

## **APPENDIX C**

### **Landing Lake Water Quality**



# Environmental Test MFC

IES

Summer data

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Thicket Portage

Date Received: 97/ 7/29

Date Reported: 97/ 8/ 8

Work Order: W970713884

Units	Date Analysed	Guideline Value
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97-A43710

Analysis of Water - Well Raw  
 Sample I.D. Raw-Treatment Plant  
 Location Thicket Portage  
 Date Sampled 97/ 7/28  
 Time Sampled 14:00

Specific Conductivity	165.	umhos/cm	97/ 7/29	-----
pH	7.77	pH units	97/ 7/29	6.5-8.5
Alkalinity as CaCO3	81.	mg/L	97/ 7/29	-----
Alkalinity as Bicarbonate	99.	mg/L	97/ 7/29	-----
Alkalinity as Carbonate	< 20	mg/L	97/ 7/29	-----
Alkalinity as Hydroxide	< 10	mg/L	97/ 7/29	-----
Coliform Total MF **	23	CFU/100 mL	97/ 7/30	0
Coliform Fecal MF	< 1	CFU/100 mL	97/ 7/30	0
Chloride - Dissolved	< 10	mg/L	97/ 7/30	250
NitrateNitrite-N Dissolve	0.08	mg/L	97/ 7/30	10
Sulphate - Dissolved	< 10	mg/L	97/ 7/30	250
Hardness as CaCO3	80.5	mg/L		500
Calcium - Extractable	22.0	mg/L	97/ 8/ 6	-----
Magnesium - Extractable	6.20	mg/L	97/ 8/ 6	-----
Iron - Extractable	0.01	mg/L	97/ 8/ 6	0.3
Manganese - Extractable	0.005	mg/L	97/ 8/ 6	0.05
Sodium - Extractable	3.9	mg/L	97/ 8/ 6	200
Copper - Extractable	0.041	mg/L	97/ 8/ 6	1.0
Zinc - Extractable	0.06	mg/L	97/ 8/ 6	5.0
Lead - Extractable	0.001	mg/L	97/ 7/31	0.01
Colour - True	15.	ColourUnit	97/ 8/ 5	-----
Fluoride - Dissolved	0.1	mg/L	97/ 7/30	-----
Solids - Dissolved	90.	mg/L	97/ 7/31	-----
Turbidity	0.55	NTU	97/ 8/ 5	-----

Approved By: Paul Nicolas

Date 97/ 8/ 8

ENVIRO-TEST ANALYSIS REPORT

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W970713884 CONT...

	<u>Results</u>	<u>Units</u>	<u>Date</u> <u>Analysed</u>	<u>Guideline</u> <u>Value</u>
97-A43710	(continued)			
Prep water quality filter	Completed		97/ 7/30	-----
Aluminum - Extractable	0.02	mg/L	97/ 7/31	-----
Arsenic - Total	< 0.001	mg/L	97/ 8/ 5	-----
Barium - Extractable	0.009	mg/L	97/ 8/ 6	-----
Boron - Extractable	< 0.01	mg/L	97/ 8/ 6	-----
Cadmium - Extractable	< 0.0005	mg/L	97/ 7/30	-----
Prep ICP Inorganic	completed		97/ 8/ 6	-----
Saturation Index/Langlier	-1.	SI 4.4C		-----
Saturation Index/Langlier	0.	SI 60C		-----

**\*\* The indicated total Coliform results are not acceptable resampling is recommended. If this is a resample please contact your local public health inspector.**

Specific Conductivity is an electrical measurement of the mineral content of this water.

Langlier's Stability Index

Positive values (+) indicate the water will have scaling tendencies

Negative values (-) indicate the water will have corrosive tendencies

Zero (0) indicates the water is neutral

Total Anions in Milliequivalents:	1.87
Total Cations in Milliequivalents:	1.78
Percent Error:	2.61

Approved By: Paul Nicolas

Date 97/ 8/ 8

ENVIRO-TEST ANALYSIS REPORT

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<u>Results</u>	<u>Units</u>	<u>Date</u> <u>Analysed</u>	<u>Guideline</u> <u>Value</u>
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97-A43711

Analysis of Water - Well Raw  
Sample I.D. Treated-Treatment Plant  
Location Thicket Portage  
Date Sampled 97/ 7/28  
Time Sampled 14:00

