Golder Associates Ltd.

1796 Courtwood Crescent
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REPORT ON

2000 GROUNDWATER MONITORING PROGRAM
COMMUNAL SEWAGE SYSTEM
NATION MUNICIPALITY
FOURNIER, ONTARIO

Submitted to:

Ontario Clean Water Agency
2015 Lajoie Street
Box 252
Lefaivre, Ontario
K0B 1J0

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March 21, 2001

001-2772

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1796 Courtwood Crescent
Ottawa, Ontario, Canada K2C 2B5
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March 21, 2001

Ontario Clean Water Agency
Box 252, 2015 Lajoie St.
Lefaivre, Ontario
K0B 1J0

Attention: Jacques Breen

RE: FOURNIER COMMUNAL SEWAGE SYSTEM MONITORING REPORT

Dear Mr. Breen,

Please find enclosed two copies of a report sent to you based on direction from Mary McCuaig (Nation Municipality) with respect to annual reporting requirements of Certificate of Approval (Sewage) No. 3-0436-99-006 for the Fournier communal sewage system. This report specifically addresses the reporting requirements of Condition 5.2(a).

This report prepared by Golder Associates Ltd. along with the additional monitoring data to be provided by the Ontario Clean Water Agency must be prepared, and upon request, submitted to MOE by March 31, 2001 as per Condition 5.2 of the Certificate of Approval.

Do not hesitate to contact the undersigned should you have any questions or concerns.

Yours truly,

GOLDER ASSOCIATES LTD.

M.A. Venhuis, M.Sc.
Environmental Geochemist

K.A. Marentette, M.Sc.
Senior Hydrogeologist/Associate

MAV:KAM:dc
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EXECUTIVE SUMMARY

The objective of the 2000 monitoring investigation was to conduct the necessary hydrogeological investigation activities to define the baseline groundwater quality at the Fournier Sewage Site. The investigation included a borehole drilling and monitoring well installation and groundwater monitoring covering the period between August and December, 2000.

The geology at the Fournier site consists of a surficial topsoil layer underlain by fine sand and silty sand laminated with clay interbeddings.

Based on the November 10, 2000 groundwater elevations in the monitoring wells, the interpreted direction of horizontal groundwater flow at the site is towards the north from the sewage site.

Background water quality is varied between monitoring wells MW99-6 and MW99-7. Chloride and conductivity levels are higher in MW99-6 whereas DOC and sulphate are higher in MW99-7. DOC concentrations slightly exceed ODWS in MW99-7.

Based on the 2000 groundwater quality data, the most relevant observations to date are as follows:

- Elevated chloride levels in background well MW99-6 compared to MW99-7;
- High chloride concentrations in MW99-4;
- High chloride and DOC levels in MW99-8; and
- Elevated nitrate and sulfate levels in MW99-8 in November 2000.

The sewage system became fully operational in November or December 2000, and thus compliance under MOEE Guideline B-7 is not relevant. Nitrate concentrations in MW99-8 however, were close to the trigger level during the November sampling session. In addition, the total ammonia and total phosphorus levels at monitor BH99-4 approached or exceeded the trigger concentrations during at least one sampling session in 2000. Based on the groundwater quality data obtained during the 2000 monitoring program, the existing trigger mechanisms associated with the site should be re-evaluated upon completion of the 2001 monitoring program.

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INTRODUCTION

This report presents the results of the 2000 groundwater monitoring program at the Fournier communal sewage system. The sewage system is located on part of Lot 1, Concession XIII, in the former Township of South Plantagenet, Village of Fournier, in the Nation Municipality, Ontario (Figure 1).

The 2000 monitoring program included the installation of eight monitoring wells and monthly groundwater sampling covering the period from August to December, 2000. It is understood that the sewage system became operational in November or December, 2000. This report describes the sampling dates and locations and provides an interpretation of the data in order to characterize the baseline groundwater conditions present in the area of the Fournier communal sewage system.

The objectives of this report are to describe the drilling of the boreholes and installation of monitoring wells at the site and to tabulate and interpret the monitoring and analytical results obtained in 2000, including the monitoring locations and dates. This report satisfies Condition 5.2(a) of Certificate of Approval (Sewage) No. 3-0436-99-006 (the "C of A") dated June 11, 1999.

FIELD PROCEDURES

Borehole Drilling and Monitoring Well Installation Program

The borehole drilling and monitoring well installation program was conducted between August 3 and 8, 2000. Borehole MW99-1 is located near one of the leaching beds. MW99-2 and MW99-3 are located about 25 metres downgradient from the leaching beds and MW99-4 and MW99-5 are located 125 metres downgradient from the leaching beds. Borehole MW99-6 and MW99-7 are located near the south property boundary up-gradient of the sewage system and MW99-8 is located on the north side of the municipal drain 265 metres downgradient from the sewage system. All borehole locations are shown on Figure 2. The boreholes were drilled using a CME55 track mounted 100 millimetre inside diameter hollow stem auger/rotary drill rig supplied and operated by Marathon Drilling Co. of Gloucester, Ontario under the full time supervision of a member of Golder Associates field technical staff.

The boreholes were advanced to depths ranging from 3.8 metres to 4.6 metres below ground surface. The overburden lithology was logged during advancement of the augers by the Golder Associates technician at the drill rig. The logs detailing the geological conditions encountered in each borehole are given on the Record of Borehole Sheets in Appendix A. The boreholes were drilled and the monitoring wells constructed in a manner consistent with requirements specified in the C of A.

