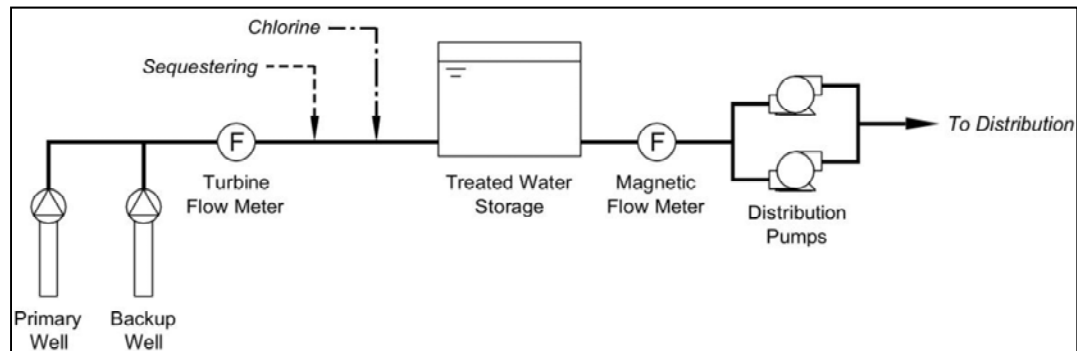


Figure 1.1 Grunthal WTP Process (Associated Engineering (Sask.) Ltd.)

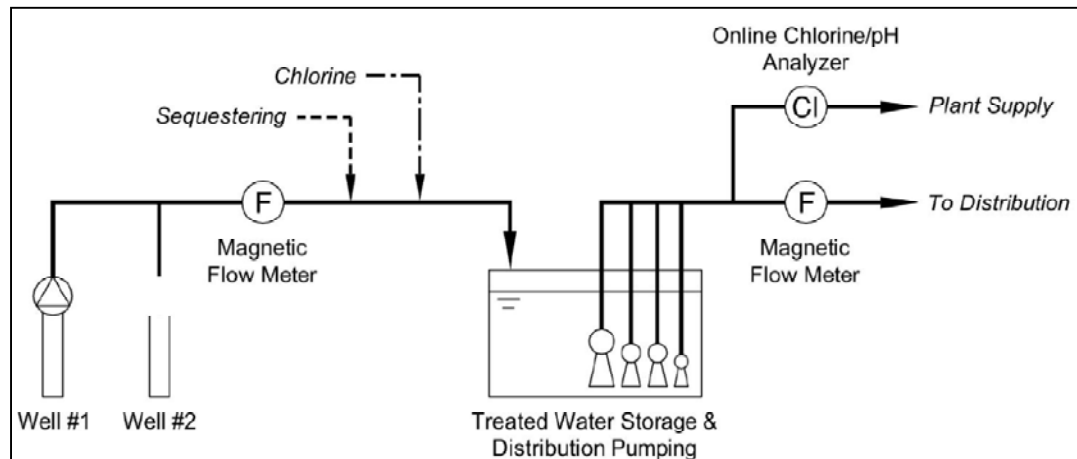


Figure 1.2 Kleefeld WTP Process (Associated Engineering (Sask.) Ltd.)

The well in Grunthal supplies raw water to the Grunthal WTP. Water flows from the 200 mm diameter well which is 24.4 m deep pipe to a 150 mm PVC pipeline. A 10 hp submersible pump conveys the water through a 150 mm pipeline to the WTP. Raw water quality meets health based parameters under the GCDWQ however parameters exceeding aesthetic objectives include total hardness, iron, and manganese as shown in Table 1.2. Ammonia concentrations may be a concern to disinfection if not sufficiently removed or oxidized prior to distribution. The full raw water chemistry results can be found in Appendix F.

The Grunthal WTP distributes well water that is treated by Clearhib5 and chlorination. The Office of Drinking Water (ODW) currently conducts annual audits of all public water systems which includes sampling and chemistry analysis once every three years for secure groundwater supply systems. In addition the operators tests chlorine residuals daily on the treated water. The treated water quality as shown in Table 1.2 shows that ammonia is oxidized and therefore is producing free chlorine residuals. The water is still considered hard with some elevated iron and manganese concentrations. The addition of Clearhib 5 keeps iron and manganese dissolved such that it does not become as great of a nuisance to customers. The Grunthal WTP is in general compliance with the Drinking Water Safety Act (DWSA), GCDWQ and the Ten State Standards.

The Kleefeld treatment process is essentially the same as Grunthal except that the groundwater supply in Kleefeld has elevated barium and a higher concentration of ammonia. The proposed water distribution system would connect the Grunthal reservoir to the Kleefeld WTP reservoir via pressure pipeline.

Table 1.2 – WATER QUALITY SUMMARY

Parameter	Unit	RAW 2011 - 2014	Treated 2011 - 2014	GCDWQ
Ammonia	mg/L	0.308	<0.01	
Hardness	mg/L	316 – 376	335 - 394	200/500 ^a
Iron	mg/L	0.4 - 2.08	0.22 - 1.01	≤ 0.3
Manganese	mg/L	0.0032 - 0.0698	0.0026 - 0.0692	≤ 0.05
^a Hardness levels greater than 200 are considered poor but tolerable. Hardness levels greater than 500 are generally considered unacceptable				

1.1.6 Water Rights Act

Water Rights Act License No. 2005-011 was issued to the RM of Hanover to permit Grunthal's groundwater withdrawal of water not exceeding 17 L/s and a total volume of 154.18 cubic decametres annually. Water Rights Licence (WRL) 2005-011 is provided in Appendix D. Grunthal's current instantaneous demand is within Licence limits however it is estimated that the annual demand exceeds current licence limits and is approximately 165 (estimated for 2015) to 200 (year 2011) cubic decametres.

Water Rights Act License No. 2005-012 was issued to the RM of Hanover to permit Kleefeld's withdrawal of water not exceeding 11.4 L/s and a total volume of 70 cubic decametres annually. Kleefeld's current annual demand is about 46 (year 2011) to 48 (estimated for 2015) cubic decametres.

