RM OF HANOVER

ENVIRONMENT ACT PROPOSAL

NEW BOTHWELL WASTEWATER TREATMENT LAGOON EXPANSION

MARCH 19, 2019

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RM OF HANOVER

ENVIRONMENT ACT PROPOSAL REPORT

PROJECT NO.: 181-11991-00
DATE: MARCH 19, 2019

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March 19, 2019

Manitoba Sustainable Development
Environment Approvals
1007 Century Street
Winnipeg, MB R3H 0W4

Attention: Tracey Braun, M.Sc. - Director, Environmental Approvals

Dear Ms. Braun:

Subject: Environment Act Proposal – RM of Hanover
Wastewater Treatment Lagoon Expansion

The Rural Municipality of Hanover has an existing three-cell wastewater treatment lagoon in the Community of New Bothwell operating under Environment Act Licence No. 1524 R, dated June 28, 2010. Expansion of the facility was completed in 2011, as laid out in the December 2009 Environment Act Proposal. This previous expansion was designed for a 20-year growth scenario, however, the production increases at the cheese plant within New Bothwell has triggered the need for expansion much sooner than expected. With a considerable industry component, the proposed expansion involves the construction of three (3) new aerated primary cells, two (2) additional secondary cells, the conversion of the existing northern cells into one (1) secondary cell and the decommissioning of the oldest two (2) cells.

The enclosed Environment Act Proposal Report (4 copies, 1 CD) 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.

Jason Bunn, P.Eng.
Engineer, Wastewater Infrastructure

JB/al
Encl.
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MANITOBA
Certificate of Authorization
WSP Canada Inc.
No. 5750 Date: 2019-03-19

EXECUTIVE SUMMARY

This Environment Act Proposal (EAP) comes over nine (9) years after the submission of the previous EAP regarding expansion of the New Bothwell wastewater treatment lagoon (WWTL). The previous EAP was completed in December 2009 by GENIVAR (now WSP), which led to Environment Act Licence (EAL) No. 1524 R, dated June 28, 2010.

The 2009 EAP detailed the wastewater generation from the Community of New Bothwell and the rural area, as well as the New Bothwell Cheese Plant (Bothwell Cheese Inc.). At the time, Bothwell Cheese Inc. (BCI) was still utilizing their own lagoon to treat their wastewater. Discussions between BCI and the RM of Hanover developed into a plan outlining the RM's acceptance of BCI's wastewater, complete with an Industrial Services Agreement (ISA). Other infrastructure upgrades were also completed within the Community to facilitate this acceptance.

The design details of the lagoon expansion completed in 2011 included an allowance for a 42% volume increase in the wastewater generated by BCI over the 20-year design period (2029). However, growth and expansion at BCI has been far greater than originally anticipated. With this increase comes the need to again expand the lagoon, which will again be for a 20-year period (2040).

As the industrial component of a municipal lagoon increases, the practicality of treating it by means of a facultative lagoon diminishes. Weighing the factors associated with treatment through facultative versus aeration, the RM of Hanover concluded that it was appropriate to upgrade the treatment process. Thus, the proposed expansion involves the construction of three (3) aerated primary cells. Additional storage volume is also required, therefore, two (2) new secondary cells will also be constructed. These new cells will be constructed east of the existing cells. The two (2) groups of cells will be separated by the South Lateral Drain and the roads that run parallel to it on either side. The location of the new cells necessitates a forcemain extension and interconnecting gravity flow piping constructed beneath the road and drainage infrastructure.

Work will also be completed on the existing cells. The two (2) most northerly cells will be converted into a single secondary cell, and the two (2) original cells (southerly) will be decommissioned the year after the expansion is completed.

For the complete lagoon system, phosphorus removal will be achieved by chemical injection into mixing chambers, with settling in the third primary cell. Besides housing the blowers, the aeration building will also be sized for the chemical storage tank and dosing system.

The existing discharge route into the South Lateral Drain (that converges with the Manning Canal) will remain the same, except for a new discharge ditch and culvert into the Drain for the new secondary cells.

The project driver is the wastewater loading generated by BCI. Therefore, BCI and the RM of Hanover will cost share this project based on a breakdown of the organic and hydraulic loading. The RM of Hanover has reached out to the Manitoba Water Services Board as a potential project funder to no avail.

Upon approval from Manitoba Sustainable Development and the issuance of an EAL, tendering and construction will begin in the late summer of 2019.

The RM of Hanover has already contacted the Environmental Approvals Branch (December 2018) to communicate the project timelines, and has requested priority status.

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Wastewater Treatment Lagoon Expansion

Name of development

Rural Municipality of Hanover

Legal name of the proponent of the development

West half of 28-7-5 EPM; East half of 29-7-5 EPM

Location of development

Contact Person for Proponent:

Mr. Luc Lahaie
Chief Administrative Officer
RM of Hanover
28 Westland Drive
Mitchell, MB R5G 2N9

Contact Person for Environmental Assessment:

Mr. Jason Bunn, P.Eng.
WSP
1600 Buffalo Place
Winnipeg, MB R3T 6B8

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2 DESCRIPTION OF DEVELOPMENT

2.1 LEGAL DESCRIPTION AND OWNERSHIP

The existing WWTL is located within the east half of 29-7-5 EPM. The RM of Hanover is the registered owner of the existing lagoon land, as identified in the following Status of Titles:

- 1261388/1, Lot 1 Plan 28788, Winnipeg Land Titles Office (WLTO) [Original two (2) cells]
- 2420052/1, Parcel A and B Plan 49458, WLTO [2009 expansion cells]

The new lagoon cells are to be located within the southwest quarter of 28-7-5 EPM, as shown in Figure 2-1.