After the completion of drilling, a monitoring wells were installed in each borehole to allow subsequent measurement of groundwater levels and groundwater sampling. Monitoring wells with 1.5 metre lengths of 38 millimetre diameter #10 slot PVC screen were installed in each borehole. Native sand caved material/backfill or filter sand is present below, around and above the screened intervals in the monitoring wells. Bentonite seals were placed at various locations in the boreholes to provide seals to prevent vertical migration of groundwater along the well bore and/or surface water intrusion.

All of the monitoring wells constructed during the borehole drilling and monitoring well installation program were provided with dedicated sampling devices consisting of a length of flexible low density polyethylene (LDPE) tubing and a Model D-25 foot valve manufactured by Waterra Pumps Ltd. of Toronto, Ontario. Golder Associates personnel surveyed the ground surface and top of casing elevations at each borehole location. The reference datum was the invert of the inlet pipe at Pumping Station "B" at an elevation 49.76 metres (geodetic datum).

Field Procedures

The groundwater monitoring sessions were conducted on August 10, September 13, October 05, November 10 and December 11, 2000. The December monitoring session yielded no groundwater samples due to frozen wells.

The groundwater levels in the monitoring wells were measured during each monitoring session. The monitoring wells were then developed through the removal of at least three standing volumes of water using the dedicated samplers. Sampling of groundwater was performed in all monitoring wells immediately after well development. It is noted that the monitoring wells during the December 11 monitoring session had frozen, preventing sampling.

The temperature, pH, and conductivity of the groundwater samples were measured in the field at the time of sampling. The field conductivity measurements were obtained using a Myron L Conductivity Meter EP calibrated in the field prior to use. All samples were entered on a Chain of Custody Form and placed in coolers with ice packs until they were delivered in person to Accutest Laboratories Ltd. in Nepean, Ontario for analysis of ammonia, bromide, chloride, DOC, *Escherichia-coli* (*E-coli*) fluoride, nitrate, nitrite, sulphate, total kjeldahl nitrogen (TKN) and unionized ammonia. In addition, total phosphorus was analyzed on samples collected from MW99-4 and MW99-5. Results of the analyses are provided in Appendix B. Copies of the Report of Analysis sheets from Accutest Laboratories Ltd. are provided in Appendix C.

PHYSICAL HYDROGEOLOGY

Geological Conditions

The detailed geological conditions encountered and details of the monitoring well installations in each of the boreholes put down in 2000 are given on the Record of Boreholes in Appendix A.

It is noted that the boundaries between strata on the borehole logs should be considered as transitional in nature rather than an exact plane of geological change. Natural variations other than those encountered in the boreholes should be expected to exist.

The geology encountered in the boreholes during the drilling program consisted of a surficial topsoil layer underlain by fine sand to depths of between 0.9 and 2.7 metres. At each borehole location (except MW99-8), silty sand containing clay interbeds was present below the sand layer. At MW99-8, the sand was underlain by silty clay.

Water Level Data

Water levels were measured in each of the wells prior to each sampling event. The table below summarizes the water level elevations according to a geodetic datum located at the invert of the inlet pipe at Pumping Station "B". The monitoring wells during the December 11 monitoring sessions were frozen.

Monitoring Well	Ground Surface Elevation (m)	Top of Casing Elevation (m)	Groundwater Elevation (m)				
			Aug 10 2000	Sept 13 2000	Oct 05 2000	Nov 10 2000	Dec 11 2000
MW99-1	53.48	54.08	51.76	51.30	51.41	51.91	Frozen
MW99-2	53.05	53.78	51.27	50.89	51.02	51.33	Frozen
MW99-3	53.67	53.67	51.26	50.86	51.02	51.27	Frozen
MW99-4	52.91	51.73	48.98	48.72	48.01	49.05	Frozen
MW99-5	51.50	52.25	49.31	48.86	49.02	48.99	Frozen
MW99-6	52.86	53.60	51.36	51.34	51.51	51.81	Frozen
MW99-7	53.36	54.12	52.09	51.91	52.08	52.72	Frozen
MW99-8	47.72	48.43	45.04	45.78	46.09	46.63	Frozen

Groundwater Flow Direction

Based on the groundwater elevation data, the shallow groundwater flow direction is interpreted to be to the north as illustrated in Figure 2.

GROUNDWATER QUALITY

Chemical and Physical Analyses

Preamble

The groundwater quality in the vicinity of the communal sewage system was assessed by collecting samples from the existing monitors and submitting them for laboratory analyses. The results of the field and laboratory chemical, physical and bacteriological analyses conducted during the 2000 monitoring program, along with relevant Ontario Drinking Water Standards (MOE, 2000), are presented in Appendix B. The unionized ammonia values presented in Appendix B are calculated values provided by Accutest Laboratories Ltd.

Discussions relating to compliance with the Ontario Drinking Water Standards (ODWS) relate specifically to non-health related objectives (i.e., aesthetic parameters) and health related parameters for which a Maximum Acceptable Concentration (MAC) or Interim Maximum Acceptable Concentration (IMAC) have been established.

Background Monitoring Wells

The background groundwater quality upgradient (south) of the sewage system is represented by the groundwater quality data from monitoring wells MW99-6 and MW99-7. These monitors are hydrogeologically upgradient from the sewage system (see Figure 2) and are interpreted not to be impacted by septic effluent originating from the sewage system. Comparison of the groundwater quality at monitoring locations MW99-6 and MW99-7 reveals differences in a number of parameters, which are tabulated below. In particular, chloride and conductivity are higher in MW99-6 and DOC and sulphate are higher in MW99-7.

