

# City of Portage la Prairie



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## ***2019 Residual Biosolids Land Application Program***

*As per Environment Licence 1907*

# 2019 Residual Biosolids Land Application Program

City of Portage la Prairie, Water Pollution Control Facility

*Report to Manitoba Sustainable Development*

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## **Introduction**

The City of Portage la Prairie owns and operates a wastewater treatment system known as the Water Pollution Control Facility (WPCF). Flows from the McMillan Industrial Park are pre-treated in the on-site Low Rate Anaerobic Reactor. This pre-treated water is combined with municipal flows as well as pre-treated industrial wastewater from Poplar Bluff industrial park. These flows are conveyed to the Sequencing Batch Reactors (SBRs) that provide secondary treatment. Waste Activated sludge (WAS) is the residual solids that are generated through this process and required to be removed from the SBRs to ensure ongoing treatment. WAS is thickened through the addition of polymer and dewatered by gravity belt. The material is then stabilized in the City's anaerobic digester to produce biosolids material that is suitable for land application as a fertilizer. The biosolids is stored throughout the year in the Bulk Volume Fermenter (BVF) or the Biosolids Storage Tanks (BSTs) until weather and harvest permits an opportunity to remove the material and inject it on agricultural land as a soil enhancement product. The removal, hauling, analyses and injection of this stored material constitutes the Residual Biosolids Land Application program.

Samples of biosolids from the two storage areas are sent to a contract lab for analyses as required in the EAL #1907. The fields to be used are also sampled and analyzed. From this, application rates are calculated to determine how much, if any, biosolids can be applied. Once the land is approved for use, biosolids are pumped from one of the two storage areas into tanker trucks and transported to the field. From there, material is pumped into a nurse tank which feeds the application equipment that inject the material below the surface. Injection helps to reduce runoff, prevent vector attraction and minimize odours.

## **Field Selection Process**

The City of Portage la Prairie administration contacted owners of land located in the Rural Municipality of Portage la Prairie, that are within 25 km of the Water Pollution Control Facility.

Initial screening consisted of reviewing the proposed land application area and determining the subsurface geological formation. This was obtained from a map of the Rural Municipality of Portage la Prairie on which was superimposed areas that had been deemed acceptable in accordance to Manitoba Environment Licence #1907. The criteria can be listed as follows:

- i) Depth of clay or clay till of less than 1.5 metres between the soil surface and the water table;
- ii) Within 100 metres of an identifiable boundary of an aquifer which is exposed to the ground surface;
- iii) Where, prior to the application of biosolids, the soil pH is less than 6.0;
- iv) Where the surface slope of the land is greater than 5 percent;
- v) where, prior to application of biosolids, the level of nitrate-nitrogen exceeds 100 kilograms per hectare in the upper 60 cm of the soil; or
- vi) Where, prior to the application of biosolids, the concentration of sodium bicarbonate extractable phosphorous, as P, exceeds 60 micrograms per gram in the upper 15 centimetres of the soil.

All sites that met the above criteria were considered for biosolids application. Potential fields for use were advertised in the local newspaper as well as on the City of Portage la Prairie website. Letters of notification were also sent to the Department of Sustainable Development and the Rural Municipality of Portage la Prairie. Copies of the ad and letters are included in this report. Areas selected were then subject to soil testing processes and final selection.

#### *Nutrient Testing*

Soil testing was carried out on all usable fields to determine the pH, sodium bicarbonate extractable phosphorous, as P, and nitrate nitrogen according to the following criteria as specified in Manitoba Environment Licence #1907.

<b>Parameter</b>	<b>Depth of Analysis (cm)</b>
Phosphorous	15
pH	15
Potassium	15
Nitrate-Nitrite	60
Total Nitrogen	60

Core samples were obtained from the selected application sites, as per license requirements. One core sample was collected for each 2-hectare area and combined to form a composite sample for analysis. A sample for clay analyses and to verification of water table was also taken. An external laboratory was contracted by the City of Portage la Prairie to conduct all soils testing.

### *Heavy Metals*

Soil samples were collected and analysed for background heavy metal concentrations. Heavy metal application was limited to one-third of the initial maximum addition of each heavy metal to be applied in any single application period as per environment license. All heavy metal analysis was conducted by an external laboratory. See Appendix B for background heavy metal concentration results. Back-ground heavy metal concentrations in the soil not exceeding the following:

<b>Metal</b>	<b>Background Concentration (kg/h)</b>
Cadmium	2.88
Copper	90
Nickel	90
Lead	90
Zinc	270
Mercury	0.9
Chromium	216

The following fields were sampled and analyzed:

NE 1-13-7

SE 30-12-8

Based on results, all fields were selected for use. Once a field had been tested and selected for application, prior to application, City of Portage la Prairie staff attended each field to mark out borders and boundaries in accordance with Sections 9 and 10-Discharge Limits, Terms, and Conditions of the license was adhered to during the application process. An agreement with each land owner was signed specifying the restrictions on future growing conditions. Copies of these agreements are also included in this report.

### **Biosolids Sampling and Testing**

It is also necessary to sample and analyze the residual solids material to determine nutrient and metals levels. This is used to firstly- confirm the material contains levels lower than the maximum allowable concentration before applying and secondly- to determine the application rate that the material can be applied to ensure the cumulative amounts are below license limits.

### *Bulk Volume Fermenter Composite Sample*

Sludge samples were collected from alternate sample ports located on the BVF cover. The individual samples were combined to form a composite sample that was submitted for analysis.

### *Biosolids Storage Tanks #1 & #2*

Section 2 of the Environment Act License #1907 requires that wastewater solids must be held for a minimum of 30 days at 20°C prior to land application. The anaerobic digester currently does not have mixing which has reduced the overall capacity of the digester and the minimum 30 days of retention time cannot be confirmed. The BVF provides an additional 90 days of anaerobic digestion at 32°C however, the material stored in the BSTs does not receive this additional high temperature treatment. The City of Portage la Prairie requested two suspensions to this clause to allow the land application of biosolids material that had not met the license requirements in either Storage Tank. AECOM Engineering produced a report that demonstrated how the material in the biosolids storage tanks met the intended outcomes of anaerobic digestion using US EPA (40 CRF Part 503, Standards for the Use or Disposal of Sewage Sludge) as a reference. Testing for fecal coliform was performed 4 times per week for several weeks leading up to the removal of biosolids. Temperature, pH, conductivity and solids were also monitored. The Department of Sustainable Development granted the suspensions for BST 1 and 2 for the 2018 application program. Copies of the letters of request, data, and approval letters are included in this report in Appendix A.

Once approval was received, each storage tank was sampled and tested separately. Biosolids material was recirculated throughout the tanks and samples were collected from the sample port within the facility. Biosolids testing was conducted by ALS Labs, in accordance with Clause 1, Appendix A of Environmental Act Licence 1907, for the following components:

- a. conductivity
- b. pH
- c. total solids
- d. volatile solids
- e. nitrate nitrogen
- f. total kjeldahl nitrogen
- g. ammonia nitrogen
- h. organic nitrogen
- i. total phosphorous
- j. lead
- k. mercury
- l. nickel
- m. potassium
- n. cadmium
- o. copper
- p. zinc
- q. chromium

Based on the reported results, the materials contained in the BVF and the BSTs met the required criteria and were available for land application.

## **Sludge Handling**

### *Bulk Volume Fermenter*

Sludge was withdrawn from the BVF by means of internal lateral sludge lines that are normally used for sludge recirculation within the BVF. Sludge was pumped directly to the trucks through a sludge transfer port and an overhead fill pipe. City staff continuously monitored the entire filling process and operation of the sludge pumps. Communication was maintained by means of two-way radios.

Very little spillage was observed throughout the filling process. All spillage that occurred was contained on a concrete spill pad that was washed after each load hauled. The spilled material and wash water were conveyed to the headworks of the WPCF by means of a gravity collection line to a pumping station.

A significantly lower amount of sludge was removed from the BVF this year. This is for several reasons; the construction of a new Low Rate Anaerobic Reactor (LRAR) was completed which can also be used for sludge storage and reducing the need to remove extra from the BVF. As well, as the new LRAR was put into use in the summer. The lower flow to the BVF made the extraction of solids from the BVF more difficult. The third factor was a significant amount of rain fall occurred in the fall limiting access to the fields. The compounding of these three factors influenced the decision to stop removal of solids from the BVF after only 31.35 Tonnes was removed.

### *Biosolids Storage Facility*

The contents of the storage tank were thoroughly mixed using the Seepex progressive cavity pumps in the facility and pumped to tanker trucks through an overhead fill line. City staff continuously monitored the entire filling process and operation of the sludge pumps.

Very little spillage was observed throughout the filling process. All material that drips from the overhead filling hose is collected on the concrete spill pad that is washed down into a pit that conveys all material back to the Biosolids Storage Tanks.

## **Biosolids Transportation and Transfer Station**

The biosolids was hauled via tanker truck to the application area. Transportation routes were determined prior to application and Manitoba Sustainable Development and the RM of Portage la Prairie were notified of the intended routes.

A transfer station was located on site and contained a turning area, nurse tank and transfer pump. Sludge was transferred from the trucks via a sludge transfer pump to the nurse tank. The nurse

tank can hold approximately four (4) sludge loads. Cam-lock connections were used for all hose connection mitigating any spillage, which may have occurred during the sludge transfer stage.

### **Injection**

All sludge injection was conducted by a Drag-Line injection system which had been modified to allow for sludge injection and to allow for a furrow spacing of 0.50 metres (20 inches). A total of 6 furrows were created with each pass.

Injection rate was based on the ground speed of the Drag-Line and the solids and ammonia information of the sludge. Solids content and ammonia data was transferred to the field by means of cellular phones. This data was used by the driver to estimate the speed of the unit by means of an injection rate chart. Approximately 100 kg/ha of plant available nitrogen was applied to each application area as based on the following formula:

$$S = \frac{N_p}{(\text{NO}_3\text{-N} + \text{NH}_3\text{-N} + F \times \text{Org-N})}$$

Where:

S= sludge application rate (dry kg/ha)

$N_p$ = plant available nitrogen requirement (kg/ha) = 100 kg/ha

$\text{NO}_3\text{-N}$ = nitrate nitrogen content of sludge (kg/kg sludge)

$\text{NH}_3\text{-N}$ = ammonia nitrogen content of sludge (kg/kg sludge)

F= organic nitrogen mineralization factor (0.2 dimensionless)

Org-N= organic nitrogen content of sludge (kg/kg sludge)

### **Biosolids Testing During Land Application**

During the land application program, ongoing testing of samples from the BSTs and BVF is conducted. One grab sample is collected from five truck tankers to form a composite sample. Each composite is analyzed for solids and ammonia content.

The ammonia and solids testing that occurs during the biosolids hauling process are analyzed in-house by City of Portage lab techs. Solids are determined using a moisture balance and ammonia is determined via Flow Injection Analysis in accordance with APHA Standard Methods for the Examination of Water and Wastewater 20<sup>th</sup> Ed, 1998 Method 4500-NH<sub>3</sub> H. Flow Injection Analysis.

The ongoing testing of ammonia and solids for each composite sample ensures that the application rate is being adjusted accordingly as the program proceeds. The spreadsheets used to determine rates, also calculates the applied amount of metals, Phosphorous, and Nitrogen along with the background soil composition to ensure the cumulative values do not exceed license requirements.

This information is documented in the Biosolids Application Recording sheets which are included in this report. A copy of this report is also given to each land owner.

### **Summary**

Residual solids were required to be removed in the fall of 2019. The fall program was carried out between September 9 - September 23. This included injection of 31.35 dry tonnes of solids from the BVF and 224.92 dry tonnes from the Biosolids Storage Tanks for a total removal of 256.27 dry tonnes. Due to significant rain fall and the additional storage capacity available in the newly constructed LRAR, the amount of biosolids applied was less than determined, however, will not have any negative impact to the operation of the WPCF in 2020. There were no incidents or spills that occurred during the land application process. Follow up with all farmers indicated they were content with the application process and are willing to have residual solids applied in future years.



**APPENDIX A**  
**LAND SOLICITATION AND ADVERTISING**

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File No: WPCF 30- 4

March 12, 2019

Mr. Tyler Kneeshaw  
Regional Supervisor  
Environmental Compliance and Enforcement  
Sustainable Development  
25 Tupper Street North  
Portage la Prairie, MB R1N 3K1

**Re: 2019 Residual Biosolids Application Program**

Dear Mr. Kneeshaw:

The City of Portage la Prairie intends to conduct land application of residual biosolids in the fall of 2019. The following land areas that have been identified as potential application sites and pending soil analysis, biosolids may be applied to the following agricultural lands:

**LEGAL LAND DESCRIPTIONS**

Owner: *Lori Stangl*- W 15-12-8  
SW 23-12-8

Owner: *Ron Brooks*- SE 30-12-8  
S 21-12-8

Owner: *Darren McDonald*- NE 1-13-7

Owner: *Westroc Colony*- 31-12-8  
6-13-8  
7-13-8  
W 8-13-8  
SW 17-13-8  
18-13-8

A map of the Portage la Prairie region with fields identified has been included with this letter.

As required in Environment Act License 1907, clause 17, notice of intent to land apply to the above noted sites has been sent to the RM of Portage la Prairie as well as yourself as the representative for the Department of Sustainable Development. For public notification, this information will be printed in the City of Portage la Prairie Citizens Info page to be distributed to all residents the week of March 18-22. An ad has been submitted to the Portage Daily Graphic and will be included in the March 21<sup>st</sup> edition. It will also be posted on the City of Portage la Prairie website as of March 13.

A copy of the intended routes of transport will be sent once they are confirmed by the contractor. Please contact me at 204-239-8359 if you have or receive any concerns regarding the above sites.

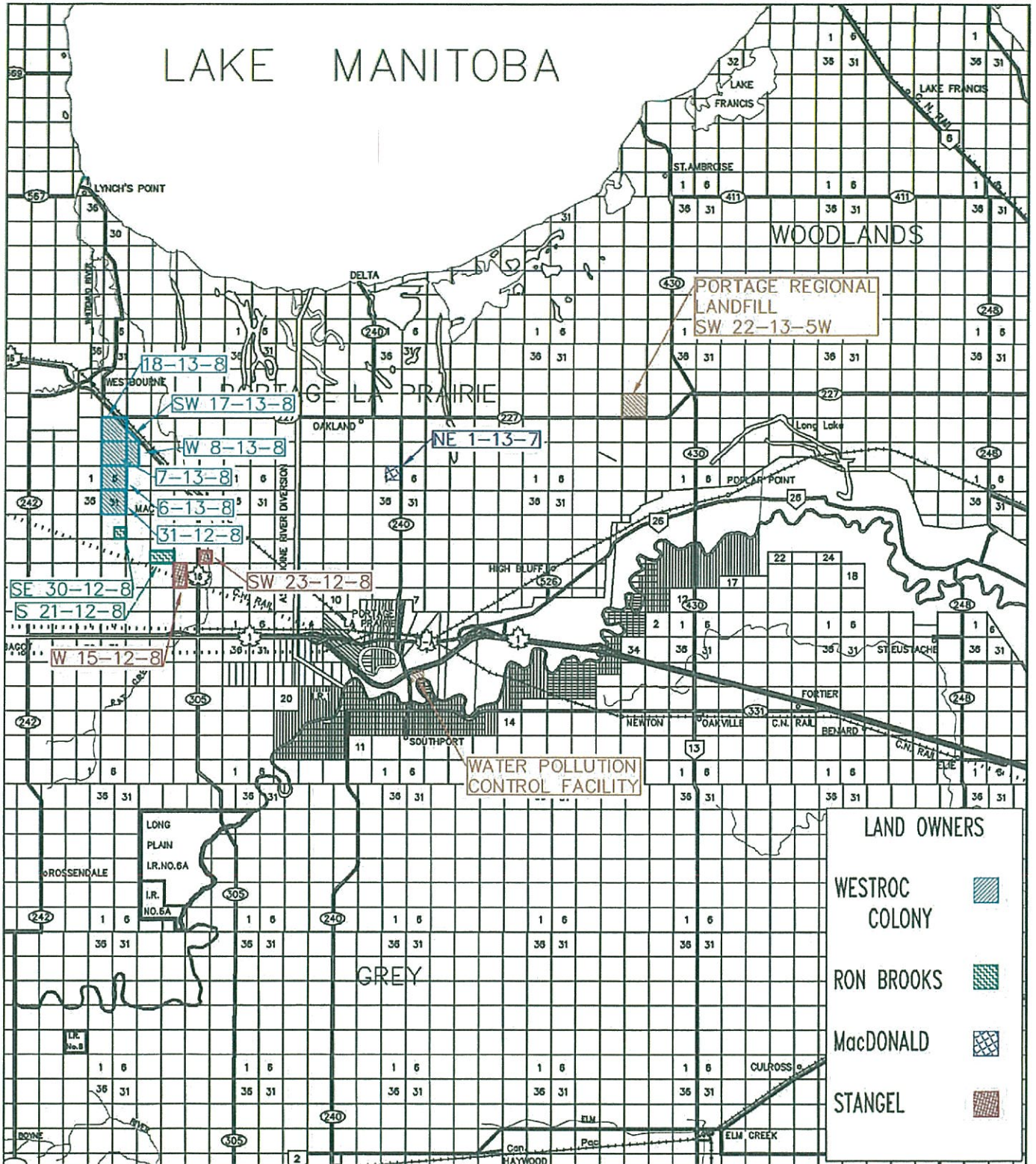
Sincerely,

A handwritten signature in blue ink, appearing to read 'Karly Friesen', with a stylized flourish at the end.

Karly Friesen  
Manager, Wastewater Treatment Division

Cc: Kelly Braden P. Eng., Director of Operations

# LAKE MANITOBA



**Portage la Prairie**  
City of Possibilities

Project  
2019  
BIOSOLIDS  
APPLICATION  
LAND DESCRIPTION

Sheet	1	y/m/d	19/03/12
Scale	N.T.S.		
Drawing No.	M-214	Rev.	0

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File No: WPCF 30- 4

March 12, 2019

Ms. Nettie Neudorf, CPA, CGA, CMMA  
Chief Administrative Officer  
Rural Municipality of Portage la Prairie  
35 Tupper Street South  
Portage la Prairie, MB R1N 1W7

**Re: 2019 Residual Biosolids Application Program**

Dear Ms. Neudorf:

The City of Portage la Prairie intends to conduct land application of residual biosolids in the fall of 2019. The following land areas that have been identified as potential application sites and pending soil analysis, biosolids may be applied to the following agricultural lands:

**LEGAL LAND DESCRIPTIONS**

Owner: *Lori Stangl*- W 15-12-8  
SW 23-12-8

Owner: *Ron Brooks*- SE 30-12-8  
S 21-12-8

Owner: *Darren McDonald*- NE 1-13-7

Owner: *Westroc Colony*- 31-12-8  
6-13-8  
7-13-8  
W 8-13-8  
SW 17-13-8  
18-13-8

A map of the Portage la Prairie region with fields identified has been included with this letter.

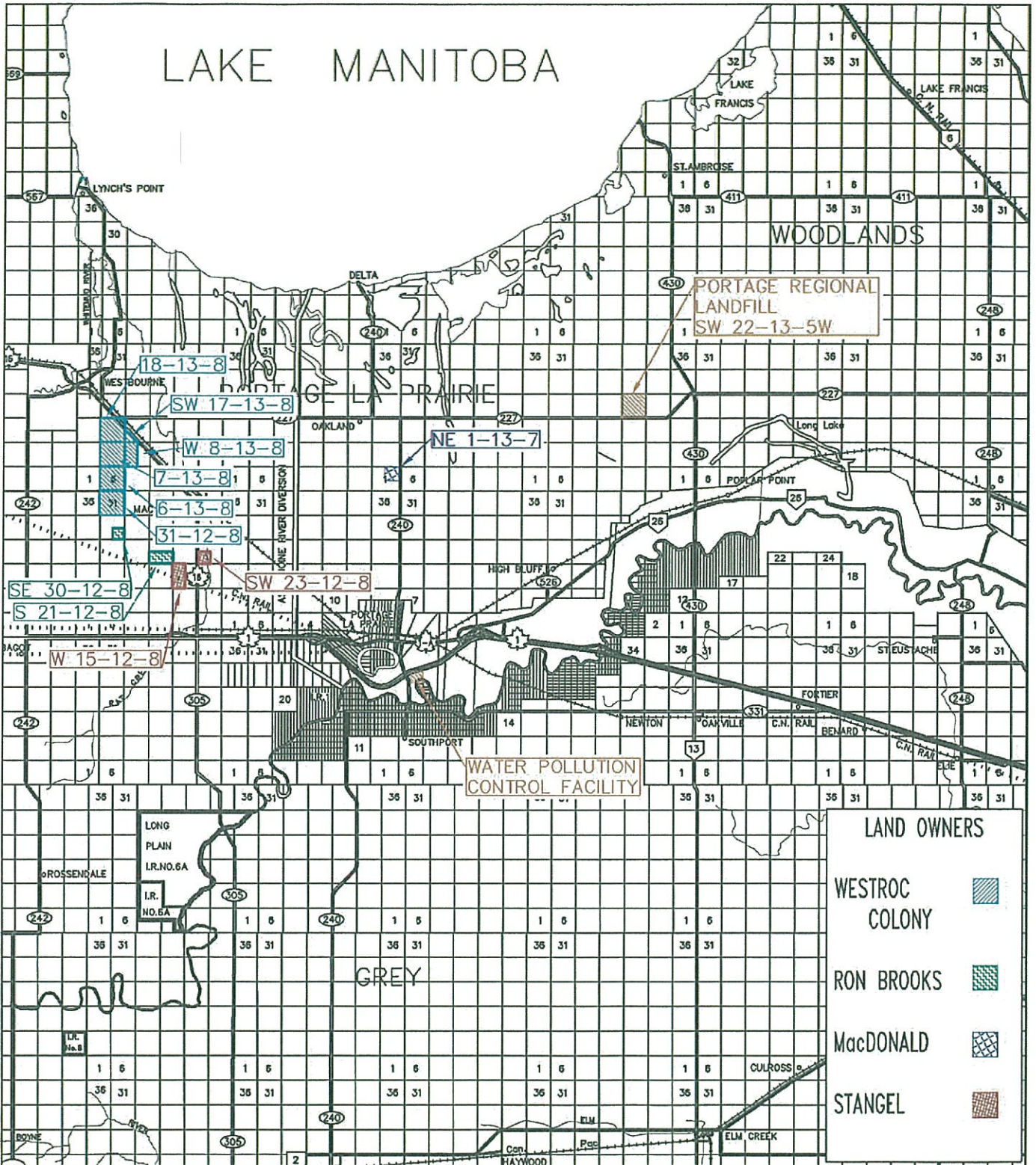
A copy of the intended routes of transport will be sent once they are confirmed by the contractor.  
Please contact me at 204-239-8359 if you have or receive any concerns regarding the above sites.

Sincerely,

A handwritten signature in blue ink, appearing to read 'KF', with a long horizontal flourish extending to the right.

Karly Friesen  
Manager, Wastewater Treatment Division

Cc: Kelly Braden P. Eng., Director of Operations



  
 City of Possibilities

Project  
 2019  
 BIOSOLIDS  
 APPLICATION  
 LAND DESCRIPTION

Sheet	1	yr/m/d	16/03/12
Scale	N.T.S		
Drawing No.	M-214	Rev.	0

The City of Portage la Prairie intends to conduct the Residual Biosolids Land Application Program commencing in the fall of 2019.

