KGS GROUP

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May 27, 2021

Manitoba Conservation and Climate
Environmental Approvals Branch
123 Main Street, Suite 160
Winnipeg, Manitoba R3C 1A5

Attention: Ms. Laura Pyles
Acting Director

Re: RFP No. MNRF-R-(15) 2-19
R.M. of St Clements - Notice of Alteration for Pilot Project for Leachate Irrigation at St. Clements Waste Disposal Ground Licence No. 2274 S2 RRR

Dear Ms. Pyles:

On behalf of the Rural Municipality of St. Clements, KGS Group is pleased to submit one electronic PDF version (via email) of a Notice of Alteration (NoA) for an alteration to the St. Clements Waste Disposal Ground Licence No. 2274 S2 RRR, for a Pilot Leachate Irrigation Project.

Leachate Treatment is an extremely important component of landfill site management. For some rural sites, leachate is directed to a pond for evaporation, through a natural and/or enhanced process. The alternative is to pump or haul to sewage treatment facility suitable for handling leachate. Depending on the distance to the facility and fees charged, this can be cost prohibitive.

In 2020 the R.M. of St. Clements (RM) carried out leachate evaporation in the north pond using a system similar to the system used at the City of Steinbach landfill. The effectiveness and long-term potential for utilizing this method of leachate management has not been fully assessed yet by the RM.

The RM is interested in examining optional leachate management technologies in addition to the current evaporation method to ensure a long-term solution. Leachate irrigation is an approach that the RM would like to evaluate. However, the parameters for design of leachate irrigation systems and measurement of long-term impacts need to be determined before considering a full-scale project. Therefore, a pilot project approach is required to develop site specific design parameters for this potential application.

The St. Clements Waste Disposal Ground is an ideal site to consider irrigation of leachate because of it's soil conditions (abundance of clay), remote location and availability of areas that will be dedicated for future landfilling for irrigation.

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The details of the proposed pilot study are given in the attached NoA report, in order to obtain formal authorization from Manitoba Conservation and Climate (MCC) for an alteration to Licence No. 2274 S2 RRR. The completed Notice of Alteration form is included in Appendix A. The $500 application fee will be couriered separately to the Minister of Finance.

We are confident that with our solid waste management experience, understanding of the site, significant involvement with this landfill, and our completion of a successful pilot leachate irrigation project at a regional landfill in Saskatchewan, we can carry out a successful similar pilot project at the St. Clements Waste Disposal Ground.

Please do not hesitate to contact Mr. Stan Lozecznik at 204-918.5827 or by email at slozecznik@kgsgroup.com if you have any questions regarding the enclosed information.

Yours truly,

Jason Mann, M.Sc., P.Geo.
Environmental Department Head/Associate Principal

JDM/jr
Enclosure

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Attention: Ms. Laura Pyles
Acting Director

Re: R.M. of St Clements – Notice of Alteration (NoA) for Pilot Project for Leachate Irrigation at St. Clements Waste Disposal Ground Licence No 2274 S2 RRR – NoA Report

Dear Ms. Pyles:

On behalf of the R.M. of St. Clements, Kontzamanis Graumann Smith MacMillan Inc (KGS Group) is pleased to provide you with one (1) electronic copy of the NoA report regarding a pilot project for leachate irrigation at the St. Clements Waste Disposal Ground.

BACKGROUND

The site currently operates under Environment Act Licence No. 2274 S2 RRR. The Site is classified as a Class 1 WDG under the *Waste Management Facilities Regulation (M.R. 37/2016)*. The site accepts commercial and residential waste from residents of the R.M. of St. Clements (R.M.).

On July 8, 2016, KGS Group on behalf of the R.M., submitted a Notice of Alteration to Environment Act Licence No. 2274 S2 RR for the addition of two leachate collection ponds and associated infrastructure for evaporation and installation of a leachate extraction header into the existing waste area. In 2020 the RM carried out leachate evaporation in the north pond using a system similar to the system at the City of Steinbach landfill. The effectiveness and long-term potential for this method of leachate management has not been fully assessed yet by the R.M.

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As with all landfills, leachate will continue to be generated on an ongoing basis, requiring interim storage and ultimately treatment/management to replenish storage capacity and containment within the pond system. The R.M. is interested in examining optional leachate management technologies in addition to the current evaporation method to ensure a long-term solution. Leachate irrigation is an approach that the R.M. would like to evaluate. However, the parameters for design of leachate irrigation systems and measurement of long term impacts need to be determined before considering a full scale project. Therefore, a pilot project approach is required to develop site specific design parameters for this potential application.