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

The RM is in the process of purchasing the west half of the northwest quarter (28-7-5 EPM). The following are the applicable and associated Status of Titles for the purchase land that still shows the former owners, Elden Wiebe Warkentin and Geraldine Ann Warkentin:

- 1929578/1, Legal Subdivisions 5 and 6 of 28-7-5 EPM
- 1929581/1, West half of West half of NW 28-7-5 EPM
- 1929585/1, East half of West half of NW 28-7-5 EPM

At the time of the report submission, the land purchase was in legal process. When completed, legal documentation can be submitted if required. The Status of Titles are included in Appendix 1.

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 West half of 28-7-5 EPM were transferred by the Dominion of Canada in 1890/1 and they lie with the current surface ownership. Correspondence is included in Appendix 5.

2.3 DESCRIPTION OF EXISTING LAND USE

The RM of Hanover Zoning By-Law No. 2171 indicates that the land intended for lagoon development (SW 28-7-5 EPM) is zoned "R" Rural Zone.

The land proposed for the construction of the new aeration cells and secondary cell is currently utilized for agriculture and is bordered on the north, east and south sides by agriculture, and on the west side by mile road 26E.

2.4 PREVIOUS STUDIES

2018 **"RM of Hanover – New Bothwell Wastewater Treatment Lagoon Expansion – Geotechnical Report" prepared by WSP for the RM of Hanover**

This Report provides a detailed geotechnical investigation of the proposed development site conducted by WSP on October 1 and 2, 2018. The investigation included testhole drilling, sample collection and laboratory testing, followed by slope stability analysis. The Report concluded that based on soil conditions, the proposed expansion should be constructed with a clay core utilizing the underlying high plasticity clay with a 5 hor:1 vert slope for the primary cells only.

2009 **"Environment Act Proposal – Community of New Bothwell Wastewater Stabilization Pond" prepared by GENIVAR (now WSP) for the RM of Hanover**

This Environment Act Proposal Report details the proposed expansion of the New Bothwell lagoon based on a 20-year design outlook (2029). The expansion proposes the construction of a new primary and secondary cell, along with the conversion of the existing cells into one (1) secondary cell. Expansion was necessary due to continued growth in the Community and acceptance of wastewater from the New Bothwell Cheese Plant. Appended in the EAP is a Geotechnical Report (2009) on the proposed site.

3 EXISTING WASTEWATER TREATMENT LAGOON

3.1 DESCRIPTION

The origins of the existing wastewater treatment facility at New Bothwell began in 1991, when a two-cell lagoon was constructed. It was expanded in 2009 by adding a new primary and secondary cell, at which time the existing cells were operated as a single secondary cell. Therefore, the current 18.5 ha facility consists of three (3) cells that function to provide wastewater treatment and storage for the Community, surrounding RM and BCI. The lagoon is located northeast of the Community of New Bothwell in the east-half of 29-7-5 EPM. It is situated approximately 550 metres south of PR 311 and 1,070 metres east of PR 216.

The Community of New Bothwell is serviced by low pressure sewers (LPS). In 2011, a new lift station and 200mm diameter forcemain (FM) was constructed to the lagoon, which essentially services the areas of New Bothwell west of PR 216 (including BCI). Whereas the areas east of PR 216 are serviced by a 150mm diameter LPS that discharges directly to the lagoon. The lagoon has a concrete ramp for receiving truck-hauled septage.

The existing licence directing lagoon operation is EAL No. 1524 R, dated June 28, 2010, which is included in Appendix 2.

3.2 EXISTING CAPACITY

When discussing the capacity of a lagoon, we will review its treatment capacity and storage capacity. Information regarding the actual dimensions and elevations of the existing lagoon is based on the following:

— 2011 As-Constructed drawings (Primary Cell and Secondary Cell #1)
— 1991 Design drawings and 2009 survey information (Secondary Cell #2A & B)

Table 3-1 provides details on the existing cells.

Table 3-1: New Bothwell Lagoon Existing Cell Details

Cell	Operating Depth [m]	Liquid Surface Area (1.5 m depth) [ha]	Total Volume [m^3]	Dead Storage Volume [m^3]	Discharge Pipe Invert Elevation [m]	Storage Volume [m^3]
Primary	1.5	7.17	102,580	--	n/a	51,290
Secondary #1	1.5	3.77	53,000	11,070	0.33*1	41,930
Secondary #2A	1.5	1.09	14,530	2,630	0.30*2	11,900
Secondary #2B	1.5	2.20	30,400	2,820	0.15*3	27,580
TOTAL	**--**	**14.23**	**200,510**	**16,520**	**--**	**132,700**

*1 Based on 2011 As Constructed drawings
*2 Elevation assumed based on typical pipe invert
*3 Based on 1991 design drawings

The ability of a lagoon to treat the incoming wastewater is a measure of organic loading capacity. Organic loading refers to the quantity of organic material present in the incoming wastewater and is measured as the five-day Biochemical Oxygen Demand (BOD_5). The organic loading becomes the total mass of BOD_5 in kg/d in the wastewater discharged to the lagoon. The wastewater from piped collection system areas are consistent on a year-round basis and do not have a seasonal variation, whereas truck-hauled wastewater from septic systems are seasonally variable.

