Environment Act Proposal Form

Manitoba

Name of the development:
Boissevain Wastewater Treatment Lagoon Upgrades

Type of development per Classes of Development Regulation (Manitoba Regulation 164/88):
Class 2 - Wastewater Treatment Lagoon

Legal name of the applicant:
Municipality of Boissevain-Morton

Mailing address of the applicant: 420 South Railway Street

Contact Person: Leo Poulin, CAO

City: Boissevain Province: MB Postal Code:

Phone Number: (204) 534-2433 Fax: email: admin@boissevain.ca

Location of the development: SE-23-3-20-WPM

Contact Person: Leo Poulin, CAO

Street Address:

Legal Description: Parcel 1 Plan 390 BLTO BO DIV in SE-23-3-20-WPM

City/Town: Boissevain Province: MB Postal Code:

Phone Number: (204) 534-2433 Fax: email: admin@boissevain.ca

Name of proponent contact person for purposes of the environmental assessment:
Dana Bredin

Phone: (204) 259-1486
Fax:

Mailing address: 1600 Buffalo Place, Winnipeg,MB R3T 6B8

Email address: dana.bredin@wsp.com

Webpage address: wsp.com

Date: 2024-12-20

Signature of proponent, or corporate principal of corporate proponent:
[redacted]

Printed name: Dana Bredin

PRINT RESET

A complete **Environment Act Proposal (EAP)** consists of the following components:

- ☑ **Cover letter**
- ☑ **Environment Act Proposal Form**
- ☑ **Reports/plans supporting the EAP** (see "Information Bulletin - Environment Act Proposal Report Guidelines" for required information)
- ☑ **Application fee** (Cheque, payable to Minister of Finance, for the appropriate fee)

Per Environment Act Fees Regulation (Manitoba Regulation 168/96):

Class 1 Developments	$1,000
Class 2 Developments	$7,500
Class 3 Developments:	
Transportation and Transmission Lines	$10,000
Water Developments	$60,000
Energy and Mining	$120,000

Submit the complete EAP to:
Director
Environmental Approvals Branch
Environment and Climate Change
Box 35, 14 Fultz Boulevard
Winnipeg MB R3Y 0L6
EABDirector@gov.mb.ca

For more information:
Toll-Free: 1-800-282-8069
Phone: 204-945-8321
Fax: 204-945-5229

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$1,000.....C1 B-02
$7,500.....C2 B-02
$10,000....TT B-02
$60,000.....WD B-02
$120,000...EM B-02

THE MANITOBA WATER BOARD SERVICES
REPORT NUMBER: MWSB 23-53

BOISSEVAIN-MORTON WASTEWATER TREATMENT LAGOON

ENVIRONMENT ACT PROPOSAL

DECEMBER 20, 2024 FINAL

BOISSEVAIN-MORTON WASTEWATER TREATMENT LAGOON

ENVIRONMENT ACT PROPOSAL

FINAL REPORT

PROJECT NO.: CA0017817.1877
CLIENT REF:MWSB 23-53
DATE: DECEMBER 20, 2024

WSP
1600 BUFFALO PLACE
WINNIPEG, MB
CANADA R3T 6B8

T: +1 204 477-6650
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WSP.COM

December 20, 2024

Manitoba Environment and Climate Change
Environmental Approvals Branch
Box 35, 14 Fultz Boulevard
Winnipeg, MB R3Y 0L6

Dear Sir/Madam:

Subject: Environment Act Proposal - Community of Boissevain Wastewater Treatment Lagoon
Client ref.: MWSB 23-53

The Municipality of Boissevain-Morton has an existing two-cell wastewater treatment lagoon southwest of the Community of Boissevain, operating under Environment Act Licence No. 3415, dated October 26, 2023. This Licence was granted for the construction of a proposed lagoon development at the existing waste disposal grounds, but it has not been developed due to cost escalations. The rising costs are now beyond the financial bounds of the Municipality, and they have elected to upgrade the existing lagoon site instead, which requires the submission of a new Environment Act Proposal Report. The proposed development includes the construction of one new primary aerated cell, two submerged attached growth reactor (SAGR) cells, a new sewage wastewater lift station, a treated effluent lift station and outfall into Cherry Creek, upgrading and converting the existing secondary cell to a primary aerated cell, and decommissioning of the existing primary cell.

The enclosed Environment Act Proposal Report provides the details and information of the proposed development. It is accompanied by the signed Application Form, a completed Application for Wastewater Treatment Facility Classification and a cheque in the amount of $7,500.00. We request the opportunity to review the draft Environment Act Licence when it is issued. Please contact the undersigned if further information is required.

Yours sincerely,

[redacted]

Dana Bredin, P.Eng., PMP
Project Manager

DB/BL/MW

WSP ref.: CA0017817.1877

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REVISION HISTORY

FIRST ISSUE

November 15, 2024	Draft Submission for Review			
Prepared by	Reviewed by	Approved By		
Brianna Landrie, P.Eng.	Jason Bunn, P.Eng.	Dana Bredin, P.Eng.		
Final Report				
December 20, 2024	Final Submission			
Prepared by	Reviewed by	Approved By		
Brianna Landrie, P.Eng.	Jason Bunn, P.Eng.	Dana Bredin, P.Eng.		

SIGNATURES

PREPARED BY

[redacted]

December 20, 2024

Brianna Landrie, P.Eng.
Project Engineer

Date

REVIEWED BY

[redacted]

December 20, 2024

Jason Bunn, P.Eng.
Senior Engineer

Date

APPROVED[1] BY

[redacted]

ENGINEERS
GEOSCIENTISTS
MANITOBA
Certificate of Authorization
WSP Canada Inc.
[redacted] Date: 12/20/2024

December 20, 2024

Dana Bredin, P.Eng., PMP
Project Manager

Date

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

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CONTRIBUTORS

CLIENT

Chief Administrative Officer	Leo Poulin
Public Works Manager	Doug Harper
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WSP

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Senior Designer	Anastasiia Taranovska
Senior Wastewater Engineer	Jason Bunn, P.Eng.
Senior Conveyance Engineer	Bill Brant, P.Eng., FEC
Project Manager	Dana Bredin, P.Eng., PMP

EXECUTIVE SUMMARY

This Environment Act Proposal (EAP) comes over two years after the previous EAP regarding the expansion of the Boissevain wastewater treatment lagoon (WWTL). The previous EAP was completed by Stantec Consulting Ltd. (Stantec) in April 2021, which led to the issuance of Environment Act Licence (EAL) No. 3415, dated October 26, 2023.

The existing lagoon has historically struggled to meet the CEC Order effluent limits, specifically fecal coliforms and is a continuously discharging facility. As a result, Manitoba Environment and Climate Change (MECC) required a feasibility study to be completed. The study was completed by Stantec and concluded that the lagoon aeration equipment was undersized and identified that the lagoon berms do not meet current liner requirements as they were constructed with sand, gravel, and organics allowing the wastewater to seep into the surrounding lands.

The 2021 EAP detailed the construction of a new WWTL located in SE 11-04-20 WPM. The proposed facility included the construction of two synthetically lined aerated cells, two Submerged Attached Growth Reactor (SAGR) cells, a new sewage wastewater lift station, and a treated effluent lift station and 9 km twin forcemains, to allow for year-round continuous discharge into Cherry Creek.

However, due to the rising costs of constructing the new facility, the RM has selected to upgrade the existing lagoon facility located at SE 23-03-20 WPM. The upgrades to the existing facility include relining and upgrading the existing facultative secondary cell with conversion to an aerated primary cell, the construction of a new primary aerated cell and two SAGR cells, a new operations building, a chemical dosing system, a new outfall into Cherry Creek, and upgrading the sewage wastewater lift station.

This expansion proposes using a 1.0 m (min.) thick clay liner system for the new primary aerated cell and the upgrading of the existing facultative secondary cell. The liner material will be sourced from a borrow area located in NW 14-03-20 WPM. WSP completed a geotechnical investigation on the borrow area and acquired samples for hydraulic conductivity testing. The resulting remoulded hydraulic conductivities were 5.92×10^{-8} cm/s and 4.76×10^{-8} cm/s, which meets the minimum requirements and thus a clay liner was selected.

For the lagoon system, phosphorus reduction will be achieved by slipstream chemical injection, with settling occurring in Primary Cell #2. Ammonia reduction, polishing and disinfection will occur in the SAGR cells.

The lagoon will continuously discharge into Cherry Creek, similar to how it has been discharged for the past 60 years.

Upon approval from MECC and the issuance of an EAL, tendering and construction will begin in Summer 2025. The construction is expected to take two years to complete.

The MWSB has contacted the Environmental Approvals Branch to communicate the project timelines.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 DEVELOPMENT INFORMATION

Municipality of Boissevain-Morton – Boissevain Wastewater Treatment Lagoon Upgrades

Name of development

Municipality of Boissevain-Morton

Legal name of the proponent of the development

SE-23-3-20 WPM

Location of development

Contact Person for Proponent:

Mr. Leo Poulin
CAO
Municipality of Boissevain-Morton
420 South Railway Street
Boissevain, MB R0K 0E0

Contact Person for Environmental Assessment:

Mr. Dana Bredin, P.Eng., PMP
WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB R3T 6B8

Table 1-1: Proposal Contents

SECTION OF ENVIRONMENTAL ACT PROPOSAL FORM		SECTION NUMBER IN REPORT
Description of Development:		
(i)	Legal description and map of development	2.1
(ii)	Mineral rights	2.2
(iii)	External land use	2.3
(iv)	Land use designation	2.3
(v)	Previous studies	2.4
(vi)	Proposed development	5.0
(vii)	Storage of gasoline or associated products	6.3.1
(viii)	Potential impacts	6.0
(ix)	Proposed environmental management	7.0
Schedule:		8.0
Funding:		8.0

1.1 CANADIAN ENVIRONMENTAL ASSESSMENT INFORMATION

Table 1-2: CEAA Proposal Contents

SCREENING REPORT OUTLINE		SECTION NUMBER IN REPORT
1.	Assessment Responsibility - Funding	8.0
2.	Project Description	
	2.1 General	2.0, 4.0, 5.0
	2.2 Project Components	5.2
	2.3 Construction Details	5.2.14
	2.4 Project Scoping	4.0
3.	Description of Environment	
	3.1 Land Uses and Ownership	2.1, 2.2, 2.3
	3.2 Local Soils, Topography, Geology	5.1
	3.3 Hydrology / Hydrogeology	6.3, 6.4
	3.4 Vegetation Communities	6.5
	3.5 Fish, Wildlife, and Habitat	6.5, 6.6, 6.7
	3.6 Endangered or Threatened Species	6.5
	3.7 Historic and Cultural Sites	6.8
4.	Environmental Impacts and Mitigation	
	4.1 Water Quality	6.3
	4.2 Odour	6.1
	4.3 Fisheries	6.3, 6.6
	4.4 Wetland / Wildlife Habitat	6.3
	4.5 Soils and Vegetation	6.2, 6.5
	4.6 Heritage Resources	6.8
	4.7 Navigable Waters	6.3
5.	Cumulative Effects	6.0
6.	Public Involvement	6.10
7.	Follow-Up	7.0
8.	Contacts	1.0
9.	Personal Communication	Appendix H
10.	Attachments	Appendix A,B,C,D,E,F,G,H

2 DESCRIPTION OF DEVELOPMENT

2.1 LEGAL DESCRIPTION AND OWNERSHIP

The existing WWTL and the expansion boundaries are located within the southeast quarter of 23-03-20 WPM. A borrow area located in the northwest quarter of 14-03-20 WPM will be utilized for the construction of the expanded facility, as shown in **Figure 2-1**.