Specific Conductivity	171.	umhos/cm	97/ 7/29	-----
pH	7.82	pH units	97/ 7/29	6.5-8.5
Alkalinity as CaCO3	80.	mg/L	97/ 7/29	-----
Alkalinity as Bicarbonate	97.	mg/L	97/ 7/29	-----
Alkalinity as Carbonate	< 20	mg/L	97/ 7/29	-----
Alkalinity as Hydroxide	< 10	mg/L	97/ 7/29	-----
Coliform Total MF	< 1	CFU/100 mL	97/ 7/30	0
Heterotrophic Plate Count	40	CFU/mL	97/ 7/30	500
Coliform Fecal MF	< 1	CFU/100 mL	97/ 7/30	0
Chloride - Dissolved	< 10	mg/L	97/ 7/30	250
NitrateNitrite-N Dissolve	0.08	mg/L	97/ 7/30	10
Sulphate - Dissolved	< 10	mg/L	97/ 7/30	250
Hardness as CaCO3	79.2	mg/L		500
Calcium - Extractable	21.6	mg/L	97/ 8/ 6	-----
Magnesium - Extractable	6.13	mg/L	97/ 8/ 6	-----
Iron - Extractable	0.01	mg/L	97/ 8/ 6	0.3
Manganese - Extractable	0.005	mg/L	97/ 8/ 6	0.05
Sodium - Extractable	3.9	mg/L	97/ 8/ 6	200
Copper - Extractable	0.103	mg/L	97/ 8/ 6	1.0
Zinc - Extractable	0.07	mg/L	97/ 8/ 6	5.0
Lead - Extractable	< 0.001	mg/L	97/ 7/31	0.01
Colour - True	15.	ColourUnit	97/ 8/ 5	-----
Fluoride - Dissolved	0.1	mg/L	97/ 7/30	-----
Solids - Dissolved	110	mg/L	97/ 7/31	-----
Turbidity	0.48	NTU	97/ 8/ 5	-----
Prep water quality filter	Completed		97/ 7/30	-----
Aluminum - Extractable	0.02	mg/L	97/ 7/31	-----

Approved By: Paul Nicolas

Date 97/ 8/ 8

ENVIRO-TEST ANALYSIS REPORT

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	Results	Units	Date Analysed	Guideline Value
97-A43711 (continued)				
Arsenic - Total	< 0.001	mg/L	97/ 8/ 5	-----
Barium - Extractable	0.009	mg/L	97/ 8/ 6	-----
Boron - Extractable	< 0.01	mg/L	97/ 8/ 6	-----
Cadmium - Extractable	< 0.0005	mg/L	97/ 7/30	-----
Prep ICP Inorganic	completed		97/ 8/ 6	-----
Saturation Index/Langlier	-1.	SI 4.4C		-----
Saturation Index/Langlier	0.	SI 60C		-----

If this water is used for consumption purposes then the sample complies with The Guidelines for Canadian Drinking Water Quality for the above analysis.

Specific Conductivity is an electrical measurement of the mineral content of this water.

Langlier's Stability Index

Positive values (+) indicate the water will have scaling tendencies  
Negative values (-) indicate the water will have corrosive tendencies

Zero (0) indicates the water is neutral

Total Anions in Milliequivalents:	1.84
Total Cations in Milliequivalents:	1.75
Percent Error:	2.46

97-A43712

Analysis of Water - Well Raw  
Sample I.D. Distribution-Far Standpipe  
Location Thicket Portage  
Date Sampled 97/ 7/28  
Time Sampled 14:00

pH	7.66	pH units	97/ 7/29	6.5-8.5
Alkalinity as CaCO3	80.	mg/L	97/ 7/29	-----
Alkalinity as Bicarbonate	98.	mg/L	97/ 7/29	-----

Approved By: Paul Nicolas

Date 97/ 8/ 8

ENVIRO-TEST ANALYSIS REPORT

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	Results	Units	Date Analysed	Guideline Value
97-A43712 (continued)				
Alkalinity as Carbonate	< 20	mg/L	97/ 7/29	-----
Alkalinity as Hydroxide	< 10	mg/L	97/ 7/29	-----
Coliform Total MF **	2	CFU/100 mL	97/ 7/30	0
Heterotrophic Plate Count **	620	CFU/mL	97/ 7/30	500
Coliform Fecal MF	< 1	CFU/100 mL	97/ 7/30	0
Sulphate - Dissolved	< 10	mg/L	97/ 7/30	250
Calcium - Extractable	21.8	mg/L	97/ 8/ 6	-----
Magnesium - Extractable	6.12	mg/L	97/ 8/ 6	-----
Iron - Extractable	0.01	mg/L	97/ 8/ 6	0.3
Manganese - Extractable	< 0.005	mg/L	97/ 8/ 6	0.05
Copper - Extractable	0.192	mg/L	97/ 8/ 6	1.0
Zinc - Extractable	0.06	mg/L	97/ 8/ 6	5.0
Lead - Extractable	0.001	mg/L	97/ 7/31	0.01
Colour - True	35.	ColourUnit	97/ 8/ 5	-----
Fluoride - Dissolved	0.1	mg/L	97/ 7/30	-----
Turbidity	0.44	NTU	97/ 8/ 5	-----
Prep water quality filter	Completed		97/ 7/30	-----
Aluminum - Extractable	0.10	mg/L	97/ 7/31	-----
Barium - Extractable	0.009	mg/L	97/ 8/ 6	-----
Prep ICP Inorganic	completed		97/ 8/ 6	-----
Saturation Index/Langlier	-1.	SI 4.4C		-----
Saturation Index/Langlier	0.	SI 60C		-----
Bromodichloromethane-P	< 2	ug/L	97/ 8/ 5	-----
Bromoform - Potential	< 1	ug/L	97/ 8/ 5	-----
Carbon Tetrachloride-P	< 1	ug/L	97/ 8/ 5	-----
Chloroform - Potential	< 1	ug/L	97/ 8/ 5	-----
Dibromochloromethane-P	< 1	ug/L	97/ 8/ 5	-----
Perchloroethylene-P	< 1	ug/L	97/ 8/ 5	-----

Approved By: Paul Nicolas

Date 97/ 8/ 8

ENVIRO-TEST ANALYSIS REPORT

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<u>Results</u>	<u>Units</u>	<u>Date</u> <u>Analysed</u>	<u>Guideline</u> <u>Value</u>
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97-A43712 (continued)

\*\* The indicated total Coliform results are not acceptable resampling is recommended. If this is a resample please contact your local public health inspector.