Pending soil analysis, biosolids **may** be applied to the following agricultural lands:

**LEGAL DESCRIPTION**

S 21-12-8, SE 30-12-8, NE 1-13-7, W 15-12-8, SW 23-12-8, 31-12-08, 6-13-8, 7-13-8, 8-13-8,  
SW 17-13-8, W 8-13-8

A map of land locations can be found at [www.city-plap.com](http://www.city-plap.com)

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Please contact Karly Friesen, Manager, Wastewater Treatment Division at 204-239-8359 if you have or receive any concerns regarding the above sites.



**APPENDIX B**  
**SUSPENSION OF LICENSE –**  
**CORRESPONDANCE & SUPPORTING DATA**

August 21, 2018

Ms. Tracey Braun  
Environmental Approvals Branch  
Manitoba Sustainable Development  
1007 Century Street  
Winnipeg, Manitoba  
R3H 0W4

**Re: Notice of Alteration for Alternative Digestion Method for Residual Solids Stored in Biosolids Storage Tanks at the Water Pollution Control Facility.**

Dear Ms. Braun:

The City of Portage la Prairie is submitting a Notices of Minor Alteration regarding residual solids material that is stored at the Water Pollution Control Facility (WPCF). The anaerobic digester that processes the residual solids does not provide a 30-day residence time as required in Clause 2, EAL 1907 and would like an equivalent digestion process to be considered for approval. Clause 2 of Biosolids Environment Act License 1907 states, "the licensee shall, after the 1<sup>st</sup> of June 1996, ensure that prior to removal for disposal on agricultural land, the biosolids have been subjected to anaerobic digestion for a period of 30 days at a minimum temperature of 20°C or an equivalent digestion process acceptable to the Director." The mixers in the anaerobic digester failed and solids have accumulated in the tank, reducing the overall capacity which in turn reduces the residence time. The residual materials processed through the anaerobic digester do not comply with the license requirement of 30 days.

The biosolids license uses the time and temperature criteria as a confirmation of bacterial destruction and for the reduction in volatile solids to reduce vector attraction. The US EPA states that for Class B biosolids, (40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge) expected fecal coliforms levels in Class B biosolids should be < 2,000,000 CFU per gram total dry weight. The CCME "A Review of the Current Canadian Legislative Framework for Wastewater Biosolids" also refers to this standard. The US EPA standard states a reduction in volatile solids concentration lowers vector attraction. Through ongoing laboratory analysis, the City of Portage la Prairie has been able to demonstrate that the fecal coliform count is below the EPA standard as stated above. Although the anaerobic digester is not functioning as designed, the intended outcome of bacterial destruction is occurring and meets the US EPA guidelines for Class B biosolids. Regarding the second objective of

reduced vector attraction, this is mitigated when biosolids are injected, as is done by the City of Portage la Prairie.

As required as part of the NOA application, the City of Portage la Prairie engaged AECOM Engineering to review the provision of using EPA guidelines for bacteria count. The memo provided demonstrated how bacterial destruction is considered an equivalent measurement of time and temperature under the EPA guidelines. A copy of this memo was submitted with the original applications. Ongoing monitoring of temperature, pH and coliform counts of residual solids in BST Tank 1 and 2 have been conducted and these results are included with this NOA. Updates of the data will be sent to all as they become available.

The City intends to clean out the digester in 2019 and install two pumps which will return the digester to designed performance. The long-term plan to remedy this situation includes refurbishing the digester with externally located mixing equipment. This is included in the Nutrient Reduction upgrade for the wastewater facility which also includes a second anaerobic digester. This will allow the either digester to be taken offline for maintenance and repair. The current timeline for the construction and operation of the new anaerobic digester is in 2021.

It is necessary for biosolids to be removed from storage to ensure ongoing capacity is available for solids being removed from the secondary system. Without storage room, the solids would accumulate in the secondary system and wash out to the river with the discharged effluent. The City of Portage la Prairie requests that the Director approve the alternative digestion process as described in EAL 1907, clause 2 to allow the land application of biosolids if the requirement of fecal coliform count is below 2,000,000 CFU per dry gram and if biosolids is applied via injection until November 30, 2019.

If you have any questions or require any additional information, please contact me at (204) 239-8359.

Regards,




Karly Friesen  
Manager, Wastewater Treatment Division

Cc: Jay Rackham, Environmental Compliance and Enforcement  
Tyler Kneeshaw, Environmental Compliance and Enforcement  
Kelly Braden P. Eng., Director of Operations  
Natalie Wilson, P. Eng., AECOM Engineering

Notice of Alteration Form



Client File No. :		Environment Act Licence No. : EAL 1907	
Legal name of the Licencee: City of Portage la Prairie			
Name of the development: Water Pollution Control Facility			
Category and Type of development per Classes of Development Regulation: Waste Treatment and Storage <SELECT>			
Licencee Contact Person: Karly Friesen Mailing address of the Licencee: 97 Saskatchewan Ave E City: Portage la Prairie Province: Mb Postal Code: R1N 0L8 Phone Number: 204-239-8359 Fax: Email: kfriesen@city-plap.com			
Name of proponent contact person for purposes of the environmental assessment (e.g. consultant): Natalie Wilson, P.Eng, AECOM Canada			
Phone: 204-982-8322 Fax:		Mailing address: 99 Commerce Dr, Winnipeg, Mb, R3P 0Y7	
Email address: natalie.wilson@aecom.com			
Short Description of Alteration (max 90 characters): Equivalent Digestion Process for biosolids in Storage Tanks 1 & 2 for land application			
Alteration fee attached: Yes: <input type="checkbox"/> No: <input checked="" type="checkbox"/>			
If No, please explain: Minor Alteration with no environmental effects			
Date: 21/8/2019	Signature:  Printed name: Karly Friesen		
<p>A complete Notice of Alteration (NoA) consists of the following components:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Cover letter</li> <li><input checked="" type="checkbox"/> Notice of Alteration Form</li> <li><input type="checkbox"/> 2 hard copies and 1 electronic copy of the NoA detailed report (see "<a href="#">Information Bulletin - Alteration to Developments with Environment Act Licences</a>")</li> <li><input type="checkbox"/> \$500 Application fee, if applicable (Cheque, payable to the Minister of Finance)</li> </ul>		<p><b>Submit the complete NoA to:</b></p> <p>Director Environmental Approvals Branch Manitoba Sustainable Development 1007 Century Street Winnipeg, Manitoba R3H 0W4</p> <p><b>For more information:</b></p> <p>Phone: (204) 945-8321 Fax: (204) 945-5229 <a href="http://www.gov.mb.ca/sd/eal">http://www.gov.mb.ca/sd/eal</a></p>	
<p><b>Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")</b></p>			

## Memorandum

To	Karly Friesen	Page	1
cc	Jean-Marc Nadeau, Kelly Braden		
Subject	Portage la Prairie Water Pollution Control Facility Environment Act Licence 1907 Land Application Review		
From	Natalie Wilson, P.Eng. Simon Baker, M.Sc., P.Eng.		
Date	May 8, 2017	Project Number	60539202

### 1. Introduction

AECOM has been requested by the City of Portage la Prairie to review the current operation of biosolids treatment with respect to Environment Act Licence 1907, issued April 13, 1995. The licence, under General Requirements, Section 2 states that:

*"prior to removal for disposal on agricultural land, the biosolids have been subjected to anaerobic digestion for a period of 30 days at a minimum temperature of 20°C, or an equivalent digestion process acceptable to the Director".*

This provision of the Licence is very typical within the industry as it provides Class B biosolids, as defined by the United States Environmental Protection Agency (USEPA). Due to malfunctions in the digestion process, this provision of the Licence is not being met. However, this memo demonstrates that the biosolids continues to meet the requirements for Class B biosolids and thus is still acceptable for land application.

### 2. Solids Treatment Process

The solids treatment at WPCF involves removing waste activated sludge from the sequencing batch reactors to an aerated equalization tank prior to thickening in two gravity belt thickeners. After thickening the solids stream is directed to one 1900 m<sup>3</sup> digester.

Temperatures in the digester averaged 21°C in 2016. While the calculated retention time averaged 24.5 days in 2016, it is not believed to be representative of actual operation. Due to failure of mixing equipment in the digester, solids have likely accumulated within the digester, which would cause noticeable short circuiting. This short circuiting is believed to decrease the residence time for digestion. After digestion, the solids are stored in two biosolids storage tanks until the land application program, which runs in spring and fall of each year.

### 3. Biosolids Land Application

The USEPA has well-established regulations for land application of biosolids in particular Title 40 of the Code of Federal Regulations, Part 503. The intent of these regulations is to:

*"protect public health and the environment from any reasonably anticipated adverse effects of certain pollutants that might be present in sewage sludge biosolids"*

These regulations are followed throughout the United States and are used in many jurisdictions around the world, including Canada, in the development of biosolids regulations. Although the Province of Manitoba does not necessarily follow all aspects of Part 503, it follows the key requirements of the USEPA, namely controlling pollutant (heavy metals) limits, and requiring a treatment process for pathogen and vector attraction reduction.

**Table 1: Comparison of Licence 1907 and USEPA Part 503**

	<b>Licence 1907</b>	<b>USEPA Part 503</b>
Pollutant (Heavy Metal) limits	Heavy metal application rate (kg/hectare)	Heavy metal application rate (kg/hectare)
Pathogen Reduction Limits	Anaerobic digestion	Three Alternatives are allowed. Alternative 2 includes anaerobic digestion as one of the allowable treatment options.
Vector Attraction Reduction Limits	Injection into the soil	Twelve Options are allowed. Option 9 is for injection into the soil.

Table 1 shows that Licence 1907 follows the same approach for biosolids application as the USEPA 503 regulations. However, due to the faulty mixing equipment, it is likely that the City's digester is not providing sufficient anaerobic digestion time before transfer to the biosolids storage tanks. This means that the biosolids for land application are likely not in strict compliance with the provisions of Licence 1907.

The City needs to dispose of the biosolids currently stored in the biosolids storage tanks and therefore needs to be able to demonstrate that land application without sufficient anaerobic digestion time remains within the overall intent of Licence 1907 i.e. land application of Class B biosolids. AECOM recommends that other provisions of USEPA Part 503 be used to demonstrate that the existing biosolids can be classified as Class B to provide equivalency with the provisions of Licence 1907.

As described in Table 1, Pathogen Reduction Limits in USEPA Part 503 can be one of three Alternatives. All three Alternatives are considered by USEPA as equivalent to each other, i.e. one Alternative is not considered better or worse than another Alternative. Licence 1907 follows the approach of Alternative 2 where treatment in a prescribed process (e.g. anaerobic digestion) is deemed to have reduced pathogens to the necessary level. Alternative 1 requires actual

measurement of pathogens in the biosolids to demonstrate that pathogens have been reduced to the necessary level. Alternative 1 is summarized below:

*"Test for fecal coliform density as an indicator for all pathogens. The geometric mean of seven samples shall be less than 2 million MPNs per gram per total solids or less than 2 million CFUs per gram of total solids at the time of use or disposal."*

Samples of biosolids from Biosolids Storage Tank No.1 have been taken by the City and analyzed for fecal coliform density. The eight samples taken in March and April of 2017 have a geometric mean density of 0.23 million MPNs per gram of total solids, or about ten times lower than the maximum allowed by the USEPA.

#### **4. Conclusion**

Testing shows that the biosolids from Biosolids Storage Tank No.1 contains fecal coliform densities well below the minimum required to demonstrate pathogen reduction when compared to the USEPA Regulations, Part 503 and is therefore suitable for land application subject to compliance with the provisions of Licence 1907 related to heavy metals and sub-surface soil injection.

Date	Digester					BST #1						BST Tank #2								
	pH	Temperature	TSS (mg/L)	VSSIn	VSSout	pH	Conductivity	Temperature (oC)	TSS (mg/L)	VSS (mg/L)	Fecal Coliform (MPN/100mL)	Fecal Coliform (MPN/dry gram) (calculated)	pH	Conductivity	Temperature (oC)	TSS (mg/L)	VSS (mg/L)	Fecal Coliform (MPN/100mL)	Fecal Coliform (MPN/dry gram) (calculated)	
7/30/2019	6.7	36.2	37500	24100	25350	6.7	3770	15.3	11750	7820	2620	2230								
7/31/2019	6.7	29.8	35900	24700	24550	6.7		15.3	8040	5530	1600	1990								
8/1/2019	6.6	30	36300	22700	24400	6.6		15.4	1503	1072	410	2728								
8/2/2019	6.7	26.7	33250	28250	23400															
8/3/2019		27.1	38200	31300	29400															
8/4/2019		26.2	31900	36700	22400															
8/5/2019		30.1	40600	24100	27500															
8/6/2019	6.9	27	41200	38400	27250		3760	15.1	14900	11500	750	503		3060	18.2	59500	39600	1600	269	
8/7/2019	6.8	26.5	38750	29350	26250	7.0		15.3	21800	15250	1340	615	6.8		15.5	13200	9950	1710	1295	
8/8/2019	6.8	25.2	36800	24350	24800	6.7		15.0	10900	8100	1340	1229	6.6		17.3	10900	8100	14600	13394	
8/9/2019	6.8	26.2	32350	33050	22150															
8/10/2019		21.4	39200	19300	24200															
8/11/2019		25.5	31900	23100	21700															
8/12/2019	6.8	25	33550	23250	22900	6.6		17.0	34900	24800	2010	576	6.6		17.9	37200	25200	1600	430	
8/13/2019	6.7	27.4	38000	33650	29050	6.7	3750	15.6	12250	9200	1600	1306	6.8	3170	17.8	48300	32900	2660	551	
8/14/2019	7.0	23.6	19400	24800	14600	6.7		15.3	9900	6710	2010	2030	6.7		17.8	28040	18450	1990	710	
8/15/2019	6.8	27.5	25800	21650	18800															
8/16/2019	6.8	29.9	33950	22600	23600															
8/17/2019		27.3	30100		20800															
8/18/2019		23.7	32100		22100															
8/19/2019	6.6		37750		25300	6.7		15.7	10110	6790	1340	1325	6.6		17.6	35700	23750	1210	339	
8/20/2019	6.7		33200		21950	6.8	Pending	15.9	117400	7860	Pending	Pending	6.7	Pending	18.1	33100	23500	Pending	Pending	
8/21/2019											Pending	Pending						Pending	Pending	





## Sustainable Development

Environmental Stewardship Division  
Environmental Approvals Branch  
1007 Century Street, Winnipeg, Manitoba, Canada R3H 0W4  
T 204 945-8321 F 204-945-5229  
[www.gov.mb.ca/sd](http://www.gov.mb.ca/sd)

File: 1020.30

September 3, 2019

Karly Friesen  
Manager, Wastewater Treatment Division  
City of Portage la Prairie  
97 Saskatchewan Avenue East  
Portage la Prairie, MB R1N 0L8

Dear Ms. Friesen:

**Re: Application for Alternative Digestion – City of Portage la Prairie Water Pollution Control Facility – Biosolids Storage Tanks**

I am responding to your August 21, 2019 Notice of Alteration (NoA) consisting of a request for approval for an alternative digestion method for the stabilization of biosolids materials that originate from the City of Portage la Prairie Water Pollution Control Facility (Facility) and are currently held in the biosolids storage tanks at the Facility. Environment Act Licence No. 1907 relates to the sludge solids disposal activities associated with the Facility.

The August 21, 2019 letter indicates that solids have again accumulated in the digesters, creating short-circuiting and reductions in digester residence time. The letter and attachment indicate that recent laboratory analysis demonstrates that interim bacterial destruction has occurred and that the fecal coliform count of the biosolids is below what the US EPA states as the maximum allowable for Class B biosolids. A previously submitted memorandum from AECOM dated May 8, 2017 concluded that, compared with US EPA Regulations Part 503, testing of biosolids from the biosolids storage tanks No. 1 had indicated that similar material was suitable for land application subject to compliance with the provisions of Environment Act Licence No. 1907 related to heavy metals and sub-surface soil injection.

Through ongoing laboratory analysis, the City of Portage la Prairie has again determined that the fecal coliform count of the biosolids currently contained in the biosolids storage tanks is below the maximum allowable for Class B biosolids. The NoA requests authorization to land apply biosolids from the biosolids storage tanks via injection until November 30, 2019.

Upon review of the NoA and the Licence, I have decided that the environmental impacts of the proposed alteration are insignificant. Accordingly, pursuant to Section 14(2) of The Environment Act, I hereby approve the request to allow the biosolids from the biosolids storage tanks to be land applied subject to the following limits, terms and conditions:

1. All associated activities are completed in accordance with the requirements of Environment Act Licence No. 1907;

...2/

2. The City of Portage la Prairie shall submit updates of monitoring activities and data associated with the removal biosolids from the biosolids storage tanks for hauling and land application by sub-surface injection to the assigned Environment Officers once every week as the related monitoring and land application activities commence or as may be requested by the assigned Environment Officers;
3. The City of Portage la Prairie shall not apply, or allow to be applied, biosolids from the biosolids storage tanks to land where the fecal coliform count of the biosolids exceeds 2,000,000 CFU per dry gram; and
4. This approval shall terminate on the 10<sup>th</sup> day of November 2019, unless otherwise approved by the Director.

Unless otherwise indicated, the assigned Environment Officers for activities associated with the removal biosolids from the biosolids storage tanks for land application shall be Jay Rackham of the Environmental Compliance and Enforcement Branch ([Jay.Rackham@gov.mb.ca](mailto:Jay.Rackham@gov.mb.ca)) and Robert Boswick of the Environmental Approvals Branch ([Robert.Boswick@gov.mb.ca](mailto:Robert.Boswick@gov.mb.ca)).

If you have any questions or would like to discuss the foregoing, please contact Robert Boswick, Environmental Engineer, at 204-945-6030.

Yours sincerely,



Siobhan Burland Ross, M.Eng., P.Eng.  
Director  
Environment Act

c: Yvonne Hawryliuk/Tyler Kneeshaw/Jay Rackham, Environmental Compliance and Enforcement Branch  
Robert Boswick, Environmental Approvals Branch  
Public Registries

**APPENDIX C**  
**APPLICATION AREA SUMMARY, SOIL TESTING,**  
**BIOSOLIDS TESTING AND ANALYTICAL RESULTS**

**FALL**

**NE 1-13-7**

**SE 30-12-8**

---

September 4, 2019

Mr. Tyler Kneeshaw  
Regional Supervisor- Environment Officer  
Manitoba Sustainable Development  
309-25 Tupper Street North  
Portage la Prairie, MB  
R1N 3K1

Re: 2019 Residual Biosolids Application Program Truck Routes

Dear Mr. Kneeshaw:

Please find the enclosed route maps for spring biosolids application for review and comment. Transport and application of biosolids is scheduled to begin on Monday, September 9, 2019, pending dry weather conditions. Should there be any concerns throughout the hauling process with traffic or dust, please do not hesitate to contact myself as the contractor is responsible for both items.

Please direct any questions or concerns regarding routing to myself at 204-239-8359.

Sincerely,



Karly Friesen  
Manager, Wastewater Treatment Division

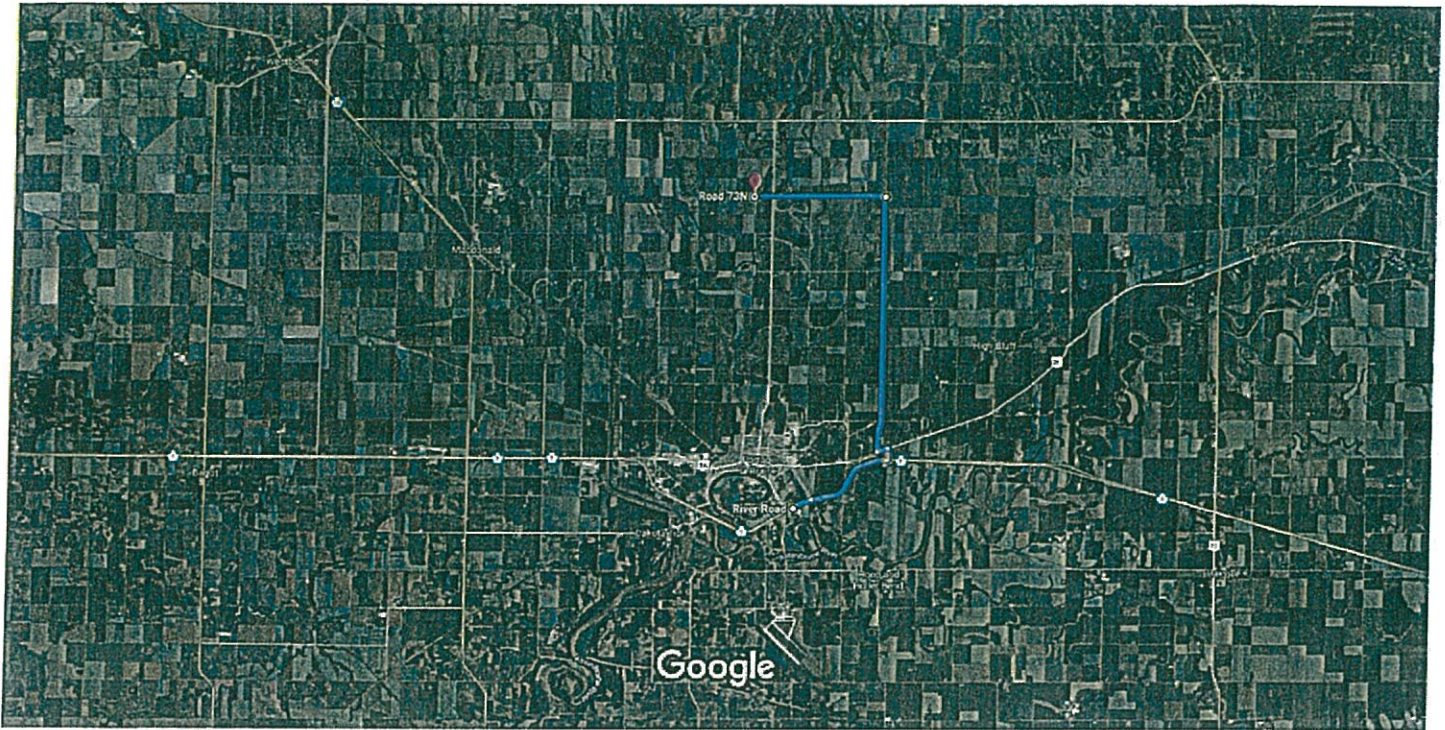
Cc: Kelly Braden, P. Eng., Director of Operations



River Rd, Southport, MB R0H 1N1 to Road 73N, Macdonald, MB R0H 0S0

Drive 23.0 km, 28 min

To Field NE 1-13-7 (McDonald)



Imagery ©2019 Maxar Technologies, CNES / Airbus, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019 2 km

