REPORT NO.: 141-20119-00

ENVIRONMENTAL ACT PROPOSAL (EAP)

RIVERDALE MUNICIPALITY
WASTEWATER TREATMENT
LAGOON EXPANSION

FEBRUARY 2016

WSP

ENVIRONMENTAL ACT PROPOSAL (EAP)

RIVERDALE MUNICIPALITY

Wastewater Treatment Lagoon Expansion

DRAFT REPORT

Project no: 141-20119-00
Date: February 2016

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January 25, 2016

Ms. Tracey Braun, M.Sc.
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Manitoba Conservation and Water Stewardship
160 – 123 Main Street
Winnipeg, MB. R2C 1A5

Subject: **Environmental Act Proposal (EAP) – Riverdale Municipality – Wastewater Treatment Lagoon Expansion**

Dear Ms. Braun,

Riverdale Municipality has an existing two cell wastewater stabilization pond that is to be expanded to meet Provincial and Federal effluent regulations. The major items of the proposed development are a new pump station to lift the influent wastewater to a new primary treatment system. Two new secondary storage cells and a new outfall to the Little Saskatchewan River are also part of the new civil works.

The enclosed Environmental Act Proposal report (4 hard copies, 1 pdf file) provides the engineering details and background for the proposed development. It is accompanied by the signed application form and a cheque in the amount of $7,500. We request the opportunity to review the draft Environmental Act Licence when it is issued. Please do not hesitate to contact the undersigned if further information is required.

Yours truly,

Dan Dankewich, M.Eng., P. Eng.
Senior Engineer, Environmental Infrastructure
DJD/djd
Cc:
Encl.

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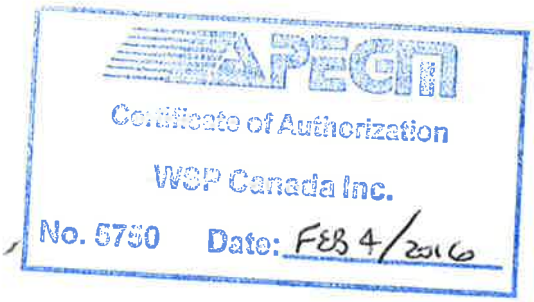

EXECUTIVE SUMMARY

Leading up to this Environmental Act Proposal (EAP), WSP recently completed a predesign report reviewing possible lagoon configurations for the site. The report, complete with opinions of probable costs, was accepted by MWSB and Riverdale Municipality. Mayor and Council issued a resolution on December 2, 2015 in which they concur with the WSP predesign report recommendation for a facultative lagoon. As such, WSP is moving forward on behalf of Riverdale Municipality, as directed by MWSB, to complete the Environmental Act Proposal submission.

The existing wastewater treatment lagoon consists of a facultative treatment cell and unlined storage cell, located south of the Community of Rivers on an escarpment overlooking the Little Saskatchewan River. Long standing concerns by Manitoba Conservation about the level of treatment provided by the existing lagoon system has been the largest driver leading to the EAP submission.

In achieving the requisite 20 year hydraulic and organic design capacity, the existing lagoons have not been integrated into the future treatment and storage. Our geotechnical investigation made mention of slope failure in the bank area adjacent to the existing storage cell. As such, WSP concluded the technical uncertainty and associated cost and schedule implications were unacceptably high.

The proposed development involves the construction of a lift station to receive gravity inflow wastewater from the Town of Rivers collection sewer. Conventional lined facultative and storage lagoon cells will be constructed north of the existing lagoon and south of the CNR mainline and industrial lands. A new outfall to the Little Saskatchewan will be constructed with planned seasonal discharge scheduled between June 15 and November 1, with expected late spring and fall discharges.

Upon approval from Manitoba Conservation and Water Stewardship and the issuance of an Environmental licence, it is anticipated that the tender and construction will begin when funding is in place.

TABLE OF CONTENTS

1 DEVELOPMENT INFORMATION 1

1.1 PROPONENT INFORMATION 1

1.2 CANADIAN ENVIRONMENTAL ASSESSMENT INFORMATION 3

2 DESCRIPTION OF DEVELOPMENT 4

2.1 BACKGROUND 4

2.2 CERTIFICATE OF TITLE 4

2.3 LAND OWNERSHIP 5

2.4 MINERAL RIGHTS 5

2.5 LAND USE DESIGNATION 6

2.6 DESCRIPTION OF EXISTING LAND USE 6

2.7 PREVIOUS STUDIES 7

3 EXISTING WASTEWATER TREATMENT LAGOON 9

3.1 DESCRIPTION 9

3.2 EXISTING CAPACITY 9

3.3 EFFLUENT QUALITY AND DISCHARGE ROUTE 9

4 POPULATION SERVICED AND DESIGN LOADING 12

4.1 POPULATION GROWTH ASSUMPTIONS 12

4.2 HYDRAULIC LOADING 13

4.3 ORGANIC LOADING 17

5 PROPOSED DEVELOPMENT 20

5.1 SITE CONDITIONS 20

5.2 DESCRIPTION OF PROPOSED DEVELOPMENT 21

6 ENVIRONMENTAL IMPACTS 28

6.1 ODOUR 28

6.2 NOISE 28

6.3 LAND 28

6.4 WATER 28

6.5 SPECIES 29

6.6 FISHERIES 29

6.7 FORESTRY 30

6.8 SOCIO-ECONOMIC 30

6.9 HERITAGE RESOURCES 30

6.10 PUBLIC INVOLVEMENT 30

6.11 DOCUMENTATION AND RECORD KEEPING 30

7 MANAGEMENT PRACTICE 32

8 SCHEDULE AND FUNDING 33

9 REFERENCES 34

TABLES

TABLE 1-1: PROPOSAL CONTENTS 2
TABLE 1-2: CEPA PROPOSAL CONTENTS 3
TABLE 3-1: CONTRAST RIVERS LAGOON INFLUENT WASTEWATER STRENGTH 10
TABLE 4-1: SOURCES OF WASTEWATER BY POPULATION 13
TABLE 4-2: COMPARING WTP METERED DISTRIBUTION AND QUARTERLY METERED WATER USE BILLING 14
TABLE 4-3: TOWN OF RIVERS AVERAGE ANNUAL WATER USE ESTIMATE TO THE YEAR 2035 [20 YEAR] 15
TABLE 4-4: 20 YEAR ESTIMATE FACTORED (0.85% [1]) FOR NORMAL RESIDENTIAL LOSSES 15
TABLE 4-5: ESTIMATE REQUIRED 227 DAY STORAGE FROM NOVEMBER 01 AND JUNE 15 15
TABLE 4-6: ACCOUNT FOR AVERAGE WATER SERVICE BLEEDER WATER USE FROM DECEMBER TO APRIL 16
TABLE 4-7: ACCOUNT FOR ESTIMATED AVERAGE EXTRANEOUS FLOWS 16
TABLE 4-8: SUMMARY LAGOON ORGANIC LOADING ASSUMPTIONS 18
TABLE 5-1: SPECIFICATIONS FOR THE PROPOSED PRIMARY CELL 23
TABLE 5-2: SPECIFICATIONS FOR THE PROPOSED SECONDARY CELL NO. 1 24
TABLE 5-3: SPECIFICATIONS FOR THE PROPOSED SECONDARY CELL NO. 2 24
TABLE 5-4: EXPANDED WASTEWATER LAGOON CAPACITIES 27

FIGURES

FIGURE 2-1: LOCATION MAP OF LAGOON SITE WITH GOOGLE EARTH INSET 6

APPENDICES

APPENDIX A: STATUS OF TITLE
APPENDIX B: CLEAN ENVIRONMENT COMMISSION
APPENDIX C: GEOTECHNICAL REPORT
APPENDIX D: DESIGN PLANS AND DETAILS
APPENDIX E: GENERAL CORRESPONDENCE FOR REFERENCE

1 DEVELOPMENT INFORMATION

1.1 PROPONENT INFORMATION

1.1.1 NAME OF DEVELOPMENT

Riverdale Municipality – Wastewater Treatment Lagoon Upgrade

1.1.2 LEGAL NAME OF PROPONENT

Riverdale Municipality

1.1.3 LOCATION OF DEVELOPMENT

Portions of SE ¼ 23-12-21 and SW ¼ 24-12-21 WPM

1.1.4 CONTACT PERSON FOR PROPONENT

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1.1.5 CONTACT PERSON FOR ENVIRONMENTAL ASSESSMENT

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Table 1-1: Proposal Contents

Section of Environmental Act Proposal Form		Section Number in Report
Description of Development:		
(i)	Legal Description and Map of Development	1.1
(ii)	Mineral Rights	2.4
(iii)	Existing Land Use	2.6
(iv)	Land use Designation	2.5
(v)	Previous Studies	2.7
(vi)	Proposed Development	5
(vii)	Storage of Gasoline or Associated Products	6
(viii)	Potential Environmental Impacts	6
(ix)	Proposed Environmental Management	7
Schedule:		8
Funding:		8

1.2 CANADIAN ENVIRONMENTAL ASSESSMENT INFORMATION

Table 1-2: CEPA Proposal Contents

Screening Report Outline		Section Number in Report
1.	Assessment Responsibility - Funding	8
2.	Project Description	
	2.1 General	2, 4, 5
	2.2 Project Components	5.2
	2.3 Construction Details	5.2
	2.4 Project Scoping	4
3.	Description of Environment	
	3.1 Land Uses and Ownership	1.1, 2.2 to 2.6
	3.2 Local Soils, Topography, Geology	0
	3.3 Hydrology / Hydrogeology	6.3, 6.4
	3.4 Vegetation Communities	6.5
	3.5 Fish, Wildlife, and Habitat	6.5, 6.6, 6.7
	3.6 Endangered or Threatened Species	6.5
	3.7 Historic and Cultural Sites	6.9
4.	Environment Impacts and Mitigation	
	4.1 Water Quality	6.4
	4.2 Odour	6.1
	4.3 Fisheries	6.4, 6.6
	4.4 Wetland / Wildlife Habitat	6.6
	4.5 Soils and Vegetation	6.3, 6.5
	4.6 Heritage Resources	6.9
	4.7 Navigable Waters	6.4, 6.6
5.	Cumulative Effects	6
6.	Public Involvement	6.10
7.	Follow-up	7
8.	Contacts	1.1
9.	Personal Communication	Appendix E
10.	Attachments	Appendix A, B, C, D, E

2 DESCRIPTION OF DEVELOPMENT

2.1 BACKGROUND

The existing wastewater treatment lagoon was constructed in 1956 and presently receives wastewater from the Town of Rivers, rural residences, and local cottages utilizing gravity sewer from the town and truck haul septage from holding tanks in the area representing residential acreages and cottages. The lagoon is located approximately 420 metres south of Rivers on SE ¼ of Section 23-12-21 WPM; and SW ¼ of Section 24-12-21 WPM. The lagoon consists of one primary cell and one secondary cell, receiving wastewater by gravity sewers in the Town (see Appendix-A drawings) and the trucked septage from rural residences and cottages.

A biosolids cell was constructed in 1997 adjacent to the primary cell (west side) to receive solids cleaned out of the primary cell. The lagoon has a “seepage” discharge system, which ultimately discharges south to the Little Saskatchewan River. Seepage discharge is not considered acceptable by Manitoba Conservation under the Manitoba Environment Act and its Regulations.

Beginning in January 2015, administration responsibilities of the Town of River and the R.M. of Daly merged into a single administrative entity to be called the Riverdale Municipality. This combined entity will be responsible for municipal infrastructure including the new upgraded treatment lagoon.

The new community water treatment plant, scheduled for construction in 2016, will generate residual wastewater that is assumed to be accommodated with a dedicated discharge to the Little Saskatchewan River. The dedicated discharge decision is associated with the uncertain timing of the new treatment lagoon construction and storage area limitations at the lagoon site. Appendix D includes two email correspondences communicating an understanding that the new water treatment plant will dispose of process residuals in this manner.

2.2 CERTIFICATE OF TITLE

Copies of the Manitoba Status of Title documents produced March 10, 2014 by Hunt, Miller & Co. LLP of 148-8th Street Brandon Manitoba, R7A 3X1, and Phone (204) 727-8471 have been provided in Appendix A as part of the certificate of title information package.

A plan map for the subject lands has been provided as part of the Appendix A certificate of title information package. The proposed lagoon upgrade expansion is to be located immediately north and east of the existing Town of Rivers lagoon.

The existing lagoon encompasses Parcel “A” Plan 801 BLTO SW ¼ of Section 24-12-21 WPM, and Parcel “B” Plan 801 BLTO of the SE ¼ of Section 23-12-21 WPM. The proposed new lagoon will expand onto Lot 10 Plan 38952 BLTO of the SE ¼ of Section 23-12-21 WPM and Parcel 3 Plan 392 BLTO of the SW ¼ of Section 24-12-21 WPM. Parcel 3 has been renamed as Parcel “A” Plan 55127 BLTO.

- Title number 2698011/2
- Title number 2698005/2
- Title number 2697997/2
- Title number 1758454/2
- Title number 1448840/2

2.3 LAND OWNERSHIP

- Title 2698011/2 – Town of Rivers registered owner.
  - Parcel “A” Plan 55127 BLTO (formerly Parcel 3 Plan 392 BLTO).
- Title 2698005/2 – Town of Rivers registered owner.
  - Parcels 8 and 9 Plan 392 BLTO of the SE ¼ of Section 23-12-21 WPM.
- Title 2697997/2 – Town of Rivers registered owner.
  - All that portion of the SW ¼ of Section 24-12-21 WPM, lying west and south of the westerly and southerly limits of Parcels 2 and 3 Plan 392 BLTO.
  - Excluding road diversion Plan 371 BLTO
  - Caveat: Manitoba Hydro-Electric Board
  - Easement: Grant of Right-of-Way, from Town of Rivers to CNR
- Title 1758454/2 – Town of Rivers registered owner.
  - Lot 10 Plan 38952 BLTO of the SE ¼ of Section 23-12-21 WPM.
- Title 1448840/2 – Town of Rivers registered owner.
  - Parcels “A” and “B” Plan 801 BLTO of the SW ¼ of Section 24-12-21 WPM and SE ¼ of Section 23-12-21 WPM.

2.4 MINERAL RIGHTS

- Title 2698011/2 –CNR retains the mines and minerals rights.
  - Parcel “A” Plan 55127 BLTO (formerly Parcel 3 Plan 392 BLTO).
- Title 2698005/2 – CNR retains the mines and mineral rights.
  - Parcels 8 and 9 Plan 392 BLTO of the SE ¼ of Section 23-12-21 WPM.
- Title 2697997/2 – CNR retains the mines and minerals rights.
  - All that portion of the SW ¼ of Section 24-12-21 WPM, lying west and south of the westerly and southerly limits of parcels 2 and 3 Plan 392 BLTO.
- Title 1758454/2 – Town of Rivers owns the mines and mineral rights.
  - Lot 10 Plan 38952 BLTO of the SE ¼ of Section 23-12-21 WPM.
- Title 1448840/2 – CNR retains the mines and mineral rights.
  - Parcels “A” and “B” Plan 801 BLTO of the SW ¼ of Section 24-12-21 WPM and SE ¼ of Section 23-12-21 WPM.

2.5 LAND USE DESIGNATION

A planning study by MRB Planning Consultants from April 2012 shows the lagoon site zoned as follows. The existing lagoon lands are Zone “A” = Rural, and directly north the lands proposed for the expanded lagoon are Zone “M2” = Heavy Industrial. Appendix A includes the zoning map from the MRB planning study. The Zone “A” lands extend some distance west and east to the CNR mainline.

2.6 DESCRIPTION OF EXISTING LAND USE

Based on a brief site visit by two WSP engineers following the September 10, 2014 project start up meeting in Rivers, there are existing power poles along the property line (i.e. utility easement) between the Zone “A” and Zone “M2” lands, Figure 2-1. The power poles carry 3-Phase overhead electric power. There are active industries located on the M2 lands. West of the lagoon site is one acreage and a farm homestead.

Figure 2-1: Location Map of Lagoon Site with Google Earth Inset

South of the lagoon site is lands which exhibits relief over a distance of 100 metres down to the bank of the Little Saskatchewan River. North and east of the lagoon site the CNR mainline curves down from the north before crossing the Little Saskatchewan River.

Along the west side of the subject lands is a former CNR parcel of land containing an abandoned raw river water pipeline that was originally used by the CNR to convey river water. Eventually the CNR had no further use for the pipeline. Later on the Town of Rivers made use of the pipeline as a raw water intake and supply pipeline between the Little Saskatchewan River and the water treatment plant. Later Rivers built a pipeline between Lake Wahtopanah and the water treatment plant abandoning the pipeline from the Little Saskatchewan River.

2.6.1 DESCRIPTION OF LAND USE CHANGES

Land use changes include a road allowance closure for the north-south road allowance which runs through the lagoon site. In order to accommodate an expanded lagoon, a number of power poles will need to be relocated a distance, as yet to be determined, north. This procedure may require an alteration to the utility easement. It may be beneficial to designate the lagoon site lands light industrial Zone “M1” to better reflect the land use.

2.7 PREVIOUS STUDIES

Wastewater Treatment Lagoon Upgrade, Riverdale Municipality, Design Brief, by WSP Group Inc., October 2015. This study considered several options but compared two treatment lagoon configurations on technical merit and life cycle cost considerations. The following excerpt is from the final design brief:

> *Conventional facultative and aerated wastewater lagoons have been compared and contrasted for capital and life cycle costs. The facultative and aerated designs include one and two primary cells respectively. Both designs include two storage cells that treat and store the estimated 2035 design loads. The organic loading is 158 kg-BOD_5/d and 227 day storage is 100,000 m^3. Twenty year life cycle costs for the facultative and aerated designs have been estimated at $6,172,500 and $6,584,700 respectively. Initial capital costs for the designs are within $70,000 favoring the aerated design. The difference in future capital, operation, and maintenance costs is approximately $480,000 favoring the facultative design. WSP recommends the facultative lagoon design as the most beneficial for Rivers*

Riverdale Planning District Background Study for Town of Rivers RM of Daly, by MRB Planning Consultants and GENIVAR, April 2012. This broad based planning study touched on municipal infrastructure including the collection sewer and treatment lagoon. The following excerpt is from the planning report:

> *Most rural residents’ truck septage from their septic tanks or holding tanks to the Regional Wastewater Stabilization Pond in the Town of Rivers, however the primary cell of the lagoon is currently beyond its design capacity. The construction of a new facility is being investigated, and land acquisition has yet to be finalized. The lagoon was constructed in 1956. The secondary cell operates with a continuous discharge by infiltration through the bottom of the cell. This method of discharge is not acceptable to Manitoba Conservation.*

Town of Rivers Lagoon Assessment Update, by GENIVAR, August 2009. The following excerpt is from the assessment report:

> *As identified in report Sections 3.5 and 4.4, the existing Town of Rivers lagoon is undersized and requires expansion in order to provide adequate wastewater treatment and storage for the existing and proposed wastewater sources for a 20 year period (2029)*
>
> *A conventional lagoon system is proposed for treatment. The conventional lagoon depends on natural processes to treat the wastewater and provides 227 days of storage over the winter (November 1st to June 15th) and the cells are restricted to 1.5 metres of liquid depth plus one metre of freeboard.*
>
> *Based on the estimated loadings six options are considered. Option I proposes to build a new facility to handle the total present and future organic and hydraulic loadings required for the 20 year period from the Town of Rivers and the R.M. of Daly. Options II to VI consist of the construction of a new lagoon facility to treat the total organic and hydraulic loadings required for the 20 year period from the Town of Rivers only.*

3 EXISTING WASTEWATER TREATMENT LAGOON

3.1 DESCRIPTION

The existing Town of Rivers wastewater treatment lagoon is located approximately 420 metres south of the Town in SE ¼ 23-12-21 WPM and SW ¼ 24-12-21 WPM. The existing 3.0 hectare Town of Rivers lagoon has a primary cell and an unlined secondary cell that collectively provide treatment, storage and final disposal of the treated wastewater to the sandy subsoil below.

The Town of Rivers sewer system was constructed in 1956 and includes gravity sewer mains, and the two-cell treatment lagoon described above. A sludge cell was constructed in 1997 to receive solids cleaned out of the primary cell. The Town of Rivers has freezing problems with water services and uses bleeder lines in the winter months, between December and April, to prevent water services from freezing. The treatment lagoon secondary cell has a “seepage” discharge system, which ultimately discharges to the Little Saskatchewan River. This method of discharge is not acceptable according to Manitoba Conservation. The existing licence directing lagoon operation is Environment Act Licence No. 1347, dated March 16, 1990.

3.2 EXISTING CAPACITY

The lagoon cell capacities are based on the areal imagery of the existing cells (no “as constructed” drawings were available). At an assumed operating depth of 1.5 m, the primary cell has an estimated total volume of 21,576 m^3 and a storage volume of 10,788 m^3 (Manitoba Conservation stipulates that only half of the total volume contributes to the hydraulic storage of the facility). The secondary cell has a storage volume of 6,720 m^3, at an assumed operating depth of 1.5 m, and subtracting 0.3 m dead storage for the bottom of the cell. The total regulated storage provided by the two cells is therefore 17,508 m^3. Both cells are assumed to have 4:1 interior side slopes.

The existing primary cell has a surface area of 1.62 ha. Generally, lagoon primary cells can assimilate wastewater at a rate of 56 kg-BOD_5/ha/d. This is based on the province of Manitoba Design Objectives for Standard Sewage Lagoons (1985). This equates to a maximum organic loading capacity for the lagoon primary cell of 90.7 kg-BOD_5/d.

3.3 EFFLUENT QUALITY AND DISCHARGE ROUTE

3.3.1 INFLUENT CHARACTERIZATION

WSP is aware of typical physical constraints when siting a treatment lagoon. For Rivers, these include topographic relief, soils characteristics, existing gravity sewer elevation, and regulated offsets from residential buildings. Equally important is maintaining the existing lagoon operations during new lagoon construction. With these constraints in mind, WSP wanted to have an improved

understanding of the wastewater characterization at Rivers. Sizing of primary treatment cells typically involves applying a “generic” organic loading assumption. Engineering design should, to the extent possible, provide for a facility “upgrade” path. To this end, an improved understanding of the actual influent wastewater characterization was explored with funding assistance from MWSB. The driver for a characterization study was the possibility of minimizing the lagoon footprint by improving the treatment process and discharging highly treated effluent continuously to the Little Saskatchewan River. In the end, Manitoba Conservation fish biologists voiced concern with respect to winter low flow river conditions and the idea of continuous discharge was promptly discontinued.

Influent Wastewater characterization occurred during between December 17, 2014 and February 5, 2015. Seven 24 hour composite lagoon influent samples were collected by the Town of Rivers. The first two samples are believed to pre-date Rivers seasonal activation of the water service bleeders. Because residents will often activate bleeders without notifying the Town, it isn’t completely certain that the observed dilution (approximately 15%) is valid, owing to the small sample set. That said, an estimate of 100 m^3/day of additional water use was observed from the water treatment plant distribution records over the years 2010 to 2013. This value will be applied later in the report under hydraulic loading assumptions.

Table 3-1: Contrast Rivers Lagoon Influent Wastewater Strength

	Range Source: Metcalf & Eddy 4th Edition			Town of Rivers
Parameter:	low	medium	High	Max / Min / Avg.
Ammonia,Total (as N)	12	25	45	22 / 12 / 17
Biochemcial Oxygen Demand	110	190	350	132 / 64 / 88
Chemical Oxygen Demand	25	430	800	638 / 167 / 400
COD Dissolved	200	300	500	560 / 125 / 247
Phosphorus (P) Total	4	7	12	7.3 / 3.1 / 3.8
Total Suspended Solids	120	210	400	142 / 88 / 112
pH	6.5	7.3	8.5	9.8 / 7.4 / 8.1
Total Kjeldahl Nitrogen	8	15	25	39 / 24 / 28
Total Nitrogen (calculated)	20	40	70	39 / 24 / 28

The observed lagoon influent wastewater strength from the characterization study Table 3-1 suggests the Rivers wastewater to be low to medium strength when contrasted with the industry standard Metcalf & Eddy.

3.3.2 TREATED EFFLUENT REGULATIONS

The treated effluent from the proposed treatment lagoon is expected to meet the Provincial and Federal effluent regulations which include limits of 25 mg/L $CBOD_5$, 25 mg/L TSS, 200 fecal coliform / 100 ml sample, 1.0 mg/L total phosphorus, and 1.25 mg/L unionized ammonia, expressed as (N).

3.3.3 PROPOSED DISCHARGE ROUTE

The proposed lagoon will discharge treated effluent by a new piped outfall to the riparian zone adjacent to the Little Saskatchewan River, Figure 2-1. The outfall pipe alignment will follow the former CNR utility easement along the west side of the existing and new lagoon cells. The distance of the piped outfall from the discharge point of the proposed lagoon to the Little Saskatchewan River is approximately 400 metres. The existing and proposed lagoons are in the Little Saskatchewan River Conservation District (No. 82B).

Manitoba Conservation has advised WSP through an email dated January 8, 2015 (Appendix D) that fish present downstream of Rivers in the Little Saskatchewan River is the same as in the Assiniboine River. Further, the Little Saskatchewan River is of interest to the Manitoba Conservation Fisheries Branch. A current study commissioned by the Province will eventually guide water allocation decisions on the river.

Department of Fisheries and Oceans (DFO Fisheries) will not review engineering documents related to municipal wastewater lagoon treated effluent river outfalls. A project self-assessment has been conducted based on the guidance provided on the DFO website. The self-assessment covers the broad topics: Project Timing, Site Selection, Containment and Spill Management, Erosion and Sediment Control, Shoreline / Bank Re-vegetation and Stabilization, and Fish Protection. A DFO “Request for Review” form was completed for the project per the DFO website template. DFO will issue a “Letter of Advice” in response to the request for review.

4 POPULATION SERVICED AND DESIGN LOADING

4.1 POPULATION GROWTH ASSUMPTIONS

The existing lagoon services the Town of Rivers, rural residences and cottages utilizing “truck haul” services. The 2015 population of the Town of Rivers is estimated at 1,237. Statistical data indicates a modest 0.43% population increase over the past four (1996-2011) Federal censuses.

For rural population centres, MWSB suggests a population growth in the range of 0.50% to 1.00% in the absence of more specific growth data. JRCC the consultant for the new water treatment plant has assumed a 0.50% growth rate for their 20 year design.

We know that the existing lagoon system has no record of flow volumes over its service life. There is no lift station run time data or annual discharge volumes that can be referred to. Uncertainty surrounding water service bleeders and potential flow and infiltration suggest a conservative approach to population estimates would be prudent. WSP has assumed an annual compounded growth rate of 1.00% for the period from 2011 (most recent census, population 1,189) to 2035. The assumed growth rate projects a 2015 population of 1,237 growing over 20 years by 238 for an estimated population of 1,475 in the year 2035.

In addition to the serviced residents, the Town of Rivers sewer system currently serves 155 out of town students and teachers at the various schools in town. In calculating wastewater flow we use a factor of 3 to1 (3 students or teachers are equivalent to 1 person in a residential dwelling). Therefore: 155 ÷ 3 = 52 equivalent population. Applying a 1.00% compounded growth rate over a 20year period, the 2035 school population of 186 will equate to an equivalent population of 62.

The 2011 census reported 830 residents in the RM of Daly and 298 residences (2.78 people per residence), which we assume are using septic tanks and fields for wastewater treatment. As the rural farm population has not been increasing, we assume the numbers will remain the same over the next 20 years.