The current combined annual withdrawal for Kleefeld and Grunthal is estimated at a maximum of 250 cubic decametres. Based on the 20 year projected demand for Grunthal, Kleefeld and surrounding area, the future projected water demand is estimated as 400 cubic decametres annually.

MWSB has currently secured the services of W.L. Gibbons and Associates Inc. to assess Grunthal's current well capacity and to locate additional supply to meet both Grunthal's and Kleefelds demands. This process will be completed with the necessary Exploration Permits and Licenses.

2.0 Description of Proposed Development

2.1 Project Description

The proposed development involves the construction of an 11.5 km water distribution pipeline to service the Community of Kleefeld and surrounding area from the Grunthal WTP and planned upgraded well system.

The current Kleefeld water supply system does not meet the DWSA and GCDWQ. Since Grunthal complies with drinking water standards, treated water from Grunthal will supply Kleefeld via an approximate 11.5 km of 150 mm pipeline installed along PR 216 from Grunthal to Kleefeld. The pipeline will join to an existing WTP in Kleefeld that services the community. The proposed pipeline will be installed in government road allowances and PR right-of-ways with some private easements to facilitate construction if necessary. The pipeline will be constructed of Polyvinyl Chloride (PVC) or High Density Polyethylene (HDPE) with a service life of more than 40 years.

The proposed conceptual layout of the pipeline network is included in Appendix A. Additional well capacity is anticipated plus upgrades to the Grunthal WTP distribution pumping system will be needed to meet demands.

2.1.1 The Untreated Water Supply

The Grunthal WTP was built in 1976 and was upgraded in October 2011. Raw water is withdrawn from wells located in Grunthal and treated using a dosing system with CLearhib5 and a chlorination system. The WTP has a reservoir storage capacity of 1,227 m³.

2.1.2 Operation and Maintenance

The RM of Hanover will be responsible for operating and maintaining the water treatment and distribution systems. The combined system will result in a Class II Water Treatment and Class II Water Distribution certified operator to ensure system operation and monitoring is maintained. A certified operator will monitor and maintain the pipeline, pumphouses, and reservoirs. The operator will also perform sampling and fulfill reporting requirements in accordance with the Manitoba *Drinking Water Quality Standards Regulation*.

2.2 Certificate of Title

It is proposed to install the rural water pipeline within municipal and provincial road right-of-ways owned by the Crown. If necessary, private easements will be obtained to accommodate the pipeline installation.

2.3 Existing and Adjacent Land Use

The proposed land for the development will be on municipal and provincially owned land in previously disturbed road right-of-ways. Adjacent land is used for mainly agricultural and related industries. The existing and adjacent land uses will not change as a result of the proposed development.

2.4 Land Use Designation and Zoning

The proposed development will be on municipal owned land, government road allowances and land adjacent to the development which is predominately agricultural land. Zoning designation for this development is not applicable.

2.5 Project Schedule

The project is scheduled to be tendered in the spring of 2016 with construction completed during the 2016 construction season depending on the availability of funding and the receipt of all approvals.

2.6 Project Funding

This project is eligible for 50/50 cost sharing between the MWSB and the RM of Hanover subject to the approval of the project and the availability of funding. The RM plans to raise its 50% share through the borrowing By-law process.

2.7 Regulatory Approvals

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

Manitoba Conservation and Water Stewardship
Office of Drinking Water
Manitoba Infrastructure and Transportation

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

2.8 Public Consultation

A public consultation will be held to present and discuss the proposed water distribution system with the citizens of the RM of Hanover. In addition a borrowing By-law public hearing will be required in order for the municipality to acquire funds for this project. It is not expected that there will be major concerns forwarded to the Municipality regarding the water distribution system.

2.9 Storage of Petroleum Products and Other Chemicals

Fuel will not be stored on-site at any time or location along the proposed construction route or near any well. Fuel will be supplied by fuelling trucks which are regulated under *The Storage and Handling of Petroleum Products and Allied Products Regulation*. Records of fuel volumes and an emergency response plan which includes spill prevention, notification, and response will be implemented. No fuelling activities will be permitted within 100 m of watercourses during construction. Contractors will be required to ensure that all equipment is properly maintained to prevent leaks of fuel and motor fluids. Any spills will be reported to the governing authority.

3.0 Physical Environment

3.1 Physiographic Setting and Climate

The RM of Hanover is located approximately 20 km southeast of Winnipeg. The community of Kleefeld and surrounding area is located within the RM and are situated along PR 216. Grunthal is located further south also along PR 216 in the RM of Hanover. The RM of Hanover is seeking to construct a water pipeline extending from the Grunthal reservoir to the Kleefeld reservoir.

The elevation ranges from 252 m to 265 m within the RM of Hanover which is situated in the Interlake Plain within the Prairies ecosystem. The area is drained by Tourond Creek and various smaller tributaries.

The local Environment Canada weather data available for the RM of Hanover has been collected for the town of Kleefeld. Data for Kleefeld, which is the closest location to the project area with available data, demonstrates that the annual temperature for the area in 2015 is 4.08°C with below zero average daily temperature from November through March. The annual precipitation for 2015 is approximately 628 mm.

3.2 Hydrogeology

The RM of Hanover is located in the Canadian Shield hydrogeological region. Early investigations during well digging in the area show that the hydrogeology of the area mainly consists of clay, gravel and limestone deposits.

The Interlake Plain Eco-region is typically underlain by limestone bedrock which is covered by extremely calcareous, very stony, water-worked, loamy glacial tills. Sandy to clayey sediments overlie the till in the northwest and southeast.

3.3 Hydrology

Tourond Creek is one of the main waterways within the geography of the RM of Hanover and is the main waterway within the area of the proposed development location. There are numerous drains within the RM of Hanover. Appendix B shows a detailed map of the hydrology of the project area.

3.4 Fish and Fish Habitat

Tourond Creek and its associated tributaries are potential fish habitat within the project area. A list of fish species found in Tourond Creek has been included in Appendix C.