\*\* The indicated Heterotrophic Plate Count results are not acceptable resampling is recommended. If this is a resample please contact your local public health inspector.

Langlier's Stability Index

Positive values (+) indicate the water will have scaling tendencies  
Negative values (-) indicate the water will have corrosive tendencies

Zero (0) indicates the water is neutral

Approved By: Paul Nicolas

Date 97/ 8/ 8

# Analysis Report



**REPORT ON:** Analysis of Water Samples  
**REPORTED TO:** Manitoba Conservation - Drinking Water  
1007 Century St  
Winnipeg, MB  
R3H 0W4

Att'n: Mr. Scott Davies

**cc:** Manitoba Conservation 59 Elizabeth Dr Thompson MB R8N 1X4 Att'n: Ms. Christine Roberts

**CHAIN OF CUSTODY:** 37304 MB  
**PROJECT NAME:** Thicket  
**PROJECT NUMBER:** 227.00

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**NUMBER OF SAMPLES:** 3 **REPORT DATE:** April 18, 2007

**DATE SUBMITTED:** March 15, 2007 **GROUP NUMBER:** 80315003

**SAMPLE TYPE:** Water

**NOTE:** Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

**TEST METHODS:**

**Anions in Water by Ion Chromatography** - was determined based on Method 4110 in Standard Methods (21st Edition) and EPA Method 300.0 (Revision 2.1).

**Nitrate and Nitrite in Water** - was determined based on Method 4500-NO<sub>3</sub> F in Standard Methods (21st Edition) and Method X328 in the BC Laboratory Manual (2005).

**Ammonia in Water** - analysis was performed based on Method 4500-NH<sub>3</sub> in Standard Methods for the Examination of Water and Wastewater (21st Edition).

**Total Dissolved Solids in Water** - was determined based on Method 2540 C in Standard Methods for the Examination of Water and Wastewater (21st Edition).

**Total Organic Carbon in Water** - was determined based on Method 5310 A and B in Standard Methods (21st Edition) and Method X314 in the BC Laboratory Manual (2005).

**Conventional Parameters** - analyses were performed using procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2005 edition) Province of British Columbia and "Standard Methods for the

(Continued)

CANTEST LTD.

Greg Sparrow, B.Sc.  
Senior Analyst



REPORTED TO: Manitoba Conservation - Drinking Water

REPORT DATE: April 18, 2007

GROUP NUMBER: 80315003



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### Conventional Parameters

Examination of Water and Wastewater" (21st Edition), published by the American Public Health Association.

#### **Conventional Parameters - Winnipeg Laboratory (Unit D-675 Berry Street, Winnipeg, Manitoba R3H 1A7): -**

Analyses performed at Cantest's Winnipeg facilities follow procedures based on those described in the "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials" (2005 Edition) and "Standard Methods for the Examination of Water and Wastewater" (21st Edition).

**Haloacetic Acids in Water** - analysis was performed using procedures based on U.S. EPA Methods 552, involving pH adjustment, extraction, derivatization and clean-up steps. Instrumental analysis was by GC/MS or GC/ECD as described.

**Langelier Saturation Index** - analysis was performed based on Standard Methods for the Examination of Water and Wastewater (21st Edition).

**Metals in Water** - analysis was performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS).

**Volatile Organic Compounds in Water and Soil** - analysis was performed using procedures based on U.S. EPA Methods 624/8240/8260, involving sparging with a Purge and Trap apparatus and analysis using GC/MS.

### TEST RESULTS:

(See following pages)

REPORTED TO: Manitoba Conservation - Drinking Water

REPORT DATE: April 18, 2007

GROUP NUMBER: 80315003



Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		Thicket Portage Raw	Thicket Portage Treated	DETECTION LIMIT	UNITS
DATE SAMPLED:		Mar 14/07	Mar 14/07		
CANTEST ID:		703150013	703150014		
Hardness (Total)	CaCO <sub>3</sub>	96	96	1	mg/L
Total Dissolved Solids		111	113	10	mg/L
Dissolved Fluoride	F	0.07	0.05	0.05	mg/L
Dissolved Chloride	Cl	0.52	3.74	0.2	mg/L
Bromide	Br	<	<	1	mg/L
Nitrate and Nitrite	N	0.11	0.11	0.01	mg/L
Dissolved Sulphate	SO <sub>4</sub>	2.30	2.32	0.5	mg/L
Total Organic Carbon	C	9.6	10	1	mg/L
Total Inorganic Carbon	C	21	22	1	mg/L
Total Carbon	C	30	32	1	mg/L
Ammonia Nitrogen	N	0.02	0.03	0.01	mg/L
Cation-Anion Balance		1.8	3.2	-	% Difference