The Municipality of Boissevain-Morton (RM) is the registered owner of the existing lagoon land, as identified in the following Status of Titles:

- 1710726/2, Brandon Land Titles Office (BLTO) [existing facility].
- 16962742/2, BLTO [existing facility].

The Status of Titles are included in **Appendix A**.

The existing lagoon berms encroach on the neighbouring property, and the RM is currently working with the neighbouring landowner to obtain an easement, as shown in **Figure 2-2**. At the time of the submission of the EAP, an easement agreement letter was signed by the neighbouring landowner, and a draft easement plan was completed. The signed letter and draft easement plan are included in **Appendix A**. The easement is currently with legal and is intended to be finalized in the coming months. Following the completion of the easement, the updated easement land title will be submitted to MECC.

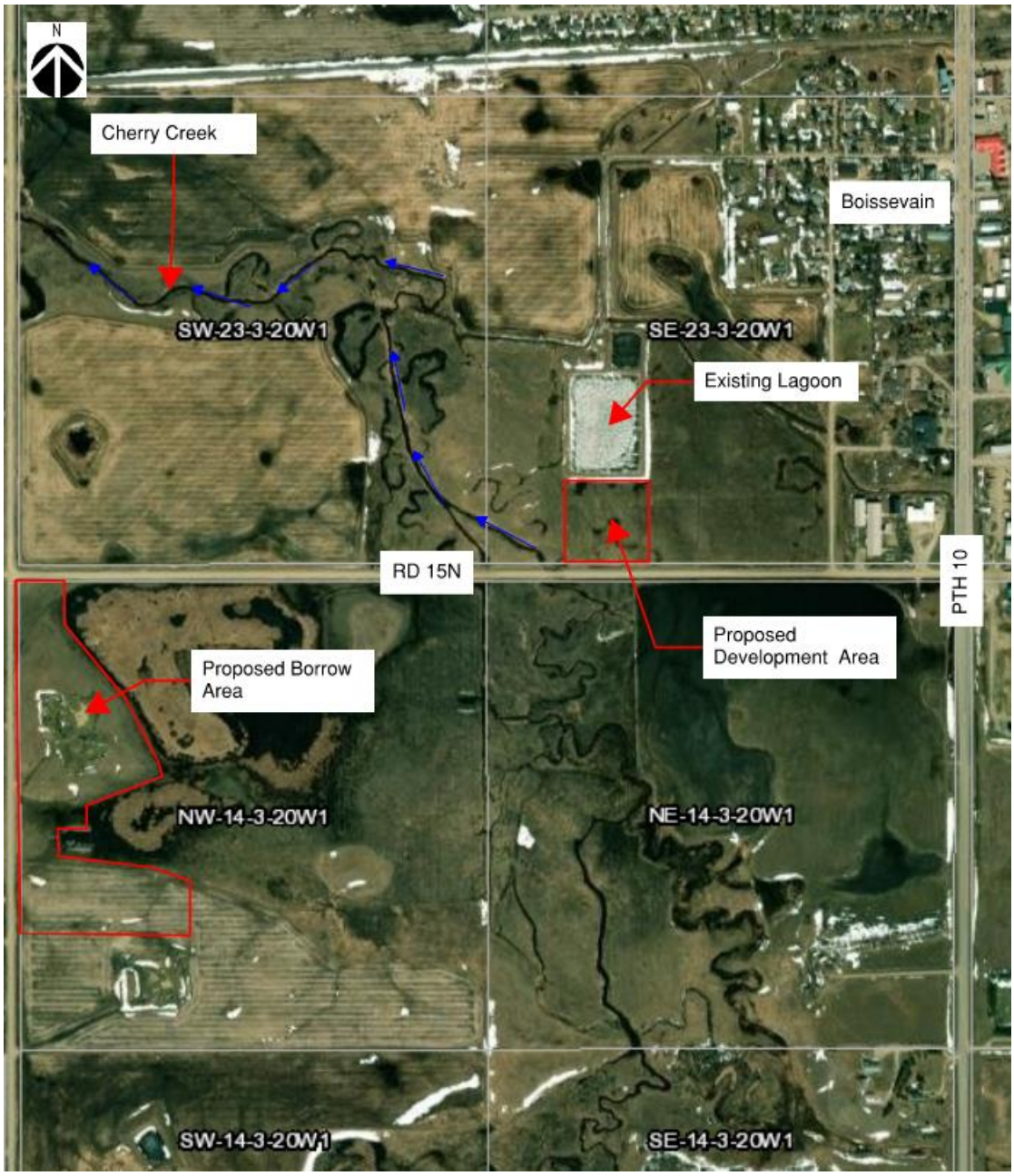

Figure 2-1: Location Map of Existing Lagoon, Proposed Lagoon Development and the Proposed Borrow Area

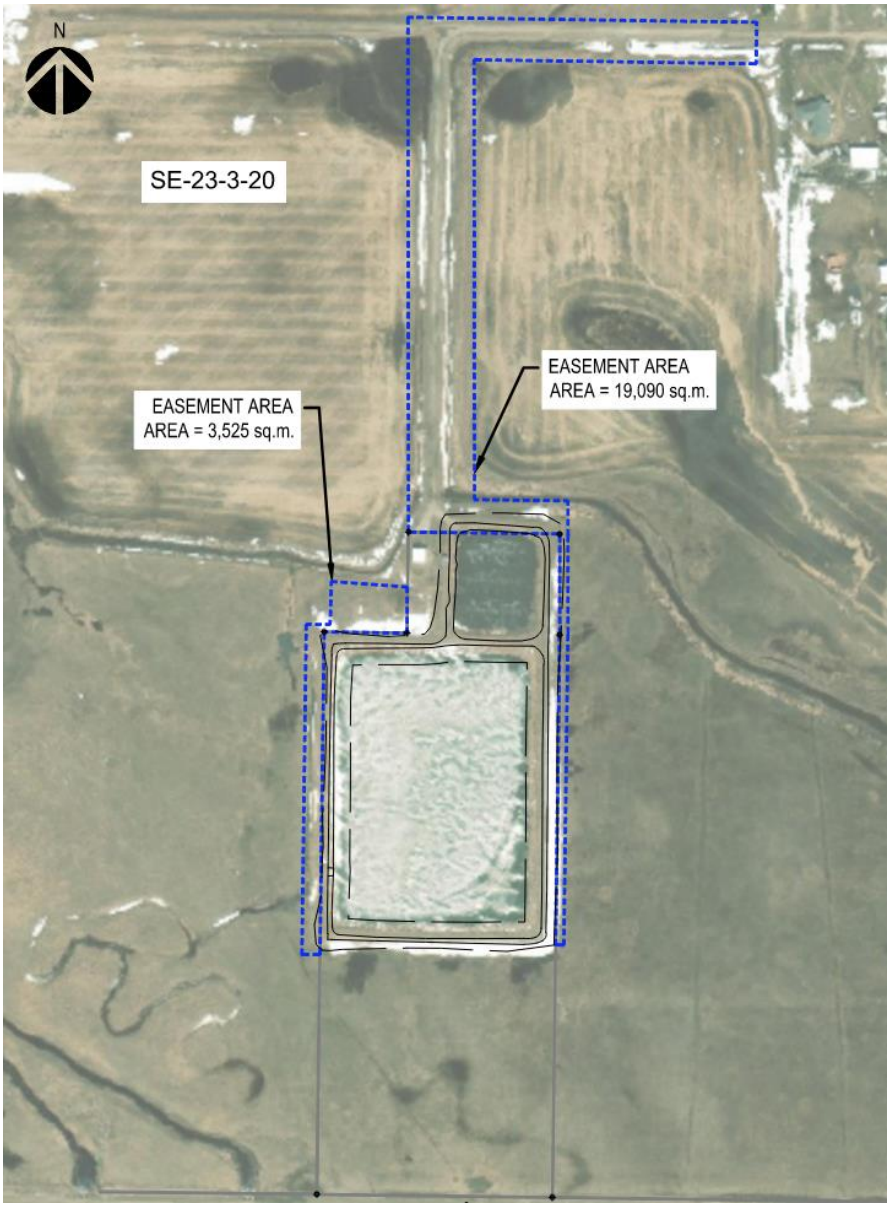

Figure 2-2: Easement Areas

2.2 MINERAL RIGHTS

The Real Estate Services Division of the Manitoba Department of Finance (formerly Crown Lands and Property Agency – Lands Branch) was contacted to provide information on the mines and minerals and sand and gravel ownership of the applicable purchased lands discussed in the previous section. It has been confirmed that the mines, minerals, sand, and gravel for SE 23-03-20 WPM and NW 14-03-20 WPM were transferred by the Dominion of Canada in 1889 and 1891, respectively, and they lie with the current surface ownership. Correspondence is included in **Appendix H**.

2.3 DESCRIPTION OF EXISTING LAND USE

The Municipality of Boissevain-Morton Zoning By-Law No. 2019-03 indicates that the land intended for the lagoon development (SE 23-03-20 WPM) and borrow area (NW 14-03-20 WPM) are zoned as AG – Agriculture Zone.

2.4 PREVIOUS STUDIES

2024 **"Boissevain-Morton Wastewater Treatment Lagoon – Geotechnical Report" prepared by WSP for the Municipality of Boissevain-Morton**

This report provides a detailed geotechnical investigation of the proposed development site and borrow areas. The work was conducted by WSP in August 2024. The investigation included test hole drilling, sample collection and laboratory testing. The report concluded that based on soil conditions the proposed expansion should be constructed with a clay surface liner, utilizing the material located at the borrow area, located to the southwest of the existing lagoon.

2024 **"Boissevain-Morton Wastewater Treatment Lagoon Design - Design Basis" prepared by WSP for the Municipality of Boissevain-Morton**

This report updates the 2021 Pre-Design Report design, based on updated population and flow data.

2021 **"Application for an Environment Act Licence for an Aerated Lagoon with Post Lagoon Nitrification Wastewater Treatment System for the Community of Boissevain" prepared by Stantec for the Municipality of Boissevain-Morton**

This EAP details the proposed wastewater treatment facility located at the Municipality owned waste disposal grounds, the environmental impacts of the proposed development, and operations and maintenance procedures of the development. This EAP led to the issuance of EAL No. 3415.

2021 **"Municipality of Boissevain-Morton Proposed Aerated Lagoon with Post Lagoon Nitrification Pre-Design Report" prepared by Stantec for the Municipality of Boissevain-Morton**

This report details the proposed wastewater treatment lagoon facility located at the Municipality owned waste disposal grounds. The proposed facility includes an aerated lagoon followed by post nitrification using SAGR cells and UV disinfection, chemical dosing for phosphorus reduction, a new raw water lift station, a treated effluent lift station, 9 km twin forcemains, a new outfall into Cherry Creek. The facility will continuously discharge into Cherry Creek.

2019 **"Boissevain Wastewater Lagoon Study" prepared by Stantec for the Municipality of Boissevain-Morton**

This report details three potential wastewater systems that were assessed to replace the existing system including a facultative lagoon system, aerated lagoon with post lagoon nitrification, and extended aeration mechanical wastewater treatment plant. The study recommends proceeding with the aerated lagoon with post lagoon nitrification.