3.5 Wildlife Habitat and Vegetation

The project area is located within the Interlake Plain Eco-region of the Boreal Plains Eco-zone (Agriculture and Agri-Food Canada). The mean annual temperature in this eco-zone is approximately 1.0°C with a mean winter temperature of -14.5°C and a mean summer temperature of 15.5°C. It is mainly associated with trembling aspen, balsam poplar, white spruce, balsam spruce and black pine. The soils in the eco-zone are Eutric Brunisols on glacial till and shallow to deep Organic Mesisols and Fibrisols on peatlands. Gray Luvisols are typical soils on clayey, glaciolacustrine sediments, while Humic Gleysols and Cumulic Regosols occur on recent alluvial deposits. There is considerable agricultural production, forestry and mining, in the eco-zone.

Characteristic mammals in the Boreal Plains Eco-zone include moose, deer, timber wolf, black bear, beaver, squirrel and the northern pocket gopher. The main bird species include gray jay, common loon, white-tailed sparrow, American redstart, Canada Warbler, and ovenbird, (National Ecological Framework Report). The CLI classification for this area is 5 to 7 which indicates there is moderate to severe limitations to waterfowl production (Agriculture and Agri-Food Canada).

3.6 Socioeconomic

The project area is located within the RM of Hanover. The RM has an area of 740.31 km² and a population of 17,608 (2014 RM estimate). The main economic base is agriculture. The project is anticipated to generate additional temporary employment and bring long-term positive economic benefits to the area by providing a sustainable potable water supply.

3.7 Heritage Resources

Construction activities will occur in previously disturbed municipal and provincial right-of-ways. The proponent will work with Heritage Resources Branch to mitigate any concerns as required.

4.0 Potential Environmental Effects

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

4.1 Air Quality

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

4.2 Soils

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

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

4.3 Surface Water, Fish and Fish Habitat

Minor and short term impacts on surface water may occur as a result of construction activity in road allowance ditches during runoff events. The impact on surface water would include sediment that may be eroded from excavation activities, minor engine leaks and potential fuel spills should runoff events occur during construction. Horizontal directional drilling will be conducted to install the pipeline at the drain and river outlets. This will eliminate excavation within the riparian zone and minimize impacts. There is potential for some loss of drilling mud to surface water. However, risks to fisheries and fish habitat are considered minor.

4.4 Groundwater Quality

Groundwater quality can be impacted by surface activities and surface water quality. Mitigation measures are necessary to protect groundwater quality during construction activities. The proposed activities are unlikely to result in adverse changes to groundwater quality.

4.5 Groundwater Levels

An amendment to the Water Rights Act Licence will be applied for prior to construction, though no significant impacts are anticipated from the project. This will include appropriate pump test data and hydrogeological report. Groundwater monitoring will be conducted by the RM of Hanover as required.

4.6 Vegetation

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

During construction access to land will be restricted to designated and previously disturbed areas. Potential effects to vegetation are considered to be negligible.

4.7 Wildlife Habitat and Vegetation

The construction and operation activities associated with this project will be limited to areas already developed for urban or agricultural uses. The potential adverse effects of wildlife habitat loss were assessed to be negligible to minor.

4.8 Noise and Vibration

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

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

4.9 Employment/Economy

Socio-economic implications are not expected as a result of environmental impacts as impacts are considered minor and short-term. Some economic responsibilities exist for the Municipality due to the costs of developing the water system, however, the development of a sustainable potable water supply will be an economic benefit for the RM. There may be some local economic benefit during construction. The potential effects of the project on employment and the economy were assessed to be positive.

4.10 Human Health and Well Being

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

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

4.11 Climate Change

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

5.0 Environmental Management Measures

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

5.1 Air Quality

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

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

5.2 Soils

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

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

5.3 Surface Water

Mitigation of surface water issues may be achieved by limiting open cut trenching to within 30 m ahead or behind the pipe laying, redirecting surface water runoff, pumping accumulated water to adjacent ditches and providing erosion control practices as required.

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

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

Chlorinated water used to disinfect pipelines will be de-chlorinated and not released to surface waters.

5.4 Groundwater

Potential groundwater impacts from petroleum products can be mitigated as described in Section 5.3. The availability of groundwater usage for this proposal and potential future users will be assessed through the Water Rights Act Licensing process. Groundwater monitoring will be performed as required.

5.5 Vegetation and Wildlife

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

5.6 Fisheries

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

5.7 Noise and Vibration

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

5.8 Water Conservation

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

5.9 Socio-Economic Implications

There are no known negative environmental socio-economic impacts that need mitigation. Since the proposed development would provide a reliable healthy drinking water supply, it would be expected to enhance quality of life and economic viability for the Municipality. The proposed project may provide some economic benefits to the area for local businesses and employment opportunities during the construction phase.

6.0 References

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Statistics Canada. 2011 Census Profile - Census Program

<http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E>

Statistics Canada. Community Profiles from the 2006 Census

<http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E>

Statistics Canada. 2001 Community Profiles - Census Program

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Statistics Canada. 2012. Focus on Geography Series, 2011 Census. Statistics Canada Catalogue no. 98-310-XWE2011004. Ottawa, Ontario. Analytical products, 2011 Census. Last updated October 24, 2012.
<http://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-csd-eng.cfm?Lang=Eng&GK=CSD&GC=4602041> (accessed December 9, 2015).