Parameter	Typical Range in Concentrations for Background Monitoring Well MW99-6	Typical Range in Concentrations for Background Monitoring Well MW99-7
Ammonia	0.77 - 0.95	0.39 - 0.68
Bromide	<0.05 - 1.3	<0.05 - 0.2
Chloride	182 - 263	21 – 52
Conductivity	600 - 847	270 - 451
DOC	1.7 - 2.3	3.8 - 5.3
E-coli	0	0 - 1
Fluoride	<0.10 - 0.22	<0.10 - 0.21
Nitrate	<0.10 - 1.0	<0.10 - 0.32
Nitrite	<0.10	<0.10
pH	6.9 - 8.1	7.1 - 7.9
Phosphorus	0.10	0.05
Sulphate	<3 - 21	18 - 30
TKN	1.11 – 2.87	0.78 – 2.41
Unionized Ammonia	<0.02 - 0.03	<0.02 - 0.02

Discussion of Groundwater Quality

It is understood that the Fournier communal sewage system became operational in November or December 2000. Therefore the quality of groundwater observed in downgradient monitoring wells is indicative of baseline conditions prior to any effects from septic effluent. A comparison of the groundwater quality to background conditions in both monitoring wells MW99-6 and MW99-7 and an interpretation of the existing data are presented in Table 1.

Based on the 2000 groundwater quality data, the most relevant observations to date are as follows:

- Elevated chloride levels in background well MW99-6 compared to MW99-7;
- High chloride concentrations in MW99-4;
- High chloride and DOC levels in MW99-8; and
- Elevated nitrate and sulfate levels in MW99-8 in November 2000.

COMPLIANCE ASSESSMENT

In accordance with Certificate of Approval (Sewage) No. 3-0436-99-006 dated June 11, 1999, a trigger level of 3.7 mg/L nitrate (based on an assumed background nitrate level of 0 mg/L) at monitoring well MW99-8 has been established for the Fournier communal sewage system site. The purpose of the trigger value is to ensure that the wastewater treatment system installed at the site is in accordance with MOEE Reasonable Use Guideline B-7 (MOEE, 1994). Exceedance of the trigger level activates contingency measures to upgrade treatment processes and improve the quality of wastewater being discharged before exceeding the Reasonable Use requirements at the downgradient property. In addition, a trigger mechanism associated with possible surface water impact at monitoring wells MW99-4 and MW99-5 has been developed. The trigger is based on total ammonia (1.8 mg/L at 10°C and pH of 8) and total phosphorus (5 mg/L).

As noted previously, the Fournier sewage system became operational in November or December 2000. Results from the 2000 monitoring program therefore only represents baseline conditions at the site. As such, it is reasonable to defer the discussion of site compliance until a time in the future when the influence of the system on groundwater quality becomes apparent. It is noted, however, that the nitrate concentrations in MW99-8 was close to the trigger level during the November sampling session. In addition, the following comments are provided with respect to the surface water trigger mechanism associated with monitors MW99-4 and MW99-5;

- The total ammonia concentration of 1.61 mg/L at monitor MW99-4 in November 2000 approaches the trigger concentration of 1.8 mg/L;

- The total phosphorus levels of 18.1 mg/L at monitor MW99-4 in September 2000 exceeds the trigger concentration of 5 mg/L.

Based on the groundwater quality data obtained during the 2000 monitoring program, the existing trigger mechanisms associated with the site should be re-evaluated upon completion of the 2001 monitoring program.

GOLDER ASSOCIATES LTD.
Environmental Division

M.A. Venhuis, M.Sc.
Environmental Geochemist

K.A. Marentette, M.Sc.
Senior Hydrogeologist/Associate

MAV:KAM:dc
Rpt-001

LIST OF REFERENCES

Ministry of the Environment, 2000. Ontario Drinking Water Objectives, Revised 2000: Ontario Ministry of the Environment.

Ministry of the Environment, 1994. Guideline B-7: Incorporation of the Reasonable Use Concept into MOE Groundwater Management: Ontario Ministry of the Environment Program development Branch: Ontario Ministry of the Environment, April 1994, 8p.