2018 **“Boissevain Wastewater Lagoon Study and EAP Technical Memorandum #1” prepared by Stantec for the Municipality of Boissevain-Morton**

This report provides a summary of preliminary field assessments and data collection including lift station drawdown testing, geotechnical drilling, laboratory testing of soils and effluent samples.

3 EXISTING WASTEWATER TREATMENT LAGOON

3.1 DESCRIPTION

The Community of Boissevain currently operates a two-cell aerated WWTL that was constructed approximately 60 years ago southwest of the Community within the southeast quarter of Section 23-3-20 WPM. The lagoon consists of an aerated primary cell and a facultative secondary cell, and the treated effluent is continuously discharged into Cherry Creek. The existing licence directing lagoon operation is EAL No. 3415, dated October 26, 2023, which is included in **Appendix B**.

The existing lagoon has historically struggled to meet the EAL effluent limits, specifically fecal coliforms. As a result, MECC required a feasibility study to be completed. The study was completed by Stantec and concluded that the lagoon aeration equipment was undersized and identified issues with the lagoon berms. The berms were constructed with sand, gravel and organics and do not meet current liner requirements allowing the wastewater to seep into the surrounding lands.

The lagoon continuously discharges into Cherry Creek which flows into a wetland area on the east side of Whitewater Lake. The lagoon specifications for the existing primary and secondary cells are summarized in **Table 3-1** below based on the topographic survey.

Table 3-1: Existing Boissevain Wastewater Treatment Lagoon Specifications

Parameter	Primary Cell	Secondary Cell
Cell Floor Dimensions	34.0 m x 24.0 m	106.0 m x 155.0 m
Operating Depth	3.0 m	1.5 m
Cell Depth	4.0 m	2.5 m
Cell Floor Elevation	±506.9 m	±507.4 m
Top of Berm Elevation	±510.9 m	±509.9 m

The existing WWTL has never had any biosolids removed from the existing cells. Stantec completed a biosolids depth survey on October 10, 2018. The estimated biosolid depths and volumes based on the survey are presented in **Table 3-2**.

Table 3-2: Boissevain Lagoon Biosolids Volume - based on 2018 Survey

Cell	Depth	Volume
Primary	1.7 m	5,600 m^3
Secondary	0.4 m	8,600 m^3
Total		14,200 m^3

3.2 EXISTING CAPACITY

Minimal information and records exist regarding the existing wastewater treatment lagoon.

3.2.1 TREATMENT CAPACITY

The existing primary cell is an aerated system, the organic treatment capacity of the existing system is unknown.

3.2.2 STORAGE CAPACITY

Since the lagoon is a continuous discharge facility, the storage capacity is essentially the hydraulic retention time for each cell. The existing primary cell has an operating depth of 3.0 m and a total volume of 4,644 m^3, whereas the secondary cell has an operating depth of 1.5 m and a total volume of 21,360 m^3. The primary and secondary cells have a hydraulic retention time of 5.3 and 24.2 days, respectively.

3.3 EXISTING DISCHARGE ROUTE

The existing facility discharges continuously into a constructed ditch approximately 440 m in length that flows into Cherry Creek for approximately 8.7 km before reaching a natural wetland ahead of Whitewater Lake. The existing discharge route is presented in **Figure 3-1**. The existing lagoon facility is located in the Whitewater Lake Watershed, the watershed map is included in **Appendix C**.

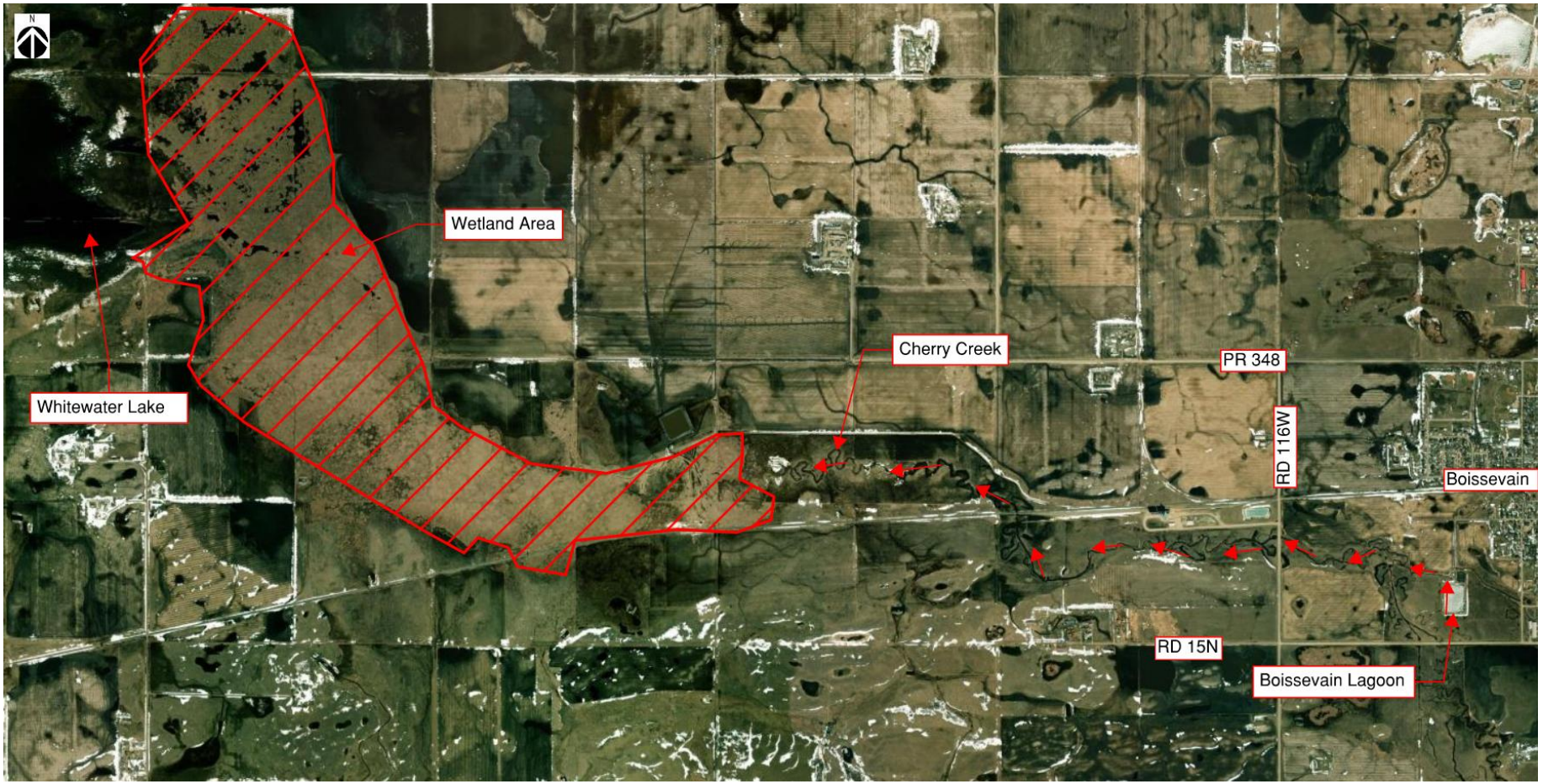

Figure 3-1: Existing Discharge Route

3.4 OPERATIONAL PLAN

The existing licence (EAL No. 3415) recognizes the treated effluent limits for a new facility. However, the existing facility has been in operation for over 60 years and struggles to meet modern EAL discharge limits. The existing licence is restrictive in terms of the limits proposed for this facility and the reality is that the facility cannot meet these limits until the new facility is fully commissioned.

As approved by the Environmental Compliance and Enforcement Branch, the RM has implemented an operational plan to monitor the quality of the lagoon effluent to determine if the discharge route effectively reduces the fecal coliforms and total phosphorus levels to below the discharge limits. Details of the operation plan and results are discussed in the following sections.

3.4.1 EFFLUENT MONITORING

Currently, the RM samples the treated effluent discharged from the existing facility every two weeks. The effluent is tested for $CBOD_5$, fecal coliform, total suspended solids, and total phosphorus. The wastewater samples are collected from the end-of-discharge pipe and are submitted to an accredited laboratory for analysis. The effluent monitoring results are presented in **Table 3-3**. The results show that the existing facility struggles to meet all effluent limits imposed by the new EAL.

Table 3-3: Existing Boissevain Wastewater Treatment Lagoon Effluent Monitoring Results

Date	TSS (mg/L)	TP (mg/L)	Fecal Coliform (CFU /100 mL)	CBOD (mg/L)
EAL Limit	25	1.0	200	25
March 25, 2024	24.0	5.70	>2,420	30.4
April 10, 2024	29.0	5.24	>2,420	33.4
April 24, 2024	32.1	4.96	20	19.4
May 22, 2024	47.5	3.99	310	18.5
June 6, 2024	58.5	3.12	1,730	36.3
June 18, 2024	73.0	3.21	>2,420	46.5* (BOD)
July 2, 2024	38.7	3.72	>2,420	17.2
July 16, 2024	106	3.51	>2,420	24.9
July 30, 2024	34.4	3.02	770	15.2
August 13, 2024	34.6	5.34	230	2.00
August 27, 2024	86.9	4.83	689	25.3
September 10, 2024	66.8	5.49	1,990	22.6
September 24, 2024	49.7	5.83	>2,420	16.8
October 8, 2024	86.4	6.10	>2,420	29.1
October 22, 2024	51.0	6.21	687	17.1

3.4.2 DISCHARGE ROUTE MONITORING

The RM also samples at two locations along the discharge route to determine if the current discharge route effectively reduces the fecal coliforms and the total phosphorus within the effluent to below the discharge limits. The sampling locations and results are illustrated in **Figure 3-2** and **Table 3-4**.

Figure 3-2: Discharge Route Sampling Locations

Table 3-4: Existing Boissevain Wastewater Treatment Lagoon Discharge Route Monitoring Results

Date	Sampling Location	TP (mg/L)	Fecal Coliform (CFU /100 mL)
EAL limit		1.0	200
May 6, 2024	Lagoon	5.00	980
	Creek Crossing	0.242	131
	Viterra	0.443	326
June 6, 2024	Lagoon	3.12	173
	Creek Crossing	0.528	160
	Viterra	0.504	150
July 2, 2024	Lagoon	3.72	>2,420
	Creek Crossing	0.546	770
	Viterra	0.597	687
July 30, 2024	Lagoon	3.02	770
	Creek Crossing	1.78	1,730
	Viterra	2.62	34
August 27, 2024	Lagoon	4.83	689
	Creek Crossing*	3.84	238
	Viterra	5.35	1,010
September 24, 2024	Lagoon	5.83	>2,420
	Creek Crossing	5.24	770
	Viterra	3.21	649
October 22, 2024	Lagoon	6.21	687
	Creek Crossing	4.56	1730
	Viterra	4.00	236

*Creek crossing was dry and not flowing, sample taken from stagnant water

The results indicate that for the period from May into early July, the discharge route does function to lower the total phosphorus and fecal coliforms in the treated effluent, however, as the summer continues the

results regularly exceed the EAL limits. Three possible explanations for the exceedance are dilution in the spring and early summer due to higher flows, the influence of the surrounding agricultural lands, or a reduced uptake of phosphorus in the latter part of summer by the riparian vegetation. When the samples were collected on August 27, 2024, a representative from the RM reported that Cherry Creek was dry at the creek crossing location. This circumstance suggests that the lagoon effluent may be exfiltrating into the creek bed.