Appendix A - Preliminary Pipeline Route

Preliminary Pipeline Route

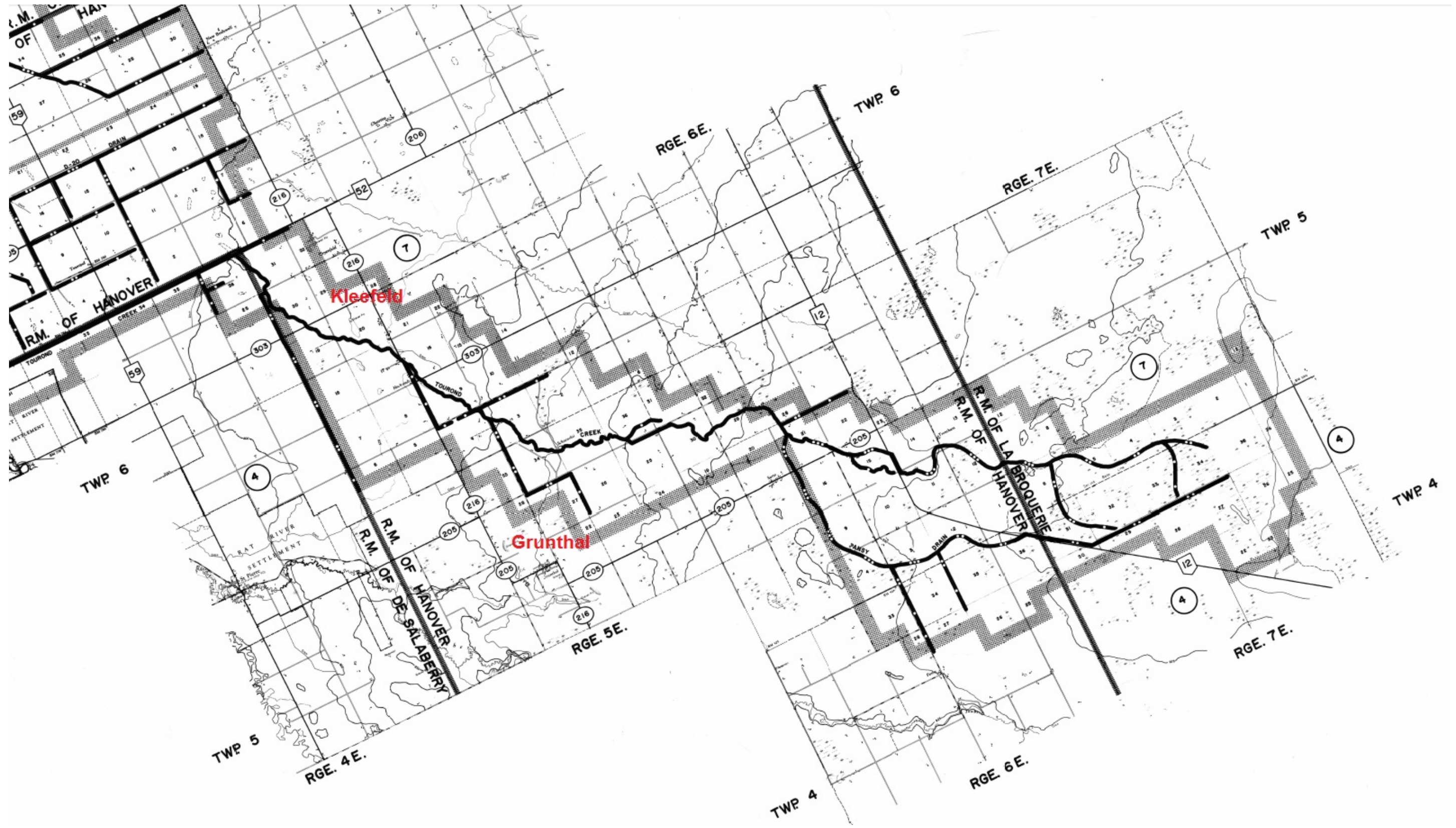


CONNECT TO 'A'

PROVINCE OF MANITOBA THE MANITOBA WATER SERVICES BOARD MANITOBA MUNICIPAL GOVERNMENT			RM OF HANOVER GRUNTHAL TO KLEEFELD WELL LINE		
DRAWN	CHECKED	DATE	SCALE	PAGE	FILE NO.
C. LUCIER		15-10-13	NTS	1 OF 1	

Appendix B - Hydrology of the RM of Hanover

Hydrology of the RM of Hanover



Kleefeld

Grunthal

R.M. OF HANOVER

R.M. OF HANOVER

R.M. OF DE SALABERRY

R.M. OF LA BROQUERIE

TWP 6

TWP 5

RGE. 4 E.

RGE. 5 E.

RGE. 6 E.

TWP 4

RGE. 6 E.

TWP 6

RGE. 7 E.

RGE. 7 E.

TWP 5

TWP 4

59

216

52

206

303

216

205

205

12

205

1

4

12

4

4

RAT RIVER SETTLEMENT

TOUROND CREEK

CREEK

JANSY DRAIN

TWP 6

TWP 5

RGE. 4 E.

RGE. 5 E.

RGE. 6 E.

TWP 4

RGE. 6 E.

TWP 6

RGE. 7 E.

RGE. 7 E.

TWP 5

TWP 4

Appendix C - Fish Species

Fish Species in Tourond Creek

Waterbody: Tourond Creek					
Provincial Waterbody Id #	Watershed	Region	District	Map Sheet	Latitude: 49 38 19
2651.00	SOCA	Eastern	Steinbac	62H11	Longitude: 97 6 40

Habitat Suitability	Resource Access														
Seasonal Habitat Suitability*	Resource Distance (km)														
<table border="1"> <tr> <td>All</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td><td>None</td> </tr> </table>	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	None	
All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	None		

*The month(s) the waterbody is useable for fish Habitat (without human intervention)

Habitat Classifications	
Habitat Class	Class

General Uses	
General Use	Harvest Weight

Needed Improvements		
Year	Improvements	Comments
2004	Water quality/habitat assessments, riparian classification, rehab. site identification, a fish capture breakdown and an inventory of benthic invertebrates were conducted as part of the "Seine River Survey and Restoration Planning Project".	Results can be found in the report.
2006	The creek is slow moving and has a varying substrate. Some areas have a sandy substrate, while others have a cobble substrate. Some parts have a epifaunal substrate with lots of submerged and instream vegetation. 1999 Note: Milani conducted a visual-based habitat assessment on this waterbody. The parameters of this assessment are outlined in (continued) 1999 Milani's "2002-2004 Agricultural Drain Inventory" in addition to Barbour et al. which may also be found online at http://www.epa.gov/OWOW/monitoring/techmon.html .	"Rapid Bioassessment Protocols For Use In Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition" by Barbour, Gerritsen, Snyder and Stribling. For the condition category of each habitat parameter consult (continued)

BIOLOGY	
BROOK STICKLEBACK <i>Culaea inconstans</i>	Common
CENTRAL MUDMINNOW <i>Umbra limi</i>	Unknown
NORTHERN PIKE <i>Esox lucius</i>	Unknown
WHITE DUCKER <i>Catostomus commersoni</i>	Unknown

