Rural Municipality of Ellice-Archie

Environment Act Proposal
for the
McAuley Wastewater Treatment Lagoon

PROVINCE OF MANITOBA
REGISTERED PROFESSIONAL ENGINEER
MAR 18 2020
J. G.
DYCK
Member
21376
E-730.02

Prepared by:

Oswald Wohlgemut, M.Sc.
Environmental Scientist

APEGM
Certificate of Authorization
J. R. Cousin Consultants Ltd.
No. 234 Date: MAR 18 2020

Reviewed by:

Jeff Dyck, P.Eng.
Senior Municipal Engineer

March 2020

JRCC ENGINEERING CONSULTANTS

ACKNOWLEDGMENTS

To prepare this report various sources of information were investigated and researched. JR Cousin Consultants Ltd. (JRCC) wishes to thank the RM of Ellice-Archie and the Manitoba Water Services Board (MWSB) who contributed to the data and content of this study. In addition, we wish to commend the RM of Ellice-Archie and the Manitoba Water Services Board for their fortitude in addressing the need for a long-term solution to wastewater treatment for residents in the Hamlet of McAuley and surrounding RM.

REMARKS

JR Cousin Consultants Ltd. has conducted this environment act proposal in accordance with generally accepted professional engineering principles and practices for the purpose of identifying conditions that may have an environmental impact on the site. The findings and recommendations reached in this report are based on information made available to JRCC during the investigation and conditions at the time of the site investigation. Conclusions derived in this report are intended to reduce, but not wholly eliminate the uncertainty regarding potential environmental concerns on the site, and recognizes reasonable limitations with regards to time, accuracy, work scope and cost. It is possible that environmental conditions may change from the date of this report. If conditions appear different from those encountered and expressed in this report, JRCC should be informed so that mitigation recommendations can be reviewed and adjusted as required. Historical data and information obtained from personal communication used in this report, are assumed to be correct, however JRCC has not conducted further investigations into the accuracy of this data. JRCC has produced this report for the use of the client, and takes no responsibility for any third party decisions or actions based on information contained in this report.

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Environment Act Proposal Form

Manitoba
Sustainable Development

Name of the development: McAuley Wastewater Treatment Lagoon	
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Class 2 Development - Wastewater Lagoon	
Legal name of the applicant: RM of Ellice-Archie	
Mailing address of the applicant: 318 Railway Ave. Contact Person: Ms. Trish Huberdeau, CAO City: McAuley Province: Manitoba Postal Code: R0M 1H0 Phone Number: (204) 722-2053 Fax: (204) 722-2027 email: rmarchie@mts.net	
Location of the development: McAuley Contact Person: Ms. Trish Huberdeau, CAO Street Address: Legal Description: NW 11-15-29 WPM City/Town: McAuley Province: Manitoba Postal Code: R0M 1H0 Phone Number: (204) 722-2053 Fax: (204) 722-2027 email: rmarchie@mts.net	
Name of proponent contact person for purposes of the environmental assessment: Jeff Dyck, P.Eng	
Phone: (204) 489-0474 Fax: (204) 489-0489	Mailing address: JR Cousin Consultants Ltd. 91 A Scurfield Blvd. Winnipeg, Manitoba, R3Y 1G4
Email address: jdyck@jrcc.ca	
Webpage address: www.jrcc.ca	
Date: MAR 18 2020	Signature of proponent, or corporate principal of corporate proponent: Printed name: Jeff Dyck

PRINT RESET

EXECUTIVE SUMMARY

General

The RM of Ellice-Archie has requested assistance from the Manitoba Water Services Board (MWSB) to construct new wastewater treatment lagoon cells near the Hamlet of McAuley, Manitoba. An Environment Act Licence will be required from Manitoba Conservation and Climate for the construction and operation of the proposed lagoon. JR Cousin Consultants Ltd. (JRCC) was retained for the engineering services.

Description

The existing McAuley wastewater treatment lagoon is in need of replacement due to concerns with the hydraulic capacity and liner integrity. A new facultative lagoon is being proposed at NW 11-15-29 WPM, to the southeast of the existing lagoon cells, which will continue to service residents in the community and surrounding rural residents.

Population Contributing Effluent

The projected Year 20 population used for sizing the new McAuley lagoon consisted of the residential population in the Hamlet of McAuley (110 people) and surrounding rural residents (543 people).

Lagoon Loading

The total projected Year 20 organic loading to the lagoon primary cell would be approximately 21.0 kg BOD_5/day, which considers average daily piped loading from the residents in McAuley and septic hauling from rural residents and the St. Lazare wastewater treatment facility (WWTF).

Based on a per capita hydraulic loading rate of 372 L/person/day, the projected Year 20 hydraulic load from residents in McAuley to the lagoon would be approximately 41 m^3/day. Therefore, the lagoon would require a total hydraulic capacity of 9,420 m^3 in Year 20 for 230 days of storage, which was utilized in design for sizing the new lagoon cells.

Topographical Survey and Geotechnical Investigation

The general area for lagoon development was gently sloped agricultural and grassland, surrounded by agricultural land, and bordered to the north by the lagoon and municipal access road. The land generally slopes towards the north, to Scissor Creek.

The general soil profile in the proposed lagoon development area consisted of topsoil followed by layers of low to medium plastic silt, sand till and silt till. These soils were not expected to be suitable for a lagoon liner construction. The soils in the existing lagoon dikes indicated layers of saturated, unsuitable soil material, which is likely permitting effluent seepage into the surrounding land and groundwater.

Lagoon Liner

Based on the onsite geotechnical investigation, it is proposed that a synthetic liner be used for containment of liquid in the lagoon cells. Excavated soils will be utilized to construct the lagoon dikes and suitable sand material will be used for liner bedding and cover material to prevent punctures.

Design Considerations

The design of the proposed McAuley lagoon will include:

- construction of a primary cell and a storage cell
- cell depths of 2.5 m (1.5 m liquid operating depth and 1.0 m freeboard)
- inner dike slopes of 5H:1V in both cells
- outer dikes slopes of 4H:1V in both cells
- constructing a lagoon approach and truck turnaround with compacted granular material
- an intercell pipe and valve located in the intercell dike between the primary cell and the storage cell
- a discharge pipe and valve located in the east dike of the storage cell
- degassing and dewatering piping below the floor of the lagoon cells
- a perimeter ditch around the outside toe of dike
- a fixed knot game fence located along the outside top of dike
- a lockable gate at the entrance to the lagoon access road
- a sign at the entrance gate.

Nutrient Management Plan

Normal facultative lagoon operation with spring and fall discharges, will typically produce effluent quality meeting provincial and federal requirements for BOD, CBOD, TSS, fecal coliforms, E. coli, and un-ionized ammonia. Phosphorus reduction would be achieved through the application of Alum on the surface of the storage cell, if effluent quality does not meet the provincial requirement of 1 mg/L or less, prior to discharge.

Existing Lagoon Cells

The existing lagoon cells will be decommissioned by discharging effluent, and having accumulated sludge removed, after dewatering. The cells will be abandoned in place for use as emergency storage in years of high precipitation and liquid levels in the new lagoon cells.

Potential Concerns and Mitigation Measures

The potential concerns identified with the lagoon construction and associated mitigation measures include:

Potential Concern	Mitigation Measure
Emissions from Construction Equipment	The construction contractor will maintain heavy equipment to meet provincial and local emission standards
Dust Generation	Dust suppression methods (i.e. wetting) will be utilized if dry and windy conditions are a nuisance to nearby residents
Odour Nuisance	Primary cell will be sized large enough for the projected organic loadings. Setback distance requirements to residents and the community will be met
Contamination of Surface and Groundwater from Lagoon Operation and Seepage	The lagoon will not be discharged unless the effluent quality requirements of the Environment Act Licence are met. The new lagoon cells will utilize a synthetic liner meeting provincial requirements for permeability
Spills or Leaks during Construction works	Contractor to have emergency spill kit on site. Hazardous materials and fuel to be handled in accordance with all federal and provincial regulations
Siltation into Surface Water	Siltation will be prevented by utilizing silt fencing along the boundary of the site, and installing sten logs in the drainage ditch between the creek and the development
Impacts to Wildlife and Vegetation	Areas of vegetation clearing will be clearly marked prior to beginning clearing and grubbing works
Traffic Impacts	Impacts from heavy construction traffic would be minimized by maintaining setback distances from the community, and utilizing warning signs when working near roadways.
Noise Impacts	Construction works will be limited to daylight hours only and all residential setback requirements will be met.
Health and Safety	Construction workers will be required to adhere to the safety program which will include utilizing personal protective equipment while on site. Warning signs will be utilized at the entrance to the site to prevent unauthorized entry.

Schedule and Approvals

The lagoon construction works are scheduled to begin upon receipt of the Environment Act Licence, and upon obtaining funding and completion of design. An Environment Act Licence is required from Manitoba Conservation and Climate for the construction works and the lagoon operation. The RM will be responsible to submit annual monitoring reports to Environment Canada and Manitoba Conservation and Climate (as required).

1.0 INTRODUCTION AND BACKGROUND

The development described in this document is for constructing and operating a new wastewater treatment lagoon in the RM of Ellice-Archie, Manitoba, for the residents in the Hamlet of McAuley and surrounding rural areas in the RM.

1.1 Introduction

The RM of Ellice-Archie and the Manitoba Water Services Board (MWSB) are proposing to construct a new wastewater treatment lagoon near McAuley, Manitoba. The new wastewater treatment lagoon would replace the existing lagoon in McAuley, which is at capacity and there are concerns with the liner integrity. The new lagoon would accommodate future proposed growth in the community and the surrounding rural residents in the RM. An Environment Act Licence is required from Manitoba Conservation and Climate for the construction and operation of the proposed lagoon. JR Cousin Consultants Ltd. (JRCC) was retained for the related engineering services.

1.2 Contact Information

Mr. Jeff Dyck, P.Eng.
JR Cousin Consultants Ltd.
91A Scurfield Boulevard
Winnipeg, Manitoba
R3Y 1G4
Phone: (204) 489-0474, Fax (204) 489-0487

Ms. Trish Huberdeau, CAO
RM of Ellice-Archie
318 Railway Avenue
McAuley, Manitoba
R0M 1H0
Phone: (204) 722-2053, Fax (204) 722-2027

1.3 Background Information

The Hamlet of McAuley is located approximately 350 km west of Winnipeg, in the RM of Ellice-Archie, and is accessed by PTH 41. McAuley currently utilizes a two cell facultative lagoon for wastewater treatment and storage, located at NW 11-15-29 WPM. McAuley utilizes a gravity sewer collection system and a lift station which pumps effluent to the lagoon primary cell.

The existing McAuley wastewater treatment lagoon is located approximately 630 m northeast of the community, and has been experiencing capacity and liner issues. The lagoon is currently operating under a Clean Environment Commission Licence (No. C-B-162). The service population utilizing the lagoon includes residential and commercial populations within the Hamlet of McAuley. The existing lagoon does not have a spillway and does not receive truck hauled wastewater.

1.4 Description of Previous Studies

The report entitled *Hamlet of McAuley – Water and Sewer Infrastructure Study*, by JRCC (May 2000) was reviewed to obtain background information on the existing McAuley lagoon. The infrastructure study discussed findings from the water source, water treatment process, water distribution system, sewer collection system, lift station, and wastewater lagoon. The lagoon was originally built 1967 utilizing compacted onsite soils for containment. The lagoon was not constructed with a spillway for septage dumping, therefore only receives piped wastewater from the community. The top of dike elevations varied based on soils being placed on top of the dikes from the ditch excavation. There was no concern for hydraulic or organic overloading at the time on the study. There were rodent burrow holes in the lagoon dike, which were a concern to the lagoon operator. The sewage collection system appeared to be in good operating condition, however weeping tile infiltration was a concern. Upgrades recommended at the time of the study included: leveling of the top and outside of the dikes, removing rodent burrows and excessive vegetation growth, re-grading of the perimeter ditch and repairing the lagoon access road.

The report entitled *RM of Ellice-Archie – Preliminary Design Report for McAuley Lagoon Expansion Study*, by JRCC (April 2019) was reviewed to obtain background information on the existing McAuley lagoon and expansion options. Based on site observations and discussions with the operator, the lagoon has experienced issues with hydraulic capacity. Based on the soils investigation, the existing lagoon liner has layers of unsuitable material that do not meet provincial requirements for permeability, and therefore it is assumed that effluent is seeping out of the lagoon dikes into the surrounding land and groundwater. Options for remediation included, re-lining the existing lagoon cells, constructing a cut-off wall around the perimeter of the cells, or constructing new adjacent lagoon cells with either soil or synthetic liners. It was recommended to construct new lagoon cells to the southwest of the existing lagoon and to install a synthetic liner for containment.

1.5 Project Description

The RM of Ellice-Archie requires an Environment Act Licence for the construction and operation of a new facultative lagoon to replace the existing lagoon near the Hamlet of McAuley, Manitoba. Due to hydraulic capacity issues of the existing lagoon and concerns with the liner integrity, new lagoon cells are being proposed at NW 11-15-29 WPM, to the southeast and adjacent to the existing lagoon cells. The lagoon cell development will include a synthetic liner, degassing system, forcemain re-routing, perimeter ditching, perimeter fencing, an access approach and spillway.

2.0 DESCRIPTION OF THE DEVELOPMENT

For each heading there is an information request from the Environment Act Proposal Form. These requests are repeated herein in italics followed by the pertaining response.

2.1 Land Title/Location

Certificate of Title showing the owner(s) and legal description of the land upon which the development will be constructed; or, in the case of highways, rail lines, electrical transmission lines, or pipelines, a map or maps at a scale no less than 1:50,000 showing the location of the proposed development:

The proposed lagoon development site is located at NW 11-15-29 WPM, in the RM of Ellice-Archie. The location of the proposed lagoon layout is included on Plan 1 in Appendix C. The land parcel is currently owned privately by Ja-Lyn Farms Ltd. A copy of the current Land Titles Transactions (No. 2719215/2) for the land on which the lagoon development is proposed is attached in Appendix A. The RM will be purchasing the property and is in the process of obtaining a land purchase agreement with the land owner.

2.2 Owner of Land and Mineral Rights

Owner of land upon which the development is intended to be constructed, and of mineral rights beneath the land, if different from surface owner:

According to the status of title (No. 2719215/2), all mines and minerals are excluded from the surface title as reserved in the grant from the Crown. Refer to the status of title attached in Appendix A.

2.3 Existing Land Use

Existing land use on the site and on land adjoining it, as well as changes that will be made in such land use for the purposes of the development:

The proposed lagoon development site is located approximately 620 m northeast of McAuley and adjacent to the existing lagoon cells. The site is partially cleared agricultural land and low lying scrub brush. The agricultural land is utilized for crop growth; however the scrub brush area is not maintained by the owner. The site is surrounded by active agricultural land used for crop production and a low lying wetland area to the southwest. The site is bordered to the north by the lagoon, municipal access road, and Scissor Creek, which is approximately 150 m to the north.

Soil would be excavated on the site of the proposed lagoon cells, for construction of the lagoon cell dikes and surrounding drainage ditch. A new approach off of the municipal access road will need to be constructed for maintenance vehicles and septic haulers.

2.4 Land Use Designation/Zoning Designation

Land use designation for the site and adjoining land as identified in a development plan adopted under The Planning Act or The City of Winnipeg Act, and the zoning designation as identified in a zoning by-law, if applicable:

The lagoon development site is zoned as Agricultural General, based on zoning designations in the RM of Ellice-Archie.

2.5 Description of Development

Description of proposed development and schedule for stages of the development, including proposed dates for planning, design, construction, commissioning, operation, and decommissioning and/or termination of operation (if known), identifying major components and activities of the development as applicable (e.g. access road, airstrip, processing facility, waste disposal area, etc.).

2.5.1 Project Schedule

The lagoon development design is proposed to begin upon receipt of the Environment Act Licence, with site works beginning upon availability of funding. Commissioning and operation of the lagoon would begin upon completion of construction and after approval for use is obtained from Manitoba Conservation and Climate. The proposed lagoon would be designed for a 20 Year lifespan. The existing lagoon cells would be used for dewatering sludge after the new cells are constructed and commissioned.

2.5.2 Basis for Proposed Lagoon Site Selection

The locations explored for the proposed lagoon site were initially chosen based on discussions with the RM, considering proximity to the existing residences, future development and property boundaries, as well as land availability, existing land use, land ownership, adjacent drainage routes, site topography and soil conditions.

The Manitoba Conservation and Climate guidelines for the location of a wastewater treatment lagoon (*Information Bulletin - Design Objectives for Standard Sewage Lagoons,* Province of Manitoba, Environmental Management, September 2014) are outlined in the following table. A description of the proposed site in relation to each of the guidelines is also provided in the following table.

Table A: Location of Proposed Lagoon Site in Relation to Provincial Guidelines

Manitoba Conservation and Climate Guideline	Proposed Relation to Site
Lagoons must be located a minimum of 460 m from the nearest center of population.	The proposed lagoon development site is located beyond the 460 m setback from the boundary of McAuley.

Manitoba Conservation and Climate Guideline	Proposed Relation to Site
Lagoons must be located a minimum of 300 m from any residence. (Measured from the outer toe of the nearest dike).	The proposed lagoon development site is located beyond the 300 m setback from the nearest residence.
Consideration should be given to sites in which prevailing winds are in the direction of uninhabited areas.	The prevailing winds are typically from the north and west. The proposed lagoon development site is located northeast of the community.
Sites with an unobstructed wind sweep across the lagoon are preferred.	The proposed lagoon development site is located in a partially cleared open field surrounded by open agricultural land.
Areas that are habitually flooded shall be avoided.	The proposed lagoon development site is located adjacent to a wetland area, however not in an area that is subject to overland flooding. The dikes of the proposed lagoon development would be constructed at elevations of 1 m to 3 m above the existing ground surface.
Sewage lagoons are to be designed and constructed such that the interior surface of the proposed lagoon is underlain by at least one metre of soil having a hydraulic conductivity of 1×10^{-7} cm/sec or less. In areas sensitive to groundwater contamination or without suitable soils, a flexible synthetic liner may be utilized.	As the excavated soils at the site are unsuitable for a liner construction, a synthetic liner would be installed to provide containment of liquid in the cells.

The lagoon development area is located beyond all setback distances required by Manitoba Conservation and Climate and is in an area that meets other provincial siting requirements, therefore there are no expected concerns for the location of the proposed lagoon cells. Plan 2 in Appendix C, shows the minimum setback distance requirements for the proposed lagoon to the nearby residences and the Hamlet of McAuley.

2.5.3 Land Classification

Based on the *Nutrient Management Regulation* (*Reg. 62/2008*) under the Water Protection Act, and from a review of land-use capability mapping for the proposed area of development, the land is considered Class 3 or N1, which would have moderate productivity with no restrictions for developing a wastewater treatment lagoon and the application of nutrients to the soil through effluent discharge, given that the provincial requirements for effluent quality are met.

2.5.4 Proposed Lagoon Drainage Route

Based on a review of topographic information obtained from the site and mapping for the region, the lagoon would continue to discharge to the north, into Scissor Creek (Fourth Order Provincial

Drain). From Scissor Creek, the flow is to the east for approximately 13 km to the Assiniboine River. The length of the discharge route from the proposed lagoon storage cell would be approximately 150 m before reaching Scissor Creek (See Plan 2 in Appendix C).

2.5.5 Lagoon Access

The proposed lagoon cells will require a new lagoon access approach, off of the municipal access road to the north. This access approach will tie into a truck turnaround area utilized by maintenance vehicles and septic haulers. This access approach would be constructed with compacted granular material.

2.5.6 Proposed Piping

The location of the proposed lagoon development would require the re-routing of the existing forcemain into the new primary cell, which will be located to the southeast of the existing forcemain (see Plan 3 in Appendix C).

2.6 Population Contributing Effluent

Population data was obtained from Statistics Canada and discussions with the RM of Ellice-Archie. The service population utilizing the McAuley wastewater treatment lagoon will include residents within the Hamlet of McAuley, and rural residents in the RM of Ellice-Archie.

2.6.1 Hamlet of McAuley

McAuley consists of residential and commercial populations. The RM reported a residential population for the Hamlet of McAuley of ninety people, with a relatively stable population. For design it was agreed that an annual growth rate of 0.5% would be applied to project population to Design Year 20. No significant commercial or institutional populations are located in McAuley, which would bring additional populations into the community and impact the overall population. Therefore, the Year 20 design population is projected to be 110 people.

2.6.2 Rural Population

Currently rural residents in the RM of Ellice-Archie are being serviced by the St. Lazare lagoon and lagoons in surrounding RMs. From discussion with the RM, they would like the majority of the rural septic dumping from the RM of Ellice-Archie to occur at the McAuley lagoon. Therefore, the latest census data from Statistics Canada was reviewed. Based on the census data, the RM of Ellice-Archie had a population of 887 people, and the population has been in decline over the past five years. Included in this total RM population are the communities of McAuley (ninety people) and St. Lazare (254 people). As these communities are serviced by piped collection systems, their populations would not be counted in the rural population, therefore the total rural population is currently estimated to be 543 people. Based on the declining population trend, there is no growth rate assumed for the rural population over the next 20 years. While St. Lazare is also proposing to construct a wastewater treatment facility (WWTF) which will have the capacity to service rural residents, it is unknown when this development will take place, so as a

safety precaution it is assumed that the McAuley lagoon will be sized large enough to accommodate the organic loading from the entire rural population.

2.6.3 Population Summary Table

The current and projected populations for the service area have been included in the summary table below and in the attached Table 1 in Appendix B.

Contributing Population	Current Population	Year 20 Population
Hamlet of McAuley	90	110
RM of Ellice-Archie (rural)	543	543

2.7 Wastewater Production

The proposed McAuley wastewater treatment lagoon expansion will service the projected residential and rural populations as described above. The lagoon sizing will be based on the projected 20 year populations and the projected organic and hydraulic loadings to the lagoon.

2.7.1 Organic Loading

The organic loading calculation is based upon the organics in typical residential wastewater, which is a per capita value of 0.076 kg BOD_5/person/day. Based on the projected Year 20 population of 110 people utilizing the piped collection system in the community, an organic load of 8.4 kg BOD_5/day will be generated.

Septic tank wastewater typically has higher concentrations of Biochemical Oxygen Demand (BOD_5), as piped wastewater has a higher dilution factor and septic tanks have a greater accumulation of solids. The septage from these tanks typically impacts the peak daily BOD_5 loading. The following assumptions were made to determine organic loading from the rural septic tanks:

- the rural housing population density of 2.3 people/household, as determined from Statistics Canada
- average daily wastewater production of 338 L/person/day, as per the water demand in McAuley
- average septic tank volume of 4,500 L
    - based upon typical septic truck sizing, it is assumed that each truck load can hold two septic tank loads
- each septic tank is pumped out annually
- an average generation rate of 200 L/person/year of septage solids at 0.007 kg BOD_5/L
- a calculated average BOD_5 concentration of 0.000227 kg BOD_5/L for non-solid septage effluent.