The ability of a lagoon to store the incoming wastewater is a measure of its hydraulic loading capacity. Hydraulic loading refers to the volume of sewage flow to the lagoon. Wastewater treatment lagoons are presently designed for a 227-day storage period beginning November 1st and ending June 15th of the following year. Hydraulic loading over the 227-day storage period is used to calculate the volume of storage required in the current lagoon facility.

3.2.1 TREATMENT CAPACITY

Most lagoons in the Province of Manitoba have conventional facultative primary treatment cells. Justification for the selection of conventional primary cells is found in the availability of land within the Province and the limited costs associated with an acceptable amount of treatment that conventional primary cells provide. Mechanical treatment of wastewater comes at a cost, albeit at a reduced footprint.

The move to mechanical treatment is usually triggered by a large population base or high strength wastewater that requires more intensive treatment. In the case of New Bothwell, the 2010 expansion involved the construction of a new facultative primary cell which accounts for 50% of the liquid surface area for the entire lagoon. This larger than normal surface area was necessary to provide treatment for the industry (high strength) wastewater, which accounted for 79% of the total design organic loading. Table 3-2 summarizes the design details behind the sizing of the existing New Bothwell primary cell.

Table 3-2: Summary of the 2029 Design Organic Loading to the New Bothwell Lagoon

WASTEWATER SOURCE	TYPE	2029 DESIGN ORGANIC LOADING [kg-BOD_5/d]
Community of New Bothwell	Low Pressure Sewer/Forcemain	65.8
Rural Area	Septic Tank	17.3
Bothwell Cheese Inc.	Low Pressure Sewer/Forcemain	307.9
TOTAL	--	**391.0**

The 20-year design in the 2009 EAP was for a total of 391.0 kg-BOD_5/d. Based on the 2011 as-built information, the liquid surface area of the existing primary cell is 7.17 ha (see Table 3-1). Therefore, the actual treatment capacity of the New Bothwell lagoon is **401.5 kg-BOD_5/d**.

3.2.2 STORAGE CAPACITY

In a facultative lagoon, all cells contribute to the storage capacity of the facility. The primary cell contributes half of its total volume to storage, accounting for the fact that this cell can only be lowered by equalizing with a secondary cell, as well as the fact that the primary cell continues receiving incoming wastewater while the secondary cells are discharging.

A secondary cell, also referred to as a storage cell, contributes the volume of the cell above the invert of the discharge pipe. The volume below the cell cannot be discharged by gravity flow and is referred to as the dead storage volume. Typically, the invert of a pipe is set at 0.30 m above the cell bottom, although it is permitted to be as low as 0.15 m, as is the case in Secondary Cell #2B. Table 3-3 summarizes the minimum design storage capacity for the New Bothwell lagoon based on the 20-year loading (as anticipated in 2009).

Table 3-3: Summary of the 2029 Design Hydraulic Loading to the New Bothwell Lagoon

WASTEWATER SOURCE	TYPE	2029 DESIGN HYDRAULIC LOADING [m^3]
Community of New Bothwell	Low Pressure Sewer/Forcemain	43,670
Rural Area	Septic Tank	66
Bothwell Cheese Inc.	Low Pressure Sewer/Forcemain	45,218
TOTAL	--	**88,954**

Even though it was anticipated that the storage requirement would be 88,954 m^3, Table 3-1 identifies the actual total storage capacity of the existing cells is **132,700 m^3**. The reason behind the excess storage lies in the RM of Hanover's desire to make full use of the land purchased for the 2010 expansion. Secondary Cell #1 was constructed as large as possible in the available area.

3.3 DISCHARGE ROUTE

The lagoon secondary cells are typically discharged over the course of the allowable discharge period from June 15th to October 31st. Currently, the effluent is discharged from Secondary Cell #1 and #2B via a 200mm diameter pipe. Secondary Cell #2A is hydraulically connected to #2B by pipe and does not have a dedicated discharge pipe. From the discharge point (end of pipe), the effluent flows in a constructed ditch for 110-300 m (depending on the cell) to an existing second order drain, known as the South Lateral Drain, that converges with the Manning Canal. The distance of the route from the discharge point of Secondary Cell #1 to the Manning Canal is approximately 1.8 km and an additional 12.4 km to the Seine River Diversion. From this point along the Seine River Diversion it is 8.5 km to the Red River.

Changes to the discharge route are discussed in Section 5.2.7.

4 POPULATION SERVICED AND DESIGN LOADINGS

4.1 SOURCES OF WASTEWATER

The existing New Bothwell lagoon services the following areas:

- The Community of New Bothwell
- Rural residents in the RM of Hanover surrounding the Community (septic tanks)
- Bothwell Cheese Inc. (located within the Community)

The year 2040 was selected as the 20-year design date because the lagoon will begin fully operating in 2020.

The storage period for the expanded lagoon will be increased to 283 days from the typical 227 days. The move to an aerated lagoon is accompanied by a loss of storage attributed to the facultative primary cell. As such, while the first discharge of the spring and the last discharge of the fall are occurring, the other secondary cells are continually receiving wastewater. On the basis of this operational reality, an additional 28 days of storage for both the spring and fall discharges has been added to the total lagoon storage period (October 4th to July 13th).

4.1.1 COMMUNITY OF NEW BOTHWELL

The Community of New Bothwell is an unincorporated community within the Rural Municipality of Hanover. As such, there are no community population statistics available online from Statistics Canada. According to information provided by the RM of Hanover, there were 213 residential units within the Community in 2016 and a population of 648. Therefore, within the Community there is an average of 3.04 persons per residential unit.