Creel		
Year	Species	Catch/Unit Effort*

*Catch/Unit Effort = Catch/Hour

Appendix D - Water Rights Licence

RM of Hanover Water Rights Act Licence

WS-14234 (English)

**Licence to Use Water for
Municipal-Distribution System
Purposes**

Manitoba Water Stewardship
Infrastructure and Operations Division
200 Saulheux Cresc.
Winnipeg, Manitoba
R3J 3W3



Project: Village of Grunthal

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

Licence No.: **2005-011**

U.T.M.: Zone 14 655573 E
5475299 N

Know all men by these presents that in consideration of and subject to the provisos, conditions and restrictions hereinafter contained, the Minister of Water Stewardship for the Province of Manitoba does by these presents give full right and liberty, leave and licence to **Rural Municipality of Hanover** in the Province of Manitoba (hereinafter called "the LICENSEE") to divert water from a **sand and gravel aquifer** by means of two (2) water wells, pumps, pipeline(s) and other appurtenances (hereinafter called "the WORKS"), located on the following described lands:

Main Supply Well - in the unincorporated village of Grunthal, in the right-of-way for Ash Street lying South of Lot 2 of Plan 10791 WLTO in the Northwest Quarter of Section 21, Township 5 and Range 5 EPM,

Back-up Supply Well - in the unincorporated village of Grunthal, in Lot 45 of Plan 6152 WLTO in the Northeast Quarter of Section 21, Township 5 and Range 5 EPM

and more particularly shown on a plan filed in the office of the Executive Director, Infrastructure and Operations Division, a copy of which plan is hereto attached and marked Exhibit "A" for **municipal-distribution system** purposes on the following described lands:

in the unincorporated village of Grunthal, in Section 21, Township 5 and Range 5, East of the Principal Meridian in Manitoba.

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

1. The water shall be used solely for **municipal-distribution system** purposes.
2. The WORKS shall be operated in accordance with the terms herein contained.
3. a) The maximum rate at which water may be diverted pursuant hereto shall not exceed **0.017 cubic metres per second (0.6 cubic feet per second)**
b) The total quantity of water diverted in any one year shall not exceed **154.18 cubic decametres (125.00 acre feet)**
4. Water shall not be diverted during any period when the water level in the aquifer as measured at:
a) the main well is more than 19.81 metres (65.0 feet) beneath the surface of the ground,
b) the back-up well is more than 24.38 metres (80.0 feet) beneath the surface of the ground.
5. The LICENSEE does hereby remise, release and forever discharge Her Majesty the Queen in Right of the Province of Manitoba, of and from all manner of action, causes of action, claims and demands whatsoever which against Her Majesty the LICENSEE ever had, now has or may hereafter have, resulting from the use of water for **municipal-distribution system** purposes.
6. In the event that the rights of others are infringed upon and/or damage to the property of others is sustained as a result of the operation or maintenance of the WORKS and the rights herein granted, the LICENSEE shall be solely responsible and shall save harmless and fully indemnify Her Majesty the Queen in Right of the Province of Manitoba, from and against any liability to which Her Majesty may become liable by virtue of the issue of this Licence and anything done pursuant hereto.
7. This Licence is not assignable or transferable by the LICENSEE and when no longer required by the LICENSEE this Licence shall be returned to the Executive Director, Infrastructure and Operations Division, for cancellation on behalf of the Minister.
8. Upon the execution of this Licence the LICENSEE hereby grants the Minister or the Minister's agents the right of ingress and egress to and from the lands on which the WORKS are located for the purpose of inspection of the WORKS and the LICENSEE shall at all times comply with such directions and/or orders that may be given by the Minister or the Minister's agents in writing from time to time with regard to the operation and maintenance of the WORKS.
9. If for any reason whatsoever the Minister deems it advisable to cancel this Licence, he may do so by letter addressed to the LICENSEE at **Box 1720, Steinbach, MB, R0A 2A0, Canada** and thereafter this Licence shall be determined to be at an end.
10. Notwithstanding anything preceding in this Licence, the LICENSEE must have legal control, by ownership or by rental, lease, or other agreement, of the lands on which the WORKS shall be placed and the water shall be used.

11. The term of this Licence shall be twenty (20) years and this Licence shall become effective only on the date of execution hereof by a person so authorized in the Department of Water Stewardship. The LICENSEE may apply for renewal of this Licence not more than 365 days and not less than 90 days prior to the expiry date.
12. This Licence expires automatically upon the loss of the legal control of any of the lands on which the WORKS are located or on which water is used, unless the Licence is transferred or amended by the Minister upon application for Licence transfer or amendment.
13. The LICENSEE shall keep records of daily and annual water use and shall provide a copy of such records to the Executive Director, Infrastructure and Operations Division, not later than February 1st of the following year.
14. A flow meter must be installed, positioned to accurately measure instantaneous pumping rate and accumulative withdrawals from the water source.
15. The LICENSEE does hereby agree to correct, to the satisfaction of the Minister, any water supply problems to other currently existing wells, dugouts, or other forms of supply, which are partly or wholly attributable, in the opinion of the Minister, to the diversion of water as authorized by this Licence.
16. The LICENSEE shall hold and maintain all other regulatory approvals that may be required and shall comply with all other regulatory requirements for the construction, operation, or maintenance of the WORKS or to divert or use water as provided by this Licence.

In witness whereof I the undersigned hereby agree to accept the aforesaid Licence on the terms and conditions set forth therein and hereby set my hand and seal this 12th day of April A.D. 2015.

SIGNED, SEALED AND DELIVERED
in the presence of

_____ } Angela E. Lowe (Seal)
Witness Licensed

Canada, PROVINCE OF MANITOBA To Wit:

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

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

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

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

My Commission expires _____

Issued at the City of Winnipeg, in the Province of Manitoba, this 18 day of April A.D. 2015.

[Signature]
The Honourable the Minister of Water Stewardship

Appendix E - Watercourse Crossings

MWSB Guidelines for Watercourse Crossings

WATERCOURSE CROSSINGS

Mitigation Measure

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

Reclamation

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

Pressure Loss/Fluid Loss Response

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

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

Loss of Fluid and Frac-out Response Plan

1. If an abnormal loss of fluid, drop in pressure or visible plume is observed indicating a frac-out or possible frac-out, drilling is to stop immediately.