4 POPULATION SERVICED AND DESIGN LOADINGS

4.1 SOURCES OF WASTEWATER

The Boissevain wastewater treatment lagoon services the following areas:

- The Community of Boissevain
- Rural residents in the RM of Boissevain-Morton surrounding the Community (holding tanks)

The year 2048 was selected as the ultimate design year, and it is expected the upgraded lagoon will be fully commissioned in 2026.

4.2 POPULATION

Based on the available data, the Community of Boissevain population has fluctuated over the past 17 years. Since the 2021 Census was released, the Community has opened a 35-unit assisted living facility and has developed 10 additional residential lots. Recently, the RM has been working with a group that is looking to build additional housing and attract industry. As a result, a design population of 2,000 has been selected by the RM, which results in an annual growth rate of 0.8% over the design period. The historical and proposed population projection is summarised in **Table 4-1.**

Table 4-1: Community of Boissevain Census Population Data and Projection

Year	Population	Percent Change (%)	Annual Growth Rate (%)
2006	1,497	-	-
2011	1,572	5.0	1.0
2016	1,656	5.3	1.1
2021	1,567	-5.4	-1.1
2022[1]	1,611	2.8	2.8
2023[1]	1,656	2.8	2.8
2048 (projected)	2,000	20.7	0.8

[1] Population data provided by the RM

4.3 ORGANIC LOADING

Detailed organic loading calculations are presented in **Appendix D**.

4.3.1 GRAVITY SEWER

Per capita loadings based on piped domestic sewage literature values by Metcalf and Eddy (Table 3-16, 2014) were applied to the design population of 2,000 people to determine the organic loading from the wastewater received from the community's gravity sewer system. The design organic loading and per capita loading are presented in **Table 4-2.**

Table 4-2: Literature Per Capita Wastewater Loadings (Metcalf and Eddy) and the Calculated Design Loading from the Community of Boissevain's Gravity Sewer System

Parameter	Per capita loading (kg/person/day)	Design Loading (kg/d)
BOD_5	0.077	154.0
TSS	0.074	148.0
TKN	0.013	26.0
NH_3-N	0.0077	15.4
TP	0.0021	4.2

4.3.2 TRUCK HAUL

WSP was provided with truck haul records for the Boissevain wastewater treatment lagoon from 2018 to 2023. The truck haul data was analysed to determine the peak day loading to the lagoon. Southwest Vac is the sole septic truck company in the area that hauls to the Boissevain Lagoon. The Community and Southwest Vac confirmed all wastewater hauled to the lagoon is from holding tanks. The truck haul data was analysed to determine a peak day loading to the lagoon. During the review of truck haul data, it was observed that sewage is hauled to the lagoon a few times a month, as a result, a peak day truck haul volume was selected rather than the average peak month volume. The resulting peak day truck haul volume is 57 m^3/d, which equates to 10 loads in one day. To account for growth in the Municipality an annual growth rate of 0.3% was applied to the truck haul, therefore, a design truck haul volume of 62 m^3/d was selected.

The holding tank wastewater was characterized as high-strength domestic wastewater. The concentrations are based on literature values for high-strength untreated domestic wastewater by Metcalf and Eddy (Table 3-18, 2014). The design organic loading and concentrations for holding tank wastewater are presented in **Table 4-3**.

Table 4-3: Literature Concentrations of Various Wastewater Parameters (Metcalf and Eddy) and a Calculation of the Design Loading from Holding Tank Wastewater

Parameter	Concentration (mg/L)	Design Loading (kg/d)
BOD_5	400	24.8
TSS	389	24.1
TKN	69	4.3
NH_3-N	41	2.5
TP	11	0.68

4.3.3 SUMMARY

The projected organic loading was determined based on the design population of 2,000 and literature organic loading values. The organic loading summary is presented in **Table 4-4**, the detailed calculations are presented in Section 2.5 of **Appendix D**.

Table 4-4: Summary of the Calculated Loading Parameters for the Projected 2048 Population of Boissevain and Rural Areas

Source	BOD_5 (kg/d)	TSS (kg/d)	TKN (kg/d)	NH_3-N (kg/d)	TP (kg/d)
Gravity Sewer	154.0	148.0	26.0	15.4	4.2
Holding Tank	24.8	24.1	4.3	2.5	0.7
Total	178.8	172.1	30.3	17.9	4.9

4.4 HYDRAULIC LOADING

WSP completed a lift station drawdown test to determine the pumping rates of the existing duplex system. The lift station building also includes an overflow manhole outfitted with a standby pump which is utilised when the inflow exceeds the capacity of the lift station. With the known pumping rates and historical pump hour data, the annual wastewater volumes generated by the community were then calculated. From a review of the annual average wastewater generation rates from 2018-2023, these rates vary from 242 litres per capita per day (L/c/d) to 531 L/c/d. As a conservative approach, 531 L/c/d was selected as the design wastewater generation rate, which equates to 957 m^3/d for a projected population of 2,000 people. The selected design wastewater generation rate can be further broken down into a domestic wastewater generation rate component of 261 L/c/d and an inflow and infiltration rate component of 270 L/c/d.

The calculated theoretical flows were compared to the observed flow conditions. The maximum day average flow was consistent for both the theoretical and observed flow. However, for all situations, the observed conditions exceeded the theoretical values. To be conservative the observed flow values will be used for the design of the lagoon and lift station.

The hydraulic loading summary is presented in **Table 4-5**, the detailed calculations are presented in Section 2.4 of **Appendix D**.

Table 4-5: Summary of the Hydraulic Loading for the Projected 2048 Population of Boissevain

Parameter	Flow
Lagoon	
Average Day Flow	1,064 m^3/d
Max Month Flow	2,295 m^3/d

5 PROPOSED DEVELOPMENT

The proposed development consists of:

- Upgraded sewage wastewater lift station at the lagoon site;
- New septic truck dump station and turnaround area;
- One (1) new aerated primary cell with a 2.0 m liquid operating depth;
- Conversion and relining of the existing facultative secondary cell to an aerated primary cell with a 2.0 m liquid operating depth;
- Two (2) SAGR cells;
- Chemical dosing system for the reduction of phosphorus;
- Operations building (to house the blowers and chemical dosing system);
- Disinfection;
- Effluent flow monitoring;
- Treated effluent pump station and outfall to Cherry Creek;
- Biosolids removal and land application from the existing primary and secondary cells;
- Decommissioning of the existing primary cell; and
- Fencing and signage.

The EAP design drawings are appended (**Appendix E**). The expansion work is to be completed while the facility remains in operation.

5.1 GEOTECHNICAL INVESTIGATION

From May 6-8, 2024, WSP supervised the drilling of eight (8) test holes for the lift station and existing lagoon sites. Test holes TH24-01 and TH24-02 pertain to the lift station and were advanced to 12.6 m below existing grade (a companion test hole, TH24-01A, was advanced to 7.6 m below existing grade immediately adjacent to TH24-01 to permit installation of a standpipe piezometer in the vicinity of the lift station). Whereas test holes TH24-03 to TH24-08 pertain to the lagoon expansion area and were advanced to approximately 6.1 m below existing grade.

On August 1-2, 2024, WSP also supervised the drilling of seven (7) test holes for each of two potential clay borrow area sites located within NW13-3-20W and NW14-3-20W, for a total of fourteen (14) test holes. All borrow test holes were advanced to 4.6 m below the existing grade.

The test holes were drilled using track-mounted drill rigs (Acker MP5, Mobile B57, and Mobile B48) equipped with 125 mm solid stem augers and 200 mm hollow stem augers, operated by Paddock Drilling Ltd. of Brandon, Manitoba. During drilling, WSP field personnel visually classified the soil stratigraphy within the test holes in accordance with the Modified Unified Soil Classification System (MUSCS); and recorded observed seepage and sloughing conditions. Soil sampling consisted of grab samples of the auger cuttings in all test holes, split spoon samples obtained in combination with Standard Penetration Tests (SPTs) in cohesionless or till soils (except borrow area test holes) and relatively undisturbed Shelby Tube samples of the clay and clay till obtained at select depths in lift station, lagoon expansion area and borrow area test holes.

The in-situ relative consistency of cohesive soil was evaluated during drilling using a pocket penetrometer. SPTs were conducted in cohesionless soils to characterize the density of till deposits (except borrow area test holes).

Two standpipe piezometers were installed for the lift station site, one was placed within the top sand layer in test hole TH24-02 to a depth of 3 m and another within the clay till at a depth of 7.3 m. One standpipe piezometer was also installed within a sand layer at 4.5 m in test hole TH24-03 for the lagoon site.

Upon completion of drilling, the depths of seepage and sloughing zones as well as depths to accumulated slough and groundwater level were measured before backfilling.

The complete Geotechnical Report is included in **Appendix F**.

5.1.1 SOIL CONDITIONS

Consistent with the regional soil deposits, the stratigraphy across the lagoon and borrow area sites at the test holes consisted of the following, in descending order from grade level:

- Sand Fill
- Organic Clay
- Clay
- Silt
- Sand
- Clay Till

A brief description of each of the soil layers listed above is presented in the following sub-sections.

5.1.1.1 *EXISTING LAGOON SITE*

ORGANIC CLAY

Organic clay was encountered at the ground surface in test holes TH24-05 and TH24-06 and was 0.2 m to 0.6m thick. The organic clay was silty, medium plastic, moist, stiff, dark brown, and contained occasional grass roots and rootlets. Moisture contents in the organic clay was about 50%.

CLAY

Clay was encountered from the surface in test hole TH24-03, and below the organic clay in test holes TH24-05 and TH24-06 extending to depths ranging from 1.2m to 2.1m. The clay contained silt amounts ranging from silty to and silt, had trace sand and was medium plastic, moist, firm to stiff, and dark brown to grey. Clay in test hole TH24-03 contained occasional roots. The moisture content for the clay ranged from 25% to 39%.

SILT

Silt was encountered at the surface in test holes TH24-04, TH24-07, TH24-08, below the clay layer in test holes TH24-03, TH24-05, and again below the sand layer in test hole TH24-03, extending to depths ranging from 1.5m to 5.5m. The silt contained clay amounts ranging from clayey to trace clay, had trace sand to some sand, and was low plastic, soft to stiff, and brown to dark grey. The moisture content for the silt ranged from 11% to 40% depending on clay content.

SAND

Sand was encountered below the clay layer in test holes TH24-06 and below the silt layer in test holes TH24-03 to TH24-05, TH24-07 and TH24-08 extending to depths ranging from 3.7 m to 6.4 m. The sand contained gravel amounts ranging from gravelly to no gravel, and had some silt to no silt, and trace to no clay, and was poorly graded, fine to coarse grain, very moist to wet, loose to compact, and brown to grey. Standard penetration test (SPT) ‘N’ values ranged from 4 to 24. The moisture content for the sand ranged from 14% to 23%.

CLAY TILL

Clay till was present below the sand layer in test holes TH24-04 to TH24-08 and below the silt layer in test hole TH24-03 extending to depths explored ranging from 6.1m to 6.7m. The clay till was described as silty, generally contained trace sand and trace gravel, and was low plastic, moist, firm to very stiff, and dark grey. Standard penetration test (SPT) was conducted in test holes TH24-03 to TH24-07 where the SPT 'N' values ranged from 7 to 26. Moisture contents in the clay till layer ranged from 8% to 19%.