Growth over the 20-year design period was based on development in the Community. In New Bothwell, Fairfield Ridge is a 94-lot subdivision with five (5) duplex lots (NE 29-7-5 EPM). The first home was built in this development in 2017. The total population expected from this development is 301 people (99 residential units; 3.04 persons per).

There is potential for future developments within New Bothwell. Conservatively, an additional 25 lots (76 people) in a future subdivision will be included in the 20-year design as well.

Therefore, the total 20-year design population for New Bothwell is (648+301+76 =) **1,025 people**. The associated growth rate corresponds to 10.03% per five (5) years or 1.93% per year. This growth rate is in line, but slightly below, the RM of Hanover average of 12.2% per five (5) years (Statistics Canada) for the previous census. Working backwards from this design population number equates to a 2018 population of **673 people**.

Within the Community of New Bothwell, we must also account for bussed-in students to the Bothwell School. Currently there are 40 bussed-in students from outside of the Community. In calculating wastewater loading, we use a ratio of 3:1 (three [3] bussed-in students are equivalent to one [1] person in a dwelling). This adds 13 people to the 2018 New Bothwell population. A 1.00% growth per five (5) years is assessed to the bussed-in students, which only adds one (1) equivalent person to the population for a total of 14 people (2040 design year).

The wastewater generated by the Community of New Bothwell is collected by low pressure sewers, some of which discharge directly to the lagoon and others that first discharge into a lift station. Provincial Road 216 is essentially the boundary with the lift station servicing those on the west side of the road.

Being a low pressure sewer community also means that each residence has a septic tank. The septic tanks collect the solid portion of the wastewater generated while the liquid portion continues on via the low pressure sewers, resulting in two (2) wastewater streams. The solid portion is pumped out by a septic truck, typically on an annual or biannual basis.

The liquid portion of the Community's wastewater is consistent year-round, while the septage from the septic tanks is restricted by the EAL to a hauling period from June 2nd to October 14th, or 135 hauling days. We will deal with each wastewater component separately.

WASTEWATER – LIQUID PORTION

With a well-functioning septic tank, typical BOD_5 removal efficiencies are 30 to 50 percent (EPA, 2002). If we assume 40% removal, it leaves 60% of the BOD_5 in the liquid portion that is pumped to the lagoon. On the basis of accepted practice, the daily BOD_5 production for domestic wastewater collected via a piped system is 0.077 kg per person. For the liquid portion of the wastewater, we will attribute 60% of this value, or a daily production of 0.046 kg per person.

We can determine the volume of the liquid portion of the wastewater to the Community by a review of the lift station records. As mentioned, the lift station only receives a share of the total wastewater generated by the Community.

Lift station records from 2018 were used to determine the average per capita flow from the Community of New Bothwell. Operational issues prevented the use of earlier records. An update to the original commissioning pump test was also required. The pump hours were not congruent with the flow meter totalizer based on the commissioning pumping rate. A pump test was conducted on December 12, 2018. During the pump test we confirmed the following:

- the pumps are operating at a much lower rate then experienced during the commissioning pump test;
- there is good agreement between the flow meter totalizer and measured pumped volume;
- the pump hour meters appear to be recording accurately; and
- the ultrasonic measurements are accurate.

From the recent pump test in the duplex lift station, we have the following pumping rates:

- Pump 1: 19.70 L/s
- Pump 2: 22.16 L/s

As the lift station only serves the portion of the Community west of PR 216, the population of this area in 2018 was determined to be 383 people, based on a dwelling count. After removing the BCI process wastewater and the employee domestic contribution to the lift station, the average wastewater generation rate for the Community was determined to be 278 litres per person per day (Lpcd). For the purposes of this report, it has been rounded to **280 Lpcd**. This rate will be attributed to the entire Community.

For a 2018 equivalent population of 686, the daily average organic loading for the liquid portion of the wastewater is 31.56 kg-BOD_5/d. The corresponding hydraulic loading is 54,359 m^3 over the extended lagoon storage period (283 days).

For a 2040 equivalent population of 1,039, the daily average organic loading for the liquid portion of the wastewater is 47.79 kg-BOD_5/d. The corresponding hydraulic loading is 82,330 m^3 over the extended lagoon storage period.

WASTEWATER – SOLIDS PORTION

In 2016, WSP conducted a septic truck sampling program in a neighbouring municipality. The program was implemented from May through October. From the laboratory analysis, the average septage load strength was 4,992 mg-BOD_5/L. For the purpose of this EAP, we will round up to 5,000 mg-BOD_5/L and assess this wastewater strength to septage hauled to the lagoon.

Based on information provided to us by the local septage hauler, the average volume of the Community's septic tanks is 2,730 L (600 IGAL). According to the haul records from 2017-2018, approximately 35% of the septage is hauled during the typical 227-day lagoon storage period. If we extend the storage period to account for the loss of storage in aerated primary cells by 56 days, this value increases to 56%. We will round this value to 55% for the necessary calculations. As a conservative approach, we assume that the septic tanks are emptied on a yearly basis.

For the organic loading, we assume that all tanks are emptied during the allowable hauling period. Whereas for the hydraulic loading calculations, we assume only those tanks that are hauled during the extended storage period count towards the total.

The current (2018) organic and hydraulic loading during the extended lagoon storage period based on the septage hauling from within the Community of New Bothwell is 22.81 kg-BOD_5/d and 339 m^3, respectively. Whereas, the design (2040) organic and hydraulic loading is 34.56 kg-BOD_5/d and 513 m^3.