In addition, the R.M. indicated 61 cottages (20 permanent and 41 seasonal) at Chimo Beach. The 61 cottages are further divided into 10 septic tanks and fields and 51 holding tanks. Holding tanks require wastewater to be pumped out and hauled during occupancy while septic tanks require wastewater solids (septage) to be pumped out and hauled typically in the fall, annually or biannually. The number of Chimo Beach units is assumed to increase by 104 for a total of 165 by the year 2035. New units are expected to have holding tanks.

The R.M. has indicated interest by some parties for developing the old air base southwest of Rivers. The name associated with the proposed redevelopment is Springland, though specifics are

unavailable at this time. Given the remote likelihood of this development, WSP has made no further attempt at estimating population numbers for Springland.

Table 4-1: Sources of Wastewater by Population

	2015 (estimate)	Growth	2035 (estimate)
Town of Rivers			
population	1,237	238	1,475
schools (equivalent)	52	10	62
Subtotal	**1,289**	**248**	**1,537**
R.M. of Daly			
Rural Septic Fields	298		298
Subtotal	**298**		**298**
Chimo Beach			
Septic Fields	10		10
Holding Tanks	51	104	155
Subtotal	**61**	**104**	**165**
Total Estimated Population	**1,648**	**352**	**2,000**

R.M. of Daly & Chimo Beach data is estimated number of persons by type of wastewater treatment.

4.2 HYDRAULIC LOADING

Hydraulic loading represents the estimated volume of wastewater directed to the lagoon from various sources including the Rivers collection sewer and truck haul wastewater. There are numerous methods for estimating wastewater volumes for design depending on the availability of actual wastewater flow data.

The collection sewer at Rivers currently conveys sewage from the town to the existing lagoon by gravity, without the need for a main conveyance lift station. As such lift station flow records of pumped wastewater volumes are not available for estimating monthly or annual wastewater volumes. Hydraulic loading must therefore be estimated by comparing water plant distribution flow data, water plant backwash records, quarterly metered water use billing records, and industry average per person water use assumptions.

Hydraulic loading estimates must also account for extraneous flows. This value is often included in the industry average per person water use. Unique to Rivers is the use of water service bleeders to prevent freezing. The water services are shallow for the Manitoba climate and the bleeders are typically operated between December and April to prevent water service freezing. This water use is taken ahead of the house utility meter and therefore is not recorded in the quarterly billing.

It should be noted that the JRCC design for the new water treatment plant assumes process wastewater will be piped directly to the Little Saskatchewan River and not to the new treatment lagoon upgrade.

Excluding water treatment process wastewater, the hydraulic contributions to the new treatment lagoon can be divided into the following sources. Each source will be described below:

- Town of Rivers wastewater (residences and schools);
- Town of Rivers water service bleeders;
- Town of Rivers estimated extraneous flows;
- R.M. of Daly residences septic systems; and
- Chimo Beach residences holding tank & septic tank systems;

4.2.1 CURRENT WTP DISTRIBUTION AND METERED WATER USE

Table 4-2 represents water consumption for the Town of Rivers over the years 2006 to 2013. WTP data from 2014 was considered unreliable as the distribution water meter failed early in the year affecting several months of measurements. As well, the table presents the average daily water use per person (L/c/d) which was estimated using population 1,189 from the 2011 Census.

Reviewing the measured water use data, it can be shown that the annual WTP distribution volume has remained consistently higher than the annual quarterly billings by 66% on average, for the years 2006 to 2013. WSP has raised this apparent inconsistency with the operations foreman with the Town of Rivers. The current assumption for the difference is based upon the water service connections between the asbestos cement watermain pipe and the copper pipe water services. Over the years, many of the copper water services have needed to be thawed. Therefore, it is believed that the expansion and contraction from freezing and thawing may have impacted the water tightness of the water distribution piping.

If we acknowledge that there may be an average annual water loss of 69,000 m^3 from the distribution piping, the destination for this water needs to be better understood. The 227 storage period represents roughly 62% of the calendar year and applied to the annual water loss value, this represents 42,900 m^3, a significant volume relative to a treatment lagoon.

WSP continued the discussion with the operations foreman to better understand the destination of the lost water. It was observed that 1) the sanitary sewer is in the middle of the roadway compared with the watermain, located on the roadway shoulder. As well, 2) the watermain and wastewater sewer piping is believed to have been installed in separate trenches. Finally, 3) the subgrade soils in Rivers are primarily sandy in nature and readily drained. As such, for the purpose of the design, sanitary hydraulic loading estimates will be based on metered quarterly water use billings.

Table 4-2: Comparing WTP Metered Distribution and Quarterly Metered Water Use Billing

Year	2006	2007	2008	2009	2010	2011	2012	2013	Average
WTP, m^3	155,789	166,727	173,979	178,703	171,085	175,777	181,845	183,837	**173,468**
L/c/d	359	384	401	412	394	405	419	424	**400**
Billing, m^3	93,481	101,387	109,292	107,070	105,066	104,449	111,304	105,108	**104,645**
L/c/d	215	234	252	247	242	241	256	242	**241**

Note: Average L/c/d water use was estimated using population 1,189 from the 2011 Census.

4.2.2 FUTURE ESTIMATED WATER USE TO YEAR 2035

The 2035 population from Table 4-1 was distributed linearly, and per person average water use from Table 4-2 was applied to generate the estimated average annual water use over the 20 year design horizon presented in Table 4-3 for the Town of Rivers.

Table 4-3: Town of Rivers Average Annual Water Use Estimate to the Year 2035 [20 Year]

Year	2015	2020	2025	2030	2035
Population	1289	1350	1412	1474	1537
L/c/d	241	241	241	241	241
Estimate, m^3	113,387	118,753	124,207	129,660	135,202

4.2.3 WATER USE AND SEWAGE HYDRAULIC ASSUMPTIONS

The 20 year estimated average annual water use has been factored down by 15% in Table 4-4 in an effort to account for normal losses related to activities such as watering lawns, washing automobiles and the like.

Table 4-4: 20 Year Estimate Factored (0.85% [1]) for Normal Residential Losses

Year	2015	2020	2025	2030	2035
Population	1289	1350	1412	1474	1537
Estimate, m^3	96,379	100,940	105,576	110,211	114,922

[1] Metcalf & Eddie, Fourth Edition, page 155, In the United States, on average about 60 to 90 percent of the per capita water consumption becomes wastewater. 85% selected as mid-range.

The 20 year estimated average annual waste use has been factored down in Table 4-5 to represent the regulated 227 day storage period volume between November 01 from one year until June 15 of the following year.

Table 4-5: Estimate Required 227 Day Storage from November 01 and June 15

Year	2015	2020	2025	2030	2035
Population	1289	1350	1412	1474	1537
Estimate, m^3	59,940	62,776	65,659	68,542	71,472

4.2.4 TOWN WATER SERVICE BLEEDERS

The Town of Rivers has installed 6.5 mm diameter plastic bleeder lines off of the 19.0 mm diameter copper water services, before the water meter. The bleeders drain to the adjacent sanitary service pipe. The bleeders are typically turned on immediately following Christmas and turned off in March or April, depending on the winter and depth of frost. Of the 150 total number of bleeders, 30 are most likely to be turned on each winter with the remainder turned on depending on the severity of the winter.

WSP reviewed 2009 to 2013 WTP metered distribution volumes, comparing and contrasting the average daily volume for the three months preceding and following December. The high value was 100 m^3/day and the low value was 54 m^3/day. For the purpose of this design, 100 m^3/day has been assumed for the 152 day period from December to April for an average year total of 15,200 m^3 volume. This volume has been factored into Table 4-6.

It should be noted that the capital cost of replacing individual water services plus the necessary surface restoration would be significant and beyond the capacity-to-pay for the community. Because the main is also in the frost range, eliminating water service bleeders would transfer the freezing problem back to the mains. The cost of frost protection for the water mains is significant and beyond the capacity-to-pay for the community.

Table 4-6: Account for Average Water Service Bleeder Water Use from December to April

Year	2015	2020	2025	2030	2035
Population	1289	1350	1412	1474	1537
Estimate, m^3	75,140	77,976	80,859	83,742	86,672

4.2.5 TOWN EXTRANEOUS FLOWS

WSP combined several data sources in an effort to estimate a value for average extraneous flows to the sanitary sewer. The Town of Rivers provided a map sketch with street manholes known to pond water and catch basins known to be plumbed to the sewer. Based on inflow of 345,600 L/day (10 manholes) and infiltration of 46,000 L/d (2 hectares), the total average daily extraneous flow has been assumed at 391,600 litres (392 m^3)

Environment Canada historic statistics indicated that for the mid-April to mid-June period, Rivers can expect 30 precipitation days on average. Combining the assumed extraneous flows contribution and the average number of precipitation days, the net result of 11,750 m^3 has been added to the Table 4-7 hydraulic loading estimate.

It should be noted that the capital cost of eliminating inflow and infiltration with new drainage sewer infrastructure plus necessary surface restoration would be significant and beyond the capacity-to-pay for the community. Inflow volumes that would otherwise enter the sewer (drainage, or sanitary) would potentially require the construction of offline retention pond(s) with pump station(s) within the original developed areas of town. The cost of these drainage improvements is significant and beyond the capacity-to-pay for the community.

Table 4-7: Account for Estimated Average Extraneous Flows

Year	2015	2020	2025	2030	2035
Population	1289	1350	1412	1474	1537
Estimate, m^3	86,890	89,726	92,609	95,492	98,422

4.2.6 RURAL HYDRAULIC LOADING

WSP, has in the past, discussed septage practices with local haulers in southern Manitoba. From these earlier discussions, WSP have made assumptions related to rural permanent versus rural seasonal septage hauling. As well, the distinction between rural septic tanks versus rural holding tanks has been factored. Finally, the seasonal nature of the septage haul industry has resulted in 1,517 m^3 for the trucked volume corresponding with the 227 day storage period for 2035. This results in a total storage requirement of 99,939 cubic metres, say 100,000 cubic metres for the 20 year design period.

4.2.7 CONCLUSION

Hydraulic loading assumptions began with known water use data and a known census population used to estimate average per person water use. The average per person water use was applied to future population projections derived using an assumed 1.0% compounded annual growth rate from 2015. The water use estimate was than factored down by 15% to account for assorted domestic water use losses in route to the wastewater sewer, an industry accepted approach.

Domestic wastewater contributions include average daily wastewater, extraneous flows, water service bleeders, and rural hauled wastewater from septic and holding tanks. Acknowledging the 227 day regulated storage period (November 01 of one year until June 15 of the following year), the annual hydraulic loading has adjusted for the storage interval. These factored contributions to the wastewater sewer are unlikely to change going forward given the signification cost of renewing infrastructure.

The required storage corresponding with the 20 year hydraulic loading to the year 2035, has been estimated at 99,939 m^3 from which WSP would recommend a minimum value of 100,000 m^3. In a conventional facultative lagoon, this storage volume, as per Manitoba Conservation guidelines is calculated as 50% of the primary cell(s) volume plus the secondary storage cell(s) volume. The storage volume guidelines account for the 1.0 m freeboard and the dead space of 300 mm depth (below the discharge pipe) yielding the net secondary storage volume.

4.3 ORGANIC LOADING

Organic loading refers to the quantity of organic material present in the incoming wastewater and is measured as the five day Biochemical Oxygen Demand (BOD_5). The organic loading becomes the total mass of BOD_5 in kg/d in the wastewater entering the lagoon. The wastewater from the Town of Rivers community is consistent on a year-round basis, while the R.M. of Daly rural area residents has a seasonal variation. However, the peak loading from the rural area residents occurs within the fall months as described below.

4.3.1 TOWN OF RIVERS

On the basis of accepted practice, the daily BOD_5 production for domestic wastewater is 0.077 kg per person. Therefore, with a current equivalent population of 1,289 (including bussed-in students); the

organic loading to the existing Town of Rivers lagoon is 99.3 kg-BOD_5/d. Over the course of the future design period, a population increase of 248 (including bussed-in students) equates to an additional loading of 19.1 kg-BOD_5/d, for a total of 118.3 kg-BOD_5/d as observed at the top portion of Table 4-8.

4.3.2 RURAL, RM OF DALY, CHIMO BEACH

A local septage hauler representative has noted that approximately 296 rural residences with septic tanks and 61 cottages (20 permanent and 41 seasonal) with 10 septic tanks and 51 holding tanks are currently hauled to the Town of Rivers lagoon. Of the 306 septic tanks, 230 (~75%) will be emptied in any given year and approximately 126 (~55%) will be emptied into the facility during the 45-day peak period in the fall months. The wastewater strength of each septic tank is approximately 12 kg-BOD_5. Excluding the holding tanks at Chimo Beach, rural residences are assumed to use septic fields for disposal of the liquid component of the wastewater.

Table 4-8: Summary Lagoon Organic Loading Assumptions

Year	2015		2035
Rivers Population-w-School Equivalent	1289		1537
Organic Load, kg/d	99.3		118.3
		Town-Piped kg-BOD_5/d	**118.3**
Rural Residences [permanent] Septage	296		296
Organic Load, kg/d	32.6		32.6
		Rural Septage(45 day fall) kg- BOD_5/d	**32.6**
Chimo Beach [permanent] Septage	10		10
Organic Load, kg/d	1.1		1.1
		Chimo Beach(Permanent)Septage (45 day fall) kg-BOD_5/d	**1.1**
Chimo Beach [permanent] Holding Tanks	10		44
Organic Load, kg/d	0.59		2.6
		Chimo Beach (Permanent) Holding Tanks kg-BOD_5/d	**2.6**
Chimo Beach (seasonal) Holding Tanks	41		111
Organic load, kg/d	1.2		3.1
		Chimo Beach (Seasonal) Holding Tank kg-BOD_5/d	**3.1**
		Total kg-BOD_5/d	**158**

Table 4-8 presents the organic loading assumptions for the Rivers Lagoon upgrade. The total organic loading quantity is 157.7 kg-BOD_5/d. Additional assumptions include:

- Persons per residence, 2.0 for permanent and 3.0 for seasonal
- Flow 60 L/c/d, permanent
- Flow 40 L/c/d, seasonal
- Organic load for holding tanks, 500 mg/L
- Occupancy factor, 5% for winter and 40% for summer for seasonal residences

4.3.3 CONCLUSION

Organic loading assumptions began on the basis of accepted practice, the daily BOD_5 production for domestic wastewater is 0.077 kg per person. The average per person organic load was extrapolated to an annual total. Average annual organic load was applied to future population projections derived using an assumed 1.0% compounded annual growth rate from 2015. The organic load was factored to account for school contributions.

Demonstrated using Table 4-8 additional organic contributions from rural septic tanks are presented making use of previous discussions by WSP engineers with the truck haul septage industry. Other contributions include permanent and seasonal rural residential septage from Chimo Beach. The 20 year organic loading to the year 2035, has been estimated at 158 kg BOD_5/day from which WSP would recommend a minimum value of 160 kg BOD_5/day.

5 PROPOSED DEVELOPMENT

Sizing the new lagoon upgrade for a 20-year life involved optimizing the available escarpment lands adjacent to the existing lagoon, without the expectation of using the existing lagoon for treatment. Due consideration for bank stability and set back from buildings was provided in the design. Wastewater treatment for a design population, Table 4-1, has been provided in terms of both organic and hydraulic capacity.

The proposed development consists of:

- One new primary cell
- Electrical service
- Two new secondary cells
- Phosphorus removal (manual coagulant dosing as required)
- Sanitary lift station
- Manholes, piping, valves

The EAP design drawings are included as Appendix D. The expansion work is to be completed while the existing facility remains in operation. The expanded lagoon will provide adequate organic loading (treatment) capacity for a population, Table 4-1, and hydraulic loading (storage) capacity, Table 4-5.

5.1 SITE CONDITIONS

A field investigation was undertaken on May 25, 2015. A track-drill rig was used to drill a total of five additional testholes (supplement an earlier investigation by GENIVAR), between 4.6 m and 15.2 m depth below ground level. Two testholes (TH1 and TH3) were chosen to adequately cover the railroad tracks for assessing potential contamination. All testholes were sealed with Bentonite clay plugs. The geotechnical report is included as Appendix C.

5.1.1 LOCAL TOPOGRAPHY

There exists a line of power poles along the north property line between the Zone “A” and Zone “M2” lands. The power poles carry 3-Phase overhead electric power across the top of the escarpment servicing various industries. These industries are located on the M2 lands. West of the lagoon site the relief falls gradually over several hundred metres to the Little Saskatchewan River below and is home to one residential acreage and a farm homestead.

South of the lagoon site, the land exhibits abrupt relief dropping over a distance of 100 metres down to the bank of the Little Saskatchewan River. North and east of the lagoon site the CPR mainline curves down from the north before crossing the Little Saskatchewan River. East of the lagoon site the relief falls gradually over several hundred metres to the Little Saskatchewan River below. Along the west side of the subject lands is a former CNR parcel of land containing an abandoned raw river

water pipeline that was originally used by the CNR to convey river water to their facilities south of the town site.

5.1.2 SOIL CONDITIONS

With the exception of TH4 and TH5, the general soil profile encountered in the testholes revealed a consistent soil profile. The general soil profile revealed a topsoil/fill layer of 150 mm to 600 mm in thickness underlain by a sand layer followed by a high plastic clay till layer which extended to the bottom of the testholes at 15.2 m below ground surface. At TH4 and TH5, a medium plastic clay was encountered below the topsoil/fill layer at the surface, respectively. However the proposed lagoon site consists mainly of an area where SAND is present. The proposed site should either be built with geosynthetic plastic system (PVC or HDPE) or locate borrow to produce a 1.0 metre deep high plastic clay liner. The geotechnical report is included as Appendix C.

5.1.3 GROUNDWATER

Seepage from the sand layer was observed at 7.9 m depth (TH4, elevation 493.1 m) five minutes after completion of drilling. A detailed description of the soil profile is presented in the geotechnical report included as Appendix C. Based on the drainage mapping for the area, groundwater flow is towards the west toward the Assiniboine River Valley which flows in the southeast direction toward Brandon.

5.1.4 SITE INVESTIGATION

As part of the investigation, a review was made of the slope stability. Based on our inspection, one cross-section (A-A') was reviewed since this is the closest to the proposed expansion. The section indicates one gradual slope face. A slope failure was observed near the gradual eastern slope. The face dropped down at least 1.0 m and created a bench structure. Slope analysis found the minimum factor of safety of 1.495. The target safety factor is 1.5 indicating acceptable conditions related to bank stability. The geotechnical report is included as Appendix C.

5.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The following sections describe the construction and upgrades proposed for the development. The new lagoon system will include a piped discharge with outfall to a riparian area adjacent to the Little Saskatchewan River, a sanitary lift station, facultative primary cell, two secondary cells, and secure access for truck haul.

The lagoon cell construction is based on the information and recommendations provided in the Wastewater Treatment Lagoon Upgrade Design Brief by WSP, October 2015. For disturbed areas where sediment or erosion control is deemed necessary, the contractor will be required to employ appropriate erosion and sediment control measures.

The design of a proposed wastewater treatment lagoon addresses geographical relief of the existing lagoon site. The elevation of the site changes approximately 10 m from its north end, near the CN rail

lines, to its south end, near the existing lagoon and the top of the bank for the Little Saskatchewan River valley. Therefore, a significant amount of material will need to be moved to construct any type of wastewater treatment lagoon at this location. An existing 3-phase hydro line running east/west bisects the property and will need to be relocated north as part of the lagoon construction.

The current lagoon receives wastewater from Rivers through a 250 mm vitrified clay tile gravity sewer pipe. This pipe surfaces at the bottom of the existing primary cell. Since there is a large change in relief across the lagoon site, the existing gravity sewer is buried at depths greater than 6 m where the proposed primary cells of the wastewater lagoon are to be located. Consequently, the proposed lagoon will have a lift station and forcemain to pump the wastewater into the proposed primary cell.

5.2.1 PROPOSED PRIMARY CELL

The proposed design for a conventional facultative wastewater lagoon will consist of one new primary cell and two new secondary cells as illustrated in the preliminary design drawings (Appendix D). In this proposed design, one primary and two secondary cells collectively function to treat and store the design organic and hydraulic loads projected for the year 2035. The basis for the design is an organic load estimated at 158 kg-BOD_5/d, and a hydraulic load estimated at 100,000 m^3. The hydraulic load represents wastewater generated during the 227 day winter storage period.

A consistent and suitable clay layer was not identified by the geotechnical investigation at the existing lagoon site, nor was a known clay borrow source identified in the near vicinity. Therefore, the proposed lagoon cells to be constructed at this site will require a synthetic HDPE liner system. A synthetic liner typically requires a 300 mm thick sand cover layer to protect it from damage.

Table 5-1: Specifications for the Proposed Primary Cell

Parameter	Proposed Primary Cell
Cell Bottom Dimensions	300 m x 95 m
Liquid Surface Dimensions (at operating depth)	345 m x 120 m
Top of Dyke (inside to inside)	355 m x 130 m
Operating Depth	1.5 m
Freeboard Height	1.0 m
Interior Side Slope	5 H : 1 V
Exterior Side Slope	4 H : 1 V
Total Volume (at Operating Depth)	38,840 m^3
Storage Volume (50% Total Volume)	19,420 m^3
Surface Area	2.9 ha
Liner System	HDPE

5.2.1 PROPOSED SECONDARY CELLS

All primary and secondary cells will support a liquid depth of 1.5 metres and provide a minimum of 1.0 metre freeboard. The liquid depth of 1.5 metres is the maximum depth allowed by Manitoba Conservation and Water Stewardship (CWS) for facultative lagoons. The interior of the dykes will be lined with rip rap (9.0 m wide) and sloped at 5H:1V. The top width of the dykes are designed as none gravelled and 3.0 metres wide, permitting vehicle access around the lagoon. Phosphorus treatment is assumed to be by chemical addition to the secondary cells as required before discharge. It will be necessary to monitor phosphorus levels in the new lagoon as the dilute nature of the wastewater may result in low levels in the cells to be discharged. Alum or ferric chloride are possible chemicals to be used and ferric chloride is probably a better choice as it is more “environmentally friendly” for when sludge will have to be removed from the cells, presumably 20-30 years or more down the road. Table 5-1, Table 5-2, and Table 5-3, detail the design specifications for the new primary and secondary cells respectively.

Table 5-2: Specifications for the Proposed Secondary Cell No. 1

Parameter	Proposed Secondary Cell no. 1
Cell Bottom Dimensions	337 m x 85 m
Liquid Surface Dimensions (at operating depth)	352 m x 100 m
Top of Dyke (inside to inside)	362 m x 110 m
Operating Depth	1.5 m
Freeboard Height	1.0 m
Interior Side Slope	5 H : 1 V
Exterior Side Slope	4 H : 1 V
Total Volume (at Operating Depth)	47,560 m^3
Dead Storage Volume (at 0.3 m Depth)	8,745 m^3
Storage Volume	38,815 m^3
Liner system	HDPE

Table 5-3: Specifications for the Proposed Secondary Cell No. 2

Parameter	Proposed Secondary Cell no. 2
Cell Bottom Dimensions	Irregular
Liquid Surface Dimensions (at operating depth)	Irregular
Top of Dyke (inside to inside)	Irregular
Operating Depth	1.5 m
Freeboard Height	1.0 m
Interior Side Slope	5 H : 1 V
Exterior Side Slope	4 H : 1 V
Total Volume (at Operating Depth)	52,080 m^3
Dead Storage Volume (at 0.3 m Depth)	9,750 m^3
Storage Volume	42,330 m^3
Liner system	HDPE

5.2.2 EXISTING LAGOON CELLS

At this time there is no intention of integrating the existing lagoon into the new lagoon upgrade. Possibly in the future when the subsoil has of the existing lagoon has sufficiently dried out, there may be an opportunity to line one of more of the cells to manage settled solids from the new treatment lagoon.

5.2.3 PROPOSED LIFT STATION AND HAUL TRUCK STATION

The Town of Rivers has a gravity sewer discharge to the existing lagoon system. Wastewater flow rates have been estimated from engineering principals as a starting point. The configuration for the lift station will be a standard duplex pump wet well unit composed of either fiberglass or concrete barrel, whichever is most cost effective.

Utility power will be required for the new lift station. Utility 3-Phase power is available nearby allowing for straight forward servicing of the lift station and the secure access haul truck discharge station on the north berm of the new primary cell. Secure gated haul truck access packages are installed at numerous lagoons in the province. Riverdale Municipality will tour one or more of this installations with the preferred system integrated into the final lagoon design.

5.2.4 PHOSPHORUS REMOVAL SYSTEM

The proposed Riverdale Municipality lagoon will need to implement a process within their lagoon system to meet the requirements of the Water Quality Standards, Objectives and Guidelines Regulation under The Water Protection Act (2011). The regulations call for less than 1.0 mg/L total phosphorus in the treated lagoon effluent.

A manual form of chemical dosing to the secondary cells is proposed at the Riverdale Municipality lagoon. Phosphorus removal will be performed using chemical precipitation and flocculation of orthophosphate with aluminum sulfate or ferric chloride broadcast manual with motor boat. The quantity will be established in the field using water quality analysis prior to effluent discharge.

The treated effluent will be discharged by gravity into the riparian area adjacent to the Little Saskatchewan River. Aluminum sulfate or ferric chloride will be jar tested in advance to establish the most cost effective dosing chemical. Chemical dosing will precede intermittent releases generally identified in June and October.

5.2.5 EFFLUENT QUALITY AND OUTFALL

To date, owing to the lagoon design at Rivers, Riverdale Municipality has not been required to test effluent quality under Environment Act regulations. As discussed, we anticipate a 1.0 mg/L phosphorus limit to be applied to the facility and have implemented a nutrient reduction strategy demonstrated at other locations.

According to the Federal Wastewater Systems Effluent Regulations (WSER), the Riverdale Municipality wastewater treatment lagoon is considered an Intermittent Wastewater System. This type of wastewater system treatment lagoon must manage the release of the following deleterious substances:

- Five day Carbonaceous Biochemical Oxygen demand (BOD_5);
- Total Suspended Solids (TSS);
- Total residual chlorine; and

- Un-ionized ammonia.

The discharge of treated effluent must comply with the following conditions:

- The annual average $CBOD_5$ in the effluent not to exceed 25 mg/L;
- The annual average TSS in the effluent not to exceed 25 mg/L;
- The annual average total residual chlorine in the effluent not to exceed 0.02 mg/L; and
- The annual maximum concentration of un-ionized ammonia in the effluent not to exceed 1.25 mg/L, expressed as nitrogen (N), at 15°C ± 1°C.

These federal parameters now appear in provincial licences issued under the Environment Act. WSER also calls for acute lethality testing on the discharging treated effluent, with the sampling frequency dependent on the annual average daily volume.

The effluent quality will also be restricted to a fecal coliform limit, as indicated by the MPN index, of 200 per 100 mL. A well maintained lagoon system will meet these effluent conditions, with the exception of the phosphorus. As required, the dosing approach discussed is expected to provide phosphorus removal to meet the regulations.

The facultative lagoon is anticipated to be licenced for discharge between June 15 and October 31. Treated effluent will discharge through a pipe and energy dissipating culvert to a riparian area adjacent to the Little Saskatchewan River. It is understood that the Little Saskatchewan River supports a community of fish species. The intermittent release of treated lagoon effluent and the river outfall are not anticipated to negatively impact water quality and water quantity. Treated effluent will achieve provincial and federal water quality regulations, standards, objectives and guidelines.

The piped lagoon outfall is proposed to discharge treated effluent in a manner to avoid a discharge volumes that could create a channel within the riparian area adjacent to the river. This will be achieved by a valve to throttle flows at the lagoon, and by geometry to dissipate energy at the riparian area. Initially, it is anticipated that the discharge point will be monitored by town staff to check for any channelling or sediment accumulation in the riparian area.