As discussed during our meeting on April 29, 2021, this letter is to notify Manitoba Conservation and Climate (MCC) of a proposed alteration to the St. Clements Waste Disposal Ground for a Pilot Leachate Irrigation Project. The details of the proposed pilot project are given in the following section, in order to obtain formal authorization from MCC for inclusion in License No. 2274 S2 RRR. The Notice of Alteration form is included in Appendix A.

PROJECT METHODOLOGY

The field study will be carried out at the St. Clements Waste Disposal Ground and will involve KGS Group personnel, with the assistance of staff of the RM of St Clements. Leachate storage tanks will be set up on a 0.15 m gravel base close to onsite power, close to the leachate ponds as shown in Figure 1 attached. Leachate will be pumped from the leachate ponds into the 1 m^3 leachate storage tanks alternately, to enable cleaning as required.

Inside the tanks, an aeration system will be installed to provide air and increase the REDOX (reduction-oxidation) of the leachate, promoting precipitation of metals, removal of organics and to promote ammonia/odors/VOC's (Volatile Organic Compounds) volatilization. The retention and aeration time required for the treatment of the leachate within the tanks will be determined by running a field test and inducing air until the electrical conductivity of the leachate stabilizes. After the leachate is sufficiently aerated, it will be pumped from the tank via flexible hose to sprinklers on the irrigation plot.

It is anticipated that a minimum of 25 m^3 of leachate could be irrigated onto the irrigation test plot over the growing season for testing purposes, however, the total amount of leachate irrigated will depend on weather conditions such as rainfall, heat and wind.

Two plots (25m x 10m) are proposed at the Libau landfill for irrigation with aerated leachate, located on an area that will be used for future landfill cell development and expansion. Seeds for Alfalfa and the selected salt tolerant species such as slender wheatgrass, switchgrass and inland salt grass will be planted in spring in each plot (one control and one irrigated with leachate) as shown in Figure 1.

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Potential environmental and human health effects

Leachate migration into the soil vertically and laterally.

Mitigation measures

It is important to note that the leachate irrigation will follow stringent operational procedures as follows:

- Containment of leachate within the irrigation test plot by using clay enclosing berms, and ditching external to the berms to divert surface water from the plots (see Figure 1).
- Growing the plants to a germination stage before adding leachate, to minimize detrimental initial growth issues which could inhibit the uptake of leachate by the plants.
- Irrigating will need to vary according to weather events, particularly precipitation. For example, during high rainfall intensity events, long rainfall duration, or excessive moisture conditions in the ground, minimal leachate irrigation will be carried out. For severe drought conditions, supplemental irrigation with clean water may be required to compensate for typical precipitation over the span of the project. Overall, leachate irrigation rates will be adjusted to maximize plant uptake and minimize leachate migration from the test plots both vertically and laterally.
- Test plots will be located on a future landfill cell area.

Expected irrigation rates for St. Clements Waste Disposal Ground

The Mar-kit landfill in Hallock (Minnesota, USA) irrigates aerated leachate at a maximum rate of 93 L/m^2. In 2019, KGS Group and the University of Manitoba carried out various pot tests under greenhouse controlled conditions, testing various leachate irrigation rates from 79 L/m^2 to 170 L/m^2, showing no detrimental effects. After the greenhouse study, KGS Group carried out a pilot leachate irrigation project at a regional landfill in Saskatchewan with an estimate irrigation rate of 100 L/m^2. For this pilot leachate irrigation project, KGS Group estimates a leachate irrigation range between 70 L/m^2 and 150 L/m^2, respectively.

Proposed Testing

Plant performance will be assessed by biomass and height at the end of the project in comparison to the control plot. The grasses and alfalfa above ground biomass will be harvested at the end of the growing season and analyzed for total metals accumulation (various metals such as Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Cesium, Chromium, Copper, Iron, Manganese, Nickel, Titanium and others). Soil samples will likewise be taken before the startup and end of this pilot project to check for accumulation of total metals (same as above) with depth. Throughout this project, aerated leachate will be sampled bi-weekly and sent to an accredited CALA laboratory for total metals, conductivity, pH, alkalinity, chloride, sulphate, sodium and potassium, PAH's, COD and BOD. In summary, twelve (12) leachate samples, twelve soil (12) samples and twelve (12) plants samples will be analyzed during this pilot leachate irrigation project.

A final report describing the pilot project details and results will be submitted to the R.M. of St Clements and MCC with recommendations as to next steps for advancing this technology.

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KGS Group trusts that the above meets your requirements. If you have any questions regarding this submission, please contact the undersigned.