4.1.2 RURAL RESIDENTS

The RM of Hanover has several lagoons throughout the Municipality that service the communities and rural areas. The Communities of Mitchell, Blumenort, Kleefeld, Grunthal and New Bothwell all have lagoons with truck dump stations. Consequently, each lagoon is able to service the septage from the surrounding rural area. For New Bothwell, the current surrounding rural area residential units total 163. Referencing information from Statistics Canada (2016 Community Profiles), the RM of Hanover has an average of 3.5 persons per occupied dwelling. The outcome of combining the residential units with the information from Statistics Canada is a 2018 population of 571.

For calculating the organic loading, the assumption will be made that each residence has one (1) septic tank and all of the tanks are emptied during the hauling period. Using a strength of 5,000 mg-BOD_5/L and a volume of 2,730 L (600 IGAL), the average wastewater strength per tank is 13.65 kg-BOD_5. Over the course of the 135-day hauling period, the current (2018) organic loading (for 163 residences) is 16.48 kg-BOD_5/d.

When calculating the hydraulic loading, only those tanks that are hauled during the extended storage period (from October 4th to July 13th), count towards the total. There is a 51-day period where the septage can be hauled (according to the EAL) during the extended lagoon storage period. We must also consider emergency situations where septage must be hauled outside of the hauling period. As was done for the septage hauling within the Community of New Bothwell, we will attribute 55% of the total septage loading to the extended lagoon storage period. As such, the current (2018) hydraulic loading is 245 m^3.

The design (2040) organic and hydraulic loading is 17.19 kg-BOD_5/d and 255 m^3 with a 1.00% growth per five (5) years.

4.1.3 NEW BOTHWELL CHEESE PLANT

BCI is located within the Community of New Bothwell on the west of side of PR 216, and is at the physical address of 61 Main Street. The company began in New Bothwell in 1936. A transition occurred in 2011 when as part of a larger infrastructure project within New Bothwell, BCI's wastewater was tied into the Community's wastewater collection system. An ISA was part and parcel with the RM's acceptance of this wastewater.

Growth within BCI is the main driver for expansion of the lagoon as both the wastewater strength and volume has exceeded both the short and long-term projections. In 2017, negotiations between both parties took place to revise the original ISA to reflect current conditions. A second round of revisions will transpire after the proposed lagoon expansion.

BCI implemented pre-treatment in 2018 and at the time of report drafting they are in the process of commissioning the equipment. As a result, reliable design data is in short supply for the current wastewater loading from BCI, and subsequently, determining the future loadings is subject to greater uncertainty. BCI wastewater currently includes two (2) separate wastewater streams that are serviced by the lagoon, as follows:

- Sanitary wastewater serviced by 75 LPS which discharges into the New Bothwell lift station
- Process wastewater serviced by 100 LPS which discharges into the New Bothwell lift station

A sanitary wastewater stream is generated by the office and process area washrooms. Currently there are 100 employees and BCI projects growth to 150. Conservative wastewater generation estimates from the *Province of Alberta Private Sewage Treatment and Disposal Regulations* have the following:

- Industrial and commercial buildings employees at 45 L/d

With this wastewater generation, the current (2018) sanitary wastewater generation totals 4,500 L/d with a future loading of 6,750 L/d. Sanitary wastewater will be assessed a strength of 500 mg/L.

Process wastewater is generated from both the manufacturing effluent (which now runs through dissolved air floatation [DAF] treatment equipment currently being piloted) and from ultrafiltration reverse osmosis (UFRO) polished water. Currently, the UFRO water is directed to BCI's lagoon, but will be combined with the manufacturing effluent when the lagoon expansion and necessary infrastructure upgrades are completed.

BCI has a flowmeter on the process wastewater that is being pumped via the 100 LPS to the lift station. For 2018, the average was 261 m^3/d or 73,863 m^3 over the extended lagoon storage period. Composite sampling for 2018 was used to determine the organic loading for the process wastewater, which was 487.55 kg-BOD_5/d (1,868 mg/L).

BCI projects that the future loading (2040) from the plant will rise to 583 m^3/d (164,989 m^3) over the extended lagoon storage period with an organic loading of 498.47 kg-BOD_5/d (855 mg-BOD_5/L). The DAF system is currently being piloted by BCI which justifies the lower wastewater strength. UFRO polished water will add 400 m^3/d (113,200 m^3 over the extended lagoon storage period) with an organic loading of 40 kg-BOD_5/d (100 mg-BOD_5/L).

Existing infrastructure, including the 100 LPS and the lift station pumps, will require upgrading to adequately service BCI's wastewater loading.

4.2 LOADING SUMMARY

In summary, each wastewater stream serviced or anticipated to be serviced by the New Bothwell lagoon within the 20-year design period (2040) has been detailed. In consultation with the RM of Hanover, population growth projections have been assessed to determine the future loadings. In addition, communication with BCI has identified their future wastewater loading. A summarized table for the existing and proposed organic and hydraulic loading is shown below, appearing as Table 4-1.