5.2.6 CONCLUSION

After expansion, the Rivers lagoon will be a three cell lagoon. One facultative primary cell will provide adequate treatment for the estimated 2035 population, while two secondary cells will provide storage for the corresponding 2035 population. Table 5-4 summarizes the expanded lagoon capacities.

Table 5-4: Expanded Wastewater Lagoon Capacities

Cell Type	Liquid Surface Area [ha]	Total Liquid Volume [m^3]	Dead Space Volume [m^3]	Storage Volume [m^3]
New Primary Cell	2.9	38,840	19,420	19,420
New Secondary Cell #1	3.5	47,560	8,745	38,815
New Secondary Cell #2	3.8	52,080	9,750	42,330
Total	10.2	138,480	25,635	100,565

6 ENVIRONMENTAL IMPACTS

6.1 ODOUR

It is expected that the new facility will operate without causing any significant odour problems. The new primary cell is designed for the future flows with a 56 kg-BOD5/ha/d loading. This actual cell loading will fall below the intended 20 year design loading capacity for many years.

The only time of the year that some minor impact from odours may be present is during the spring while the ice thaws. During the winter, ice cover largely prevents free oxygen from entering the water. This condition leads to the production of hydrogen sulphide gas (H_2S) during the winter by bacteria that do not require free oxygen. These accumulated gases dissipate quickly into the atmosphere when the ice breaks and the normal summer pond operation returns.

The closest residence to the proposed lagoon is located northwest 400 metres away, which meets the Manitoba Conservation minimum setback distance of 300 metres.

6.2 NOISE

There are potential sources of noise from the new upgraded lagoon construction.

6.3 LAND

The Riverdale Planning District Background Study for the Town of Rivers, RM of Daly by MRB Planning and Genivar, April 2012 shows two zone designations for the lagoon lands. The existing lagoon lands are designated “A” Rural while the new lagoon will expand north onto lands designated “M2” Heavy Industrial. The client is advised to determine if all the lagoon lands would best be designated as the same zone. Equally important, to the client is whether the lagoon lands should be designated “A” Rural or perhaps “M1” Light Industrial.

6.4 WATER

Treated effluent will be conveyed by a discharge pipe down the river valley to an engineered outfall structure constructed within an existing riparian area adjacent to the main river body of the Little Saskatchewan River.

6.4.1 SURFACE WATER

Perimeter ditching will be constructed to provide positive drainage for surface water around the lagoon. The Town of Rivers and the existing and proposed lagoons are located in the Lower Little Saskatchewan River and Adjacent Area Watershed (No. 82).

6.4.2 GROUNDWATER

The lagoon development and the discharge route are located inside a groundwater pollution hazard area, based on the Virden Area Map. As discussed in Geotechnical Report, the main aquifer in the area is good water bearing formations or aquifers consisting of the alluviam deposits along the Little Saskatchewan River and fair to poor aquifers come from intertill deposits located around the Town. Geotechnical bore logs in the area indicate loose silty sand about 0.6 to 3.50 m followed by a gravely sand layer which extended to the bottom of the testholes at 6.09 to 7.62 m below grade.

Based on the drainage map of the area, groundwater flow at the site is immediately towards the south to the Little Saskatchewan River and eventually to the Assiniboine River. Groundwater monitoring will be performed as required by Manitoba Conservation.

The design of the new lagoon complies with Manitoba Conservation guidelines and should therefore sufficiently contain the influent wastewater. The treated effluent intended for discharge should comply with the parameters listed in the new Environment Act Licence.

6.4.2.1 FUEL STORAGE ON SITE

The proposed facility does not require the onsite storage of gasoline or diesel fuel. During construction and upgrading, the contractor will be required to ensure that all equipment is properly maintained to prevent leaks and spills of fuel and motor fluids. Refuelling of equipment will not be within 100 metres of a water body, stream or wetland.

6.5 SPECIES

A file search with the Biodiversity Conservation Wildlife and Ecosystem Protection Branch of Manitoba Conservation resulted in no occurrences found near the development site.

6.6 FISHERIES

The lagoon discharges into a discharge pipe sloped towards the Little Saskatchewan River (Figure 3.1). According to Fisheries and Oceans Canada (DFO) the Little Saskatchewan River identified as a type A habitat (complex habitat, indicators present). Correspondence is included in Appendix D.

In order to protect any potential fish in the critical springtime spawning season, when effluent un-ionised ammonia tends to be high, the lagoon has been designed to the 227-day storage period. The lagoon will discharge after June 15th and will allow for significant conversion of toxic un-ionised ammonia into relatively benign nitrates. (See also Section 3.3.3)

6.6.1 FISHERIES ACT INFORMATION

As noted from Fisheries and Oceans Canada (DFO), the deposit of deleterious substances into water frequented by fish is prohibited under the Fisheries Act. In addition, according to subsection 35(1) of the Fisheries Act, “no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.”

6.7 FORESTRY

There is no known forestry activity in the area. The construction of the lagoon will not affect any forested area.

6.8 SOCIO-ECONOMIC

The lagoon construction will result in a short-term boost to the construction industry in the area. The community will implement managed truck haul receiving through the means of card access security gate with bill system.

6.9 HERITAGE RESOURCES

In a letter dated November 23, 2009 from the Historic Resources Branch (Appendix D), it was stated that the potential to impact significant heritage resources is low, and therefore, the Historic Resources Branch has no concerns with the project.

6.10 PUBLIC INVOLVEMENT

Comments from concerned members of the public will be solicited as part of Manitoba Conservation review prior to issuing a licence.

6.11 DOCUMENTATION AND RECORD KEEPING

The new wastewater treatment facility is specifically designed to provide wastewater treatment and storage capacity for the existing infrastructure and estimated 20 year growth. The proposed Town of Rivers lagoon is designed to treat wastewater up to an average loading of 162.0 kg-BOD_5/d and store the treated effluent for 227 days. The facility will normally discharge in spring soon after June 15th, and again in fall prior to October 31st. The discharge rate from the new secondary cells will remain low enough to prevent scour in the riparian area. The maximum discharge volume into the riparian area from this cells is 80,000 m^3 and therefore the time duration to discharge the secondary cells will extend over several weeks.

Manitoba Conservation requires treated effluent to have a BOD_5 < 25 mg/L, TSS < 25 mg/L, fecal coliform MPN of <200 organisms/100 mL, unionized ammonia < 1.25 mg/L expressed as (N) at 15 degrees Celsius, total phosphorus < 1.0 mg/L, and total residual chlorine < 0.02 mg/L. The proposed facility should not have difficulty meeting these requirements.

6.11.1 DISCHARGE PROCEDURES

- Manipulate the valve to isolate one or both of the secondary storage cells three weeks before collecting the BOD_5, bacteriological, and any other samples required in the new Environment Act Licence.
- Sample the isolated secondary cell(s). Allow at least one week to analyze the sample(s), plus shipment time.

- If results meet licence parameter limits, cells are discharged. If the faecal coliform MPN index does not exceed 200 per 100 mL of sample, and the BOD_5 does not exceed 25 mg/L, then the bacteriological and BOD_5 component of the testing is satisfied. Further discharge parameters may be instituted in the new Environment Act Licence that should be satisfied prior to discharge.
- While discharging, the valve(s) between the primary cell and the secondary cell(s) remain closed to prevent the primary cell from simultaneously discharging effluent into the discharging secondary cell(s).
- Once the secondary cell(s) are discharged, close the discharge valve(s), and reopen the valve(s) between the primary cell and the secondary cell(s). This will allow the water levels in the cells to equalize. In many cases a sufficient amount of treated effluent is discharged from the secondary cell(s) using this procedure to permit operation until the next scheduled discharge period. However, it may be necessary to discharge additional treated effluent to have enough storage for the wastewater flows in the following operational season.
- If further discharging is necessary, repeat the isolation, testing and discharge process.

6.11.2 RECORD KEEPING

A record book, organized in four sections, should be maintained:

- Daily Records – Lift station pumping hours (flow volumes) and water consumption records should be collected and retained for future estimation of flows to the wastewater treatment facility. Septic hauling records (dates and volumes) from the individual haulers trucking to the lagoon should also be collected and retained.
- Weekly Records - The weekly summer inspection would consist of recording the following: The water level, presence of odours and their source, and presence of floating objects (removal). The summer maintenance should also include grass cutting on the dykes, if necessary, elimination of emergent vegetation, extermination of burrowing animals, repair of the dykes and rip rap if damaged by wind erosion and wave action, repair of the fence and gate.
- Periodic Winter Inspection is confined to inspecting for frozen piping, checking if the water level in the cells is as it should be.
- Discharge Records - The records should contain all treated effluent quality analyses, dates of discharge, discharge procedure followed, water levels and other pertinent data.

7 MANAGEMENT PRACTICE

The upgraded wastewater treatment facility is designed to provide wastewater treatment and storage capacity for the existing infrastructure and proposed developments up to a 20 year projected population to the year 2035. The upgraded treatment lagoon is designed to treat wastewater up to an average loading of 158 kg-BOD_5/d and storage of treated effluent for 227 days. The facility will normally have an intermittent seasonal discharge between the allowable periods from June 15th to October 31st. After the upgrade, the lagoon will consist of one primary and two secondary cells.

The proposed management and operation of the facility is discussed in the following sections.

7.1.1 OPERATION

Operation of the expanded wastewater treatment lagoon must comply with the specifications, limits, terms and conditions of the new Environment Act Licence, as is the case with the existing Licence. Riverdale Municipality must also be in compliance with WSER and the associated reporting outlined in the Regulation.

7.1.2 COMMISSIONING

After the construction involved in expanding the lagoon is completed, all of the new systems will be commissioned. The decision to split the storage in to two cells reflects the decision to keep the existing lagoon until the lift station, primary cell and one storage cell is completed and commissioned. At this point the second storage cell will be constructed and subsequently commissioned completing the full lagoon system.

Phosphorus removal systems, should they be required, will be established well in advance of the initial release of treated effluent to the Little Saskatchewan River. It is reasonable to expect that the discharges will respect the 1.0 mg/L phosphorus limit as the chemical dosing is very effective should it be required. Bench scale testing and/or piloting of the treated wastewater will be used to optimize the required dose.

7.1.3 DISCHARGE

The expanded lagoon facility will be capable of storing wastewater for 227 days at the design loading. In effect, until the design loads are reached, the lagoon will provide storage in excess of 227 days, if the need should arise for any reason. The planned seasonal discharge will be from June 15th through to October 31st or periods within.

A minimum of three weeks prior to the June 15th, valves will be manipulated to isolate the secondary cells for a period of two weeks prior to testing. This schedule allows for one week to obtain the laboratory results. Testing shall be conducted according to the current Environment Act Licence and the Wastewater Systems Effluent Regulation. After successful results, the isolated cell(s) will be discharged.

8 SCHEDULE AND FUNDING

The Manitoba Water Services Board (Board) is a crown corporation established July 1972 under *The Manitoba Water Services Board Act*, to assist in the provision of water and sewerage facilities for the residents of rural Manitoba. Based out of Brandon, since August 1981, the Board is mandated to deliver water and sewer programs which provides for the installation or upgrading of water and sewer facilities in rural Manitoba communities.

The Board receives, and prioritizes projects and subject to available funding and approvals will conduct the necessary physical and technical investigations, and submit an offer (Agreement) to the proponent for the construction of the new works. After the proponent has received the necessary Municipal Board approvals, an Agreement is executed and the Board enters into the necessary contracts for Engineering services and construction of the works.

Scheduling of the EAP submission should accommodate 4 to 6 months for Manitoba Conservation and Water Stewardship to review and comment on the EAP and ultimately grant the licence. Tender and construction will begin when funding is in place. Generally the Manitoba Water Services Board provides project management, including interim financing and tendering of all construction contracts for the projects undertaken. The schedule will ultimately depend on the availability of funding.

9 REFERENCES

- Manitoba Conservation and Water Stewardship. (2014). Information Bulletin – Environment Act Proposal Report Guidelines.
- Environment Canada. (2013). Wastewater System Effluent Regulations (WSER). Information for Owners and Operators of Intermittently Discharging Wastewater Systems.
- Alberta Environment. (2013). Part 4 Wastewater Systems Guidelines for Design, Operating, and Monitoring.
- Manitoba Water Stewardship. (2011). Manitoba Water Quality Standards, Objectives, and Guidelines.
- Ontario Ministry of the Environment. (2010). Optimization Guidance Manual for Sewage Works.
- Environment Canada. (2003). Treatment Processes for the Removal of Ammonia from Municipal Wastewater.

Appendix A

STATUS OF TITLE

Appendix B

CLEAN ENVIRONMENT COMMISSION

Appendix C

GEOTECHNICAL REPORT

Appendix D

DESIGN PLANS AND DETAILS

Appendix E

GENERAL CORRESPONDENCE FOR REFERENCE

THIS DEED made the 19 day of October, 2012

BETWEEN:

THE TOWN OF RIVERS,

(the "Grantor")

- and -

CANADIAN NATIONAL RAILWAY COMPANY,

(the "Grantee")

GRANT OF RIGHT-OF-WAY

IN CONSIDERATION of One ($1.00) Dollars and other good and valuable consideration paid by the Grantee to the Grantor, receipt of which is acknowledged, the Grantor grants to the Grantee, its heirs and assigns and the occupants of

a right-of-way for persons and vehicles over the following land

All that portion of the SW 1/4 24-12-21 WPM lying West and South of the Westerly and Southerly limits of Parcels 2 and 3 Plan 392 BLTO excepting thereout:

Firstly: Parcel A Plan No. 801 BLTO

Secondly: Road Diversion Plan No. 371 BLTO

Thirdly: All mines, minerals, oils, petroleum, gas, coal and valuable stone as set forth in Transfer No. 878207

- and -

All that portion of the W 1/2 of Section 24 Township 12 Range 21 WPM contained within the limits of a Plan of Works prepared by Albert Gerhard Degner, of the City of Winnipeg, Manitoba Land Surveyor, and sworn to by him on the 14th day of October, 2010, Plan No. (Deposit No. 958/2010) BLTO.

1. The Grantee, for itself, its heirs and assigns, covenants with the Grantor, its heirs and assigns, that the Grantee will at its own expense keep the right-of-way in good repair.

2. This grant of right-of-way shall terminate if the right-of-way is used otherwise than for its present contemplated use.

IN WITNESS WHEREOF the parties have executed this agreement the day, month and year first written above.

SIGNED, SEALED AND DELIVERED)
in the presence of:)
)
)
)
)

Town of Rivers

Per: _____

Todd Gill , Mayor

_____

Kathryn Bridgeman, C.A.O.

CANADIAN NATIONAL RAILWAY COMPANY

Per: _____

Name:

Title:

I HAVE AUTHORITY TO BIND THE CORPORATION

WITNESS

LLOYD D. LUTIC
Barrister and Solicitor
2900, 10180 - 101 Street
Edmonton, Alberta T5J 3V5

ANITA FLEMING
Director, Western Canada
Business Development & Real Estate

DATE: 2014/11/26
TIME: 13:51
PST

MANITOBA

STATUS OF TITLE

TITLE NO: 1448840/2

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	TOWN OF RIVERS
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	BOX 520
REGISTERING OFFICE...	BRANDON		RIVERS MB ROK 1XO
REGISTRATION DATE....	1996/03/21		
COMPLETION DATE.....	1996/05/24		
		CLIENT FILE...	CN/TOWN
		PRODUCED BY...	E.POOLE

LEGAL DESCRIPTION:

THE TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND:

PARCEL ONE: PARCEL A PLAN 801 BLTO
EXC ALL MINES AND MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL AND VALUABLE STONES AS SET FORTH IN TRANSFER NO. 78207
SUBJECT TO ALL RESERVATIONS CONTAINED IN THE GRANT FROM THE CROWN IN SW 1/4 24-12-21 WPM

PARCEL TWO: PARCEL B PLAN 801 BLTO
EXC ALL MINES AND MINERALS AS SET FORTH IN TRANSFER NO. 73919
IN SE 1/4 23-12-21 WPM

ACTIVE TITLE CHARGE(S):

NO ACTIVE TITLE CHARGES EXIST ON THIS TITLE

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	THE TOWN OF RIVERS GENERAL DELIVERY RIVERS MB	ROK 1XO

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1004053/2	EREQC	1996/03/21	$0.00	$0.00

PRESENTED BY: BLTO CONVERSION
FROM: BRANDON LAND TITLES OFFICE CONVERSION
TO:

FROM TITLE NUMBER(S):

203280/2 ALL

LAND INDEX:

LOT	BLOCK	SURVEY PLAN	
A		801	
NOTE:	SW 1/4 24-12-21W		EXC M & M
B		801	
NOTE:	SW 1/4 23-12-21W		EXC M & M

DUPLICATE PRODUCED FOR.. HOLD FOR PROD OF DUPL CT NO(S) ON 1996/05/27
ADDRESS..... 80403

POSTAL CODE.....

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM ON 2014/11/26 OF TITLE NUMBER 1448840/2

********** STATUS OF TITLE 1448840/2 CONTINUED ON NEXT PAGE **********

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	TOWN OF RIVERS
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	BOX 520
REGISTERING OFFICE...	BRANDON		RIVERS MB ROK 1X0
REGISTRATION DATE....	1996/03/21		
COMPLETION DATE.....	1996/05/24		
		CLIENT FILE...	CN/TOWN
		PRODUCED BY...	E.POOLE

ACCEPTED THIS 21ST DAY OF MARCH, 1996
BY W.KNIGHT FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/11/26 OF TITLE NUMBER 1448840/2.

********** END OF STATUS OF TITLE 1448840/2 **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	TOWN OF RIVERS
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	BOX 520
REGISTERING OFFICE...	BRANDON		RIVERS MB ROK 1X0
REGISTRATION DATE....	2000/11/07		
COMPLETION DATE.....	2000/11/09		
		CLIENT FILE...	CN/TOWN
		PRODUCED BY...	E.POOLE

LEGAL DESCRIPTION:

THE TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES
RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND

LOT 10 PLAN 38952 BLTO EXC
FIRSTLY: ALL MINES AND MINERALS, MINERAL OILS, PETROLEUM, GAS
COAL AND VALUABLE STONE AS SET FORTH IN TRANSFER NO 73919 AND R26707
SECONDLY: OUT OF THAT PORTION FORMERLY TAKEN FOR PLAN 1063 BLTO
ALL GRAVEL AS SET FORTH IN TRANSFER NO R26707

IN SE 1/4 23-12-21 WPM

ACTIVE TITLE CHARGE(S):

NO ACTIVE TITLE CHARGES EXIST ON THIS TITLE

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	THE TOWN OF RIVERS BOX 520 RIVERS MB	ROK 1X0

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1087564/2	T	2000/11/07	$28,648.00	$28,648.00

PRESENTED BY: HUNT, MILLER & COMBS
FROM: JOHN FAST AND FLORENCE ELEANOR OLIVE FAST
TO: THE TOWN OF RIVERS

FROM TITLE NUMBER(S):

1534786/2	PART	93763/2	PART

LAND INDEX:

LOT	BLOCK	SURVEY PLAN
10		38952

NOTE: SE 23-12-21 WPM EXC M&M OIL PET GAS COAL & VS

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/11/26 OF TITLE NUMBER 1758454/2

********** STATUS OF TITLE 1758454/2 CONTINUED ON NEXT PAGE **********

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	TOWN OF RIVERS
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	BOX 520
REGISTERING OFFICE...	BRANDON		RIVERS MB ROK 1XO
REGISTRATION DATE....	2000/11/07		
COMPLETION DATE.....	2000/11/09		
		CLIENT FILE...	CN/TOWN
		PRODUCED BY...	E.POOLE

ACCEPTED THIS 7TH DAY OF NOVEMBER, 2000
BY K.ANGUS FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/11/26 OF TITLE NUMBER 1758454/2.

********** END OF STATUS OF TITLE 1758454/2 **********

DATE: 2014/03/10
TIME: 22:52

MANITOBA

STATUS OF TITLE

TITLE NO: 2698030/2

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10	CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LEGAL DESCRIPTION:

THE GRAND TRUNK PACIFIC RAILWAY COMPANY

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON
IN THE FOLLOWING DESCRIBED LAND

FIRSTLY: ALL MINES AND MINERALS IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER 1350498:
PARCELS 8 AND 9 PLAN 392 BLTO
IN SE 1/4 23-12-21 WPM

SECONDLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R26706:
ALL THAT PORTION OF PUBLIC ROAD PLAN 1063 BLTO
CONTAINED WITHIN THE LIMITS OF PARCEL 7 PLAN 392 BLTO
IN SE 1/4 23-12-21 WPM

THIRDLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R26707:
PARCELS 1, 2 AND 3 PLAN 1063 BLTO
IN SE 1/4 23-12-21 WPM

FOURTHLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R27901:
ALL THAT PORTION OF PLAN 1095 BLTO CONTAINED WITHIN THE
LIMITS OF PARCEL 7 PLAN 392 BLTO
IN SE 1/4 23-12-21 WPM

FIFTHLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R34061:
ALL THAT PORTION OF PLAN 1152 BLTO CONTAINED WITHIN THE
LIMITS OF PARCEL 7 PLAN 392 BLTO
IN SE 1/4 23-12-21 WPM

ACTIVE TITLE NOTE(S):

ALL FURTHER DEALINGS MUST BE REFERRED TO THE DISTRICT REGISTRAR FOR
REVIEW REGARDING AFFECT OF S.132(2) OF RAILWAY ACT CHAP 58 3 EDW VII
PROCLAIMED FEB. 1, 1904 RE: ISSUE THAT RAILWAY MAY *NOT* HAVE
ACQUIRED M&MS. CRAIG RUSSELL DR, BLTO

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698030/2

********** STATUS OF TITLE 2698030/2 CONTINUED ON NEXT PAGE **********

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

ACTIVE TITLE CHARGE(S):

1350518/2 ACCEPTED DISTRICT REGISTRAR'S CAVEAT **REG'D:** 2013/12/02
DESCRIPTION: DISTRICT REGISTRAR'S CAVEAT FORBIDDING REGISTRATION
FROM/BY:
TO:
CONSIDERATION: **NOTES:** DR CAVEAT FORBIDDING REG

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	GRAND TRUNK PACIFIC RAILWAY CO 2ND FLOOR - BUILDING B 10229 - 127 AVE EDMONTON, AB	T5E 0B9

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1350500/2	ITREQ	2013/12/02	$0.00	$0.00

PRESENTED BY: HUNT, MILLER & CO. LLP
FROM: BLTO
TO:

FROM TITLE NUMBER(S):

2494360/2 BAL

R.P.A./CROWN GRANT NUMBER(S):

4417

LAND INDEX:

LOT	BLOCK	SURVEY PLAN	
7		392	
NOTE:		SE 23-12-20W	M&M, GRAVEL & VS IN PARTS
8		392	
NOTE:		SE 23-12-20W	M&M
9		392	
NOTE:		SE 23-12-20W	M&M
		1063	
NOTE:		SE 23-12-20W	M&M, GRAVEL & VS IN PT PUBLIC ROAD PLAN
1		1063	
NOTE:		SE 23-12-20W	M&M, GRAVEL & VS

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698030/2

********** STATUS OF TITLE 2698030/2 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LAND INDEX:

LOT	BLOCK	SURVEY PLAN
2		1063
NOTE:	SE 23-12-20W M&M, GRAVEL & VS	
3		1063
NOTE:	SE 23-12-20W M&M, GRAVEL & VS	
		1095
NOTE:	SE 23-12-20W M&M, GRAVEL & VS IN PART	
		1152
NOTE:	SE 23-12-20W M&M, GRAVEL & VS IN PART	

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	SE	23	12	21W
NOTE:	M&M, G & VS IN PTS			

**ACCEPTED THIS 2ND DAY OF DECEMBER, 2013
BY C.RUSSELL FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698030/2.

********** END OF STATUS OF TITLE 2698030/2 **********

DATE: 2014/03/10
TIME: 22:52

MANITOBA

STATUS OF TITLE

TITLE NO: 2698039/2

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10	CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LEGAL DESCRIPTION:

THE GRAND TRUNK PACIFIC RAILWAY COMPANY

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON
IN THE FOLLOWING DESCRIBED LAND

FIRSTLY: PARCELS 2, 4, 4A, 5 AND 6 PLAN 392 BLTO
EXC: OUT OF SAID PARCEL 5, ROAD PLAN 1063 BLTO AND
PLANS 1095, 1152 BLTO AND 35183 BLTO
AND EXC: OUT OF SAID PARCEL 6, ROAD PLAN 1063 BLTO,
PLANS 1047, 28673, 35183 AND 33870 BLTO,
PARCEL "A" PLAN 23130 BLTO AND
PARCEL "B" PLAN 33003 BLTO
IN W 1/2 24 AND N 1/2 23-12-21 WPM

SECONDLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R26103:
PLAN 1047 BLTO
IN NW 1/4 23-12-21 WPM

THIRDLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R26706:
ALL THAT PORTION OF PUBLIC ROAD PLAN 1063 BLTO
CONTAINED WITHIN THE LIMITS OF PARCELS 5 AND 6 PLAN 392 BLTO
IN N 1/2 23-12-21 WPM

FOURTHLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R27901:
ALL THAT PORTION OF PLAN 1095 BLTO
CONTAINED WITHIN THE LIMITS OF PARCEL 5 PLAN 392 BLTO
IN SE 1/4 23-12-21 WPM

FIFTHLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER R34061:
ALL THAT PORTION OF PLAN 1152 BLTO CONTAINED WITHIN THE
LIMITS OF PARCEL 5 PLAN 392 BLTO
IN NE 1/4 23-12-21 WPM

SIXTHLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,
GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER 88-12655:
PARCEL "A" PLAN 23130 BLTO
IN NW 1/4 23-12-21 WPM

SEVENTHLY: ALL MINES, MINERALS, MINERAL OILS, PETROLEUM, GAS, COAL,

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698039/2

********** STATUS OF TITLE 2698039/2 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LEGAL DESCRIPTION:

GRAVEL AND VALUABLE STONE IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER 95-13492:
PARCEL "B" PLAN 33003 BLTO
IN NW 1/4 23-12-21 WPM

EIGHTHLY: ALL MINES AND MINERALS IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER 1011699:
LOT 1 PLAN 33870 BLTO
IN NW 1/4 23-12-21 WPM

NINTHLY: ALL MINES AND MINERALS IN THE FOLLOWING DESCRIBED LAND
AS SET FORTH IN TRANSFER 1350498:
PARCEL "A" PLAN 55127 BLTO
IN W 1/2 24-12-21 WPM

ACTIVE TITLE NOTE(S):

ALL FURTHER DEALINGS MUST BE REFERRED TO THE DISTRICT REGISTRAR FOR REVIEW REGARDING AFFECT OF S.132(2) OF RAILWAY ACT CHAP 58 3 EDW VII PROCLAIMED FEB. 1, 1904 RE: ISSUE THAT RAILWAY MAY *NOT* HAVE ACQUIRED M&MS. CRAIG RUSSELL DR, BLTO

ACTIVE TITLE CHARGE(S):

1112706/2 ACCEPTED — CAVEAT — **REG'D:** 2002/05/10
DESCRIPTION: EASEMENT AGRT DATED 3 APR 2002 BY ANITA FLEMING, AGENT
FROM/BY: CANADIAN NATIONAL RAILWAY COMPANY
TO:
CONSIDERATION: $18,000.00 **NOTES:** PT 5 & 6 PL 392 DOMINANT