TABLE 1

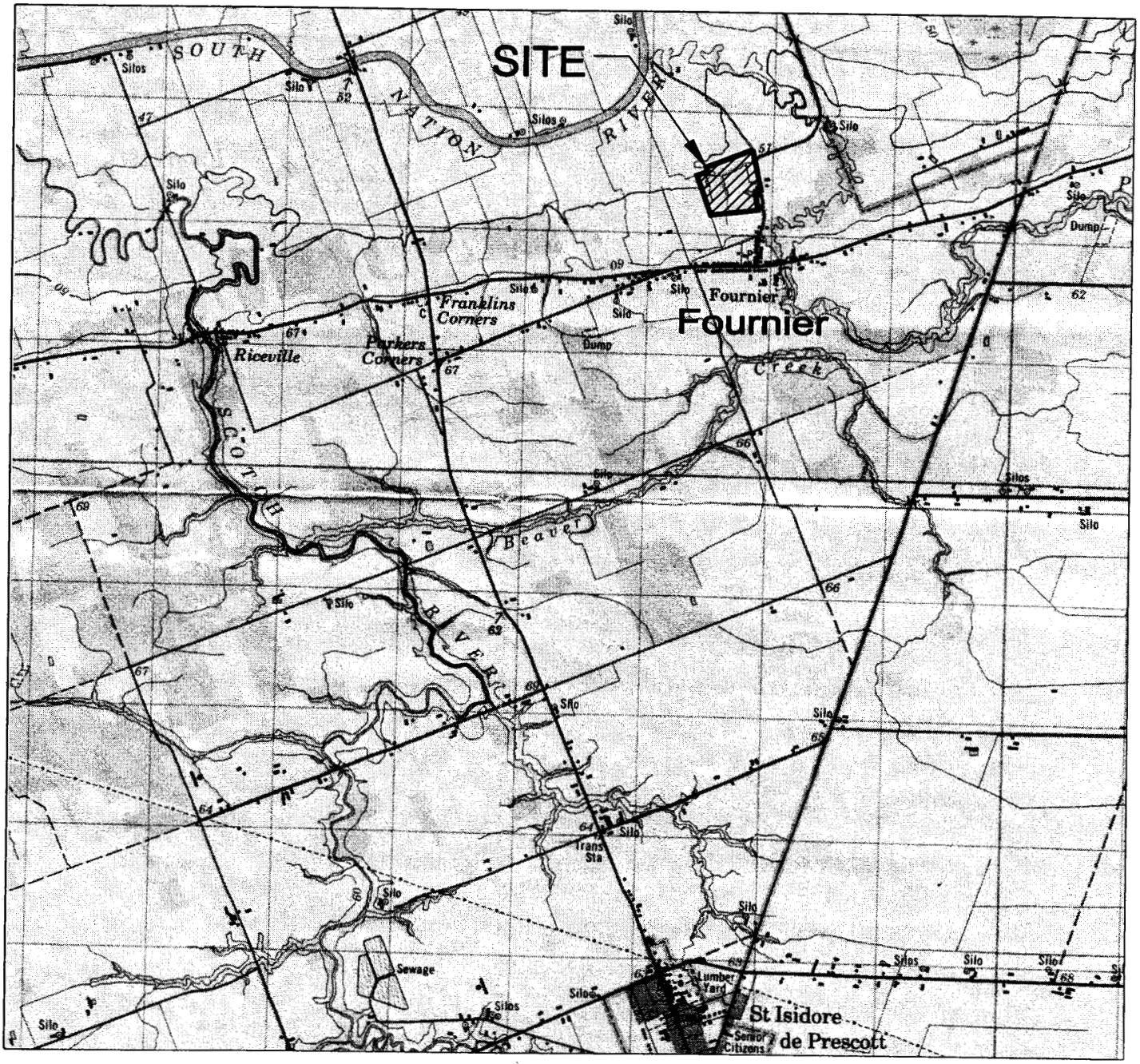
INTERPRETATION OF 2000 GROUNDWATER QUALITY DATA
DOWNGRADIENT MONITORING WELLS

Sampling Location	Parameters Exceeding ODWS/O	Trend(s)	Parameters Consistently Elevated Compared to Background Conditions at MW99-6	Parameters Consistently Elevated Compared to Background Conditions at MW99-7	Hydrogeological Interpretation
MW99-1	[None]	• groundwater quality consistent over time • high TKN in Aug.	sulphate	sulphate	• borehole MW99-1 is located to the north of the leaching beds (see Figure 2) • sewage disposal system became operational in Nov. or Dec. 2000, therefore groundwater quality likely represents natural water quality conditions prior to any impacts from the system (i.e., baseline conditions)
MW99-2	[None]	• groundwater quality consistent over time with higher chloride concentrations in Sept. • high TKN in Aug.	sulphate	[None]	• borehole MW99-2 is located about 25 metres downgradient from leaching beds (see Figure 2) • sewage disposal system became operational in Nov. or Dec. 2000, therefore groundwater quality represents natural water quality conditions prior to any impacts from the system (i.e., baseline conditions)
MW99-3	[None]	• groundwater quality consistent over time with higher chloride concentrations in Aug. and Sept. • high TKN in Aug.	DOC and sulphate	sulphate	• borehole MW99-3 is located about 25 metres downgradient from leaching beds (see Figure 2) • sewage disposal system became operational in Nov. or Dec. 2000, therefore groundwater quality represents natural water quality conditions prior to any impacts from the system (i.e., baseline conditions)
MW99-4	Chloride DOC *E-coli*	• groundwater quality variable with elevated sulfate and TKN in Aug. • elevated phosphorus in Sept. • higher chloride levels during Sept., Oct. and Nov.	ammonia, bromide, chloride, conductivity, and DOC	ammonia, bromide, chloride, conductivity, and DOC	• borehole MW99-4 is located about 125 metres downgradient from leaching beds (see Figure 2) • sewage disposal system became operational in Nov. or Dec. 2000, therefore groundwater quality represents natural water quality conditions prior to any impacts from the system (i.e., baseline conditions)
MW99-5	*E-coli*	• groundwater quality consistent over time with variable *E-coli* concentrations • higher chloride, conductivity, DOC and TKN levels in Aug. • higher sulphate and phosphorus concentrations in Nov.	DOC and sulphate	[None]	• borehole MW99-5 is located 125 metres downgradient from leaching beds (see Figure 2) • sewage disposal system became operational in Nov. or Dec. 2000, therefore groundwater quality represents natural water quality conditions prior to any impacts from the system (i.e., baseline conditions)
MW99-8	Chloride DOC	• groundwater quality consistent over time with high chloride levels present • high TKN in Aug. • nitrate and sulphate increase in Nov.	ammonia, bromide, chloride, conductivity, DOC, sulphate, TKN and unionized ammonia	ammonia, bromide, chloride, conductivity, DOC, sulphate, TKN and unionized ammonia	• borehole MW99-8 is located across municipal drain 265 metres downgradient from the sewage system (see Figure 2) • sewage disposal system became operational in Nov. or Dec. 2000, therefore groundwater quality represents natural water quality conditions prior to any impacts from the system (i.e., baseline conditions)

NOTES: ODWS/O - Ontario Drinking Water Standards/Objectives (Ministry of the Environment, 2000)

KEY PLAN

FIGURE 1



SCALE 1 : 50,000

SPECIAL NOTE
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT

Date: MARCH 6, 2001

Project: 001-2772

Golder Associates

Drawn: K.T.