5.1.1.2 *BORROW AREA*

SAND FILL

Sand fill was present at the ground surface in test hole TH24-10 and was 1.2m thick. The sand fill contained some gravel, and was fine grained, inferred as loose, and brown.

ORGANIC CLAY

Organic clay was encountered at the ground surface in test holes TH24-09, TH24-12, TH24-13, and TH24-15 and was 0.2 m to 0.4m thick. The organic clay contained silt amounts ranging from silty to and silt, trace sand, and trace gravel, and was medium plastic, damp moist, firm to very stiff, dark brown, and contained occasional grass roots and rootlets.

ORGANIC SILT

Organic silt was encountered at the ground surface in test holes TH24-16 and was 0.5 m thick. The organic silt contained some clay, and was medium plastic, moist, firm, and dark brown.

CLAY

Clay was encountered from surface in test hole TH24-11, and below the sand fill in test hole TH24-10, below the organic clay in test holes TH24-09, TH24-12, TH24-13, and TH24-15 extending to depths ranging from 1.5 m to 4.6 m (at the termination depths). The clay contained silt amounts ranging from silty to and silt, and trace sand. Moisture content of the clay ranged from 16% to 29% increasing with depth.

The hydraulic conductivity was performed on remolded specimens compacted to 95% Standard Proctor Maximum Dry Density (SPMDD). The resulting hydraulic conductivities were $5.92x10^{-8}$ cm/s and $4.76x10^{-8}$ cm/s.

It is noted that the moisture contents (MC) of the clay are on the wet side of the optimum moisture contents (OMC). Accordingly, the clay will require moisture conditioning to bring the MC to approximately the OMC for the compaction.

The conductivity values are considered representative of the low plastic clay that is likely dominant within this site.

SILT

Silt was encountered below a sand layer in test holes TH24-09, below the clay layer in test holes TH24-13 and TH24-15, and below the organic silt layer in test hole TH24-16, extending to depths ranging from 2.6 m to 4.6 m (termination depth). The silt contained clay amounts ranging from clayey to some clay, and was low to medium plastic, soft to stiff, and brown to light grey.

SAND

Sand was encountered below the clay layer in test hole TH24-09 and TH24-11, and below the silt layer in test hole TH24-16, extending to depths ranging from 3.3 m to 3.8 m. The sand contained trace gravel, and trace silt, and was poorly graded, fine grained, very moist to wet, inferred as loose, and brown.

CLAY TILL

Clay till was present below the sand layer in test holes TH24-11 and TH24-16, below the silt layer in test holes TH24-13 and TH24-15, extending to the termination depth of 4.6 m. The clay till was described as silty, generally contained trace sand and trace gravel, and was medium plastic, moist, very stiff to hard, and brown to grey.

5.1.2 GROUNDWATER

Seepage and sloughing conditions were observed during our geotechnical investigations. At the existing lagoon site, the groundwater ranged from 0.3 metres below grade (mbg) to 1.5 mbg upon completion of drilling. One standpipe piezometer was installed in the lagoon expansion area and two standpipe piezometers were installed around the existing lift station during the geotechnical investigation in May. The groundwater levels in the standpipes were measured on August 28, 2024, they ranged from dry to 2.53 mbg at the existing lift station, and 1.68 mbg at the existing lagoon site. However, groundwater levels are prone to fluctuations and may be affected by seasonal fluctuations, recent rainfall, surface drainage, and infiltration, etc.

A review of the Groundwater Pollution Hazard Map – Virden Area shows the proposed development area is located inside a groundwater pollution hazard area.

5.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The following sections describe the construction and modifications proposed for the development.

5.2.1 SEWAGE LIFT STATION

The existing lift station will be upgraded with a slip-in lift station barrel, and the existing operations building that houses the lift station (and the existing aeration blower) will be demolished. The lift station pumps will be sized to accommodate a peak hour flow of 64 L/s. A new forcemain will be constructed from the lift station to the proposed Aerated Cell #1. The forcemain will be approximately 390 m in length with a diameter of 250 mm. As part of the upgrades, the existing panel will be upgraded, and a new standby generator will be installed.

5.2.2 PRIMARY CELL #1

A new aeration cell will be constructed as illustrated in the EAP design drawings, south of the existing secondary cell. The new primary cell is designed with a 1.0 m (min.) thick surface clay liner based on the geotechnical findings. The clay material will be sourced from a borrow area located in NW 14-3-20 WPM.

A fine bubble, partial mix aeration system will be installed to provide the necessary aeration to the proposed cell. Construction involves the installation of a header pipe from the new operations building to the new cell that will connect with floating laterals and suspended membrane diffusers.

The cell will be constructed with 4:1 interior and exterior side slopes and will have a normal liquid operating depth of 2.0 m with a minimum of 1.0 m freeboard. The interior berms will be armoured with rip rap to prevent erosion for a 4.0 m length centred around the normal operating level. The cell design parameters are presented in **Table 5-1**.

A concrete truck dump structure will be installed at the cell's inlet, and a new truck turnaround and access road will also be constructed.

Table 5-1: New Aerated Primary Cell #1 Design Parameters

Parameter	Aerated Primary Cell #1
Cell Bottom Dimensions	39.0 m x 100.0 m
Cell Bottom Area	3,900 m^2
Operating Depth	2.0 m
Freeboard Height	1.0 m
Interior Side Slope	4:1
Exterior Side Slope	4:1
Total Volume	10,074 m^3
Liner System	Clay Surface Liner

5.2.3 PRIMARY CELL #2

The existing facultative secondary cell will be converted into an aerated primary cell. As part of the rehabilitation of this cell, a new 1.0 m (min.) thick clay surface liner will be constructed. The clay liner will be constructed using clay material sourced from a borrow area located in NW 14-3-20W. The cell floor will be excavated 1.0 m and replaced with impervious clay. The existing lagoon berms will be raised by 0.5 m, allowing the cell to have an operating depth of 2.0 m. The berms will be raised and lined with 1.0 m (min.) thick clay liner. The cell design parameters are presented in **Table 5-2**.

A fine bubble, partial mix aeration system will be installed to provide the necessary aeration to Primary Cell #2. Construction involves the installation of a header pipe from the new blower building to the new cell that will connect with floating laterals and suspended membrane diffusers.

Table 5-2: Converted Aerated Primary Cell #2 Design Parameters

Parameter	Converted Aerated Primary Cell #2
Cell Bottom Dimensions	91.0 m x 147.51 m
Cell Bottom Area	13,423 m^2
Operating Depth	2.0 m
Freeboard Height	1.0 m
Interior Side Slope	4:1
Exterior Side Slope	4:1
Total Volume	30,829 m^3
Liner System	Clay Surface Liner

5.2.4 AERATION SYSTEM

The existing aeration equipment including blower, laterals, and diffusers will be removed and disposed of. A new aeration system will be installed in the newly constructed Primary Cell #1 and the converted Primary Cell #2. One new 40 hp blower will be installed to provide a design airflow of 814 SCFM, which will be designated to the aeration system. The facility will have three blowers in total, with the remaining two blowers dedicated to the SAGR system.

The new lateral piping will be connected to a new header and each lateral will have a valve for ease of operation and maintenance. The laterals will float on the surface of the water and will be secured with a stainless-steel cable system anchored to the lagoon berms. All lateral piping will be thermally fused HDPE.

Submerged fine bubble diffusers will be used to provide oxygen to the wastewater. The diffusers consist of an air distribution body with individual tubular EPDM membranes extending outwards in a horizontal plane. The diffusers will be suspended with a marine-grade rope directly under the lateral at a uniform depth. Each diffuser will be attached to a small concrete weight, encased in an HDPE pipe.

5.2.5 CONSTRUCTION OF TWO SAGR CELLS

The SAGR process is designed to provide nitrification in cold climates which will allow a lagoon-based treatment facility to continuously discharge to the environment. Each SAGR consists of a clean gravel bed with aeration piping installed through the floor of the cell. Wastewater is distributed evenly across the width of the cells.

Two SAGR cells will be constructed to the east of the proposed Primary Cell #1. Piping to each SAGR cell will have individual valves, to allow either cell to be isolated for ease of maintenance. The SAGR cells will operate in parallel and have a liquid operating level of 2.44 m. A layer of mulch covers the gravel bed for insulation and wood-framed support walls with a 60-mil HDPE liner and non-woven geotextile wraps the interior walls and floor of the SAGR cells providing full containment. The air supply in the SAGR system will be provided by two 60 hp positive displacement blowers with one duty and one standby. The blowers will be housed in the operations building. The SAGR design parameters are presented in **Table 5-3**.

Table 5-3: Proposed SAGR Cell Design Parameters for the Boissevain Lagoon Expansion

Parameter	SAGR Cells
Dimensions	48.5 m x 12.50 m
Water Depth	2.44 m

5.2.6 PHOSPHORUS REDUCTION

As part of the upgrades, a chemical injection system is proposed. A new operations building will be sized to house chemical storage and be situated in a location that satisfies the aeration needs and is in close vicinity to the dosing location. To effectively dose and mix the liquid aluminium sulphate (alum) into the wastewater, a small portion of the wastewater is drawn from the weir manhole located between the two aeration cells and it is pumped into the operations building. A controlled and paced dose of alum is introduced into this wastewater stream and is then sent through a static mixer for rapid mixing. The alum-dosed wastewater is then sent back to the weir manhole before entering Primary Cell #2. The aeration within this cell will provide slow mixing necessary for flocculation and settling.

5.2.7 DISINFECTION

Disinfection is a requirement for continuously discharging facilities. While ultraviolet (UV) disinfection is an option for implementation in the treatment process, it is known and accepted that the SAGR cells also provide a suitable amount of disinfection in their treatment of wastewater. According to Nexom, the data that they have acquired from their SAGR installation sites show a proven record of disinfection, however, there have been instances where a disinfection limit was not met. The Boissevain lagoon expansion project will rely on the disinfection provided by the SAGR cells, but provision will be made to incorporate a UV system if required. If necessary, a WEDECO LBX 90 pressurized UV unit will be installed.

5.2.8 EFFLUENT MONITORING

It is expected that the new EAL will require an effluent monitoring station before discharging to Cherry Creek. The monitoring station will be located within the operations building and will include a composite sampler and a flowmeter.

5.2.9 OPERATIONS BUILDING

The operations building will be constructed near the SAGR cells to house the aeration and SAGR blowers, chemical feed system, chemical and water storage tank, flowmeter, composite sampler, provision for UV disinfection equipment, and the treated effluent pump station. The building footprint will be approximately 10 m x 20 m and it will be heated in the winter months to maintain a suitable temperature for the liquid alum dosing and composite sampling.

5.2.10 TREATED EFFLUENT PUMP STATION AND OUTFALL

Once the treated effluent is discharged from the SAGR cells it flows by gravity into a discharge lift station which also functions as a level control structure to maintain the water level within the SAGR cells. The duplex pump station discharges the treated effluent into Cherry Creek. The effluent will be pumped via forcemain to the proposed outfall location. The pump station will be designed for a flow of 42 L/s. The effluent will be dispersed in the creek via a new outfall structure to prevent erosion.