1350481/2 ACCEPTED — DISTRICT REGISTRAR'S CAVEAT — **REG'D:** 2013/12/02
DESCRIPTION: DR CAVEAT FORBIDDING REGISTRATION
FROM/BY: BLTO
TO:
CONSIDERATION: **NOTES:** DR CAVEAT FORBIDDING REG

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698039/2

********** STATUS OF TITLE 2698039/2 CONTINUED ON NEXT PAGE **********

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE... BRANDON
REGISTERING OFFICE... BRANDON
REGISTRATION DATE.... 2013/12/02
COMPLETION DATE..... 2014/03/10

PRODUCED FOR.. HUNT, MILLER & CO. LLP
ADDRESS..... 148-8TH ST
BRANDON MB R7A 3X1

CLIENT FILE... 73963R-C (TOWN OF RIVERS)
PRODUCED BY... SYSTEM for Series: 1350496/2

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	GRAND TRUNK PACIFIC RAILWAY CO 2ND FLOOR - BUILDING B 10229 - 127 AVE EDMONTON, AB	T5E 0B9

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1350500/2	ITREQ	2013/12/02	$0.00	$0.00

PRESENTED BY: HUNT, MILLER & CO. LLP
FROM: BLTO
TO:

FROM TITLE NUMBER(S):

2697725/2 BAL

LAND INDEX:

LOT	BLOCK	SURVEY PLAN
4A		392
NOTE:	NW 24-12-21W	
2		392
NOTE:	SW 24-12-21W	
4		392
NOTE:	NW 24-12-21W	
5		392
NOTE:	SE 23-12-21W EX PLS 1063, 1095, 1152 & LT 2 PL 35183	
6		392
NOTE:	SW 23-12-21W EX 1063/1047/28673/33003/33870/23130/ETC	
		1047
NOTE:	NW 23-12-21W M&M, MO, P, G, C, G & VS	
		1063
NOTE:	N 23-12-21W PT 5 & 6 PL 392 M&M, MO, P, G, C, G & VS	
		1095
NOTE:	SE 23-12-21W PT 5 PL 392 M&M, MO, P, G, C, G & VS	
		1152
NOTE:	NE 23-12-21W PT 5 PL 392 M&M, MO, P, G, C, G & VS	
A		23130
NOTE:	NW 23-12-21W M&M, MO, P, G, C, G & VS	
B		33003
NOTE:	NW 23-12-21W M&M, MO, P, G, C, G & VS	
1		33870
NOTE:	NW 23-12-21W M&M	
A		55127
NOTE:	W 1/2 24-12-21W M&M	

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698039/2

********** STATUS OF TITLE 2698039/2 CONTINUED ON NEXT PAGE **********

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STATUS OF TITLE

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

**ACCEPTED THIS 2ND DAY OF DECEMBER, 2013
BY C.RUSSELL FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698039/2.

********** **END OF STATUS OF TITLE 2698039/2** **********

DATE: 2014/03/10
TIME: 22:52
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STATUS OF TITLE

TITLE NO: 2698011/2

PAGE: 1

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LEGAL DESCRIPTION:

TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON
IN THE FOLLOWING DESCRIBED LAND

PARCEL "A" PLAN 55127 BLTO
EXC ALL MINES AND MINERALS AS SET FORTH IN TRANSFER 1350498
IN W 1/2 24-12-21 WPM

ACTIVE TITLE CHARGE(S):

1350499/2 ACCEPTED EASEMENT **REG'D:** 2013/12/02
DESCRIPTION: GRANT OF RIGHT-OF-WAY
FROM/BY: TOWN OF RIVERS
TO: CANADIAN NATIONAL RAILWAY COMPANY
CONSIDERATION: **NOTES:**

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	TOWN OF RIVERS BOX 520 RIVERS, MB	ROK 1XO

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1350498/2	T	2013/12/02	$37,500.00	$37,500.00

PRESENTED BY: HUNT, MILLER & CO. LLP
FROM: CANADIAN NATIONAL RAILWAY COMPANY
TO: TOWN OF RIVERS

FROM TITLE NUMBER(S):

2697725/2 PART

LAND INDEX:

LOT	BLOCK	SURVEY PLAN
A		55127

NOTE: SW 24-12-21W PLAN OF WORKS

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698011/2

********** STATUS OF TITLE 2698011/2 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	SW	24	12	21W

NOTE: PLAN OF WORKS 55127

**ACCEPTED THIS 2ND DAY OF DECEMBER, 2013
BY C.RUSSELL FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698011/2.

********** **END OF STATUS OF TITLE 2698011/2** **********

DATE: 2014/03/10
TIME: 22:52
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STATUS OF TITLE

TITLE NO: 2698005/2

PAGE: 1

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LEGAL DESCRIPTION:

TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON
IN THE FOLLOWING DESCRIBED LAND

PARCELS 8 AND 9 PLAN 392 BLTO
EXC ALL MINES AND MINERALS AS SET FORTH IN TRANSFER 1350498
IN SE 1/4 23-12-21 WPM

ACTIVE TITLE CHARGE(S):

NO ACTIVE TITLE CHARGES EXIST ON THIS TITLE

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	TOWN OF RIVERS BOX 520 RIVERS, MB	ROK 1XO

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1350498/2	T	2013/12/02	$37,500.00	$37,500.00

PRESENTED BY: HUNT, MILLER & CO. LLP
FROM: CANADIAN NATIONAL RAILWAY COMPANY
TO: TOWN OF RIVERS

FROM TITLE NUMBER(S):

2494360/2 PART

R.P.A./CROWN GRANT NUMBER(S):

4417

LAND INDEX:

LOT	BLOCK	SURVEY PLAN
8		392
NOTE:	SE 23-12-21W EXC M&M	
9		392
NOTE:	SE 23-12-21W EXC M&M	

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698005/2

********** STATUS OF TITLE 2698005/2 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10	**CLIENT FILE...**	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	SE	23	12	21W

NOTE: PCLS 8 & 9 PL 392 EXC M&M

**ACCEPTED THIS 2ND DAY OF DECEMBER, 2013
BY C.RUSSELL FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2698005/2.

********** END OF STATUS OF TITLE 2698005/2 **********

DATE: 2014/03/10
TIME: 22:52
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MANITOBA

STATUS OF TITLE

TITLE NO: 2697997/2

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10	**CLIENT FILE...**	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

LEGAL DESCRIPTION:

TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES
RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND

ALL THAT PORTION OF THE SW 1/4 OF SECTION 24-12-21 WPM
LYING WEST AND SOUTH OF THE WLY AND SLY LIMITS OF
PARCELS 2 AND 3 PLAN 392 BLTO
EXC FIRSTLY: PARCEL "A" PLAN 801 BLTO
SECONDLY: ROAD DIVERSION PLAN 371 BLTO
AND THIRDLY: ALL MINES, MINERALS, OILS, PETROLEUM, GAS, COAL,
AND VALUABLE STONE AS SET FORTH IN TRANSFER 78207

ACTIVE TITLE CHARGE(S):

R21034/2 ACCEPTED CAVEAT **REG'D:** 1961/07/24
FROM/BY: MANITOBA HYDRO-ELECTRIC BOARD
TO:
CONSIDERATION: **NOTES:** PART

1350499/2 ACCEPTED EASEMENT **REG'D:** 2013/12/02
DESCRIPTION: GRANT OF RIGHT-OF-WAY
FROM/BY: TOWN OF RIVERS
TO: CANADIAN NATIONAL RAILWAY COMPANY
CONSIDERATION: **NOTES:**

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	TOWN OF RIVERS BOX 520 RIVERS, MB	ROK 1XO

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1350498/2	T	2013/12/02	$37,500.00	$37,500.00

PRESENTED BY: HUNT, MILLER & CO. LLP
FROM: CANADIAN NATIONAL RAILWAY COMPANY
TO: TOWN OF RIVERS

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2697997/2

********** STATUS OF TITLE 2697997/2 CONTINUED ON NEXT PAGE **********

MANITOBA

STATUS OF TITLE

STATUS OF TITLE.....	**ACCEPTED**	**PRODUCED FOR..**	HUNT, MILLER & CO. LLP
ORIGINATING OFFICE...	BRANDON	**ADDRESS.....**	148-8TH ST
REGISTERING OFFICE...	BRANDON		BRANDON MB R7A 3X1
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10		
		CLIENT FILE...	73963R-C (TOWN OF RIVERS)
		PRODUCED BY...	SYSTEM for Series: 1350496/2

FROM TITLE NUMBER(S):

1926347/2 ALL

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	SW	24	12	21W

NOTE: PT S&W OF PLAN 392 EXC PL 801, RD PL 371 & M&M ETC.

**ACCEPTED THIS 2ND DAY OF DECEMBER, 2013
BY C.RUSSELL FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2014/03/10 OF TITLE NUMBER 2697997/2.

********** END OF STATUS OF TITLE 2697997/2 **********

DATE: 2015/02/10
TIME: 09:04

MANITOBA

STATUS OF TITLE

TITLE NO: 2698011/2

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE... BRANDON
REGISTERING OFFICE... BRANDON
REGISTRATION DATE.... 2013/12/02
COMPLETION DATE..... 2014/03/10

PRODUCED FOR.. TOWN OF RIVERS
ADDRESS..... BOX 520
RIVERS MB ROK 1X0

CLIENT FILE... CN-
PRODUCED BY... E.POOLE

LEGAL DESCRIPTION:

TOWN OF RIVERS

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON
IN THE FOLLOWING DESCRIBED LAND

PARCEL "A" PLAN 55127 BLTO
EXC ALL MINES AND MINERALS AS SET FORTH IN TRANSFER 1350498
IN W 1/2 24-12-21 WPM

ACTIVE TITLE CHARGE(S):

1350499/2 ACCEPTED EASEMENT **REG'D:** 2013/12/02
DESCRIPTION: GRANT OF RIGHT-OF-WAY
FROM/BY: TOWN OF RIVERS
TO: CANADIAN NATIONAL RAILWAY COMPANY
CONSIDERATION: **NOTES:**

ADDRESS(ES) FOR SERVICE:

EFFECT	NAME AND ADDRESS	POSTAL CODE
ACTIVE	TOWN OF RIVERS BOX 520 RIVERS, MB	ROK 1X0

ORIGINATING INSTRUMENT(S):

REGISTRATION NUMBER	TYPE	REG. DATE	CONSIDERATION	SWORN VALUE
1350498/2	T	2013/12/02	$37,500.00	$37,500.00

PRESENTED BY: HUNT, MILLER & CO. LLP
FROM: CANADIAN NATIONAL RAILWAY COMPANY
TO: TOWN OF RIVERS

FROM TITLE NUMBER(S):

2697725/2 PART

LAND INDEX:

LOT	BLOCK	SURVEY PLAN
A		55127

NOTE: SW 24-12-21W PLAN OF WORKS

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA
STORAGE SYSTEM ON 2015/02/10 OF TITLE NUMBER 2698011/2

********** STATUS OF TITLE 2698011/2 CONTINUED ON NEXT PAGE **********

STATUS OF TITLE.....	ACCEPTED	PRODUCED FOR..	TOWN OF RIVERS
ORIGINATING OFFICE...	BRANDON	ADDRESS.....	BOX 520
REGISTERING OFFICE...	BRANDON		RIVERS MB ROK 1XO
REGISTRATION DATE....	2013/12/02		
COMPLETION DATE.....	2014/03/10	CLIENT FILE...	CN-
		PRODUCED BY...	E.POOLE

LAND INDEX:

LOT	QUARTER SECTION	SECTION	TOWNSHIP	RANGE
	SW	24	12	21W

NOTE: PLAN OF WORKS 55127

**ACCEPTED THIS 2ND DAY OF DECEMBER, 2013
BY C.RUSSELL FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF BRANDON.**

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM ON 2015/02/10 OF TITLE NUMBER 2698011/2.

********** END OF STATUS OF TITLE 2698011/2 **********

1189

Lagoon License

COPY

396.00

AN ORDER OF THE CLEAN ENVIRONMENT COMMISSION

UNDER THE CLEAN ENVIRONMENT ACT

RE: THE CLEAN ENVIRONMENT COMMISSION and THE TOWN OF RIVERS, Applicant,

WHEREAS pursuant to the provisions of The Clean Environment Act, the Town of Rivers filed a registration with the department in connection with the operation of a sewage lagoon system located in the SW 1/4 of Section 24 and the SE 1/4 of Section 23, Township 12, Range 21 WPM in the said Town;

AND WHEREAS in the absence of limits, terms and conditions prescribed by a regulation, the proposal was referred to The Clean Environment Commission to prescribe limits, terms and conditions;

AND WHEREAS after giving notice of its intention to set limits, terms and conditions, the Commission did not receive notice of representation from any person who was likely to be affected;

AND WHEREAS the Commission considered the operation on the 30th day of March, 1988;

IT IS HEREBY ORDERED THAT

1. The Applicant shall operate and maintain the said sewage lagoon system in such a manner that

   (a) the release of offensive odours is minimized;

   (b) the organic loading on the primary cell of the said sewage lagoon system, as indicated by the five day biochemical oxygen demand, is not in excess of 56 kilograms per hectare per day.

2. The Applicant shall comply fully with the limits, terms and conditions prescribed either in Clause 3 or in Clause 4 of this Order.

3. Subject to Clause 2, the Applicant shall

(a) on or before the 1st day of October, 1990 upgrade the secondary cell of the said sewage lagoon in such a manner that all interior surfaces of the cell are lined with one metre of soil having a hydraulic conductivity of 1×10^{-7} centimetres per second, or less;

(b) notify the Environmental Management Division at least two weeks prior to the completion of construction of the lining of the secondary cell;

(c) (i) subject undisturbed soil samples from the completed secondary cell to hydraulic conductivity tests, the number and location of the samples to be as specified by an officer of the Environmental Management Division up to a maximum of twenty samples, or,

(ii) where undisturbed soil samples cannot be taken, test the soil of 2 plane surfaces of the lagoon cell for hydraulic conductivity by an in situ field test method acceptable to the said Division at locations specified by an officer of the Division;

(d) not less than two weeks prior to said secondary cell being utilized, submit to the said Division the results of the tests carried out pursuant to (c);

(e) on and after the 1st day of October, 1990, not discharge effluent from the said sewage lagoon system

(i) where the organic content of the effluent, as indicated by the five day biochemical oxygen demand, is in excess of 30 milligrams per litre;

(ii) where the fecal coliform content of the effluent, as indicated by the MPN Index, is in excess of 200 per 100 millilitres of sample;

3. (e) (iii) where the total coliform content of the effluent, as indicated by the MPN Index is in excess of 1500 per 100 millilitres of sample,

(iv) between the 1st day of November of any year and the 15th day of May of the following year.

4. Subject to 2, the Applicant shall, on or before the 1st day of October, 1990, submit to the Environmental Management Division

(a) a proposal to operate a lagoon where the interior surface of the lagoon cells is not underlain by one metre of soil having a hydraulic conductivity of 1 x 10^{-7} centimetres per second or less;

(b) an engineering report sealed by a registered professional engineer, which contains the following information

(i) the expected seepage losses;

(ii) the boundary conditions and other assumptions used to calculate the expected seepage losses;

(iii) a summary of the measured hydraulic conductivity of the in situ material in all soil profiles;

(iv) an environmental impact statement stating the effects of the expected seepage on the soil, groundwater and the Little Saskatchewan River.

Order No. 1189

Dated at the City of Winnipeg

this 30th day of March, 1988.

Chairperson,
The Clean Environment Commission.

File: 396.0

SUPPLEMENTAL GEOTECHNICAL/ PHASE 2 ESA REPORT
PROPOSED TOWN OF RIVERS WWSP EXPANSION
RIVERS, MANITOBA

Prepared for:

Manitoba Water Services Board
Box 22080-2010 Currie Blvd.
Brandon, MB
R7A 6Y9

Project No: 141-20119-00
October, 2015

WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB R3T 6B8
Phone: (204) 477-6650 ~ Fax: (204) 474-2864

www.wspgroup.com

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 BACKGROUND 1
3.0 TOPOGRAPHY AND SITE INFORMATION 2
4.0 FIELD METHODOLOGY, TESTING AND ASSESSMENT CRITERIA 2
5.0 SUBSURFACE INVESTIGATION 5
5.1 SOIL PROFILE/GROUNDWATER 5
5.2 LABORATORY TESTING AND CHEMICAL ANALYSIS 5
6.0 SLOPE ASSESSMENT 7
7.0 DESIGN CONSIDERATIONS 9
8.0 ADDITIONAL CONSIDERATIONS 11
9.0 STANDARD LIMITATIONS 12

Appendix A – Site Plan and Slope Assessment Figures (Figures 2 to 4)

Appendix B – Testhole Logs

Appendix C – Laboratory Test Results and Chemical Analysis

Appendix D – Granular Specification

1.0 INTRODUCTION

The Town of Rivers is located on PTH 25, 241 km west of Winnipeg and 37 km northwest of Brandon, Manitoba. As part of a sewage lagoon feasibility study and with the acquisition of the railway lands, a Phase 2 Environmental Site Assessment was conducted for soil contamination. The purpose of the assessment was to examine subsurface conditions at the existing site for the presence of hydrocarbon contamination. The scope of work includes the following:

- A drilling program on the existing site and the recovery of samples at various depths.
- Screening and laboratory analysis of representative samples for hydrocarbon contamination.
- Preparation of a report which includes a site plan, testhole logs, interpretation of test results and conclusions.

In addition, a slope stability assessment was also conducted since the expansion areas and existing lagoon are located on top of a hill and overlooking a river.

This report deals with the site selection of the wastewater lagoon expansion based on the soil conditions with respect to the Environmental Act passed in 1988. Manitoba Conservation's Environmental guidelines require that the dykes and the bottom of any lagoon be provided with a layer consisting of at least one metre of soil having a permeability of $1x10^{-7}$ cm/s or less or equivalence, i.e. the use of a plastic liner.

A site plan of the existing wastewater stabilization ponds, as well as the testhole locations is attached, see Appendix A; Site Plan.

2.0 BACKGROUND

At present, the Town of Rivers has an existing wastewater treatment facility comprised of one primary cell and one secondary cell.

3.0 TOPOGRAPHY AND SITE INFORMATION

The proposed expansion site is located on flat sloping topography but is frequently marked by deep enclosed basins and contains some moderate ravines. Surficial deposits consist of outwash plain and alluvial terraces deposits (sand and gravel) of various textures over glacial till deposits. The site topography is relatively gently sloping towards the south and abruptly sloped towards the Little Saskatchewan River based on ground elevations. The existing cells area is developed on outwash sand and gravel deposits that generally range from about 1.83m to about 5.18m in thickness followed by glacial till deposits overlying a Red River and Winnipeg Formation of limestone, dolostone and sandstone with minor shale bedrock of Ordovician age.

The adjacent land uses of the expansion site is an existing Westman Mobile Welding shop to the west, Grain Terminal after railroad tracks to the east, various empty lots after railroad tracks to the north and vacant lots to the south.

4.0 FIELD METHODOLOGY, TESTING AND ASSESSMENT CRITERIA

The subsoils encountered were visually classified to the full extent in the testhole and representative soil samples were recovered at regular depth intervals and some samples were submitted for moisture content, particle size analysis and atterberg limit tests. Pocket penetrometer tests were conducted on the cohesive soil to determine the approximate unconfined compressive strength and relative density respectively. Any groundwater seepage and sloughing encountered in the testholes were noted.

The field investigation was undertaken on May 25, 2015. A track-drill rig was used to drill a total of five additional testholes between 4.6m and 15.2m depth below grade. Two (TH1 and TH3) of which were chosen to adequately cover the railroad tracks for any contamination, if found. At these two testholes, soil samples were recovered at 0.76m intervals in each testhole. Each testhole was backfilled with auger cuttings and capped with a Bentonite plug.

Soil samples were recovered at 0.76m intervals in each testhole plus the surface samples (0.3m). Each testhole was backfilled with auger cuttings and capped with a Bentonite plug. The testholes locations are shown on the site plan in Appendix A. To minimize the potential for cross contamination of the samples, the outer surface of each soil sample was first removed using a steel scraper. Samples were then placed in clean, labelled plastic bags. After reaching an ambient temperature of about + 20°C, soil samples were checked for the presence of hydrocarbon odours and/or stains, and hydrocarbon vapours using a Gastech Trace-Tector analyzer calibrated to hexane and used in the a No Methane mode.

Soil samples which showed the highest hydrocarbon vapour concentration readings or any indication of staining were placed in clean glass jars and sealed with teflon-lined lids as quickly as possible to minimize the potential loss of volatile hydrocarbons. The jars were then placed in a cooler and the plastic bag soil samples were then returned to our office. Two samples were then submitted for BTEX, F1 to F4 and metal analysis to ALS laboratory.

Detailed descriptions of the soil profiles in each testhole are shown on the attached logs, TH1 to TH5 in Appendix B. Laboratory test results for moisture contents, atterberg limit, particle size analysis as well as the ALS chemical test results are attached in Appendix C.

ASSESSMENT CRITERIA

The site is located in the commercial zone of Rivers, MB. Manitoba Conservation, the Provincial regulatory body, currently references the environmental assessment criteria as outlined in the following two documents produced by the Canadian Council of Ministers of the Environment (CCME):

- *CCME, 1999 (updated 2004). Canadian Environmental Quality Guidelines (EQGs).*
- *CCME, 2008 Canada-Wide Standards for Petroleum Hydrocarbons in Soil (CWS-PHC).*

Based on the above current CCME documents (and their precursors), WSP Canada Inc. conducted an evaluation of the applicable exposure pathways, land uses, key receptors and visual classification of the soil texture at the site.

Based on the surrounding land/groundwater usage, existing land usage (wastewater stabilization pond) and local subsurface conditions (mostly SAND over CLAY TILL), the site classification is classed as COMMERCIAL with fine-grained soil guideline and inhalation of indoor air (slab-on-grade) as the main exposure pathway.

This is shown in Table 1 at surface depth (≤1.5m) and at subsoil depth (≥1.5m) as defined by Canada-Wide Standards(CWS) for Petroleum Hydrocarbons(PHCs) of Canadian Council Ministry of Environment (CCME) guidelines.

TABLE 1: ASSESSMENT CRITERIA

		Fine Grained Soil Guidelines (mg/kg) (PHCs)							
Land Use	Exposure Pathway	Benzene	Toluene	Ethyl benzene	Xylene	F1	F2	F3	F4
Commercial (≤ 1.5m depth)	Soil Ingestion	11	82000	36000	560000	19000[1]	10000[1]	23000[1]	RES
	Soil Dermal Contact	25	790000	210000	NA				
	Inhalation of Indoor Air (Slab-on Grade)	0.28	13000	6500	1600	4600	23000	NA	NA
	Ecological Soil Contact	310	330	430	230	**320**	**260**	**2500**	**6600**
	Management Limits	NG	NG	NG	NG	800	1000	5000	10000
Commercial (≥1.5m depth)	Inhalation of Indoor Air (Slab on Grade)	**0.29**	**13000**	**6700**	**1600**	4600	23000	NA	NA
	Management Limits	NG	NG	NG	NG	**800**	**1000**	**5000**	**10000**

Notes:

1 Combined values for soil ingestion and dermal contact for exposure pathway

- F1-volatile petroleum hydrocarbons (C6-C10)
- F2-volatile petroleum hydrocarbons (C6-C16)
- F3-volatile petroleum hydrocarbons (C16-C34)
- F4-volatile petroleum hydrocarbons (C34-C50)
- NG-No guideline available
- NA-Not Applicable
- BOLD-selected guideline
- CCME EQG Criteria-commercial land use criteria as outlines in the Canadian Council of the Ministers of the Environment (CCME)"Canadian Environmental Quality Guidelines", 1999 (updated 2009). The benzene concentration is based on 10-6 incremental risk of cancer.
- CCME CWS PHC Criteria-Commercial land use criteria as outlined in the CCME "Canada-Wide Standards for Hydrocarbons in Soil", 2001, revised 2008.

5.0 SUBSURFACE CONDITIONS

5.1 SOIL PROFILE/GROUNDWATER

With the exception of TH4 and TH5, the general soil profile encountered in the testholes revealed a consistent soil profile. The general soil profile revealed a topsoil/fill layer of 150 to 600mm in thickness underlain by a SAND layer followed by a high plasticity clay till layer which extended to the bottom of the testholes at 15.2m below grade. At TH4 and TH5, a medium plastic clay was encountered below the topsoil/fill layer at the surface, respectively.

Seepage from the SAND layer was observed at 7.9m depth (TH4, Elevation 463.1m) five minutes after completion of drilling. A detailed description of the soil profile is presented in the attached logs, Appendix B.

At present, potable water for the Town of River is obtained from Lake Wahtopanah which is recharged from the Little Saskatchewan River upstream of the Town and is distributed by a piped system to the residents. In the Town of Rivers area, good water bearing formations or aquifers consist of the alluvial deposit along the Little Saskatchewan River and fair to poor aquifers comes from intertill deposits located around the Town. Within the Town, some individual wells were constructed for domestic and livestock usage. Only a few wells are still used for domestic purposes, some are used for garden and yard usage in summer.

Based on the drainage map of the area, groundwater flow is towards the west to the Assiniboine River Valley which flows in the south-east direction towards Brandon.

5.2 LABORATORY TESTING AND CHEMICAL ANALYSIS

In the laboratory, selected samples were submitted for moisture contents, atterberg limit and hydrometer test for classification and estimation of hydraulic conductivity. The test results are shown in Appendix C.

As classified during our field investigation, the general subsurface condition is majorly comprised of fine to coarse SAND. The estimated hydraulic conductivity of this SAND layer based on the hydrometer test results should range *between 10^{-3} to 10^{-5} cm/sec.*

CHEMICAL ANALYSIS

Hydrocarbon vapour concentrations measured in the recovered soil samples are shown in Table 2 below. The soil vapours encountered ranged from 50 to 100 ppm.

TABLE 2
HYDROCARBON VAPOUR READINGS
TOWN OF RIVERS WWSP

Hydrocarbon Vapour readings, ppm								
	Depth , m							
Testhole Number	0.3	0.76	1.5	2.25	3.0	3.75	4.5	
TH1	100[2]	80	80	80	60	50	50	
TH3	80	80	100[2]	100[1]	80	50	50	

[1] Jarred soil samples

[2] Jarred soil samples submitted for Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Petroleum Hydrocarbons(PHC), Fraction 1 to Fraction 4 (F1 to F4).

Soil test results from ALS Environmental Analytical Report are shown in Table 3. The original copy of the test results is included in Appendix C.