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

Appendix F - Water Quality Data

Grunthal and Kleefeld 2014 Water Quality Data

ANALYTICAL REPORT

Physical Tests (WATER)

		ALS ID		L997019-1	L997019-2
		Sampled Date		20-APR-11	20-APR-11
		Sampled Time		11:45	11:45
		Sample ID		GRUNTHAL 1 -	GRUNTHAL 2 -
Analyte	Unit	Guide Limit #1	Guide Limit #2	RAW	TREATED
Colour, True	CU	-	-	<5.0	<5.0
Conductivity	umhos/cm	-	-	717	728
Langelier Index (4 C)	No Unit	-	-	0.71	0.69
Langelier Index (60 C)	No Unit	-	-	1.5	1.5
pH	pH units	6.5-8.5	-	7.94	7.93
Total Dissolved Solids	mg/L	500	-	398	434
Turbidity	NTU	-	-	2.26	0.97

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		L997019-1	L997019-2
		Sampled Date		20-APR-11	20-APR-11
		Sampled Time		11:45	11:45
		Sample ID		GRUNTHAL 1 -	GRUNTHAL 2 -
Analyte	Unit	Guide Limit #1	Guide Limit #2	RAW	TREATED
Alkalinity, Total (as CaCO ₃)	mg/L	-	-	345	344
Ammonia as N	mg/L	-	-	0.308	<0.010
Bicarbonate (HCO ₃)	mg/L	-	-	421	420
Carbonate (CO ₃)	mg/L	-	-	<0.60	<0.60
Chloride	mg/L	250	-	21.5	26.2
Fluoride	mg/L	-	1.5	0.129	0.127
Hardness (as CaCO ₃)	mg/L	-	-	363	360
Hydroxide (OH)	mg/L	-	-	<0.40	<0.40
Ion Balance	%	-	-	99.5	98.4
Nitrate and Nitrite as N	mg/L	-	10	0.163	0.169
Total Kjeldahl Nitrogen	mg/L	-	-	0.47	<0.20
TDS (Calculated)	mg/L	500	-	401	408
Sulfate	mg/L	500	-	28.9	28.8

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		L997019-1	L997019-2
		Sampled Date		20-APR-11	20-APR-11
		Sampled Time		11:45	11:45
		Sample ID		GRUNTHAL 1 -	GRUNTHAL 2 -
Analyte	Unit	Guide Limit #1	Guide Limit #2	RAW	TREATED
Total Carbon	mg/L	-	-	81.2	81.4
Total Inorganic Carbon	mg/L	-	-	80.1	80.1
Total Organic Carbon	mg/L	-	-	1.0	1.3

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

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	ALS ID		L997019-1	L997019-2
		Guide Limit #1	Guide Limit #2	Sampled Date	Sampled Date
				20-APR-11	20-APR-11
				11:45	11:45
				Sample ID	Sample ID
				GRUNTHAL 1 - RAW	GRUNTHAL 2 - TREATED
Aluminum (Al)-Total	mg/L	0.1	-	<0.0050	<0.0050
Antimony (Sb)-Total	mg/L	-	0.008	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00047	0.00048
Barium (Ba)-Total	mg/L	-	1	0.313	0.318
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	0.057	0.061
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	0.000014
Calcium (Ca)-Total	mg/L	-	-	88.1	88.5
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	-	-	0.00024	0.00025
Copper (Cu)-Total	mg/L	1	-	0.0193	0.0199
Iron (Fe)-Total	mg/L	0.3	-	0.48	0.45
Lead (Pb)-Total	mg/L	-	0.01	<0.000090	0.000124
Lithium (Li)-Total	mg/L	-	-	0.0141	0.0151
Magnesium (Mg)-Total	mg/L	-	-	34.7	34.9
Manganese (Mn)-Total	mg/L	0.05	-	0.0698	0.0682
Molybdenum (Mo)-Total	mg/L	-	-	0.00105	0.00102
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.20	<0.20
Potassium (K)-Total	mg/L	-	-	3.87	3.79
Rubidium (Rb)-Total	mg/L	-	-	0.00212	0.00213
Selenium (Se)-Total	mg/L	-	0.01	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	7.72	7.79
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	16.4	19.3
Strontium (Sr)-Total	mg/L	-	-	0.335	0.336
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	-	-	0.00032	0.00023

Federal Guidelines for Canadian Drinking Water Quality (JUN, 2008)
 #1: GCDWQ - Aesthetic Objective
 #2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	ALS ID		L997019-1	L997019-2
		Guide Limit #1	Guide Limit #2	Sampled Date	Sampled Date
				20-APR-11	20-APR-11
				11:45	11:45
				GRUNTHAL 1 - RAW	GRUNTHAL 2 - TREATED
Tungsten (W)-Total	mg/L	-	-	<0.0010	<0.0010
Uranium (U)-Total	mg/L	-	0.02	0.00079	0.00081
Vanadium (V)-Total	mg/L	-	-	<0.00020	<0.00020
Zinc (Zn)-Total	mg/L	5	-	<0.0050	<0.0050
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

Volatile Organic Compounds (WATER)

Analyte	Unit	ALS ID		L997019-1
		Guide Limit #1	Guide Limit #2	Sampled Date
				20-APR-11
				11:45
				GRUNTHAL 1 - RAW
Benzene	ug/L	-	5	<0.50
1,1-Dichloroethylene	ug/L	-	14	<0.50
Dichloromethane	ug/L	-	50	<1.5 ^{DLA}
Ethyl Benzene	ug/L	2.4	-	<0.50
MTBE	ug/L	-	15	<0.50
Tetrachloroethylene	ug/L	-	30	<0.50
Toluene	ug/L	24	-	<0.50
1,1,1-Trichloroethane	ug/L	-	-	<0.50
1,1,2-Trichloroethane	ug/L	-	-	<0.50
Trichloroethylene	ug/L	-	5	<0.50
o-Xylene	ug/L	-	-	<0.50
m+p-Xylenes	ug/L	-	-	<1.0
Xylenes (Total)	ug/L	300	-	<1.5

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

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum and Interim Maximum Acceptable Concentrations



RM of Hanover
ATTN: ROB DRIEDGER
PO Box 1720
Steinbach MB R5G 1N4

Date Received: 16- SEP- 15
Report Date: 21- SEP- 15 11:28 (MT)
Version: FINAL

Client Phone: 204- 346- 7121

Certificate of Analysis

Lab Work Order #: L1673372
Project P.O. #: NOT SUBMITTED
Job Reference: KLEEFELD: NITRITE - NTRATE
C of C Numbers:
Legal Site Desc:

A handwritten signature in black ink, appearing to read 'Hua Wo', positioned above a horizontal line.