5.2.11 BIOSOLIDS REMOVAL

The converted Primary Cell #2 and the decommissioned primary cell will have the accumulated biosolids removed and land applied to the surrounding agricultural fields. The identification of the receiving agricultural land, agreements with the agricultural producers and sampling will be completed in a separate report and submitted to MECC. Sampling will be conducted on the biosolids and on the receiving land to determine the maximum application rate. The sampling results, application rate, and all remaining information will be submitted to MECC before any decommissioning or biosolids removal activities commence. The removal of biosolids is expected to occur in fall 2025 and 2026. It is anticipated that the existing cells will be dredged with a barge and the biosolids will be pumped overland for direct injection into the selected agricultural fields.

5.2.12 EXISTING PRIMARY CELL DECOMMISSIONING

After the new two-cell WWTL is operational, the RM will decommission the existing primary cell. As part of this EAP, it is requested that the typical decommissioning clauses be drafted into the new Environment Act Licence. Once the biosolids are removed, the berms of the primary cell will be levelled (the south berm will remain as part of the Primary Cell #2). Following the levelling of the berms, the area will be capped off with topsoil and managed according to terms of the new Environment Act Licence. It is expected that the site will be restricted from growing cereal, forage, or oil seed crops for a period of three years once levelled, although because of its location and small footprint, the land is expected to remain dormant.

5.2.13 PROPOSED DISCHARGE ROUTE

As previously licenced in the 2023 EAL No. 3415, the new facility will continuously discharge into Cherry Creek year-round, which is also the case with the existing lagoon. The outfall will be located within the municipal right-of-way at the intersection of Cherry Creek and Road 15 N.

The treated effluent will follow a similar discharge route to the existing lagoon. From the new outfall location, the effluent will be discharged into Cherry Creek, where it will pass through a wetland before entering Whitewater Lake. The proposed discharge route is presented in **Figure 5-1** and **Figure 5-2**.

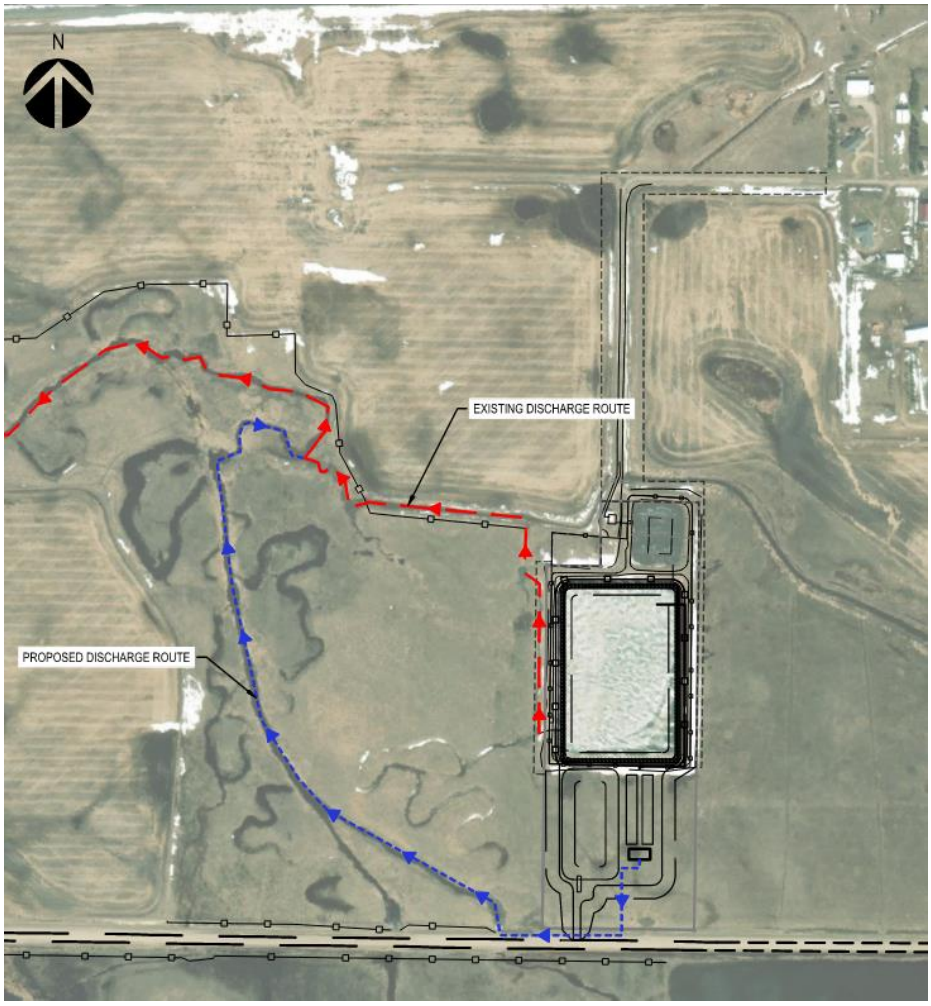

Figure 5-1: Proposed Wastewater Treatment Lagoon Discharge Route – Local Area

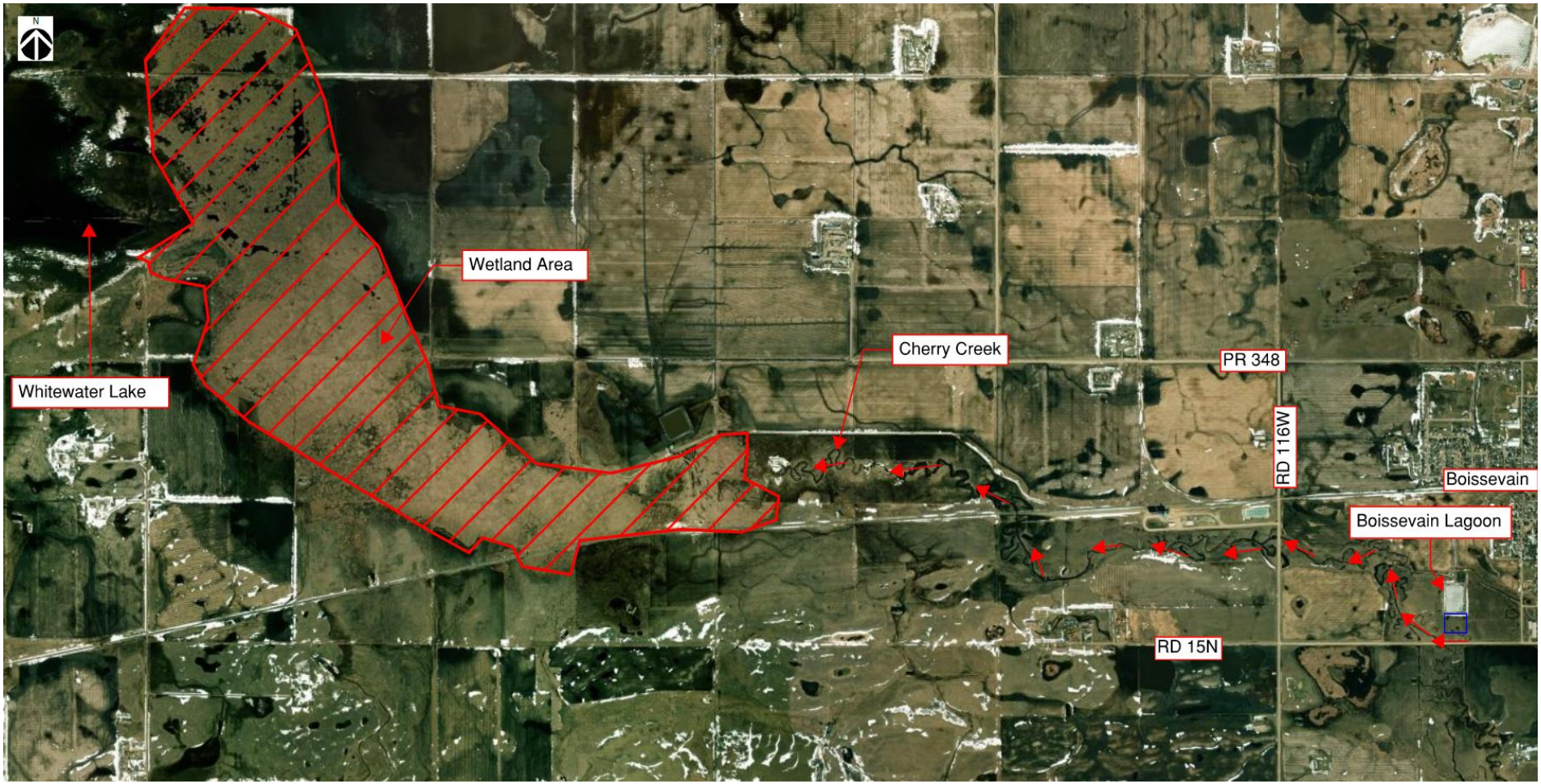

Figure 5-2: Proposed Wastewater Treatment Lagoon Discharge Route – Lagoon to Wetland Area

5.2.14 CONSTRUCTION DETAILS

The subsurface conditions encountered at the site are anticipated to provide a suitable foundation for the proposed dykes subject to subgrade treatment. The recommended subgrade treatment includes clearing and stripping all organics and topsoil. The exposed subgrade should be scarified and re-compacted to at least 95% SPMDD. Soils with organic matter, soft or weak zones will be excavated and replaced with compacted local clay material.

Clay dykes not exceeding 3 m in height may typically be designed with side slopes not exceeding 4H:1V. The clay should be placed in layers not to exceed 200 mm non-compacted thickness at moisture content within ±2% of the optimum moisture content and compacted to at least 95% of SPMDD.

Erosion protection measures will be required on the slope surfaces of the proposed dykes. The exterior slopes will be protected using a suitable vegetation cover. For the interior slopes, the design includes rip-rap armouring to protect against rainfall, snowmelt, wave action, or any other erosive actions.

5.2.15 CONSTRUCTION PHASING

The WWTL system upgrades are expected to be completed over two years, so the construction and commissioning activities have been split into two phases. Phase 1 will be completed in 2025, and Phase 2 will be completed in 2026.

5.2.15.1 *PHASE 1*

The construction activities in Phase 1 include:

- Sewage wastewater lift station upgrades and new forcemain;
- Construct the aerated Primary Cell #1 and truck dumping turnaround and concrete structure;
- Liner testing of Primary Cell #1 in the presence of MECC;
- Construct the SAGR cells;
- Construct and outfit the operations building with all internal equipment;
- Construct treated effluent pump station, forcemain, and outfall ;
- Begin use of the temporary bypass piping; and,
- Removal of biosolids.

During Phase 1 of construction, the Existing Secondary Cell may need to be discharged into Cherry Creek via a pump to control the wastewater levels in the cell and potential seepage from the cell while work is completed on the shared berm between this cell and the new Primary Cell #1.

Once the necessary pre-requisite work is completed all wastewater will be diverted from the existing cells and into the newly constructed cells for treatment. At this point, all remaining wastewater in the existing cells will be pumped to allow the cells to dry. Accumulated biosolids in the converted Primary Cell #2 cell will be removed and directly injected into the surrounding agricultural fields or stored in the decommissioned primary cell to allow for further dewatering before land application.

5.2.15.2 *PHASE 2*

The construction activities associated with Phase 2 include:

- Complete all upgrades to the Primary Cell #2 including raising the berms 0.5 m, constructing a surface clay liner, and installing aeration equipment;
- Liner testing of Primary Cell #2 in the presence of MECC;
- Construct a new intercell pipe between Primary Cell #1 and #2; and,
- Decommissioning of the existing primary cell.