Therefore, based on the above criteria, each septic tank pump out would generate approximately 4.2 kg BOD_5, based on the following:

$$(200 \times 2.3 \times 0.007) + ((4{,}500-(200 \times 2.1)) \times 0.000227) = 4.2 \text{ kg } BOD_5.$$

Septage is only permitted to be hauled to the lagoon over the time period of 135 days. Based on the number of hauling days and the projected number of septic loads per year, it is estimated that a maximum of one truck load would be hauled to the facility per day, which would be an organic load of 8.4 kg BOD_5/day. It is also expected that the St. Lazare WWTF will be contributing the equivalent of one septic tank load of wastewater to the McAuley lagoon per day (peak), which would be an additional 4.2 kg BOD_5/day. Therefore, the total daily organic loading from piped sources and truck-hauled septage is projected to be approximately 21.0 kg BOD_5/day in Design Year 20. Table 1, attached in Appendix B, shows the current and projected organic loadings to the lagoon.

2.7.2 Hydraulic Loading

The hydraulic loading to the McAuley wastewater treatment lagoon is comprised of three wastewater streams: water usage, water treatment plant backwash water, and infiltration. Manitoba Conservation and Climate requires a facultative lagoon to have sufficient storage for a 230 day period over the winter and spring months (November 1 to June 15), which is the basis for sizing the hydraulic capacity of the lagoon cells.

The water treatment plant water usage records from 2015 to 2018 were reviewed to provide an estimate of the wastewater production. Based on these records a per capita wastewater production rate of 327 L/person/day was estimated. These records also include backwash water from the WTP.

For lagoon hydraulic storage requirements, only the flow between November 1 and June 15 is of importance as it represents the lagoon storage period (retention time). The summer flows to the lagoon are significantly higher, however since the lagoon can be discharged multiple times during the period from June 15 to November 1 as hydraulics require, the higher summer flows were not included in the lagoon sizing.

The annual pumping records from lift station in McAuley were reviewed from 2015 to 2018 and a drawdown test was conducted at the lift station to determine the volume of effluent being pumped to the lagoon. However, based on a review of the pumping records it was determined that the lift station hour meter was not operating correctly and could not be relied on for accurate pumping data.

The lagoon operator was asked to record liquid levels in the lagoon cells after discharge, to estimate the volume of liquid reaching the lagoon. From the spring 2018 discharge to the late summer of 2018 the hydraulic loading was estimated based on liquid levels in the lagoon. From the operator information provided, a total per capita hydraulic loading rate of 338 L/person/day was estimated, which is similar to the water usage rate over the same period of time. Another

consideration was potential exfiltration through the lagoon dikes, which based on the most permeable layer recorded in the dike, for which an allowance of approximately 10% of the liquid entering the lagoon cells was made. This would increase the per capita hydraulic loading rate to approximately 372 L/person/day, which was assumed for future loadings from the service population.

Based on the above per capita wastewater production rates, the projected hydraulic loadings to the lagoon in Design Year 20, would be approximately 41 m^3/day, during the 230 day storage period.

The additional volume of wastewater from truck hauled septage has not been included as the septage is not permitted to be hauled to the lagoon during the majority of the 230 day storage period and does not significantly impact the hydraulic loading.

The total hydraulic capacity of the lagoon would need to be 9,420 m^3 over the required 230 day storage period to meet the Year 20 demand. Table 1, attached in Appendix B, shows the current and projected Year 20 hydraulic loadings to the lagoon.

2.7.3 Wastewater Production Summary Table

The current and projected organic and hydraulic loadings for the service area have been included in the summary table below and in the attached Table 1 (Appendix B).

Contributing Wastewater Load	Current Daily Load	Year 20 Daily Load
Organic Loading (kg BOD_5/day)	15.2	21.0
Hydraulic Loading (m^3/day)	33.5	41

2.8 Lagoon Sizing Requirements

An Environment Act Licence is required from Manitoba Conservation and Climate for the construction and operation of any new lagoon, therefore the design requirements of Manitoba Conservation and Climate would be met in the lagoon sizing. The new lagoon licence will require a minimum hydraulic storage period of 230 days (November 1 to June 15), which is the basis of the lagoon storage capacity design.

The new lagoon would be constructed with one primary cell and one storage cell, each with 5H:1V inner slopes. The storage cell discharge pipe would be located 0.3 m above the cell floor elevation, to maintain a minimum level of liquid in the storage cell at all times. The lagoon cells will be sized for the projected Year 20 organic and hydraulic loading requirements.

2.8.1 Primary Cell

The minimum sizing of the primary cell is based on the required surface area at a height of 0.75 m from the cell floor and the standard organic treatment rate for a facultative lagoon of 56 kg BOD_5/ha/day. The minimum required surface area at 0.75 m to treat the projected peak organic loadings would be 3,744 m^2.

The primary cell would be designed with a maximum liquid level of 1.5 m and a freeboard height of 1.0 m from the maximum liquid level to the top of the dike, as per Manitoba Conservation and Climate requirements. The flat bottom area would be approximately 2,800 m^2 (see Plan 4 attached in Appendix C).

2.8.2 Storage Cell

The total hydraulic storage capacity of the lagoon would be generated from the volume of the storage cell between the discharge pipe invert (0.3 m) and the maximum liquid operating level (1.5 m), along with the "top half" of the primary cell (0.75 m depth to 1.5 m depth). The total hydraulic storage capacity required for the 230 day storage period in Design Year 20 would be 9,420 m^3.

The top half of the primary cell would provide a hydraulic storage of approximately 3,245 m^3. Therefore, to accommodate the 230 day storage period the storage cell would be required to store a minimum of 6,175 m^3 of effluent. The storage cell would have a flat bottom area of approximately 4,900 m^2 and would be designed with a maximum liquid level of 1.5 m and a freeboard height of 1.0 m from the maximum liquid level to the top of the dike.

2.9 Topography and Geotechnical Information

A topographical survey and geotechnical investigation in the potential development area surrounding the lagoon cells was completed on May 3, 2017, to determine the suitability of the proposed site for the lagoon construction works.

2.9.1 Site Conditions and Topography

The proposed development site consists of partially cleared agricultural field used for crop production and unmaintained grassland and low lying scrub brush. The development area is surrounded by agricultural land and bordered to the north by the existing lagoon cells and a municipal access road. Based on a topographic survey, the potential development area was relatively flat to depressional, with a maximum measured elevation difference of approximately 0.9 m from the southwest corner of the site to the northeast corner. The existing lagoon dikes are approximately 1.5 m above the surrounding prairie grade.

2.9.2 Past Geotechnical Data

Driller well log reports in the quarter section of the existing lagoon site were reviewed for background soils and groundwater information. This well log reports indicated that the subsoil profile at generally consists of variations of surficial clay, gravel and silt, followed by deposits of stony till down to a depth of 4.8 m below the surface. No groundwater data was recorded in the well logs. Driller well log reports are attached in Appendix A.

Manitoba Reconnaissance Soil Survey Report No. 6 was reviewed for additional information regarding soils in the general area of development. According to the report, the soils in the

lagoon expansion area were classified as Oxbow Association. These soils consist of loam to clay loam soils developed on moderately calcareous boulder till. The topography is generally undulating and impacts the drainage characteristics of the soils. Soils on slopes are well-drained, while soils in depressions are poorly drained.

2.9.3 Geotechnical Investigation

There were four test holes excavated during the geotechnical investigation to a maximum depth of 2.4 m. The test holes were located on the cleared portion of agricultural land on the proposed development site.

Potential Development Area

Based on the soils observed in the test holes around the existing lagoon cells, the subsurface soil profile was similar across the site. The general soil profile across the sampling area is summarized in the following table.

Primary Soil Type	Average Depth Range of Soil Layer	Secondary Soil Characteristics
Topsoil	0 m – 0.3 m	silty
Silt (low to medium plastic)	0.3 m – 4.5 m	sandy
Sand Till	3.0 m – 4.2 m	silty
Silt Till (high plastic)	4.2 m – 6.0 m	stones

The soil samples tested had results that were marginal for construction of a lagoon liner. Standing water was recorded in all of the test holes at depths ranging from 0.4 m to 2.5 m below the surface. Details of the soil profile and groundwater conditions can be found the test hole logs attached in Appendix A.

Existing Lagoon Dikes

Based on the soils observed in the test holes conducted along the perimeter dikes, the subsurface soil profile in the dikes varied, with regards to soil type and depth. The general soil profile in the dikes is summarized in the following table.

Primary Soil Type	Average Depth Range of Soil Layer	Secondary Soil Characteristics
Topsoil	0 m – 0.1 m	silty
Silt (medium plastic)	0.1 m – 0.7 m	sandy
Silt (medium plastic)	0.7 m – 3.0 m	organic
Silt (low plastic)	0.8 m – 3.0 m	clayey
Silt Till (medium plastic)	1.8 m – 4.5 m	clayey

Two Shelby tube samples from the existing lagoon dikes were tested for hydraulic conductivity and both samples had values that were greater than 1 x 10^{-7} cm/sec. Standing water was recorded in these test holes at depths ranging from 0.6 m to 2.7 m below the top of dike. Details of the soil profile and groundwater conditions can be found the test hole logs attached in Appendix A.

2.10 Lagoon Liner

2.10.1 Design Guidelines

Manitoba Conservation and Climate guidelines requires that a standard wastewater lagoon liner to have a minimum hydraulic conductivity (i.e. the potential rate of fluid movement through the soil) of 1 x 10^{-7} cm/sec or less. This low permeability rate is to protect the underlying groundwater from lagoon effluent seepage. This containment can be achieved by utilizing excavated soils to construct a liner, or installing a synthetic liner.

2.10.2 Proposed Lagoon Liner Design

Based on the results of the onsite geotechnical investigation, the excavated soils at the lagoon development site would likely not achieve a consistent permeability of 1 x 10^{-7} cm/sec or less, therefore a synthetic liner would be the most feasible option, due to the lack of suitable clay in the immediate area and the cost of hauling borrow soils to the site. The seams of the liner would be inspected, air tested and approved prior to commissioning the lagoon cells.

Synthetic liners typically require sand bedding and cover, to protect against punctures, either from rocks in the surrounding soil layers or from excavation equipment when removing sludge from the cells. The excavated soil observed at the proposed development site did contain some stone material, therefore sand bedding material would likely be needed for bedding and cover material for the synthetic liner. A dewatering/degassing system of piping would also be required under the proposed cell to prevent gas and groundwater buildup under the liner, which can cause operational issues.

2.11 Review of Regulatory Requirements

The Manitoba Conservation *Design Objectives for Wastewater Treatment Lagoons* (September 2014) was used as a guideline in the layout and design of the lagoon development. The provincial siting requirements are described in Section 2.5.2 above.

2.11.1 Effluent Quality Requirements

Any new or expanding wastewater treatment lagoons are required to meet the Manitoba *Water Quality Standards, Objectives and Guidelines - Tier 1 Water Quality Standards* at a minimum, along with the Federal *Wastewater Systems Effluent Regulations*, for discharged effluent. The effluent requirements for the RM wastewater treatment lagoon, at a minimum, would include:

- Fecal coliforms of 200/100 ml or less, or E. coli of 200/100 ml or less
- BOD of 25 mg/L or less

- CBOD of 25 mg/L or less
- TSS of 25 mg/L or less
- Total residual chlorine of 0.02 mg/L or less
- Un-ionized ammonia (as N) of 1.25 mg/L or less, at 15ºC
- 1 mg/L Total Phosphorus or demonstrated nutrient reduction strategy.

2.11.2 Nutrient Management Plan

The Manitoba *Water Quality Standards, Objectives, and Guidelines*, 2011, outline the nutrient reduction requirements for effluent in all new, expanding or modified wastewater treatment facilities. The guidelines include province wide standards for biological reduction, suspended solids reduction, phosphorus reduction and where site-specific conditions warrant, nitrogen reduction. The Federal *Wastewater Systems Effluent Regulations*, 2012, outline the limits on un-ionized ammonia concentration in the effluent.

From a review of various methods for reducing phosphorus, the most feasible method for the RM would be the addition of aluminum sulphate (alum) to the surface of the storage cell to encourage chemical precipitation, with phosphorus settling out of the liquid as floc. The most cost effective method for alum addition for the RM would be spraying chemical onto the surface of the cells from the top of the dikes, or by utilizing a boat and adding chemical by hand over the surface of the cells. In this way, there would be adequate coverage over the entire lagoon cell. However, achieving good mixing is also important to the process and can be difficult with these application methods.

Typically an un-ionized ammonia concentration of 1.25 mg/L can be met by a facultative lagoon cell with no specific treatment for ammonia, however there is the possibility that in mid-summer, high temperatures combined with algae blooms can cause the pH to rise, which could result in an un-ionized ammonia above 1.25 mg/L. If the un-ionized ammonia concentration is above the limits, the most practical solution would be to wait until the temperature and pH drop in the fall, before discharging.

2.12 Lagoon Construction Details

The area proposed for the lagoon construction would be cleared of surface vegetation, and would have the topsoil layer removed and stockpiled. The subsurface soils would be excavated and the dikes constructed with excavated and compacted soil. Borrow soils may be required from the east side of the existing lagoon cells to build up the lagoon dikes as needed to provide the elevation for the dewatering/degassing cells. Any borrow area will be used for backfill of unsuitable excavated material and re-vegetated after use.

For the dike construction, the excavated material will be compacted with a sheepsfoot roller on maximum 150 mm compacted lifts. A limited range of moisture content will be permitted during construction. The soil material shall not be so wet or so dry that compaction equipment cannot compact the fill into a homogeneous mass. Material too wet shall be dried or wasted and material too dry shall be wetted. The

surface that is to receive the liner shall be smooth and free of protruding rocks, soil lumps, roots and other sharp objects that can damage the liner. If any stony material is observed on the surface of the cell floors or inner slopes, it should be removed and replaced with suitable bedding material. The entire site will be rolled with a smooth drum roller to prevent any objects from protruding from the surface and damaging the liner.

An anchor trench would be constructed along the top of dike to secure the liner in place. Cover material consisting of sandy soil with smooth fine-grained particles, free of rocks or soil lumps greater than 25 mm in diameter, debris and organic material, would be placed on the floor to a thickness of 0.3 m. A degassing and dewatering system of piping would be installed under the synthetic liner to prevent gas bubbles from forming beneath the liner and to drain groundwater from below the cells. The degassing/dewatering pipes would be installed at intervals of approximately 20 m apart and would discharge into the perimeter ditching. The degassing/dewatering pipes would vent up through the top of dike (See Plan 5 in Appendix C).

The top of the lagoon dikes will be constructed with a width of 3.0 m to allow vehicle access. All organic topsoil removed from the development area and stockpiled will be used as cover material on the dike tops and outer slopes. The top of dikes and outside slopes would be seeded with grass upon completion of construction to reduce soil erosion. Rip rap stone would be placed at the intake and outfall of the discharge and intercell piping, along with the discharge end of the dewatering pipes and at the forcemain inlet, to minimize erosion.

Egress ramps will be placed on the inner slopes of both the primary cell and secondary cell. These ramps will consist of a synthetic geogrid with granular material placed in the grid (see Plan 5 in Appendix C). A heavy duty non-woven geotextile will be placed between the egress ramps and the liner surface to prevent damage to the liner beneath the ramps.

A perimeter ditch will be constructed around the outside toe of the lagoon cells and will tie into the existing discharge route to Scissor Creek. The outer slope and perimeter drainage ditching would prevent surface drainage from entering into the lagoon and would prevent ponding of surface drainage water around the perimeter of the cell. The lagoon discharge ditch would be constructed from the east dike of the storage cell and tie into the existing discharge route.

A 1.8 m high fixed knot game fence would be installed around the outside perimeter of the dikes to discourage unauthorized entry into the lagoon area by people and large animals. A locked gate at the entrance to the site would prevent unauthorized vehicle entry into the lagoon area. The lagoon access approach would be constructed with compacted granular material composed of compacted subgrade, geotextile, 200 mm C base and 150 mm A base material (see Plan 6 in Appendix C).

The existing forcemain will be disconnected and re-routed into the new lagoon primary cell, which will be located to the southeast.

2.12.1 Lagoon Appurtenances

Additional lagoon design items would include:

- constructing a lagoon approach off of the municipal access road with compacted granular material
- an intercell pipe and valve located in the intercell dike between the primary cell and the storage cell
- a discharge pipe and valve located in the east dike of the storage cell
- a perimeter ditch around the outside toe of dike
- egress ramps placed on inner slopes of both cells
- a fixed knot game fence located along the outside top of dike
- a lockable gate at the entrance to the lagoon access road
- a sign at the entrance gate
- degassing and dewatering piping below the floor of the lagoon cells.

2.12.2 Summary of Selected Design Criteria

A list of design parameters used in sizing the proposed McAuley wastewater lagoon development are provided below:

- a 20 Year design period
- a total service population of 110 people on a piped collection system
- a hydraulic storage period of 230 days
- a daily Design Year 20 organic loading of 21.0 kg BOD_5/day
- a daily Design Year 20 hydraulic loading of 41 m^3/day
- a total projected hydraulic load of 9,420 m^3 over the 230 day storage period
- a discharge pipe invert of 0.3 m above the floor of the storage cell
- inner dike slopes of 5H:1V in both cells
- outer dike slopes of 4H:1V in both cells
- cell depths of 2.5 m (1.5 m liquid operating depth and 1.0 m freeboard)
- synthetic lagoon cell liners installed along the floor and inner slopes of the lagoon cells
- sand cover material over the floor of the synthetic liner to a thickness of 0.3 m.

2.13 Existing Lagoon Cells

2.13.1 Sludge Assessment

Assiniboine Injections Ltd. conducted a sludge assessment on August 1, 2016 to determine the volume and thickness of sludge accumulation in the existing lagoon primary cell (see report attached in Appendix A). The sludge assessment of the primary cell indicated a total sludge

accumulation of approximately 1,800 m^3, with a sludge thickness ranging from 0.13 m to 0.6 m. The thickest accumulation (0.6 m) of sludge was located near the forcemain pipe inlet, which is in the centre of the cell, while the average sludge thickness throughout the cell was 0.26 m.

2.13.2 Lagoon Cell Decommissioning and Re-Use

The existing McAuley lagoon cells will be decommissioned upon completion of construction and commissioning of the proposed lagoon cells. Details of the lagoon decommissioning would be provided to Manitoba Conservation and Climate after the lagoon commissioning, but would generally include the discharging of liquid from the cells and allowing the accumulated sludge to dewater naturally on the lagoon dikes. After dewatering the sludge would be removed from the cells and disposed of by land application or at a licenced waste disposal site.

The existing cells would then be abandoned in place as a wildlife habitat and potentially used by the RM for additional storage, in the event that an emergency discharge is required from the new cells in the future. This would potentially only occur in years with high precipitation levels.

2.14 Lagoon Maintenance

Maintenance of the proposed lagoon will include:

- maintaining the fencing and gate
- ensuring the entrance gate is locked at all times
- opening and closing the intercell and discharge piping valves when required
- maintaining grass cover on dikes to a height of no more than 0.3 m in height
- maintaining a program to prevent and remove burrowing animals
- maintaining rip rap at the location of lagoon discharge to prevent erosion of soils
- monitoring liquid level in the lagoon cells
- sampling lagoon effluent prior to and during discharge period, as required
- adding alum as needed for phosphorus removal
- discharging the lagoon cells
- maintaining records of discharge events and water quality testing.

3.0 POTENTIAL ENVIRONMENTAL IMPACTS

The biophysical and socioeconomic environment as related to the development, and potential impacts of the development on the environment.

3.1 Releases to Air, Water, Land

3.1.1 Air

In general, nuisance odours occur in facultative lagoons that are improperly sized and organically overloaded. Odours are also generated under anaerobic conditions, which are common at the bottom of facultative lagoons. During the summer, the lagoon would be aerobic at the surface, facultative at the centre and anaerobic at the bottom. Minimal to no treatment would occur in the winter due to the ice cover on the surface; the treatment process would predominantly be anaerobic during winter and would also include solids settling. Therefore, the lagoon may generate some odours for a short time each spring during the thawing or turn-over period when water temperature inversion causes turbulence in the lagoon cells and gases produced from the anaerobic treatment process at the bottom are brought to the surface. Prevailing winds in the area can carry odours if the area is exposed and wind breaks are not utilized around the lagoon cells. This can cause a nuisance to nearby residents.

There is also a potential for greenhouse gas emissions during construction works from heavy equipment and transport vehicles. There is also the potential for impacts from dust generation during excavation works on the site.

3.1.2 Water

Pollutants that may be released into surface and ground water during the operation of the lagoon include coliforms, organic wastes, suspended solids, nutrients and other materials that are typically disposed of into the sewer collection system in a residential community. Pollutants in the wastewater produced by the service population are expected to be residential in nature.

Pollutants that have a potential to be released into the surface or ground water during the lagoon construction activities, include petroleum hydrocarbons (PHCs) from heavy equipment and sediments from soil erosion.

Surface Water

Surface water may be impacted if the wastewater is not sufficiently treated and subsequently discharged from the lagoon into a surface water body. Effluent discharged from the lagoon would flow directly into Scissor Creek, which is located approximately 150 m north of the proposed lagoon cells. There is also the potential to impact surface waters from erosion and sedimentation or equipment leaks/spills during the lagoon construction works.

The discharge from the lagoon should not cause or contribute to flooding in or along the discharge route. There is no potential to impact the navigation of surface waters as a result of

the lagoon project, as Scissor Creek is not classified as a navigable body of water in the area of the lagoon development.

Groundwater

There is a potential for groundwater impacts if wastewater leaks/seeps through the lagoon liner and into the groundwater below. There is also a potential for groundwater impacts from equipment leaks or fuel spills during construction.

3.1.3 Land

The landscape would be altered by construction of the lagoon dikes and perimeter ditching. Disturbed land areas can be impacted through soil erosion if not covered or re-vegetated.

Pollutants that may be released to the land are typically petroleum hydrocarbons (PHCs), which could be released during construction activities from equipment leaks or re-fuelling incidences.

3.2 Wildlife

The proposed lagoon site is located in the "Aspen Parkland" Ecoregion of Canada. Characteristic wildlife includes white-tailed deer, coyote, snowshoe hare, cottontail, red fox, northern pocket gopher, and ground squirrel. Bird species include waterfowl, sharp-tailed grouse and black-billed magpie.