### River Rd

Southport, MB R0H 1N1

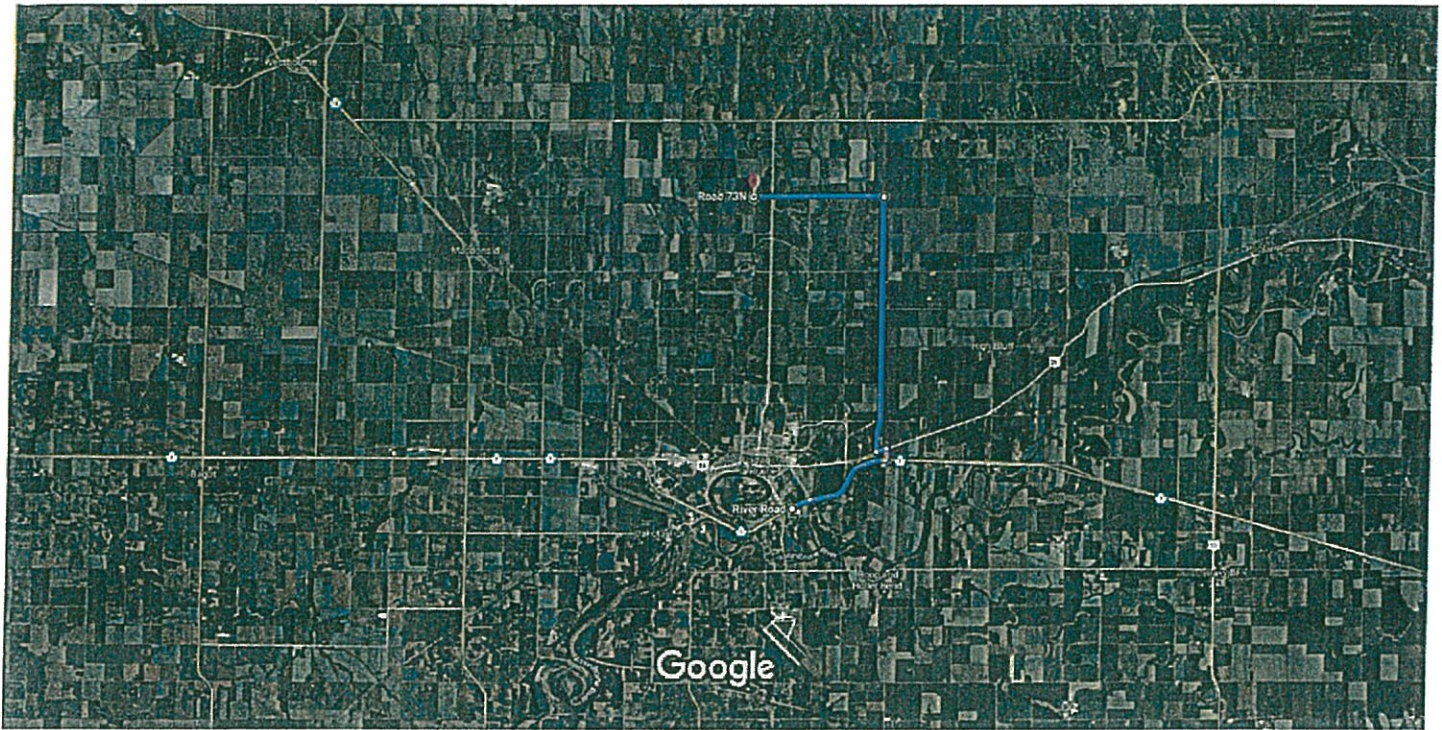
- ↑ 1. Head northeast on River Rd  
900 m
- ↶ 2. Turn left at the 1st cross street toward Trans-Canada Hwy/MB-1 E  
34 m
- ↷ 3. Turn right at the 1st cross street onto Trans-Canada Hwy/MB-1 E  
4.0 km
- ↶ 4. Turn left onto MB-26 E  
500 m
- ↶ 5. Turn left  
500 m
- ↷ 6. Turn right onto Rd 33W  
11.2 km
- ↶ 7. Turn left onto Road 73N  
  - 📍 Destination will be on the left
5.7 km



River Rd, Southport, MB R0H 1N1 to Road 73N, Macdonald, MB R0H 0S0

Drive 23.0 km, 28 min

From Field NE 1-13-7 (McDonald) to WPCF



Imagery ©2019 Maxar Technologies, CNES / Airbus, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019 2 km

### River Rd

Southport, MB R0H 1N1

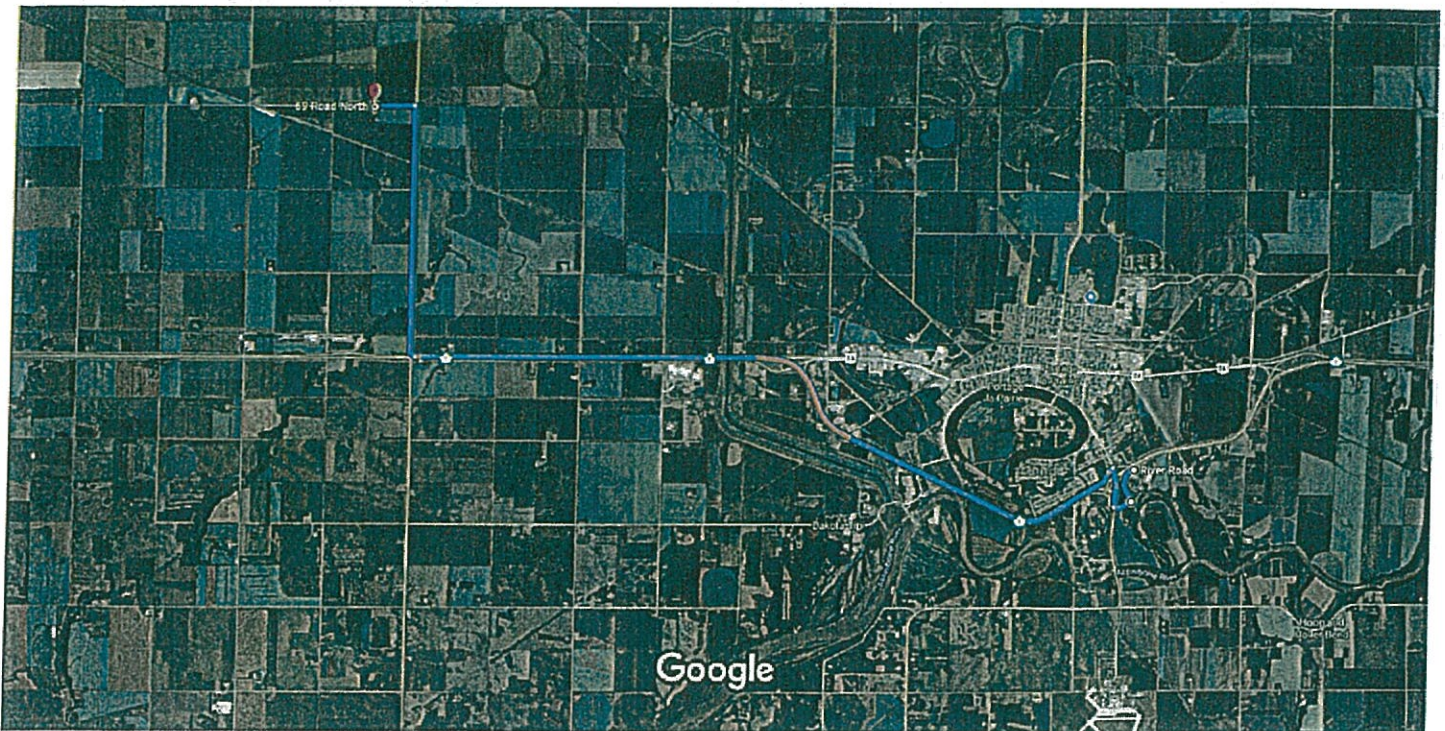
- ↑ 1. Head northeast on River Rd  
900 m
- ↶ 2. Turn left at the 1st cross street toward Trans-Canada Hwy/MB-1 E  
34 m
- ↷ 3. Turn right at the 1st cross street onto Trans-Canada Hwy/MB-1 E  
4.0 km
- ↶ 4. Turn left onto MB-26 E  
500 m
- ↶ 5. Turn left  
500 m
- ↷ 6. Turn right onto Rd 33W  
11.2 km
- ↶ 7. Turn left onto Road 73N  
Destination will be on the left  
5.7 km



River Rd, Southport, MB R0H 1N1 to 69 Rd N, Macdonald, MB R0H 0S0

Drive 23.0 km, 19 min

To W 15-12-8 (Stangl) and Return to WPCF



Imagery ©2019 Maxar Technologies, CNES / Airbus, Southport Aerospace, Imagery ©2019 TerraMetrics, Map data ©2019 1 km

### River Rd

Southport, MB R0H 1N1

- ↑ 1. Head southwest on River Rd toward Norah St  
750 m
- ↗ 2. Turn right onto Norah St  
350 m
- ↗ 3. Turn right onto River Rd/MB-240 N  
800 m
- ↖ 4. Turn left to merge onto Trans-Canada Hwy/MB-1 W  
15.3 km
- ↗ 5. Turn right onto MB-16 W (signs for Trans Canada Highway/Saskatoon/Neepawa/Yellow Head Highway)  
5.0 km
- ↖ 6. Turn left onto 69 Rd N  
Destination will be on the left  
800 m

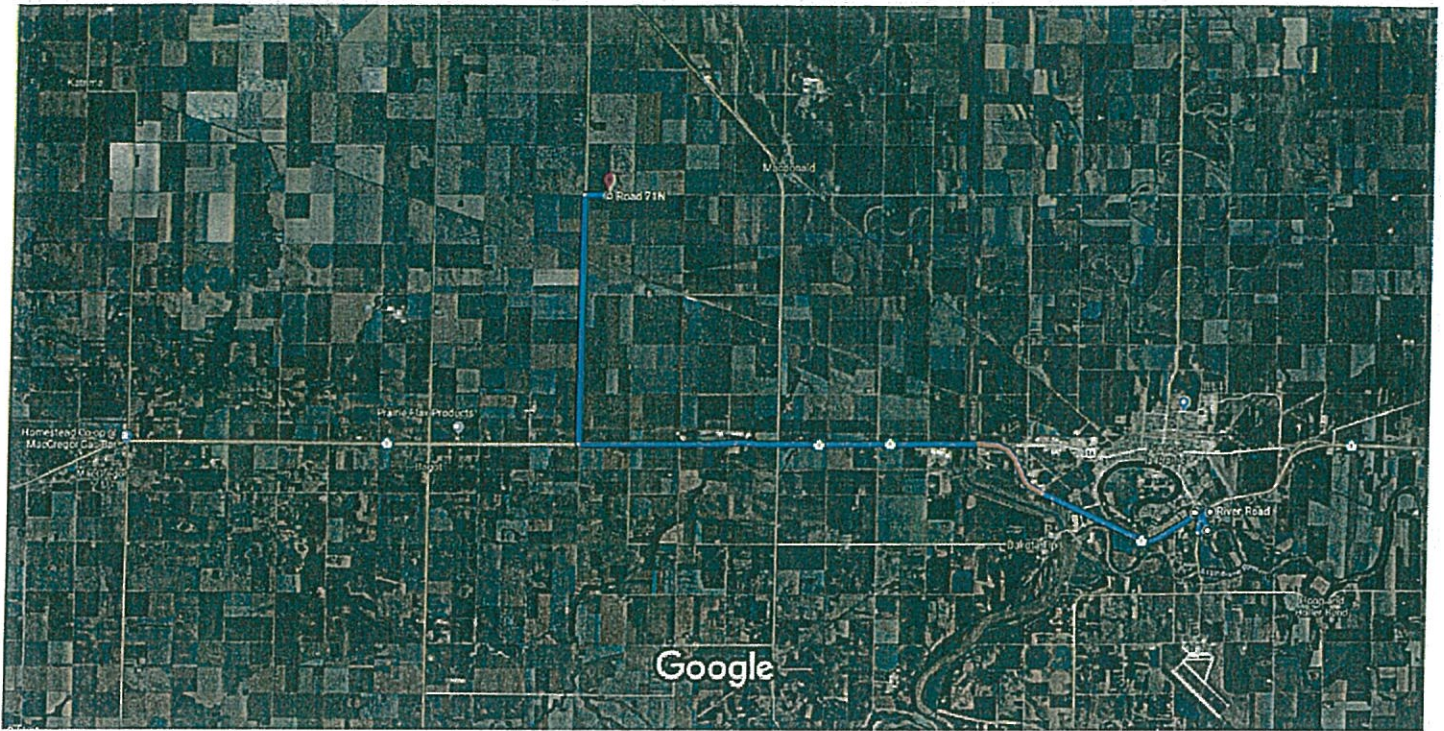
### 69 Rd N



River Rd, Southport, MB R0H 1N1 to Rd 71N, Macdonald, MB R0H 0S0

Drive 32.9 km, 29 min

To S 21-12-8 (Brooks)



Imagery ©2019 Maxar Technologies, CNES / Airbus, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019 2 km

### River Rd

Southport, MB R0H 1N1

- ↑ 1. Head southwest on River Rd toward Norah St  
750 m
  - ↘ 2. Turn right onto Norah St  
350 m
  - ↘ 3. Turn right onto River Rd/MB-240 N  
800 m
  - ↙ 4. Turn left to merge onto Trans-Canada Hwy/MB-1 W  
22.0 km
  - ↘ 5. Turn right onto Road 48W  
8.2 km
  - ↘ 6. Turn right onto Rd 71N  
800 m
- i** Destination will be on the right

### Rd 71N

Macdonald, MB R0H 0S0

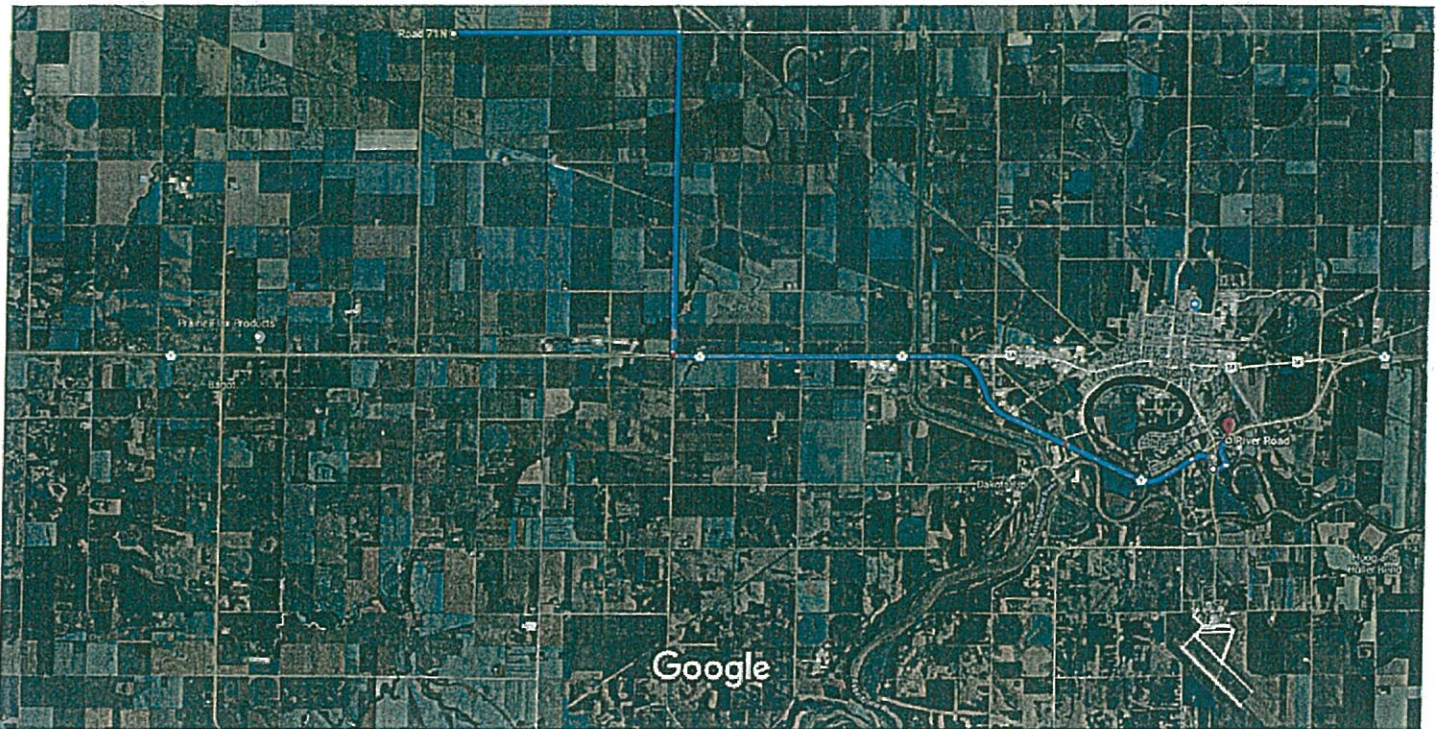




Rd 71N, Macdonald, MB R0H 0S0 to River Rd, Southport, MB R0H 1N1

Drive 30.7 km, 28 min

From S 21-12-8 (Brooks) to WPCF



Imagery ©2019 Maxar Technologies, CNES / Airbus, Southport Aerospace, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019

### Rd 71N

Macdonald, MB R0H 0S0

- ↑ 1. Head east on Rd 71N toward Road 47W  
5.7 km
- ↘ 2. Turn right onto MB-16 E  
8.1 km
- ↙ 3. Turn left onto Trans-Canada Hwy/MB-1 E (signs for Trans Canada Highway/Winnipeg/Yellow Head Highway)  
14.8 km
- ↘ 4. Take the MB-240 exit toward Southport/Portage  
600 m
- ↘ 5. Turn right onto River Rd/MB-240 S (signs for Southport)  
350 m
- ↙ 6. Turn left onto Norah St  
350 m
- ↙ 7. Turn left onto River Rd  
750 m

**i** Destination will be on the right

---

---

September 4, 2019

Ms. Nettie Neudorf, CPA, CGA, CMMA  
Chief Administrative Officer  
Rural Municipality of Portage la Prairie  
35 Tupper Street South  
Portage la Prairie, MB R1N 1W7

**Re: 2019 Residual Biosolids Application Program Truck Routes**

Dear Ms. Neudorf:

Please find the enclosed route maps for spring biosolids application, for review and comment. Transport and application of biosolids is scheduled to begin on Monday, September 9, 2019, pending dry weather conditions. Should there be any concerns throughout the hauling process with traffic or dust, please do not hesitate to contact myself as the contractor is responsible for these items.

Please direct any questions or concerns regarding routing to myself at 204-239-8359.

Sincerely,



Karly Friesen  
Manager, Wastewater Treatment Division

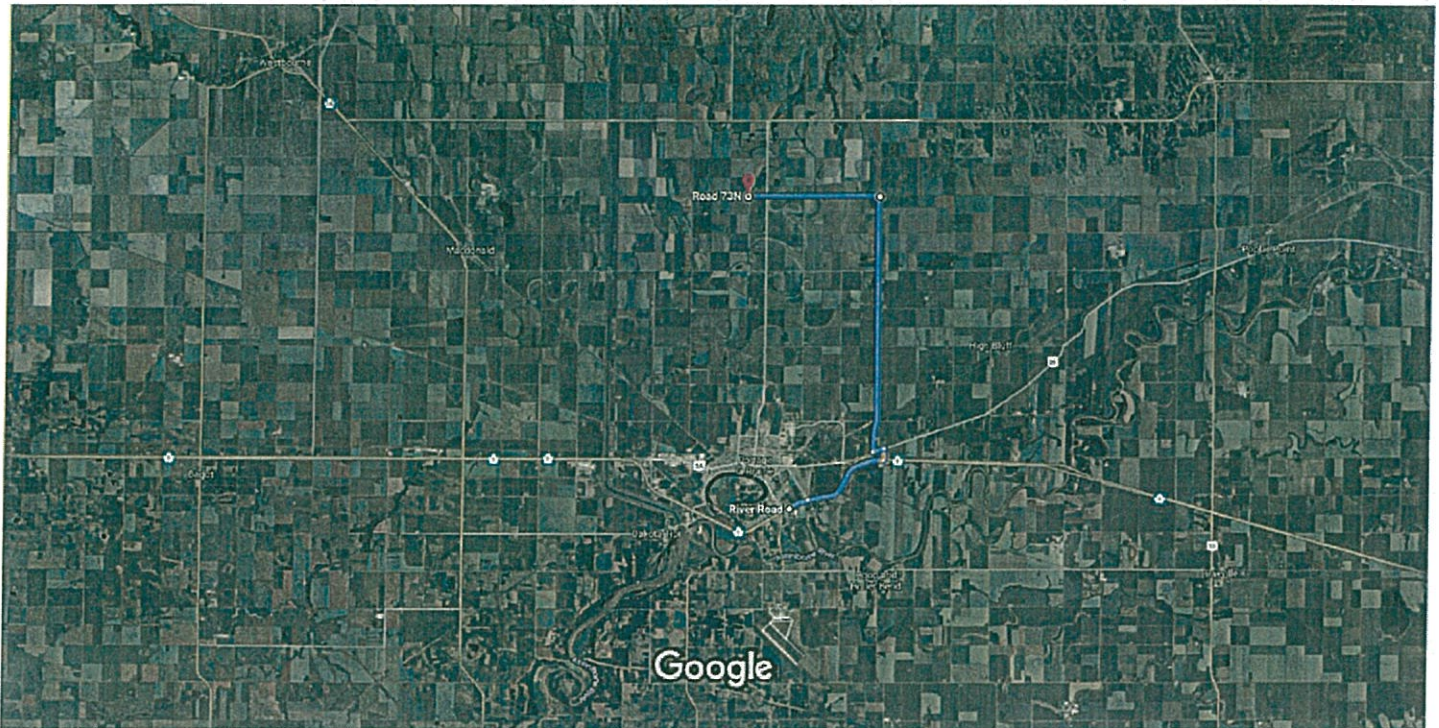
Cc: Kelly Braden, P. Eng., Director of Operations



River Rd, Southport, MB R0H 1N1 to Road 73N, Macdonald, MB R0H 0S0

Drive 23.0 km, 28 min

To Field NE 1-13-7 (McDonald)



Imagery ©2019 Maxar Technologies, CNES / Airbus, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019 2 km