Chkd:

APPENDIX A

RECORD OF BOREHOLE SHEETS

PROJECT: 001-2772

RECORD OF BOREHOLE: MW 99-1

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: August 3, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		53.48							
0	Power Auger 200mm Diam. Hollow Stem	TOPSOIL		0.00 / 53.18							Native Backfill
		Brown medium SAND		0.30 / 52.57							Bentonite Seal
1		Loose brown very fine SAND		0.91 / 51.80							Native Backfill
		Loose grey SILTY SAND, laminated with clay interbeds		1.68	1	50 DO	5				Bentonite Seal
2											Native Backfill
3					2	50 DO	2				38mm PVC #10 Slot Screen
4											Granular Filter
		END OF BOREHOLE		48.91 / 4.57							W.L.in Screen at Elev. 51.76m Aug. 10/00
5											

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MV

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

PROJECT: 001-2772

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: MW 99-2

BORING DATE: August 3, 2000

SHEET 1 OF 1

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		53.05							
		TOPSOIL		0.00							Native Backfill
				52.84							Bentonite Seal
		Loose brown very fine SAND, trace silt		0.21							Native Backfill
1											
											Bentonite Seal
2	Power Auger 200mm Diam. Hollow Stem				1	50 DO	5				Native Backfill
		Loose grey SILTY SAND, with clay interbeds		51.37 1.68							
					2	50 DO	4				38mm PVC #10 Slot Screen
3											
					3	50 DO	2				Granular Filter
4											
		END OF BOREHOLE		48.48 4.57							W.L.in Screen at Elev. 51.27m Aug. 10/00
5											

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MW

PROJECT: 001-2772

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: MW 99-3

BORING DATE: August 3, 2000

SHEET 1 OF 1

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		53.67							
		TOPSOIL		0.00							Native Backfill
											Bentonite Seal
				53.06							Granular Filter
1		Loose very fine brown SAND		0.61							Native Backfill
											Bentonite Seal
				51.99							
2		Loose grey SILTY SAND, with clay interbeds		1.68	1	50 DO	6				Native Backfill ▽
3					2	50 DO	3				38mm PVC #10 Slot Screen
4					3	50 DO	2				Granular Filter
				49.10							
		END OF BOREHOLE		4.57							
5											W.L.in Screen at Elev. 51.26m Aug. 10/00

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: .....

PROJECT: 001-2772

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: MW 99-4

BORING DATE: August 3, 2000

SHEET 1 OF 1

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		52.91							
		TOPSOIL		0.00							
				52.70							Native Backfill
		Loose brown very fine SAND, laminated		0.21							
1											Bentonite Seal
											Native Backfill
											Bentonite Seal
2	Power Auger 200mm Diam. Hollow Stem				1	50 DO	3				
											Native Backfill
				50.17							
		Loose grey SILTY SAND, with clay interbeds		2.74							
3					2	50 DO	4				
											38mm PVC #10 Slot Screen
4											▽
					3	50 DO	2				Granular Filter
				48.34							
		END OF BOREHOLE		4.57							
5											W.L.in Screen at Elev. 48.98m Aug. 10/00

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MV

PROJECT: 001-2772

RECORD OF BOREHOLE: MW 99-5

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: August 8, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		51.50							
		TOPSOIL		0.00							Native Backfill
				51.10							Bentonite Seal
		Loose brown very fine SAND		0.40							Native Backfill
1											Bentonite Seal
					1	50 DO	4				
2											Native Backfill ▽
		Loose grey SILTY SAND, with clay interbeds		48.94 2.56							Granular Filter
3					2	50 DO	4				38mm PVC #10 Slot Screen
4					3	50 DO	4				Granular Filter
		END OF BOREHOLE		46.93 4.57							W.L.in Screen at Elev. 49.31m Aug. 10/00
5											

DEPTH SCALE
1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MV

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

PROJECT: 001-2772

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: MW 99-6

BORING DATE: August 3, 2000

SHEET 1 OF 1

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		52.86							
		Sand (FILL)		0.00							
				52.71							
		TOPSOIL		0.15							
				52.40							Concrete
		Loose brown very fine SAND, some silt		0.46							
1											Granular Filter
				51.64							
		Loose grey SILTY fine SAND, with clay interbeds		1.22							Bentonite Seal
					1	50 DO	5				
2											Native Backfill
											38mm PVC #10 Slot Screen
3					2	50 DO	2				
											Granular Filter
				49.05							
		END OF BOREHOLE		3.81							
4											W.L.in Screen at Elev. 51.36m Aug. 10/00
5											

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MW

PROJECT: 001-2772

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: MW 99-7

BORING DATE: August 4, 2000

SHEET 1 OF 1

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		53.36							
		TOPSOIL		0.00 / 53.21							
		Loose brown very fine SAND		0.15							Native Backfill
											Bentonite Seal
											Native Backfill
1		Loose grey SILTY fine SAND, laminated with clay interbeds		52.45 / 0.91							
											Bentonite Seal
					1	50 DO	4				
2											Native Backfill
											38mm PVC #10 Slot Screen
3					2	50 DO	3				
											Granular Filter
		END OF BOREHOLE		49.55 / 3.81							
4											W.L.in Screen at Elev. 52.09m Aug. 10/00
5											