The typical concern on any construction project is that wildlife species would being displaced through the construction works. There is a potential to impact wildlife habitat in the low lying grassland and scrub area, which will be cleared, however due to the scale of the project it is unlikely that the construction works will have any significant impact on wildlife in the area. In addition, the Manitoba Conservation and Climate Wildlife and Fisheries Branch was contacted regarding the proposed lagoon development project and they indicated that there were no occurrences of species at risk at the proposed development site in the provincial database. There were two bird species identified within 2 km of the site. Refer to the May 21, 2019 email correspondence, attached in Appendix B.

3.3 Fisheries

The typical concerns for impacts to fish and fish habitat are from sediments released during construction and from untreated lagoon effluent discharges into surface water utilized by fish species. These impacts could include the reduction of water quality or physical disturbances which would create an unfavorable environment for fish or fish eggs.

Manitoba Conservation and Climate Fisheries Science and Fish Culture Section was contacted for information on fish species in Scissor Creek. No fish species have been recorded in the provincial database, but there is information that suggests the creek has habitat to support seasonal fish populations (see May 22, 2019 email correspondence in Appendix B).

3.4 Forestry

As part of the lagoon development, tree clearing will not be required therefore no impacts on commercial forestry in the region are expected.

3.5 Vegetation

Characteristic vegetation in the "Aspen Parkland" Ecoregion is classified as being a transitional grassland ecoclimate, with a significant degree of farmland. The native landscape is characterized by trembling aspen, oak groves and mixed tall shrubs and intermittent fescue grasslands.

The proposed lagoon site is partially cleared agricultural land and partial grassland with scrub species. Therefore, surface vegetation removal will be required for the development works. Manitoba Conservation and Climate Wildlife and Fisheries Branch were contacted regarding occurrences of rare or endangered species in their database around the proposed lagoon development site. The Branch indicated that there were no known occurrences of a species at risk at the proposed development site in the provincial database. There was one vascular plant species identified within the general area, however with low locational accuracy. Refer to the May 21, 2019 email correspondence, attached in Appendix B.

3.6 Noise Impacts

There is a potential for noise impacts in the immediate area of lagoon development due to the heavy equipment utilized during construction. Other than occasional maintenance vehicles and septic haulers, the operation of the lagoon itself will not have a potential for noise impacts.

3.7 Health and Safety

There is a potential for impacts to the health and safety of workers and the public during the construction works, as heavy equipment will be utilized on site.

3.8 Heritage Resources

The RM was not aware of any historic or heritage resources located at the proposed lagoon development site or along the forcemain route. The Manitoba Historic Resources Branch was contacted regarding the proposed site, however they did not provide information regarding concerns from any potential historic sites or heritage resources.

3.9 Socio-Economic Implications

The heavy equipment traffic in the area of the construction would increase temporarily during the construction works. The construction related economic activity should have a positive economic impact on the nearby community of McAuley. In addition, the increased wastewater storage capacity should encourage continued growth in the service area.

3.10 Aesthetics

The lagoon development is not expected to have significant adverse impacts on the general aesthetics of the area, as the lagoon construction would be an earthen structure developed adjacent to the existing lagoon cells, several hundred metres from the nearest residence. The aesthetics would be temporarily impacted by the presence of heavy equipment on the site during the construction works.

4.0 MANAGEMENT PRACTICE

Proposed environmental management practices to be employed to prevent or mitigate adverse implications from the impacts identified above.

4.1 Mitigation of Impacts to Air

To reduce the potential for odour nuisance in the nearby Hamlet of McAuley, the primary cell will be sized large enough for the projected Year 20 organic loadings from the service population. This takes into consideration the maximum allowable organic loading rate of 56 kg BOD_5/ha/day into the lagoon primary cell, which is impacted by the odours generated from a peak day organic loading. Therefore, nuisance odours as a result of organic over-loading are not expected.

Although the lagoon would likely generate some odours for a short time each spring, during the thawing or turn-over period, prevailing (i.e. northwesterly) winds should not cause odours to drift toward the community, as the proposed lagoon would be located northeast of the residential community. Furthermore, the proposed lagoon development would be located beyond the minimum setback distances of 300 metres from the nearest resident and 460 metres from the residential community.

Emissions from construction equipment and transport vehicles will be controlled through regular maintenance by the construction contractor, and will meet all provincial and local standards. Dust suppression methods (i.e. water spraying) will be utilized at the construction site if dry conditions create excessive dust through construction activities and transport, which becomes a nuisance to nearby residents. Due to the setback distance from residences, it is unlikely that dust will have any impact on the community or nearby residents.

4.2 Mitigation of Impacts to Water

Surface Water

Impacts to surface waters from discharge of lagoon effluent are not expected, as the lagoon effluent would be treated to the *Tier I Manitoba Water Quality Standards, Objectives and Guidelines*, and the *Federal Wastewater Systems Regulations* prior to discharge.

Siltation in Scissor Creek from erosion of any excess material stockpiles would be prevented by either covering any bare soil stockpiles or seeding with grass. Silt fencing would be installed between the construction site and the adjacent roadside ditch, and sten logs would be installed across the drainage ditch near the outfall to prevent siltation from impacting the river. This siltation control should remain in place until grass growth is established. The dike tops, dike slopes, ditch slopes and potential borrow area would be seeded with grass to help control erosion and sediment entry into the discharge route. Disturbance of the soils adjacent to the discharge route would be minimized during construction. The municipal access road separates the construction site from the creek to provide a buffer zone.

To minimize impacts from construction equipment on surface waters, the construction specifications should outline to the contractor the requirements for handling and storage of fuels and hazardous

materials during construction, as per federal and provincial regulations. The specification should state wording similar to the following:

- Diesel or gasoline should be stored in double walled tanks or have containment dikes around fuel containers for volumes greater than 68.2 L (15 gallons) or in compliance with provincial regulations
- Clean up material should be available at the site, consisting of a minimum of 25 kg of suitable commercial sorbent, 30 m^2 of 6 mil PVC, and an empty fuel barrel for spill collection and disposal
- Fuel storage and hazardous material areas established for project construction should be located a minimum of 100 m from a water body, and comply with provincial regulations
- Waste hazardous materials from construction activities and equipment must be properly collected and disposed of in compliance with provincial regulations
- Hazardous material handling and storage are to follow all provincial and federal regulations including WHMIS and spill containment requirements
- In the event of spills or leaks of fuels and hazardous materials, the contractor or operator should contain the spill and notify the project engineer and provincial authorities.

The specifications should state that when working near water with construction equipment:

- Construction equipment is to be properly maintained to prevent leaks and spills of fuels, lubricants, hydraulic fluids or coolants
- There can be no re-fueling or servicing of construction equipment within 100 m of a water body.

If overland flooding occurs along the discharge route, the RM would not discharge the lagoon. The discharge should not cause or contribute to overland flooding in or along Scissor Creek.

Groundwater

Seepage of effluent from the lagoon is unlikely to affect groundwater as the proposed lagoon cell would utilize a synthetic liner for containment of liquid, which would meet the minimum hydraulic conductivity requirements of Manitoba Conservation and Climate and would be inspected and tested prior to commissioning.

Mitigation of potential impacts to groundwater during the lagoon construction activities from fuel handling, equipment leaks or fuel spills, would follow the same procedures as described above for surface waters.

4.3 Mitigation of Impacts to Land

As the lagoon would be lined with a synthetic liner, seepage to the surrounding land is expected to be negligible. To minimize the potential for the release of Petroleum Hydrocarbon (PHC) pollutants into the soil, the mitigation measures described in Section 4.2 above outlining fuel handling procedures should be followed.

To minimize the potential for slope erosion, the outside slopes of the newly constructed dikes would be constructed at 4H:1V and the dike tops and outside slopes would be seeded with grass. The location of the discharge pipe outlets from the lagoon would be covered with rip rap stone to minimize potential soil erosion during discharge events.

4.4 Mitigation of Impacts to Wildlife

To minimize the potential impacts to wildlife habitat, clearing works will be limited to the development area.

4.5 Mitigation of Impacts to Fisheries

To minimize the potential impacts to fisheries, the lagoon discharge would only occur after the spring fish spawning period has normally occurred, and treated effluent requirements of the Environment Act Licence would be met prior to the effluent being discharged. Sten logs would also be utilized in the drainage route and silt fencing placed between Scissor Creek and the development site, to minimize sedimentation in the creek.

4.6 Mitigation of Impacts to Vegetation

To minimize the potential impacts to vegetation, the area of scrub and native grasses to be cleared will be clearly marked prior to clearing activities beginning. Clearing and construction will be limited to areas marked.

4.7 Mitigation of Noise Impacts

To minimize the potential for noise impacts, construction equipment and transport vehicles should have mufflers working properly, and construction activities should be limited to daylight hours only. All minimum setback requirements to residences will be met, which should minimize noise impacts during construction activities.

4.8 Mitigation of Impacts to Health and Safety

To minimize impacts to health and safety of workers and the public, the construction specifications should state that the contractor have a safety program in place, in accordance with all federal and provincial health and safety regulations. During construction, site access will be limited to the construction crew only and warning signs will be posted at the entrance to the construction site. Personal protective equipment will be worn in accordance with the contractor's safety program. The contractor will utilize roadside warning signs, barricades, and flagmen, if required, for works along roadways and for areas with heavy equipment traffic.

4.9 Mitigation of Impacts to Heritage Resources

If any significant historic or heritage resources are discovered in the course of excavation or construction, the specifications should identify that works are to temporarily cease and an investigation

of the site is to be conducted by the RM, Manitoba Historic Resources Branch and any other authority as may be required.

4.10 Mitigation of Socio-Economic Impacts

Traffic impacts from the lagoon construction will be minimized in the community, due to the setback distances maintained from the community roads. Warning signs will be placed along municipal road during construction works if material hauling is occurring.

5.0 RESIDUAL AND CUMULATIVE EFFECTS

Residual environmental effects remaining after the application of mitigation measures, to the extent possible expressed in quantitative terms relative to baseline conditions

No negative residual effects are anticipated through the construction and operation of the proposed wastewater treatment lagoon, due to the mitigation measures described above. Positive residual effects are expected from the properly sized wastewater treatment lagoon, which will allow for expansion of the service area in the future.

No cumulative effects are anticipated from other construction works in the area and the RM is not planning any other significant construction works at the same time as the lagoon works.

6.0 MONITORING AND FOLLOW-UP

Proposed follow-up activities that will be required at any stage of development (eg. Monitoring, inspection, surveillance, audit, etc.)

Monitoring of the lagoon operation is to be conducted by a trained lagoon operator, who is to ensure the lagoon is operated under the requirements of the Environment Act licence. The operator is to:

- ensure liquid levels in the lagoon cells are maintained within the required limits
- conduct sampling of lagoon effluent prior to discharge
- ensure water quality parameters as described in the Environment Act licence are met
- maintain records of discharge events and water quality monitoring for reporting to Manitoba Conservation and Climate and Environment Canada (as required).

If there are any concerns with the operation of the lagoon, the owner is to contact the local environment officer to discuss mitigation options. The construction contractor is to ensure that grass growth occurs on outer slopes and disturbed areas, after the construction activities are completed.

7.0 FUNDING AND APPROVALS

Name and address of any Government Agency or program (federal, provincial or otherwise) from which a grant or loan of capital funds have been requested (where applicable). Other federal, provincial or municipal approvals, licences, permits, authorizations, etc. known to be required for the proposed development, and the status of the project's application or approval.

Partial funding for the project works are being sought from the Manitoba Water Services Board. The RM will need to provide approval for the new approach off of the municipal road. No additional approvals, licences or permits are anticipated for the lagoon construction and operation. The RM will also be responsible for registering the lagoon with Environment Canada and providing annual monitoring reports to Environment Canada under the *Federal Wastewater Systems Effluent Regulations*.

8.0 PUBLIC CONSULTATION

Results of any public consultations undertaken or to be undertaken in conjunction with project planning.

Public consultation by the RM of Ellice-Archie has not been conducted to date for residents in the Hamlet of McAuley. Public consultation for residents would likely occur during future phases of the project, once funding has been established. Public comments will be received by Manitoba Conservation and Climate through the public registry during the Environmental Act Proposal review period.

9.0 CONCLUSION

Based on the design of the project, and the implementation of the mitigation measures identified in Section 4.0 above, no significant negative environmental impacts are anticipated.

The proponent would like to complete the requirements of the Environment Act Proposal as soon as possible so that the lagoon design and construction can begin in a timely fashion.

JR Cousin Consultants Ltd. requests that a draft copy of the Environment Act Licence be forwarded for review prior to the issuing of the final licence.

APPENDICES

Appendix A

Status of Title

Test Hole Logs, JR Cousin Consultants Ltd., May 3, 2017

Soils Analysis Report - McAuley Lagoon Study, AMEC Foster Wheeler Environment and Infrastructure, June 28, 2017

Soils Analysis Report - McAuley Lagoon Study, AMEC Foster Wheeler Environment and Infrastructure, November 17, 2017

Groundwater Well Log Report, GWDrill Database (2014), Province of Manitoba, Groundwater Management

Sludge Assessment Report, Assiniboine Injections Ltd. August 4, 2016

Appendix B

Table 1: McAuley Lagoon Population, Hydraulic and Organic Loading Projections to Design Year 20

Manitoba Conservation and Climate – Wildlife and Fisheries Branch, Email Correspondence, May 21, 2019

Manitoba Conservation and Climate – Fisheries Science and Fish Culture Section, Email Correspondence, May 22, 2019

Appendix C

Title Page

Plan 1: Test Hole Location Plan

Plan 2: Proposed Lagoon Location with Residential Setbacks and Drainage Route

Plan 3: Proposed Lagoon Layout Plan

Plan 4: Lagoon Dike, Liner and Inlet Details

Plan 5: Degassing/Dewatering System, Escape Ramp, Spillway and Pipe Trench Details

Plan 6: Sign, Access Road, Fence, Gate, Lock and Truck Turnaround Details

Plan 7: Silt Fence, Valve, Single Trench Piping, Sten Log, Ditch, Pipe Boot Connection, Rip Rap and Valve Marker Details

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Soils Analysis Report - McAuley Lagoon Study, AMEC Foster Wheeler Environment and Infrastructure, June 28, 2017

Soils Analysis Report - McAuley Lagoon Study, AMEC Foster Wheeler Environment and Infrastructure, November 17, 2017

Groundwater Well Log Report, GWDrill Database (2014), Province of Manitoba, Groundwater Management

Sludge Assessment Report, Assiniboine Injections Ltd. August 4, 2016

Status of Title

STATUS OF TITLE

Title Number **2719215/2**
Title Status **Accepted**
Client File

The Property Registry
A Service Provider for the Province of Manitoba

1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION

JA-LYN FARMS LTD.

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

FIRSTLY: THE NW 1/4 OF SECTION 11-15-29 WPM
EXC LOTS 7, 8 AND 9 PLAN 560 BLTO
ALSO EXC PLAN 1337 BLTO
ALSO EXC ROAD PLANS 550 AND 1083 BLTO
AND FURTHER EXC ALL MINES AND MINERALS AS RESERVED
IN THE GRANT FROM THE CROWN
SUBJECT TO THE RESERVATIONS CONTAINED IN THE CROWN LANDS ACT

SECONDLY: PARCEL "C" PLAN 1337 BLTO
EXC OUT OF THE LAND SECONDLY DESCRIBED, ALL MINES AND
MINERALS AS RESERVED IN THE GRANT FROM THE CROWN
SUBJECT TO THE RESERVATIONS CONTAINED IN THE CROWN LANDS ACT
IN NW 1/4 11-15-29 WPM

The land in this title is, unless the contrary is expressly declared, deemed to be subject to the reservations and restrictions set out in section 58 of *The Real Property Act.*

2. ACTIVE INSTRUMENTS

Instrument Type:	**Caveat**
Registration Number:	**R147765/2**
Instrument Status:	**Accepted**
Registration Date:	1980-11-13
From/By:	MANITOBA TELEPHONE SYSTEM
To:	
Amount:	
Notes:	PART OF NW 1/4
Description:	No description

Instrument Type:	**Caveat**
Registration Number:	**1048922/2**
Instrument Status:	**Accepted**
Registration Date:	1998-08-10
From/By:	MTS COMMUNICATIONS INC.
To:	MICKEY TARONNO, AS AGENT
Amount:	
Notes:	PT "FIRSTLY" RE: PL 36146
Description:	R/W AGRT DATED 1990-11-27

Instrument Type:	**Caveat**
Registration Number:	**1091415/2**
Instrument Status:	**Accepted**
Registration Date:	2001-02-12
From/By:	MTS COMMUNICATIONS INC.
To:	WILLIAM F. JOHNSTONE AS AGENT
Amount:	
Notes:	PART
Description:	EASEMENT AGRT DATED 13 OCT 1992

3. ADDRESSES FOR SERVICE

JA-LYN FARMS LTD.
BOX 151
MCAULEY MB
R0M 1H0

4. TITLE NOTES

No title notes

5. LAND TITLES DISTRICT

Brandon

6. DUPLICATE TITLE INFORMATION

Duplicate not produced

7. FROM TITLE NUMBERS

2297092/2	Part
2297092/2	Balance

8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS

No real property application or grant information

9. ORIGINATING INSTRUMENTS

Instrument Type:	**Transfer Of Land**
Registration Number:	**1358593/2**
Registration Date:	2014-05-05
From/By:	C.L. JOHNSTON, C.M. JOHNSTON, G.E. GROSE & D.M. GROSE
To:	JA-LYN FARMS LTD.
Consideration:	$135,292.28

10. LAND INDEX

Lot C Plan 1337
NW 1/4 11-15-29W EX M&M & SUBJ TO CLA RES

NW 11-15-29W
EX: LOTS 7-9 PL 560, PL 1337, RD PL 550 & 1083 & M&M

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM OF TITLE NUMBER 2719215/2

Test Hole Logs, JR Cousin Consultants Ltd., May 3, 2017

J. R. Cousin Consultants Ltd.

TEST HOLE LOGS

SYMBOL INDEX


GW. : Well graded gravels and gravel sand mixtures, little or no fines


GP. : Poorly graded gravels, gravel - sand mixtures, little or no fines


GM. : Silty gravels, gravel-sand-silt mixtures


GC. : Clayey gravels, gravel-sand-clay mixtures


SW. : Well graded sands, gravelly sands, little or no fines


SP. : Poorly graded sands, or gravelly sands, little or no fines


SM. : Silty sands, sand-silt mixtures


SC. : Clayey sands, sand-clay mixtures


ML. : Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity


CL. : Inorganic clays of low plasticity, gravelly clays, sandy or silty clays, lean clays


OL. : Organic silts and organic silty clays of low plasticity


CI. : Inorganic clays of medium or intermediate plasticity


MH. : Inorganic silts, fine sandy or silty soils


CH. : Inorganic clays of high plasticity, fat clays


OH. : Organic clays of medium to high plasticity, organic silts

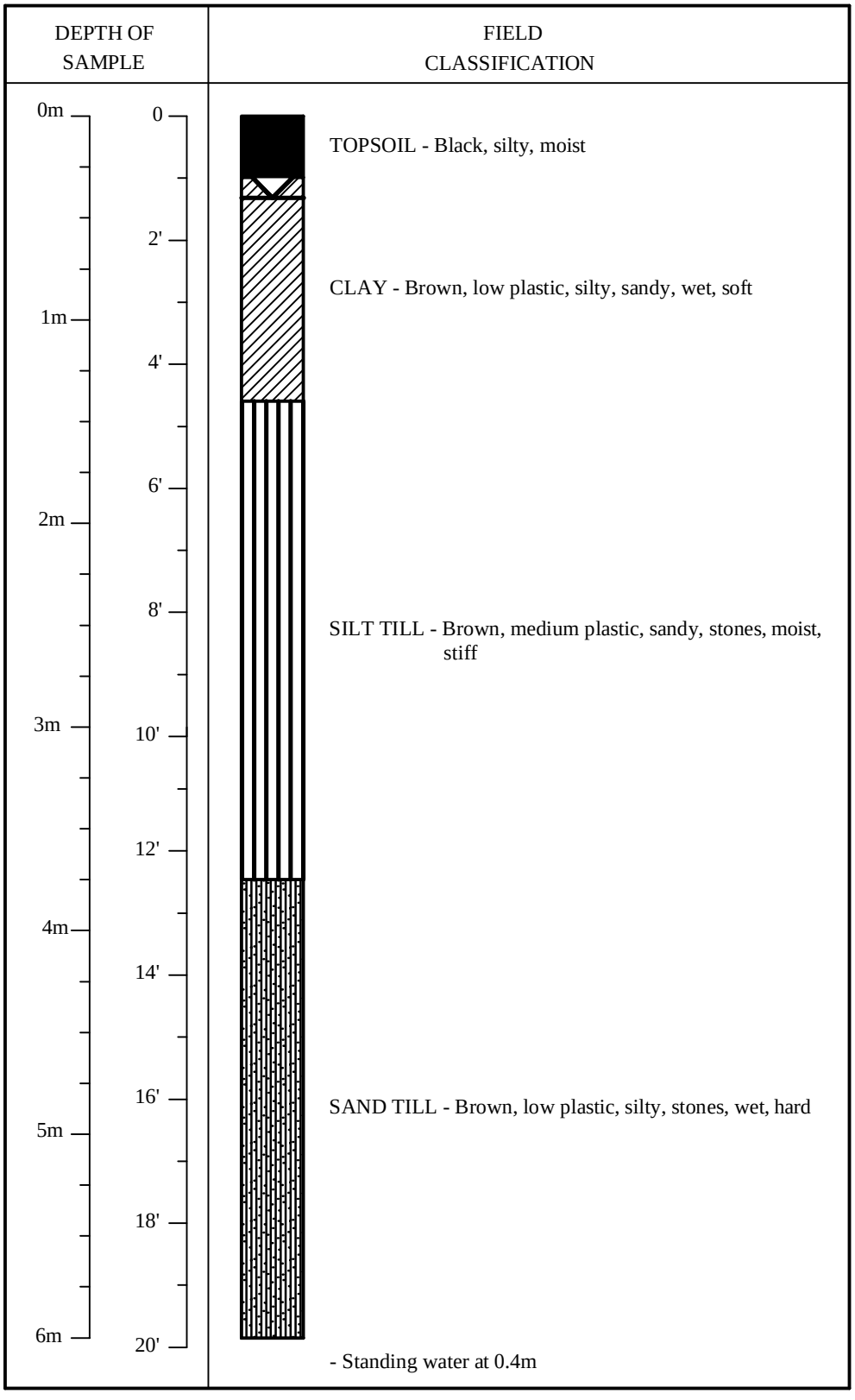

Pt. : Peat, humus, swamp soils with high organic contents

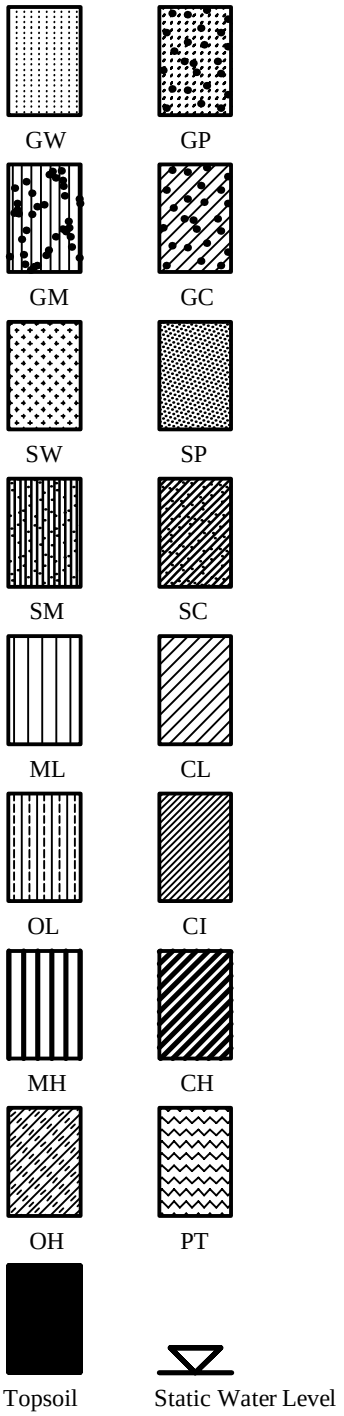

TOPSOIL

J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Northeast of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571285 N, 330697 E
ELEVATION : 477.63m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 1