Prepared By:

[redacted]

Stan Lozecznik, PhD., P.Eng.
Environmental Engineer

Reviewed By:

[redacted]

Tony Kuluk, P.Eng.
Solid Waste Specialist

Approved By:

[redacted]

Jason Mann, M.Sc., P.Geo.
Environmental Department Head/Assistant Principal

SAL/jr
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STATEMENT OF LIMITATIONS AND CONDITIONS

Limitations

This report has been prepared for R.M. of St. Clements in accordance with the agreement between KGS Group and R.M. of St. Clements (the "Agreement"). This report represents KGS Group's professional judgment and exercising due care consistent with the preparation of similar reports. The information, data, recommendations and conclusions in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole, and sections or parts should not be read out of context.

This report is based on information made available to KGS Group by R.M. of St. Clements. Unless stated otherwise, KGS Group has not verified the accuracy, completeness, or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this report apply only as they existed at the time of KGS Group's work.

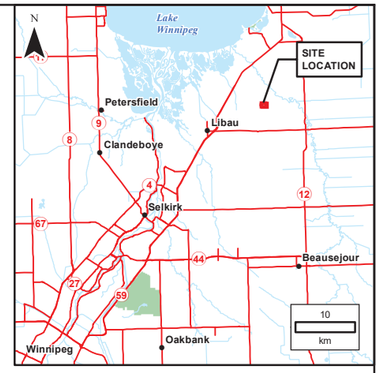
Third Party Use of Report

Any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

Geo-Environmental Statement of Limitations

KGS Group prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to KGS Group during the investigation and upon the services described, which were performed within the time and budgetary requirements of R.M. of St. Clements. As this report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate, or contradicted by additional information. KGS Group makes no representation concerning the legal significance of its findings or the value of the property investigated.

FIGURE



LEGEND:

- Active Cells
- Future Cells Development

DRAFT

25 0 25 50 75 100
Metres

SCALE: 1:2,500 METRIC 11"x17"

All units are metric and in metres unless otherwise specified.
Transverse Mercator Projection, NAD 1983, Zone 14.
Elevations are in metres above sea level (MSL).

NO.	YY/MM/DD	DESCRIPTION	ISSUED BY	CHECK BY
A	21/05/14	ISSUED WITH NOA REPORT	SAL	BJI

REVISIONS / ISSUE

KGS GROUP

St. Clements The place to be

LEACHATE MANAGEMENT AT LIBAU LANDFILL

PILOT LEACHATE IRRIGATION PROJECT LAYOUT

MAY 2021 | FIGURE 01 | REV: A

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

FileName: P:\Projects\2021\21-0607-0011\Dwg\GIS\MXDs\NoA Report\21-0607-001-Fig01.mxd
11"x17" PLOT SCALE 1:1

APPENDIX A

Notice of Alteration Form

Notice of Alteration Form

Manitoba Sustainable Development

Client File No. : 3967	Environment Act Licence No. : 2274 S2RR

Legal name of the Licencee: The Rural Municipality of St. Clements

Name of the development: St. Clements Waste Disposal Ground

Category and Type of development per Classes of Development Regulation:

Waste Treatment and Storage <SELECT>

Licencee Contact Person: Greg Elson

Mailing address of the Licencee: 1043 Kittson Road, Box 2 Grp 35 RR1

City: East Selkirk Province: Manitoba Postal Code: R03 0MO

Phone Number: (204) 482-3300 Fax: (204) 482-3098 Email: pwmanager@rmofstclements.com

Name of proponent contact person for purposes of the environmental assessment (e.g. consultant):

Stan Lozecznik, PhD, P.Eng.

Phone: (204) 896-1209 Fax:	Mailing address: 3rd floor - 865 Waverley Street

Email address: slozecznik@kgsgroup.com

Short Description of Alteration *(max 90 characters):*

Pilot Leachate Irrigation project to be carried out at the St. Clements Waste Disposal Ground

Alteration fee attached: Yes: ☑ No: ☐

If No, please explain:

Date: MAY 26 2021

Signature: [redacted]

Printed name:

A complete Notice of Alteration **(NoA)** consists of the following components:

- ☑ **Cover letter**
- ☑ **Notice of Alteration Form**
- ☑ **2 hard copies and 1 electronic copy of the NoA detailed report** (see "Information Bulletin - Alteration to Developments with Environment Act Licences")
- ☑ **$500 Application fee, if applicable** (Cheque, payable to the Minister of Finance)

Submit the complete NoA to:

Director
Environmental Approvals Branch
Manitoba Sustainable Development
1007 Century Street
Winnipeg, Manitoba R3H 0W4

For more information:

Phone: (204) 945-8321
Fax: (204) 945-5229
http://www.gov.mb.ca/sd/eal

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")