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MW

PROJECT: 001-2772

RECORD OF BOREHOLE: MW 99-8

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: August 8, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		47.72							
		Fine sand (FILL)		0.00							Native Backfill
											Bentonite Seal
		PEAT		47.20 0.52							Granular Filter
		TOPSOIL		47.01							
		Loose very fine brown SAND		46.93 0.79							Bentonite Seal
1					1	50 DO	2				
2		Grey SILTY CLAY, with sand seams		45.98 1.74							Native Backfill
3					2	50 DO	2				Granular Filter
4					3	50 DO	2				38mm PVC #10 Slot Screen
		END OF BOREHOLE		43.15 4.57							
5											W.L.in Screen at Elev. 45.04m Aug. 10/00

BOREHOLE 001-2772.GPJ HYDROGEO.GDT 3 19 01

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JFB

CHECKED: MN

APPENDIX B

GROUNDWATER CHEMICAL ANALYSIS DATA

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-1** Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.17	0.18	0.08	0.09	Frozen
Bromide		<0.05	<0.05	<0.05	<0.05	
Chloride	250	12.0	11.0	7.0	6.0	
Conductivity (uS/cm)		448	441	420	280	
DOC	5	3.5	2.6	2.4	2.1	
Escherichia coli (per 100mL)	0	<10	0	0	0	
Fluoride	1.5	<0.10	0.11	0.11	0.11	
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.7	7.1	7.9	7.9	
Sulphate	500	41.0	43.0	44.0	47.0	
Temperature (C)	15		11.0		6.0	
TKN		2.74	0.33	0.21	0.24	
Unionized Ammonia		<0.020	<0.020	<0.020	<0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-2** Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.23	0.26	0.14	0.16	Frozen
Bromide		<0.05	<0.05	<0.05	<0.05	
Chloride	250	8.0	16.0	5.0	4.0	
Conductivity (uS/cm)		340	359	305	230	
DOC	5	3.7	2.4	2.4	1.8	
Escherichia coli (per 100mL)	0	<10	0	0	0	
Fluoride	1.5	0.12	0.13	0.13	0.12	
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.8	7.4	7.9	7.7	
Sulphate	500	28.0	25.0	24.0	26.0	
Temperature (C)	15		11.0		6.0	
TKN		2.48	0.41	0.19	0.31	
Unionized Ammonia		<0.020	<0.020	<0.020	<0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-3**

Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.34	0.40	0.45	0.35	Frozen
Bromide		0.22	0.26	0.08	<0.05	
Chloride	250	44.0	63.0	16.0	18.0	
Conductivity (uS/cm)		545	595	447	310	
DOC	5	2.3	2.9	2.6	2.1	
Escherichia coli (per 100mL)	0	<10	0	0	0	
Fluoride	1.5	0.11	0.15	0.13	0.12	
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.4	7.3	8.0	7.4	
Sulphate	500	39.0	32.0	37.0	41.0	
Temperature (C)	15		11.0		6.0	
TKN		2.02	0.77	0.45	0.53	
Unionized Ammonia		<0.020	<0.020	<0.020	<0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-4** Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.89	0.29	1.28	1.61	Frozen
Bromide		3.52	6.37	5.19	<0.05	
Chloride	250	591.0	1160.0	1030.0	1030.0	
Conductivity (uS/cm)		2080	3760	3310	310	
DOC	5	6.2	6.0	3.9	5.8	
Escherichia coli (per 100mL)	0	<10	1	0	0	
Fluoride	1.5	0.17	0.20	0.22	0.22	
Nitrate (as N)	10	0.32	<0.10	<0.10	<0.10	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.6	7.6	7.7	7.7	
Phosphorus (total)		0.05	18.10	0.60	0.09	
Sulphate	500	36.0	8.0	8.0	5.0	
Temperature (C)	15		13.0		5.5	
TKN		2.35	1.66	1.49	1.88	
Unionized Ammonia		<0.020	<0.020	<0.020	0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-5**

Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.59	0.29	0.32	0.51	Frozen
Bromide		0.32	0.11	0.13	<0.05	
Chloride	250	77.0	21.0	29.0	7.0	
Conductivity (uS/cm)		588	329	345	600	
DOC	5	4.5	2.3	3.0	2.1	
Escherichia coli (per 100mL)	0	10	0	0	1	
Fluoride	1.5	<0.10	0.14	0.14	0.11	
Nitrate (as N)	10	0.21	0.20	0.24	<0.10	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.8	7.7	7.8	7.7	
Phosphorus (total)		0.04	0.05	0.08	1.36	
Sulphate	500	39.0	26.0	24.0	47.0	
Temperature (C)	15		10.0		5.0	
TKN		3.65	0.52	0.46	0.68	
Unionized Ammonia		<0.020	<0.020	<0.020	<0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-6**

Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.77	0.81	0.95	0.89	Frozen
Bromide		<0.05	1.25	1.30	1.07	
Chloride	250	195.0	182.0	199.0	263.0	
Conductivity (uS/cm)		847	821	838	600	
DOC	5	2.3	2.3	2.2	1.7	
Escherichia coli (per 100mL)	0	<10	0	0	0	
Fluoride	1.5	<0.10	0.19	0.22	0.21	
Nitrate (as N)	10	<0.10	<0.10	<0.10	1.00	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	8.0	6.9	8.1	7.7	
Sulphate	500	<3.0	4.0	3.0	21.0	
Temperature (C)	15		10.0		5.0	
TKN		2.87	1.12	1.11	1.24	
Unionized Ammonia		<0.020	0.030	<0.020	<0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-7**

Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		0.39	0.68	0.56	0.58	Frozen
Bromide		0.05	0.20	0.15	<0.05	
Chloride	250	28.0	52.0	29.0	21.0	
Conductivity (uS/cm)		385	451	370	270	
DOC	5	3.9	3.8	5.1	5.3	
Escherichia coli (per 100mL)	0	<10	1	0	0	
Fluoride	1.5	<0.10	0.21	0.19	0.17	
Nitrate (as N)	10	<0.10	<0.10	<0.10	0.32	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.7	7.1	7.9	7.6	
Sulphate	500	29.0	18.0	21.0	30.0	
Temperature (C)	15		12.0		6.5	
TKN		2.41	0.94	0.78	0.90	
Unionized Ammonia		<0.020	0.020	<0.020	<0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

FOURNIER SEWAGE SYSTEM (NATION MUNICIPALITY) - REPORT OF MONITORING RESULTS

Sample Source: **MW 99-8**

Sheet: 1

Date Sampled:		10-Aug-2000	13-Sep-2000	05-Oct-2000	10-Nov-2000	11-Dec-2000
Parameter	ODWS/O					
Ammonia (as N)		3.58	4.19	4.41	4.07	Frozen
Bromide		12.40	10.60	10.60	0.33	
Chloride	250	3560.0	2940.0	3260.0	3800.0	
Conductivity (uS/cm)		10300	10100	10200	8200	
DOC	5	15.6	14.1	13.6	14.4	
Escherichia coli (per 100mL)	0	<10	0	0	0	
Fluoride	1.5	<0.10	<0.10	<0.10	0.30	
Nitrate (as N)	10	<0.10	<0.10	<0.10	3.45	
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.9	7.4	7.7	7.4	
Sulphate	500	90.0	113.0	100.0	203.0	
Temperature (C)	15		10.0		5.0	
TKN		9.76	4.23	4.66	5.55	
Unionized Ammonia		0.040	0.160	0.050	0.050	

All values reported in mg/L unless otherwise noted.

APPENDIX C

REPORT OF ANALYSIS SHEETS
ACCUTEST LABORATORIES LTD.

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Leslie Lander

Report Number: 2008864
Date: 2000-09-18
Date Submitted: 2000-08-10
Date Collected: 2000-08-10
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82699 MW 99-1	82700 MW 99-2	82701 MW 99-3	82702 MW 99-4	82703 MW 99-5
Br	mg/L	0.05	<0.05	<0.05	0.22	3.52	0.32
Cl	mg/L	1	12	8	44	591	77
Conductivity	uS/cm	5	448	340	545	2080	588
DOC	mg/L	0.4	3.5	3.7	2.3	6.2	4.5
Escherichia Coli	ct/100mL		<10	<10	<10	<10	10
F	mg/L	0.10	<0.10	0.12	0.11	0.17	<0.10
N-NH3	mg/L	0.02	0.17	0.23	0.34	0.89	0.59
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10	0.32	0.21
pH			7.68	7.78	7.43	7.56	7.81
SO4	mg/L	3	41	28	39	36	39
Total Kjeldahl Nitrogen	mg/L	0.05	2.74	2.48	2.02	2.35	3.65
Total P	mg/L	0.01				0.05	0.04

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Leslie Lander

Report Number: 2008864
Date: 2000-09-18
Date Submitted: 2000-08-10
Date Collected: 2000-08-10
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	82704 MW 99-6	82705 MW 99-7	82706 MW 99-8		
Br	mg/L	0.05	<0.05	0.05	12.4		
Cl	mg/L	1	195	28	3560		
Conductivity	uS/cm	5	847	385	10300		
DOC	mg/L	0.4	2.3	3.9	15.6		
Escherichia Coli	ct/100mL		<10	<10	<10		
F	mg/L	0.10	<0.10	<0.10	<0.10		
N-NH3	mg/L	0.02	0.77	0.39	3.58		
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	0.04		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10		
pH			7.95	7.74	7.85		
SO4	mg/L	3	<3	29	90		
Total Kjeldahl Nitrogen	mg/L	0.05	2.87	2.41	9.76		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Leslie Lander

Report Number: 2010385
Date: 2000-09-26
Date Submitted: 2000-09-14
Date Collected: 2000-09-13
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	87846 MW99-1	87847 MW99-2	87848 MW99-3	87849 MW99-4	87850 MW99-5
Br	mg/L	0.05	<0.05	<0.05	0.26	6.37	0.11
Cl	mg/L	1	11	16	63	1160	21
Conductivity	uS/cm	5	441	359	595	3760	329
DOC	mg/L	0.4	2.6	2.4	2.9	6.0	2.3
Escherichia Coli	ct/100mL		0	0	0	1	0
F	mg/L	0.10	0.11	0.13	0.15	0.20	0.14
N-NH3	mg/L	0.02	0.18	0.26	0.40	0.29	0.29
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	0.20
pH			7.94	7.86	7.95	7.99	7.90
SO4	mg/L	1	43	25	32	8	26
Total Kjeldahl Nitrogen	mg/L	0.05	0.33	0.41	0.77	1.66	0.52
Total P	mg/L	0.01				18.1	0.05