mg/L = milligrams per liter  
 < = Less than detection limit

% Difference = Percent Difference

REPORTED TO: Manitoba Conservation - Drinking Water

REPORT DATE: April 18, 2007

GROUP NUMBER: 80315003



**Metals Analysis in Water**

CLIENT SAMPLE IDENTIFICATION:		Thicket Portage Raw	Thicket Portage Treated	
SAMPLE PREPARATION:		TOTAL	TOTAL	
DATE SAMPLED:		Mar 14/07	Mar 14/07	
CANTEST ID:		703150013	703150014	DETECTION LIMIT
Aluminum	Al	0.014	0.007	0.001
Antimony	Sb	0.0004	0.0004	0.0002
Arsenic	As	0.0003	0.0003	0.0002
Barium	Ba	0.0092	0.0089	0.0002
Beryllium	Be	<	<	0.0002
Bismuth	Bi	<	<	0.0002
Boron	B	0.08	0.02	0.01
Cadmium	Cd	<	<	0.00004
Calcium	Ca	25.9	26.0	0.05
Cesium	Cs	<	<	0.0001
Chromium	Cr	<	<	0.0002
Cobalt	Co	<	<	0.0002
Copper	Cu	0.012	0.0072	0.0002
Iron	Fe	0.06	0.07	0.01
Lead	Pb	0.0004	0.0003	0.0002
Lithium	Li	0.0017	0.0017	0.0002
Magnesium	Mg	7.62	7.58	0.05
Manganese	Mn	0.0028	0.0025	0.0002
Molybdenum	Mo	<	<	0.0001
Nickel	Ni	0.0007	0.0004	0.0002
Phosphorus	P	<	<	0.03
Potassium	K	0.86	0.86	0.02
Rubidium	Rb	0.0005	0.0006	0.0002
Selenium	Se	<	<	0.0002
Silicon	Si	0.62	0.59	0.05
Silver	Ag	<	<	0.00005
Sodium	Na	3.3	6.0	0.1
Strontium	Sr	0.034	0.034	0.001
Tellurium	Te	<	<	0.0002
Thallium	Tl	<	<	0.00002
Thorium	Th	<	<	0.0001

(Continued on next page)

REPORTED TO: Manitoba Conservation - Drinking Water

REPORT DATE: April 18, 2007

GROUP NUMBER: 80315003



**Metals Analysis in Water**

CLIENT SAMPLE IDENTIFICATION:		Thicket Portage Raw	Thicket Portage Treated	
SAMPLE PREPARATION:		TOTAL	TOTAL	
DATE SAMPLED:		Mar 14/07	Mar 14/07	
CANTEST ID:		703150013	703150014	DETECTION LIMIT
Tin	Sn	<	0.0002	0.0002
Titanium	Ti	0.0003	<	0.0002
Uranium	U	<	<	0.0001
Vanadium	V	<	<	0.0002
Zinc	Zn	0.002	0.004	0.001
Zirconium	Zr	<	<	0.002

Results expressed as milligrams per liter (mg/L)  
< = Less than detection limit

REPORTED TO: Manitoba Conservation - Drinking Water

REPORT DATE: April 18, 2007

GROUP NUMBER: 80315003



Conventional Parameters-Winnipeg Laboratory- in Water

CLIENT SAMPLE IDENTIFICATION:	Thicket Portage Raw	Thicket Portage Treated		
DATE SAMPLED:	Mar 14/07	Mar 14/07		
CANTEST ID:	703150013	703150014	DETECTION LIMIT	UNITS
pH, Laboratory	7.26	7.25	-	pH units
Conductivity	183	196	1	$\mu$ S/cm
True Color	12	<	5	CU
Turbidity	0.4	0.4	0.1	NTU
Total Alkalinity CaCO <sub>3</sub>	96.0	94.0	1	mg/L
Bicarbonate Alkalinity HCO <sub>3</sub>	117	115	0.5	mg/L
Carbonate Alkalinity CO <sub>3</sub>	<	<	0.5	mg/L
Hydroxide Alkalinity OH	<	<	0.5	mg/L

$\mu$ S/cm = microsiemens per centimeter  
NTU = nephelometric turbidity units  
< = Less than detection limit

CU = color units  
mg/L = milligrams per liter

REPORTED TO: Manitoba Conservation - Drinking Water

REPORT DATE: April 18, 2007

GROUP NUMBER: 80315003



**Langelier Saturation Index in Water**

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Saturation Index at 4.4C	Saturation Index at 60C
Thicket Portage Raw	Mar 14/07	703150013	-1.25	-0.21
Thicket Portage Treated	Mar 14/07	703150014	-1.27	-0.22
DETECTION LIMIT UNITS			- SI 4.4C	- SI 60C

SI 4.4C = Saturation Index at 4.4C

SI 60C = Saturation Index at 60C

# Analysis Report



CANTEST LTD.