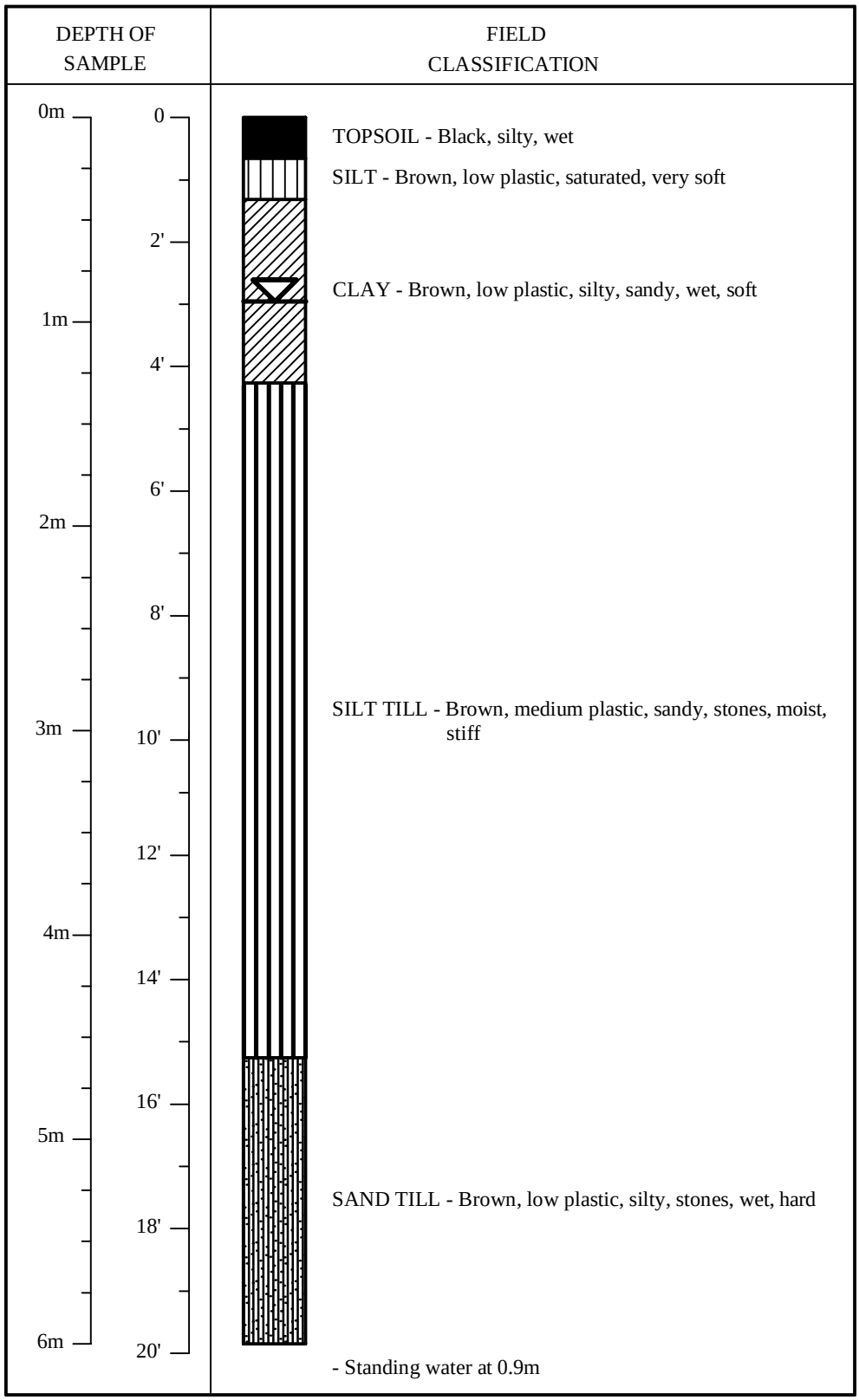


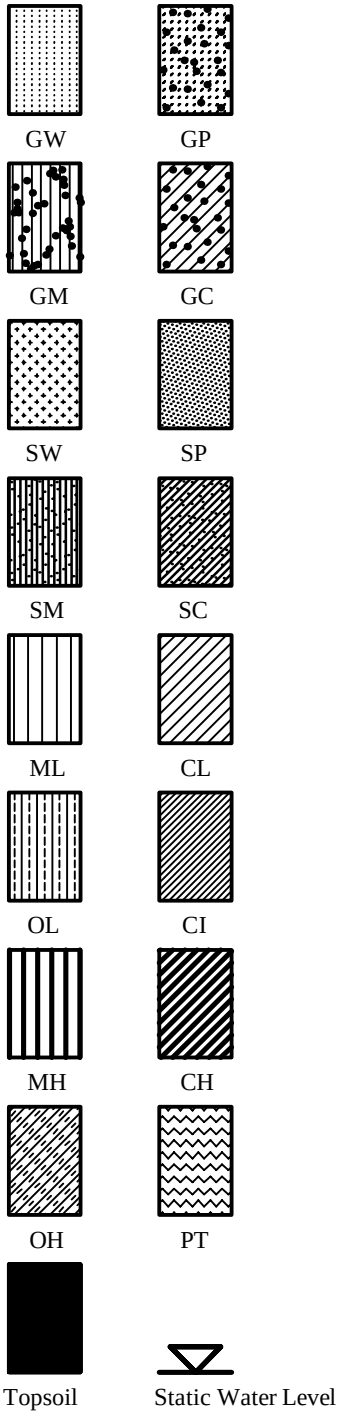
The soil logs are based upon objective data available to us at the time of forming our opinions. The soil logs indicate site specific soil characteristics and must not be generalized over larger areas due to the limited number of test holes as compared to that of an unlimited number of test holes. Every effort is made to evaluate the information by methods generally recognized. The soil logs represent our opinions. J.R. Cousin Consultants Ltd. cannot be responsible for actual site conditions proved to be materially at variance from our analysis or from the data generalization over untested areas.

J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Southeast of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571131 N, 330670 E
ELEVATION : 478.35m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 2





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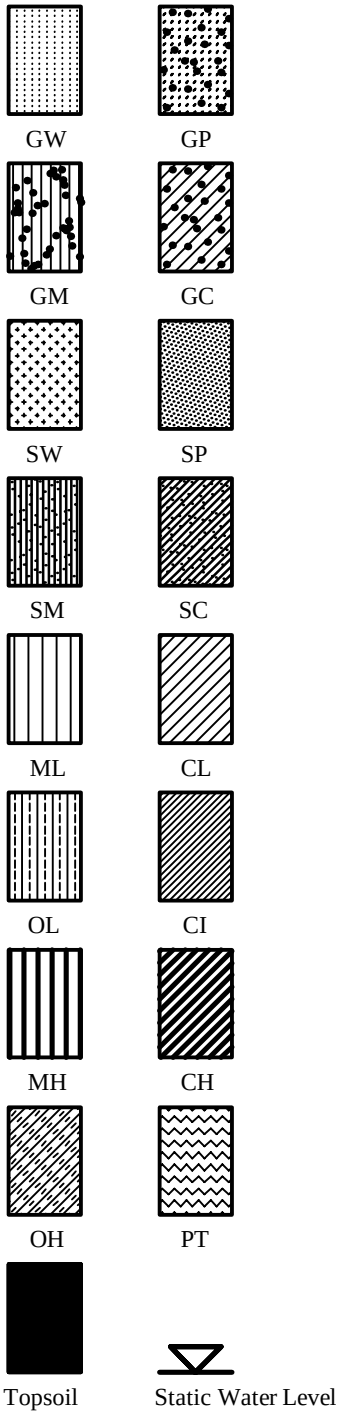
J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Southeast Dike of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571158 N, 330602 E
ELEVATION : 479.08m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 3

DEPTH OF SAMPLE	FIELD CLASSIFICATION
0m / 0	TOPSOIL - Brown, silty, damp
	CLAY - Brown, low plastic, silty, sandy, damp, stiff
2'	
1m	
4'	SILT - Black, medium plastic, clayey, sandy, moist to wet, firm
6'	SILT - Grey, low plastic, sandy, saturated, very soft
2m	
8'	SILT - Grey, high plastic, sandy, clayey, stones, damp, stiff
3m / 10'	
12'	SILT TILL - Brown, medium plastic, sandy, stones, wet, firm
4m	
14'	
	- Standing water at 0.9m
16'	
5m	
18'	
6m / 20'	



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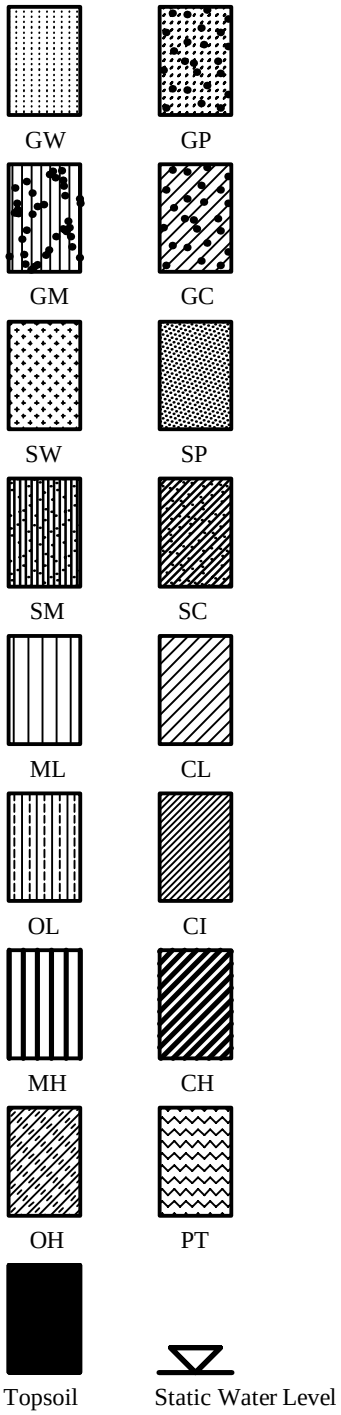
J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Southeast Dike of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571207 N, 330667 E
ELEVATION : 478.82m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 4

DEPTH OF SAMPLE	FIELD CLASSIFICATION
0m / 0	TOPSOIL - Brown, silty, damp
	CLAY - Brown, low plastic, sandy, damp, stiff
2'	SILT - Black, medium plastic, clayey, sandy, moist to wet, firm
1m / 4'	SILT - Brown, medium plastic, sandy, clayey, saturated, very soft
6' / 2m	
8'	
3m / 10'	SILT TILL - Brown, medium plastic, sandy, stones, wet, firm
12'	
4m / 14'	- Standing water at 0.6m
16' / 5m	
18'	
6m / 20'	



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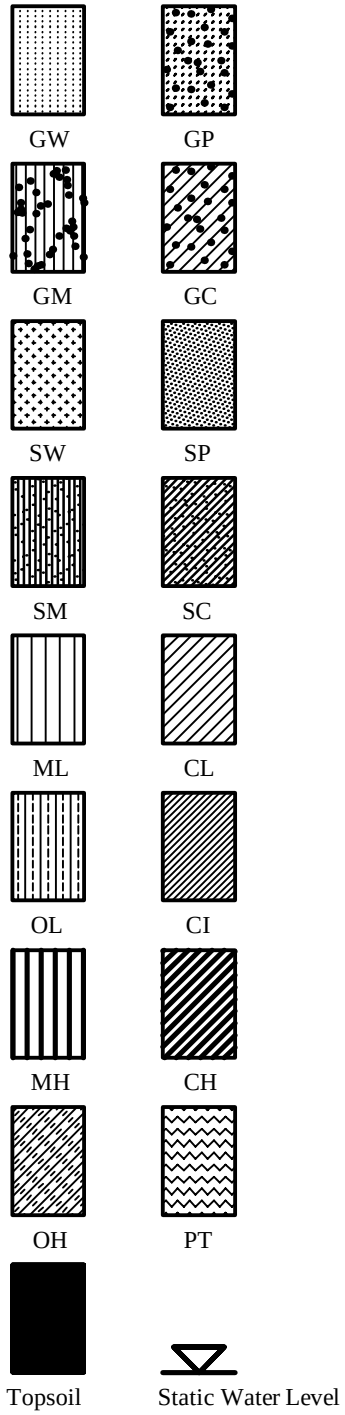
J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Northeast Dike of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571261 N, 330667 E
ELEVATION : 479.36m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 5

DEPTH OF SAMPLE	FIELD CLASSIFICATION
0m / 0	TOPSOIL - Brown, silty, damp
	SILT TILL - Brown, medium plastic, clayey, sandy, stones, moist, firm
2'	
1m	SILT - Brown/black, fill, low plastic, clayey, damp, stiff
4'	
6'	SILT TILL - Brown, medium plastic, clayey, sandy, stones, damp, firm
2m	
8'	
	SILT - Brown, medium plastic, clayey, wet, soft
3m / 10'	
12'	SILT TILL - Brown, medium plastic, clayey, sandy, stones, moist, firm
4m	
14'	
	- Standing water at 1.3m
16'	
5m	
18'	
6m / 20'	



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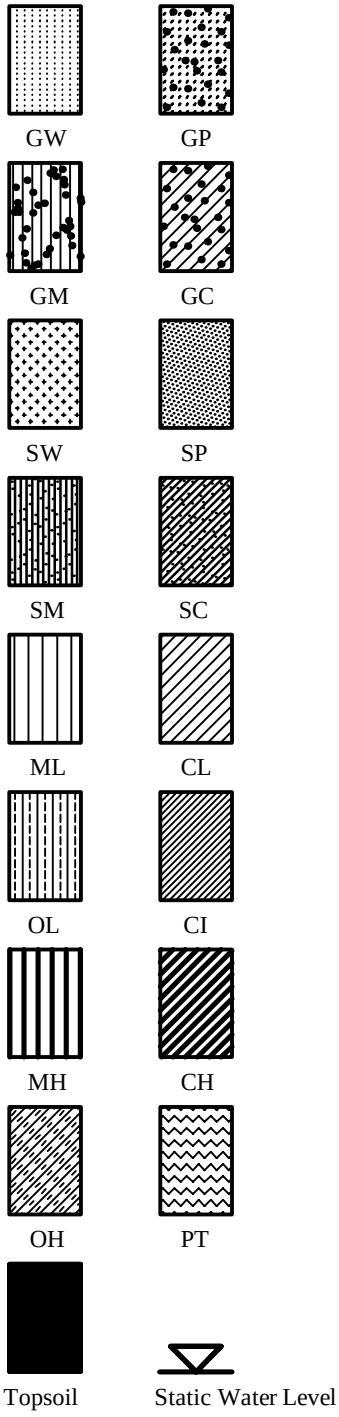
J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Northwest Dike of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571284 N, 330609 E
ELEVATION : 478.63m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 6

DEPTH OF SAMPLE	FIELD CLASSIFICATION
0m / 0	TOPSOIL - Brown, silty, damp
	SILT TILL - Brown, medium plastic, clayey, sandy, stones, moist, firm
2'	
1m / 4'	
6'	SILT - Black, medium plastic, clayey, sandy, moist to wet, firm
2m / 8'	
3m / 10'	SILT - Grey, low plastic, sandy, wet, soft
12'	SILT TILL - Brown, medium plastic, clayey, sandy, stones, moist, firm
4m / 14'	
	- Standing water at 2.5m
16'	
5m / 18'	
6m / 20'	



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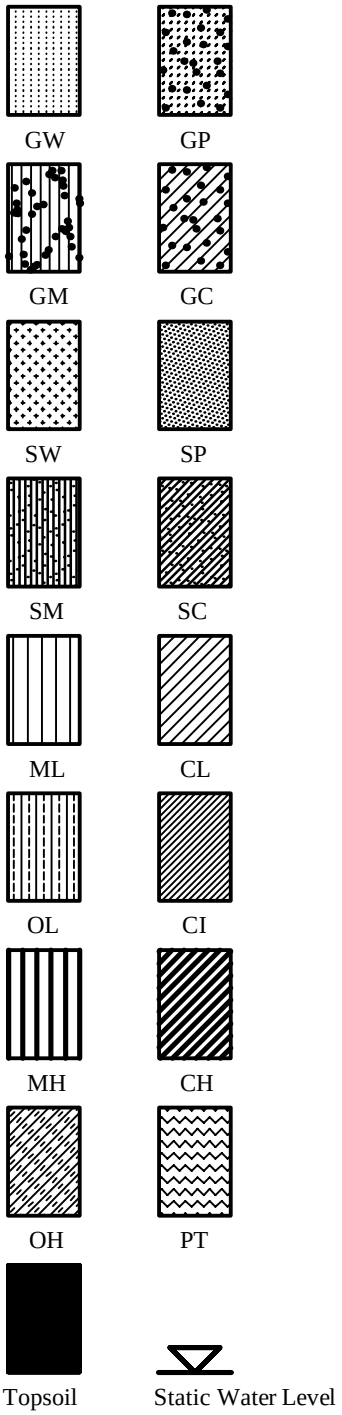
J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Northwest Dike of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571235 N, 330544 E
ELEVATION : 478.66m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 7

DEPTH OF SAMPLE	FIELD CLASSIFICATION
0m / 0	TOPSOIL - Brown, silty, damp
2'	SILT TILL - Brown, medium plastic, clayey, sandy, stones, moist, firm
1m / 4'	
6'	SILT - Black, medium plastic, clayey, sandy, moist to wet, firm
2m / 8'	
3m / 10'	SILT - Grey, low plastic, sandy, wet, soft
12'	SILT TILL - Brown, medium plastic, clayey, sandy, stones, moist, firm
4m / 14'	
	- Standing water at 2.7m
16'	
5m / 18'	
6m / 20'	



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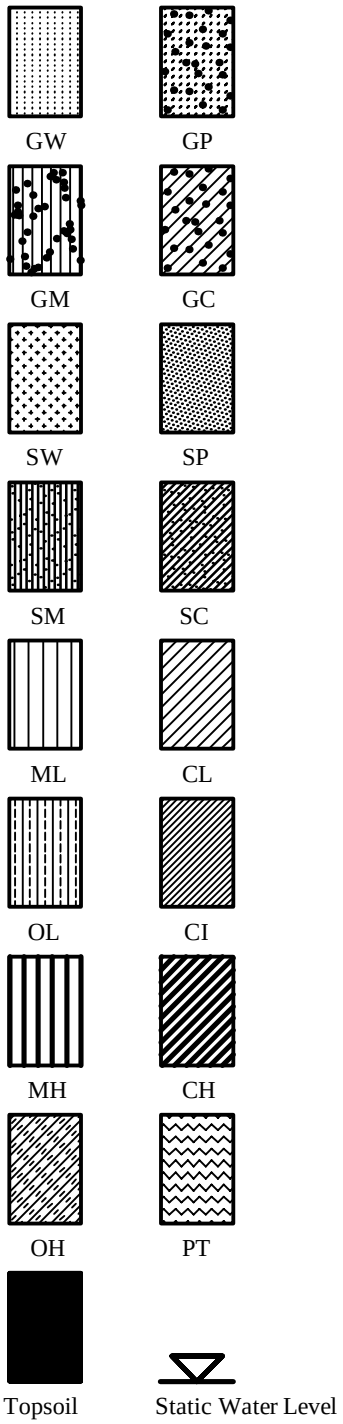
J. R. Cousin Consultants Ltd.

TEST HOLE LOG SHEET

LOCATION : Southwest of Mc Auley Lagoon
CODE : E-730.02
DATE : May 3, 2017
COORDINATES: 5571165 N, 330467 E
ELEVATION : 476.67m
PROJECT : Mc Auley Lagoon Study
METHOD OF SAMPLING : Drill Rig
TEST HOLE # 8

DEPTH OF SAMPLE	FIELD CLASSIFICATION
0m / 0	TOPSOIL - Black, silty, wet
2'	SILT - Brown, low plastic, clayey, saturated, very soft
1m / 4'	CLAY - Brown, low plastic, silty, sandy, wet, soft
6'	
2m / 8'	SILT TILL - Brown, medium plastic, sandy, clayey, stones, moist, firm
3m / 10'	
12'	SAND TILL - Brown, low plastic, silty, stones, saturated, hard
4m / 14'	
16'	
5m	SILT TILL - Brown, high plastic, stones, hard
18'	
6m / 20'	- Standing water at 2.5m



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Soils Analysis Report - McAuley Lagoon Study, AMEC Foster Wheeler Environment and Infrastructure, June 28, 2017

28 June 2017

Project No. WX11334-2700

J.R. Cousin Consultants Ltd.
91 Scurfield Boulevard
Winnipeg, Manitoba
R3Y 1G4

Attention: **Mr. Oswald Wohlgemut**

Re: Soils Analysis
McAuley Lagoon Studies

1.0 INTRODUCTION

As authorized by Mr. Oswald Wohlgemut of J.R. Cousin Consultants Ltd. (JRCC), Amec Foster Wheeler Environment and Infrastructure, a division of Amec Foster Wheeler Americas Ltd. (Amec Foster Wheeler), has completed an evaluation of 7 soil samples (grab samples) that were submitted to our office by JRCC. Visual classification, moisture content, Atterberg limits and particle size testing were requested as well as comments relating to suitability of the soils to be used as a lagoon cell liner.