Once the construction activities associated with Phase 2 are completed, the WWTL will be fully commissioned and operational.

5.2.16 EFFLUENT QUALITY

According to the Federal Wastewater Systems Effluent Regulations (WSER), the Boissevain Lagoon is a continuous discharging wastewater system with a hydraulic retention time of ≥ 5 days. The facility will be required to meet Manitoba Water Quality Standards, Objectives and Guidelines – Tier 1 Water Quality Standards and WSER effluent quality requirements, the effluent requirements are presented in **Table 5-4**.

Table 5-4: Effluent Requirements

Parameter	Limit
$CBOD_5$	25 mg/L
Fecal Coliform	200 CFU per 100 mL
TSS	25 mg/L
Total Phosphorus	1.0 mg/L
Total ammonia	Site-specific

5.2.16.1 *EFFLUENT QUALITY – PHASE 1 OPERATION*

While Phase 1 scope of work is being completed, the WWTL will continue operating utilizing the existing cells. Once Primary Cell #1 and the SAGR system are commissioned, the wastewater will be rerouted to these 3 new cells, as presented in **Figure 5-3**. It is expected that Phase 1 commissioning will occur by May 2026. The partially expanded WWTL will be operated in this manner until the Phase 2 upgrades are completed and Primary Cell #2 is commissioned. Automated chemical dosing will not be an option until Primary Cell #2 is completed and as a result, the facility will not meet the 1.0 mg/L total phosphorus limits of the EAL until after Phase 2 is completed. However, the facility is expected to meet all other parameters included in the EAL. A summary of the expected effluent quality is presented in **Table 5-5: Phase 1 Treated Effluent Quality.** Throughout the duration of Phase 1 operations, it is expected that the total phosphorus levels will be similar to what is currently experienced. In addition, the RM will continue following the operational plan discussed in Section. 3.4.

Table 5-5: Phase 1 Treated Effluent Quality

Parameter	Expected Effluent Quality within EAL Requirements
$CBOD_5$	✓
Fecal Coliform	✓
TSS	✓
Total Phosphorus	✗
Total Ammonia	✓

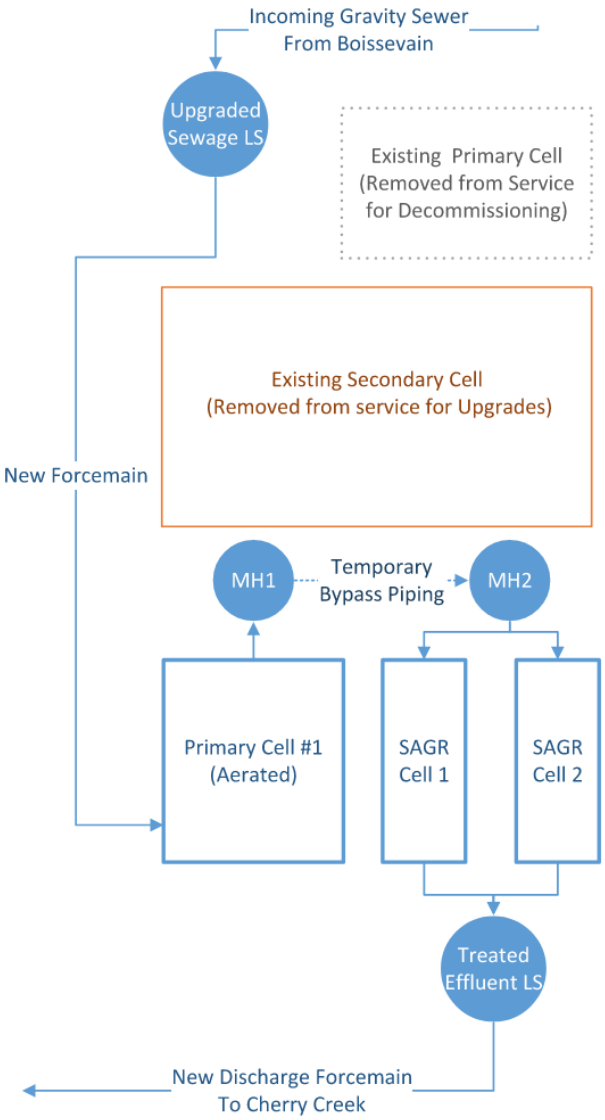

Figure 5-3: Boissevain Lagoon Treatment Process with Phase 1 Complete

5.2.16.2 *EFFLUENT QUALITY – PHASE 2 OPERATION*

Once Primary Cell #2 is commissioned, the automated chemical dosing system will be employed, and the WWTL will be fully operational. The treatment process once the WWTL is fully operational is presented in **Figure 5-4.** At this point the facility will be in compliance with the EAL treated effluent requirements.

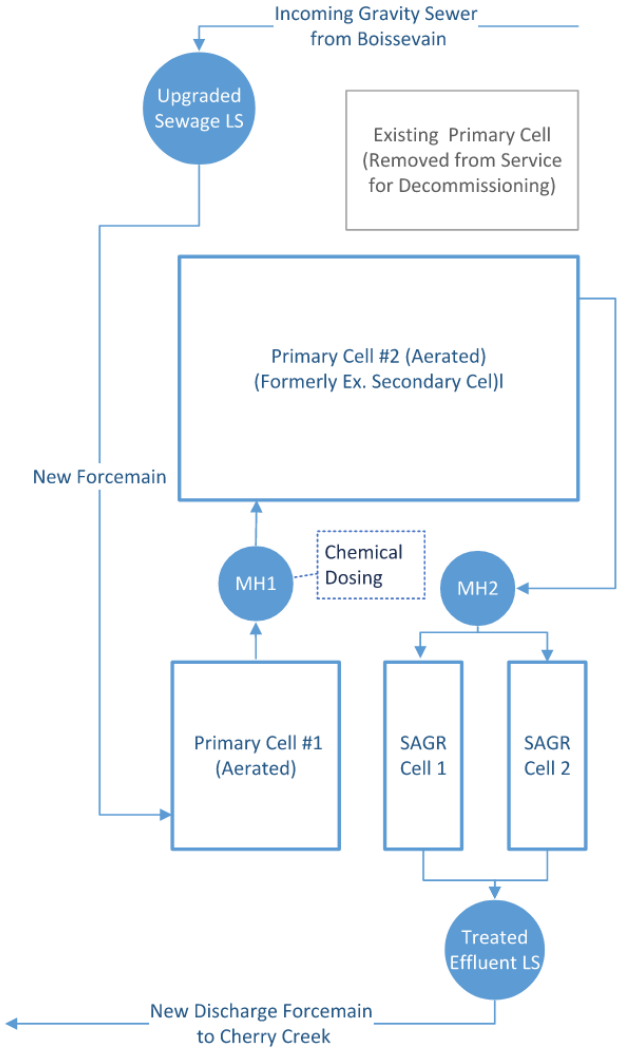

Figure 5-4: Boissevain Lagoon Treatment Process with Phase 2 Complete

6 ENVIRONMENTAL IMPACTS

6.1 ODOUR CONSIDERATIONS

It is expected that the proposed facility will operate without causing any significant odour problems.

The only time of the year that some minor odours may be present is during the spring while the ice thaws. During the winter, ice cover largely prevents free oxygen from entering the water. This condition leads to the production of hydrogen sulphide gas during the winter by bacteria that do not require free oxygen. These accumulated gases dissipate quickly into the atmosphere during ice breakup and the pond returns to a non-odorous condition.

The closest residence to the existing lagoon is located approximately 225 m away to the east of the existing primary cell, this does not meet the MECC minimum setback distance of 300 m. With the proposed upgrades to the WWTL, Primary Cell #2 will be approximately 280 m away from the exterior toe of Primary Cell #2 to the closest house. However, Primary Cell #1 and SAGR cells will exceed the 300 m setback distance. The WWTL facility exceeds the 460 m setback to the community centre. The proposed expansion will reduce current odour issues by providing sufficient treatment capacity and will be an overall improvement from the historical setbacks from the residences.

6.2 LAND IMPACT

The land selected for development is currently used as cattle pastureland. Section 2.3 should be consulted for additional information.

6.3 SURFACE WATER

From the discharge point into Cherry Creek, the treated effluent will flow into a wetland on the east side of Whitewater Lake. The discharge route is the same as the existing facility. There have been no issues with icing or impacts to the surface water along the discharge route. The lagoon discharge will be in compliance with established regulations which have been established to mitigate the impact on surface water and monitored by system operators to confirm performance.

Perimeter ditching will be established where required and maintained in the development area to provide positive drainage for surface water around the lagoon. Any local field drains that are interrupted by construction will be re-established or rerouted if no other alternative exists.

6.3.1 FUEL STORAGE ON SITE

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

6.4 GROUNDWATER

Refer to Section 5.1.2 for information relating to groundwater.

The impervious liner will reduce exfiltration into the ground. The liner will be tested to ensure the hydraulic conductivity requirements are met.

6.5 SPECIES IMPACT

A file search with the Wildlife, Fisheries, and Resource Enforcement Branch of the Manitoba Conservation Data Centre was completed. The results are presented in **Table 6-1** and **Table 6-2**, for the lagoon site and borrow area site respectively. Correspondence is included in **Appendix G**.

Table 6-1: Wildlife, Fisheries, and Resources Search – Lagoon Site

Parameter	Species
Found in the footprint of the lagoon site	Yellow Banded Bumble Bee (Bombus terricola)
	Hairy Prairie-clover (Dalea villosa va. Villosa)
	Seaside Heliotrope (Heliotropium curassavicum var. obovatum)
	Gumbo-lily (Mentzelia decapetala)
	Mule or Black-tailed Deer (Odocoileus hemionus)
Found within 2 km radius of lagoon site	Western Tiger Salamander (Ambystoma mavortium)
	Sprague's Pipit (Anthus spragueii)
	Threeleaf Milkvetch (Astragalus gilviflorus var. gilviflorus)
	Yellow Banded Bumble Bee (bombus terricola)
	Chestnut-collared Longspur (Calcarius ornatus)
	Baird's Sparrow (Centronyx bairdii)
	Hairy Prairie-clover (Dalea villosa va. Villosa)
	Seaside Heliotrope (Heliotropium curassavicum var. obovatum)
	Gumbo-lily (Mentzelia decapetala)
	Long-tailed Weasel (Neogale frenata longicauda)
	Mule or Black-tailed Deer (Odocoileus hemionus)
	Bank Swallow (Riparia riparia)
Broader Area with Similar Habitat	Western Tiger Salamander (Ambystoma mavortium)
	Grasshopper Sparrow (Ammodramus savannarum)
	Sprague's Pipit (Anthus spragueii)
	Threeleaf Milkvetch (Astragalus gilviflorus var. gilviflorus)
	Burrowing Owl (Athene cunicularia)
	Yellow Banded Bumble Bee (bombus terricola)
	Ferruginous Hawk (Buteo regalis)
	Chestnut-collared Longspur (Calcarius ornatus)
	Baird's Sparrow (Centronyx bairdii)
	Hairy Prairie-clover (Dalea villosa va. Villosa)

Parameter	Species
	Bobolink (Dolichonyx oryzuvorus)
	Seaside Heliotrope (Heliotropium curassavicum var. obovatum)
	Prairie Loggerhead Shrike (Lanius ludovicianus excubitorides)
	Gumbo-lily (Mentzelia decapetala)
	Long-tailed Weasel (Neogale frenata longicauda)
	Mule or Black-tailed Deer (Odocoileus hemionus)
	Horned Grebe (Podiceps auritus)
	Bank Swallow (Riparia riparia)