Professional  
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Burnaby, B.C.  
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FAX: 604 731 2386

TEL: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Water Samples  
REPORTED TO: Manitoba Conservation - Drinking Water  
1007 Century St  
Winnipeg, MB  
R3H 0W4

Att'n: Mr. Scott Davies

cc: Manitoba Water Stewardship Box 28 59 Elizabeth Drive Thompson MB R8N  
1X4 Att'n: Ms. Christine Roberts

PROJECT NAME: Thicket Portage - PWS  
PROJECT NUMBER: 227.00

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NUMBER OF SAMPLES: 3 REPORT DATE: April 10, 2008  
DATE SUBMITTED: March 27, 2008 GROUP NUMBER: 90327002  
SAMPLE TYPE: Water

NOTE: Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

### Aesthetic Objective Summary:

Aesthetic Objectives as set by "Guidelines for Canadian Drinking Water Quality Summary Table" -March 2007. Aesthetic objectives apply to certain substances or characteristics of drinking water that can affect its acceptance by consumers or interfere with practices for supplying good quality water. For certain parameters, both aesthetic objectives and health-related guidelines have been derived. Where only aesthetic objectives are specified, these values are below those considered to constitute a health hazard

CLIENT SAMPLE ID	STATUS
227.00 Thicket Portage - Raw	Acceptable
227.00 Thicket Portage-Treated	Acceptable

### Max. Acceptable Concentration Summary:

Maximum Acceptable Concentrations (MAC) for both chemical and microbiological parameters are put forth in the "Guidelines for Canadian Drinking Water Quality Summary Table" - March 2007. For the parameters tested, results are generally categorized by health concerns. Some parameters have no limit value denoted because: a) currently available data indicates no health risk, b) the compound is not permitted in Canada, or c) it refers to a family of compounds.

CLIENT SAMPLE ID	HEALTH	HARDNESS
227.00 Thicket Portage - Raw	Acceptable	Moderate

(Continued)

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REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Max. Acceptable Concentration SUMMARY: (Continued)

CLIENT SAMPLE ID	HEALTH	HARDNESS
227.00 Thicket Portage-Treated	Acceptable	Moderate
227.00 Thicket Portage-Dist.	Acceptable	Not tested

TEST METHODS:

Anions in Water by Ion Chromatography - was determined based on Method 4110 in Standard Methods (21st Edition) and EPA Method 300.0 (Revision 2.1).

Nitrate and Nitrite in Water - was performed using Flow Injection Analysis where Nitrate is reduced to nitrite by passing the sample through a cadmium reduction column. The nitrite produced is then determined by diazotizing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride to form a reddish azo dye which is then measured colorimetrically at 540 nm.

Ammonia in Water - was performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream, which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically @ 590 nm.

Total Dissolved Solids in Water - was determined based on Method 2540 C in Standard Methods for the Examination of Water and Wastewater (21st Edition).

Total Organic Carbon in Water - was determined based on Method 5310 A and B in Standard Methods (21st Edition) and Method X314 in the BC Laboratory Manual (2005).

Conventional Parameters - analyses were performed using procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2005 edition) Province of British Columbia and "Standard Methods for the Examination of Water and Wastewater" (21st Edition), published by the American Public Health Association.

Conventional Parameters - Winnipeg Laboratory (Unit D-675 Berry Street, Winnipeg, Manitoba R3H 1A7): - Analyses performed at Cantest's Winnipeg facilities follow procedures based on those described in the "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials" (2005 Edition) and "Standard Methods for the Examination of Water and Wastewater" (21st Edition).

Haloacetic Acids in Water - analysis was performed using procedures based on U.S. EPA Methods 552, involving pH adjustment, extraction, derivatization and clean-up steps. Instrumental analysis was by GC/MS or GC/ECD as described.

(Continued)



REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

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Langelier Saturation Index - analysis was performed based on Standard Methods for the Examination of Water and Wastewater (21st Edition).

Metals in Water - analysis was performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS).

Volatile Organic Compounds in Water and Soil - analysis was performed using procedures based on U.S. EPA Methods 624/8240/8260, involving sparging with a Purge and Trap apparatus and analysis using GC/MS.

**COMMENTS:**

The ion balance of 5.4% for sample 803270005 exceeds the 5% limit. The balance has been confirmed by recalculating the ion balance. It should be noted that total metals were used to calculate the ion balance.

**TEST RESULTS:**

(See following pages)

REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Potability (Aesthetic Criteria) in Water

CLIENT SAMPLE IDENTIFICATION:	227.00 Thicket Portage - Raw	227.00 Thicket Portage-Tr eated		
DATE SAMPLED:	Mar 26/08	Mar 26/08		
CANTEST ID:	803270004	803270005	Aesthetic Objective	UNITS
<b>Conventional Parameters</b>				
Total Dissolved Solids	120	136	500	mg/L
Dissolved Chloride Cl	0.56	8.72	250	mg/L
Dissolved Sulphate SO4	2.50	2.59	500	mg/L
<b>Conventional Parameters-Winnipeg Laboratory-</b>				
pH, Laboratory	7.58	7.69	6.5 - 8.5	pH units
Total Alkalinity CaCO3	92.0	95.0	-	mg/L
Bicarbonate Alkalinity HCO3	112	116	-	mg/L
Carbonate Alkalinity CO3	< 0.5	< 0.5	-	mg/L
Hydroxide Alkalinity OH	< 0.5	< 0.5	-	mg/L
<b>Total Metals Analysis</b>				
Copper Cu	0.011	0.0072	1.0	mg/L
Iron Fe	0.01	< 0.01	0.3	mg/L
Manganese Mn	0.0035	0.0033	0.05	mg/L
Sodium Na	3.4	11.1	200	mg/L
Zinc Zn	0.005	0.008	5	mg/L

mg/L = milligrams per liter

< = Less than detection limit

REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Potability (Health Criteria at Point of Use) in Water