### River Rd

Southport, MB R0H 1N1

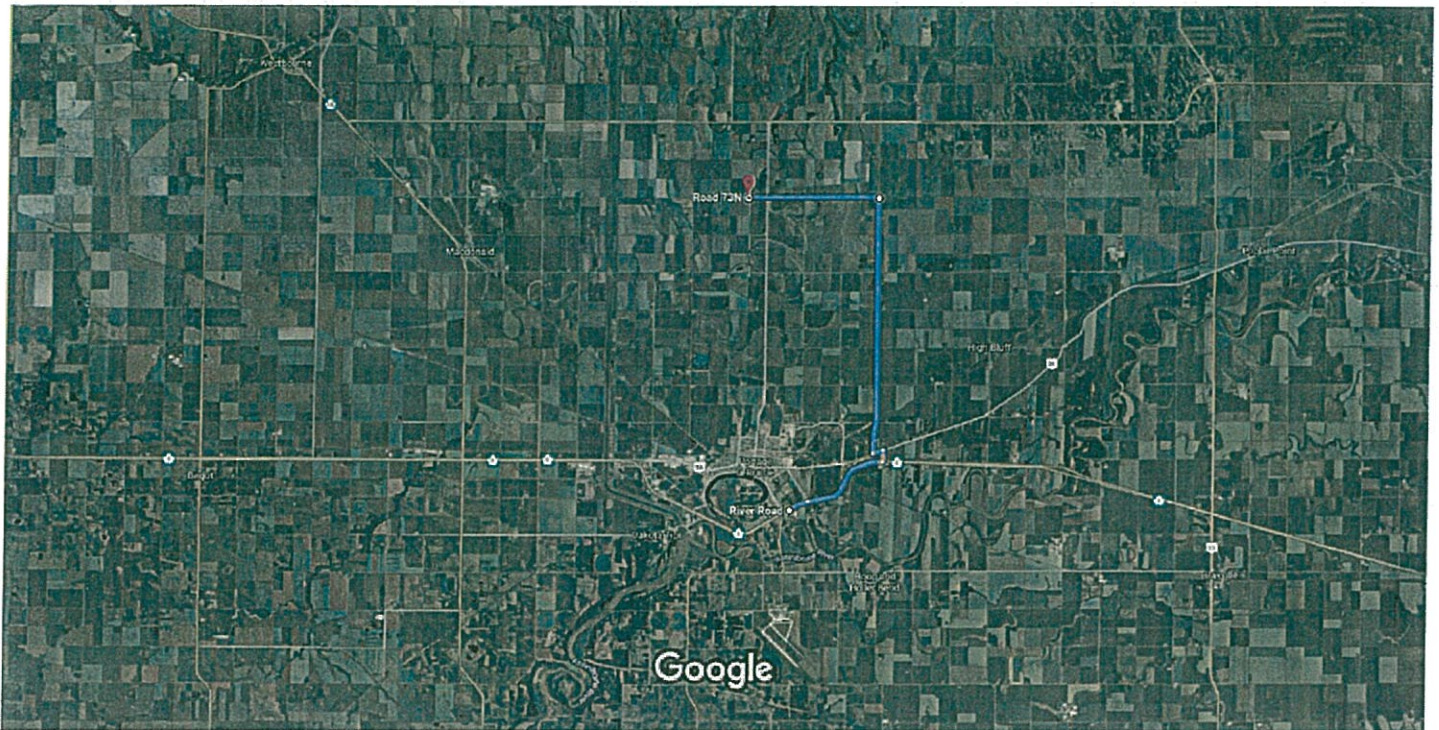
- ↑ 1. Head northeast on River Rd  
----- 900 m
- ↶ 2. Turn left at the 1st cross street toward Trans-Canada Hwy/MB-1 E  
----- 34 m
- ↷ 3. Turn right at the 1st cross street onto Trans-Canada Hwy/MB-1 E  
----- 4.0 km
- ↶ 4. Turn left onto MB-26 E  
----- 500 m
- ↶ 5. Turn left  
----- 500 m
- ↷ 6. Turn right onto Rd 33W  
----- 11.2 km
- ↶ 7. Turn left onto Road 73N  
  - 📍 Destination will be on the left
----- 5.7 km



River Rd, Southport, MB R0H 1N1 to Road 73N, Macdonald, MB R0H 0S0

Drive 23.0 km, 28 min

From Field NE 1-13-7 (McDonald) to WPCF



Imagery ©2019 Maxar Technologies, CNES / Airbus, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019 2 km

### River Rd

Southport, MB R0H 1N1

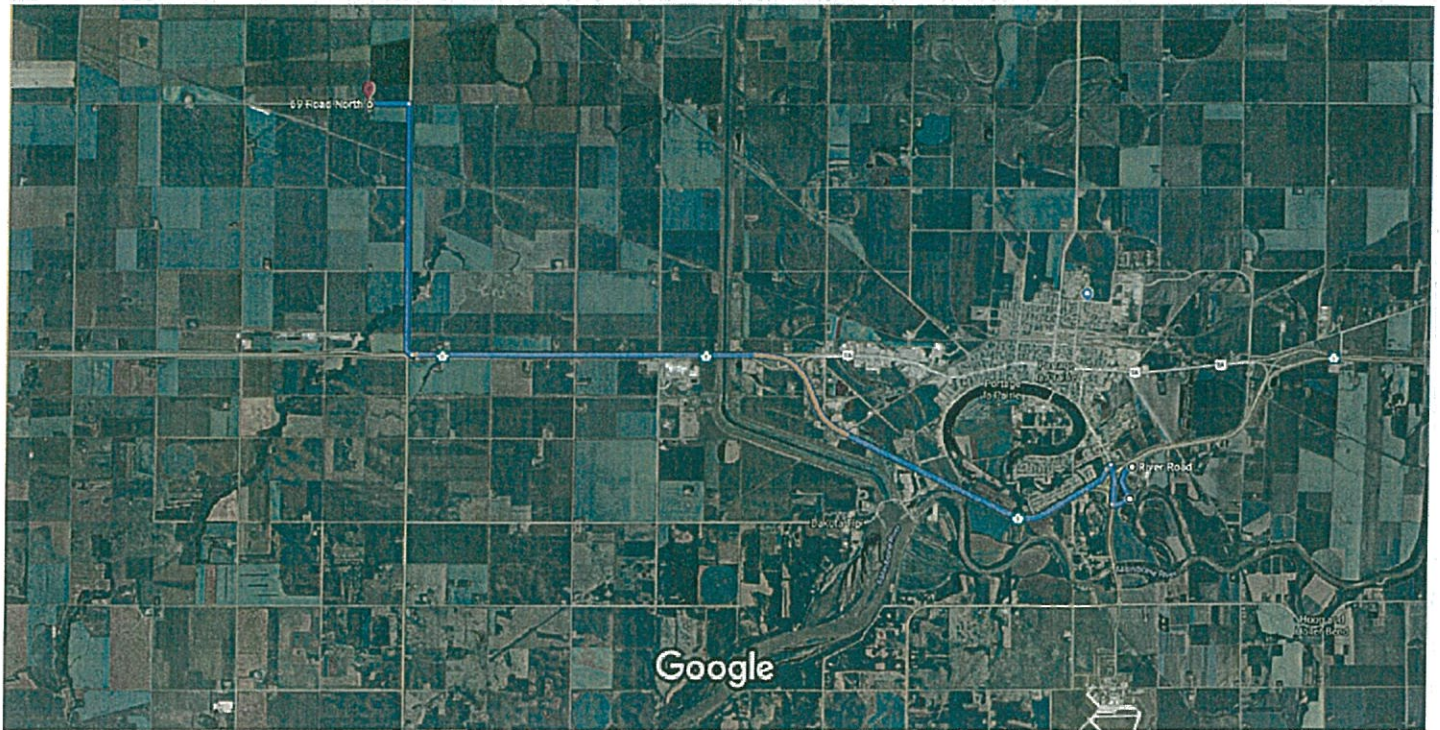
- ↑ 1. Head northeast on River Rd  
----- 900 m
- ↶ 2. Turn left at the 1st cross street toward Trans-Canada Hwy/MB-1 E  
----- 34 m
- ↷ 3. Turn right at the 1st cross street onto Trans-Canada Hwy/MB-1 E  
----- 4.0 km
- ↶ 4. Turn left onto MB-26 E  
----- 500 m
- ↶ 5. Turn left  
----- 500 m
- ↷ 6. Turn right onto Rd 33W  
----- 11.2 km
- ↶ 7. Turn left onto Road 73N  
  - 📍 Destination will be on the left
----- 5.7 km



River Rd, Southport, MB R0H 1N1 to 69 Rd N, Macdonald, MB R0H 0S0

Drive 23.0 km, 19 min

To W 15-12-8 (Stangl) and Return to WPCF



Imagery ©2019 Maxar Technologies, CNES / Airbus, Southport Aerospace, Imagery ©2019 TerraMetrics, Map data ©2019 1 km

### River Rd

Southport, MB R0H 1N1

- ↑ 1. Head southwest on River Rd toward Norah St  
----- 750 m
- ➡ 2. Turn right onto Norah St  
----- 350 m
- ➡ 3. Turn right onto River Rd/MB-240 N  
----- 800 m
- ↙ 4. Turn left to merge onto Trans-Canada Hwy/MB-1 W  
----- 15.3 km
- ➡ 5. Turn right onto MB-16 W (signs for Trans Canada Highway/Saskatoon/Neepawa/Yellow Head Highway)  
----- 5.0 km
- ↙ 6. Turn left onto 69 Rd N  
  - 📍 Destination will be on the left
----- 800 m

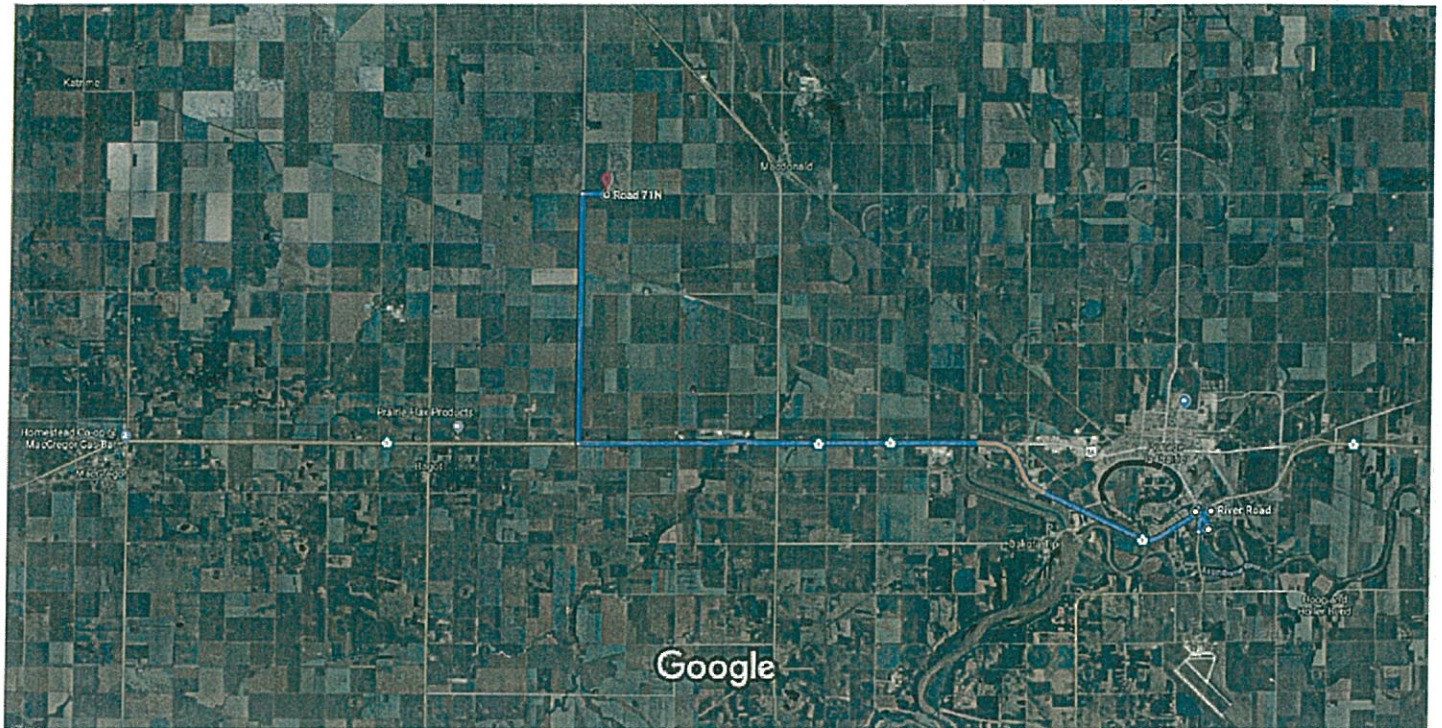
### 69 Rd N



River Rd, Southport, MB R0H 1N1 to Rd 71N, Macdonald, MB R0H 0S0

Drive 32.9 km, 29 min

To S 21-12-8 (Brooks)



Imagery ©2019 Maxar Technologies, CNES / Airbus, Maxar Technologies, Imagery ©2019 TerraMetrics, Map data ©2019 2 km

### River Rd

Southport, MB R0H 1N1

- ↑ 1. Head southwest on River Rd toward Norah St  
----- 750 m
- 2. Turn right onto Norah St  
----- 350 m
- 3. Turn right onto River Rd/MB-240 N  
----- 800 m
- ⤴ 4. Turn left to merge onto Trans-Canada Hwy/MB-1 W  
----- 22.0 km
- 5. Turn right onto Road 48W  
----- 8.2 km
- 6. Turn right onto Rd 71N  
  - 📍 Destination will be on the right
----- 800 m

### Rd 71N

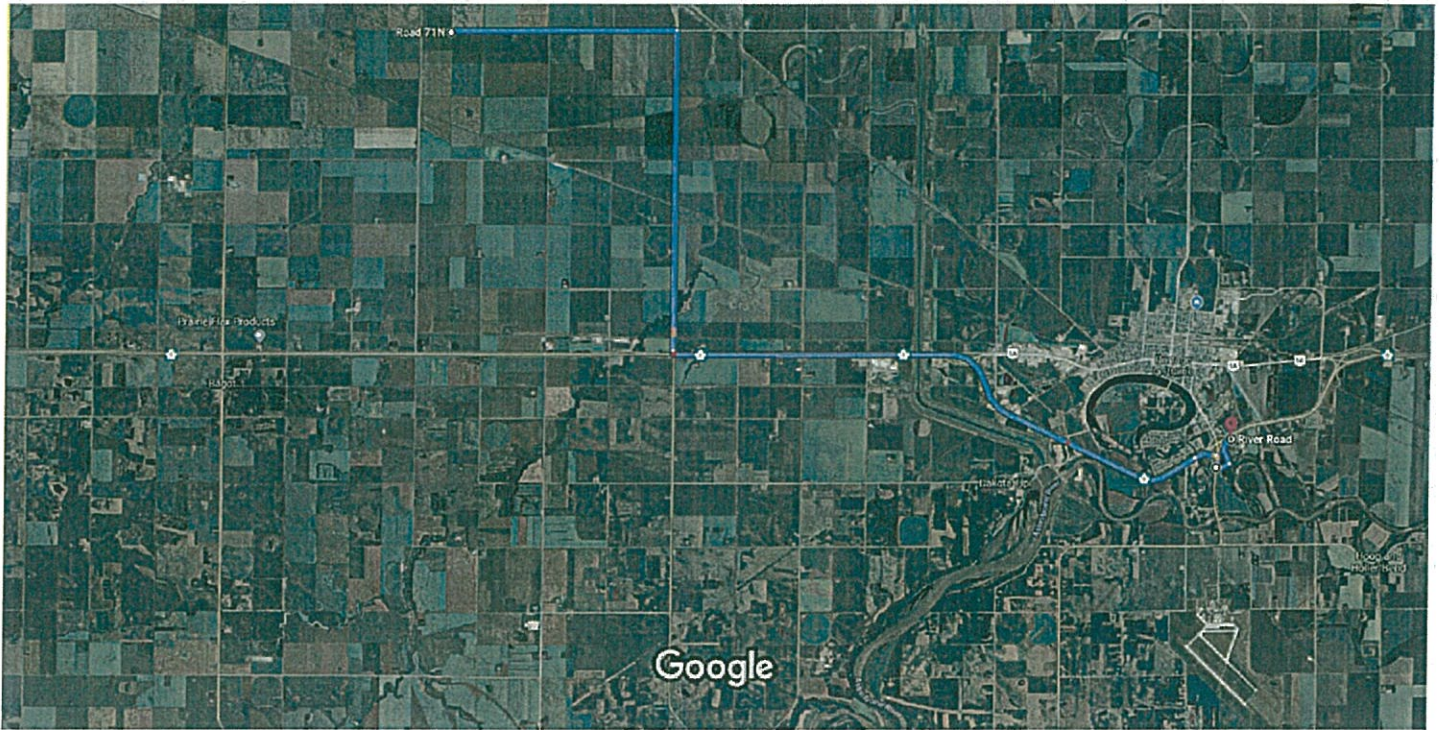
Macdonald, MB R0H 0S0



Rd 71N, Macdonald, MB R0H 0S0 to River Rd, Southport, MB R0H 1N1

Drive 30.7 km, 28 min

From S 21-12-8 (Brooks) to WPCF



Imagery ©2019 Maxar Technologies, CNES / Airbus, Southport Aerospace, Maxar Technologies, Imagery ©2019 TerraMetrics, Map 2 km data ©2019

### Rd 71N

Macdonald, MB R0H 0S0

- ↑ 1. Head east on Rd 71N toward Road 47W  
----- 5.7 km
- ➔ 2. Turn right onto MB-16 E  
----- 8.1 km
- ↶ 3. Turn left onto Trans-Canada Hwy/MB-1 E (signs for Trans Canada Highway/Winnipeg/Yellow Head Highway)  
----- 14.8 km
- ➔ 4. Take the MB-240 exit toward Southport/Portage  
----- 600 m
- ➔ 5. Turn right onto River Rd/MB-240 S (signs for Southport)  
----- 350 m
- ↶ 6. Turn left onto Norah St  
----- 350 m
- ↶ 7. Turn left onto River Rd  
  - 📍 Destination will be on the right
----- 750 m

BRADEN  
McDonald

## LETTER OF AGREEMENT

Mr. Kelly Braden, P.Eng.  
Director of Operations  
City of Portage la Prairie  
97 Saskatchewan Ave. E.  
Portage la Prairie, MB  
R1N 0L8



Dear Land Owner:

I hereby agree to permit the City of Portage la Prairie to apply wastewater treatment residual biosolids to the land, which I own as described below, on the understanding that:

1. The biosolids will be injected approximately 15 cm below the surface.
2. The biosolids will be injected to a maximum rate of 10 dry tonnes per hectare. (Maximum allowable over a 4-year period.)
3. Application will occur in the 2019 crop year, or as otherwise indicated.
4. Biosolids application will not be closer than 300 meters to a dwelling not belonging to the owner or lessee of the land on which biosolids are applied.
5. Biosolids will not be applied within 15 meters of a ditch draining less than one section and 30 meters from drains serving a larger watershed.
6. All roadways, access roads, and ditches will be repaired to the original condition upon completion of the application program, to the satisfaction of the City, municipality and the landowner.
7. The City makes no warranties or representations as to the fertilizer content nor any soil conditioning effect of the biosolids.
8. The City will determine background levels of nutrients, heavy metals, pH, and clay depth prior to the application of biosolids. This information will be provided to the landowner.
9. The City will assess the biosolids quality prior to the application program and will monitor it throughout the program. Test results will be provided to the landowner.
10. Temporary halting of the application due to wet field conditions will occur upon mutual agreement between representatives of the City, contractor and landowner.
11. Biosolids may be injected at a maximum rate of addition of plant-available nitrogen of 100 kilograms per hectare.
12. The cumulative mass per hectare of each heavy metal in the soil does not exceed the respective value stipulated in the City's Environment Act License, and that not more than one-third of the initial maximum addition of each heavy metal will be applied in this year's program.
13. The City will restore the field to a condition similar that as found prior to the application program.



## LETTER OF AGREEMENT

I, on my part, agree to:

- a) Plant a cereal, oilseed, forage, field pea, or lentil crop at the beginning of the next growing season. Only these listed crops will be grown for three growing seasons following biosolids application. A crop will not be grown that is a vegetable or a fruit and livestock will not be allowed to graze for three growing seasons after biosolids application on the land.
- b) Provide crop information to the City on an annual basis.
- c) Consider the soil and biosolids test results prior to applying nitrogen fertilizer in the growing season following biosolids application and restrict the addition of plant-available nitrogen to a maximum of 100 kg/ha, including that derived from the application of biosolids. Fertilizer, including that derived from biosolids, will be applied at the recommended agronomic rates.
- d) Release and discharge the City of Portage la Prairie of and from all claims, demands, actions or causes of actions which I have or may have as the result of the application of wastewater biosolids to my land.
- e) Provide the City with a letter of acceptance upon completion of the biosolids application indicating my acceptance of field conditions.
- f) Notify the lessee of the land (if applicable) of this agreement.

Yours truly,



Land Owner



City Representative

8/14/2019  
Date

8/14/2019  
Date

Land Location(s): NE 1-13-7

\_\_\_\_\_

Brooks

## LETTER OF AGREEMENT

Mr. Kelly Braden, P.Eng.  
Director of Operations  
City of Portage la Prairie  
97 Saskatchewan Ave. E.  
Portage la Prairie, MB  
R1N 0L8



Dear Land Owner:

I hereby agree to permit the City of Portage la Prairie to apply wastewater treatment residual biosolids to the land, which I own as described below, on the understanding that:

1. The biosolids will be injected approximately 15 cm below the surface.
2. The biosolids will be injected to a maximum rate of 10 dry tonnes per hectare. (Maximum allowable over a 4-year period.)
3. Application will occur in the 2019 crop year, or as otherwise indicated.
4. Biosolids application will not be closer than 300 meters to a dwelling not belonging to the owner or lessee of the land on which biosolids are applied.
5. Biosolids will not be applied within 15 meters of a ditch draining less than one section and 30 meters from drains serving a larger watershed.
6. All roadways, access roads, and ditches will be repaired to the original condition upon completion of the application program, to the satisfaction of the City, municipality and the landowner.
7. The City makes no warranties or representations as to the fertilizer content nor any soil conditioning effect of the biosolids.
8. The City will determine background levels of nutrients, heavy metals, pH, and clay depth prior to the application of biosolids. This information will be provided to the landowner.
9. The City will assess the biosolids quality prior to the application program and will monitor it throughout the program. Test results will be provided to the landowner.
10. Temporary halting of the application due to wet field conditions will occur upon mutual agreement between representatives of the City, contractor and landowner.
11. Biosolids may be injected at a maximum rate of addition of plant-available nitrogen of 100 kilograms per hectare.
12. The cumulative mass per hectare of each heavy metal in the soil does not exceed the respective value stipulated in the City's Environment Act License, and that not more than one-third of the initial maximum addition of each heavy metal will be applied in this year's program.
13. The City will restore the field to a condition similar that as found prior to the application program.

## LETTER OF AGREEMENT

I, on my part, agree to:

- a) Plant a cereal, oilseed, forage, field pea, or lentil crop at the beginning of the next growing season. Only these listed crops will be grown for three growing seasons following biosolids application. A crop will not be grown that is a vegetable or a fruit and livestock will not be allowed to graze for three growing seasons after biosolids application on the land.
- b) Provide crop information to the City on an annual basis.
- c) Consider the soil and biosolids test results prior to applying nitrogen fertilizer in the growing season following biosolids application and restrict the addition of plant-available nitrogen to a maximum of 100 kg/ha, including that derived from the application of biosolids. Fertilizer, including that derived from biosolids, will be applied at the recommended agronomic rates.
- d) Release and discharge the City of Portage la Prairie of and from all claims, demands, actions or causes of actions which I have or may have as the result of the application of wastewater biosolids to my land.
- e) Provide the City with a letter of acceptance upon completion of the biosolids application indicating my acceptance of field conditions.
- f) Notify the lessee of the land (if applicable) of this agreement.