TABLE 3: LABORATORY TEST RESULTS

Soil – Petroleum Hydrocarbon Laboratory Results									
Sample Location	Soil Vapour Conc. (ppm)	Benzene	Toluene	Ethyl Benzene	Xylenes	VPH (F1)	EPH (F2)	EPH (F3)	EPH (F4)
TH1-0.3m	100	<0.0050	<0.050	<0.015	<0.10	<10	<25	<50	<50
TH3-1.5m	100	<0.0050	<0.050	<0.015	<0.10	<10	38	130	<50
CCME Commercial EQG surface soils (≤1.5m below grade)		0.28[1]	13000[2]	6500[2]	1600[2]	N/A			
CCME CWS PHC – fine grained surface soils (<1.5m below grade)						320[3]	260[3]	2500[3]	6600[3]
CCME Commercial EQG subsurface soils (≥1.5m below grade)		0.29[1]	13000[1]	6700[1]	1600[1]	N/A			
CCME CWS PHC – fine grained subsurface soils (≥1.5m below grade)						800[4]	1000[4]	5000[4]	10000[4]

Table Notes:

- Headspace vapour concentrations measured with an Eagle RKI combustible vapour analyzer, calibrated to hexane with methane exclusion.
- ppm_v - parts per million total organic vapours
- All concentrations in micrograms per gram (ug/g) unless otherwise stated
- VPH (F1) - volatile petroleum hydrocarbons (C6 – C10); corrected for BTEX
- EPH (F2) - extractable petroleum hydrocarbons (C10 – C16)
- EPH (F3) - extractable petroleum hydrocarbons (C16 – C34)
- EPH (F4) - extractable petroleum hydrocarbons (C34 – C50)
- < - less than the analytical detection limit
- CCME – Canadian Council of Ministers of the Environment
- Benzene assessed to 10^{-6} incremental cancer risk.
- CCME EQG Criteria – residential/parkland land use criteria for fine grained surface soils as outlined in the Canadian Council of the Ministers of the Environment (CCME) "*Canadian Environmental Quality Guidelines*", 1999 (updated 2008).
  • [1] – inhalation of indoor air check (slab-on-grade) [2] – soil contact guideline
- CCME CWS PHC – CCME residential/parkland guidelines for fine grained subsurface soils as outlined in Table 4 of the CCME document "*Canada-Wide Standards for Hydrocarbons in Soil*", 2001 (revised 2008).
  • [3] – ecosoil contact [4] – management limit

The PHC, Fractions 1 to 4 test results were compared to the fine grained soil CCME guideline as the soil in question is visually classified as fine grained SAND. As mentioned earlier, the site is classified as commercial. *Both of the soil samples analyzed (TH1-0.3m and TH3-1.5m) were well below all of the BTEX and F1 to F4 parameters of the Commercial guideline of Canadian Council of Ministers of the Environment (CCME) using inhalation of indoor (slab-on-grade) as exposure pathway.*

With respect to the metals, the test results have shown that they are within the expected range of soil metals in the Town of Rivers.

6.0 SLOPE ASSESSMENT

As part of the investigation, a review was made of the slope stability. Based on our inspection, one cross section (A-A') as shown in Figure 1 was reviewed since this is the closest section to the proposed expansion. Cross section A-A' indicates one gradual slope face (1V: 16H) followed by a steep slopes about 1H: 3V. *A slope failure was observed near the gradual slope; note that a part of this face dropped down at least 1m and created a bench structure as shown in our slope model (Figure 2, Appendix A).*

For g*eotechnical investigations, a safety factor (FS) of 1.5 is used as a guideline for determining the long-term stability of the slope with respect to construction of proposed WWSP (wastewater stabilization pond) expansion.*

The stability of the slope was evaluated by a parametric analysis of cross section A-A' using Modified Bishop method of Geo-slope software with about "14.9 kPa-surcharge load from water" pressure line from the proposed expansion and assumed circular failure surfaces. The cross section is shown orientated perpendicular to the closest edge of the proposed lagoon and included the soil stratigraphy from the testhole data. The Geo-slope software which is 2-dimensional analysis is considered appropriate for the existing bank. Since there was a slope failure, the soil parameters were determined using back-calculation from safety factor(SF) of 1.0 as shown in Figure 2; note that SF of 1.0 is considered failure(unstable slope) . The soil strength parameters utilized were based on "residual" strength parameters; 5 kPa to 10 kPa (105 psf to 208.8 psf) and 15-17 degrees for first time slides for clay parameter. All of the soil parameters are shown below in Table 4.

TABLE 4: SOIL STRENGTH PARAMETERS

SOIL	γ , kN/m^3(lb/ft^3)	C' ,kPa (lb/ft^2)	Φ ,°
Fill	17 (105)	0	25
Sand	17 (105)	10 (208.8)	20
Clay	16(98.7)	10 (208.8)	15
Clay Till	18 (111)	0	30

The piezometric level based on testhole information and the normal summer water level is at Elev. 463.1m. *Note that the water level was measured at TH4 location.* This scenario will be conducted to simulate the actual condition that might occur on this slope.

The slope stability analysis was carried out on the basis of the soil parameters shown in Table 4 and the presence of surface and pore water pressure. With this information and a presence of additional pressure exerted by the proposed surcharge load (weight of water) and additional engineered embankment fill, the slope stability was analyzed using the actual condition as

mentioned earlier. As shown by Figures 3 to 4, Appendix A, the existing slopes at cross section A-A' simulating the actual condition was determined to have a minimum safety factor of 1.495.

Since our target is near a safety factor of 1.5 (1.495), *this is an acceptable safety factor using the actual conditions scenario and still relates to a more stable bank.*

The results of the slope analysis indicated that the existing setback of about 24m from the edge of the proposed expansion dykes to the steep slope is acceptable.

All surface and roof runoff should be led to the river through a storm water system or through closed conduits in order to prevent scour and erosion gully formation. No fill should be placed upon the bank between the proposed structures and the edge of south bank that would detract from the existing level of stability. Any landscaping should be performed carefully and no stockpiling should be permitted.

For long term erosion protection, willow and alfalfa trees should be planted between the proposed lagoon and the road.

7.0 DESIGN CONSIDERATIONS

For detailed comparisons, the proposed WWSP will be designed in accordance with the Province of Manitoba Design Objectives for Standard Sewage Lagoons (1985).

The proposed cells will contain a liquid depth of 1.5m and 1m freeboard to minimize the effects of wave action and provide stability. The inside and outside side slopes of the dykes will be 4:1. The top of the dykes will be designed to be 3m wide to permit vehicles to be driven on the dyke crest.

For lagoon construction, Manitoba Conservation's Environmental guidelines require that the proposed dykes and bottom of the proposed cells be provided with a layer consisting of at least one metre of soil having a permeability of less than $1x10^{-7}$ cm/s or equivalence (plastic liner).

The proposed pond site consists mainly of an area where SAND is present.

The proposed site should either be built with a geosynthetic plastic system (PVC or HDPE liner) or borrowed 1m surface high plasticity clay liner.

If a geosynthetic liner system is selected, a geotextile sheet must be provided underneath the liner to act as a cushion and to assure integrity of the liner system. It is essential to prevent sharp edged clumps of soil and stones from contacting the liner, which is otherwise susceptible to puncture or tearing. · The liner sheets are heat-fusion welded together. A ballast layer of sandy material must be placed on top of the liner to protect it. The in-situ fine-grained sand soils will be suitable provided that care is taken by the contractor to avoid stones. The sand ballast will be susceptible to erosion, so riprap is mandatory on the inside face of the dykes, evenly divided above and below the normal water line. Above the riprap, topsoil and grass seed will be placed to finish the dyke.

To prevent any leakage from unforeseen rupture of the connecting pipe, the pipe should be enclosed with bentonite pellets or compacted clay equivalent to at least one metre thick where it penetrates the clay liner. Maintenance of the dykes such as clearing of the shrubs and tall grasses should also be conducted.

Since the site is close to a groundwater table, monitoring wells around the existing site should be installed and groundwater monitoring (testing) should be conducted.

During construction of the proposed cells, the following steps should be followed.

1. The entire area for the proposed pond should be stripped of vegetation, topsoil and organic material; the depth of stripping is approximately 150 to 600mm. The stripped materials should be stockpiled and reused later for the outer slopes and top of the dykes.

2. Layout the proposed pond to the dimensions indicated in the design drawings.

3. For the proposed bottom and interior dykes if a clay liner is selected, the liner should be compacted to 95% standard Proctor density at ±2 to 3% of optimum moisture content with a sheepsfoot roller. Ensure that the inside liner consists of at least one metre width of impervious clay compacted to at least a minimum of 95% standard Proctor maximum density in 150 to 200mm lifts. A shrinkage factor of about 25% should be used in calculating volumes of material to be used.

4. Any unsuitable material (topsoil or rootlets) can be used as backfill on the outside face of the dykes. The embankment material should be placed in 150mm lifts compacted with at least eight passes with a sheepsfoot roller having a foot pressure of no less than 700 kPa.

Due to large size of the cells, further erosion control against wind and rain action should be provided by riprap placement on the dykes immediately after construction. A well-developed and maintained grass cover below the riprap should add integrity to the dykes.

The entire completed pond system should be fenced to keep people, children in particular away from the pond. All gates should be locked to prevent access.

Appropriate warning signs should be provided on the fence around the pond, to designate the nature of the facility, and advise against trespassing.

We recommend that a minimum distance of 5 meters be maintained between the outside toe of the embankment and the fence.

8.0 ADDITIONAL CONSIDERATIONS

On the basis of the soil conditions encountered during drilling (i.e. mainly a brown clay or sand subgrade), the recommended road pavement construction at this site should be as follows:

Pavement Thicknesses

	Truck Route	% Compaction
Base Coarse	150 mm	100% Std Proctor
Subbase	225 mm	100% Std Proctor

The above pavement sections should be constructed on a prepared clay/sand subgrade, which should be free of any fibrous organics, softened and disturbed soils. The prepared subgrade should be proof rolled with a heavy sheepsfoot roller which translates to at least 95% Std Proctor and inspected by a qualified geotechnical engineer prior to the placement of the overlying granular fill.

The granular base course and subbase materials should include organic-free, non-frozen, aggregate conforming to the Manitoba Highway gradation limits.

Where soft spots are encountered at the subgrade level, construction traffic should be restricted. Soft spots should be excavated with a large backhoe fitted with a smooth bucket, to at least 300mm below the underside of the subbase and replaced with a 300mm thick layer of 100mm down crushed aggregate/limestone. In this regard, the total granular fill thickness would be 675mm for truck access.

Sieve analysis and compaction testing of the granular base and subbase materials should be conducted by qualified geotechnical personnel to ensure that the materials supplied and percent compactions are in accordance with design specifications.

9.0 STANDARD LIMITATIONS

The factual data, interpretations and recommendations contained in this report pertain to the specific project as described in this report and are not applicable to any other project, site location or party. The comments given in this report are intended only for the guidance of the design engineer. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual test data, as to how subsurface conditions may affect their work.

Soil descriptions in this report are based on commonly accepted methods of classification and identification employed in professional geotechnical practice. Classification and identification of soil involves judgement and WSP does not guarantee descriptions as exact, but infers accuracy only to the extent that is common in current geotechnical practice.

Soil formations are variable to a greater or lesser extent. The testhole logs indicate the approximate subsurface conditions only at the locations of the testholes. Boundaries between zones on the logs are often not distinct, but rather transitional, and have been interpreted. Subsurface conditions between testholes are inferred and may vary significantly from conditions encountered at the testholes.

Where conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the use, or reliance by the client, of this report that WSP is notified of the changes and provided with an opportunity to review the recommendations of this report.

Prepared by: S.S. Urbano Jr., P. Eng.
Reviewed by: Ross Webster, P. Eng.

APPENDIX A

SITE PLAN AND SLOPE ASSESSMENT FIGURES

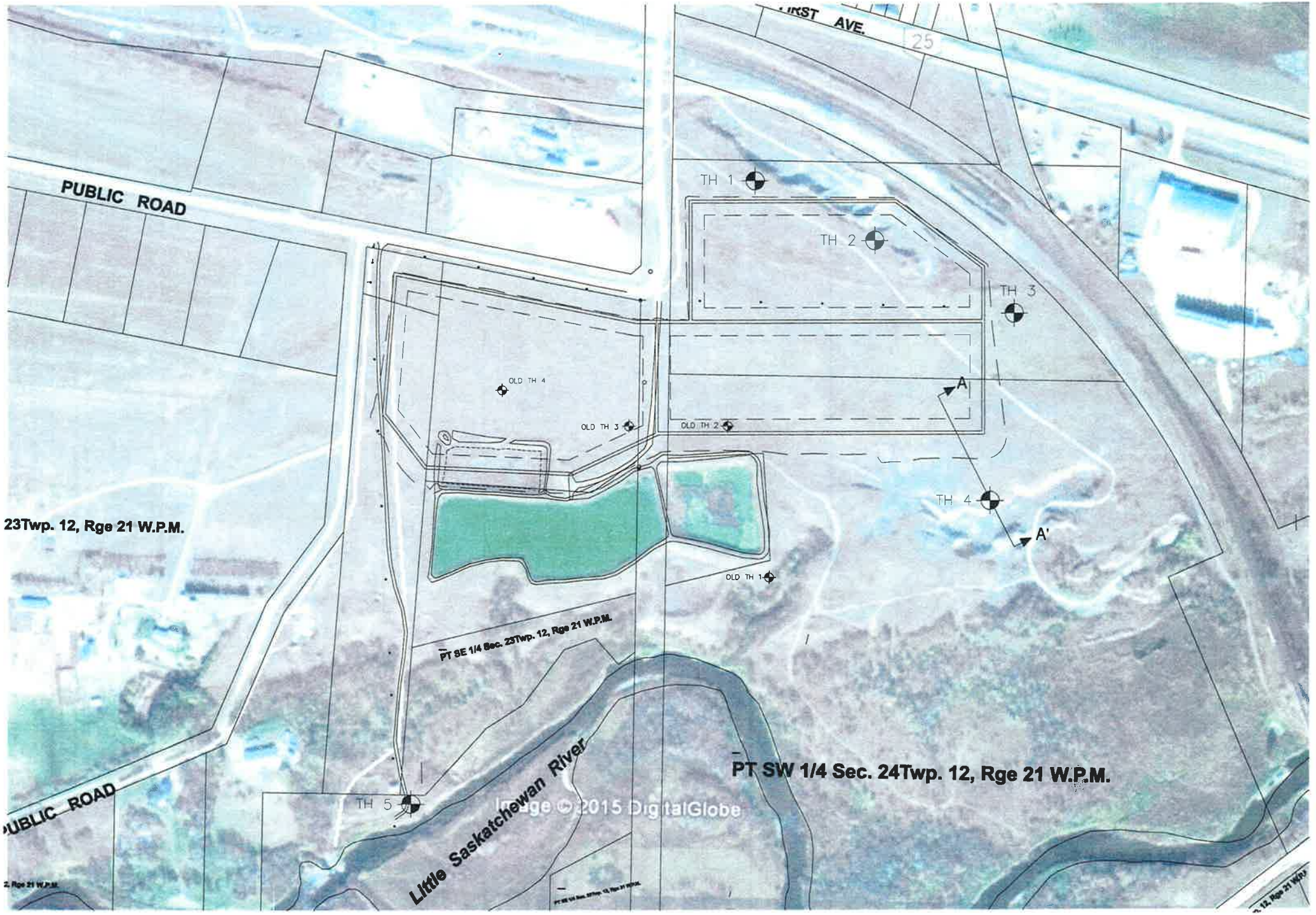

PUBLIC ROAD
TH 1
TH 2
TH 3
TH 4
TH 5
OLD TH 4
OLD TH 3
OLD TH 2
OLD TH 1
A
A'
23Twp. 12, Rge 21 W.P.M.
PT SE 1/4 Sec. 23Twp. 12, Rge 21 W.P.M.
PT SW 1/4 Sec. 24Twp. 12, Rge 21 W.P.M.
Little Saskatchewan River
Image © 2015 DigitalGlobe

FIGURE 1

River Lagoon - Slope Model

Existing Ground Profile - Back-Calculation of Soil Properties

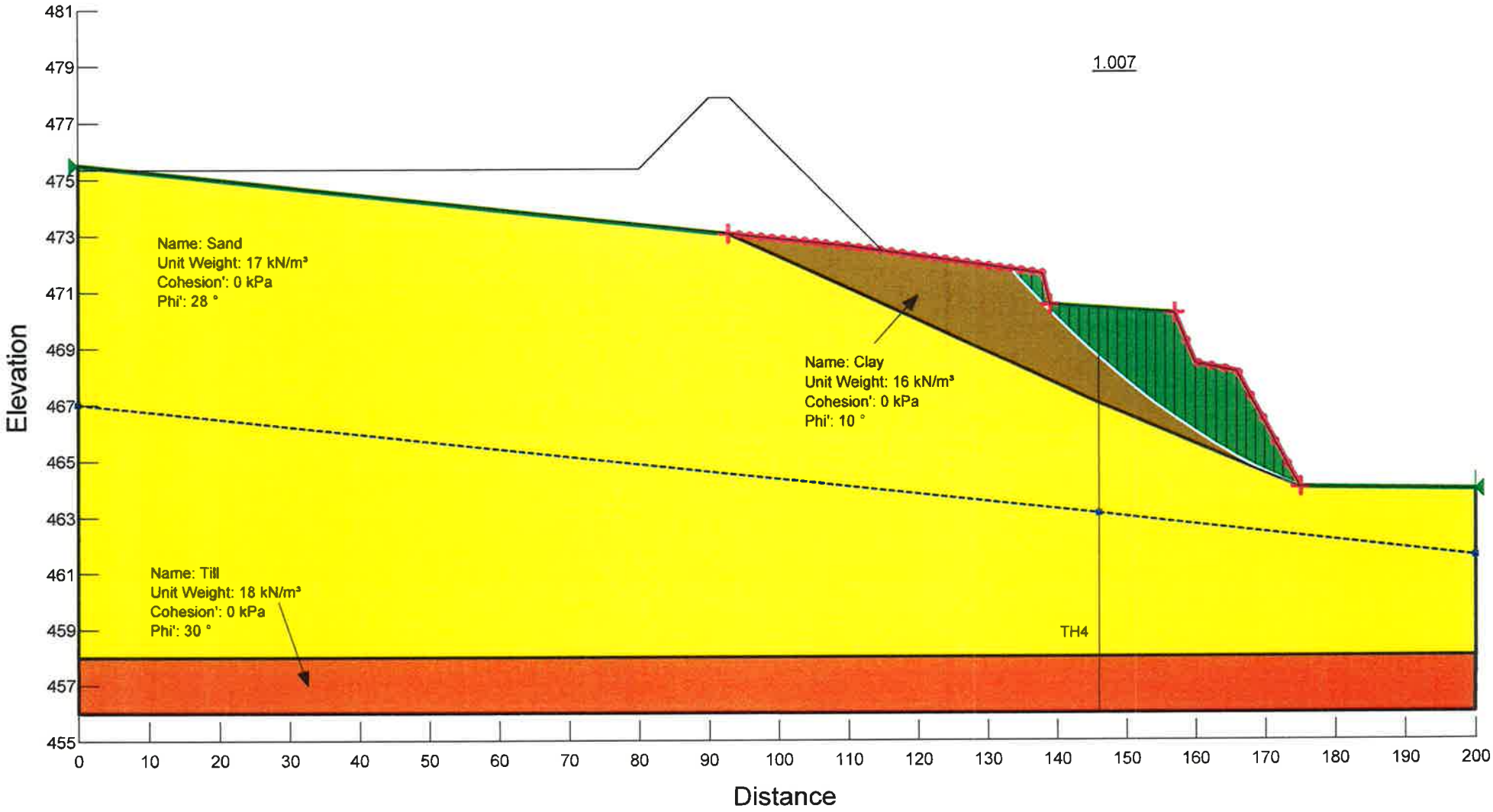


FIGURE 2

Rivers Lagoon - Slope Model

After Construction of Proposed Lagoon

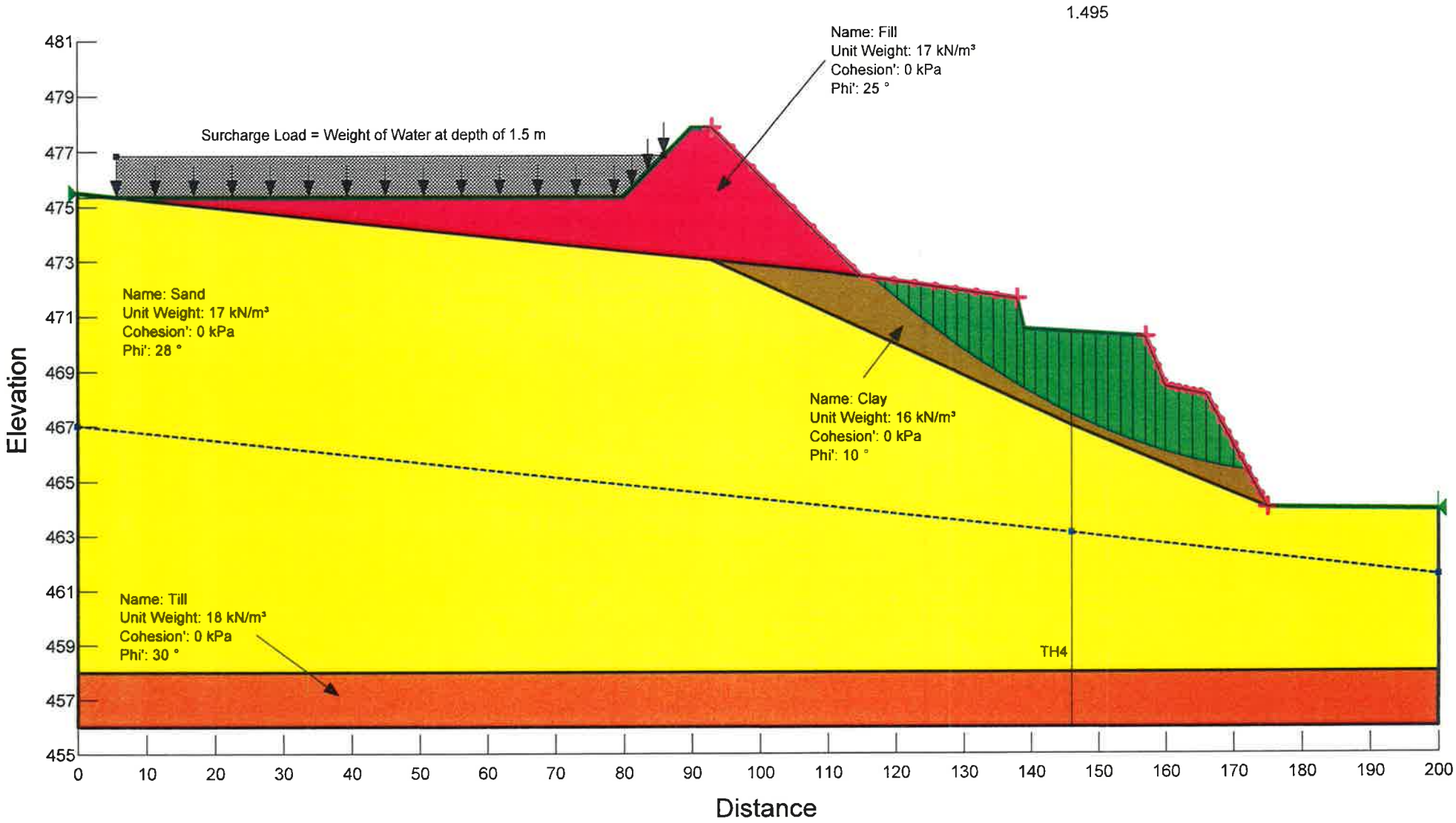


FIGURE 3

Rivers Lagoon - Slope Model

After Construction of Proposed Lagoon with Re-Graded Bank

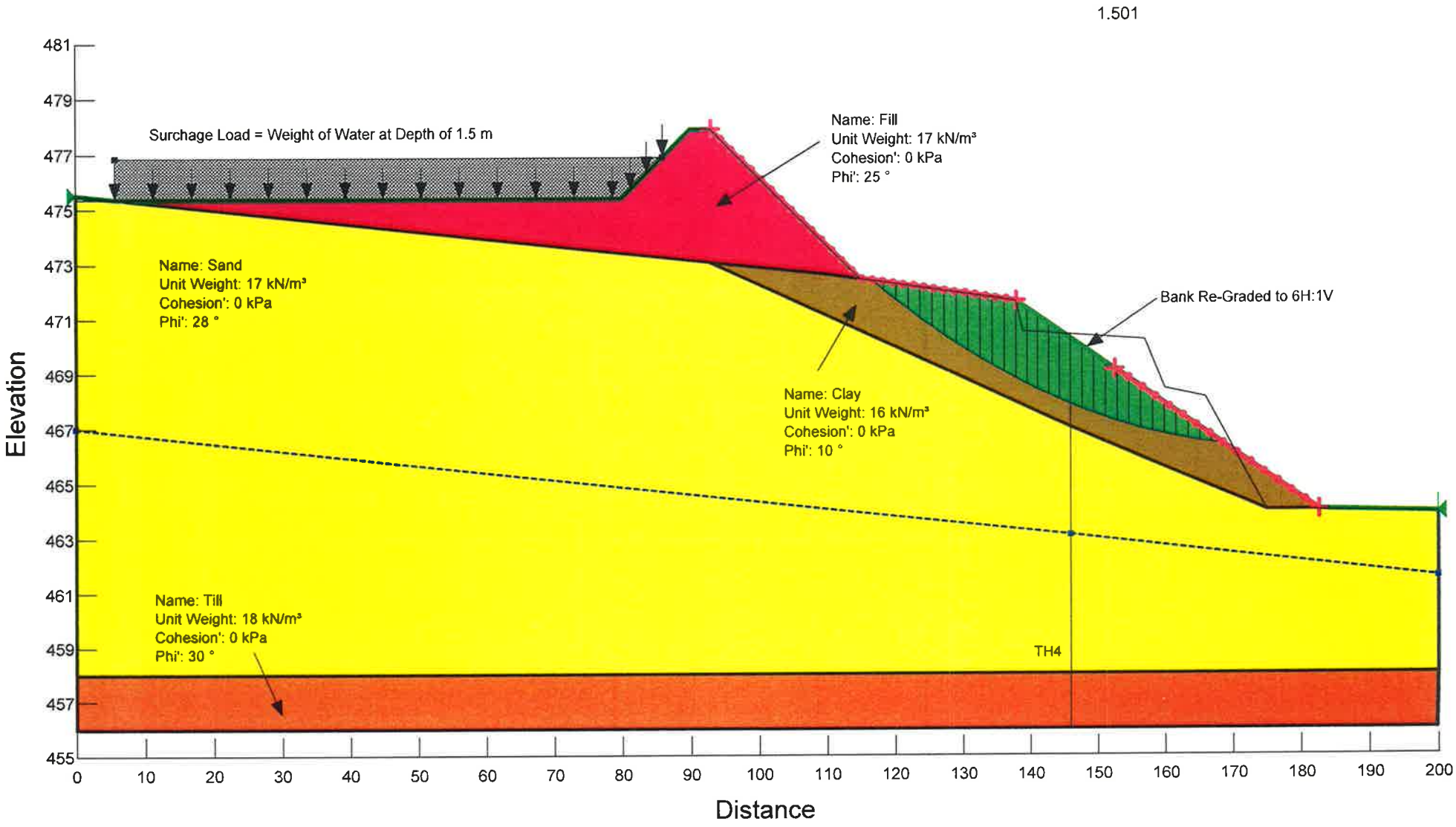


FIGURE 4

APPENDIX B

TESTHOLE LOGS

Project No: 141-20119-00

TH1

Project: TOWN OF RIVERS LAGOON STUDY & EAP

Client: MWSB

Enclosure:

Location: SE1/4 23-12-21W & SW1/4 24-12-21WPM

Engineer: SSU

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Headspace Concentration (30 / 1 / 60)	Well Data	Comment
0 / 0		Ground Surface	480					
0 – 2 / 0 – 1		***FILL*** 600mm thick; 50mm ROOTLETS over 550mm of SAND FILL, black, clayey	478			15		
2 – 15 / 1 – 4		***SAND*** loose, brown, fine grained, silty; medium dense at 2.1m, trace of fine and coarse gravel	464			10, 10, 10, 10, 10, 10		
15 / 5		End of Testhole						

Drill Method: S/S Auger

Drill Date: 05/25/15

Hole Size: 125mm

WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB.
R3T 6B8

Datum: 479.5M

Checked by: SSU

Sheet: 1 of 1

Project No: 141-20119-00

TH2

Project: TOWN OF RIVERS LAGOON STUDY & EAP

Client: MWSB

Enclosure:

Location: SE1/4 23-12-21W & SW1/4 24-12-21WPM

Engineer: SSU

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Headspace Concentration (30 / 1 / 60)	Well Data	Comment
0 / 0		Ground Surface	479					
0 – 1 / 0		***FILL*** 450mm thick; 50mm ROOTLETS over 400mm of SAND FILL, black	478			10		
1 – 10 / 0 – 3		***SAND*** loose, brown, fine grained, silty; medium dense at 2.1m, gravelly. A.R. AT 3M ON SUSPECTED BOULDER. TESTHOLE IS DRY AFTER COMPLETION OF DRILLING.				10 10 10 10		
10 / 3		End of Testhole	469			10		

Drill Method: S/S Auger

Drill Date: 05/25/15

Hole Size: 125mm

WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB.
R3T 6B8

Datum: 479.2M

Checked by: SSU

Sheet: 1 of 1

Project No: 141-20119-00

TH3

Project: TOWN OF RIVERS LAGOON STUDY & EAP

Client: MWSB

Enclosure:

Location: SE1/4 23-12-21W & SW1/4 24-12-21WPM

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Symbol	Description	Elev.
0 / 0		Ground Surface	476
0 / 0		***TOPSOIL*** 150mm thick; 50mm ROOTLETS over 100mm of SANDY LOAM, black	
1 / 0 – 2 / 1		***SAND*** loose, brown, fine to medium grained, gravelly; medium dense at 2.1m, gravelly. A.R. AT 2.7M ON SUSPECTED BOULDER. TESTHOLE IS DRY AFTER COMPLETION OF DRILLING.	
9 / 3		End of Testhole	467

SAMPLE

Number	Type	Headspace Concentration (30 / 1 / 60)	Well Data	Comment
		10		
		10		
		10		SPT= 60 BLOWS/FT.
		10		
		10		

Drill Method: S/S Auger

Drill Date: 05/25/15

Hole Size: 125mm

WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB.
R3T 6B8

Datum: 476.0M

Checked by: SSU

Sheet: 1 of 1

Project No: 141-20119-00

Client: MWSB

TH4

Project: TOWN OF RIVERS LAGOON STUDY & EAP

Location: SE1/4 23-12-21W & SW1/4 24-12-21WPM

WSP

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE / SAMPLE

Depth (m)	Symbol	Description	Depth/Elev.,m	PP(kPa)	SPT, N	Water Content %
0		Ground Surface	471			
0–4		***TOPSOIL*** 150mm thick; 150mm ROOTLETS with CLAYEY LOAM ***CLAY*** firm, grey-black, sandy	467	50; 75		
4–13		***SAND*** medium dense, fine to medium grained, tan-brown; gravelly to 4.6m; fine grained below 4.6m; WET at 7.9m, fine to medium grained, DENSE	458		60	
13–15		***CLAY TILL*** stiff, grey, trace of fine gravel. END OF TESTHOLE AT 15.2M DEPTH. WATER AND CAVING CONDITIONS WERE MEASURED AT 7.9M AFTER COMPLETION OF DRILLING.	456			
		End of Testhole				

PP(kPa) scale: 50, 150, 250, 350

Water Content % scale: Wp |------0------| Wl; 10, 30, 50, 70, 90

Depth scale: ft 0–60; m 0–18

Drill Method: S/S Auger

Drill Date: 05/25/15

Hole Size: 125mm

WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB.
R3T 6B8

Elevation: 471.1M

Checked by: SSU

Sheet: 1 of 1

Project No: 141-20119-00

Client: MWSB

TH5

Project: TOWN OF RIVERS LAGOON STUDY & EAP

Location: SE1/4 23-12-21W & SW1/4 24-12-21WPM

WSP

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Depth/Elev.,m	PP(kPa) (50, 150, 250, 350)	SPT, N	Water Content % (Wp |----0----| Wl; 10, 30, 50, 70, 90)
0 / 0		Ground Surface	453			
0–8 ft / 0–2.4 m		***FILL*** 2400mm thick; 50mm ROOTLETS over 2350mm of SANDY LOAM mixed with fine gravel, clayey, brown and black	451		26	
8–16 ft / 2.4–4.9 m		***CLAY*** stiff, tan-brown, trace of fine gravel, till-like structure; SAND SEAMS at 3.3m, WET, medium dense	448	100; 125		
16–25 ft / 4.9–7.6 m		***CLAY TILL*** stiff, grey, trace of fine gravel. END OF TESTHOLE AT 7.6M DEPTH. WATER AND CAVING CONDITIONS WERE MEASURED AT 3M AFTER COMPLETION OF DRILLING.	445	275; 350		
		End of Testhole				

Drill Method: S/S Auger	WSP Canada Inc.	Elevation: 453.0M
Drill Date: 05/25/15	1600 Buffalo Place	Checked by: SSU
Hole Size: 125mm	Winnipeg, MB. R3T 6B8	Sheet: 1 of 1

APPENDIX C

LABORATORY TEST RESULTS AND CHEMICAL ANALYSIS

H. MANALO CONSULTING LTD.

H. MANALO CONSULTING LTD.
1402 Notre Dame Avenue, Winnipeg, MB R3E 3G5
Phone: 204 697 3854 Cell: 204 997-1355
hmanalo@mts.net

PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

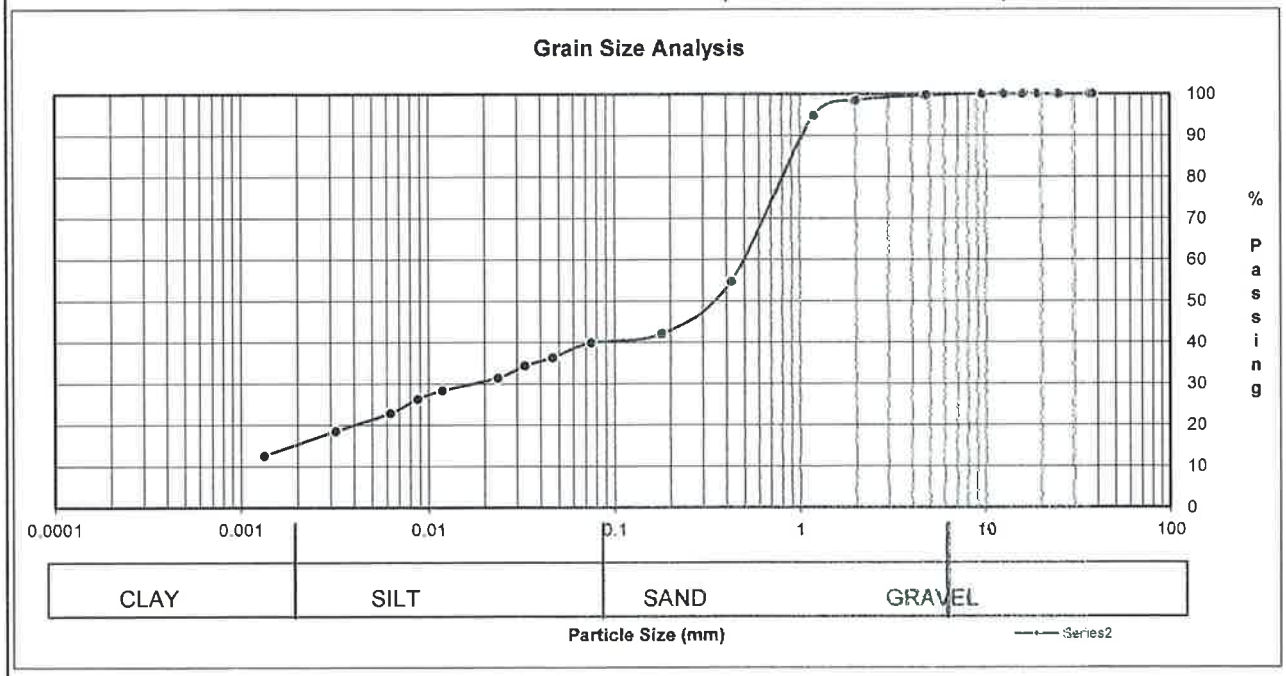
CLIENT: WSP Canada
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTN: Silvestre Urbano, P. Eng.
PROJECT: Rivers

PROJECT NO. 1502-10

Date Sampled:	unknown	Date Received:	05-Jun-15
Sampled By:	Client	Date Tested:	19-Jun-15

Material Identification
B.H./T.H. No. **TH1 @2.5'**
Sample No. **3**
Sample Source
Specific Gravity of Material: 2.65

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0464	36.3
9.50	100.0	0.0330	34.4
4.75	99.7	0.0236	31.4
2.00	98.4	0.0119	28.3
1.18	94.7	0.0087	26.3
0.425	54.7	0.0063	22.9
0.180	42.1	0.0032	18.5
0.075	39.9	0.0013	12.6



SOIL DESCRIPTION	% Composition			
	0	Gravel	D10	
	60	Sand	D30	0.01190
	27	Silt	D60	0.42500
	13	Clay	Cu	#DIV/0!
			Cc	#DIV/0!

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: GM

Reviewed by: Hermie Manalo

H. MANALO CONSULTING LTD.

H. MANALO CONSULTING LTD.
1402 Notre Dame Avenue, Winnipeg, MB R3E
Phone: 204 697-3854 Cell: 204 997-1355
hmanalo@mts.net

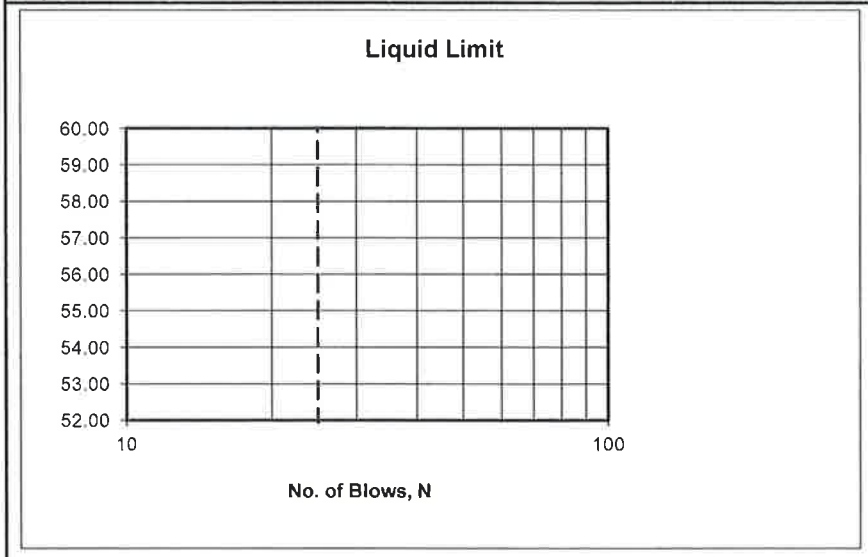
ATTERBERG LIMITS

CLIENT: WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Silvestre Urbano, P. Eng.
PROJECT: Rivers

PROJECT NO.: 1502-10

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit 25 Blows
Wet Soil + Dish:					
Dry Soil + Dish:					
Moisture:					
Dish:					
Dry Soil:					
% Moisture:					
No. of Blows:	**CAN NOT BE TESTED, NON-PLASTIC,**				
Liquid Limits:	**ALMOST ALL SAND AND SMALL STONES**				**0.00**



Material Identification:

T.H./B.H. No. **4**

Depth: **5 FT.**

Liquid Limit, %: **0.00**
Plastic Limit, %: **0.00**
Plasticity Index: **0.00**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	**CAN NOT BE ROLLED**				
Dry Soil + Dish:					
Moisture:					
Dish:					
Dry Soil:					
% Moisture:					
Average:	**NON PLASTIC (SANDY)**				**0.00**

Test Method : ASTM: D4318, D2216
HMCL Tech: GM
Date Tested: 19-Jun-15

Reviewed by: Hermie Manalo

WSP Canada Inc.
ATTN: SILVESTRE URBANO
1600 Buffalo Place
Winnipeg MB R3T 6B8

Date Received: 17-JUN-15
Report Date: 22-JUN-15 13:19 (MT)
Version: FINAL

Client Phone: 204-477-6650

Certificate of Analysis

Lab Work Order #: L1628038

Project P.O. #: NOT SUBMITTED
Job Reference: WWSP EXPANSION FOR TOWN OF RIVERS
C of C Numbers:
Legal Site Desc:

Chantal Bouchard

Chantal Bouchard
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1628038-1 TH1 -1' (0.3M)							
Sampled By: CLIENT on 25-MAY-15 @ 13:00							
Matrix: Soil							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	17-JUN-15	19-JUN-15	R3212084
Toluene	<0.050		0.050	mg/kg	17-JUN-15	19-JUN-15	R3212084
Ethyl benzene	<0.015		0.015	mg/kg	17-JUN-15	19-JUN-15	R3212084
o-Xylene	<0.050		0.050	mg/kg	17-JUN-15	19-JUN-15	R3212084
m+p-Xylenes	<0.050		0.050	mg/kg	17-JUN-15	19-JUN-15	R3212084
F1 (C6-C10)	<10		10	mg/kg	17-JUN-15	19-JUN-15	R3212084
Surrogate: 4-Bromofluorobenzene (SS)	97.1		70-130	%	17-JUN-15	19-JUN-15	R3212084
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	<25		25	mg/kg	17-JUN-15	18-JUN-15	R3210633
F3 (C16-C34)	<50		50	mg/kg	17-JUN-15	18-JUN-15	R3210633
F4 (C34-C50)	<50		50	mg/kg	17-JUN-15	18-JUN-15	R3210633
Surrogate: 2-Bromobenzotrifluoride	102.1		60-140	%	17-JUN-15	18-JUN-15	R3210633
Chrom. to baseline at nC50	YES				17-JUN-15	18-JUN-15	R3210633
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		22-JUN-15	
Total Hydrocarbons (C6-C50)	<76		76	mg/kg		22-JUN-15	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		22-JUN-15	
Miscellaneous Parameters							
Moisture	18.5		0.10	%		17-JUN-15	R3209957
Metals							
Aluminum (Al)	7830		5.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Antimony (Sb)	0.24		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Arsenic (As)	4.24		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Barium (Ba)	127		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Beryllium (Be)	0.36		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Bismuth (Bi)	0.088		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Boron (B)	<10		10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Cadmium (Cd)	0.275		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Calcium (Ca)	16000		100	mg/kg	19-JUN-15	19-JUN-15	R3211964
Chromium (Cr)	14.1		1.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Cobalt (Co)	5.40		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Copper (Cu)	7.7		1.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Iron (Fe)	12900		25	mg/kg	19-JUN-15	19-JUN-15	R3211964
Lead (Pb)	6.01		0.20	mg/kg	19-JUN-15	19-JUN-15	R3211964
Magnesium (Mg)	6530		10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Manganese (Mn)	861		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Molybdenum (Mo)	0.553		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Nickel (Ni)	13.6		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Phosphorus (P)	430		100	mg/kg	19-JUN-15	19-JUN-15	R3211964
Potassium (K)	1240		25	mg/kg	19-JUN-15	19-JUN-15	R3211964
Selenium (Se)	<0.50		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Silver (Ag)	<0.10		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Sodium (Na)	69		10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Strontium (Sr)	19.3		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Thallium (Tl)	0.15		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Tin (Sn)	<5.0		5.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Titanium (Ti)	81.8		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Uranium (U)	0.396		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Vanadium (V)	31.1		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Zinc (Zn)	51		10	mg/kg	19-JUN-15	19-JUN-15	R3211964

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1628038-1 TH1 -1' (0.3M) Sampled By: CLIENT on 25-MAY-15 @ 13:00 Matrix: Soil							
L1628038-2 TH3 -5' (1.5M) Sampled By: CLIENT on 25-MAY-15 @ 13:00 Matrix: Soil							
BTEX and F1-F4 by Tumbler Method							
BTX plus F1 by GCMS							
Benzene	<0.0050		0.0050	mg/kg	17-JUN-15	19-JUN-15	R3212084
Toluene	<0.050		0.050	mg/kg	17-JUN-15	19-JUN-15	R3212084
Ethyl benzene	<0.015		0.015	mg/kg	17-JUN-15	19-JUN-15	R3212084
o-Xylene	<0.050		0.050	mg/kg	17-JUN-15	19-JUN-15	R3212084
m+p-Xylenes	<0.050		0.050	mg/kg	17-JUN-15	19-JUN-15	R3212084
F1 (C6-C10)	<10		10	mg/kg	17-JUN-15	19-JUN-15	R3212084
Surrogate: 4-Bromofluorobenzene (SS)	95.2		70-130	%	17-JUN-15	19-JUN-15	R3212084
CCME Total Extractable Hydrocarbons							
F2 (C10-C16)	38		25	mg/kg	17-JUN-15	18-JUN-15	R3210633
F3 (C16-C34)	130		50	mg/kg	17-JUN-15	18-JUN-15	R3210633
F4 (C34-C50)	<50		50	mg/kg	17-JUN-15	18-JUN-15	R3210633
Surrogate: 2-Bromobenzotrifluoride	102.8		60-140	%	17-JUN-15	18-JUN-15	R3210633
Chrom. to baseline at nC50	YES				17-JUN-15	18-JUN-15	R3210633
CCME Total Hydrocarbons							
F1-BTEX	<10		10	mg/kg		22-JUN-15	
Total Hydrocarbons (C6-C50)	168		76	mg/kg		22-JUN-15	
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.071		0.071	mg/kg		22-JUN-15	
Miscellaneous Parameters							
Moisture	5.64		0.10	%		17-JUN-15	R3209957
Metals							
Aluminum (Al)	6120		5.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Antimony (Sb)	0.40		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Arsenic (As)	8.67		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Barium (Ba)	150		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Beryllium (Be)	0.23		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Bismuth (Bi)	1.80		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Boron (B)	<10		10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Cadmium (Cd)	0.175		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Calcium (Ca)	57400		100	mg/kg	19-JUN-15	19-JUN-15	R3211964
Chromium (Cr)	32.7		1.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Cobalt (Co)	6.88		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Copper (Cu)	18.7		1.0	mg/kg	19-JUN-15	19-JUN-15	R3211964
Iron (Fe)	23700		25	mg/kg	19-JUN-15	19-JUN-15	R3211964
Lead (Pb)	38.3		0.20	mg/kg	19-JUN-15	19-JUN-15	R3211964
Magnesium (Mg)	23100		10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Manganese (Mn)	1920	DLA	50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Molybdenum (Mo)	3.23		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Nickel (Ni)	22.1		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Phosphorus (P)	490		100	mg/kg	19-JUN-15	19-JUN-15	R3211964
Potassium (K)	1380		25	mg/kg	19-JUN-15	19-JUN-15	R3211964
Selenium (Se)	<0.50		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Silver (Ag)	0.11		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Sodium (Na)	127		10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Strontium (Sr)	37.8		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Thallium (Tl)	0.21		0.10	mg/kg	19-JUN-15	19-JUN-15	R3211964
Tin (Sn)	<5.0		5.0	mg/kg	19-JUN-15	19-JUN-15	R3211964

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1628038-2 TH3 -5' (1.5M)							
Sampled By: CLIENT on 25-MAY-15 @ 13:00							
Matrix: Soil							
Metals							
Titanium (Ti)	496		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Uranium (U)	0.916		0.020	mg/kg	19-JUN-15	19-JUN-15	R3211964
Vanadium (V)	29.4		0.50	mg/kg	19-JUN-15	19-JUN-15	R3211964
Zinc (Zn)	39		10	mg/kg	19-JUN-15	19-JUN-15	R3211964

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

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BTEXS+F1-HSMS-WP	Soil	BTX plus F1 by GCMS	EPA 8260C

The soil methanol extract is added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

F1-F4-CALC-WP	Soil	CCME Total Hydrocarbons	CCME CWS-PHC DEC-2000 - PUB# 1310-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F2-F4-TMB-FID-WP	Soil	CCME Total Extractable Hydrocarbons	CCME CWS-PHC Dec-2000 - Pub# 1310

A soil or sediment sample is extracted with 1:1 hexane/acetone in a tumbler, followed by a silica gel clean up to facilitate separation of the hydrocarbons from other polar extractions. An aliquot of the solvent is analyzed using a gas chromatograph equipped with a flame -ionization detector.

MET-200.2-MS-WP	Soil	Metals	EPA 200.2/6020A

Samples for analysis are homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested by block digester (EPA 200.2). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MOISTURE-WP	Soil	% Moisture	CCME CWS-PHC Dec 2000 Pub# 1310

Moisture content in solid matrices is determined gravimetrically after drying to constant weight at 105 C.

XYLENES-SUM-CALC-WP	Soil	Sum of Xylene Isomer Concentrations	CALCULATED RESULT

Total xylenes represents the sum of o-xylene and m&p-xylene.

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

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

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

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

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

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

Quality Control Report

Workorder: L1628038 Report Date: 22-JUN-15

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTEXS+F1-HSMS-WP	Soil							
Batch R3212084								
WG2110257-4 DUP		**L1626925-2**						
Benzene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	19-JUN-15
Toluene		<0.050	<0.050	RPD-NA	mg/kg	N/A	50	19-JUN-15
Ethyl benzene		<0.015	<0.015	RPD-NA	mg/kg	N/A	50	19-JUN-15
o-Xylene		0.982	0.919		mg/kg	6.6	50	19-JUN-15
m+p-Xylenes		<0.050	<0.050	RPD-NA	mg/kg	N/A	50	19-JUN-15
F1 (C6-C10)		34	30		mg/kg	12	50	19-JUN-15
WG2110257-2 LCS								
Benzene			86.5		%		70-130	19-JUN-15
Toluene			89.2		%		70-130	19-JUN-15
Ethyl benzene			98.4		%		70-130	19-JUN-15
o-Xylene			102.7		%		70-130	19-JUN-15
m+p-Xylenes			95.1		%		70-130	19-JUN-15
WG2110257-3 LCS								
F1 (C6-C10)			89.8		%		70-130	19-JUN-15
WG2110257-1 MB								
Benzene			<0.0050		mg/kg		0.005	19-JUN-15
Toluene			<0.050		mg/kg		0.05	19-JUN-15
Ethyl benzene			<0.015		mg/kg		0.015	19-JUN-15
o-Xylene			<0.050		mg/kg		0.05	19-JUN-15
m+p-Xylenes			<0.050		mg/kg		0.05	19-JUN-15
F1 (C6-C10)			<10		mg/kg		10	19-JUN-15
Surrogate: 4-Bromofluorobenzene (SS)			85.8		%		70-130	19-JUN-15
F2-F4-TMB-FID-WP	Soil							
Batch R3210633								
WG2110651-3 DUP		**L1628038-1**						
F2 (C10-C16)		<25	<25	RPD-NA	mg/kg	N/A	40	18-JUN-15
F3 (C16-C34)		<50	<50	RPD-NA	mg/kg	N/A	40	18-JUN-15
F4 (C34-C50)		<50	<50	RPD-NA	mg/kg	N/A	40	18-JUN-15
WG2110651-4 IRM		**ALS PHC2 IRM**						
F2 (C10-C16)			106.1		%		70-130	18-JUN-15
F3 (C16-C34)			119.2		%		70-130	18-JUN-15
F4 (C34-C50)			116.7		%		70-130	18-JUN-15
WG2110651-2 LCS								
F2 (C10-C16)			114.2		%		70-130	18-JUN-15

ALS Environmental

Quality Control Report

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-TMB-FID-WP	Soil							
Batch R3210633								
WG2110651-2 LCS								
F3 (C16-C34)			109.4		%		70-130	18-JUN-15
F4 (C34-C50)			100.8		%		70-130	18-JUN-15
WG2110651-1 MB								
F2 (C10-C16)			<25		mg/kg		25	18-JUN-15
F3 (C16-C34)			<50		mg/kg		50	18-JUN-15
F4 (C34-C50)			<50		mg/kg		50	18-JUN-15
Surrogate: 2-Bromobenzotrifluoride			100.2		%		60-140	18-JUN-15
MET-200.2-MS-WP	Soil							
Batch R3211964								
WG2112155-3 CRM		**CANMET TILL-1**						
Aluminum (Al)			98.6		%		70-130	19-JUN-15
Antimony (Sb)			100.3		%		70-130	19-JUN-15
Arsenic (As)			108.1		%		70-130	19-JUN-15
Barium (Ba)			103.3		%		70-130	19-JUN-15
Beryllium (Be)			99.6		%		70-130	19-JUN-15
Bismuth (Bi)			104.5		%		70-130	19-JUN-15
Cadmium (Cd)			103.5		%		70-130	19-JUN-15
Calcium (Ca)			107.4		%		70-130	19-JUN-15
Chromium (Cr)			102.8		%		70-130	19-JUN-15
Cobalt (Co)			102.0		%		70-130	19-JUN-15
Copper (Cu)			99.1		%		70-130	19-JUN-15
Iron (Fe)			98.9		%		70-130	19-JUN-15
Lead (Pb)			92.7		%		70-130	19-JUN-15
Magnesium (Mg)			104.7		%		70-130	19-JUN-15
Manganese (Mn)			105.6		%		70-130	19-JUN-15
Molybdenum (Mo)			98.4		%		70-130	19-JUN-15
Nickel (Ni)			102.8		%		70-130	19-JUN-15
Phosphorus (P)			104.5		%		70-130	19-JUN-15
Potassium (K)			99.6		%		70-130	19-JUN-15
Selenium (Se)			107.9		%		70-130	19-JUN-15
Silver (Ag)			117.7		%		70-130	19-JUN-15
Sodium (Na)			104.4		%		70-130	19-JUN-15
Strontium (Sr)			104.9		%		70-130	19-JUN-15
Thallium (Tl)			0.12		mg/kg		0.03-0.23	19-JUN-15

Quality Control Report

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
Batch R3211964								
WG2112155-3 CRM		**CANMET TILL-1**						
Tin (Sn)			88.3		%		70-130	19-JUN-15
Titanium (Ti)			92.7		%		70-130	19-JUN-15
Uranium (U)			107.3		%		70-130	19-JUN-15
Vanadium (V)			105.6		%		70-130	19-JUN-15
Zinc (Zn)			99.1		%		70-130	19-JUN-15
WG2112155-4 CRM		**PACS-3**						
Aluminum (Al)			101.2		%		70-130	19-JUN-15
Antimony (Sb)			97.5		%		70-130	19-JUN-15
Arsenic (As)			99.0		%		70-130	19-JUN-15
Barium (Ba)			79.4		%		70-130	19-JUN-15
Beryllium (Be)			95.5		%		70-130	19-JUN-15
Boron (B)			93.0		%		70-130	19-JUN-15
Cadmium (Cd)			97.1		%		70-130	19-JUN-15
Calcium (Ca)			98.2		%		70-130	19-JUN-15
Chromium (Cr)			99.8		%		70-130	19-JUN-15
Cobalt (Co)			101.3		%		70-130	19-JUN-15
Copper (Cu)			100.5		%		70-130	19-JUN-15
Iron (Fe)			96.1		%		70-130	19-JUN-15
Lead (Pb)			90.0		%		70-130	19-JUN-15
Magnesium (Mg)			111.2		%		70-130	19-JUN-15
Manganese (Mn)			97.2		%		70-130	19-JUN-15
Molybdenum (Mo)			96.6		%		70-130	19-JUN-15
Nickel (Ni)			100.8		%		70-130	19-JUN-15
Phosphorus (P)			103.9		%		70-130	19-JUN-15
Potassium (K)			101.6		%		70-130	19-JUN-15
Selenium (Se)			0.94		mg/kg		0.51-1.51	19-JUN-15
Silver (Ag)			101.0		%		70-130	19-JUN-15
Sodium (Na)			103.8		%		70-130	19-JUN-15
Strontium (Sr)			83.9		%		70-130	19-JUN-15
Thallium (Tl)			0.37		mg/kg		0.23-0.43	19-JUN-15
Tin (Sn)			91.3		%		70-130	19-JUN-15
Titanium (Ti)			90.5		%		70-130	19-JUN-15
Uranium (U)			98.1		%		70-130	19-JUN-15
Vanadium (V)			103.1		%		70-130	19-JUN-15