Hua Wo
Chemistry Laboratory Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



KLEEFELD: NITRITE - NTRATE

L1673372 CONTD....
 PAGE 2 of 3
 Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1673372-1 KLEEFELD RAW Sampled By: CLIENT on 15-SEP-15 Matrix: WATER Single Metal in Water by ICPMS (Total) Total Metals by ICP-MS Barium (Ba)-Total	1.88		0.00050	mg/L	18-SEP-15	19-SEP-15	R3270645
L1673372-2 KLEEFELD TREATED Sampled By: CLIENT on 15-SEP-15 Matrix: WATER Single Metal in Water by ICPMS (Total) Total Metals by ICP-MS Barium (Ba)-Total	1.64		0.00050	mg/L	18-SEP-15	19-SEP-15	R3270645

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



RM of Hanover - Kleefeld PWS
 Kleefeld - PWS
 PO Box 1720, 28 Westland Drive
 Steinbach MB R5G 1N4
 ATTN: BARRY BROESKY

Date: 04-NOV-14
 PO No.:
 WO No.: L1539471
 Project Ref:
 Sample ID: PLT TAP #50
 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539471-2
 Matrix: WATER

PAGE 4 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Alkalinity						
Hydroxide (OH)	<6.8		mg/L			30-OCT-14
CDWQG = Health Canada Guideline Limits updated AUG 2012						
* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit. * Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality - A blank entry designates no known limit. - A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.						
Approved by <u>Chantal Bouchard</u> Chantal Bouchard Account Manager						

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RM of Hanover - Kleefeld PWS
 Kleefeld - PWS
 PO Box 1720, 28 Westland Drive
 Steinbach MB R5G 1N4
 ATTN: BARRY BROESKY

Date: 04-NOV-14
 PO No.:
 WO No.: L1539471
 Project Ref:
 Sample ID: RAW #50
 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539471-1
 Matrix: WATER

PAGE 1 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Langelier Index (4 C)	0.96					04-NOV-14
Langelier Index (80 C)	1.7					04-NOV-14
*Nitrate and Nitrite as N	<0.071		mg/L	10		31-OCT-14
pH						
pH	8.30		pH units			30-OCT-14
Turbidity						
*Turbidity	20.3		NTU	0.1		29-OCT-14
Total Metals by ICP-MS						
Calcium (Ca)-Total	67.2		mg/L			30-OCT-14
Iron (Fe)-Total	2.08		mg/L		0.3	30-OCT-14
Magnesium (Mg)-Total	35.9		mg/L			30-OCT-14
Manganese (Mn)-Total	0.0032		mg/L		0.05	30-OCT-14
Potassium (K)-Total	4.33		mg/L			30-OCT-14
Sodium (Na)-Total	24.9		mg/L		200	30-OCT-14
Sulfate by Ion Chromatography						
Sulfate	<0.50		mg/L		500	29-OCT-14
Sodium Adsorption Ratio						
Sodium Adsorption Ratio	0.61					31-OCT-14
Nitrite as N by Ion Chromatography						
*Nitrite-N	<0.050		mg/L	1		29-OCT-14
Nitrate as N by Ion Chromatography						
*Nitrate-N	<0.050		mg/L	10		29-OCT-14
Ion Balance Calculation						
Hardness Calculated						
Hardness (as CaCO3)	316		mg/L		500	31-OCT-14
Fluoride by Ion Chromatography						
Fluoride	0.31		mg/L	1.5		29-OCT-14
Conductivity						
Conductivity	624		umhos/cm			30-OCT-14
Colour, True						
Colour, True	<5.0		CU			29-OCT-14
Chloride by Ion Chromatography						
Chloride	4.16		mg/L		250	29-OCT-14
Alkalinity						
Alkalinity, Total (as CaCO3)	346		mg/L			30-OCT-14
Bicarbonate (HCO3)	420		mg/L			30-OCT-14
Carbonate (CO3)	<12		mg/L			30-OCT-14

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 Lab Sample ID: L1539471-1
 Matrix: WATER

PAGE 2 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Alkalinity						
Hydroxide (OH)	<6.8		mg/L			30-OCT-14
<p>CDWQG = Health Canada Guideline Limits updated AUG 2012</p> <p>* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit. * Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality - A blank entry designates no known limit. - A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.</p>						
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 ATTN: BARRY BROESKY

Date: 04-NOV-14
 PO No.:
 WO No.: L1539471
 Project Ref:
 Sample ID: PLT TAP #50
 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539471-2
 Matrix: WATER

PAGE 3 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Langelier Index (4 C)	1.0					04-NOV-14
Langelier Index (60 C)	1.8					04-NOV-14
*Nitrate and Nitrite as N	<0.071		mg/L	10		31-OCT-14
pH						
pH	8.33		pH units			30-OCT-14
Turbidity						
*Turbidity	0.99		NTU	0.1		29-OCT-14
Total Metals by ICP-MS						
Calcium (Ca)-Total	71.8		mg/L			30-OCT-14
Iron (Fe)-Total	1.01		mg/L		0.3	30-OCT-14
Magnesium (Mg)-Total	37.8		mg/L			30-OCT-14
Manganese (Mn)-Total	0.0026		mg/L		0.05	30-OCT-14
Potassium (K)-Total	4.62		mg/L			30-OCT-14
Sodium (Na)-Total	33.3		mg/L		200	30-OCT-14
Sulfate by Ion Chromatography						
Sulfate	<0.50		mg/L		500	29-OCT-14
Sodium Adsorption Ratio						
Sodium Adsorption Ratio	0.79					31-OCT-14
Nitrite as N by Ion Chromatography						
*Nitrite-N	<0.050		mg/L	1		29-OCT-14
Nitrate as N by Ion Chromatography						
*Nitrate-N	<0.050		mg/L	10		29-OCT-14
Ion Balance Calculation						
Hardness Calculated						
Hardness (as CaCO3)	335		mg/L		500	31-OCT-14
Fluoride by Ion Chromatography						
Fluoride	0.30		mg/L	1.5		29-OCT-14
Conductivity						
Conductivity	641		umhos/cm			30-OCT-14
Colour, True						
Colour, True	<5.0		CU			29-OCT-14
Chloride by Ion Chromatography						
Chloride	10.1		mg/L		250	29-OCT-14
Alkalinity						
Alkalinity, Total (as CaCO3)	346		mg/L			30-OCT-14
Bicarbonate (HCO3)	416		mg/L			30-OCT-14
Carbonate (CO3)	<12		mg/L			30-OCT-14