2.0 LABORATORY TESTING

On receipt, the grab samples were classified in accordance with the Modified Unified Soil Classification System and were tested for moisture content, particle size (hydrometer method) and Atterberg limits. The visual classification and laboratory testing results are summarized in Table 1 with the laboratory data summary also appended to this report.

440 Dovercourt Drive
Winnipeg, Manitoba R3Y 1N4
Tel +1 (204) 488-2997
amecfw.com

Amec Foster Wheeler Environment & Infrastructure
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642
PBN: 899879050PG0015

Table 1: Lab Results

Sample Number	Depth (m)	Water Content (%)	Atterberg Limits			Particle Size Analysis			
			Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	% Gravel	% Sand	% Silt	% Clay
TH1	0.3 – 1.7	26.8	38	15	23	0.0	26.0	43.0	30.9
		Classification: Clay (CL) – and silt, sandy, low plastic, very moist to wet							
TH3	0.5 – 1.7	27.5	43	19	24	0.5	36.6	38.4	24.5
		Classification: Clay (CI) – and silt and sand, medium plastic, moist							
TH3	1.7 – 2.0	23.4	29	14	15	1.0	48.4	32.0	18.6
		Classification: Clay (CL) – and sand, silty, low plastic, very moist							
TH3	2.8 – 4.5	17.4	32	13	19	4.5	40.0	34.7	20.9
		Classification: Clay (CI) – and sand, silty, medium plastic, moist							
TH4	1.0 – 1.8	29.0	38	15	23	1.2	33.9	35.0	29.9
		Classification: Clay (CI) – silty, sandy, medium plastic, moist							
TH6	0.8 – 3.0	28.4	40	18	22	0.0	37.8	42.7	19.6
		Classification: Clay (CI) – and sand and silt, medium plastic, moist							
TH7	2.8 – 3.0	20.2	29	13	16	1.0	52.4	28.0	18.5
		Classification: Clay (CL) – and sand, silty, low plastic, moist							

Note: Sample information provided by JRCC

3.0 DISCUSSION

Amec Foster Wheeler was requested to comment on the suitability of the tested soils for use as a liner in a re-compacted or in-situ condition, based on the visual assessment and the test results summarized in Section 2.0 above.

Feasibility for the utilization of the various materials as an impermeable liner for the proposed lagoon will largely depend on the quality and amount of the clay available. Typical engineering practice is to specify materials that comply with the following minimum parameters:

- Liquid Limit of 30% or greater ;
- Plastic Index of 10% or greater;
- 30% or more passing a number 200 mesh sieve; and
- 20% or more of clay particles (2-µm particle size)

In general, materials meeting the combination of characteristics noted above would typically provide a re-compacted liner having a hydraulic conductivity not exceeding the maximum allowable value of $1x10^{-7}$ cm/sec required by Manitoba Conservation for construction of lagoon liners in Manitoba. Where the characteristics of materials tested exceed one or more of these criteria, the required hydraulic conductivity may not be achieved.

Based on the laboratory test data obtained on the grab samples, the following submitted samples meet the above criteria, and in this regard are expected to meet the maximum conductivity value specified by Manitoba Conservation with or without re-working.

- TH1, 0.3 – 1.7 m
- TH3, 0.5 – 1.7 m
- TH3, 2.8 – 4.5 m
- TH4, 1.0 – 1.7 m

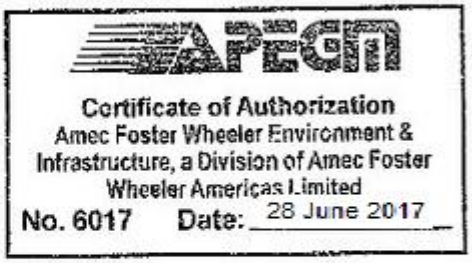
The remaining samples marginally fall below these specifications and as such may meet the criteria of of $1x10^{-7}$ cm/sec, however it is recommended that hydraulic conductivity testing be completed on these samples to verify. Hydraulic conductivity testing would also be recommended on samples from TH3 and TH4 as, while meeting the requirements noted above, contain relatively amounts of sand and as such could potentially fall below the conductivity value specified by Manitoba Conservation as a result.

Standard Proctor Moisture Dry Density Testing is recommended on all samples to evaluate workability and optimum moisture content conditions should they be selected for use in lagoon construction.

4.0 CLOSURE

Amec Foster Wheeler trusts that the forgoing is sufficient for your present requirements. Should you require additional information, please contact the undersigned at this office.

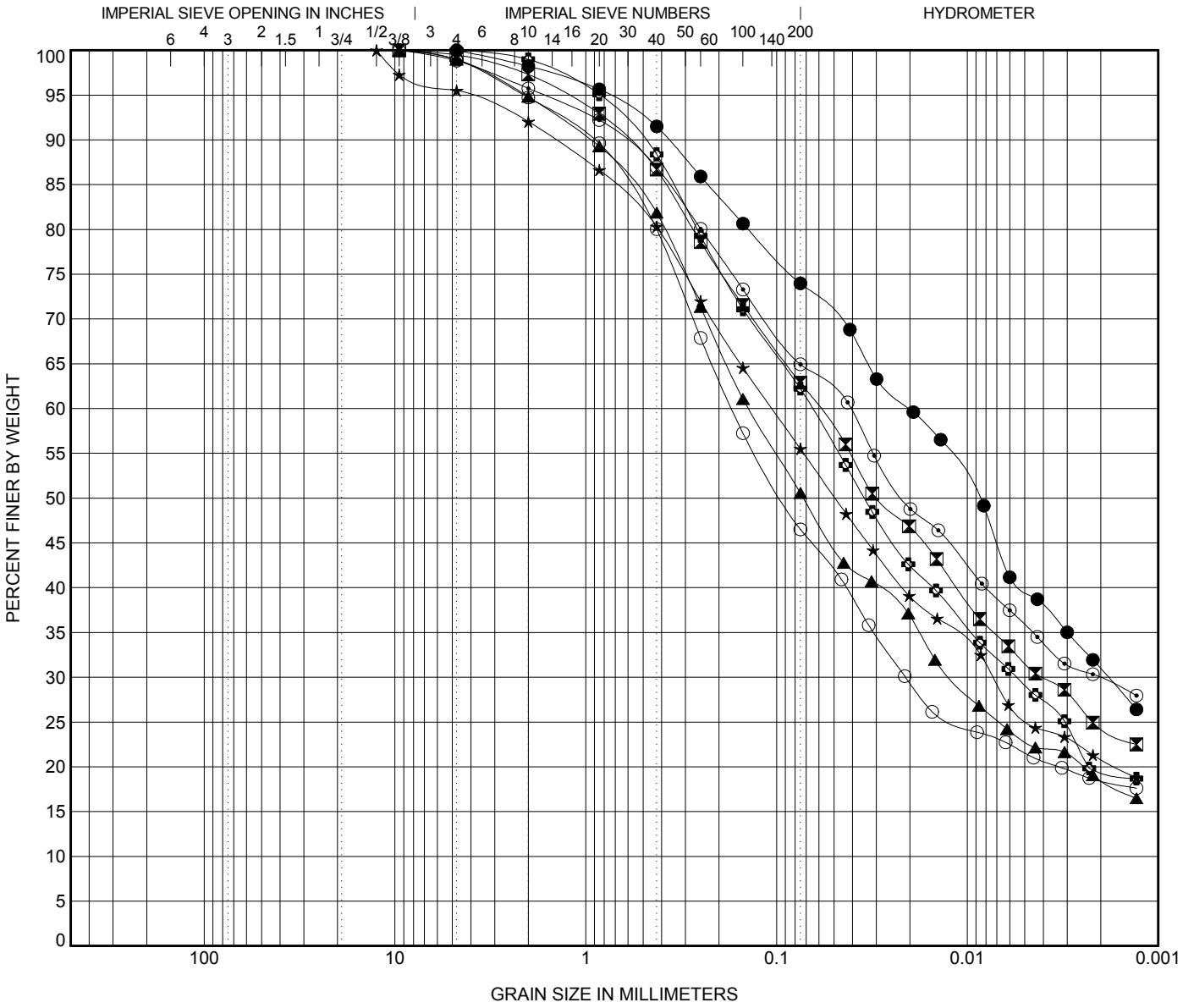
Sincerely,
Amec Foster Wheeler Environment & Infrastructure
A Division of Amec Foster Wheeler Americas Limited



Jorden Wiwcharyk, P. Eng.
Geotechnical Engineer

Reviewed by:
Trevor Gluck, P.Eng.
Associate Geotechnical Engineer

Attachments: Lab Summary (1)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Depth	MC	LL	PL	PI	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TH01**	**0.3 m**	**26.8**	**38**	**15**	**23**	**4.75**	**0.02**	**0.002**		**0.0**	**26.0**	**43.0**	**30.9**
⊠	**TH03**	**0.5 m**	**27.5**	**43**	**19**	**24**	**9.5**	**0.06**	**0.004**		**0.5**	**36.6**	**38.4**	**24.5**
▲	**TH03**	**1.7 m**	**23.4**	**29**	**14**	**15**	**9.5**	**0.14**	**0.012**		**1.0**	**48.4**	**32.0**	**18.6**
★	**TH03**	**2.8 m**	**17.4**	**32**	**13**	**19**	**12.5**	**0.106**	**0.007**		**4.5**	**40.0**	**34.7**	**20.9**
⊙	**TH04**	**1 m**	**29.0**	**38**	**15**	**23**	**9.5**	**0.041**	**0.002**		**1.2**	**33.9**	**35.0**	**29.9**
✿	**TH06**	**0.8 m**	**28.4**	**40**	**18**	**22**	**4.75**	**0.065**	**0.005**		**0.0**	**37.8**	**42.7**	**19.6**
○	**TH07**	**2.8 m**	**20.2**	**29**	**13**	**16**	**9.5**	**0.171**	**0.021**		**1.0**	**52.4**	**28.0**	**18.5**

Soils Analysis Report - McAuley Lagoon Study, AMEC Foster Wheeler Environment and Infrastructure, November 17, 2017

17 November 2017

Project No. WX11334-2700

J.R. Cousin Consultants Ltd.
91 Scurfield Boulevard
Winnipeg, Manitoba
R3Y 1G4

Attention: **Mr. Oswald Wohlgemut**

Re: Soils Analysis
McAuley Lagoon Studies

1.0 INTRODUCTION

As authorized by Mr. Oswald Wohlgemut of J.R. Cousin Consultants Ltd. (JRCC), Amec Foster Wheeler Environment and Infrastructure, a division of Amec Foster Wheeler Americas Ltd. (Amec Foster Wheeler), has completed an evaluation of 3 soil samples (2 Shelby Tube samples, 1 grab sample) that were submitted to our office by JRCC. Visual classification, moisture content, Atterberg limits and particle size testing were requested on the grab sample, with hydraulic conductivity testing requested on the Shelby Tube samples. Additionally, comments relating to suitability of the grab sample soil for use as a lagoon cell liner were requested.

2.0 LABORATORY TESTING

On receipt, the grab sample was classified in accordance with the Modified Unified Soil Classification System and was tested for moisture content, particle size (hydrometer method) and Atterberg limits. The visual classification and laboratory testing results are summarized in Table 1 with the laboratory data summary also appended to this report.

The two Shelby tube samples were tested for hydraulic conductivity, with results summarized below. Hydraulic conductivity testing reports for both samples are appended to this report.

440 Dovercourt Drive
Winnipeg, Manitoba R3Y 1N4
Tel +1 (204) 488-2997
amecfw.com

Amec Foster Wheeler Environment & Infrastructure
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642
PBN: 899879050PG0015

Table 1: Lab Results – TH8

Sample Number	Depth (m)	Water Content (%)	Atterberg Limits			Particle Size Analysis			
			Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	% Gravel	% Sand	% Silt	% Clay
TH8	1.5 – 3.0	17.4	33	13	20	6.1	37.8	33.7	22.4
		Classification: Clay (CL) – and silt, sandy, low plastic, very moist to wet							

Note: Sample information provided by JRCC

Results of the hydraulic conductivity testing completed on the 2 Shelby tube samples were as follows:

TH3 1.5 – 2.1 m: 7.63×10^{-5} cm/sec
TH6 1.5 – 2.1 m: 8.27×10^{-7} cm/sec

3.0 DISCUSSION

Amec Foster Wheeler was requested to comment on the suitability of the TH8 soils for use as a liner in a re-compacted or in-situ condition, based on the visual assessment and the test results summarized in Section 2.0 above.

Feasibility for the utilization of the various materials as an impermeable liner for the proposed lagoon will largely depend on the quality and amount of the clay available. Typical engineering practice is to specify materials that comply with the following minimum parameters:

- Liquid Limit of 30% or greater ;
- Plastic Index of 10% or greater;
- 30% or more passing a number 200 mesh sieve; and
- 20% or more of clay particles (2-µm particle size)

In general, materials meeting the combination of characteristics noted above would typically provide a re-compacted liner having a hydraulic conductivity not exceeding the maximum allowable value of 1×10^{-7} cm/sec required by Manitoba Conservation for construction of lagoon liners in Manitoba. Where the characteristics of materials tested exceed one or more of these criteria, the required hydraulic conductivity may not be achieved.

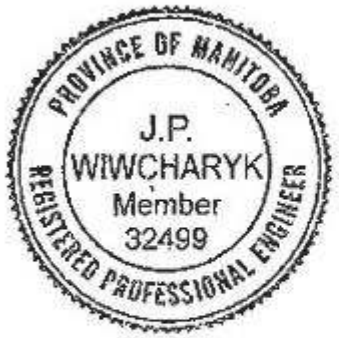
Based on the laboratory test data obtained on the grab sample (TH8, 1.5 – 3.0 m), the submitted sample meets the above criteria, and in this regard is expected to meet the maximum conductivity value specified by Manitoba Conservation with or without re-working. It is recommended that hydraulic conductivity testing be completed on the sample to verify.

Standard Proctor Moisture Dry Density Testing is also recommended on all samples to evaluate workability and optimum moisture content conditions should they be selected for use in lagoon construction.

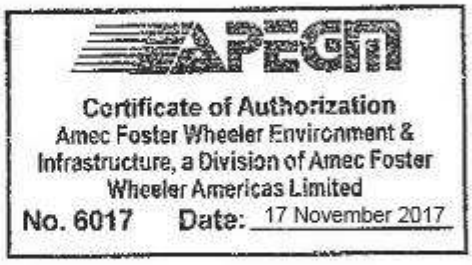
4.0 CLOSURE

Amec Foster Wheeler trusts that the forgoing is sufficient for your present requirements. Should you require additional information, please contact the undersigned at this office.

Sincerely,
Amec Foster Wheeler Environment & Infrastructure
A Division of Amec Foster Wheeler Americas Limited



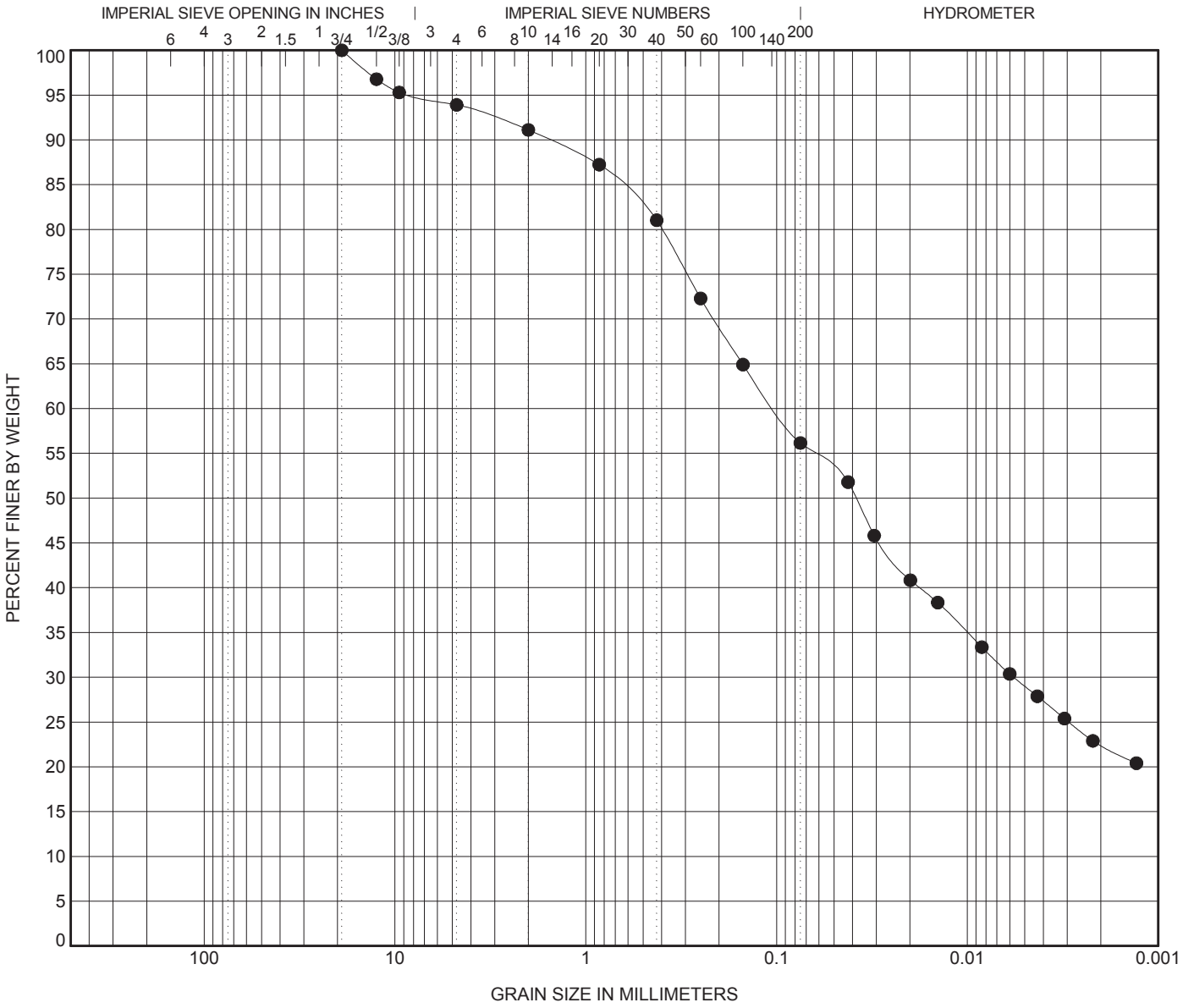
17 November 2017



Jorden Wiwcharyk, P. Eng.
Geotechnical Engineer

Reviewed by:
Trevor Gluck, P.Eng.
Associate Geotechnical Engineer

Attachments: Lab Summary – TH8
Hydraulic Conductivity Testing Results – TH3
Hydraulic Conductivity Testing Results – TH6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	Depth	MC	LL	PL	PI	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TH08**	**1.5 m**	**17.4**	**33**	**13**	**20**	**19**	**0.102**	**0.006**		**6.1**	**37.8**	**33.7**	**22.4**

WX11334-2700 SOIL ANALYSIS FOR MCAULEY LAGOON.GPJ 17/11/17 08:49 AM (WPG - GRAIN SIZE WITH ATTERBERG & MC)

Amec Foster Wheeler Environment and Infrastructure
Winnipeg, Manitoba

PARTICLE SIZE DISTRIBUTION

ASTM D5084 - HYDRAULIC CONDUCTIVITY REPORT

TO: Oswald Wohlgemut, M.Sc
JR Cousin Consultants Ltd
91 Scurfield Boulevard
Winnipeg, MB R3Y 1G4

PROJECT NO: WX11334 - 2700
CLIENT: JR Cousin Consultants Ltd
DATE SUBMITTED: 4-Oct-17

PROJECT: McAuley Lagoon

TEST HOLE: TH03
SAMPLE NO.: 1
SAMPLE DEPTH: 1.5-2.1m

PERMEANT: De-Aired Tap Water
HYDRAULIC GRADIENT: 9.61

CONSTANT HEAD METHOD (K = cQL/thA)

	Sample Height, L (cm)	Sample Dia. (cm)	Water Content (%)	Dry Density (kg/m^3)	Degree of Saturation (%)	Cell Pressure (kPa)	Back Pressure (kPa)	Differential Pressure, h (kPa)
Initial	7.32	7.20	29.0%	1455	91.6%	241.4	203.4	6.9
Final	7.32	7.17	30.0%	1494	100.5%			

Date & Time		Time, t	Flow (Q)		Temp. Corr, c	Hyd. Cond. Corrected, K (cm/s)
Start	End	(seconds)	Influent (ml)	Effluent (ml)		
10/24/17 9:54 AM	10/24/17 10:05 AM	660	20.20	19.90	1.238	9.62E-05
10/24/17 10:05 AM	10/24/17 10:14 AM	540	20.40	20.20	0.980	9.42E-05
10/24/17 10:14 AM	10/24/17 10:25 AM	660	20.30	19.60	0.980	7.58E-05
10/24/17 10:25 AM	10/24/17 10:30 AM	300	10.00	9.30	0.980	8.06E-05
10/24/17 10:30 AM	10/24/17 10:35 AM	300	9.80	9.00	0.980	7.85E-05
10/24/17 10:35 AM	10/24/17 10:41 AM	360	11.00	10.70	0.980	7.56E-05
10/24/17 10:41 AM	10/24/17 10:48 AM	420	12.00	11.60	0.980	7.04E-05

Soil Description: CLAY - silty, some sand to sandy, medium to high plastic, moist, stiff (pp = 1.50), dark grey to black, trace some organic, rootlet inclusion (> 1cm)

Average Temperature Corrected Value (cm/s): 7.63E-05

Amec Foster Wheeler Environment & Infrastructure

Per:

Brad Wiebe, M.Sc., P.Eng.
Senior Associate Geotechnical Engineer

Reporting of these results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

Amec Foster Wheeler Environment & Infrastructure
440 Dovercourt Drive
Winnipeg, Manitoba
R3Y 1N4

Tel +1 (204) 488-2997
Fax +1 (204) 489-8261

ASTM D5084 - HYDRAULIC CONDUCTIVITY REPORT

TO: Oswald Wohlgemut, M.Sc
JR Cousin Consultants Ltd
91 Scurfield Boulevard
Winnipeg, MB R3Y 1G4