Table 4-1: Current and Design (2040) Organic and Hydraulic Loading to the New Bothwell Lagoon

POPULATION SEGMENT	EXISTING (2018)		PROPOSED (2040)	
	ORGANIC LOADING [kg-BOD_5/d]	HYDRAULIC LOADING [cu.m.]	ORGANIC LOADING [kg-BOD_5/d]	HYDRUALIC LOADING [cu.m.]
Community of New Bothwell & Bussed-In Students - Forcemain (liquid portion)	31.56	54,359	47.79	82,330
Community of New Bothwell & Bussed-In Students - Septic Tanks (solid portion)	22.81	339	34.56	513
Rural Residents - Septic Tanks	16.48	245	17.19	255
Bothwell Cheese - Sanitary Wastewater	2.25	1,274	3.38	1,910
Bothwell Cheese - Process Wastewater	487.55	73,863	498.47	164,989
Bothwell Cheese - RO Membrane Concentrate	n/a	n/a	40.00	113,200
TOTAL	**560.65**	**130,080**	**641.39**	**363,197**

5 PROPOSED DEVELOPMENT

The RM of Hanover has purchased parcels of land in West half 28-7-5 EPM for the purpose of expanding the lagoon. The purchased area totals 62.9 ha (155.5 acres).

The proposed development consists of:

- three (3) new aerated primary cells with 4.0 m operating depths;
- forcemain and LPS extension to the new primary cells;
- blower and chemical storage/dosing building;
- two (2) 100 hp blowers;
- chemical dosing system c/w rapid and slow mix manholes;
- two (2) new secondary cells with 2.1 m operating depths;
- conversion of northerly primary and secondary cell to one (1) secondary cell;
- decommissioning oldest two (2) lagoon cells (Secondary Cell #2A & #2B);
- piping connection between new primary cells and converted cell;
- truck dump station;
- fencing and signage; and
- lift station and LPS piping upgrades

The EAP design drawings are appended (Appendix 4). The expansion work is to be completed while the facility remains in operation.

The expanded lagoon will provide adequate organic loading (treatment) and hydraulic loading (storage) capacity for the anticipated 2040 wastewater loadings. Similar to the 2010 expansion, the RM of Hanover desires to construct the new secondary cells to make use of the available land rather than to the calculated storage requirement. In this case, the new storage cells will utilize all of the available land east of the new primary cells. The layout of the new cells was designed with future expansion in mind. There is adequate room for added treatment and storage cells to the north of the proposed cells.

Submissions have been made to Manitoba Infrastructure for:

- the pipeline crossings of the South Lateral Drain;
- the discharge culvert installation into this Drain; and
- the two (2) access approaches to the lagoon.

At the time of the report submission, the applications were under review.

5.1 SITE CONDITIONS

On October 1 and 2, 2018, WSP conducted a geotechnical investigation at the proposed development area, during which a drill rig was used to drill a total of 15 testholes (TH1 to TH15). Drilling depths were between 4.6 m and 7.6 m below grade. The complete Geotechnical Report is included in Appendix 3.

5.1.1 LOCAL TOPOGRAPHY

The proposed lagoon site is situated on an area known as the Red River Plain Sub-Area. This area is a clay basin with local flood plains and river levees that occupy the flat depressional area, and was once covered by Glacial Lake Agassiz. Surficial deposits are composed of lacustrine clay and alluvial deposits which range from 15 to 60 m in thickness overlying a limestone and dolomite bedrock of the Ordovician period.

5.1.2 SOIL CONDITIONS

Except for TH5, the general soil profile reveals a topsoil layer of approximately 75mm to 200mm, followed by a thick, high plastic clay layer which extended to the bottom of the testholes at 4.6 m to 7.6 m below grade. The upper part of the thick clay layer was observed to be silty down to approximately 1.2 m to 4.1 m below grade. Traces of sulfates were also noted. For TH5, a silt layer of approximately 375mm thickness was observed above the clay layer.

Seepage and caving conditions were not observed during our investigation. However, saturated conditions should be expected from the silt seams or silty layers during the wet season (spring). Detailed descriptions of the soil conditions are available in the testhole logs, TH1 to TH15, attached in Appendix B of the Geotechnical Report.

5.1.3 GROUNDWATER

Based on the well logs and groundwater availability maps, groundwater bearing formations, or aquifers, are formed by the Ordovician carbonate bedrock aquifer and occasional sand and gravel seams within the till layer. The depth of the bedrock aquifer based on the well logs in this area (28-7-5 EPM & 29-7-5 EPM) range from 24 m to 30 m below grade. The yield usually is adequate to abundant for household and normal farm requirements (approximately 1.0 to 5.0 litres per second). Water quality in this aquifer ranges from fair to excellent potable water. Detailed well logs are attached in Appendix B of the Geotechnical Report.

A review of the Groundwater Pollution Hazard Map – Winnipeg Area shows that the existing lagoon and proposed development area are not located inside a groundwater pollution hazard area.

Based on the drainage map of the area, local ground water flow at the site is to the northwest towards the Manning Canal.

5.1.4 SITE INVESTIGATION

The selected area consists mainly of upper silty clay (0.1 to 4.1 m below grade) which may not meet the specified hydraulic conductivity of $1x10^{-7}$ cm/s. Beneath the silty clay is a high plasticity clay down to the depths explored. The two (2) samples (taken from the high plasticity clay layer) that were submitted for hydraulic conductivity testing achieved a test result of $7.25 x10^{-9}$ and $5.73x10^{-9}$ cm/s, thus meeting the guideline for a clay liner. The sampled clay material is a CL-CH material based on the Atterberg limit results.

5.2 DESCRIPTION OF PROPOSED DEVELOPMENT

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

5.2.1 PROPOSED AERATION CELLS

Three (3) new aeration cells will be constructed as illustrated in the EAP design drawings (Appendix 4) and will be located in southwest 28-7-5 EPM, east and slightly south of the existing cells. A connection will be made to the existing 150 mm diameter LPS and 300 mm forcemain, and both pipelines will be extended into new Primary Cell #1.