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 PO Box 1720, 28 Westland Drive
 Steinbach MB R5G 1N4
 ATTN: BARRY BROESKY

Date: 04-NOV-14
 PO No.:
 WO No.: L1539463
 Project Ref:
 Sample ID: RAW #50
 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539463-1
 Matrix:

PAGE 1 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Langelier Index (4 C)	1.0					04-NOV-14
Langelier Index (60 C)	1.8					04-NOV-14
* Nitrate and Nitrite as N	0.137		mg/L	10		31-OCT-14
pH						
pH	8.28		pH units			30-OCT-14
Turbidity						
* Turbidity	3.16		NTU	0.1		29-OCT-14
Total Metals by ICP-MS						
Calcium (Ca)-Total	88.4		mg/L			30-OCT-14
Iron (Fe)-Total	0.40		mg/L		0.3	30-OCT-14
Magnesium (Mg)-Total	37.7		mg/L			30-OCT-14
Manganese (Mn)-Total	0.0679		mg/L		0.05	30-OCT-14
Potassium (K)-Total	4.11		mg/L			30-OCT-14
Sodium (Na)-Total	21.9		mg/L		200	30-OCT-14
Sulfate by Ion Chromatography						
Sulfate	37.0		mg/L		500	29-OCT-14
Sodium Adsorption Ratio						
Sodium Adsorption Ratio	0.49					31-OCT-14
Nitrite as N by Ion Chromatography						
* Nitrite-N	<0.050		mg/L	1		29-OCT-14
Nitrate as N by Ion Chromatography						
* Nitrate-N	0.137		mg/L	10		29-OCT-14
Ion Balance Calculation						
Hardness Calculated						
Hardness (as CaCO3)	376		mg/L		500	31-OCT-14
Fluoride by Ion Chromatography						
Fluoride	0.17		mg/L	1.5		29-OCT-14
Conductivity						
Conductivity	731		umhos/cm			30-OCT-14
Colour, True						
Colour, True	<5.0		CU			29-OCT-14
Chloride by Ion Chromatography						
Chloride	19.4		mg/L		250	29-OCT-14
Alkalinity						
Alkalinity, Total (as CaCO3)	349		mg/L			30-OCT-14
Bicarbonate (HCO3)	426		mg/L			30-OCT-14
Carbonate (CO3)	<12		mg/L			30-OCT-14

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 Sample ID: RAW #50
 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539463-1
 Matrix:

PAGE 2 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Alkalinity						
Hydroxide (OH)	<6.8		mg/L			30-OCT-14
CDWQG = Health Canada Guideline Limits updated AUG 2012 * CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit. * Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality - A blank entry designates no known limit. - A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.						
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 Project Ref:
 Sample ID: PLT TAP #50
 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539463-2
 Matrix:

PAGE 3 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Langelier Index (4 C)	1.1					04-NOV-14
Langelier Index (60 C)	1.9					04-NOV-14
*Nitrate and Nitrite as N	0.151		mg/L	10		31-OCT-14
pH						
pH	8.31		pH units			30-OCT-14
Turbidity						
*Turbidity	0.54		NTU	0.1		29-OCT-14
Total Metals by ICP-MS						
Calcium (Ca)-Total	92.9		mg/L			30-OCT-14
Iron (Fe)-Total	0.22		mg/L		0.3	30-OCT-14
Magnesium (Mg)-Total	39.4		mg/L			30-OCT-14
Manganese (Mn)-Total	0.0396		mg/L		0.05	30-OCT-14
Potassium (K)-Total	4.27		mg/L			30-OCT-14
Sodium (Na)-Total	29.0		mg/L		200	30-OCT-14
Sulfate by Ion Chromatography						
Sulfate	37.1		mg/L		500	29-OCT-14
Sodium Adsorption Ratio						
Sodium Adsorption Ratio	0.64					31-OCT-14
Nitrite as N by Ion Chromatography						
*Nitrite-N	<0.050		mg/L	1		29-OCT-14
Nitrate as N by Ion Chromatography						
*Nitrate-N	0.151		mg/L	10		29-OCT-14
Ion Balance Calculation						
Hardness Calculated						
Hardness (as CaCO3)	394		mg/L		500	31-OCT-14
Fluoride by Ion Chromatography						
Fluoride	0.16		mg/L	1.5		29-OCT-14
Conductivity						
Conductivity	752		umhos/cm			30-OCT-14
Colour, True						
Colour, True	<5.0		CU			29-OCT-14
Chloride by Ion Chromatography						
Chloride	26.3		mg/L		250	29-OCT-14
Alkalinity						
Alkalinity, Total (as CaCO3)	347		mg/L			30-OCT-14
Bicarbonate (HCO3)	420		mg/L			30-OCT-14
Carbonate (CO3)	<12		mg/L			30-OCT-14

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 Sampled By: BARRY B
 Date Collected: 28-OCT-14
 Lab Sample ID: L1539463-2
 Matrix:

PAGE 4 of 5

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Municipal Water Supplies #50						
Alkalinity						
Hydroxide (OH)	<6.8		mg/L			30-OCT-14
CDWQG = Health Canada Guideline Limits updated AUG 2012 * CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit. * Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality - A blank entry designates no known limit. - A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.						
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