Quality Control Report

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
Batch R3211964								
WG2112155-4 CRM		**PACS-3**						
Zinc (Zn)			97.5		%		70-130	19-JUN-15
WG2112155-5 CRM		**OGGEO08**						
Aluminum (Al)			97.8		%		70-130	19-JUN-15
Antimony (Sb)			97.3		%		70-130	19-JUN-15
Arsenic (As)			103.8		%		70-130	19-JUN-15
Barium (Ba)			82.9		%		70-130	19-JUN-15
Beryllium (Be)			97.2		%		70-130	19-JUN-15
Bismuth (Bi)			101.0		%		70-130	19-JUN-15
Cadmium (Cd)			89.0		%		70-130	19-JUN-15
Calcium (Ca)			90.4		%		70-130	19-JUN-15
Chromium (Cr)			92.9		%		70-130	19-JUN-15
Cobalt (Co)			90.2		%		70-130	19-JUN-15
Copper (Cu)			89.5		%		70-130	19-JUN-15
Iron (Fe)			96.1		%		70-130	19-JUN-15
Lead (Pb)			87.9		%		70-130	19-JUN-15
Magnesium (Mg)			96.2		%		70-130	19-JUN-15
Manganese (Mn)			93.7		%		70-130	19-JUN-15
Molybdenum (Mo)			98.6		%		70-130	19-JUN-15
Nickel (Ni)			94.9		%		70-130	19-JUN-15
Phosphorus (P)			87.8		%		70-130	19-JUN-15
Potassium (K)			102.5		%		70-130	19-JUN-15
Selenium (Se)			92.2		%		70-130	19-JUN-15
Silver (Ag)			93.9		%		70-130	19-JUN-15
Sodium (Na)			102.3		%		70-130	19-JUN-15
Strontium (Sr)			96.6		%		70-130	19-JUN-15
Thallium (Tl)			98.4		%		70-130	19-JUN-15
Tin (Sn)			88.5		%		70-130	19-JUN-15
Titanium (Ti)			91.7		%		70-130	19-JUN-15
Uranium (U)			93.9		%		70-130	19-JUN-15
Vanadium (V)			94.3		%		70-130	19-JUN-15
Zinc (Zn)			94.3		%		70-130	19-JUN-15
WG2112155-7 DUP		**WG2112155-6**						
Aluminum (Al)		7830	9070		mg/kg	15	40	19-JUN-15
Antimony (Sb)		0.24	0.22		mg/kg	5.9	30	19-JUN-15

Quality Control Report

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
Batch R3211964								
WG2112155-7 DUP		**WG2112155-6**						
Arsenic (As)		4.24	4.54		mg/kg	6.9	30	19-JUN-15
Barium (Ba)		127	139		mg/kg	9.0	40	19-JUN-15
Beryllium (Be)		0.36	0.43		mg/kg	19	30	19-JUN-15
Bismuth (Bi)		0.088	0.099		mg/kg	12	30	19-JUN-15
Boron (B)		<10	<10	RPD-NA	mg/kg	N/A	30	19-JUN-15
Cadmium (Cd)		0.275	0.309		mg/kg	12	30	19-JUN-15
Calcium (Ca)		16000	15200		mg/kg	5.3	30	19-JUN-15
Chromium (Cr)		14.1	15.3		mg/kg	7.8	30	19-JUN-15
Cobalt (Co)		5.40	5.83		mg/kg	7.7	30	19-JUN-15
Copper (Cu)		7.7	9.0		mg/kg	15	30	19-JUN-15
Iron (Fe)		12900	14500		mg/kg	11	30	19-JUN-15
Lead (Pb)		6.01	6.65		mg/kg	10	40	19-JUN-15
Magnesium (Mg)		6530	6160		mg/kg	5.7	30	19-JUN-15
Manganese (Mn)		861	975		mg/kg	12	30	19-JUN-15
Molybdenum (Mo)		0.553	0.582		mg/kg	5.2	40	19-JUN-15
Nickel (Ni)		13.6	14.9		mg/kg	9.5	30	19-JUN-15
Phosphorus (P)		430	470		mg/kg	8.6	30	19-JUN-15
Potassium (K)		1240	1490		mg/kg	18	40	19-JUN-15
Selenium (Se)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	19-JUN-15
Silver (Ag)		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	19-JUN-15
Sodium (Na)		69	66		mg/kg	3.7	40	19-JUN-15
Strontium (Sr)		19.3	20.6		mg/kg	6.2	40	19-JUN-15
Thallium (Tl)		0.15	0.17		mg/kg	12	30	19-JUN-15
Tin (Sn)		<5.0	<5.0	RPD-NA	mg/kg	N/A	40	19-JUN-15
Titanium (Ti)		83.5	91.5		mg/kg	9.1	40	19-JUN-15
Uranium (U)		0.396	0.444		mg/kg	11	30	19-JUN-15
Vanadium (V)		31.1	36.0		mg/kg	15	30	19-JUN-15
Zinc (Zn)		51	58		mg/kg	13	30	19-JUN-15
WG2112155-2 LCS								
Aluminum (Al)			98.2		%		80-120	19-JUN-15
Antimony (Sb)			99.4		%		80-120	19-JUN-15
Arsenic (As)			100.7		%		80-120	19-JUN-15
Barium (Ba)			101.2		%		80-120	19-JUN-15

Quality Control Report

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
Batch R3211964								
WG2112155-2 LCS								
Beryllium (Be)			98.5		%		80-120	19-JUN-15
Bismuth (Bi)			98.2		%		80-120	19-JUN-15
Boron (B)			107.2		%		80-120	19-JUN-15
Cadmium (Cd)			99.8		%		80-120	19-JUN-15
Calcium (Ca)			102.2		%		80-120	19-JUN-15
Chromium (Cr)			98.5		%		80-120	19-JUN-15
Cobalt (Co)			99.8		%		80-120	19-JUN-15
Copper (Cu)			97.5		%		80-120	19-JUN-15
Iron (Fe)			94.8		%		80-120	19-JUN-15
Lead (Pb)			99.4		%		80-120	19-JUN-15
Magnesium (Mg)			105.9		%		80-120	19-JUN-15
Manganese (Mn)			100.5		%		80-120	19-JUN-15
Molybdenum (Mo)			100.2		%		80-120	19-JUN-15
Nickel (Ni)			101.0		%		80-120	19-JUN-15
Phosphorus (P)			95.8		%		80-120	19-JUN-15
Potassium (K)			100.3		%		80-120	19-JUN-15
Selenium (Se)			103.1		%		80-120	19-JUN-15
Silver (Ag)			98.1		%		80-120	19-JUN-15
Sodium (Na)			101.5		%		80-120	19-JUN-15
Strontium (Sr)			102.0		%		80-120	19-JUN-15
Thallium (Tl)			97.4		%		80-120	19-JUN-15
Tin (Sn)			97.0		%		80-120	19-JUN-15
Titanium (Ti)			97.5		%		80-120	19-JUN-15
Uranium (U)			101.4		%		80-120	19-JUN-15
Vanadium (V)			100.3		%		80-120	19-JUN-15
Zinc (Zn)			93.7		%		80-120	19-JUN-15
WG2112155-1 MB								
Aluminum (Al)			<5.0		mg/kg		5	19-JUN-15
Antimony (Sb)			<0.10		mg/kg		0.1	19-JUN-15
Arsenic (As)			<0.10		mg/kg		0.1	19-JUN-15
Barium (Ba)			<0.50		mg/kg		0.5	19-JUN-15
Beryllium (Be)			<0.10		mg/kg		0.1	19-JUN-15
Bismuth (Bi)			<0.020		mg/kg		0.02	19-JUN-15
Boron (B)			<10		mg/kg		10	19-JUN-15

Quality Control Report

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
Batch R3211964								
WG2112155-1 MB								
Cadmium (Cd)			<0.020		mg/kg		0.02	19-JUN-15
Calcium (Ca)			<100		mg/kg		100	19-JUN-15
Chromium (Cr)			<1.0		mg/kg		1	19-JUN-15
Cobalt (Co)			<0.020		mg/kg		0.02	19-JUN-15
Copper (Cu)			<1.0		mg/kg		1	19-JUN-15
Iron (Fe)			<25		mg/kg		25	19-JUN-15
Lead (Pb)			<0.20		mg/kg		0.2	19-JUN-15
Magnesium (Mg)			<10		mg/kg		10	19-JUN-15
Manganese (Mn)			<0.50		mg/kg		0.5	19-JUN-15
Molybdenum (Mo)			<0.020		mg/kg		0.02	19-JUN-15
Nickel (Ni)			<0.50		mg/kg		0.5	19-JUN-15
Phosphorus (P)			<100		mg/kg		100	19-JUN-15
Potassium (K)			<25		mg/kg		25	19-JUN-15
Selenium (Se)			<0.50		mg/kg		0.5	19-JUN-15
Silver (Ag)			<0.10		mg/kg		0.1	19-JUN-15
Sodium (Na)			<10		mg/kg		10	19-JUN-15
Strontium (Sr)			<0.10		mg/kg		0.1	19-JUN-15
Thallium (Tl)			<0.10		mg/kg		0.1	19-JUN-15
Tin (Sn)			<5.0		mg/kg		5	19-JUN-15
Titanium (Ti)			<0.50		mg/kg		0.5	19-JUN-15
Uranium (U)			<0.020		mg/kg		0.02	19-JUN-15
Vanadium (V)			<0.50		mg/kg		0.5	19-JUN-15
Zinc (Zn)			<10		mg/kg		10	19-JUN-15
MOISTURE-WP	Soil							
Batch R3209957								
WG2110260-1 DUP		**L1625169-1**						
Moisture		20.2	20.5		%	1.5	20	17-JUN-15

Quality Control Report

Workorder: L1628038 Report Date: 22-JUN-15

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1628038 Report Date: 22-JUN-15

Client: WSP Canada Inc.
1600 Buffalo Place
Winnipeg MB R3T 6B8
Contact: SILVESTRE URBANO

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
% Moisture							
	1	25-MAY-15 13:00	17-JUN-15 12:00	14	23	days	EHTR
	2	25-MAY-15 13:00	17-JUN-15 12:00	14	23	days	EHTR
Volatile Organic Compounds							
BTX plus F1 by GCMS							
	1	25-MAY-15 13:00	17-JUN-15 12:00	7	23	days	EHTR
	2	25-MAY-15 13:00	17-JUN-15 12:00	7	23	days	EHTR
Hydrocarbons							
CCME Total Extractable Hydrocarbons							
	1	25-MAY-15 13:00	17-JUN-15 12:00	14	23	days	EHTR
	2	25-MAY-15 13:00	17-JUN-15 12:00	14	23	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1628038 were received on 17-JUN-15 08:40.

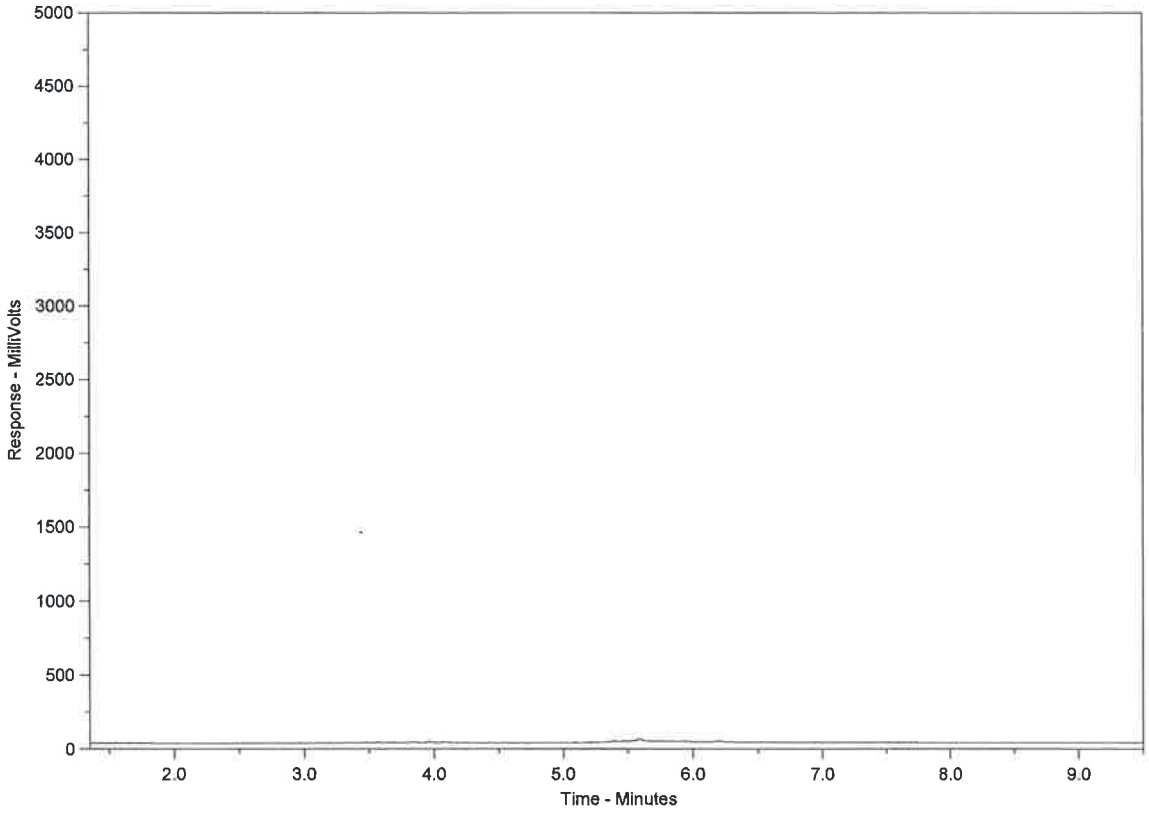
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

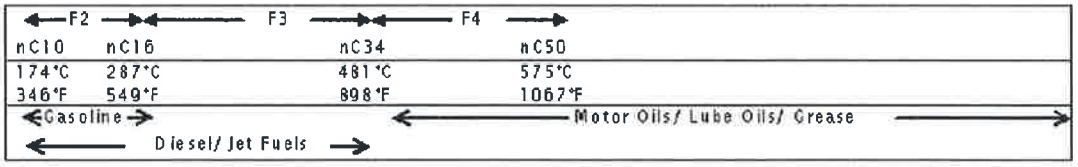
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1628038-1
Client Sample ID: TH1 -1' (0.3M)





The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

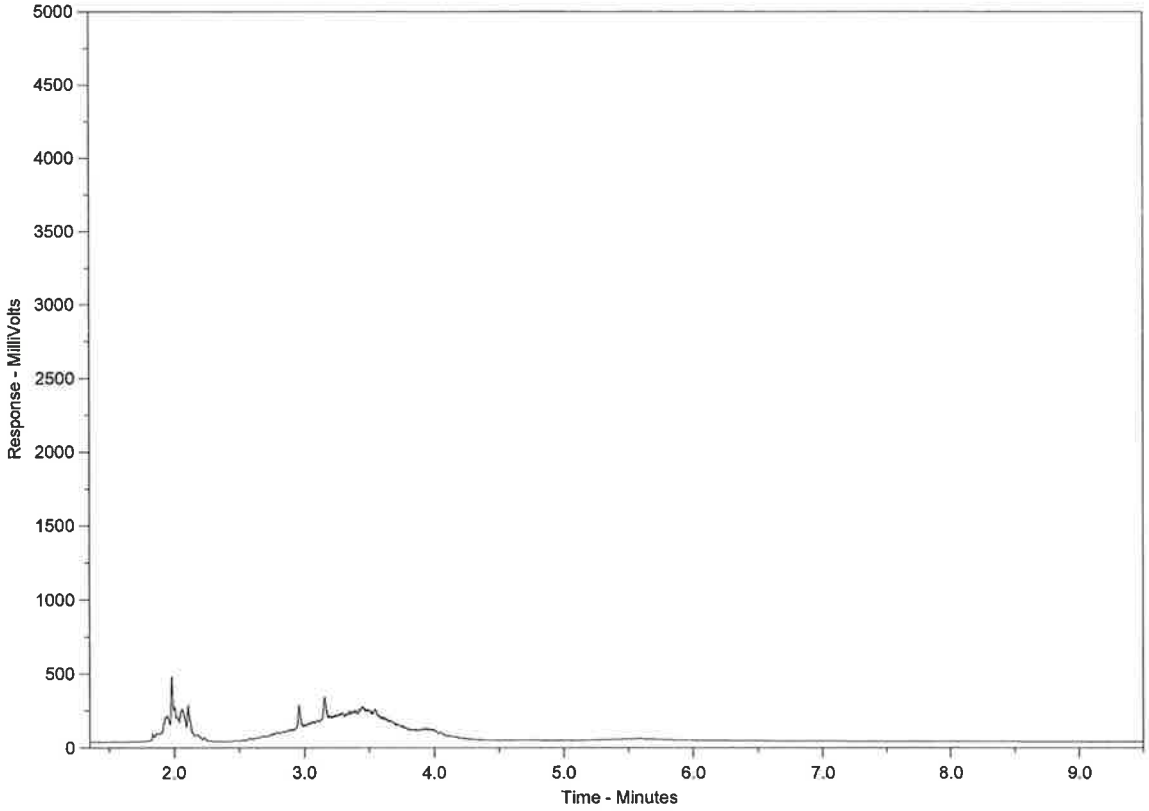
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

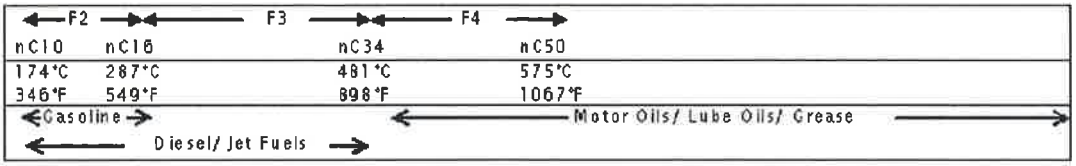
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1628038-2
Client Sample ID: TH3 -5' (1.5M)





The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1628038-COFC

COC Number: 14 - 453634

Page ___ of ___

L1628038

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	WSP CANADA INC.	Select Report Format:	☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	SILVESTRE URBANO	Quality Control (QC) Report with Report	☐ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:		☐ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 business days if received by 3pm)
		Select Distribution:	☐ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Phone:	2024 - 981 - 3473	Email 1 or Fax	SILVESTRE.URBANO@WSPGROUP.COM	Specify Date Required for E2,E or P:
		Email 2		

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No		
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	WWSP EXPANSION FOR TOWN OF RIVERS	Approver ID:	Cost Center:
Job #:		GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

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

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F1-F4, TMT	METALS	Number of Containers
	TH1 - 1' (0.3M)	MAY 25, 2015	1 PM	SOIL	✓	✓	
	TH3 - 5' (1.5M)	MAY 25, 2015	1 PM	SOIL	✓	✓	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☐ No	22°
Are samples for human drinking water use? ☐ Yes ☐ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐		SIF Observations	Yes	☐	No	☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes	☐	No	☐
Cooling Initiated	☐						

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
SILVESTRE URBANO	JUNE 17, 2015	8:40 AM	EE	6-17-15	8:40			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS 14-453634 WB Front09 October 2013

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

APPENDIX D

GRANULAR SPECIFICATION

900. 3.2 - Aggregate Requirements (Cont'd)

The Los Angeles Abrasion Loss on granular base course aggregate will be based on the total sample submitted.

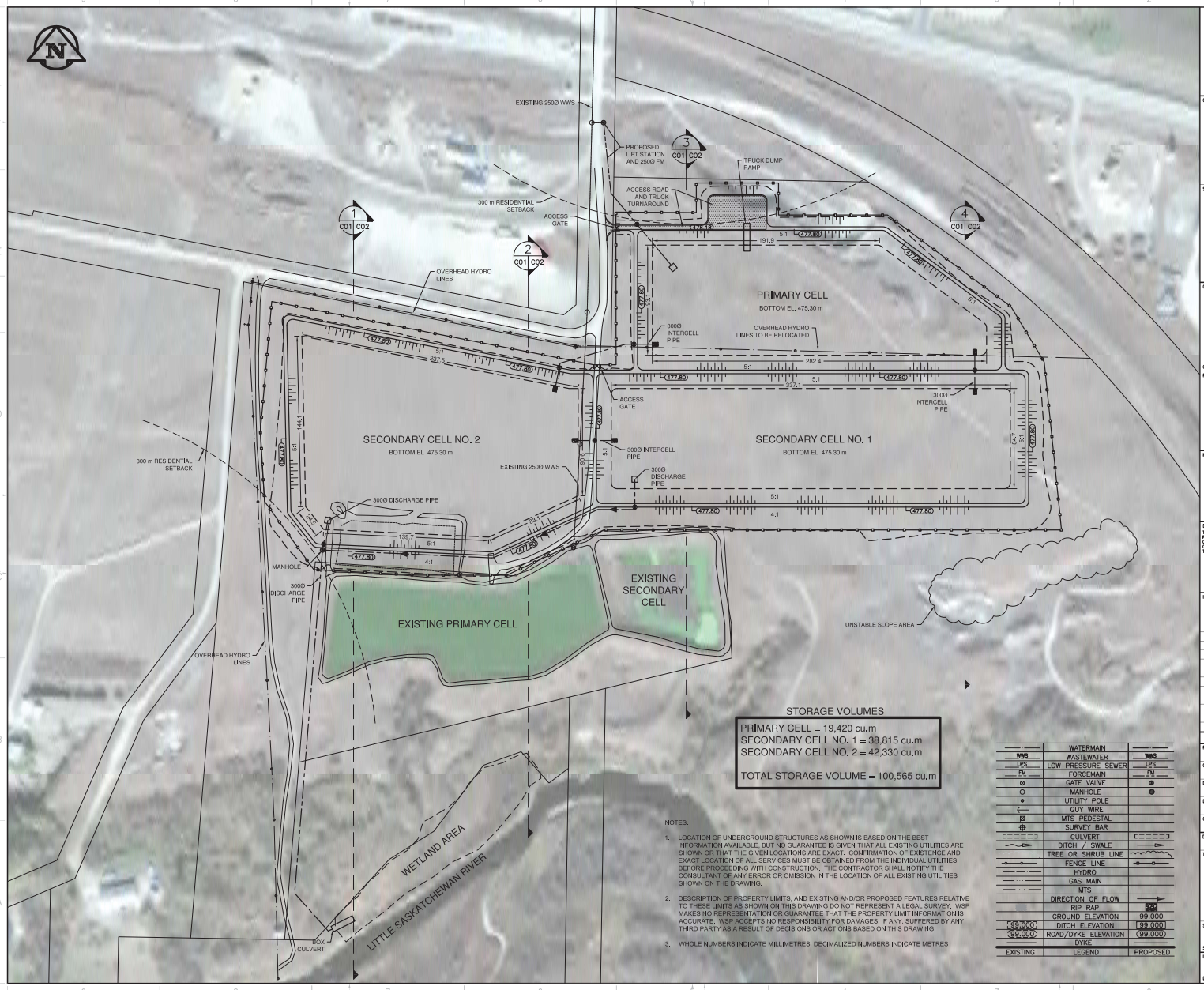
Shale Content is the percent by weight of the particles retained on a 4.75 sieve that are shale particles.

Clay balls are the percent by weight of particles retained on a 12.5 mm sieve that are clay particles.

The aggregate shall be well graded and shall not vary from maximum to minimum of the specification ranges for consecutive tests.