Yours truly,

  
\_\_\_\_\_  
Land Owner

  
\_\_\_\_\_  
City Representative

14/08/2019  
\_\_\_\_\_  
Date

14/8/2019  
\_\_\_\_\_  
Date

Land Location(s): SE 30-12-8  
S 21-12-8

Name of Land Owner		Darren McDonald				
Legal Description		NE 1-13-7				
Land Owner Authorization		Yes				
Dist. >300m from residences		Yes				
Map Enclosed		Yes				
Year Field previously Used						
GPS		Lat				
		Date	Date	Date	Date	Long
		BST 16/9/2019	BST 24/8/2018 lbs/ac			
Field Soil Analysis mg/kg 0-15 cm		Cadmium	0.469			
		Calcium	14100			
		Chromium	23.5			
		Copper	20.8			
		Lead	11.2			
		Mercury	0.0338			
		Nickel	26.5			
		pH	7.69			
		Phosphorus < 60 ug/g	12.6			
		Potassium	2920			
		Soil Nitrate Nitrogen 0-60cm<100kg/ha	2.5			
		Zinc	93			
Bio-Solids Analysis mg/kg		Ammonia Nitrogen	527			
		Cadmium	2.79			
		Chromium	44.3			
		Conductivity	3635			
		Copper	229			
		Lead	11.1			
		Mercury	0.239			
		Nickel	36.3			
		Nitrate Nitrogen	47.1			
		Organic Nitrogen	3174			
		pH	6.63			
		Potassium	10015			
		Total Nitrogen	3701			
		Total Phosphorus	12600			
		Total Solids	3.83			
		Volatile Solids	63.75			
		Zinc	509			
Cummulative Results Kg/Hectare		Cadmium < 2.88	0.850	0.758		
		Chromium < 216	42.39	37.82		
		Copper < 90	37.88	33.79		
		Lead < 90	20.18	18.01		
		Mercury < 0.9	0.06	0.05		
		Nickel < 90	47.77	42.62		
		Nutrient Appl. Rate PA				
		N<100/kg	92.37	82.41		
		Solids <10	1.97	1.76		
		Zinc < 270	169.00	150.77		
		Phosphorus	46.74	41.70		
Comments						

Name of Land Owner		Brooks			
Legal Description		SE 30-12-8			
Land Owner Authorization		Yes			
Dist. >300m from residences		Yes			
Map Enclosed		Yes			
Year Field previously Used					
GPS		Lat		Long	
Date	Date	Date	Date	Date	Date
BVF 23/9/2019	BVF 23/9/2019 lbs/ac	BST 19/9/2019 lbs/ac	BST 19/9/2019 lbs/ac	BST 19/9/2019 lbs/ac	Comments
Cadmium	0.414		0.414		
Calcium	12800		12800		
Chromium	32.4		32.4		
Copper	26.7		26.7		
Lead	11.5		11.5		
Mercury	0.045		0.045		
Nickel	30.0		30.0		
pH	7.75		7.75		
Phosphorus < 60 ug/g	12.4		12.4		
Potassium	4550		4550		
Soil Nitrate Nitrogen 0-60cm<100kg/ha	8.1		8.1		
Zinc	96		96		
Ammonia Nitrogen	431		527		
Cadmium	3.54		2.79		
Chromium	48.2		44.3		
Conductivity	3550		3635		
Copper	223		229		
Lead	13.3		11.1		
Mercury	0.235		0.239		
Nickel	51.6		36.3		
Nitrate Nitrogen	5.0		47.1		
Organic Nitrogen	2395		3174		
pH	6.87		6.63		
Potassium	10800		10015		
Total Nitrogen	2826		3701		
Total Phosphorus	7320		12600		
Total Solids	3.99		3.83		
Volatfile Solids	52.3		63.8		
Zinc	885		509		
Cadmium < 2.88	0.749		0.668		0.673
Chromium < 216	58.37		52.08		52.15
Copper < 90	48.31		43.10		43.49
Lead < 90	20.72		18.48		18.50
Mercury < 0.9	0.08		0.07		0.07
Nickel < 90	54.06		48.23		48.27
Nutrient Appl. Rate PA N<100/kg	105.27		93.92		83.46
Solids <10	0.80		0.71		2.80
Zinc < 270	173.77		155.04		156.53
Phosphorus	30.36		27.08		53.50
<b>Comments</b>					

Field Soil Analysis mg/kg 0-15 cm

Bio-Solids Analysis mg/kg

Cummulative Results Kg/Hectare

# ASSINIBOINE INJECTIONS LTD

BOX 160 177 NOTRE DAME AVE NOTRE DAME, MB ROG 1M0 PH: 204-248-2559 FAX: 204-248-2799

## DAILY SLUDGE APPLICATION PLAN

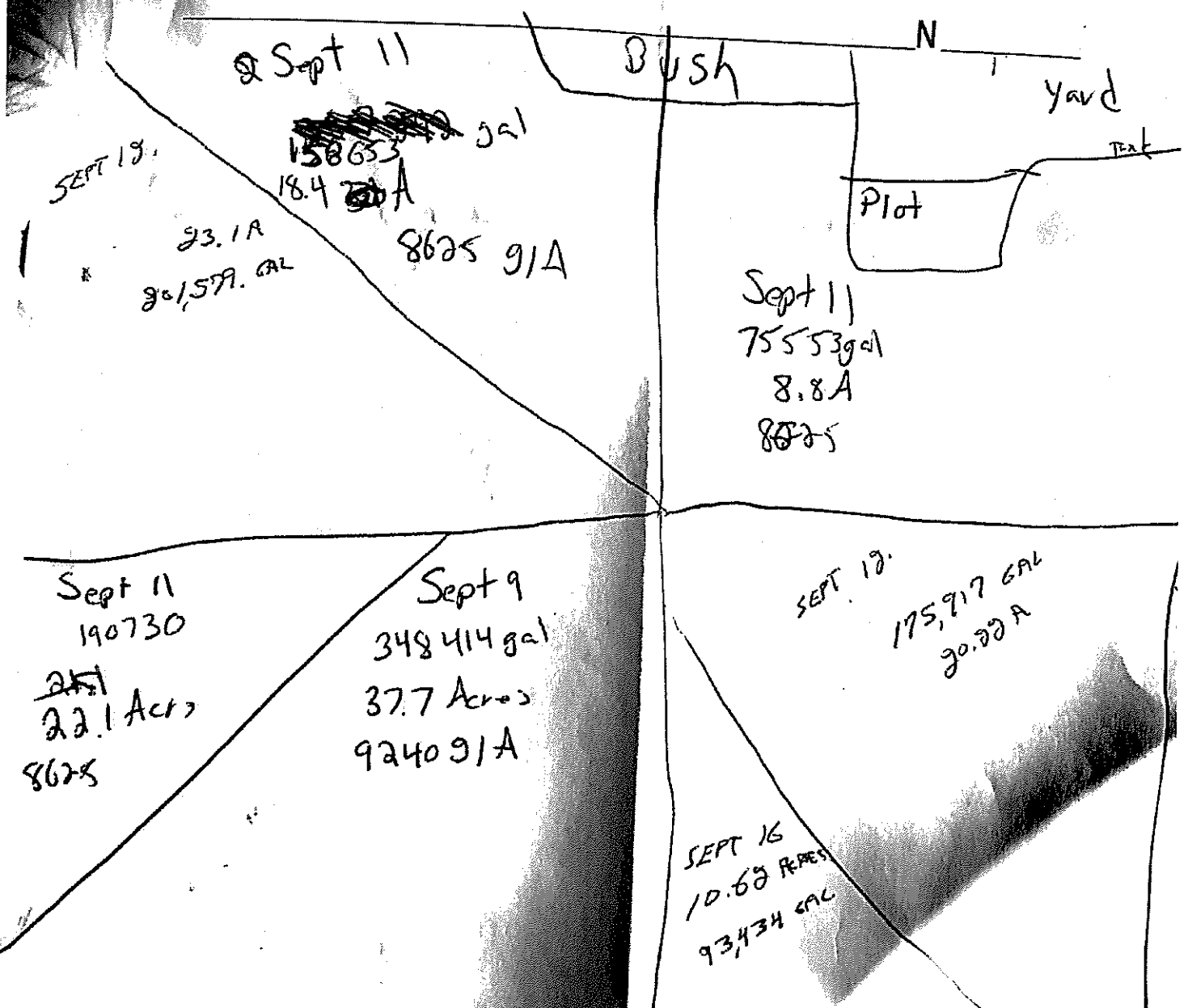
DATE: \_\_\_\_\_

FARMERS NAME: \_\_\_\_\_

FIELD: SEC. \_\_\_\_\_ TWP \_\_\_\_\_ RGE \_\_\_\_\_

APPLICATION TYPE: INJECTION

DEPTH: 6" HA: \_\_\_\_\_ CM3: \_\_\_\_\_



# ASSINIBOINE INJECTIONS LTD

BOX 160 177 NOTRE DAME AVE NOTRE DAME, MB ROG 1M0 PH: 204-248-2559 FAX: 204-248-2799

## DAILY SLUDGE APPLICATION PLAN

DATE: \_\_\_\_\_

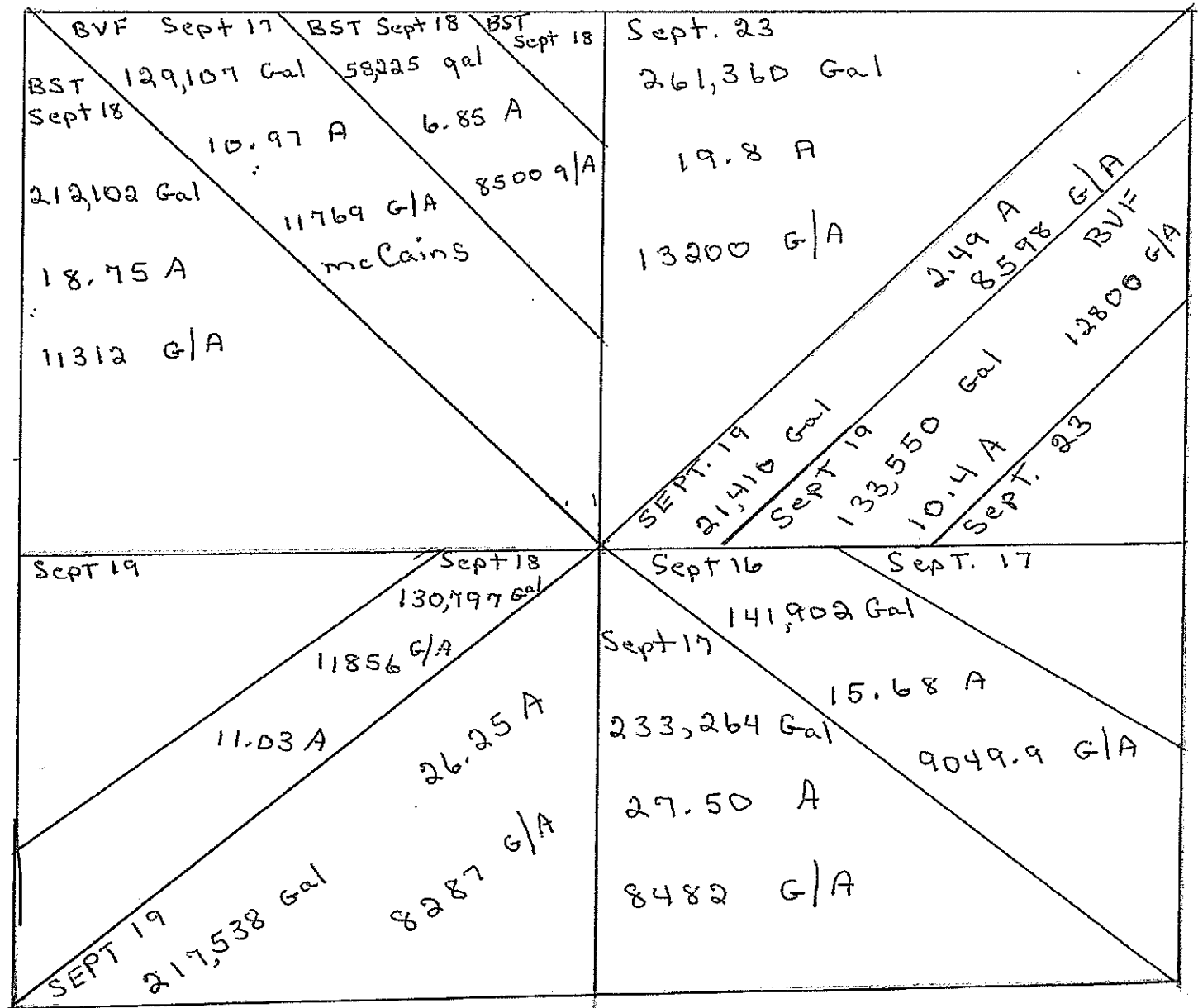
FARMERS NAME: \_\_\_\_\_

FIELD: SEC. \_\_\_\_\_ TWP \_\_\_\_\_ RGE \_\_\_\_\_

APPLICATION TYPE: INJECTION

DEPTH: 6" HA: \_\_\_\_\_ CM3: \_\_\_\_\_

N





City of Portage la Prairie - Wastewater  
ATTN: AARON STECHESEN  
97 Saskatchewan Avenue East  
Portage la Prairie MB R1N 0L8

Date Received: 04-SEP-19  
Report Date: 10-SEP-19 14:25 (MT)  
Version: FINAL

Client Phone: 204-239-8361

## Certificate of Analysis

Lab Work Order #: **L2340779**  
Project P.O. #: W02580  
Job Reference:  
C of C Numbers:  
Legal Site Desc:

NE 1-13-7  
McDonald

Hua Wo  
Chemistry Laboratory Manager

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

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



## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2340779-1 19-09-19 Sampled By: CLIENT on 03-SEP-19 @ 16:30 Matrix: SOIL							
<b>Miscellaneous Parameters</b>							
Available Phosphate-P	12.6		1.0	mg/kg	06-SEP-19	06-SEP-19	R4793569
Mercury (Hg)	0.0338		0.0050	mg/kg	05-SEP-19	06-SEP-19	R4785035
% Moisture	25.5		0.10	%	06-SEP-19	06-SEP-19	R4784475
pH (1:2 soil:water)	7.69		0.10	pH	06-SEP-19	06-SEP-19	R4785210
<b>Metals</b>							
Aluminum (Al)	16200		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Antimony (Sb)	0.34		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Arsenic (As)	8.31		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Barium (Ba)	198		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Beryllium (Be)	0.71		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Bismuth (Bi)	0.190		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Boron (B)	19		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cadmium (Cd)	0.469		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Calcium (Ca)	14100		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Chromium (Cr)	23.5		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cobalt (Co)	9.12		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Copper (Cu)	20.8		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Iron (Fe)	22000		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Lead (Pb)	11.2		0.20	mg/kg	05-SEP-19	05-SEP-19	R4784341
Magnesium (Mg)	8700		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Manganese (Mn)	898		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Molybdenum (Mo)	0.35		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Nickel (Ni)	26.5		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Phosphorus (P)	670		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Potassium (K)	2920		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Selenium (Se)	<0.50		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Silver (Ag)	0.11		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Sodium (Na)	214		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Strontium (Sr)	56.0		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Thallium (Tl)	0.29		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Tin (Sn)	<5.0		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Titanium (Ti)	52.0		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Uranium (U)	1.21		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Vanadium (V)	52.6		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Zinc (Zn)	93		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
L2340779-2 19-09-20 Sampled By: CLIENT on 03-SEP-19 @ 16:30 Matrix: SOIL							
<b>Miscellaneous Parameters</b>							
Available Nitrate-N	2.5	DLM	2.0	mg/kg	07-SEP-19	07-SEP-19	R4789288
% Moisture	33.5		0.10	%	06-SEP-19	06-SEP-19	R4784475
Total Nitrogen by LECO	1790		200	mg/kg	06-SEP-19	06-SEP-19	R4785729
<b>Total Available N &amp; NO3-N, NO2-N &amp; NH4</b>							
Available Ammonium-N							
Available Ammonium-N	5.5		1.0	mg/kg	06-SEP-19	06-SEP-19	R4786108
<b>Available Ammonium-N - Calculation</b>							
Total Available Nitrogen	7.9		2.2	mg/kg		06-SEP-19	
<b>Nitrate, Nitrite &amp; Nitrate+Nitrite-N(KCL</b>							
Nitrite-N	<1.0		1.0	mg/kg	06-SEP-19	06-SEP-19	R4786088
Nitrate+Nitrite-N	2.4		2.0	mg/kg	06-SEP-19	06-SEP-19	R4786088
Nitrate-N	2.4		2.0	mg/kg	06-SEP-19	06-SEP-19	R4786088

\* 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
L2340779-2 19-09-20							
Sampled By: CLIENT on 03-SEP-19 @ 16:30							
Matrix: SOIL							
L2340779-3 19-09-21							
Sampled By: CLIENT on 03-SEP-19 @ 16:30							
Matrix: SOIL							
<b>Atterberg limits</b>							
Liquid Limit (LL)	49		1	%	06-SEP-19	06-SEP-19	R4784958
Moisture at Plastic Limit	24		1	%	06-SEP-19	06-SEP-19	R4784958
Plasticity Index (PI)	25		1	%	06-SEP-19	06-SEP-19	R4784958

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

## Reference Information

## Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ATTERBERG-SK	Soil	Atterberg limits	CARTER CSSS 58
<p>The liquid limit (or upper plastic limit) is the point at which the soil becomes semifluid, like softened butter. In operational terms, the liquid limit is defined as the water content at which a trapezoidal groove cut in moist soil is closed after 25 taps on a hard rubber plate (ASTM D-18, 1958).</p> <p>The plastic limit (or lower plastic limit) is defined as the water content at which soil begins to crumble on being rolled into a thread 1/8 inch (or 3 mm) in diameter. It represents the lowest water content at which soil can be deformed readily without cracking.</p> <p>The plastic index (which is the difference between the liquid and plastic limits) gives an indication of the "clayeyness" or plasticity of a clay and is employed in engineering classification systems for soils.</p> <p>This method is equivalent to ASTM D4318-10.</p>			
ETL-N-TOT-AVAIL-SK	Soil	Available Ammonium-N - Calculation	Soil Methods of Analysis (1993) CSSS
HG-200.2-CVAA-WP	Soil	Mercury in Soil	EPA 200.2/1631E (mod)
<p>Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.</p>			
MET-200.2-MS-WP	Soil	Metals	EPA 200.2/6020B (mod)
<p>Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the &lt;2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.</p> <p>Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H<sub>2</sub>S) may be excluded if lost during sampling, storage, or digestion.</p>			
MOIST-SK	Soil	Moisture Content	CCME PHC in Soil - Tier 1 (mod)
<p>The weighed portion of soil is placed in a 105°C oven overnight. The dried soil is allowed to cooled to room temperature, weighed and the % moisture is calculated.</p>			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
<p>The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.</p>			
N2/N3-AVAIL-KCL-SK	Soil	Nitrate, Nitrite & Nitrate+Nitrite-N(KCL	CSSS (2008) 6.2-6.3
<p>Plant available nitrate and nitrite are extracted from the sample with 2N KCl. Nitrate and Nitrite in the filtered extract are determined colorimetrically by Technicon auto-analyzer or flow injection analyzer at 520 nm.</p>			
NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)
<p>Ammonium (NH<sub>4</sub>-N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.</p>			
NO3-AVAIL-SK	Soil	Available Nitrate-N	Alberta Ag (1988)
<p>Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution. Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm.</p>			
PH-1:2-SK	Soil	pH (1:2 Soil:Water Extraction)	AB Ag (1988) p.7
<p>1 part dry soil and 2 parts de-ionized water (by volume) is mixed. The slurry is allowed to stand with occasional stirring for 30 - 60 minutes. After equilibration, pH of the slurry is measured using a pH meter.</p>			
PO4-AVAIL-OLSEN-SK	Soil	Available Phosphate-P by Olsen	CSSS (2008) 8
<p>Plant available phosphorus is extracted from air dried soil using a fixed ratio bicarbonate extraction. Phosphorus is determined by colorimetry.</p>			

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

## Reference Information

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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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
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

## Chain of Custody Numbers:

## GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



## Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

Page 1 of 7

Client: City of Portage la Prairie - Wastewater  
 97 Saskatchewan Avenue East  
 Portage la Prairie MB R1N 0L8

Contact: AARON STECHESEN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ATTERBERG-SK Soil								
<b>Batch R4784958</b>								
<b>WG3154206-1 DUP L2340779-3</b>								
Liquid Limit (LL)		49	49		%	0.8	20	06-SEP-19
Moisture at Plastic Limit		24	24		%	0.2	20	06-SEP-19
Plasticity Index (PI)		25	24		%	1.4	20	06-SEP-19
<b>WG3154206-2 IRM ATB-1_SOIL</b>								
Liquid Limit (LL)			103.9		%		80-120	06-SEP-19
Moisture at Plastic Limit			99.4		%		80-120	06-SEP-19
Plasticity Index (PI)			109.9		%		80-120	06-SEP-19
HG-200.2-CVAA-WP Soil								
<b>Batch R4785035</b>								
<b>WG3153211-4 CRM CANMET TILL-1</b>								
Mercury (Hg)			93.8		%		70-130	05-SEP-19
<b>WG3153211-5 DUP L2340779-1</b>								
Mercury (Hg)		0.0338	0.0323		mg/kg	4.6	40	05-SEP-19
<b>WG3153211-2 LCS</b>								
Mercury (Hg)			93.0		%		80-120	05-SEP-19
<b>WG3153211-1 MB</b>								
Mercury (Hg)			<0.0050		mg/kg		0.005	05-SEP-19
MET-200.2-MS-WP Soil								
<b>Batch R4784341</b>								
<b>WG3153211-4 CRM CANMET TILL-1</b>								
Aluminum (Al)			102.3		%		70-130	05-SEP-19
Antimony (Sb)			101.9		%		70-130	05-SEP-19
Arsenic (As)			99.3		%		70-130	05-SEP-19
Barium (Ba)			98.0		%		70-130	05-SEP-19
Beryllium (Be)			89.5		%		70-130	05-SEP-19
Bismuth (Bi)			100.3		%		70-130	05-SEP-19
Boron (B)			4		mg/kg		0-8	05-SEP-19
Cadmium (Cd)			99.3		%		70-130	05-SEP-19
Calcium (Ca)			90.7		%		70-130	05-SEP-19
Chromium (Cr)			94.8		%		70-130	05-SEP-19
Cobalt (Co)			95.8		%		70-130	05-SEP-19
Copper (Cu)			99.1		%		70-130	05-SEP-19
Iron (Fe)			97.3		%		70-130	05-SEP-19
Lead (Pb)			100.3		%		70-130	05-SEP-19
Magnesium (Mg)			104.3		%		70-130	05-SEP-19



## Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

Page 2 of 7

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Manganese (Mn)			103.4		%		70-130	05-SEP-19
Molybdenum (Mo)			97.3		%		70-130	05-SEP-19
Nickel (Ni)			95.1		%		70-130	05-SEP-19
Phosphorus (P)			96.9		%		70-130	05-SEP-19
Potassium (K)			83.0		%		70-130	05-SEP-19
Selenium (Se)			103.6		%		70-130	05-SEP-19
Silver (Ag)			100.4		%		70-130	05-SEP-19
Sodium (Na)			84.7		%		70-130	05-SEP-19
Strontium (Sr)			96.0		%		70-130	05-SEP-19
Thallium (Tl)			0.12		mg/kg		0.03-0.23	05-SEP-19
Tin (Sn)			1.0		mg/kg		0-3.1	05-SEP-19
Titanium (Ti)			83.9		%		70-130	05-SEP-19
Uranium (U)			101.7		%		70-130	05-SEP-19
Vanadium (V)			94.2		%		70-130	05-SEP-19
Zinc (Zn)			97.2		%		70-130	05-SEP-19
<b>WG3153211-5</b>	<b>DUP</b>	<b>L2340779-1</b>						
Aluminum (Al)		16200	15600		mg/kg	3.6	40	05-SEP-19
Antimony (Sb)		0.34	0.31		mg/kg	7.0	30	05-SEP-19
Arsenic (As)		8.31	8.11		mg/kg	2.4	30	05-SEP-19
Barium (Ba)		198	185		mg/kg	7.2	40	05-SEP-19
Beryllium (Be)		0.71	0.68		mg/kg	5.2	30	05-SEP-19
Bismuth (Bi)		0.190	0.188		mg/kg	0.8	30	05-SEP-19
Boron (B)		19	18		mg/kg	4.2	30	05-SEP-19
Cadmium (Cd)		0.469	0.464		mg/kg	1.1	30	05-SEP-19
Calcium (Ca)		14100	12900		mg/kg	8.8	30	05-SEP-19
Chromium (Cr)		23.5	23.1		mg/kg	1.9	30	05-SEP-19
Cobalt (Co)		9.12	8.96		mg/kg	1.8	30	05-SEP-19
Copper (Cu)		20.8	20.8		mg/kg	0.0	30	05-SEP-19
Iron (Fe)		22000	21500		mg/kg	2.3	30	05-SEP-19
Lead (Pb)		11.2	11.1		mg/kg	1.1	40	05-SEP-19
Magnesium (Mg)		8700	8600		mg/kg	1.2	30	05-SEP-19
Manganese (Mn)		898	847		mg/kg	5.9	30	05-SEP-19
Molybdenum (Mo)		0.35	0.34		mg/kg	3.1	40	05-SEP-19
Nickel (Ni)		26.5	25.9		mg/kg	2.3	30	05-SEP-19



## Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

Page 3 of 7

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-5</b>	<b>DUP</b>	<b>L2340779-1</b>						
Phosphorus (P)		670	680		mg/kg	0.9	30	05-SEP-19
Potassium (K)		2920	2870		mg/kg	1.6	40	05-SEP-19
Selenium (Se)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	05-SEP-19
Silver (Ag)		0.11	0.11		mg/kg	4.5	40	05-SEP-19
Sodium (Na)		214	201		mg/kg	6.4	40	05-SEP-19
Strontium (Sr)		56.0	51.1		mg/kg	9.1	40	05-SEP-19
Thallium (Tl)		0.29	0.29		mg/kg	2.3	30	05-SEP-19
Tin (Sn)		<5.0	<5.0	RPD-NA	mg/kg	N/A	40	05-SEP-19
Titanium (Ti)		52.0	49.1		mg/kg	5.7	40	05-SEP-19
Uranium (U)		1.21	1.17		mg/kg	3.1	30	05-SEP-19
Vanadium (V)		52.6	50.2		mg/kg	4.7	30	05-SEP-19
Zinc (Zn)		93	91		mg/kg	2.0	30	05-SEP-19
<b>WG3153211-2</b>	<b>LCS</b>							
Aluminum (Al)			102.5		%		80-120	05-SEP-19
Antimony (Sb)			103.4		%		80-120	05-SEP-19
Arsenic (As)			101.6		%		80-120	05-SEP-19
Barium (Ba)			104.0		%		80-120	05-SEP-19
Beryllium (Be)			98.6		%		80-120	05-SEP-19
Bismuth (Bi)			100.4		%		80-120	05-SEP-19
Boron (B)			98.5		%		80-120	05-SEP-19
Cadmium (Cd)			99.7		%		80-120	05-SEP-19
Calcium (Ca)			100.5		%		80-120	05-SEP-19
Chromium (Cr)			102.6		%		80-120	05-SEP-19
Cobalt (Co)			100.9		%		80-120	05-SEP-19
Copper (Cu)			101.6		%		80-120	05-SEP-19
Iron (Fe)			96.1		%		80-120	05-SEP-19
Lead (Pb)			100.7		%		80-120	05-SEP-19
Magnesium (Mg)			109.2		%		80-120	05-SEP-19
Manganese (Mn)			104.1		%		80-120	05-SEP-19
Molybdenum (Mo)			101.6		%		80-120	05-SEP-19
Nickel (Ni)			99.9		%		80-120	05-SEP-19
Phosphorus (P)			104.7		%		80-120	05-SEP-19
Potassium (K)			103.3		%		80-120	05-SEP-19
Selenium (Se)			101.0		%		80-120	05-SEP-19



## Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-2</b>	<b>LCS</b>							
Silver (Ag)			100.7		%		80-120	05-SEP-19
Sodium (Na)			103.4		%		80-120	05-SEP-19
Strontium (Sr)			105.6		%		80-120	05-SEP-19
Thallium (Tl)			101.5		%		80-120	05-SEP-19
Tin (Sn)			100.4		%		80-120	05-SEP-19
Titanium (Ti)			99.2		%		80-120	05-SEP-19
Uranium (U)			106.0		%		80-120	05-SEP-19
Vanadium (V)			102.5		%		80-120	05-SEP-19
Zinc (Zn)			99.2		%		80-120	05-SEP-19
<b>WG3153211-1</b>	<b>MB</b>							
Aluminum (Al)			<5.0		mg/kg		5	05-SEP-19
Antimony (Sb)			<0.10		mg/kg		0.1	05-SEP-19
Arsenic (As)			<0.10		mg/kg		0.1	05-SEP-19
Barium (Ba)			<0.50		mg/kg		0.5	05-SEP-19
Beryllium (Be)			<0.10		mg/kg		0.1	05-SEP-19
Bismuth (Bi)			<0.020		mg/kg		0.02	05-SEP-19
Boron (B)			<10		mg/kg		10	05-SEP-19
Cadmium (Cd)			<0.020		mg/kg		0.02	05-SEP-19
Calcium (Ca)			<100		mg/kg		100	05-SEP-19
Chromium (Cr)			<1.0		mg/kg		1	05-SEP-19
Cobalt (Co)			<0.020		mg/kg		0.02	05-SEP-19
Copper (Cu)			<1.0		mg/kg		1	05-SEP-19
Iron (Fe)			<25		mg/kg		25	05-SEP-19
Lead (Pb)			<0.20		mg/kg		0.2	05-SEP-19
Magnesium (Mg)			<10		mg/kg		10	05-SEP-19
Manganese (Mn)			<0.50		mg/kg		0.5	05-SEP-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	05-SEP-19
Nickel (Ni)			<0.50		mg/kg		0.5	05-SEP-19
Phosphorus (P)			<100		mg/kg		100	05-SEP-19
Potassium (K)			<25		mg/kg		25	05-SEP-19
Selenium (Se)			<0.50		mg/kg		0.5	05-SEP-19
Silver (Ag)			<0.10		mg/kg		0.1	05-SEP-19
Sodium (Na)			<10		mg/kg		10	05-SEP-19
Strontium (Sr)			<0.10		mg/kg		0.1	05-SEP-19





## Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-1</b>	<b>MB</b>							
Thallium (Tl)			<0.10		mg/kg		0.1	05-SEP-19
Tin (Sn)			<5.0		mg/kg		5	05-SEP-19
Titanium (Ti)			<0.50		mg/kg		0.5	05-SEP-19
Uranium (U)			<0.020		mg/kg		0.02	05-SEP-19
Vanadium (V)			<0.50		mg/kg		0.5	05-SEP-19
Zinc (Zn)			<10		mg/kg		10	05-SEP-19
MOIST-SK	Soil							
<b>Batch</b>	<b>R4784475</b>							
<b>WG3153274-3</b>	<b>LCS</b>							
% Moisture			99.8		%		90-110	06-SEP-19
<b>WG3153274-2</b>	<b>MB</b>							
% Moisture			<0.10		%		0.1	06-SEP-19
N-TOT-LECO-SK	Soil							
<b>Batch</b>	<b>R4785729</b>							
<b>WG3151376-2</b>	<b>IRM</b>	<b>08-109_SOIL</b>						
Total Nitrogen by LECO			93.2		%		80-120	06-SEP-19
<b>WG3151376-4</b>	<b>LCS</b>	<b>SULFADIAZINE</b>						
Total Nitrogen by LECO			100.4		%		90-110	06-SEP-19
<b>WG3151376-3</b>	<b>MB</b>							
Total Nitrogen by LECO			<0.020		%		0.02	06-SEP-19
N2/N3-AVAIL-KCL-SK	Soil							
<b>Batch</b>	<b>R4786088</b>							
<b>WG3153452-3</b>	<b>IRM</b>	<b>SAL814</b>						
Nitrite-N			0.1		mg/kg		0-1.4	06-SEP-19
Nitrate+Nitrite-N			101.9		%		70-130	06-SEP-19
<b>WG3153452-4</b>	<b>LCS</b>							
Nitrite-N			89.3		%		70-130	06-SEP-19
Nitrate+Nitrite-N			81.1		%		70-130	06-SEP-19
<b>WG3153452-2</b>	<b>MB</b>							
Nitrite-N			<1.0		mg/kg		1	06-SEP-19
Nitrate+Nitrite-N			<2.0		mg/kg		2	06-SEP-19
NH4-AVAIL-SK	Soil							
<b>Batch</b>	<b>R4786108</b>							
<b>WG3153451-3</b>	<b>IRM</b>	<b>SAL814</b>						
Available Ammonium-N			115.9		%		70-130	06-SEP-19
<b>WG3153451-4</b>	<b>LCS</b>							



## Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH4-AVAIL-SK	Soil							
Batch	R4786108							
WG3153451-4	LCS							
Available Ammonium-N			88.9		%		80-120	06-SEP-19
WG3153451-2	MB							
Available Ammonium-N			<1.0		mg/kg		1	06-SEP-19
NO3-AVAIL-SK	Soil							
Batch	R4789288							
WG3153453-3	IRM	SAL814						
Available Nitrate-N			97.7		%		70-130	07-SEP-19
WG3153453-4	LCS							
Available Nitrate-N			101.6		%		70-130	07-SEP-19
WG3153453-2	MB							
Available Nitrate-N			<1.0		mg/kg		1	07-SEP-19
PH-1:2-SK	Soil							
Batch	R4785210							
WG3153447-3	IRM	SAL814						
pH (1:2 soil:water)			7.92		pH		7.65-8.25	06-SEP-19
WG3153447-4	LCS							
pH (1:2 soil:water)			6.97		pH		6.66-7.06	06-SEP-19
PO4-AVAIL-OLSEN-SK	Soil							
Batch	R4793569							
WG3150868-1	DUP	L2340779-1						
Available Phosphate-P		12.6	11.2		mg/kg	12	30	06-SEP-19
WG3150868-3	IRM	FARM2005						
Available Phosphate-P			95.1		%		80-120	06-SEP-19
WG3150868-4	LCS							
Available Phosphate-P			98.1		%		80-120	06-SEP-19
WG3150868-2	MB							
Available Phosphate-P			<1.0		mg/kg		1	06-SEP-19

# Quality Control Report

Workorder: L2340779

Report Date: 10-SEP-19

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## Legend:

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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:

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Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

---

## Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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.

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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.



L2340779-COFC

Report to: **City of Portage la Prairie**  
 Company: **City of Portage la Prairie**  
 Contact: **Aaron Stechesen**  
 Address: **97 Saskatchewan Ave. E.**  
**Portage la Prairie, MB R1N 0L8**  
 Phone: **204-239-8361** Fax: **204-239-8364**

Standard:  Regular (Default) Other:   
 Select:  PDF  Excel  Digital  
 Email 1: **astechesen@city-plp.ab.ca**  
 Email 2:

Service Requested: (rush - subject to availability)  
 Regular (Default)  
 Priority (2-3 Business Days) - 50% Surcharge  
 Emergency (1 Business Day) - 100% Surcharge  
 For Emergency < 1 Day, ASAP or Weekend - Contact ALS

Client / Project Information:  
 Job #: **W02580**  
 PO / AFE: **W02580**

Quote #: **Q45423**

ALS Contact: **Judy Dalmaier**  
 Lab Work Order # (lab use only): **[REDACTED]**

Sample #	Sample Identification (This description will appear on the report)	ALS Contact		Sampler		Sample Type	Number of Containers
		Date	Time	Date	Time		
1	19-09-19	03-Sep-19	16:30	03-Sep-19	16:30	Soil	PH-1.2-SK
2	19-09-20	03-Sep-19	16:30	03-Sep-19	16:30	Soil	HG-200.2-CVAF-WP
3	19-09-21	03-Sep-19	16:30	03-Sep-19	16:30	Soil	MET-200.2-MS-WP
							PO4-AVAIL-OISEN-SK
							N-TOT-AVAIL-SK
							N-TOT-LECO-SK
							NO3-AVAIL-SK
							MOIST-SK
							PREP-DRY/GRIND-SK
							SPECIAL REQUEST-SK
							ATTEBERG-SK
							SAMPLE-DISPOSAL-WP

**RUSH**

Special Instructions / Regulations / Hazardous Details

Emergency Service please

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

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

SHIPMENT: RELEASE (client use) **19-09-19 9:30am** SHIPMENT: RECEPTION (lab use only) **03-Sep-19 11:50** SHIPMENT: VERIFICATION (lab use only) **03-Sep-19 11:50**

Received by: **[Signature]** Date: **19-09-19** Time: **11:50** Temperature: **15.1** Verified by: **[Signature]** Date & Time: **03-Sep-19 11:50**

Observations: **None**

IF Yes attach SIF **SEP 14 2019**

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF 48.00 First



City of Portage la Prairie - Wastewater  
ATTN: AARON STECHESEN  
97 Saskatchewan Avenue East  
Portage la Prairie MB R1N 0L8

Date Received: 05-SEP-19  
Report Date: 12-SEP-19 14:57 (MT)  
Version: FINAL

Client Phone: 204-239-8361

## Certificate of Analysis

Lab Work Order #: **L2342102**  
Project P.O. #: W02580  
Job Reference:  
C of C Numbers:  
Legal Site Desc:

SE 30-12-8  
Brooks

Hua Wo  
Chemistry Laboratory Manager

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

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342102-1 19-09-25 Sampled By: CLIENT on 04-SEP-19 @ 11:30 Matrix: SOIL							
<b>Miscellaneous Parameters</b>							
Available Phosphate-P	12.4		1.0	mg/kg	09-SEP-19	09-SEP-19	R4791009
Mercury (Hg)	0.0450		0.0050	mg/kg	06-SEP-19	09-SEP-19	R4789928
% Moisture	21.7		0.10	%	10-SEP-19	10-SEP-19	R4791815
pH (1:2 soil:water)	7.75		0.10	pH	09-SEP-19	09-SEP-19	R4789851
<b>Metals</b>							
Aluminum (Al)	20900		500	mg/kg	06-SEP-19	06-SEP-19	R4788490
Antimony (Sb)	0.40		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Arsenic (As)	8.93		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Barium (Ba)	180		0.50	mg/kg	06-SEP-19	06-SEP-19	R4788490
Beryllium (Be)	0.87		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Bismuth (Bi)	0.212		0.020	mg/kg	06-SEP-19	06-SEP-19	R4788490
Boron (B)	19		10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Cadmium (Cd)	0.414		0.020	mg/kg	06-SEP-19	06-SEP-19	R4788490
Calcium (Ca)	12800		100	mg/kg	06-SEP-19	06-SEP-19	R4788490
Chromium (Cr)	32.4		1.0	mg/kg	06-SEP-19	06-SEP-19	R4788490
Cobalt (Co)	9.97		0.020	mg/kg	06-SEP-19	06-SEP-19	R4788490
Copper (Cu)	26.7		1.0	mg/kg	06-SEP-19	06-SEP-19	R4788490
Iron (Fe)	25500		25	mg/kg	06-SEP-19	06-SEP-19	R4788490
Lead (Pb)	11.5		0.20	mg/kg	06-SEP-19	06-SEP-19	R4788490
Magnesium (Mg)	10200		10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Manganese (Mn)	670		0.50	mg/kg	06-SEP-19	06-SEP-19	R4788490
Molybdenum (Mo)	0.31		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Nickel (Ni)	30.0		0.50	mg/kg	06-SEP-19	06-SEP-19	R4788490
Phosphorus (P)	630		100	mg/kg	06-SEP-19	06-SEP-19	R4788490
Potassium (K)	4550		25	mg/kg	06-SEP-19	06-SEP-19	R4788490
Selenium (Se)	<0.50		0.50	mg/kg	06-SEP-19	06-SEP-19	R4788490
Silver (Ag)	0.13		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Sodium (Na)	126		10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Strontium (Sr)	40.9		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Thallium (Tl)	0.34		0.10	mg/kg	06-SEP-19	06-SEP-19	R4788490
Tin (Sn)	<5.0		5.0	mg/kg	06-SEP-19	06-SEP-19	R4788490
Titanium (Ti)	109		0.50	mg/kg	06-SEP-19	06-SEP-19	R4788490
Uranium (U)	1.09		0.020	mg/kg	06-SEP-19	06-SEP-19	R4788490
Vanadium (V)	68.2		0.50	mg/kg	06-SEP-19	06-SEP-19	R4788490
Zinc (Zn)	96		10	mg/kg	06-SEP-19	06-SEP-19	R4788490
L2342102-2 19-09-26 Sampled By: CLIENT on 04-SEP-19 @ 11:30 Matrix: SOIL							
<b>Miscellaneous Parameters</b>							
Available Nitrate-N	8.4	DLM	3.0	mg/kg	10-SEP-19	10-SEP-19	R4795350
% Moisture	17.8		0.10	%	10-SEP-19	10-SEP-19	R4791815
Total Nitrogen by LECO	1870		200	mg/kg	09-SEP-19	09-SEP-19	R4791073
<b>Total Available N &amp; NO3-N, NO2-N &amp; NH4</b>							
<b>Available Ammonium-N</b>							
Available Ammonium-N	8.3		1.0	mg/kg	09-SEP-19	09-SEP-19	R4790945
<b>Available Ammonium-N - Calculation</b>							
Total Available Nitrogen	16.4		2.2	mg/kg		09-SEP-19	
<b>Nitrate, Nitrite &amp; Nitrate+Nitrite-N(KCL</b>							
Nitrite-N	<1.0		1.0	mg/kg	09-SEP-19	09-SEP-19	R4792971
Nitrate+Nitrite-N	8.1		2.0	mg/kg	09-SEP-19	09-SEP-19	R4792971
Nitrate-N	8.1		2.0	mg/kg	09-SEP-19	09-SEP-19	R4792971

\* 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
L2342102-2 19-09-26 Sampled By: CLIENT on 04-SEP-19 @ 11:30 Matrix: SOIL							
L2342102-3 19-09-27 Sampled By: CLIENT on 04-SEP-19 @ 11:30 Matrix: SOIL							
<b>Atterberg limits</b>							
Liquid Limit (LL)	72		1	%	12-SEP-19	12-SEP-19	R4802349
Moisture at Plastic Limit	28		1	%	12-SEP-19	12-SEP-19	R4802349
Plasticity Index (PI)	44		1	%	12-SEP-19	12-SEP-19	R4802349

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

## Reference Information

## Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ATTERBERG-SK	Soil	Atterberg limits	CARTER CSSS 58

The liquid limit (or upper plastic limit) is the point at which the soil becomes semifluid, like softened butter. In operational terms, the liquid limit is defined as the water content at which a trapezoidal groove cut in moist soil is closed after 25 taps on a hard rubber plate (ASTM D-18, 1958).

The plastic limit (or lower plastic limit) is defined as the water content at which soil begins to crumble on being rolled into a thread 1/8 inch (or 3 mm) in diameter. It represents the lowest water content at which soil can be deformed readily without cracking.

The plastic index (which is the difference between the liquid and plastic limits) gives an indication of the "clayeyness" or plasticity of a clay and is employed in engineering classification systems for soils.

This method is equivalent to ASTM D4318-10.

ETL-N-TOT-AVAIL-SK	Soil	Available Ammonium-N - Calculation	Soil Methods of Analysis (1993) CSSS
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HG-200.2-CVAA-WP	Soil	Mercury in Soil	EPA 200.2/1631E (mod)
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Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

MET-200.2-MS-WP	Soil	Metals	EPA 200.2/6020B (mod)
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Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H<sub>2</sub>S) may be excluded if lost during sampling, storage, or digestion.

MOIST-SK	Soil	Moisture Content	CCME PHC in Soil - Tier 1 (mod)
----------	------	------------------	---------------------------------

The weighed portion of soil is placed in a 105°C oven overnight. The dried soil is allowed to cooled to room temperature, weighed and the % moisture is calculated.

N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
---------------	------	-------------------------------------	------------------

The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.

N2/N3-AVAIL-KCL-SK	Soil	Nitrate, Nitrite & Nitrate+Nitrite-N(KCL	CSSS (2008) 6.2-6.3
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Plant available nitrate and nitrite are extracted from the sample with 2N KCl. Nitrate and Nitrite in the filtered extract are determined colorimetrically by Technicon auto-analyzer or flow injection analyzer at 520 nm.

NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)
--------------	------	----------------------	---------------------------------------

Ammonium (NH<sub>4</sub>-N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.

NO3-AVAIL-SK	Soil	Available Nitrate-N	Alberta Ag (1988)
--------------	------	---------------------	-------------------

Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution.

Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm.

PH-1:2-SK	Soil	pH (1:2 Soil:Water Extraction)	AB Ag (1988) p.7
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1 part dry soil and 2 parts de-ionized water (by volume) is mixed. The slurry is allowed to stand with occasional stirring for 30 - 60 minutes. After equilibration, pH of the slurry is measured using a pH meter.

PO4-AVAIL-OLSEN-SK	Soil	Available Phosphate-P by Olsen	CSSS (2008) 8
--------------------	------	--------------------------------	---------------

Plant available phosphorus is extracted from air dried soil using a fixed ratio bicarbonate extraction. Phosphorus is determined by colorimetry.