CLIENT SAMPLE IDENTIFICATION:	227.00 Thicket Portage - Raw	227.00 Thicket Portage-Tr eated	227.00 Thicket Portage-Di st.		
DATE SAMPLED:	Mar 26/08	Mar 26/08	Mar 26/08		
CANTEST ID:	803270004	803270005	803270006	Max. Acceptable Concentration	UNITS
<b>Conventional Parameters</b>					
Hardness (Total)	CaCO <sub>3</sub>	95	96	-	- mg/L
Dissolved Fluoride	F	0.06	0.06	-	1.5 mg/L
Nitrate and Nitrite	N	0.07	0.08	-	10 mg/L
Dissolved Sulphate	SO <sub>4</sub>	2.50	2.59	-	- mg/L
Ammonia Nitrogen	N	0.03	0.01	-	- mg/L
<b>Conventional Parameters-Winnipeg Laboratory-</b>					
Conductivity		185	215	-	- µS/cm
<b>Total Metals Analysis</b>					
Aluminum	Al	0.023	0.031	-	- mg/L
Antimony	Sb	0.0005	0.0005	-	0.006 mg/L
Arsenic	As	0.0004	0.0004	-	0.010 mg/L
Barium	Ba	0.012	0.013	-	1.0 mg/L
Boron	B	0.08	0.11	-	5 mg/L
Cadmium	Cd	0.00006	< 0.00004	-	0.005 mg/L
Calcium	Ca	25.3	25.7	-	- mg/L
Chromium	Cr	< 0.0002	< 0.0002	-	0.05 mg/L
Lead	Pb	0.0008	0.0004	-	0.01 mg/L
Magnesium	Mg	7.57	7.66	-	- mg/L
Potassium	K	1.11	1.2	-	- mg/L
Selenium	Se	< 0.0002	< 0.0002	-	0.01 mg/L
Silver	Ag	< 0.00005	< 0.00005	-	- mg/L
Uranium	U	< 0.0001	< 0.0001	-	0.02 mg/L
<b>Trihalomethanes</b>					
Bromodichloromethane		-	-	1.5	16 µg/L
<b>Volatile Organic Compounds</b>					
1,1-Dichloroethene		< 0.1	-	-	14 µg/L
Methylene Chloride		< 6	-	-	50 µg/L
Tetrachloroethene		< 0.1	-	-	30 µg/L
Trichloroethene		< 0.1	-	-	5 µg/L

mg/L = milligrams per liter

µS/cm = microsiemens per centimeter

µg/L = micrograms per liter

< = Less than detection limit

REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		227.00 Thicket Portage - Raw	227.00 Thicket Portage-Tr eated		
DATE SAMPLED:		Mar 26/08	Mar 26/08		
CANTEST ID:		803270004	803270005	DETECTION LIMIT	UNITS
Bromide	Br	<	<	1	mg/L
Total Organic Carbon	C	7.5	7.5	1	mg/L
Total Inorganic Carbon	C	23	24	1	mg/L
Total Carbon	C	30	32	1	mg/L
Cation-Anion Balance		3.9	5.4	-	% Difference

mg/L = milligrams per liter  
< = Less than detection limit

% Difference = Percent Difference

REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		227.00 Thicket Portage - Raw	227.00 Thicket Portage-Tr eated	
SAMPLE PREPARATION:		TOTAL	TOTAL	
DATE SAMPLED:		Mar 26/08	Mar 26/08	
CANTEST ID:		803270004	803270005	DETECTION LIMIT
Beryllium	Be	<	<	0.0002
Bismuth	Bi	<	<	0.0002
Cesium	Cs	<	<	0.0001
Cobalt	Co	<	<	0.0002
Lithium	Li	0.002	0.0021	0.0002
Molybdenum	Mo	<	<	0.0001
Nickel	Ni	0.0008	0.0011	0.0002
Phosphorus	P	<	<	0.03
Rubidium	Rb	0.0006	0.0007	0.0002
Silicon	Si	0.54	0.57	0.05
Strontium	Sr	0.041	0.042	0.001
Tellurium	Te	<	<	0.0002
Thallium	Tl	<	<	0.00002
Thorium	Th	<	<	0.0001
Tin	Sn	0.0002	0.0003	0.0002
Titanium	Ti	0.0004	0.0004	0.0002
Vanadium	V	<	<	0.0002
Zirconium	Zr	<	<	0.002

Results expressed as milligrams per liter (mg/L)  
 < = Less than detection limit

REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Volatile Organic Compounds in Water

CLIENT SAMPLE IDENTIFICATION:	227.00 Thicket Portage - Raw	
DATE SAMPLED:	Mar 26/08	
CANTEST ID:	803270004	
ANALYSIS DATE:	Mar 30/08	DETECTION LIMIT
cis-1,2-Dichloroethene	<	0.1
trans-1,2-Dichloroethene	<	0.1
Methyl tert-Butyl Ether	<	0.5
1,1,1-Trichloroethane	<	0.1
1,1,2-Trichloroethane	<	0.1

Results expressed as micrograms per liter ( $\mu\text{g/L}$ )

< = Less than detection limit

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REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Trihalomethanes in Water