Table 6-2: Wildlife, Fisheries, and Resource Search - Borrow Area

Parameter	Species
Found in the footprint of borrow area site	Sprague's Pipit (Anthus spragueii)
	Hairy Prairie-clover (Dalea villosa va. Villosa)
	Seaside Heliotrope (Heliotropium curassavicum var. obovatum)
	Gumbo-lily (Mentzelia decapetala)
	Mule or Black-tailed Deer (Odocoileus hemionus)
	Bank Swallow (Riparia riparia)
Found within 2 km radius of lagoon site	Western Tiger Salamander (Ambystoma mavortium)
	Sprague's Pipit (Anthus spragueii)
	Threeleaf Milkvetch (Astragalus gilviflorus var. gilviflorus)
	Yellow Banded Bumble Bee (bombus terricola)
	Ferruginous Hawk (Buteo regalis)
	Chestnut-collared Longspur (Calcarius ornatus)
	Baird's Sparrow (Centronyx bairdii)
	Hairy Prairie-clover (Dalea villosa va. Villosa)
	Seaside Heliotrope (Heliotropium curassavicum var. obovatum)
	Gumbo-lily (Mentzelia decapetala)
	Long-tailed Weasel (Neogale frenata longicauda)
	Mule or Black-tailed Deer (Odocoileus hemionus)
	Bank Swallow (Riparia riparia)
Broader Area with Similar Habitat	Western Tiger Salamander (Ambystoma mavortium)
	Grasshopper Sparrow (Ammodramus savannarum)
	Sprague's Pipit (Anthus spragueii)
	Threeleaf Milkvetch (Astragalus gilviflorus var. gilviflorus)
	Burrowing Owl (Athene cunicularia)
	Yellow Banded Bumble Bee (bombus terricola)
	Ferruginous Hawk (Buteo regalis)

Parameter	Species
	Chestnut-collared Longspur (Calcarius ornatus)
	Baird's Sparrow (Centronyx bairdii)
	Hairy Prairie-clover (Dalea villosa va. Villosa)
	Bobolink (Dolichonyx oryzuvorus)
	Seaside Heliotrope (Heliotropium curassavicum var. obovatum)
	Prairie Loggerhead Shrike (Lanius ludovicianus excubitorides)
	Gumbo-lily (Mentzelia decapetala)
	Long-tailed Weasel (Neogale frenata longicauda)
	Mule or Black-tailed Deer (Odocoileus hemionus)
	Horned Grebe (Podiceps auritus)
	Bank Swallow (Riparia riparia)

6.6 FISHERIES

According to the 2013 Milani Report, the receiving water course (Cherry Creek) is considered type E habitat (indirect habitat). A map of the area is included in **Appendix G.**

6.6.1 FISHERIES ACT INFORMATION

The *Fisheries Act* controls and regulates the deposit of deleterious substances into water frequented by fish. According to subsection 36(3) of the *Fisheries Act*,

> "no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water."

6.7 FORESTRY

There is no forestry activity in the area. No treed areas should be affected by the construction associated with the development.

6.8 HERITAGE RESOURCES

In correspondence dated July 3, 2024, from the Historic Resources Branch (**Appendix H**), it was stated that the development area and borrow area are located along water corridors Cherry Creek, tributaries, and wetlands, as well as near known archaeological sites that are located within the corridor, and therefore a heritage resource impact assessment (HRIA) is required.

North Roots Research was retained to conduct the HRIA on a 2.8 ha area in SE 23-03-20 WPM and a 10.1 ha area in NW 14-03-20 WPM. The results did not return any heritage resource concerns and Northern Roots Research has recommended that the lagoon project be allowed to proceed. The HRIA report was submitted (in draft) to the Archaeological Assessment Services Unit on December 13, 2024, and is appended in **Appendix G**.

6.9 SOCIO-ECONOMIC IMPACTS

The lagoon construction will result in a short-term boost to the construction industry in the area. The construction equipment will be operated within the noise by-law restrictions of the RM.

6.10 PUBLIC INVOLVEMENT

Comments from concerned members of the public will be solicited as part of the MECC review, before issuing a Licence.

7 MANAGEMENT PRACTICE

7.1 OPERATION

Operation of the WWTL system must comply with the specifications, limits, terms and conditions of the new Environment Act Licence. The RM must also be in compliance with WSER and the associated reporting.

The lagoon operates on a continuous discharge basis. Effluent from the aerated lagoon is discharged into the SAGR cells for nitrification and polishing. The existing WWTL will remain in operation throughout the construction of the WWTL expansion.

The following procedures will be followed for operating the lagoon and SAGR.

- Regular sampling of the treated effluent in accordance with the EAL.
- Adjustment of alum chemical dosing feed based on the observed influent loads and effluent quality.
- Perform a SAGR step-feed once annually in the fall. The procedure consists of:
  - Open the step-feed gate valve at the inlet of each SAGR cell.
  - Allow effluent to feed into each SAGR cell through the normal inlet and step-feed inlet for a period of 4 weeks.
  - After 4 weeks, close the step-feed gate valves and return to normal flow through the SAGR cells.

7.2 COMMISSIONING

The WWTL system will be commissioned in two phases. Phase 1 will include commissioning Primary Cell #1, SAGR system, and lift stations. Phase 2 includes commissioning Primary Cell #2, phosphorus reduction system, and overall lagoon system operation. It is expected Phase 1 commissioning to be completed by the Spring of 2026, and Phase 2 will be completed in the Fall of 2026.

7.2.1 PHASE 1

For the aeration system, when the new blowers are brought online, the dissolved oxygen levels in Primary Cell #1 will be tested to confirm 2.0 mg/L of dissolved oxygen in the top 2.0 meters of the liquid.

Commissioning the SAGR process requires both an equipment and process start-up. Once all equipment including pumps, blowers, piping, and level control structures are in place and the blowers are commissioned, the biological treatment process can be developed. The initial development of the biomass for treatment requires the following conditions:

- Continuous flow of water;
- Incoming water temperature above 5˚C;
- Incoming ammonia levels above 15 mg/L or 40% of the design concentration; and,
- 2-4 weeks for the biomass to develop.

The SAGR system must be commissioned when the incoming wastewater is 5˚C or higher, otherwise, the biomass will not develop, and ammonia removal in the system will be minimal until the wastewater reaches 5˚C.

7.2.2 PHASE 2

For the aeration system, when the new blowers are brought online, the dissolved oxygen levels in each of the primary cells will be tested to confirm 2.0 mg/L of dissolved oxygen in the top 2.0 meters of the liquid.

Commissioning of the phosphorus removal system will occur once both aeration cells are fully operational. It should be noted that the community is not expected to meet total phosphorus levels until both aerated cells are operational. It is reasonable to expect that it will take time to link the chemical dosing to the wastewater to bring the total phosphorus levels consistently below 1.0 mg/L.

Once Primary Cell #2 and the phosphorus removal system are commissioned the WWTL will be fully operational.

7.3 MAINTENANCE, RECORD KEEPING, AND INSPECTION

Generally, the maintenance list will include, but is not limited to, the following:

- Lift Station: regular operational checks along with routine pump maintenance.
- Gate valves: exercised regularly.
- Aeration and SAGR Blowers: weekly operation checks along with routine maintenance and servicing.
- Aeration diffusers: weekly sight checks to make sure bubble patterns are similar.
- Cleaning of the aeration building intakes, as required.
- Chemical: daily check on the dosing system and weekly tank level check; reordering of chemicals.
- Level control manhole: weekly check during winter to remove any ice build-up.
- Maintaining the supply of spare consumable parts, accessories and equipment (filters, diffusers, etc).
- Flowmeter: calibrate biannually.

The record-keeping and inspection list will include, but is not limited to, the following:

- Daily records: lift station pump hour records should be collected and retained for future estimation of flows to the WWTL. The discharge lift station records should also be collected, retained and compared with the flowmeter to check for agreement. Septic hauling records (dates and volumes) from the individual haulers trucking to the lagoon should also be collected and retained.
- Weekly records:
  - The summer inspection would consist of recording the following:
    - The water level
    - Presence of odour and their source
    - Presence of floating objects

    The summer maintenance should also include grass cutting on the berms, if necessary, elimination of emergent vegetation, extermination of burrowing animals, repair of the dykes and rip rap if damaged by wind erosion and wave action, and repair of the fence and gate.
  - Year-round inspection would consist of recording the following:
    - Levels in the chemical and water supply tankage
    - Blower hour readings
    - Appearance of aeration bubbles
  - Periodic winter inspection is confined to inspecting for frozen piping and checking if the water level in the cells is as it should be.
  - Discharge records: the records should contain all treated effluent quality analyses, dates of discharge, discharge procedure followed, water levels and other pertinent data.

8 SCHEDULE AND FUNDING

It is anticipated that the Environment Act Licence process will be finalized by April 2025, and tendering of the project will begin immediately afterwards (**Figure 8-1**). Construction is proposed for the summer of 2025, and 2026, with decommissioning of the existing primary cell taking place in 2026.

The RM has received a grant from ICIP to assist in funding the project. Funding for the remainder of the project will be a joint effort between the Municipality and the Manitoba Water Services Board.

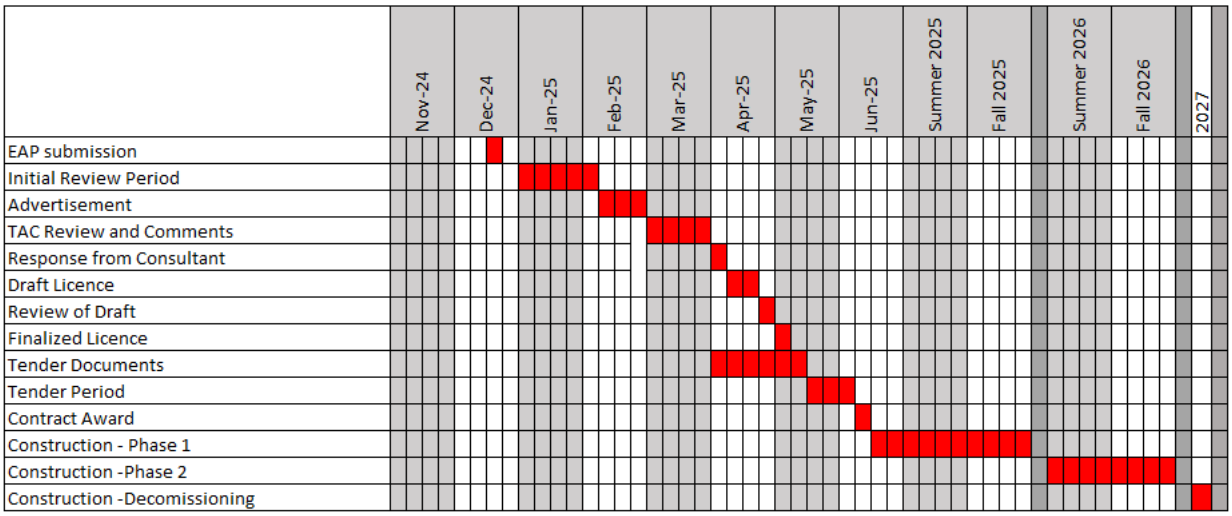

Figure 8-1: Schedule – EAP Submission to End of Construction

9 REFERENCES

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