The proposed cells are designed with a 2.0 m (min.) wide clay core situated centrally within the perimeter dyke of the new lagoon footprint. The finished clay core will be continuous and will have a permeability of $1x10^{-7}$ cm/s or less, meeting the Manitoba Sustainable Development guidelines. The remainder of the dykes will be constructed with in-situ material. All embankments will be constructed in 150 mm lifts compacted to 95% Standard Proctor Dry Density.

An OPTAER™ fine bubble partial mix aeration system, designed and installed by Nexom Inc., will provide the necessary aeration to the proposed cells. Construction involves the installation of a header pipe from the new blower building to the new cells that will connect with floating laterals and suspended membrane diffusers.

Three phase power will need to be brought to site as the current system uses single phase power for the access gate system. Three phase power exists along Crown Valley Road East, approximately 400 m south of the site. Application will be made with Manitoba Hydro at the appropriate stage of design.

The proposed cells will be constructed with 5:1 interior side slopes and 4:1 exterior side slopes, and will have a normal operating depth of 4.0 m with a minimum 1.0 m freeboard. The interior dykes will be armoured with rip rap (or equivalent) to prevent erosion, but only for a 4.0 m length centred around the normal operating level. Table 5-1 provides the details for the preliminary design specifications for the new cells.

Table 5-1: Preliminary Design Specifications for the Proposed Aerated Primary Cells

PARAMETER	AERATED PRIMARY #1	AERATED PRIMARY #2	AERATED PRIMARY #3
Cell Bottom Dimensions	50.0 x 199.2 m	50.0 x 78.5 m	50.0 x 78.5 m
Cell Bottom Area	9,940 m^2	3,925 m^2	3,925 m^2
Liquid Surface Dimensions (at operating depth)	90.0 x 239.2 m	90.0 x 118.5 m	90.0 x 118.5 m
Liquid Surface Area (at operating depth)	20,990 m^2	10,665 m^2	10,665 m^2
Operating Depth	4.0 m		
Freeboard Height	1.0 m		
Interior Side Slope	5 hor. : 1 vert.		
Exterior Side Slope	4 hor. : 1 vert.		
Total Volume (at operating depth)	61,022 m^3	27,226 m^3	27,226 m^3
Hydraulic Retention Time (at 2040 design flows)	47.5 days	21.2 days	21.2 days
Liner System	Clay core		

At the back end of the three (3) aerated primary cells, a level control structure will be installed to maintain the liquid level in these cells. The level control structure will allow the primary treated effluent to be directed to any of the storage cells. This feature increases the operational flexibility of the system.

5.2.2 PROPOSED SECONDARY CELLS

The two (2) new secondary cells will be constructed as illustrated in the design drawings (Appendix 4). The new cells will be located in southwest 28-7-5 EPM, directly east of the new primary cells.

As with the proposed primary cells, the new storage cells are designed with a 2.0 m (min.) wide clay core situated centrally within the perimeter dyke of the new lagoon footprint. The finished clay core will be continuous and will have a permeability of $1x10^{-7}$ cm/s or less, meeting the Manitoba Sustainable Development guidelines. The remainder of the dykes will be constructed with in-situ material. All embankments will be constructed in 150 mm lifts compacted to 95% Standard Proctor Dry Density.

The proposed cells will be constructed with 4:1 interior and exterior side slopes, and will have a normal operating depth of 2.1 m with a minimum 1.0 m freeboard. The interior dykes will be armoured with rip rap (or equivalent) to prevent erosion. Table 5-2 provides the details for the preliminary design specifications for the new cells.

Table 5-2: Preliminary Design Specifications for the New Secondary Cells

PARAMETER	PROPOSED SECONDARY CELL #2	PROPOSED SECONDARY CELL #3
Cell Bottom Dimensions	Irregular	Irregular
Cell Bottom Area	88,958 m^2	47,450 m^2
Liquid Surface Dimensions (at operating depth)	Irregular	Irregular
Liquid Surface Area (at operating depth)	101,485 m^2	55,227 m^2
Operating Depth	2.1 m	
Freeboard Height	1.0 m	
Interior Side Slope	4 hor. : 1 vert.	
Exterior Side Slope		
Total Volume (at operating depth)	199,783 m^3	107,734 m^3
Dead Storage Volume (0.3 m depth)	26,924 m^3	14,397 m^3
Storage Volume	172,859 m^3	93,337 m^3
Liner System	Clay core	

5.2.3 EXISTING SECONDARY CELL 2A AND 2B DECOMMISSIONING

The original New Bothwell Lagoon was constructed in 1991 as a two-cell facility. In 2010, this small primary cell was converted into a secondary cell as part of the first expansion. These cells are significantly eroded, and in the opinion of the RM of Hanover, have reached their design life. As part of this EAP, these existing cells will be decommissioned. The year following when the new facility is operational, cells #2A and #2B will be isolated and discharged according to the parameters of the existing Licence. The biosolids will be allowed to dewater over the course of a dry summer period (2020 or 2021). Once dried, the biosolids will be hauled, placed and compacted above the dyke slope rip rap on the existing cells first, and secondly for the new cells, depending on quantity. Biosolids placement thickness will be approximately 0.2 to 0.3 m, as measured perpendicular to the dyke, and will serve to promote the establishment and growth of vegetation. The seed mixture will include alfalfa, which will utilize the available nutrients in the entire depth of biosolids placed. Alternatively, the RM, at their discretion, may choose to place all or a portion of the biosolids on the 30.86 ha (76.3 ac) piece of land they have purchased in NW 28-7-5 EPM. Placement on their land north of the proposed primary cells in SW 28-7-5 EPM is also an option. Sampling would be conducted on the biosolids and the receiving land to determine the maximum application rate. Any biosolids that would be placed on the RM land would be cultivated shortly thereafter.