CLIENT SAMPLE IDENTIFICATION:	227.00 Thicket Portage-Di st.	
DATE SAMPLED:	Mar 26/08	
CANTEST ID:	803270006	DETECTION LIMIT
Bromoform	<	0.2
Carbon Tetrachloride	<	0.1
Chloroform	130	0.3
Dibromochloromethane	<	0.1
Tetrachloroethene	<	0.1
Surrogate Recovery		
1,2-Dichloroethane-d4	87	-
Toluene-d8	94	-
Bromofluorobenzene	93	-

Results expressed as micrograms per liter ( $\mu\text{g/L}$ )

Surrogate recoveries expressed as percent (%)

< = Less than detection limit

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REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Haloacetic Acids by GC/ECD in Water

CLIENT SAMPLE IDENTIFICATION:	227.00 Thicket Portage-Di st.	
DATE SAMPLED:	Mar 26/08	
CANTEST ID:	803270006	DETECTION LIMIT
Monochloroacetic Acid	<	5
Monobromoacetic Acid	<	5
Dichloroacetic Acid	14.9	5
Trichloroacetic Acid	15.1	5
Bromochloroacetic Acid	<	5
Dibromoacetic Acid	<	5
2,4-Dichlorophenol	<	5
2,4,6-Trichlorophenol	<	5
Surrogate Recovery		
3,5-Dichlorobenzoic Acid	91	-

Results expressed as micrograms per liter ( $\mu\text{g/L}$ )

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



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REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Conventional Parameters-Winnipeg Laboratory- in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	True Color	Turbidity
227.00 Thicket Portage - Raw	Mar 26/08	803270004	13	0.4
227.00 Thicket Portage-Treated	Mar 26/08	803270005	7	0.4
DETECTION LIMIT UNITS			5 CU	0.1 NTU

CU = color units

NTU = nephelometric turbidity units

REPORTED TO: Manitoba Conservation - Drinking Water



REPORT DATE: April 10, 2008

GROUP NUMBER: 90327002

Langelier Saturation Index in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Saturation Index at 4.4C	Saturation Index at 60C
227.00 Thicket Portage - Raw	Mar 26/08	803270004	-0.96	0.081
227.00 Thicket Portage-Treated	Mar 26/08	803270005	-0.84	0.21
DETECTION LIMIT UNITS			- SI 4.4C	- SI 60C

SI 4.4C = Saturation Index at 4.4C

SI 60C = Saturation Index at 60C

Client: Manitoba Conservation - Drinking Water  
 Download Date: 03/24/2009  
 Project Name: Thicket Portage - PWS  
 Project Number: 227  
 Samples received: 03/10/2009

TABLE: Results of WATER Analyses

Sample ID		Thicket Portage - Raw	Thicket Portage - Treated	Thicket Portage - Dist.
CANTEST ID		903100005	903100006	903100007
Date Sampled		03/09/2009	03/09/2009	03/09/2009
Parameter	Units			
Conventional Parameters				
Hardness (Total) CaCO3	mg/L	96	96	-
Total Dissolved Solids	mg/L	123	115	-
Dissolved Fluoride F	mg/L	0.07	0.07	-
Dissolved Chloride Cl	mg/L	0.55	4.17	-
Bromide Br	mg/L	< 1	< 1	-
Nitrate and Nitrite N	mg/L	0.05	0.06	-
Dissolved Sulphate SO4	mg/L	2.46	2.52	-
Total Organic Carbon C	mg/L	10	9.6	-
Total Inorganic Carbon C	mg/L	23	23	-
Total Carbon C	mg/L	33	32	-
Ammonia Nitrogen N	mg/L	0.07	0.02	-
Cation-Anion Balance	% Differenc	2.5	2.2	-
Metals Analysis				
Total Aluminum Al	mg/L	0.023	0.014	-
Total Antimony Sb	mg/L	0.0004	0.0004	-
Total Arsenic As	mg/L	0.0005	0.0005	-
Total Barium Ba	mg/L	0.011	0.011	-
Total Beryllium Be	mg/L	< 0.0002	< 0.0002	-
Total Bismuth Bi	mg/L	< 0.0002	< 0.0002	-
Total Boron B	mg/L	< 0.01	< 0.01	-
Total Cadmium Cd	mg/L	< 0.00004	< 0.00004	-
Total Calcium Ca	mg/L	26.2	26.1	-
Total Chromium Cr	mg/L	< 0.0002	< 0.0002	-
Total Cobalt Co	mg/L	< 0.0002	< 0.0002	-
Total Copper Cu	mg/L	0.014	0.016	-
Total Iron Fe	mg/L	0.03	0.02	-
Total Lead Pb	mg/L	< 0.0002	< 0.0002	-
Total Lithium Li	mg/L	0.002	0.002	-
Total Magnesium Mg	mg/L	7.51	7.46	-
Total Manganese Mn	mg/L	0.0045	0.0036	-
Total Molybdenum Mo	mg/L	< 0.0001	< 0.0001	-
Total Nickel Ni	mg/L	0.0008	0.0009	-
Total Phosphorus P	mg/L	< 0.03	< 0.03	-
Total Potassium K	mg/L	1.03	1.05	-
Total Rubidium Rb	mg/L	0.0007	0.0007	-
Total Selenium Se	mg/L	< 0.0002	< 0.0002	-
Total Silicon Si	mg/L	0.46	0.45	-
Total Silver Ag	mg/L	< 0.00005	< 0.00005	-
Total Sodium Na	mg/L	3.1	6	-
Total Strontium Sr	mg/L	0.045	0.045	-