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Leslie Lander

Report Number: 2010385
Date: 2000-09-26
Date Submitted: 2000-09-14
Date Collected: 2000-09-13
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	87851 MW99-6	87852 MW99-7	87853 MW99-8		
Br	mg/L	0.05	1.25	0.20	10.6		
Cl	mg/L	1	182	52	2940		
Conductivity	uS/cm	5	821	451	10100		
DOC	mg/L	0.4	2.3	3.8	14.1		
Escherichia Coli	ct/100mL		0	1	0		
F	mg/L	0.10	0.19	0.21	<0.10		
N-NH3	mg/L	0.02	0.81	0.68	4.19		
N-NH3 (unionized)	mg/L	0.02	0.03	0.02	0.16		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10		
pH			7.91	7.90	7.93		
SO4	mg/L	1	4	18	113		
Total Kjeldahl Nitrogen	mg/L	0.05	1.12	0.94	4.23		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Ms. Leslie Lander

Report Number: 2011477
Date: 2000-10-18
Date Submitted: 2000-10-06
Date Collected: 2000-10-05
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	91796 MW99-1	91797 MW99-2	91798 MW99-3	91799 MW99-4	91800 MW99-5
Br	mg/L	0.05	<0.05	<0.05	0.08	5.19	0.13
Cl	mg/L	1	7	5	16	1030	29
Conductivity	uS/cm	5	420	305	447	3310	345
DOC	mg/L	0.3	2.4	2.4	2.6	3.9	3.0
Escherichia Coli	ct/100mL		0	0	0	0	0
F	mg/L	0.10	0.11	0.13	0.13	0.22	0.14
N-NH3	mg/L	0.02	0.08	0.14	0.45	1.28	0.32
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	0.24
pH			7.86	7.93	7.95	7.73	7.77
SO4	mg/L	1	44	24	37	8	24
Total Kjeldahl Nitrogen	mg/L	0.05	0.21	0.19	0.45	1.49	0.46
Total P	mg/L	0.01				0.60	0.08

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Ms. Leslie Lander

Report Number: 2011477
Date: 2000-10-18
Date Submitted: 2000-10-06
Date Collected: 2000-10-05
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	91801 MW99-6	91802 MW99-7	91803 MW99-8		
Br	mg/L	0.05	1.30	0.15	10.6		
Cl	mg/L	1	199	29	3260		
Conductivity	uS/cm	5	838	370	10200		
DOC	mg/L	0.3	2.2	5.1	13.6		
Escherichia Coli	ct/100mL		0	0	0		
F	mg/L	0.10	0.22	0.19	<0.10		
N-NH3	mg/L	0.02	0.95	0.56	4.41		
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	0.05		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10		
pH			8.05	7.86	7.68		
SO4	mg/L	1	3	21	100		
Total Kjeldahl Nitrogen	mg/L	0.05	1.11	0.78	4.66		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Kris Marentette

Report Number: 2013239
Date: 2000-12-07
Date Submitted: 2000-11-10
Date Collected: 2000-11-10
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	99285 MW99-1	99286 MW99-2	99287 MW99-3	99288 MW99-4	99289 MW99-5
Br	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cl	mg/L	1	6	4	18	1030	7
DOC	mg/L	0.3	2.1	1.8	2.1	5.8	2.1
Escherichia Coli	ct/100mL		0	0	0	0	1
F	mg/L	0.10	0.11	0.12	0.12	0.22	0.11
N-NH3	mg/L	0.02	0.09	0.16	0.35	1.61	0.51
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	<0.02	0.02	<0.02
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH			7.72	7.66	7.36	7.65	7.66
SO4	mg/L	1	47	26	41	5	47
Total Kjeldahl Nitrogen	mg/L	0.05	0.24	0.31	0.53	1.88	0.68
Total P	mg/L	0.01				0.09	1.36

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Kris Marentette

Report Number: 2013239
Date: 2000-12-07
Date Submitted: 2000-11-10
Date Collected: 2000-11-10
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	99290 MW99-6	99291 MW99-7	99292 MW99-8		
Br	mg/L	0.05	<0.05	<0.05	0.33		
Cl	mg/L	1	<1	21	3800		
DOC	mg/L	0.3	1.7	5.3	14.4		
Escherichia Coli	ct/100mL		0	0	0		
F	mg/L	0.10	<0.10	0.17	0.30		
N-NH3	mg/L	0.02	0.89	0.58	4.07		
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	0.05		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	0.32	3.45		
pH		1.00	7.69	7.59	7.81		
SO4	mg/L	1	4	30	203		
Total Kjeldahl Nitrogen	mg/L	0.05	1.24	0.90	5.55		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Kris Marentette

Report Number: 2013239
Date: 2001-02-26
Date Submitted: 2000-11-10
Date Collected: 2000-11-10
Project: 001-2772

P.O. Number:
Matrix: Water

PARAMETER	UNITS	MDL	99290 MW99-6	99291 MW99-7	99292 MW99-8		
Br	mg/L	0.05	1.07	<0.05	0.33		
Cl	mg/L	1	263	21	3800		
DOC	mg/L	0.3	1.7	5.3	14.4		
Escherichia Coli	ct/100mL		0	0	0		
F	mg/L	0.10	0.21	0.17	0.30		
N-NH3	mg/L	0.02	0.89	0.58	4.07		
N-NH3 (unionized)	mg/L	0.02	<0.02	<0.02	0.05		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	1.00	0.32	3.45		
pH		1.00	7.69	7.59	7.81		
SO4	mg/L	1	21	30	203		
Total Kjeldahl Nitrogen	mg/L	0.05	1.24	0.90	5.55		

REVISED

MDL = Method Detection Limit INC = Incomplete

Comment:

This is a correction certificate and supercedes all previous copies of this report.
Anion results have been corrected for sample MW99-6.

APPROVAL: _____

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