PROJECT NO: WX11334 - 2700
CLIENT: JR Cousin Consultants Ltd
DATE SUBMITTED: 4-Oct-17

PROJECT: McAuley Lagoon

TEST HOLE: TH06
SAMPLE NO.: 1
SAMPLE DEPTH: 1.5-2.1m

PERMEANT: De-Aired Tap Water
HYDRAULIC GRADIENT: 9.80

CONSTANT HEAD METHOD (K = cQL/thA)

	Sample Height, L (cm)	Sample Dia. (cm)	Water Content (%)	Dry Density (kg/m^3)	Degree of Saturation (%)	Cell Pressure (kPa)	Back Pressure (kPa)	Differential Pressure, h (kPa)
Initial	7.17	6.91	29.3%	1422	88.2%	241.4	203.4	6.9
Final	7.13	6.84	33.7%	1418	100.7%			

Date & Time		Time, t	Flow (Q)		Temp. Corr, c	Hyd. Cond. Corrected, K (cm/s)
Start	End	(seconds)	Influent (ml)	Effluent (ml)		
10/24/17 9:30 AM	10/24/17 10:00 AM	1800	0.70	0.70	1.238	1.31E-06
10/24/17 10:00 AM	10/24/17 12:30 PM	9000	2.80	2.90	0.980	8.44E-07
10/24/17 12:30 PM	10/24/17 1:35 PM	3900	1.25	1.30	0.980	8.71E-07
10/24/17 1:35 PM	10/24/17 3:00 PM	5100	1.75	1.60	0.980	8.75E-07
10/24/17 3:00 PM	10/24/17 4:20 PM	4800	1.30	1.40	0.980	7.49E-07
10/24/17 4:20 PM	10/24/17 5:50 PM	5400	1.70	1.60	0.980	8.14E-07

Soil Description: CLAY - silty, some sand, medium to high plastic, moist, stiff (pp=1.5), dark grey to black, trace some organic

Average Temperature Corrected Value (cm/s): 8.27E-07

Amec Foster Wheeler Environment & Infrastructure

Per:

Brad Wiebe, M.Sc., P.Eng.
Senior Associate Geotechnical Engineer

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R3Y 1N4

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Fax +1 (204) 489-8261

Groundwater Well Log Report, GWDrill Database (2014), Province of Manitoba, Groundwater Management

Location: NW11-15-29W
Well_PID: 19773
Owner: WRB
Driller: M & M Drilling Rivers Ltd.
Well Name: MA-17
Well Use: TEST WELL
Water Use:
UTMX: 330507.337
UTMY: 5570927.44
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z: UNKNOWN
Date Completed: 1973 Nov 02
WELL LOG

From (ft.)	To (ft.)	Log
0	3.0	CLAY-BROWN SANDY SOFT
3.0	6.0	TILL-BROWN FIRM
6.0	15.0	TILL-GREY STONY

No construction data for this well.
Top of Casing: 0 ft. below ground
No pump test data for this well.
REMARKS
MCAULEY TOWN INVESTIGATION, N OF SCHOOL, NEAR FENCE OFF PTH 41

Location: NW11-15-29W
Well_PID: 35002
Owner: RM OF ARCHIE
Driller: M & M Drilling Rivers Ltd.
Well Name: MA78-1
Well Use: TEST WELL
Water Use:
UTMX: 330507.337
UTMY: 5570927.44
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1978 Aug 09
WELL LOG

From (ft.)	To (ft.)	Log

0	5.0	GRAVEL; STONY RED TO BROWN, OXIDIZED
5.0	10.0	TILL; BROWN, SILTY, CLAYEY, STONY
10.0	16.0	TILL; GREY

No construction data for this well.
Top of Casing: 0 ft. below ground
No pump test data for this well.

Location: NW11-15-29W
Well_PID: 35003
Owner: RM OF ARCHIE
Driller: M & M Drilling Rivers Ltd.
Well Name: MA78-2
Well Use: TEST WELL
Water Use:
UTMX: 330507.337
UTMY: 5570927.44
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1978 Aug 09
WELL LOG

From (ft.)	To (ft.)	Log
0	3.0	SAND; SILTY, CLAYEY
3.0	6.0	GRAVEL; COARSE RED-OXIDIZED
6.0	9.0	TILL; BROWN, STONY
9.0	15.0	TILL; GREY CLAYEY

No construction data for this well.
Top of Casing: 0 ft. below ground
No pump test data for this well.

Sludge Assessment Report, Assiniboine Injections Ltd. August 4, 2016

Assiniboine Injections Ltd.

Box 160 177 Notre Dame Ave Notre Dame de Lourdes, MB R0G-1M0
PH: 204-248-2559 FAX: 204-248-2799 EMAIL: info@lagooncleaning.com

DATE: AUGUST 4, 2016
TOWN: McAULEY

As requested, Assiniboine Injections Ltd completed our biosolids survey of primary Cell.
This survey was completed on JULY 26, 2016

Methodology

The cells were surveyed using a grid pattern.
Measurements are obtained by going out on a boat and probing the bottom with a measuring pole. The depth is determined by top of sludge blanket to base of lagoon.

Please find maps of cells, grid locations, indicating depth to sludge and depth to bottom of cell.

Cell Sludge Volume

CELL	SLUDGE VOLUME
PRIMARY CELL	1800 M3

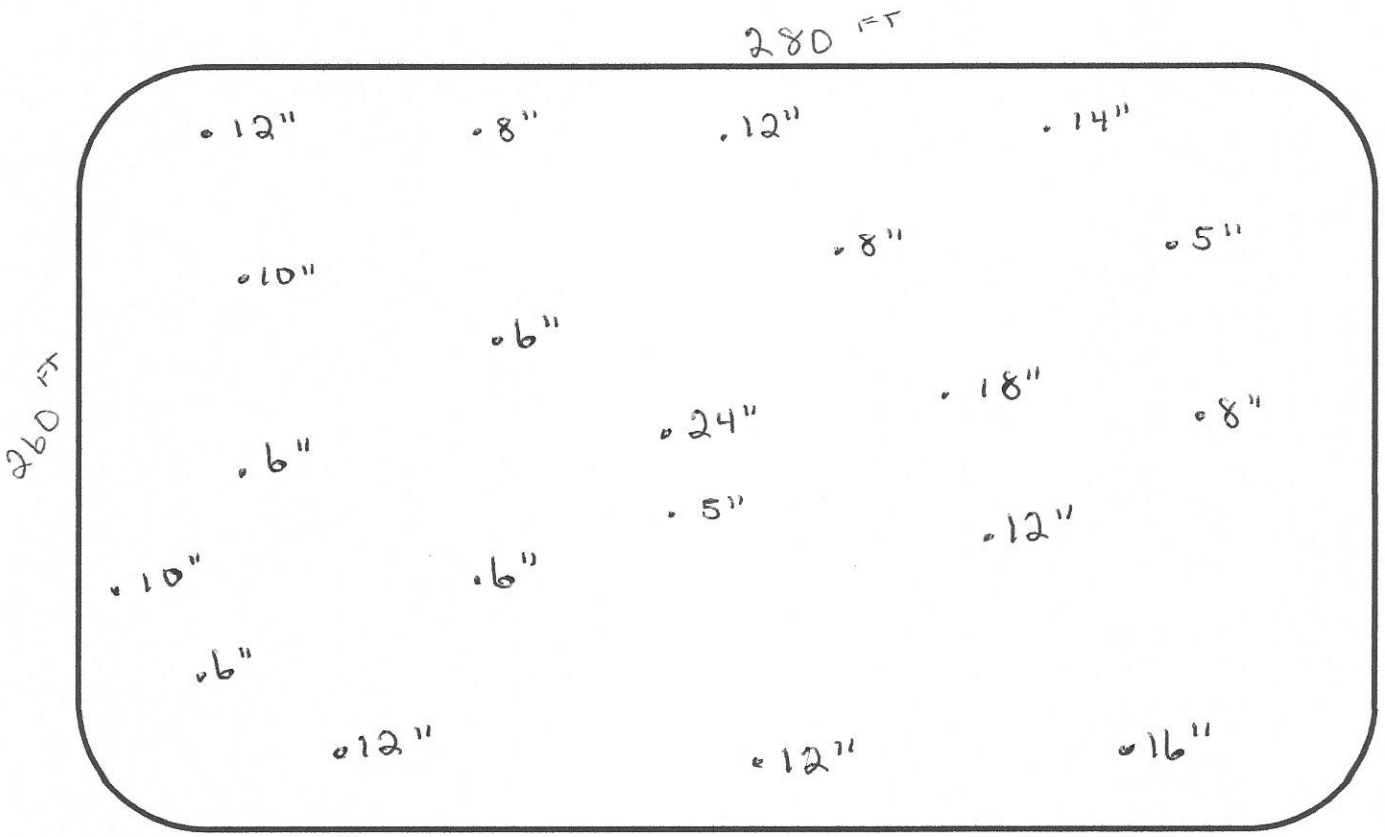
Thank you for allowing us to help you with this project. Please let me know if we can be of any more help with your biosolids management requirements. We look forward to working with you in the future.

Yours Truly,
Assiniboine Injections Ltd

Assiniboine Injections Ltd.

Box 160 177 Notre Dame Ave Notre Dame de Lourdes, MB R0G-1M0
PH: 204-248-2559 FAX: 204-248-2799 EMAIL: info@lagooncleaning.com

Project No. 1 Survey Date: JULY 26, 2016 Survey Crew: Jeff
Client: McAULEY Lagoon Id: Primary Lagoon Dimensions: 280 FT X 260 FT
Avg. Sludge Depth: 10.5 INCHES Samples Taken: NO



Appendix B

Table 1: McAuley Lagoon Population, Hydraulic and Organic Loading Projections to Design Year 20

Manitoba Conservation and Climate – Wildlife and Fisheries Branch, Email Correspondence, May 21, 2019

Manitoba Conservation and Climate – Fisheries Science and Fish Culture Section, Email Correspondence, May 22, 2019

Table 1: McAuley Lagoon Population, Hydraulic and Organic Loading Projections to Design Year 20

TABLE 1

McAULEY LAGOON - POPULATION AND WASTEWATER LOADING PROJECTIONS TO DESIGN YEAR 20

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 13	Col 14	Col 15
		Population		Organic Loading					Hydraulic Loading		
Calendar Year	Project Year	Community Population 0.50% growth/year	Total Population on Piped System	Daily Per Capita BOD_5 Loading (Piped Collection System) (kg/person/day)	Daily BOD_5 Loading (Piped Collection System) (kg/day)	Daily BOD_5 Loading (Rural Septic Loading) (kg/day)	Total Daily BOD_5 Loading (kg/day)	Primary Cell Surface Area @ 0.75 m Depth (m^2)	Daily Per Capita Hydraulic Loading (includes Infiltration) (L/person/day)	Daily Hydraulic Loading (m^3/day)	Total Lagoon Storage Volume Required (230 Days) (m^3)
2018	0	90	90	0.076	6.8	8.4	15.2	2,721	372.0	33.5	7,700
2019	1	91	91	0.076	6.9	8.4	15.3	2,735	372.0	33.9	7,786
2020	2	92	92	0.076	7.0	8.4	15.4	2,749	372.0	34.2	7,872
2021	3	93	93	0.076	7.1	8.4	15.5	2,762	372.0	34.6	7,958
2022	4	94	94	0.076	7.1	8.4	15.5	2,776	372.0	35.0	8,044
2023	5	95	95	0.076	7.2	8.4	15.6	2,790	372.0	35.3	8,130
2024	6	96	96	0.076	7.3	8.4	15.7	2,803	372.0	35.7	8,216
2025	7	97	97	0.076	7.4	8.4	15.8	2,817	372.0	36.1	8,302
2026	8	98	98	0.076	7.5	8.4	15.9	2,831	372.0	36.5	8,388
2027	9	99	99	0.076	7.5	8.4	15.9	2,844	372.0	36.8	8,474
2028	10	100	100	0.076	7.6	8.4	16.0	2,858	372.0	37.2	8,560
2029	11	101	101	0.076	7.7	8.4	16.1	2,871	372.0	37.6	8,646
2030	12	102	102	0.076	7.8	8.4	16.2	2,885	372.0	38.0	8,732
2031	13	103	103	0.076	7.8	8.4	16.2	2,899	372.0	38.3	8,818
2032	14	104	104	0.076	7.9	8.4	16.3	2,912	372.0	38.7	8,904
2033	15	105	105	0.076	8.0	8.4	16.4	2,926	372.0	39.1	8,990
2034	16	106	106	0.076	8.1	8.4	16.5	2,940	372.0	39.5	9,076
2035	17	107	107	0.076	8.1	8.4	16.5	2,953	372.0	39.8	9,162
2036	18	108	108	0.076	8.2	8.4	16.6	2,967	372.0	40.2	9,248
2037	19	109	109	0.076	8.3	8.4	16.7	2,981	372.0	40.6	9,334
2038	**20**	**110**	**110**	**0.076**	**8.4**	**8.4**	**16.8**	**2,994**	**372.0**	**41.0**	**9,420**

Manitoba Conservation and Climate – Wildlife and Fisheries Branch, Email Correspondence, May 21, 2019

Oswald Wohlgemut

From: Murray, Colin (SD) [Colin.Murray@gov.mb.ca]
Sent: Tuesday, May 21, 2019 11:54 AM
To: 'Oswald Wohlgemut'
Subject: Data request O Wohlgemut JR Cousin 20190503 Lagoon McAuley NW-11-015-29W1

Hi Oswald
Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's (CDC) rare species database for your area of interest. This includes the primary locations:
NW-11-015-29W1; and a two kilometer radius buffer from the edge of the location boundary.

The search resulted in the following occurrences:

Within the footprint or primary location(s):
NW-11-015-29W1: No listed or tracked species occurrences found at this time.

Within 2km of the footprint boundary:

TAXGROUP	SCINAME	COMNAME	SRANK	ESEA	SARA
Vertebrate Animal	Dolichonyx oryzivorus	(Bobolink)	S4B	NA	Threaten
Vertebrate Animal	Hirundo rustica	(Barn Swallow)	S4B	NA	Threaten

General area records low locational accuracy:

TAXGROUP	SCINAME	COMNAME	SRANK	ESEA	SARA
Vascular Plant	Sceptridium multifidum	(Leathery Grape-fern)	S3	NA	NA

Found in broader area and similar habitat:

TAXGROUP	SCINAME	COMNAME	SRANK	ESEA	SARA
Vertebrate Animal	Ammodramus savannarum	(Grasshopper Sparrow)	S3B	NA	NA
Vertebrate Animal	Centronyx bairdii	(Baird's Sparrow)	S1B	Endangered	Special C
Vertebrate Animal	Eremophila alpestris	(Horned Lark)	S3B;SUM	NA	NA
Vertebrate Animal	Calcarius ornatus	(Chestnut-collared Longspur)	S2B	Endangered	Threaten
Vertebrate Animal	Anthus spragueii	(Sprague's Pipit)	S2B	Threatened	Threaten
Vertebrate Animal	Buteo regalis	(Ferruginous Hawk)	S1B	Endangered	Threaten
Vertebrate Animal	Contopus virens	(Eastern Wood-pewee)	S4B	NA	Special C
Vertebrate Animal	Podiceps auritus	(Horned Grebe)	S4B	NA	Special C

Further information on this ranking system can be found on our website at: http://www.natureserve.org/conservation-tools/conservation-status-assessment.
These designations can be found at:
http://web2.gov.mb.ca/laws/statutes/ccsm/e111e.php,
https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html and
http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1.

Manitoba's recommended setback distances can be found at: https://www.gov.mb.ca/sd/pubs/conservation-data-centre/mbcdc_bird_setbacks.pdf.

The information provided in this letter is based on existing data known to the Manitoba CDC of the Wildlife and Fisheries Branch at the time of the request. These data are dependent on the research and observations of CDC staff and others

who have shared their data, and reflect our current state of knowledge. **An absence of data does not confirm the absence of any rare or endangered species.** Many areas of the province have never been thoroughly surveyed, however, and the absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. The information should, therefore, not be regarded as a final statement on the occurrence of any species of concern nor should it substitute for on-site surveys for species or environmental assessments. Also, because our Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request.

Please contact the Manitoba CDC for an update on this natural heritage information if more than six months passes before it is utilised.

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

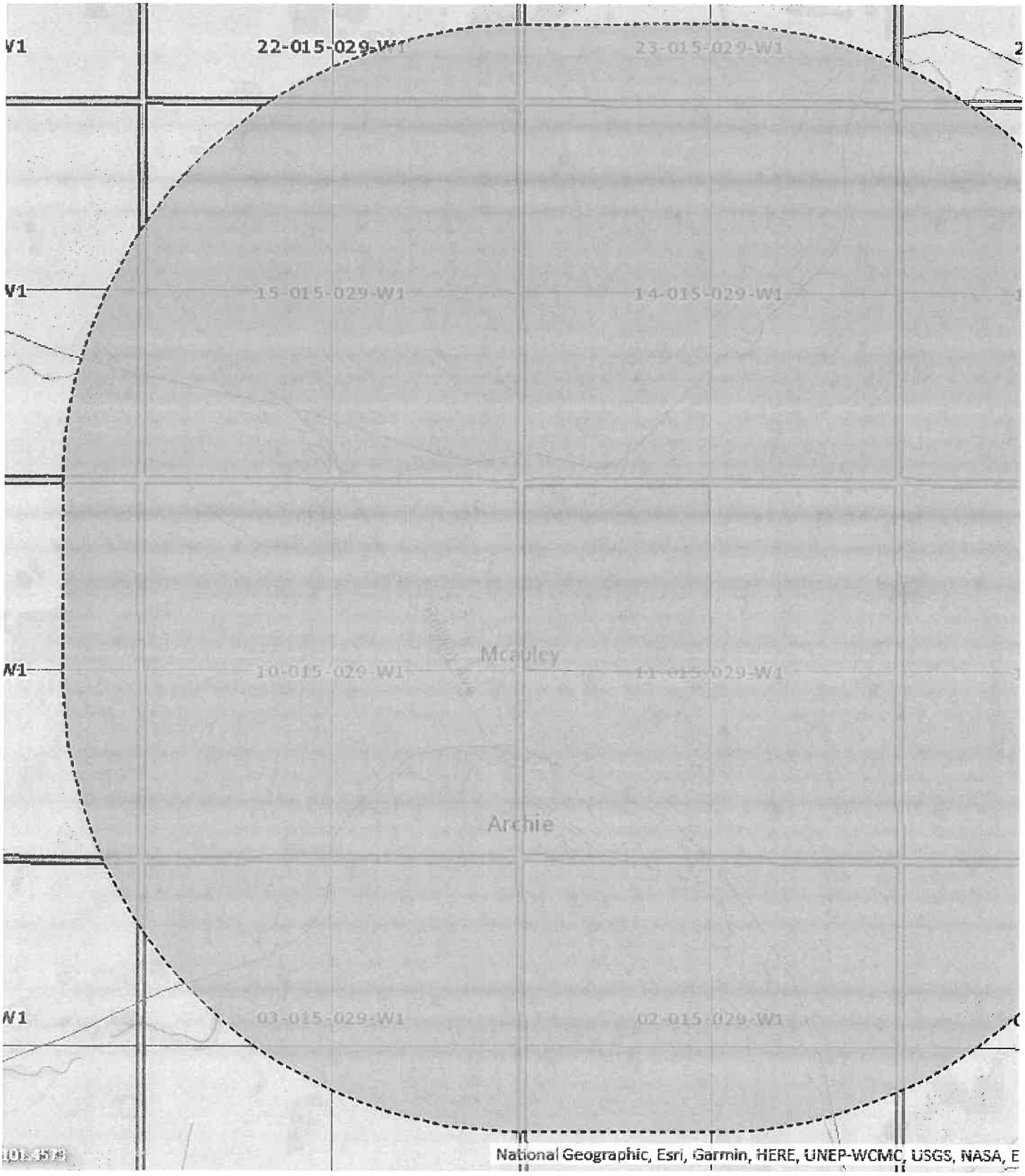
This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

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

If you have any questions or require further information contact me directly at (204) 945-7760.

Colin

Reference screen clip:



Colin Murray
Information Manager
Manitoba Conservation Data Centre
Wildlife and Fisheries Branch
Department of Sustainable Development

200 Saulteaux Crescent
Winnipeg, Manitoba, R3J3W3
204-945-7760
colin.Murray@gov.mb.ca
http://www.gov.mb.ca/sd/cdc/index.html

Manitoba Conservation and Climate – Fisheries Science and Fish Culture Section, Email Correspondence, May 22, 2019

Oswald Wohlgemut

From: Janusz, Laureen R (SD) [Laureen.Janusz@gov.mb.ca]
Sent: Wednesday, May 22, 2019 7:46 AM
To: 'Oswald Wohlgemut'
Cc: Kitch, Ian (SD); Stephens, Jonathan (SD); Long, Jeff (SD)
Subject: Scissor Creek - Fish Species
Attachments: Milani_MB fish inventory.pdf

Hi Oswald,

I have checked the Fish Inventory Habitat Classification System and there is nothing documented for this creek. I checked the attached report by Milani. He assessed two sites on Scissor Creek and noted the sites provided complex fish habitat. At the time he sampled the sites, one had no flow, and the other had flow but no fish were caught. I don't know where this creek is in relation to the stream/river it drains into. It seems from Milani's assessment that there is the habitat to support fish, at least seasonally, if the conditions are right. Fisheries does not have any information on known spawning areas within this creek.

I have cc'd our regional fisheries manager and biologist should they have anything to confirm or refute what I have just said.

Thanks Oswald.

Laureen Janusz
Fisheries Science and Fish Culture Section
Wildlife and Fisheries Branch
Department of Sustainable Development
Cell: 204 793-1154
Email: Laureen.Janusz@gov.mb.ca

From: Oswald Wohlgemut <owohlgemut@jrcc.ca>
Sent: May-03-19 4:00 PM
To: Janusz, Laureen R (SD) <Laureen.Janusz@gov.mb.ca>
Subject: Scissor Creek - Fish Species

Hello Laureen,

JR Cousin Consultants is preparing and Environment Act Proposal for the community of McAuley for a new wastewater treatment lagoon. We were wondering if you could provide information on whether there are any recorded Fish Species in Scissor Creek and if there are any known fish spawning areas in the creek near McAuley, Manitoba. The location near the site works is NW 11-15-29 WPM.