Total Tellurium Te	mg/L	< 0.0002	< 0.0002	-
Total Thallium Tl	mg/L	< 0.00002	< 0.00002	-
Total Thorium Th	mg/L	< 0.0001	< 0.0001	-
Total Tin Sn	mg/L	0.0004	< 0.0002	-
Total Titanium Ti	mg/L	0.0006	0.0004	-
Total Uranium U	mg/L	< 0.0001	< 0.0001	-
Total Cesium Cs	mg/L	< 0.0001	< 0.0001	-
Total Vanadium V	mg/L	0.0003	0.0002	-
Total Zinc Zn	mg/L	0.004	0.005	-
Total Zirconium Zr	mg/L	< 0.002	< 0.002	-
Monocyclic Aromatic Hydrocarbons				
Benzene	ug/L	< 0.1	-	-
Ethylbenzene	ug/L	< 0.1	-	-
Toluene	ug/L	< 0.1	-	-
m,p-Xylenes	ug/L	< 0.1	-	-
o-Xylene	ug/L	< 0.1	-	-
Volatile Organic Compounds				
1,1-Dichloroethene	ug/L	< 0.1	-	-
cis-1,2-Dichloroethene	ug/L	< 0.1	-	-
trans-1,2-Dichloroethene	ug/L	< 0.1	-	-
Methyl tert-Butyl Ether	ug/L	< 0.5	-	-
Methylene Chloride	ug/L	< 6	-	-
Tetrachloroethene	ug/L	< 0.1	-	-
1,1,1-Trichloroethane	ug/L	< 0.1	-	-
1,1,2-Trichloroethane	ug/L	< 0.1	-	-
Trichloroethene	ug/L	< 0.1	-	-
Trihalomethanes				
Bromodichloromethane	ug/L	-	-	3.3
Bromoform	ug/L	-	-	< 0.4
Carbon Tetrachloride	ug/L	-	-	< 0.2
Chloroform	ug/L	-	-	140
Dibromochloromethane	ug/L	-	-	< 0.2
Tetrachloroethene	ug/L	-	-	< 0.2
Haloacetic Acids by GC/ECD				
Monochloroacetic Acid	ug/L	-	-	< 5
Monobromoacetic Acid	ug/L	-	-	< 5
Dichloroacetic Acid	ug/L	-	-	23.4
Trichloroacetic Acid	ug/L	-	-	28.4
Bromochloroacetic Acid	ug/L	-	-	< 5
Dibromoacetic Acid	ug/L	-	-	< 5
2,4-Dichlorophenol	ug/L	-	-	< 5
2,4,6-Trichlorophenol	ug/L	-	-	< 5
Conventional Parameters-Winnipeg Laboratory-				
pH, Laboratory	pH units	7.56	7.61	-
Conductivity	uS/cm	189	204	-
True Color	CU	11	< 5	-
Turbidity	NTU	0.4	0.3	-
Total Alkalinity CaCO <sub>3</sub>	mg/L	96.1	97.1	-
Bicarbonate Alkalinity HCO <sub>3</sub> <sup>-</sup>	mg/L	117	118	-
Carbonate Alkalinity CO <sub>3</sub> <sup>2-</sup>	mg/L	< 0.5	< 0.5	-
Hydroxide Alkalinity OH <sup>-</sup>	mg/L	< 0.5	< 0.5	-
Langelier Saturation Index				
Saturation Index at 4.4C	SI 4.4C	-0.95	-0.89	-
Saturation Index at 60C	SI 60C	0.094	0.15	-

## **APPENDIX D**

### **Information from the Fisheries Branch**

Common Name	Commercial Fishery Species	Non-Sport	Year Round Presence	Spawn & Hatch	Over Winter	Presence
Blacksided darter		Y	Y		Y	A
Brook stickleback		Y	Y		Y	A
Burbot		Y	Y		Y	X
Cisco	Y		Y	Y	Y	C
Goldeye	Y		Y	Y	Y	C
Iowa darter		Y	Y		Y	A
Johnny darter		Y	Y		Y	A
Lake whitefish	Y		Y	Y	Y	C
Logperch		Y	Y		Y	A
Mottled sculpin		Y	Y		Y	X
Ninespine stickleback		Y	Y		Y	A
Northern pike	Y		Y	Y	Y	C
River darter		Y	Y		Y	A
Sauger	Y		Y	Y	Y	C
Slimy sculpin		Y	Y		Y	X
Spottail shiner		Y	Y		Y	A
Trout perch		Y	Y		Y	A
Walleye	Y		Y	Y	Y	C
Whitesucker	Y		Y	Y	Y	C
Yellow perch	Y		Y	Y	Y	C
Notes:						
- Manitoba Conservation Fish Habitat Inventory and Classification system indicates that Landing Lake provides year round fish habitat.						
- located in the Arnot watershed division; Landing River watershed unit						
- reference: Manitoba Conservation 2004. Fish Inventory Habitat Classification System (FIHCS). Available from Manitoba Conservation.						

# **APPENDIX E**

## **Site Photos**



Picture #1: Existing/Proposed WTP site



Picture #2: Existing/Proposed WTP site





Picture #3: Satellite Image of WTP Site