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



## Reference Information

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
---------------	--------	------------------	--------------------

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
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

## Chain of Custody Numbers:

## GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



## Quality Control Report

Workorder: L2342102

Report Date: 12-SEP-19

Page 1 of 6

Client: City of Portage la Prairie - Wastewater  
 97 Saskatchewan Avenue East  
 Portage la Prairie MB R1N 0L8

Contact: AARON STECHESEN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ATTERBERG-SK		Soil						
<b>Batch</b>	<b>R4802349</b>							
<b>WG3156992-1</b>	<b>DUP</b>	<b>L2342102-3</b>						
Liquid Limit (LL)		72	71		%	0.6	20	12-SEP-19
Moisture at Plastic Limit		28	29		%	2.2	20	12-SEP-19
Plasticity Index (PI)		44	43		%	2.5	20	12-SEP-19
<b>WG3156992-2</b>	<b>IRM</b>	<b>ATB-1_SOIL</b>						
Liquid Limit (LL)			110.9		%		80-120	12-SEP-19
Moisture at Plastic Limit			108.2		%		80-120	12-SEP-19
Plasticity Index (PI)			114.3		%		80-120	12-SEP-19
HG-200.2-CVAA-WP		Soil						
<b>Batch</b>	<b>R4789928</b>							
<b>WG3154504-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Mercury (Hg)			110.4		%		70-130	09-SEP-19
<b>WG3154504-2</b>	<b>LCS</b>		111.0		%		80-120	09-SEP-19
Mercury (Hg)					%			
<b>WG3154504-1</b>	<b>MB</b>		<0.0050		mg/kg		0.005	09-SEP-19
Mercury (Hg)					mg/kg			
MET-200.2-MS-WP		Soil						
<b>Batch</b>	<b>R4788490</b>							
<b>WG3154498-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Aluminum (Al)			98.0		%		70-130	06-SEP-19
Antimony (Sb)			95.3		%		70-130	06-SEP-19
Arsenic (As)			95.5		%		70-130	06-SEP-19
Barium (Ba)			91.6		%		70-130	06-SEP-19
Beryllium (Be)			92.8		%		70-130	06-SEP-19
Bismuth (Bi)			92.6		%		70-130	06-SEP-19
Boron (B)			5		mg/kg		0-8	06-SEP-19
Cadmium (Cd)			93.1		%		70-130	06-SEP-19
Calcium (Ca)			89.9		%		70-130	06-SEP-19
Chromium (Cr)			92.8		%		70-130	06-SEP-19
Cobalt (Co)			92.8		%		70-130	06-SEP-19
Copper (Cu)			96.7		%		70-130	06-SEP-19
Iron (Fe)			94.9		%		70-130	06-SEP-19
Lead (Pb)			91.9		%		70-130	06-SEP-19
Magnesium (Mg)			100.2		%		70-130	06-SEP-19
Manganese (Mn)			100.8		%		70-130	06-SEP-19
Molybdenum (Mo)			99.0		%		70-130	06-SEP-19



## Quality Control Report

Workorder: L2342102

Report Date: 12-SEP-19

Page 2 of 6

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4788490</b>							
<b>WG3154498-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Nickel (Ni)			91.8		%		70-130	06-SEP-19
Phosphorus (P)			95.8		%		70-130	06-SEP-19
Potassium (K)			82.6		%		70-130	06-SEP-19
Selenium (Se)			96.6		%		70-130	06-SEP-19
Silver (Ag)			94.1		%		70-130	06-SEP-19
Sodium (Na)			83.2		%		70-130	06-SEP-19
Strontium (Sr)			90.1		%		70-130	06-SEP-19
Thallium (Tl)			0.11		mg/kg		0.03-0.23	06-SEP-19
Tin (Sn)			0.9		mg/kg		0-3.1	06-SEP-19
Titanium (Ti)			82.3		%		70-130	06-SEP-19
Uranium (U)			92.3		%		70-130	06-SEP-19
Vanadium (V)			91.3		%		70-130	06-SEP-19
Zinc (Zn)			97.1		%		70-130	06-SEP-19
<b>WG3154498-2</b>	<b>LCS</b>							
Aluminum (Al)			105.4		%		80-120	06-SEP-19
Antimony (Sb)			95.1		%		80-120	06-SEP-19
Arsenic (As)			103.6		%		80-120	06-SEP-19
Barium (Ba)			102.4		%		80-120	06-SEP-19
Beryllium (Be)			94.9		%		80-120	06-SEP-19
Bismuth (Bi)			93.0		%		80-120	06-SEP-19
Boron (B)			96.0		%		80-120	06-SEP-19
Cadmium (Cd)			101.9		%		80-120	06-SEP-19
Calcium (Ca)			97.0		%		80-120	06-SEP-19
Chromium (Cr)			103.5		%		80-120	06-SEP-19
Cobalt (Co)			102.9		%		80-120	06-SEP-19
Copper (Cu)			104.6		%		80-120	06-SEP-19
Iron (Fe)			100.7		%		80-120	06-SEP-19
Lead (Pb)			93.8		%		80-120	06-SEP-19
Magnesium (Mg)			113.3		%		80-120	06-SEP-19
Manganese (Mn)			106.3		%		80-120	06-SEP-19
Molybdenum (Mo)			94.0		%		80-120	06-SEP-19
Nickel (Ni)			102.0		%		80-120	06-SEP-19
Phosphorus (P)			110.4		%		80-120	06-SEP-19
Potassium (K)			105.5		%		80-120	06-SEP-19



## Quality Control Report

Workorder: L2342102

Report Date: 12-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4788490</b>							
<b>WG3154498-2</b>	<b>LCS</b>							
Selenium (Se)			113.4		%		80-120	06-SEP-19
Silver (Ag)			92.8		%		80-120	06-SEP-19
Sodium (Na)			110.1		%		80-120	06-SEP-19
Strontium (Sr)			97.9		%		80-120	06-SEP-19
Thallium (Tl)			91.2		%		80-120	06-SEP-19
Tin (Sn)			92.9		%		80-120	06-SEP-19
Titanium (Ti)			104.6		%		80-120	06-SEP-19
Uranium (U)			97.6		%		80-120	06-SEP-19
Vanadium (V)			105.7		%		80-120	06-SEP-19
Zinc (Zn)			113.1		%		80-120	06-SEP-19
<b>WG3154498-1</b>	<b>MB</b>							
Aluminum (Al)			<5.0		mg/kg		5	06-SEP-19
Antimony (Sb)			<0.10		mg/kg		0.1	06-SEP-19
Arsenic (As)			<0.10		mg/kg		0.1	06-SEP-19
Barium (Ba)			<0.50		mg/kg		0.5	06-SEP-19
Beryllium (Be)			<0.10		mg/kg		0.1	06-SEP-19
Bismuth (Bi)			<0.020		mg/kg		0.02	06-SEP-19
Boron (B)			<10		mg/kg		10	06-SEP-19
Cadmium (Cd)			<0.020		mg/kg		0.02	06-SEP-19
Calcium (Ca)			<100		mg/kg		100	06-SEP-19
Chromium (Cr)			<1.0		mg/kg		1	06-SEP-19
Cobalt (Co)			<0.020		mg/kg		0.02	06-SEP-19
Copper (Cu)			<1.0		mg/kg		1	06-SEP-19
Iron (Fe)			<25		mg/kg		25	06-SEP-19
Lead (Pb)			<0.20		mg/kg		0.2	06-SEP-19
Magnesium (Mg)			<10		mg/kg		10	06-SEP-19
Manganese (Mn)			<0.50		mg/kg		0.5	06-SEP-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	06-SEP-19
Nickel (Ni)			<0.50		mg/kg		0.5	06-SEP-19
Phosphorus (P)			<100		mg/kg		100	06-SEP-19
Potassium (K)			<25		mg/kg		25	06-SEP-19
Selenium (Se)			<0.50		mg/kg		0.5	06-SEP-19
Silver (Ag)			<0.10		mg/kg		0.1	06-SEP-19
Sodium (Na)			<10		mg/kg		10	06-SEP-19



## Quality Control Report

Workorder: L2342102

Report Date: 12-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP Soil								
<b>Batch R4788490</b>								
<b>WG3154498-1 MB</b>								
Strontium (Sr)			<0.10		mg/kg		0.1	06-SEP-19
Thallium (Tl)			<0.10		mg/kg		0.1	06-SEP-19
Tin (Sn)			<5.0		mg/kg		5	06-SEP-19
Titanium (Ti)			<0.50		mg/kg		0.5	06-SEP-19
Uranium (U)			<0.020		mg/kg		0.02	06-SEP-19
Vanadium (V)			<0.50		mg/kg		0.5	06-SEP-19
Zinc (Zn)			<10		mg/kg		10	06-SEP-19
MOIST-SK Soil								
<b>Batch R4791815</b>								
<b>WG3156377-1 DUP</b>								
% Moisture		L2342102-2 17.8	17.6		%	1.2	20	10-SEP-19
<b>WG3156377-3 LCS</b>								
% Moisture			99.1		%		90-110	10-SEP-19
<b>WG3156377-2 MB</b>								
% Moisture			<0.10		%		0.1	10-SEP-19
N-TOT-LECO-SK Soil								
<b>Batch R4791073</b>								
<b>WG3155204-5 DUP</b>								
Total Nitrogen by LECO		L2342102-2 0.187	0.184		%	1.6	20	09-SEP-19
<b>WG3155204-2 IRM</b>								
Total Nitrogen by LECO		08-109_SOIL	97.5		%		80-120	09-SEP-19
<b>WG3155204-4 LCS</b>								
Total Nitrogen by LECO		SULFADIAZINE	101.5		%		90-110	09-SEP-19
<b>WG3155204-3 MB</b>								
Total Nitrogen by LECO			<0.020		%		0.02	09-SEP-19
N2/N3-AVAIL-KCL-SK Soil								
<b>Batch R4792971</b>								
<b>WG3155284-1 DUP</b>								
Nitrite-N		L2342102-2 <1.0	<1.0	RPD-NA	mg/kg	N/A	30	09-SEP-19
Nitrate+Nitrite-N		8.1	8.9		mg/kg	9.7	30	09-SEP-19
<b>WG3155284-3 IRM</b>								
Nitrite-N		SAL814	0.1		mg/kg		0-1.4	09-SEP-19
Nitrate+Nitrite-N			104.8		%		70-130	09-SEP-19
<b>WG3155284-4 LCS</b>								
Nitrite-N			88.8		%		70-130	09-SEP-19
Nitrate+Nitrite-N			88.1		%		70-130	09-SEP-19



## Quality Control Report

Workorder: L2342102

Report Date: 12-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
N2/N3-AVAIL-KCL-SK	Soil							
Batch	R4792971							
WG3155284-2	MB							
Nitrite-N			<1.0		mg/kg		1	09-SEP-19
Nitrate+Nitrite-N			<2.0		mg/kg		2	09-SEP-19
NH4-AVAIL-SK	Soil							
Batch	R4790945							
WG3155282-1	DUP	L2342102-2						
Available Ammonium-N		8.3	8.1		mg/kg	1.7	20	09-SEP-19
WG3155282-3	IRM	SAL814						
Available Ammonium-N			114.3		%		70-130	09-SEP-19
WG3155282-4	LCS							
Available Ammonium-N			92.4		%		80-120	09-SEP-19
WG3155282-2	MB							
Available Ammonium-N			<1.0		mg/kg		1	09-SEP-19
NO3-AVAIL-SK	Soil							
Batch	R4795350							
WG3150863-7	IRM	SAL814						
Available Nitrate-N			97.8		%		70-130	10-SEP-19
WG3150863-8	LCS							
Available Nitrate-N			100.6		%		70-130	10-SEP-19
WG3150863-6	MB							
Available Nitrate-N			<1.0		mg/kg		1	10-SEP-19
PH-1:2-SK	Soil							
Batch	R4789851							
WG3155278-3	IRM	SAL814						
pH (1:2 soil:water)			7.86		pH		7.65-8.25	09-SEP-19
WG3155278-4	LCS							
pH (1:2 soil:water)			6.97		pH		6.66-7.06	09-SEP-19
PO4-AVAIL-OLSEN-SK	Soil							
Batch	R4791009							
WG3154654-1	DUP	L2342102-1						
Available Phosphate-P		12.4	11.8		mg/kg	5.2	30	09-SEP-19
WG3154654-3	IRM	FARM2005						
Available Phosphate-P			93.1		%		80-120	09-SEP-19
WG3154654-4	LCS							
Available Phosphate-P			98.9		%		80-120	09-SEP-19
WG3154654-2	MB							
Available Phosphate-P			<1.0		mg/kg		1	09-SEP-19

# Quality Control Report

Workorder: L2342102

Report Date: 12-SEP-19

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## Legend:

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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
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

---

## Hold Time Exceedances:

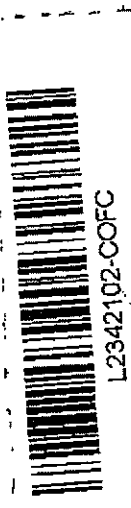
All test results reported with this submission were conducted within ALS recommended hold times.

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.

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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.



**Report to:**  
 Company: City of Portage la Prairie  
 Contact: Aaron Stechese  
 Address: 97 Saskatchewan Ave. E.  
 Portage la Prairie, MB R1N 0L8  
 Phone: 204-239-8361 Fax: 204-239-8364  
 Invoice To: Same as Report? Yes / No ?  
 Company: City of Portage la Prairie  
 Contact: Accounts Payable  
 Address: 97 Saskatchewan Ave. E.  
 Portage la Prairie, MB R1N 0L8  
 Phone: 204-239-8357 Fax:

**Client / Project Information:**  
 Job #: PO / AFE: W02580  
 Quote #: Q45423  
 ALS Contact: Judy Delmoijer  
 Sampler: Judy Delmoijer

**Sample Identification**  
 (This description will appear on the report)

Sample #	Date	Time	Sample Type
1	19-09-25	11:30	Soil
2	19-09-26	11:30	Soil
3	19-09-27	11:30	Soil

**Service Requested:** (rush - subject to availability)  
 Regular (Default)   
 Priority (2-3 Business Days) - 50% Surcharge   
 Emergency (1 Business Day) - 100% Surcharge   
 For Emergency < 1 Day, ASAP or Weekend - Contact ALS

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

PH-1:2-SK	HG-200.2-CVAF-WP	MET-200.2-MS-WP	PO4-AVAIL-OLSEN-SK	N-TOT-AVAIL-SK	N-TOT-TECO-SK	NO3-AVAIL-SK	MOIST-SK	PREP-DRY/GRIND-SK	SPECIAL REQUEST-SK	ATTEBERG-SK	SAMPLE-DISPOSAL-WP	Number of Containers
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1

Special Instructions / Regulations / Hazardous Details

Priority Service please

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

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

**SHIPMENT RELEASE (client use)**  
 Released by: [Signature] Date & Time: 2019-09-27 9:30am

**SHIPMENT RECEPTION (lab use only)**  
 Received by: [Signature] Date: 2019-09-27 Time: 2:20 Temperature: 7-6

**SHIPMENT VERIFICATION (lab use only)**  
 Verified by: [Signature] Date & Time: 2019-09-27

Observation: [Signature] Yes/No? [Signature] If Yes attach SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF 18.00 Front





City of Portage la Prairie - Wastewater  
ATTN: AARON STECHESEN  
97 Saskatchewan Avenue East  
Portage la Prairie MB R1N 0L8

Date Received: 04-SEP-19  
Report Date: 11-SEP-19 07:06 (MT)  
Version: FINAL

Client Phone: 204-239-8361

## Certificate of Analysis

Lab Work Order #: **L2340751**  
Project P.O. #: W02580  
Job Reference:  
C of C Numbers:  
Legal Site Desc:

Hua Wo  
Chemistry Laboratory Manager

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

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2340751-1 19-09-10 (19-08-76)							
Sampled By: CLIENT on 03-SEP-19 @ 11:30	BSTI						
Matrix: SLUDGE							
<b>Miscellaneous Parameters</b>							
Available Nitrate-N	86.0	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789288
Available Phosphate-P	915	DLHC	50	mg/kg	09-SEP-19	09-SEP-19	R4791009
Mercury (Hg)	0.255		0.0050	mg/kg	05-SEP-19	06-SEP-19	R4785035
Total Kjeldahl Nitrogen	4.30	DLHC	0.60	%	09-SEP-19	10-SEP-19	R4795351
<b>Total Solids and Total Volatile Solids</b>							
Total Solids	3.56		0.10	%	06-SEP-19	06-SEP-19	R4784962
Total Volatile Solids (dry basis)	64.0		0.10	%	06-SEP-19	06-SEP-19	R4784962
<b>pH and Conductivity of Liquid Manure</b>							
pH	6.59		0.10	pH	05-SEP-19	05-SEP-19	R4784954
Conductivity (EC)	3650		10	uS/cm	05-SEP-19	05-SEP-19	R4784954
<b>Metals</b>							
Aluminum (Al)	6900		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Antimony (Sb)	0.69		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Arsenic (As)	3.68		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Barium (Ba)	409		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Beryllium (Be)	0.35		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Bismuth (Bi)	6.58		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Boron (B)	48		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cadmium (Cd)	2.78		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Calcium (Ca)	22100		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Chromium (Cr)	43.4		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cobalt (Co)	12.4		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Copper (Cu)	226		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Iron (Fe)	11400		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Lead (Pb)	11.3		0.20	mg/kg	05-SEP-19	05-SEP-19	R4784341
Magnesium (Mg)	7530		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Manganese (Mn)	742		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Molybdenum (Mo)	20.8		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Nickel (Ni)	35.0		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Phosphorus (P)	12700		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Potassium (K)	10200		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Selenium (Se)	3.77		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Silver (Ag)	0.52		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Sodium (Na)	4590		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Strontium (Sr)	137		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Thallium (Tl)	0.24		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Tin (Sn)	7.7		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Titanium (Ti)	44.5		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Uranium (U)	5.51		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Vanadium (V)	18.7		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Zinc (Zn)	521		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
<b>Total Available N &amp; NO3-N, NO2-N &amp; NH4</b>							
<b>Available Ammonium-N</b>							
Available Ammonium-N	760	DLHC	100	mg/kg	07-SEP-19	07-SEP-19	R4789268
<b>Available Ammonium-N - Calculation</b>							
Total Available Nitrogen	860		100	mg/kg		09-SEP-19	
<b>Nitrate, Nitrite &amp; Nitrate+Nitrite-N(KCL</b>							
Nitrite-N	<2.0	DLM	2.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
Nitrate+Nitrite-N	93.2	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
Nitrate-N	93.2	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
<b>Total Organic N-liquid manure -as rec'd</b>							

\* 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
L2340751-1 19-09-10 (19-08-76) Sampled By: CLIENT on 03-SEP-19 @ 11:30 Matrix: SLUDGE							
Ammonium - N in Liquid Manure - as rec'd Ammonia, Total (as N)	4.3		1.0	lb/1000gal	05-SEP-19	05-SEP-19	R4784950
Nitrogen, Total Organic Total Organic Nitrogen	28.6		1.0	lb/1000gal		10-SEP-19	
Total N in Liquid Manure -as rec'd Total Nitrogen	33.0		2.0	lb/1000gal	05-SEP-19	05-SEP-19	R4784167
L2340751-2 19-09-11 (19-08-77) Sampled By: CLIENT on 03-SEP-19 @ 11:30 Matrix: SLUDGE	BST 2						
Miscellaneous Parameters							
Available Nitrate-N	8.2	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789288
Available Phosphate-P	905	DLHC	50	mg/kg	09-SEP-19	09-SEP-19	R4791009
Mercury (Hg)	0.222		0.0050	mg/kg	05-SEP-19	06-SEP-19	R4785035
Total Kjeldahl Nitrogen	4.22	DLHC	0.60	%	09-SEP-19	10-SEP-19	R4795351
Total Solids and Total Volatile Solids							
Total Solids	4.10		0.10	%	06-SEP-19	06-SEP-19	R4784962
Total Volatile Solids (dry basis)	63.5		0.10	%	06-SEP-19	06-SEP-19	R4784962
pH and Conductivity of Liquid Manure							
pH	6.67		0.10	pH	05-SEP-19	05-SEP-19	R4784954
Conductivity (EC)	3620		10	uS/cm	05-SEP-19	05-SEP-19	R4784954
Metals							
Aluminum (Al)	7550		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Antimony (Sb)	0.68		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Arsenic (As)	3.79		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Barium (Ba)	375		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Beryllium (Be)	0.37		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Bismuth (Bi)	7.15		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Boron (B)	47		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cadmium (Cd)	2.80		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Calcium (Ca)	22500		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Chromium (Cr)	45.2		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cobalt (Co)	11.9		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Copper (Cu)	232		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Iron (Fe)	12300		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Lead (Pb)	10.8		0.20	mg/kg	05-SEP-19	05-SEP-19	R4784341
Magnesium (Mg)	7970		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Manganese (Mn)	627		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Molybdenum (Mo)	21.3		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Nickel (Ni)	37.6		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Phosphorus (P)	12500		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Potassium (K)	9830		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Selenium (Se)	3.67		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Silver (Ag)	0.55		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Sodium (Na)	3770		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Strontium (Sr)	110		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Thallium (Tl)	0.24		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Tin (Sn)	8.0		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Titanium (Ti)	45.1		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Uranium (U)	5.48		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Vanadium (V)	20.7		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Zinc (Zn)	496		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Total Available N & NO3-N, NO2-N & NH4							

\* 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
L2340751-2 19-09-11 (19-08-77) Sampled By: CLIENT on 03-SEP-19 @ 11:30 Matrix: SLUDGE							
<b>Available Ammonium-N</b>							
Available Ammonium-N	1130	DLHC	100	mg/kg	07-SEP-19	07-SEP-19	R4789268
<b>Available Ammonium-N - Calculation</b>							
Total Available Nitrogen	1140		100	mg/kg		09-SEP-19	
<b>Nitrate, Nitrite &amp; Nitrate+Nitrite-N(KCL)</b>							
Nitrite-N	<2.0	DLM	2.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
Nitrate+Nitrite-N	6.5	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
Nitrate-N	6.5	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
<b>Total Organic N-liquid manure -as rec'd</b>							
<b>Ammonium - N in Liquid Manure - as rec'd</b>							
Ammonia, Total (as N)	4.5		1.0	lb/1000gal	05-SEP-19	05-SEP-19	R4784950
<b>Nitrogen, Total Organic</b>							
Total Organic Nitrogen	24.3		1.0	lb/1000gal		10-SEP-19	
<b>Total N in Liquid Manure -as rec'd</b>							
Total Nitrogen	28.8		2.0	lb/1000gal	05-SEP-19	05-SEP-19	R4784167
L2340751-3 19-09-12 (19-08-81) Sampled By: CLIENT on 03-SEP-19 @ 11:30 Matrix: SLUDGE							
<b>Miscellaneous Parameters</b>							
Available Nitrate-N	<5.0	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789288
Available Phosphate-P	277	DLHC	50	mg/kg	09-SEP-19	09-SEP-19	R4791009
Mercury (Hg)	0.235		0.0050	mg/kg	05-SEP-19	06-SEP-19	R4785035
Total Kjeldahl Nitrogen	3.52	DLHC	0.60	%	09-SEP-19	10-SEP-19	R4795351
<b>Total Solids and Total Volatile Solids</b>							
Total Solids	3.99		0.10	%	06-SEP-19	06-SEP-19	R4784962
Total Volatile Solids (dry basis)	52.3		0.10	%	06-SEP-19	06-SEP-19	R4784962
<b>pH and Conductivity of Liquid Manure</b>							
pH	6.87		0.10	pH	05-SEP-19	05-SEP-19	R4784954
Conductivity (EC)	3550		10	uS/cm	05-SEP-19	05-SEP-19	R4784954
<b>Metals</b>							
Aluminum (Al)	11200		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Antimony (Sb)	1.00		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Arsenic (As)	5.68		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Barium (Ba)	276		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Beryllium (Be)	0.57		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Bismuth (Bi)	4.54		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Boron (B)	31		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cadmium (Cd)	3.54		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Calcium (Ca)	17100		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Chromium (Cr)	48.2		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Cobalt (Co)	11.0		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Copper (Cu)	223		1.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Iron (Fe)	21300		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Lead (Pb)	13.3		0.20	mg/kg	05-SEP-19	05-SEP-19	R4784341
Magnesium (Mg)	6740		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Manganese (Mn)	577		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Molybdenum (Mo)	39.9		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Nickel (Ni)	51.6		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Phosphorus (P)	7320		100	mg/kg	05-SEP-19	05-SEP-19	R4784341
Potassium (K)	10800		25	mg/kg	05-SEP-19	05-SEP-19	R4784341
Selenium (Se)	3.54		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Silver (Ag)	0.82		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341

\* 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
L2340751-3	19-09-12 (19-08-81)						
Sampled By:	CLIENT on 03-SEP-19 @ 11:30						
Matrix:	SLUDGE						
<b>Metals</b>							
Sodium (Na)	5000		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Strontium (Sr)	58.7		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Thallium (Tl)	0.42		0.10	mg/kg	05-SEP-19	05-SEP-19	R4784341
Tin (Sn)	8.0		5.0	mg/kg	05-SEP-19	05-SEP-19	R4784341
Titanium (Ti)	42.6		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Uranium (U)	5.71		0.020	mg/kg	05-SEP-19	05-SEP-19	R4784341
Vanadium (V)	30.3		0.50	mg/kg	05-SEP-19	05-SEP-19	R4784341
Zinc (Zn)	885		10	mg/kg	05-SEP-19	05-SEP-19	R4784341
<b>Total Available N &amp; NO3-N, NO2-N &amp; NH4</b>							
<b>Available Ammonium-N</b>							
Available Ammonium-N	390	DLHC	100	mg/kg	07-SEP-19	07-SEP-19	R4789268
<b>Available Ammonium-N - Calculation</b>							
Total Available Nitrogen	390		100	mg/kg		09-SEP-19	
<b>Nitrate, Nitrite &amp; Nitrate+Nitrite-N(KCL</b>							
Nitrite-N	<2.0	DLM	2.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
Nitrate+Nitrite-N	<5.0	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
Nitrate-N	<5.0	DLM	5.0	mg/kg	07-SEP-19	07-SEP-19	R4789310
<b>Total Organic N-liquid manure -as rec'd</b>							
<b>Ammonium - N in Liquid Manure - as rec'd</b>							
Ammonia, Total (as N)	3.6		1.0	lb/1000gal	05-SEP-19	05-SEP-19	R4784950
<b>Nitrogen, Total Organic</b>							
Total Organic Nitrogen	20.0		1.0	lb/1000gal		10-SEP-19	
<b>Total N in Liquid Manure -as rec'd</b>							
Total Nitrogen	23.6		2.0	lb/1000gal	05-SEP-19	05-SEP-19	R4784167

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

## Reference Information

## Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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ETL-N-TOT-AVAIL-SK	Soil	Available Ammonium-N - Calculation	Soil Methods of Analysis (1993) CSSS
ETL-N-TOTORG-AGL-SK	Manure	Nitrogen, Total Organic	APHA 4500 Norg-Calculated as TKN - NH3-N
HG-200.2-CVAA-WP	Soil	Mercury in Soil	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

MET-200.2-MS-WP	Soil	Metals	EPA 200.2/6020B (mod)
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Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H<sub>2</sub>S) may be excluded if lost during sampling, storage, or digestion.