Regards,

Oswald Wohlgemut, M.Sc.
Environmental Scientist

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

Appendix C

Title Page

Plan 1: Test Hole Location Plan

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Plan 6: Sign, Access Road, Fence, Gate, Lock and Truck Turnaround Details

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RM OF ELLICE - ARCHIE

MCAULEY LAGOON - EAP

PRELIMINARY
NOT FOR CONSTRUCTION

REDUCED DRAWING SET
DO NOT SCALE

PLAN INDEX

LAGOON

JR Cousin Consultants Ltd.

91A Scurfield Blvd. Winnipeg MB R3Y 1G4
p. (204) 489-0474
f. (204) 489-0487
www.jrcc.ca

ENGINEERING EXCELLENCE SINCE 1981

PR. 41

RESIDENCE

SCISSOR CREEK

TH7

TH6

TH8

MCAULEY LAGOON

TH5

TH1

TH3

TH4

TH2

PRELIMINARY
NOT FOR CONSTRUCTION

SCALE BAR
(IN METRES)
10 0 5 10 20 30 40 50
1:500

No.	REVISIONS	DATE	INITIALS

B.M. EL.

LOCATIONS OF UNDERGROUND STRUCTURES/UTILITIES AS SHOWN ARE BASED ON AVAILABLE INFORMATION BUT NO GUARANTEE IS GIVEN OR IMPLIED THAT ALL EXISTING UNDERGROUND STRUCTURES/UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL UNDERGROUND STRUCTURES/UTILITIES MUST BE OBTAINED FROM THE APPROPRIATE AUTHORITY/OWNER, BY THE CONTRACTOR, BEFORE PROCEEDING WITH CONSTRUCTION.

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p. (204) 489-0474
f. (204) 489-0487
www.jrcc.ca
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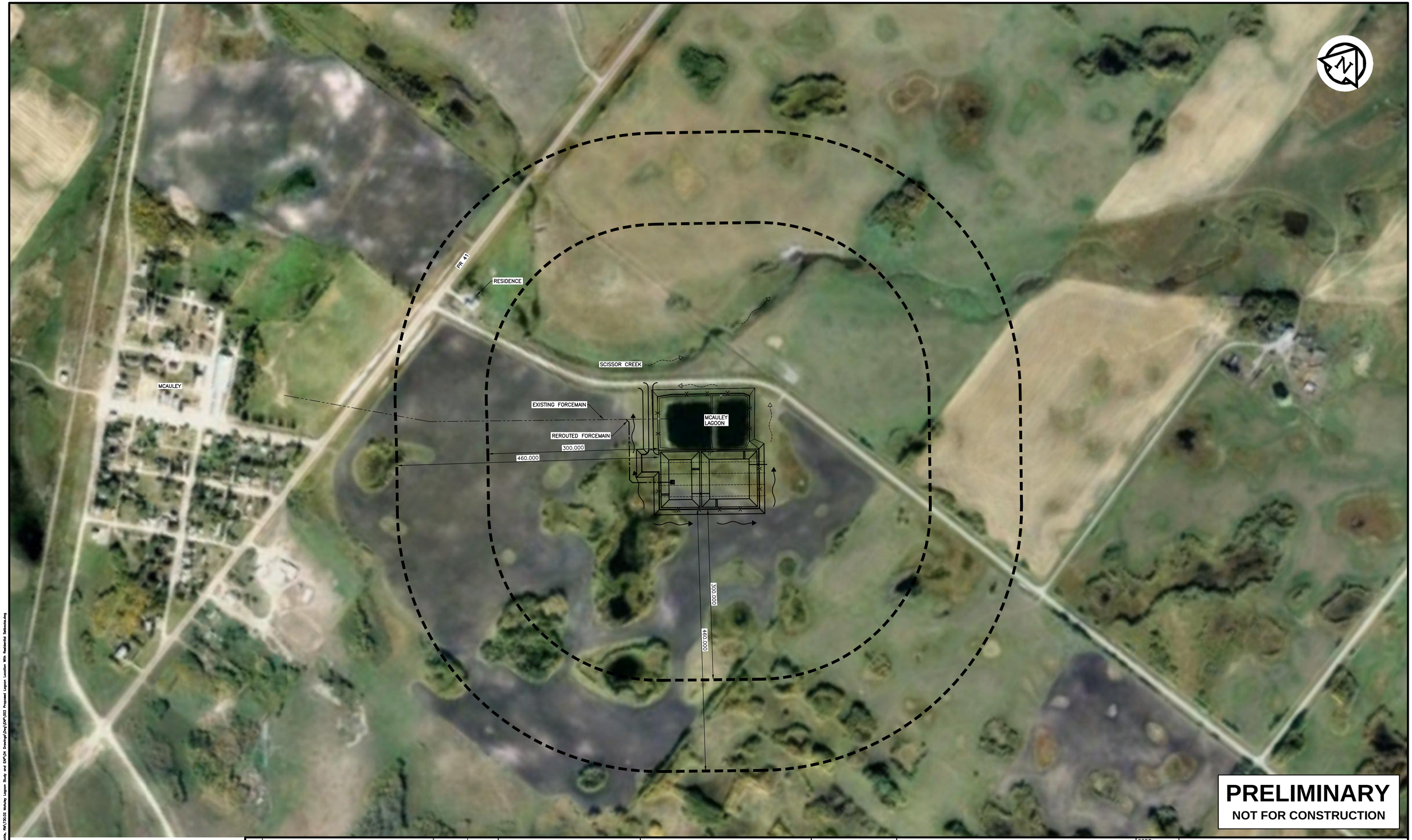
CODE:	E-730.02
DESIGNED BY:	OW
DRAWN BY:	RH
REVIEWED BY:	JD

PROJECT: RM OF ELLICE-ARCHIE
MCAULEY LAGOON - EAP

TITLE: TEST HOLE LOCATION PLAN

SCALE:	DATE:	PLAN:	SHEET:
1:1000	19/11/28	1	1 of 7

Feb 28, 2020 - 2:54pm P:\700\730 Ellice-Archie, RM\730.02 McAuley Lagoon Study and EAP\04_Drawings\Dwg\EAP\002 Test Hole Location Plan.dwg



PRELIMINARY
NOT FOR CONSTRUCTION

SCALE BAR
(IN METRES)
60 0 30 60 120 180 240 300
1:3000

No.	REVISIONS	DATE	INITIALS

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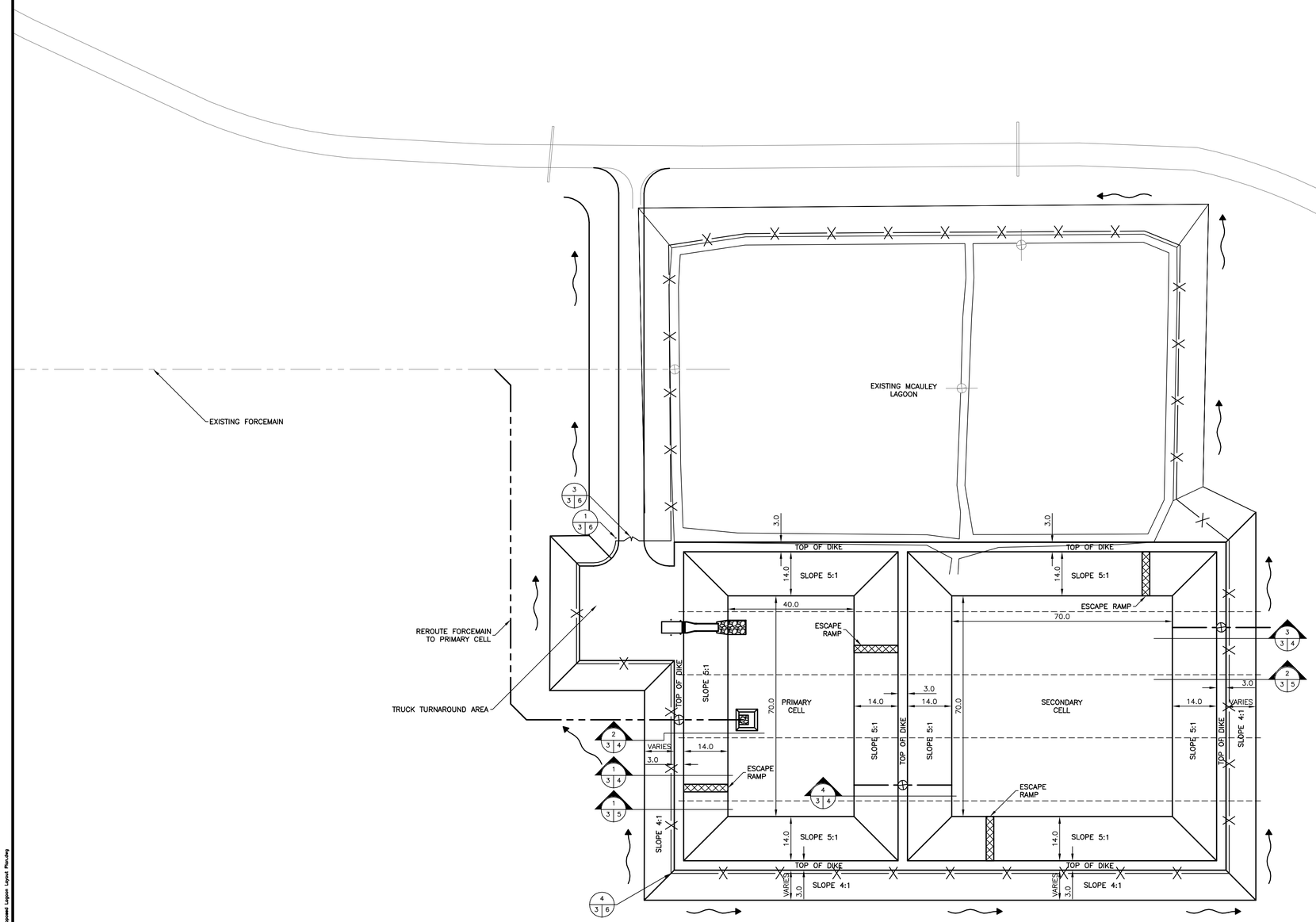
CODE:	E-730.02
DESIGNED BY:	OW
DRAWN BY:	RH
REVIEWED BY:	JD

PROJECT: RM OF ELLICE-ARCHIE
MCAULEY LAGOON - EAP

TITLE: PROPOSED LAGOON LOCATION WITH RESIDENTIAL SETBACKS AND DRAINAGE ROUTE

SCALE:	DATE:	PLAN:	SHEET:
1:3000	19/11/28	2	2 of 7

Feb 28, 2020 - 2:54pm K:\300\730 Ellice-Archie, RM\730.02 McAuley Lagoon Study and EAP\04 Drawings\Dwg\EAP\403 Proposed Lagoon Location With Residential Setbacks.dwg



PRELIMINARY
NOT FOR CONSTRUCTION

SCALE BAR
(IN METRES)
15 0 7.5 15 30 45 60 75
1:750

No.	REVISIONS	DATE	INITIALS
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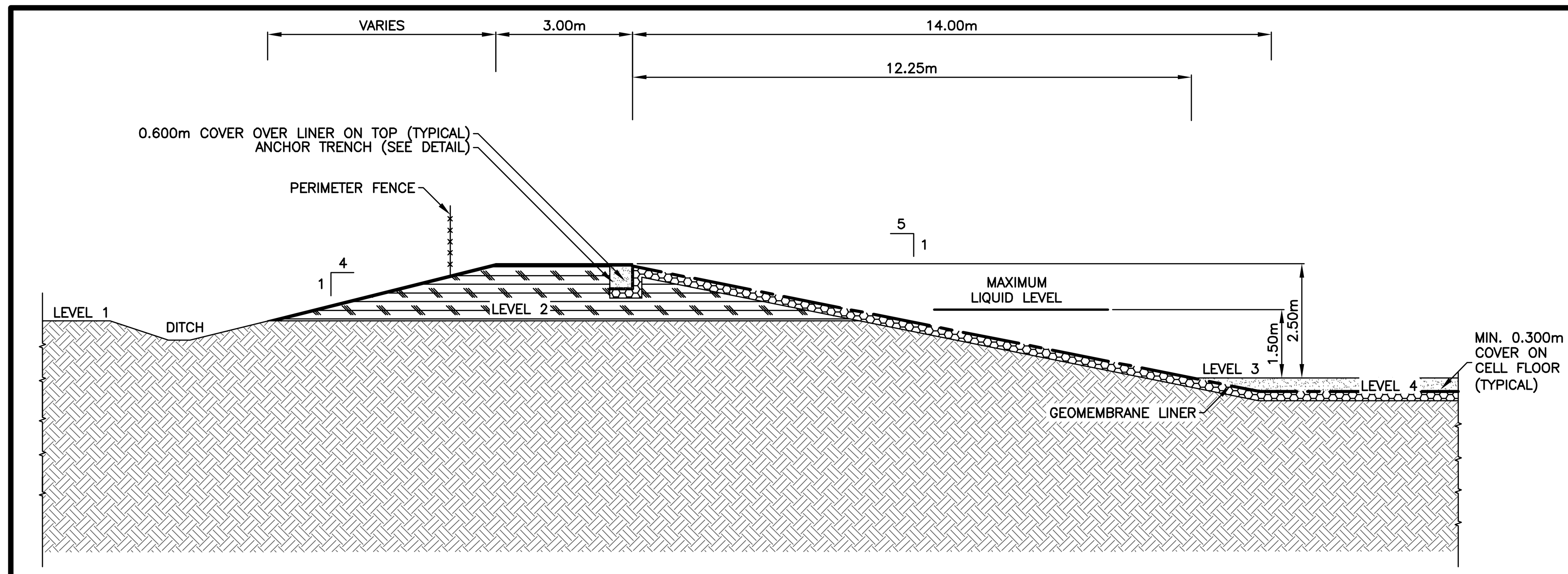
CODE:	E-730.02
DESIGNED BY:	OW
DRAWN BY:	RH
REVIEWED BY:	JD

PROJECT: RM OF ELLICE-ARCHIE MCAULEY LAGOON - EAP

TITLE: PROPOSED LAGOON LAYOUT PLAN

SCALE:	DATE:	PLAN:	SHEET:
1:750	19/11/28	3	3 of 7



1 | 3 4 PERIMETER DIKE
SCALE = 1:100

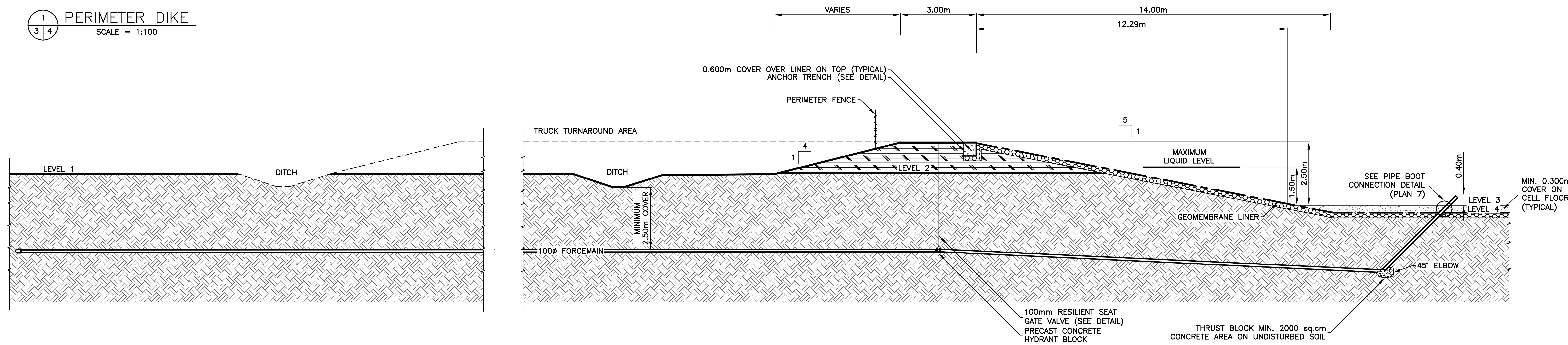
LEVEL 1 – PRE–CONSTRUCTION EXISTING PRAIRIE ELEVATION
LEVEL 2 – ELEVATION FOLLOWING TOPSOIL REMOVAL
LEVEL 3 – FINISHED CELL BOTTOM ELEVATION
LEVEL 4 – BOTTOM OF LINER

MINIMUM LINER COVER THICKNESS

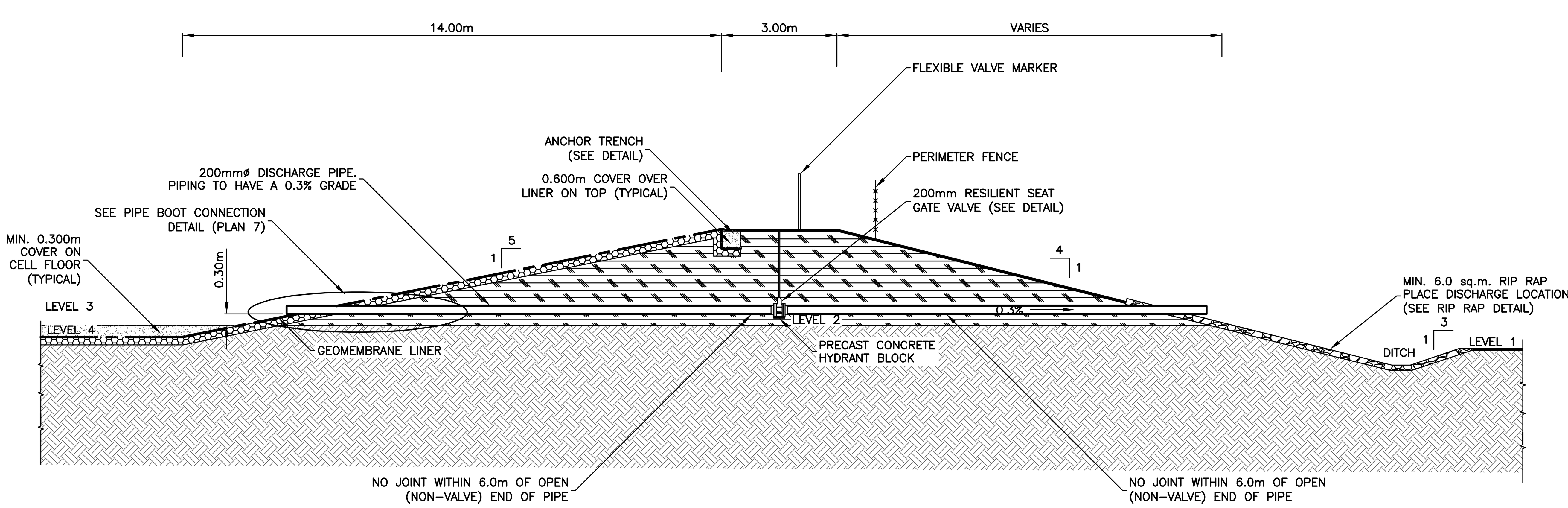
COVER THICKNESS	PLACEMENT EQUIPMENT
600 mm	D7–D9 STYLE CAT OR SMALLER
900 mm	SCRAPER, MOTOR GRADING

LEGEND:

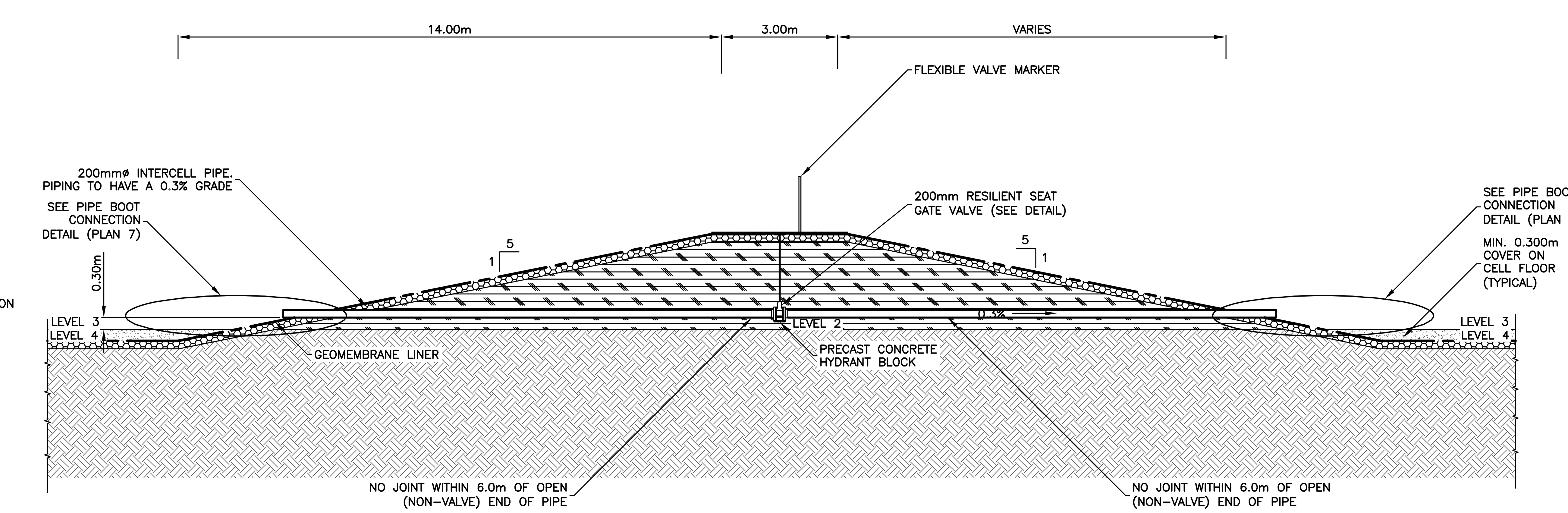
- EXCAVATED AND COMPACTED APPROVED BEDDING MATERIAL
- EXCAVATED AND COMPACTED COVER MATERIAL
- EXCAVATED AND COMPACTED SOILS SUITABLE FOR DIKE CONSTRUCTION
- INSITU SOIL
- CONCRETE
- RIP RAP
- TOPSOIL
- WICK DRAIN