The requirements for each Class will be as follows:

GRANULAR BASE COURSE					
Passing Standard Sieves	CLASS "A"		CLASS "B"	CLASS "C"	
	Gravel	Limestone	Gravel or Limestone	Gravel	Limestone
37.5 mm sieve				100%	
25 mm sieve				85 - 100%	100%
19 mm sieve	100%	100%	100%		
16 mm sieve	80 - 100%				
4.75 mm sieve	40 - 70%	35 - 70%	30 - 75%	25 - 80%	25 - 80%
2 mm sieve	25 - 55%		25 - 65%		
425 um sieve	15 - 30%	15 - 30%	15 - 35%	15 - 40%	
75 um sieve	8 - 15%	8 - 17%	8 - 18%	8 - 18%	8 - 20%
Minimum Crush Count	35%	100%	25%	15%	100%
Maximum					
a) Los Angeles Abrasion Loss	35%	35%	35%	40%	40%
b) Shale Content	12%		12%	20%	
c) Clay Balls	10%		10%		



STORAGE VOLUMES

PRIMARY CELL = 19,420 cu.m
SECONDARY CELL NO. 1 = 38,815 cu.m
SECONDARY CELL NO. 2 = 42,330 cu.m

TOTAL STORAGE VOLUME = 100,565 cu.m

NOTES:

1. LOCATION OF UNDERGROUND STRUCTURES AS SHOWN IS BASED ON THE BEST INFORMATION AVAILABLE, BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE CONSULTANT OF ANY ERROR OR OMISSION IN THE LOCATION OF ALL EXISTING UTILITIES SHOWN ON THE DRAWING.
2. DESCRIPTION OF PROPERTY LIMITS, AND EXISTING AND/OR PROPOSED FEATURES RELATIVE TO THESE LIMITS AS SHOWN ON THIS DRAWING DO NOT REPRESENT A LEGAL SURVEY. WSP MAKES NO REPRESENTATION OR GUARANTEE THAT THE PROPERTY LIMIT INFORMATION IS ACCURATE. WSP ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS OR ACTIONS BASED ON THIS DRAWING.
3. WHOLE NUMBERS INDICATE MILLIMETRES; DECIMALIZED NUMBERS INDICATE METRES

EXISTING	LEGEND	PROPOSED
	WATERMAIN	
WWS	WASTEWATER	WWS
LPS	LOW PRESSURE SEWER	LPS
FM	FORCEMAIN	FM
	GATE VALVE	
	MANHOLE	
	UTILITY POLE	
	GUY WIRE	
	MTS PEDESTAL	
	SURVEY BAR	
	CULVERT	
	DITCH / SWALE	
	TREE OR SHRUB LINE	
	FENCE LINE	
	HYDRO	
	GAS MAIN	
	MTS	
	DIRECTION OF FLOW	
	RIP RAP	
99.000	GROUND ELEVATION	99.000
99.000	DITCH ELEVATION	99.000
99.000	ROAD/DYKE ELEVATION	99.000
	DYKE	

WSP
1600 BUFFALO PLACE
WINNIPEG, MANITOBA
CANADA R3T 6B8
PHONE: 204-477-6650 FAX : 204-474-2864
WWW.WSPGROUP.COM

CONSULTANT:

PRELIMINARY
NOT FOR CONSTRUCTION

REDUCED DRAWING
DO NOT SCALE

SEAL:

CLIENT:
R.M. OF RIVERDALE

CLIENT REF. #:

PROJECT:
RIVERS WWSP UPGRADE

KEY PLAN:

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
1		2015/06/26	PRELIMINARY DESIGN REPORT

PROJECT NO: 141-20119-00
DATE: 2015/06/26
ORIGINAL SCALE: 1:1500
DESIGNED BY: DTGB
DRAWN BY: DTGB
CHECKED BY: RWW
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

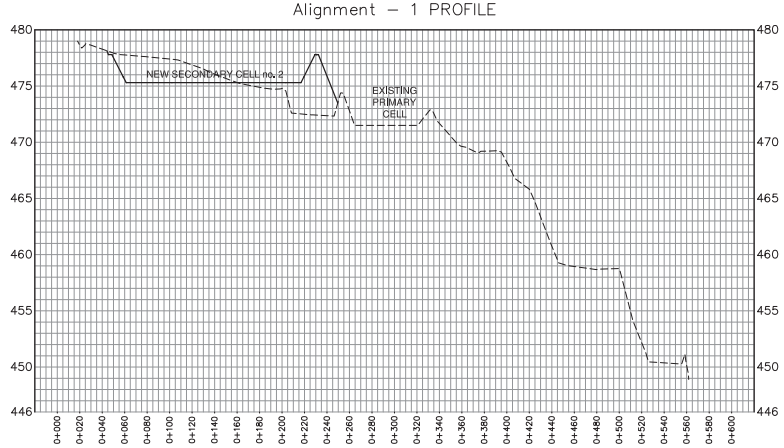
DISCIPLINE: ENVIRONMENTAL INFRASTRUCTURE

TITLE: FACULTATIVE LAGOON OPTION

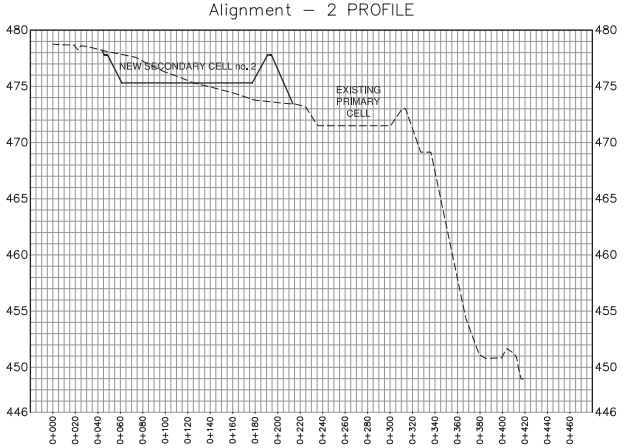
SHEET NUMBER: C01
SHEET #: 1 OF 4

ISSUE: PRELIMINARY DESIGN REPORT
REV #: 0
DATE OF: 2015/06/26

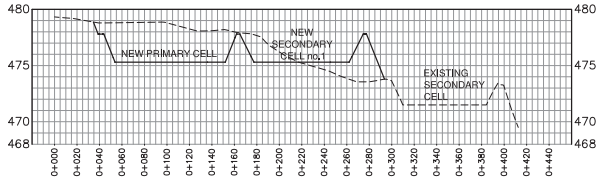
Alignment – 1 PROFILE



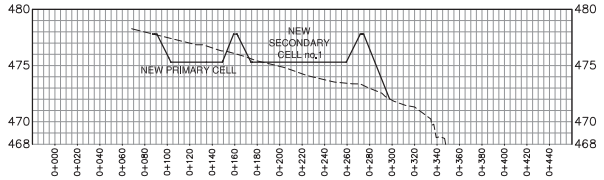
Alignment – 2 PROFILE



Alignment – 3 PROFILE



Alignment – 4 PROFILE



Alignment – 5 PROFILE

WSP
1600 BUFFALO PLACE
WINNIPEG, MANITOBA
CANADA R3T 6B8
PHONE: 204-477-6650 FAX : 204-474-2864
WWW.WSPGROUP.COM

CONSULTANT:

PRELIMINARY
NOT FOR CONSTRUCTION

REDUCED DRAWING
DO NOT SCALE

SEAL:

CLIENT:
R.M. OF RIVERDALE

CLIENT REF. #:

PROJECT:
RIVERS WWSP UPGRADE

KEY PLAN:

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
1		2015/06/26	PRELIMINARY DESIGN REPORT

PROJECT NO: 141-20119-00
DATE: 2015/06/26
ORIGINAL SCALE: 1:1000 H; 1:100 V
DESIGNED BY: DTGB
DRAWN BY: DTGB
CHECKED BY: RWW

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

DISCIPLINE: ENVIRONMENTAL INFRASTRUCTURE

TITLE:
FACULTATIVE LAGOON OPTION
CROSS SECTIONS

SHEET NUMBER: C02
SHEET #: 2 OF 4

ISSUE: PRELIMINARY DESIGN REPORT
REV #: 0
DATE OF: 2015/06/26

Dankewich, Dan

From: Smith, Brian (TCHSCP) <Brian.Smith@gov.mb.ca>
Sent: March-19-15 10:58 AM
To: Dankewich, Dan
Subject: RE: Rivers Lagoon Upgrade EAP Section 24-12-21 WPM

Dan, thank you for your email regarding the potential for the proposed Rivers Lagoon expansion project as described in your email below to impact heritage resources.

By this email I am confirming that the original assessment of this development project (Rivers Lagoon Upgrade on 24-12-21 WPM) referenced by the correspondence dated November 23, 2009 from the Historic Resources Branch remains unchanged. Historic Resources Branch is satisfied that the potential for this development to impact significant heritage resources is low and therefore is allowing the development as described to proceed. However, if significant heritage resources or human remains are encountered during any phase of development, the Historic Resources Branch is to be contacted immediately.

Brian J. Smith
Manager, Archaeological Assessment Services Unit
Historic Resources Branch
213 Notre Dame Avenue, Winnipeg, MB R3B 1N3
Phone (204) 945-1830; Fax (204) 948-2384
E-mail: Brian.Smith@gov.mb.ca

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: March-19-15 10:22 AM
To: Smith, Brian (TCHSCP)
Subject: Rivers Lagoon Upgrade EAP Section 24-12-21 WPM

Hello Brian,
Thanks for your call. The attached may help with your bearings. The red lines are the CNR mainline property boundaries. The other two figures are land acquisition sketches from the Town.

Quote from earlier EAP draft report (before my arriving to WSP)
In a letter dated November 23, 2009 from the Historic Resources Branch (~~Appendix D~~), it was stated that the potential to impact significant heritage resources is low, and therefore, the Historic Resources Brach has no concerns with the project. Correspondence is included in ~~Appendix D~~.

The existing lagoon:
Encompasses Parcel "A" Plan 801 BLTO SW ¼ of Section 24-12-21 WPM, and Parcel "B" Plan 801 BLTO of the SE ¼ of Section 23-12-21 WPM.
The proposed new lagoon:
Will expand onto Lot 10 Plan 38952 BLTO of the SE ¼ of Section 23-12-21 WPM and Parcel 3 Plan 392 BLTO of the SW ¼ of Section 24-12-21 WPM (Parcel 3 has been renamed as Parcel "A" Plan 55127 BLTO).

Do not hesitate to call should you have any further questions,
Dan Dankewich

Dan Dankewich, M.Eng., PEng.
Senior Engineer, Environmental Infrastructure

1600 Buffalo Place
Winnipeg, Manitoba R3T 6B8
T: (204) 477-6650 [ext.318] F: (204) 474-2864 | C: (204) 793-0409
Email: dan.dankewich@wspgroup.com | www.wspgroup.com

Please consider the environment before printing...

Dankewich, Dan

From: Webb, Bruce (CWS) <Bruce.Webb@gov.mb.ca>
Sent: January-08-15 10:15 AM
To: Dankewich, Dan
Cc: Webster, Ross; Parsons, Travis (MMG); Burland Ross, Siobhan (CWS)
Subject: RE: Rivers Lagoon Upgrade EAP

Hi! Sorry for the delay in replying to this!

Ross and Jason are meeting with us on January 20 to discuss several projects, and Rivers is on the list. I can likely help to focus your concept in the meantime.

So the Rivers lagoon leaks badly. If this is charmed, the charm will be over with the upgraded facility.

Concerning aeration for a relatively small facility like this, I am extremely skeptical about the feasibility of aeration. For starters, I am doubtful that the cost of an aeration system is cheaper than the capital cost of some additional earthwork. More importantly, the community will have a facility that is much more expensive to operate for its whole life. I recently licensed a new lagoon for a smaller community where aeration and continuous discharge was originally proposed. This proposal, also intended to reduce the footprint and the land cost, was stalled for over four years until the council saw the light and reverted to a conventional facultative proposal. Then they very quickly got a licence for the revised proposal. This could be a similar situation.

If you are sure that you want to use aeration and go for a continuous discharge, the proposal should include a good discussion of the options examined, and it should be clear that the council made an informed decision about the aerated option based on complete and realistic cost estimates. If an aerated facility is chosen, the effluent should be good enough to discharge directly to the river. Infiltration as a discharge method isn't on.

As you likely know, the fish collection present downstream of Rivers in the Little Saskatchewan River is the same as in the Assiniboine River, and the LSR is already of significant interest to the Fisheries Branch. (There is an instream flow study underway on the river led by the Fisheries Branch that will eventually guide water allocation decisions on the river.) Any new proposal involving effluent discharge to the LSR will need to specifically address fish habitat impacts, and a continuous discharge proposal will need to look at effects throughout the year, especially during low flow periods and during critical life stages. Minimum flows downstream of Rivers are about 20 cfs thanks to the Rivers Dam, and although this seems like a lot in comparison to other southern Manitoba streams, it still produces very low depths in the river channel, especially under ice conditions.

Bruce.

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: January-07-15 8:38 AM
To: Webb, Bruce (CWS)
Cc: Webster, Ross; Parsons, Travis (MMG)
Subject: Rivers Lagoon Upgrade EAP

Good Morning Bruce,

I have left a number of voice messages on your land line. You may still be on vacation.

I would be pleased and happy to come by your offices at your convenience to discuss our concept for upgrading the lagoon at Rivers to satisfy current and future Provincial and Federal treated effluent regulations.

Let me know a day and time that works for you and I will make it happen.

Best Regards,

Dan Dankewich

From: Dankewich, Dan
Sent: Tuesday, December 16, 2014 9:45 AM
To: Webb, Bruce (CWS) (Bruce.Webb@gov.mb.ca)
Cc: Webster, Ross; 'Parsons, Travis (MMG)'
Subject: Rivers Lagoon Upgrade EAP

Morning Bruce,

I am working with Ross Webster on the Town of Rivers Lagoon Upgrade EAP.

As you may be aware, Rivers has been charmed over the life of their community lagoon. The lagoon construction has provided continuous discharge of the treated effluent by infiltration to the sandy soils of the escarpment. Eventually effluent finds its way to the Little Saskatchewan River, receiving tertiary treatment along the way.

The Town of Rivers has never needed to store 227 days of treated effluent through the winter. We initially considered a conventional facultative lagoon solution c/w piped outfall to the river. Alternatively, we would consider reducing the footprint (and hopefully the capital cost) by using primary cell aeration and deepening the lagoon depths. Given this scenario, we would respectfully ask for a continuous release of the treated effluent by way of an infiltration gallery (alternatively we could repurpose the existing secondary cell for this purpose). Essentially this solution would mimic the outfall path that has existed for the life of the current lagoon.

At this time it would be important to learn if Conservation is open to this approach. I would be happy to give you a call at your convenience to discuss expectations on the part of Conservation.

Best Regards,

Dan Dankewich

Dan Dankewich, M.Eng., PEng.
Senior Engineer, Environmental Infrastructure

1600 Buffalo Place
Winnipeg, Manitoba R3T 6B8
T: (204) 477-6650 [ext.318] F: (204) 474-2864 | C: (204) 793-0409
Email: dan.dankewich@wspgroup.com | www.wspgroup.com

Please consider the environment before printing...

Dankewich, Dan

From: Friesen, Chris (CWS) <Chris.Friesen@gov.mb.ca>
Sent: April-01-15 10:32 AM
To: Dankewich, Dan
Subject: RE: Rivers Lagoon Upgrade EAP Section 24-12-21 WPM

Dan

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database and found no occurrences at this time for your area of interest.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. **An absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present**; in many areas, comprehensive surveys have never been completed. Therefore, this information should be regarded neither as a final statement on the occurrence of any species of concern, nor as a substitute for on-site surveys for species as part of environmental assessments.

Because the Manitoba CDC's Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. Please contact the Manitoba CDC for an update on this natural heritage information if more than six months pass before it is utilized.

Third party requests for products wholly or partially derived from Biotics must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using Biotics data, as follows as: Data developed by the Manitoba Conservation Data Centre; Wildlife Branch, Manitoba Conservation and Water Stewardship.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information please contact me directly at (204) 945-7747.

Chris Friesen
Coordinator
Manitoba Conservation Data Centre
204-945-7747
chris.friesen@gov.mb.ca
http://www.gov.mb.ca/conservation/cdc/

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: March-20-15 8:21 AM
To: Friesen, Chris (CWS)
Subject: FW: Rivers Lagoon Upgrade EAP Section 24-12-21 WPM

Hello Chris,
Thanks for your call. The attached may help with your bearings. The red lines are the CNR mainline property boundaries. The other two figures are land acquisition sketches from the Town.

Quote from earlier EAP draft report (before my arriving to WSP)

SPECIES IMPACT: A file search with the Biodiversity Conservation Wildlife and Ecosystem Protection Branch of Manitoba Conservation resulted in no occurrences found near the development site. Correspondence is included in ~~Appendix D~~.

The existing lagoon:
Encompasses Parcel "A" Plan 801 BLTO SW ¼ of Section 24-12-21 WPM, and Parcel "B" Plan 801 BLTO of the SE ¼ of Section 23-12-21 WPM.
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Do not hesitate to call should you have any further questions,
Dan Dankewich

From: Dankewich, Dan
Sent: Thursday, March 19, 2015 10:22 AM
To: 'brian.smith@gov.mb.ca'
Subject: Rivers Lagoon Upgrade EAP Section 24-12-21 WPM

Hello Brian,
Thanks for your call. The attached may help with your bearings. The red lines are the CNR mainline property boundaries. The other two figures are land acquisition sketches from the Town.

Quote from earlier EAP draft report (before my arriving to WSP)
In a letter dated November 23, 2009 from the Historic Resources Branch (~~Appendix D~~), it was stated that the potential to impact significant heritage resources is low, and therefore, the Historic Resources Brach has no concerns with the project. Correspondence is included in ~~Appendix D~~.

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Do not hesitate to call should you have any further questions,
Dan Dankewich

Dan Dankewich, M.Eng., PEng.
Senior Engineer, Environmental Infrastructure

1600 Buffalo Place
Winnipeg, Manitoba R3T 6B8
T: (204) 477-6650 [ext.318] F: (204) 474-2864 | C: (204) 793-0409
Email: dan.dankewich@wspgroup.com | www.wspgroup.com

Dankewich, Dan

From: Jeff Dyck <jdyck@jrcc.ca>
Sent: November-28-14 1:19 PM
To: Dankewich, Dan
Cc: 'Parsons, Travis (MMG)'; Webster, Ross; rivers@mymts.net
Subject: RE: Town of Rivers WTP - TM #1

Hi Dan,

My understanding is that the WTP would be constructed next summer (2015), but the lagoon might not occur until later. Given that the existing lagoon does not have capacity for the reject water, we are looking at direct discharge of the reject water back to the river.

If this has changed, please let me know – directing the process wastewater to the sewer system is a much easier option.

The exact reject volume won't be fully known until we have formally selected a treatment supplier; based upon the information I've received so far, the total average daily process waste volume could range between 141 and 302 m^3/day at Design Year 20 flows.

I hope this helps.

Jeff Dyck, P.Eng.
Senior Municipal Engineer, Principal

J.R. Cousin Consultants Ltd.
Phone: (204) 489-0474
Fax: (204) 489-0487
www.jrcc.ca

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: November-26-14 1:52 PM
To: Jeff Dyck
Cc: Parsons, Travis (MMG); Webster, Ross; rivers@mymts.net
Subject: Town of Rivers WTP - TM #1

Good afternoon Jeff,

With respect to the proposed Rivers lagoon upgrade, I am currently revisiting the hydraulic loading assumptions.

From the attached WTP memo, the process wastewater has not been quantified. Can JRCC provide the process wastewater estimate at this time?

Feel free to give me a call should you have any questions about this request.

Regards,

Dan Dankewich

(204) 477-6650

From: Kat Bridgeman [mailto:rivers@mymts.net]
Sent: Wednesday, October 08, 2014 11:44 AM
To: Dankewich, Dan
Subject: FW: Town of Rivers WTP - TM #1

Hi Dan, JR Cousin has asked that this be passed on to you for population projections
Thanks
Kat

Kat Bridgeman C.M.M.A.
Chief Administrative Officer
Town of Rivers
Box 520, Rivers MB R0K 1X0
Ph: 204.328.5250
Fax: 204.328.5374
www.riversdaly.ca

When you stop doing things for fun you might as well be dead ~ Ernest Hemingway

---

From: jdyc k@jrcc.ca
To: travis.parsons2@gov.mb.ca; rivers@mymts.net
CC: riverswp@mts.net
Subject: Town of Rivers WTP - TM #1
Date: Mon, 29 Sep 2014 13:35:46 -0500

Hello all,

Please find attached the Technical Memorandum #1, dealing with population projections and water usage, for the Town of Rivers WTP project. The TM is comprised of Section 3.0 of our functional design report.

If you have any questions, please do not hesitate to call. If there are no comments, we would appreciate MWSB and Town acceptance of this document, as it will form the basis of future calculations. We would appreciate if comments and/or acceptance could be forwarded by October 10th.

As well, once the population and water demand numbers are accepted, it would be a good idea to share these with WSP as it relates to their work on the lagoon.

Cheers,

Jeff Dyck, P.Eng.
Senior Municipal Engineer, Principal
J.R. Cousin Consultants Ltd.
Phone: (204) 489-0474
Fax: (204) 489-0487
www.jrcc.ca

***

Dankewich, Dan

From: Janusz, Laureen R (CWS) <Laureen.Janusz@gov.mb.ca>
Sent: December-17-15 4:03 PM
To: Dankewich, Dan
Cc: Bruederlin, Bruno (CWS); Long, Jeff (CWS)
Subject: Proposed wastewater lagoon at Rivers Manitoba

Hi Dan,

Thanks so much for once again following up to get our input. To summarize it looks like the option selected is a facultative lagoon discharging between June and October. The effluent would be discharged through a culvert to a wetland adjacent to the river.
As indicated earlier, the Little Saskatchewan River supports a diverse community of small and large bodied fish species. Ensuring good water quality and sufficient water quantity is important which is one of the reasons we had concerns with the original concept of a continuous discharge facility.
As long as the effluent meets Water Quality Standards, Objectives and Guidelines then our concerns should be addressed. I don't know, and perhaps you could tell me, if there is a difference in effluent quality between facultative and aerated lagoons. We certainly understand that cost is an important consideration in determining the final design. We were just wondering if effluent from an aerated lagoon is of consistently better quality, and if so, if this could be a consideration given the diverse assemblage of fish species in this river.
With respect to the proposed effluent discharge method the only concern may be the volume of discharge and the potential to create a channel within the wetland. We would hope that the discharge point could be monitored to ensure that this is not occurring and if it is the volume could be adjusted and the channel filled in and/or stabilized. We would not want the discharge area to become an ongoing point source for sediment input into the river.
Thanks again Dan for touching base throughout the design process. My apologies for not being as equally good in responding in a timely fashion. Any questions please email or call my cell 204 7793-1154. Have a great evening.

Laureen Janusz
Fisheries Science and Fish Culture Section
Fisheries Branch,
Manitoba Conservation and Water Stewardship
Box 20, 200 Saulteaux Crescent
Winnipeg, MB R3J 3W3

Phone: 204.945.7789
Cell: 204.793.1154
Fax: 204.948-2308
Email: Laureen.Janusz@gov.mb.ca

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: December-10-15 9:08 AM
To: Janusz, Laureen R (CWS)
Cc: Bruederlin, Bruno (CWS); Long, Jeff (CWS)
Subject: RE: Proposed wastewater lagoon at Rivers Manitoba

Laureen,

It has been a while since we discussed the proposed lagoon upgrade at Rivers, Manitoba.

The treatment lagoon design (first shown in Appendix A) has been excepted by the Riverdale Municipality and MWSB is anticipating the final EAP submission.

The EAP document is nearing completion for January submission to Conservation. One of the loose ends, is a response from the Fisheries Science and Fish Culture Section, related to the proposed outfall for intermittent treated effluent release to the Little Saskatchewan River.

The treatment lagoon will be designed and built to satisfy MB Conservation and Environment Canada effluent regulations.

Did your Section what to make any further comments to be submitted with the EAP?

Best Regards,

Dan Dankewich

From: Janusz, Laureen R (CWS) [mailto:Laureen.Janusz@gov.mb.ca]
Sent: December-05-14 10:17 AM
To: Dankewich, Dan
Cc: Bruederlin, Bruno (CWS); Long, Jeff (CWS)
Subject: RE: Proposed wastewater lagoon at Rivers Manitoba

Hi Dan,

Thank you for the additional information. I'll discuss with colleagues and get a response back to you. When would you like (or need) to hear back from us on this Dan?

Laureen Janusz
Fisheries Science and Fish Culture Section
Fisheries Branch
Conservation and Water Stewardship
Phone: 204 945-7789
Cell: 204 793-1154
Email: Laureen.Janusz@gov.mb.ca

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: December-05-14 7:45 AM
To: Janusz, Laureen R (CWS)
Cc: Bruederlin, Bruno (CWS); Long, Jeff (CWS)
Subject: RE: Proposed wastewater lagoon at Rivers Manitoba

Hello Laureen,

The project, relates to the Town of Rivers, MB., they currently treat municipal wastewater for a population of 1200 through a facultative lagoon, see attached. Treated effluent is continuously released by infiltration to the sandy subsoil below the secondary cell. The treated effluent ultimately finds its way to the Little Saskatchewan River approximately 100m down slope. As you are aware this type of municipal wastewater treatment, though effective, has been disallowed by Manitoba Conservation.

WSP on behalf of Manitoba Water Services Board and the Town of Rivers is preparing an EAP for a lagoon upgrade that will satisfy current and anticipated future treated effluent regulations over a 20 year design life. The upgraded treatment lagoon may be facultative with intermittent release to the Little Saskatchewan River following 227 day

storage between November 01 and June 15. We are also assessing the cost benefit for aerated secondary treatment with continuous discharge to the Little Saskatchewan River.

Whichever alternative MWSB chooses to fund, there will be a new outfall structure to the Little Saskatchewan River. My preference is to create an infiltration gallery in the floodplain adjacent to the main channel of the river. It actually looks like a small wetland.

At this early stage I was canvasing Conservation (as I have DFO, and Environment Canada) for particular concerns that WSP should be aware of as we advance the design and construction of the upgraded and river outfall for the municipal wastewater treatment lagoon at the Town of Rivers.

Best Regards,

Dan Dankewich

From: Janusz, Laureen R (CWS) [mailto:Laureen.Janusz@gov.mb.ca]
Sent: Thursday, December 04, 2014 4:19 PM
To: Dankewich, Dan
Cc: Bruederlin, Bruno (CWS); Long, Jeff (CWS)
Subject: Proposed wastewater lagoon at Rivers Manitoba

Hi Dan,

I am responding to your email that came through our general fisheries email account November 24th. Sorry for the delay in responding. Can you provide more detail regarding the proposed project and also what direction you were looking for. Thanks Dan. Have a great evening.

Laureen Janusz
Fisheries Science and Fish Culture Section
Fisheries Branch
Conservation and Water Stewardship
Phone: 204 945-7789
Cell: 204 793-1154
Email: Laureen.Janusz@gov.mb.ca

Dankewich, Dan

From: Schwartz, Todd <Todd.Schwartz@dfo-mpo.gc.ca>
Sent: September-11-14 1:20 PM
To: Dankewich, Dan
Cc: Webster, Ross; Thorsteinson, Inga
Subject: RE: Rivers Manitoba "new municipal wastewater treatment lagoon" outfall to Little Saskatchewan River

Hello Dan,

Regarding DFO reviews please note the following:

1) Please use the information on our website to self-assess your project http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html. Where you have self-assessed your project to be low risk to fish and fish habitat such that it is not causing serious harm to fish you are not required to send a notification to DFO. (Note: it is probably good practice to keep a copy of your self-assessment and recommended mitigation measures for your records should questions ever be raised).

2) If you have self-assessed your project and you think that Serious Harm is likely (i.e. the death of fish, or the permanent alteration or destruction of fish habitat) then you are encouraged to complete a Request for Review form and submit it electronically to our Triage office at fisheriesprotection@dfo-mpo.gc.ca . The request for review form is on our website http://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/index-eng.html . If you have questions call 1-855-852-8320.

3) Our Triage group will provide your completed request for review form to the appropriate biologist who will review it and let you know if you need to apply for an authorization, or will provide a letter of advice with mitigation measures to avoid serious harm.

If you are ever having difficulties contacting DFO you can contact me directly and I'll try to direct you to the right person.

With regards to Navigable Waters, please contact Transport Canada for information. I have copied Inga Thorsteinson with TC NWPP on this email and perhaps she can direct you to the appropriate contact or website for information.

Todd Schwartz
Telephone/ Téléphone: 204 983-4231
Facsimile / Télécopieur: 204 984-2404
Email / Courriel: Todd.Schwartz@dfo-mpo.gc.ca

Fisheries Protection Biologist. Biologiste, Protection des Pêches
Fisheries Protection Program. Programme pour la Protection des Pêches
Winnipeg Office. Bureau de Winnipeg
Central and Arctic Region. Région du Centre et de l'Arctique
Fisheries and Oceans Canada. Pêches et Océans Canada
501 University Crescent. 501 University Crescent

Winnipeg, MB R3T 2N6. Winnipeg (Manitoba) R3T 2N6
Government of Canada. Gouvernement du Canada

For more information on Fish and Fish Habitat and DFO Reviews Visit our Website
www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html

Fisheries and Oceans Canada has changed the way new project proposals (referrals), reports of potential *Fisheries Act* violations (occurrences) and information requests are managed in Central and Arctic Region (Alberta, Saskatchewan, Manitoba, Ontario, Nunavut and the Northwest Territories). Please be advised that general information regarding the management of impacts to fish and fish habitat and self-assessment tools (e.g. Measures to Avoid Harm) that enable you to determine *Fisheries Act* requirements are available at DFO's "Projects Near Water" website at www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html. For all occurrence reports, or project proposals where you have determined, following self-assessment, that you cannot avoid impacts to fish and fish habitat, please submit to fisheriesprotection@dfo-mpo.gc.ca. For general inquiries call 1 855 852-8320.

From: Dankewich, Dan [mailto:Dan.Dankewich@wspgroup.com]
Sent: 2014–September-11 8:01 AM
To: Schwartz, Todd
Cc: Webster, Ross
Subject: Rivers Manitoba "new municipal wastewater treatment lagoon" outfall to Little Saskatchewan River

Hello Todd,

My co-worker provided your contact information.

What I seek is guidance on DFO regulatory submissions (Fisheries, and Navigable Waters).

WSP and Rivers and Manitoba Water Services Board, are at the "early" stages of a design for a Rivers Manitoba "new municipal wastewater treatment lagoon" with outfall to the Little Saskatchewan River.

The intention is for an annual discharge (rate and volume to be determined) after June 15 of each year (and possibly October).

Preliminary options include but are not limited to:

- Piped into a river bed exfiltration gallery;
- Piped to the river's edge and discharged to a stilling basin before entering the river;
- Piped to the river's edge and discharged to a stilling basin before entering a "forebay" area adjacent to the river rich with macrophytes and riparian vegetation, ultimately entering the river; and
- Armor ditch overland to the river's edge then to either the "forebay" or directly to the river.

Thank you in advance for your consideration of this request.

Regards
Dan Dankewich

Dan Dankewich, M.Eng., PEng.
Senior Engineer, Environmental Infrastructure

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