N-TOT-LECO-AGL-SK	Manure	Total N in Liquid Manure -as rec'd	RMMA A3769 3.3
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The sample is introduced into a quartz tube where it undergoes combustion at 900 C in the presence of oxygen. Combustion gases are first carried through a catalyst bed in the bottom of the combustion tube, where oxidation is completed and then carried through a reducing agent (copper), where the nitrogen oxides are reduced to elemental nitrogen. This mixture of N<sub>2</sub>, CO<sub>2</sub>, and H<sub>2</sub>O is then passed through an absorber column containing magnesium perchlorate to remove water. N<sub>2</sub> and CO<sub>2</sub> gases are then separated in a gas chromatographic column and detected by thermal conductivity.

## Reference:

Reference: Wolf, A., Watson, M. and Nancy Wolf. 2005. In: John Peters(ed.) Recommended Methods for Manure Analysis. Method 3.3

N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3
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The soil is digested with sulfuric acid in the presence of CuSO<sub>4</sub> and K<sub>2</sub>SO<sub>4</sub> catalysts. Ammonia in the soil extract is determined colorimetrically at 660 nm.

N2/N3-AVAIL-KCL-SK	Soil	Nitrate, Nitrite & Nitrate+Nitrite-N(KCL	CSSS (2008) 6.2-6.3
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Plant available nitrate and nitrite are extracted from the sample with 2N KCl. Nitrate and Nitrite in the filtered extract are determined colorimetrically by Technicon auto-analyzer or flow injection analyzer at 520 nm.

NH4-AGL-SK	Manure	Ammonium - N in Liquid Manure - as rec'd	RMMA A3769 4.1
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Ammonium is determined by steam distillation into boric acid followed by titration with standard acid.

Reference: Wolf, A., Watson, M. and Nancy Wolf. 2005. In: John Peters(ed.) Recommended Methods for Manure Analysis. Method 4.1

NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)
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Ammonium (NH<sub>4</sub>-N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.

NO3-AVAIL-SK	Soil	Available Nitrate-N	Alberta Ag (1988)
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Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution. Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm.

PH/EC-AGL-SK	Manure	pH and Conductivity of Liquid Manure	RMMA A3769 7.5/8.5
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The sample is analyzed directly using a calibrated pH/Conductivity meter.

Reference: Wolf, A., Watson, M. and Nancy Wolf. 2005. In: John Peters(ed.) Recommended Methods for Manure Analysis. Methods 7.5 and 8.5

PO4-AVAIL-OLSEN-SK	Soil	Available Phosphate-P by Olsen	CSSS (2008) 8
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Plant available phosphorus is extracted from air dried soil using a fixed ratio bicarbonate extraction. Phosphorus is determined by colorimetry.

## Reference Information

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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SOLIDS-TOT/TOTVOL-SK	Manure	Total Solids and Total Volatile Solids	APHA 2540G
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A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103-105°C. The increase in weight over that of the empty dish represents the Total Solids. The crucible is then ignited at 550°-10°C for 1 hour. The remaining solids represent the Total Fixed Solids, while the weight lost on ignition represents the Total Volatile Solids.

\*\* 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
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

## Chain of Custody Numbers:

## GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample  
 mg/kg wwt - milligrams per kilogram based on wet weight of sample  
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight  
 mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



## Quality Control Report

Workorder: L2340751

Report Date: 11-SEP-19

Page 1 of 6

Client: City of Portage la Prairie - Wastewater  
 97 Saskatchewan Avenue East  
 Portage la Prairie MB R1N 0L8

Contact: AARON STECHESEN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-WP	Soil							
<b>Batch</b>	<b>R4785035</b>							
<b>WG3153211-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Mercury (Hg)			93.8		%		70-130	05-SEP-19
<b>WG3153211-2</b>	<b>LCS</b>							
Mercury (Hg)			93.0		%		80-120	05-SEP-19
<b>WG3153211-1</b>	<b>MB</b>							
Mercury (Hg)			<0.0050		mg/kg		0.005	05-SEP-19
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Aluminum (Al)			102.3		%		70-130	05-SEP-19
Antimony (Sb)			101.9		%		70-130	05-SEP-19
Arsenic (As)			99.3		%		70-130	05-SEP-19
Barium (Ba)			98.0		%		70-130	05-SEP-19
Beryllium (Be)			89.5		%		70-130	05-SEP-19
Bismuth (Bi)			100.3		%		70-130	05-SEP-19
Boron (B)			4		mg/kg		0-8	05-SEP-19
Cadmium (Cd)			99.3		%		70-130	05-SEP-19
Calcium (Ca)			90.7		%		70-130	05-SEP-19
Chromium (Cr)			94.8		%		70-130	05-SEP-19
Cobalt (Co)			95.8		%		70-130	05-SEP-19
Copper (Cu)			99.1		%		70-130	05-SEP-19
Iron (Fe)			97.3		%		70-130	05-SEP-19
Lead (Pb)			100.3		%		70-130	05-SEP-19
Magnesium (Mg)			104.3		%		70-130	05-SEP-19
Manganese (Mn)			103.4		%		70-130	05-SEP-19
Molybdenum (Mo)			97.3		%		70-130	05-SEP-19
Nickel (Ni)			95.1		%		70-130	05-SEP-19
Phosphorus (P)			96.9		%		70-130	05-SEP-19
Potassium (K)			83.0		%		70-130	05-SEP-19
Selenium (Se)			103.6		%		70-130	05-SEP-19
Silver (Ag)			100.4		%		70-130	05-SEP-19
Sodium (Na)			84.7		%		70-130	05-SEP-19
Strontium (Sr)			96.0		%		70-130	05-SEP-19
Thallium (Tl)			0.12		mg/kg		0.03-0.23	05-SEP-19
Tin (Sn)			1.0		mg/kg		0-3.1	05-SEP-19
Titanium (Ti)			83.9		%		70-130	05-SEP-19





## Quality Control Report

Workorder: L2340751

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-4</b>	<b>CRM</b>	<b>CANMET TILL-1</b>						
Uranium (U)			101.7		%		70-130	05-SEP-19
Vanadium (V)			94.2		%		70-130	05-SEP-19
Zinc (Zn)			97.2		%		70-130	05-SEP-19
<b>WG3153211-2</b>	<b>LCS</b>							
Aluminum (Al)			102.5		%		80-120	05-SEP-19
Antimony (Sb)			103.4		%		80-120	05-SEP-19
Arsenic (As)			101.6		%		80-120	05-SEP-19
Barium (Ba)			104.0		%		80-120	05-SEP-19
Beryllium (Be)			98.6		%		80-120	05-SEP-19
Bismuth (Bi)			100.4		%		80-120	05-SEP-19
Boron (B)			98.5		%		80-120	05-SEP-19
Cadmium (Cd)			99.7		%		80-120	05-SEP-19
Calcium (Ca)			100.5		%		80-120	05-SEP-19
Chromium (Cr)			102.6		%		80-120	05-SEP-19
Cobalt (Co)			100.9		%		80-120	05-SEP-19
Copper (Cu)			101.6		%		80-120	05-SEP-19
Iron (Fe)			96.1		%		80-120	05-SEP-19
Lead (Pb)			100.7		%		80-120	05-SEP-19
Magnesium (Mg)			109.2		%		80-120	05-SEP-19
Manganese (Mn)			104.1		%		80-120	05-SEP-19
Molybdenum (Mo)			101.6		%		80-120	05-SEP-19
Nickel (Ni)			99.9		%		80-120	05-SEP-19
Phosphorus (P)			104.7		%		80-120	05-SEP-19
Potassium (K)			103.3		%		80-120	05-SEP-19
Selenium (Se)			101.0		%		80-120	05-SEP-19
Silver (Ag)			100.7		%		80-120	05-SEP-19
Sodium (Na)			103.4		%		80-120	05-SEP-19
Strontium (Sr)			105.6		%		80-120	05-SEP-19
Thallium (Tl)			101.5		%		80-120	05-SEP-19
Tin (Sn)			100.4		%		80-120	05-SEP-19
Titanium (Ti)			99.2		%		80-120	05-SEP-19
Uranium (U)			106.0		%		80-120	05-SEP-19
Vanadium (V)			102.5		%		80-120	05-SEP-19
Zinc (Zn)			99.2		%		80-120	05-SEP-19
<b>WG3153211-1</b>	<b>MB</b>							



## Quality Control Report

Workorder: L2340751

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	Soil							
<b>Batch</b>	<b>R4784341</b>							
<b>WG3153211-1</b>	<b>MB</b>							
Aluminum (Al)			<5.0		mg/kg		5	05-SEP-19
Antimony (Sb)			<0.10		mg/kg		0.1	05-SEP-19
Arsenic (As)			<0.10		mg/kg		0.1	05-SEP-19
Barium (Ba)			<0.50		mg/kg		0.5	05-SEP-19
Beryllium (Be)			<0.10		mg/kg		0.1	05-SEP-19
Bismuth (Bi)			<0.020		mg/kg		0.02	05-SEP-19
Boron (B)			<10		mg/kg		10	05-SEP-19
Cadmium (Cd)			<0.020		mg/kg		0.02	05-SEP-19
Calcium (Ca)			<100		mg/kg		100	05-SEP-19
Chromium (Cr)			<1.0		mg/kg		1	05-SEP-19
Cobalt (Co)			<0.020		mg/kg		0.02	05-SEP-19
Copper (Cu)			<1.0		mg/kg		1	05-SEP-19
Iron (Fe)			<25		mg/kg		25	05-SEP-19
Lead (Pb)			<0.20		mg/kg		0.2	05-SEP-19
Magnesium (Mg)			<10		mg/kg		10	05-SEP-19
Manganese (Mn)			<0.50		mg/kg		0.5	05-SEP-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	05-SEP-19
Nickel (Ni)			<0.50		mg/kg		0.5	05-SEP-19
Phosphorus (P)			<100		mg/kg		100	05-SEP-19
Potassium (K)			<25		mg/kg		25	05-SEP-19
Selenium (Se)			<0.50		mg/kg		0.5	05-SEP-19
Silver (Ag)			<0.10		mg/kg		0.1	05-SEP-19
Sodium (Na)			<10		mg/kg		10	05-SEP-19
Strontium (Sr)			<0.10		mg/kg		0.1	05-SEP-19
Thallium (Tl)			<0.10		mg/kg		0.1	05-SEP-19
Tin (Sn)			<5.0		mg/kg		5	05-SEP-19
Titanium (Ti)			<0.50		mg/kg		0.5	05-SEP-19
Uranium (U)			<0.020		mg/kg		0.02	05-SEP-19
Vanadium (V)			<0.50		mg/kg		0.5	05-SEP-19
Zinc (Zn)			<10		mg/kg		10	05-SEP-19
N-TOTKJ-COL-SK	Soil							



## Quality Control Report

Workorder: L2340751

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
N-TOTKJ-COL-SK Soil								
Batch R4795351								
WG3155924-1	DUP	L2340751-3						
Total Kjeldahl Nitrogen		3.52	3.78		%	7.1	20	10-SEP-19
WG3155924-2	IRM	08-109_SOIL						
Total Kjeldahl Nitrogen			95.4		%		80-120	10-SEP-19
WG3155924-3	LCS							
Total Kjeldahl Nitrogen			92.6		%		80-120	10-SEP-19
WG3155924-4	MB							
Total Kjeldahl Nitrogen			<0.020		%		0.02	10-SEP-19
N2/N3-AVAIL-KCL-SK Soil								
Batch R4789310								
WG3154653-1	DUP	L2340751-2						
Nitrite-N		<2.0	<2.0	RPD-NA	mg/kg	N/A	30	07-SEP-19
Nitrate+Nitrite-N		6.5	9.4	J	mg/kg	2.9	10	07-SEP-19
WG3154653-3	IRM	SAL814						
Nitrite-N			0.1		mg/kg		0-1.4	07-SEP-19
Nitrate+Nitrite-N			107.8		%		70-130	07-SEP-19
WG3154653-4	LCS							
Nitrite-N			86.1		%		70-130	07-SEP-19
Nitrate+Nitrite-N			95.8		%		70-130	07-SEP-19
WG3154653-2	MB							
Nitrite-N			<1.0		mg/kg		1	07-SEP-19
Nitrate+Nitrite-N			<2.0		mg/kg		2	07-SEP-19
NH4-AVAIL-SK Soil								
Batch R4789268								
WG3154647-1	DUP	L2340751-2						
Available Ammonium-N		1130	1100		mg/kg	2.7	20	07-SEP-19
WG3154647-3	IRM	SAL814						
Available Ammonium-N			113.3		%		70-130	07-SEP-19
WG3154647-4	LCS							
Available Ammonium-N			87.2		%		80-120	07-SEP-19
WG3154647-2	MB							
Available Ammonium-N			<1.0		mg/kg		1	07-SEP-19
NO3-AVAIL-SK Soil								
Batch R4789288								
WG3153453-1	DUP	L2340751-1						
Available Nitrate-N		86.0	83.3		mg/kg	3.2	30	07-SEP-19
WG3153453-3	IRM	SAL814						



## Quality Control Report

Workorder: L2340751

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-AVAIL-SK	Soil							
<b>Batch</b> R4789288								
WG3153453-3 IRM		SAL814						
Available Nitrate-N			97.7		%		70-130	07-SEP-19
WG3153453-4 LCS								
Available Nitrate-N			101.6		%		70-130	07-SEP-19
WG3153453-2 MB								
Available Nitrate-N			<1.0		mg/kg		1	07-SEP-19
PO4-AVAIL-OLSEN-SK	Soil							
<b>Batch</b> R4791009								
WG3154654-3 IRM		FARM2005						
Available Phosphate-P			93.1		%		80-120	09-SEP-19
WG3154654-4 LCS								
Available Phosphate-P			98.9		%		80-120	09-SEP-19
WG3154654-2 MB								
Available Phosphate-P			<1.0		mg/kg		1	09-SEP-19
N-TOT-LECO-AGL-SK	Manure							
<b>Batch</b> R4784167								
WG3148216-3 IRM		BE-1_MANURE						
Total Nitrogen			96.0		%		90-110	05-SEP-19
WG3148216-4 LCS		SULFADIAZINE						
Total Nitrogen			95.5		%		90-110	05-SEP-19
WG3148216-2 MB								
Total Nitrogen			<2.0		lb/1000gal		2	05-SEP-19
NH4-AGL-SK	Manure							
<b>Batch</b> R4784950								
WG3148339-2 IRM		NH4-1000						
Ammonia, Total (as N)			106.5		%		85-115	05-SEP-19
WG3148339-3 MB								
Ammonia, Total (as N)			<1.0		lb/1000gal		1	05-SEP-19

# Quality Control Report

Workorder: L2340751

Report Date: 11-SEP-19

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## Legend:

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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:

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Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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## Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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.

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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.



L2340751-CCFC

**Report to:**  
 Company: City of Portage la Prairie  
 Contact: Aaron Stechesen  
 Address: 97 Saskatchewan Ave. E.  
 Portage la Prairie, MB R1N 0L8  
 Phone: 204-239-8361 Fax: 204-239-8364

**Standard:** X Other:  
 Select: PDF X Excel Digital  
 Email 1: astechesen@city-plap.com  
 Email 2:

**Service Requested:** (rush - subject to availability)  
 Regular (Default)  
 Priority (2-3 Business Days) - 50% Surcharge  
 Emergency (1 Business Day) - 100% Surcharge  
 For Emergency < 1 Day, ASAP or Weekend - Contact ALS

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sampler:	Analysis Request												
					EC/pH-AGL-SK	N-TOT-ORG-AGL-SK	NO3-Avail-SK	N-TOT-COL-SK	PO4-Avail-Olsen-SK	Hg-200.2-CVAF-WP	MET-200.2-MS-WP	N-TOT-Avail-SK	FC-QT97-ENDPT	Conductivity	SAMPLE-DISPOSAL-WP		
1	19-09-10 (19-08-76)	03-Sep-19	11:30	Judy Delmoijer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	19-09-11 (19-08-77)	03-Sep-19	11:30	Judy Delmoijer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	19-09-12 (19-08-81)	03-Sep-19	11:30	Judy Delmoijer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**RUSH**

**Special Instructions / Regulations / Hazardous Details**

These samples are supplemental samples to the ones in brackets. Connor Cattani should be able to provide instructions as to whether or not the two sets of analysis that should be done in Winnipeg are required or not. I believe that these samples should be destined for Saskatoon. **Please change to Emergency Service.**

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

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

**SHIPMENT RELEASE (client use)**  
 Released by: *[Signature]* Date & Time: Sep 23/19 11:30am

**SHIPMENT RECEPTION (lab use only)**  
 Received by: *[Signature]* Date: Sep 24/19 11:00 AM Temperature: 15.3

**SHIPMENT VERIFICATION (lab use only)**  
 Verified by: Date & Time: Observations: Yes / No ?  
 If Yes attach SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION  
 WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY  
 GENF 18.00 Front

Delta Ag Services  
City of Portage  
McDonald NE 1-13 -07

Test Date: Sept. 3 2019



McDonald NE 1-13-07 - 144.9 Ac ● Sample Points -2019RW - 0 t

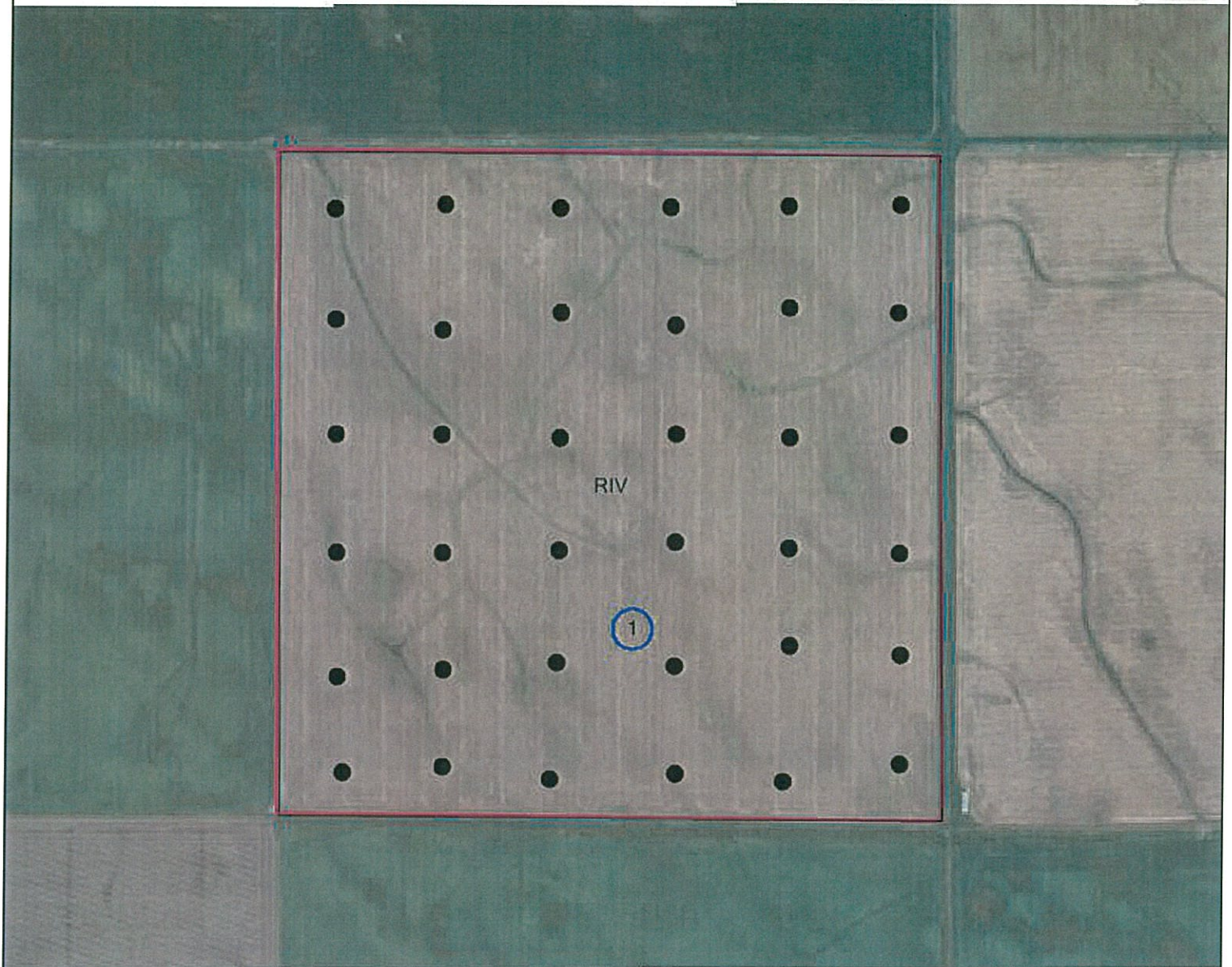
Clay Test - 1.4 Ac

Portage Soils-Clip - 150 Ac

Clay Test sites 1, 2 and 3 had no detectable water table at the 1.5 m depth

**Delta Ag Services  
City of Portage  
Brooks SE 30-12-08**

Test Date : Sept 3, 2019



- SE 30-12-08 - 162.4 Ac
- Sample Points -2019RW - 0 t
- Portage Soils-Clip - 161.5 Ac

Clay test - 0.5 Ac

Clay Test site 1 had no detectable water table at the 1.5 m depth