2 | 3 4 PERIMETER DIKE AT FORCEMAIN
SCALE = 1:100



3 | 3 4 PERIMETER DIKE AT DISCHARGE PIPE
SCALE = 1:100



4 | 3 4 INTERCELL DIKE AT INTERCELL PIPE
SCALE = 1:100

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f. (204) 489-0487
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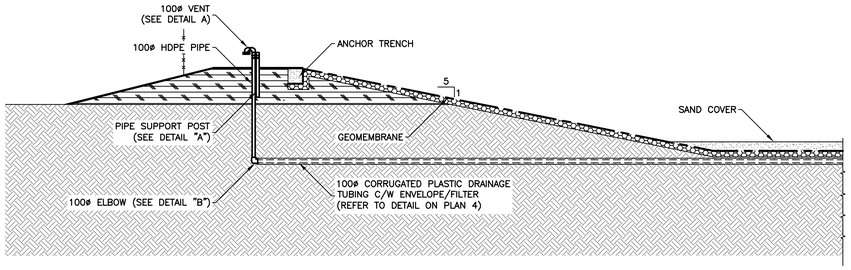
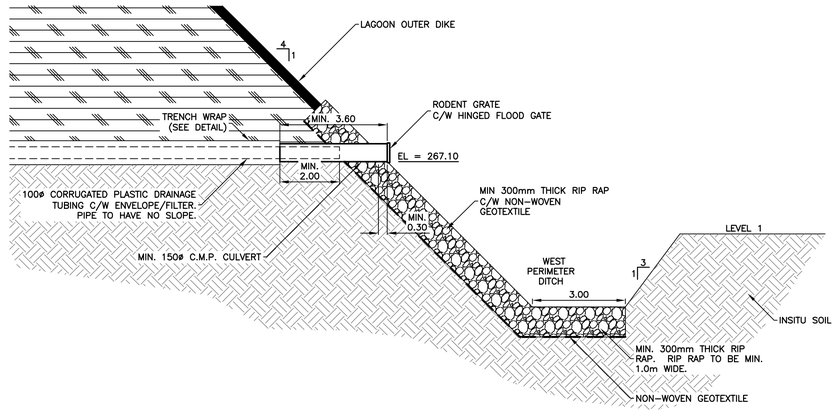
CODE: E–730.02
DESIGNED BY: OW
DRAWN BY: RH
REVIEWED BY: JD

PROJECT: RM OF ELLICE–ARCHIE MCAULEY LAGOON – EAP
TITLE: LAGOON DIKE, LINER AND INLET DETAILS

SCALE: AS NOTED
DATE: 19/11/28
PLAN: 4
SHEET: 4 of 7



1/3/5 TILE DEWATERING/DEGASSING SYSTEM VENT DETAIL
SCALE = 1:100

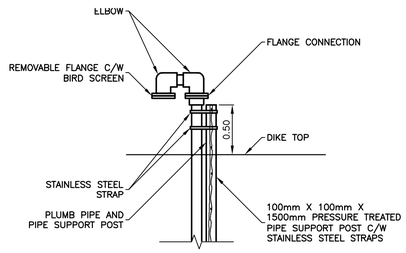


2/3/5 TILE DEWATERING/DEGASSING SYSTEM OUTFALL DETAIL
HORIZONTAL SCALE = 1:100
VERTICAL SCALE = 1:25

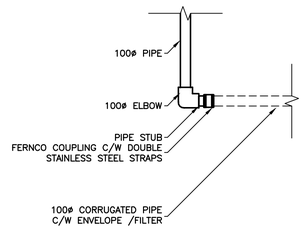
LEGEND:

- INSITU MATERIAL SUITABLE FOR LINER BEDDING. IF MATERIAL IS NOT SUITABLE, REMOVE 200mm AND REPLACE WITH SUITABLE MATERIAL AS DIRECTED BY ENGINEER.
- PLACE SUITABLE COVER MATERIAL FOR LINER
- EXCAVATED AND COMPACTED SOILS SUITABLE FOR DIKE CONSTRUCTION
- INSITU SOIL
- APPROVED BEDDING MATERIAL
- CONCRETE
- TRENCH STONE
- TOPSOIL
- SEEDED GROUND

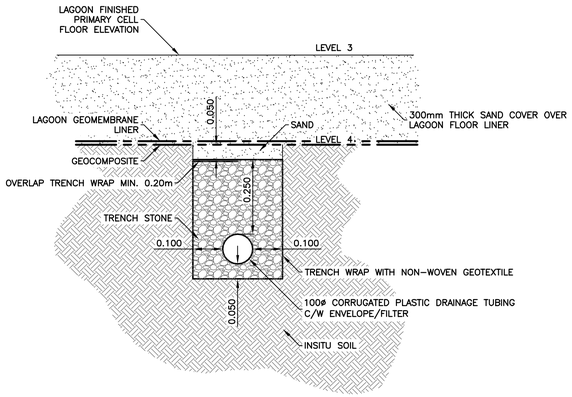
LEVEL 1	– PRE-CONSTRUCTION EXISTING PRAIRIE ELEVATION
LEVEL 2	– ELEVATION FOLLOWING TOPSOIL REMOVAL
LEVEL 3	– FINISHED CELL BOTTOM ELEVATION
LEVEL 4	– BOTTOM OF LINER
LEVEL 5	– LEVEL OF EARTHWORK PRIOR TO BEDDING



DETAIL A
SCALE = 1:30

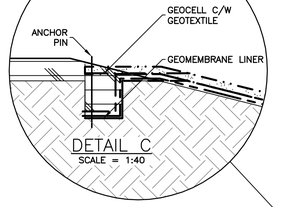


DETAIL B
SCALE = 1:30

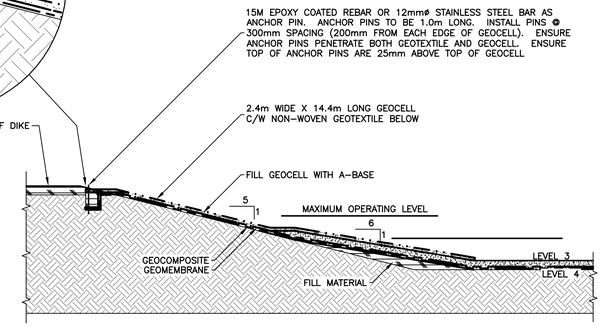


3/5 TILE DEWATERING/DEGASSING SYSTEM DETAIL
SCALE = 1:10

4/5 PICTURE OF TYPICAL ESCAPE RAMP DURING CONSTRUCTION
SCALE = NTS



DETAIL C
SCALE = 1:40



5/5 TYPICAL ESCAPE RAMP DETAIL
SCALE = 1:100

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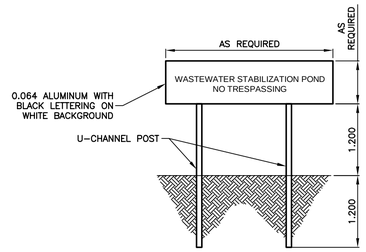
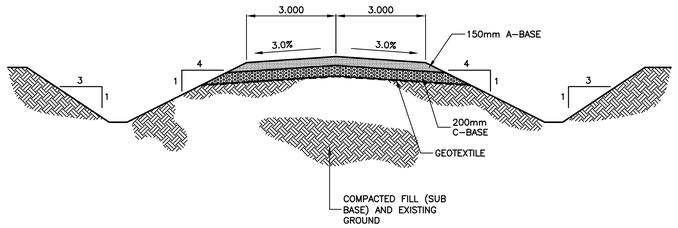
CODE:	E-730.02
DESIGNED BY:	OW
DRAWN BY:	RH
REVIEWED BY:	JD
PROJECT:	RM OF ELLICE-ARCHIE MCAULEY LAGOON – EAP
TITLE:	DEGASSING/DEWATERING SYSTEM, ESCAPE RAMP, SPILLWAY AND PIPE TRENCH DETAILS
SCALE:	1:3000
DATE:	18/10/01
PLAN:	5
SHEET:	5 of 7



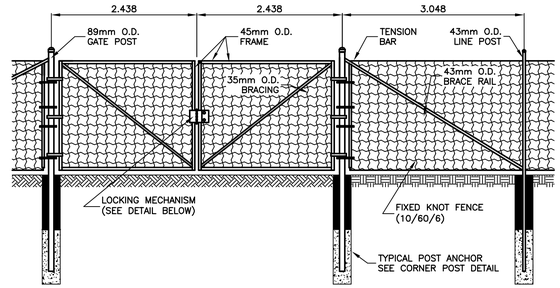
1/3,6 SIGN DETAIL
SCALE = 1:50



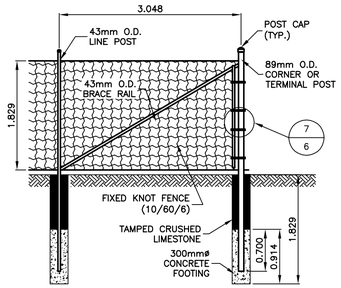
NOTE:

TOP SOIL AND ORGANICS TO BE REMOVED FOR ROAD BED PREPARATION

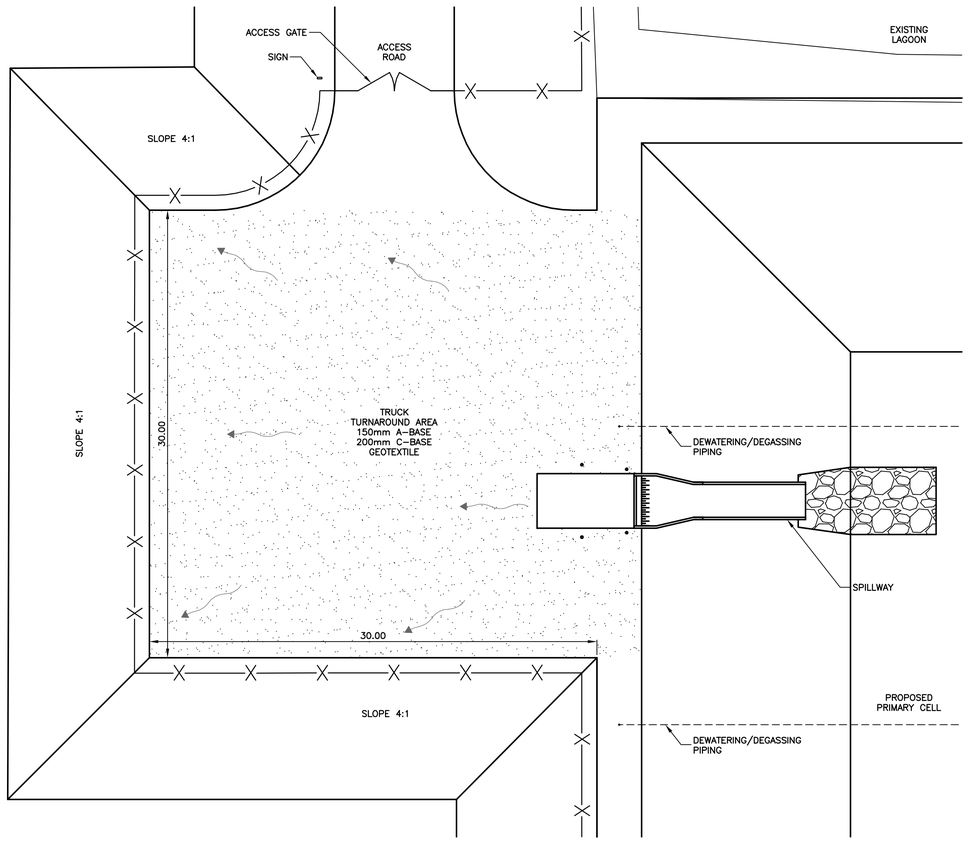
2/6 ACCESS ROAD CROSS-SECTION
Horizontal Scale = 1:100
Vertical Scale = 1:50



3/3,6 GATE DETAIL
SCALE = 1:50

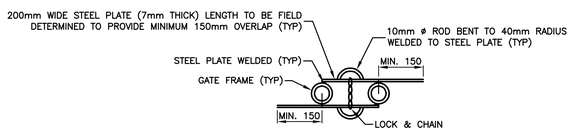


4/3,6 CORNER POST
SCALE = 1:50



SCALE BAR
(IN METRES)
4 0 2 4 8 12 16 20
1:200

5/6 TRUCK TURNAROUND DETAIL
SCALE = 1:200



6/6 LOCK DETAIL
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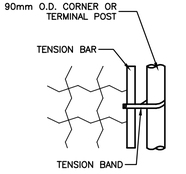

7/6 TENSION BAR
SCALE = 1:15

PRELIMINARY
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No.	REVISIONS	DATE	INITIALS

B.M. EL.

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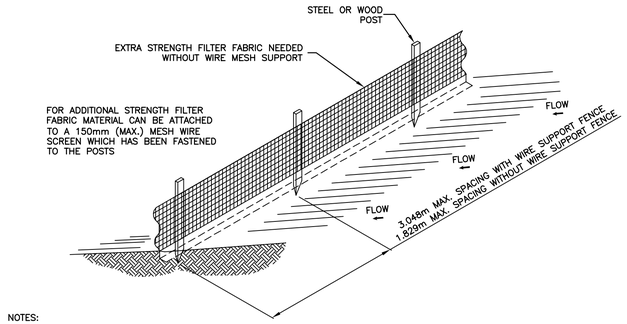
CODE:	E-730.02
DESIGNED BY:	OW
DRAWN BY:	RH
REVIEWED BY:	JD

PROJECT: RM OF ELLICE-ARCHIE MCAULEY LAGOON - EAP

TITLE: SIGN, ACCESS ROAD, FENCE, GATE, LOCK AND TRUCK TURNAROUND DETAILS

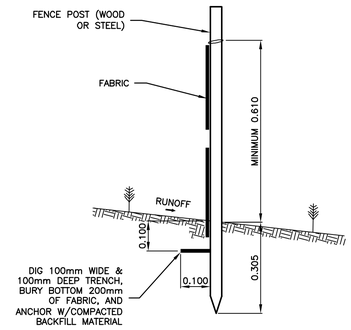
SCALE:	DATE:	PLAN:	SHEET:
AS NOTED	19/11/28	6	6 of 7



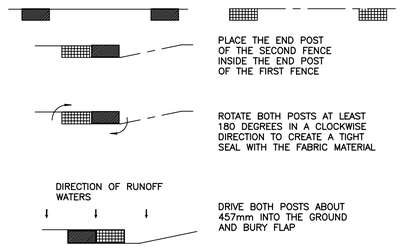
NOTES:

1. THE HEIGHT OF A SILT FENCE SHALL NOT EXCEED 914mm.
2. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS.
3. POSTS SHALL BE SPACED A MAXIMUM OF 3.048m APART AT THE BARRIER LOCATION AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 300mm. WHEN EXTRA STRENGTH FABRIC IS USED WITHOUT THE WIRE SUPPORT FENCE, POST SPACING SHALL NOT EXCEED 1.829m.
4. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 100mm WIDE AND 100mm DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 25mm LONG, TIE WIRES, OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 50mm AND SHALL NOT EXTEND MORE THAN 914mm ABOVE THE ORIGINAL GROUND SURFACE.
6. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 200mm OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 914mm ABOVE THE ORIGINAL GROUND SURFACE.
7. THE TRENCH SHALL BE BACKFILLED AND THE SOIL COMPACTED OVER THE FILTER FABRIC.
8. SILT FENCING TO BE POLYPROPYLENE SYNTHETIC FIBRE WITH ULTRAVIOLET STABILIZERS. AMOCO 1198 OR APPROVED EQUAL.
9. WOOD POSTS TO BE 38mm X 89mm (2" X 4"), POINTED AT ONE END AND FABRICATED.
10. INSTALL ALL SUPPORTING POSTS ON THE DOWN SLOPE SIDE OF THE FENCING
11. MAINTAIN SILT FENCE THROUGHOUT CONSTRUCTION AND UNTIL REVEGETATION OCCURS.

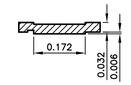
1/7 SILT FENCE DETAIL
SCALE = 1:40



2/7 SILT FENCE SECTION
SCALE = 1:10



3/7 ATTACHING TWO SILT FENCES
SCALE = 1:10



COVER DETAIL
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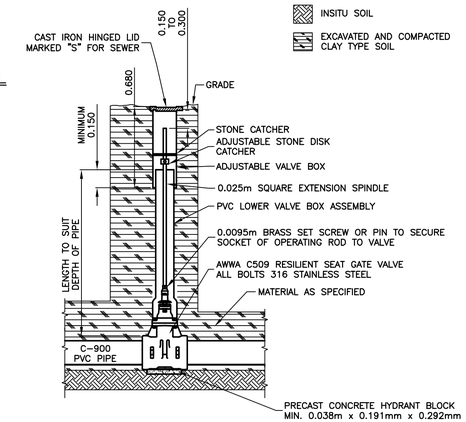
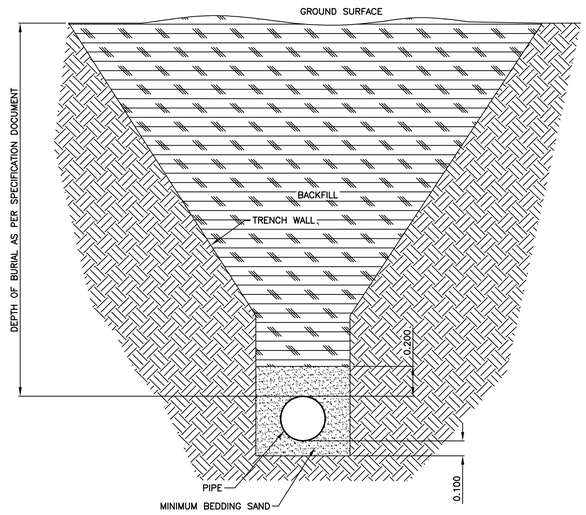
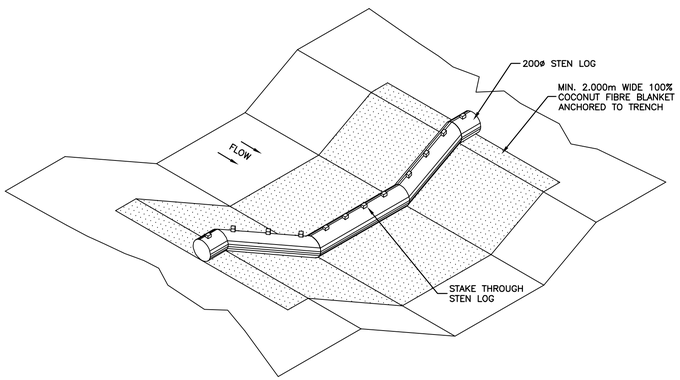


LEGEND:
- INSITU SOIL
- EXCAVATED AND COMPACTED CLAY TYPE SOIL

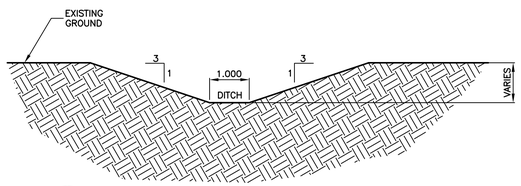
4/7 LAGOON DIKE VALVE DETAIL
SCALE = 1:25



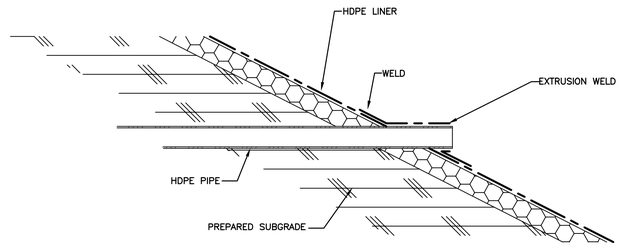
5/7 SINGLE TRENCH PIPING DETAIL
SCALE = 1:20



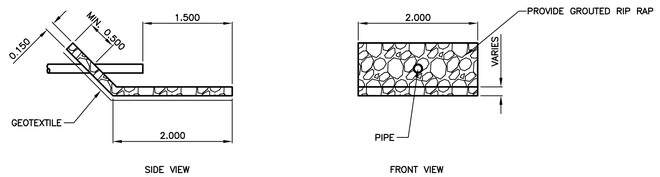
6/7 STEN LOG DETAIL
SCALE = 1:30



7/7 TYPICAL DISCHARGE DITCH DETAIL
SCALE = 1:75

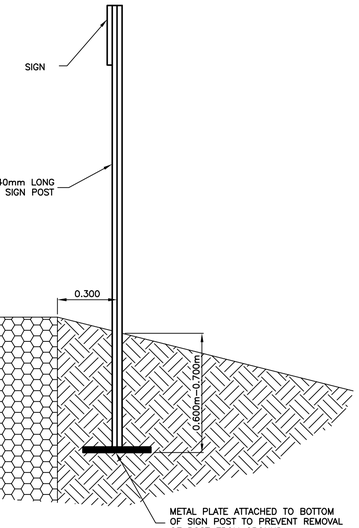


8/7 TYPICAL PIPE BOOT CONNECTION DETAIL
SCALE = 1:30



NOTE:
-RIP RAP MATERIAL SHALL BE WELL GRADED 125mm TO 200mm HARD, DENSE, ROUNDED & DURABLE FIELD STONE.

9/7 RIP RAP DETAIL
SCALE = 1:50



NOTES:
- MINIMUM SIGN SIZE: 300mm X 450mm
- MINIMUM POST LENGTH: 2140mm
- CROSSING MARKERS TO BE SET IN 200mmø X 1.0m CONCRETE AS PER SPECIFICATIONS

10/7 VALVE MARKER DETAIL
SCALE = 1:15

PRELIMINARY
NOT FOR CONSTRUCTION

No.	REVISIONS	DATE	INITIALS
	B.M. EL.		

LOCATIONS OF UNDERGROUND STRUCTURES/UTILITIES AS SHOWN ARE BASED ON AVAILABLE INFORMATION BUT NO GUARANTEE IS GIVEN OR IMPLIED THAT ALL EXISTING UNDERGROUND STRUCTURES/UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL UNDERGROUND STRUCTURES/UTILITIES MUST BE OBTAINED FROM THE APPROPRIATE AUTHORITY/OWNER, BY THE CONTRACTOR, BEFORE PROCEEDING WITH CONSTRUCTION.

ENGINEER'S SEAL
PRELIMINARY

JR Cousin Consultants Ltd.
91A Scurfield Blvd. Winnipeg MB R3Y 1G4
p. (204) 489-0474
f. (204) 489-0487
www.jrcc.ca
ENGINEERING CONSULTANTS
ENGINEERING EXCELLENCE SINCE 1981

CODE:	E-730.02
DESIGNED BY:	OW
DRAWN BY:	RH
REVIEWED BY:	JD
PROJECT:	RM OF ELLICE-ARCHIE MCAULEY LAGOON - EAP
TITLE:	SILT FENCE, VALVE, SINGLE TRENCH PIPING STEN LOG, DITCH, PIPE BOOT CONNECTION, RIP RAP AND VALVE MARKER DETAILS
SCALE:	AS NOTED
DATE:	19/11/28
PLAN:	7
SHEET:	7 of 7

Feb 28, 2020 - 2:54pm K:\2020\730 Ellice-Archie, RM\730.02 McAuley Lagoon Study and EAP\04 Drawings\Dwg\EAP\008 Silt Fence Valve Marker Rip Rap and Ditch Details.dwg