GENIVAR (now WSP) representatives were onsite on December 9, 2009 to conducted biosolids measurements in these cells. More recent confirmatory measurements were taken on March 6, 2019. Based on the collective measurements, we anticipate that approximately 4,000 to 5,000 m^3 of biosolids will require dewatering and removal. At the same time, biosolids within cell #2A was sampled and submitted for various quality indicators. Results were not available at the time of the report submission.

Once removed, the no longer required dykes of these cells will be levelled (the north dyke will remain as part of the former primary cell), the area will be capped off with topsoil and be 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 (3) years once leveled.

5.2.4 EXISTING CELL MODIFICATIONS

As discussed in Section 5.2.3, the oldest two (2) cells of the current lagoon (secondary cell #2A and #2B) will be decommissioned as part of the construction activities associated with this project. The existing Primary Cell and Secondary Cell #1 will remain, but will undergo modifications.

These existing cells will be converted into a single secondary cell and take on the name Secondary Cell #1. A new intercell pipe will be constructed from the proposed aerated primary cells into what is now the existing Primary Cell. A 20 m segment of the shared dyke will be removed between these existing cells to join them together as one (1) cell. The joined cells will discharge from the existing discharge pipe in what is now existing Secondary Cell #1, although this pipe will be twinned with a new 300 mm gate valve and pipe to accommodate the larger volume.

The forcemain and LPS piping entering this combined cell will remain and will be capped off where the new forcemain connection is made (at the southwest corner of existing Secondary Cell #2A). The intercell pipe between the existing Primary Cell and the cells to be decommissioned will be capped off or removed.

Since the existing Primary Cell was constructed in 2010, accumulated biosolids should not be affecting its operation and will not require removal at this time. Confirmatory biosolids depth testing was conducted on March 6, 2019 in both cells and samples were collected from the existing Primary Cell to verify various quality indicators. Results were not available at the time of the report submission. Based on the measurements, the existing Primary Cell has an average depth of approximately 0.06 m. However, any buildup of biosolids around the existing truck dump ramp will be removed and placed in the cells to be decommissioned. The biosolids will be dealt with as discussed in Section 5.2.3. Existing Secondary Cell #1 has an average biosolids depth of approximately 0.03 m.

The truck dump ramp in the existing Primary Cell will be modified to serve as a boat ramp access to the joined cell in the event that chemical dosing is required in the cell.

5.2.5 EFFLUENT QUALITY

According to the Federal Wastewater Systems Effluent Regulations (WSER), the New Bothwell WWTL is considered an *Intermittent Wastewater System* as it has a hydraulic retention of at least 90 days, discharging at most four (4) periods per calendar year.

This type of wastewater system treatment lagoon must manage the release of the following deleterious substances:

(a) carbonaceous biochemical oxygen demanding matter;

(b) suspended solids;

(c) total residual chlorine; and

(d) un-ionized ammonia.

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

(a) the average carbonaceous biochemical oxygen demand due to the quantity of CBOD matter in the effluent does not exceed 25 mg/L;

(b) the average concentration of suspended solids in the effluent does not exceed 25 mg/L;

(c) the average concentration of total residual chlorine in the effluent does not exceed 0.02 mg/L, if chlorine, or one of its compounds, is used in the treatment of wastewater; and

(d) the maximum concentration of un-ionized ammonia in the effluent does not exceed 1.25 mg/L, expressed as nitrogen (N), at 15°C ± 1°C.

These parameters already appear in presently issued Environment Act Licences, bringing greater order and unity to the Provincial and Federal standards. Of note, these samples must be taken during discharge at the system's final discharge point. WSER also calls for acute lethality testing on the discharging treated effluent, with the sampling frequency dependent on the annual average daily volume.

The effluent quality will also be restricted to a fecal coliform limit, as indicated by the MPN index, of 200 per 100 ml.

There is little concern that a well-maintained lagoon system will have issues with meeting any of these conditions, with the exception of the phosphorus limit. Phosphorus will be managed with a chemical dosing system.

5.2.6 PHOSPHORUS REMOVAL

The RM of Hanover currently uses a boat delivery system to manage the phosphorus in their lagoons. The dosing chemical is delivered to site in a tanker. Their pontoon boat is equipped with a chemical storage tank and dosing equipment. After sampling is completed to confirm the dose required, the RM Public Works staff simply drive the boat around the isolated lagoon cell dosing and mixing chemical, refilling from the tanker when necessary.

The RM of Hanover desires an upgrade to the current phosphorus reduction system for the New Bothwell lagoon. A chemical injection system is proposed. Chemical precipitation and flocculation of orthophosphate will be performed by dosing aluminum sulfate or ferric chloride. A new blower building will be sized to house chemical storage, and be situated in a location that satisfies the aeration needs and in close vicinity to the dosing location. The chemical will be dosed into a rapid mix manhole and then conveyed into a slow mix manhole. The flow through the manholes will be gravity fed. Depending on the results of ongoing wastewater testing, a two (2) point alum delivery system may be necessary to achieve the 1.0 mg/L phosphorus limit, which will require some revisions to the design drawings (Appendix 4).

As currently proposed, settling of the precipitate will occur in Primary Cell #3. When the accumulation of chemical sludge dictates removal, it will be dredged from the cell and injected into the RM land in the west half of 28-7-5 EPM, at a sampling governed rate. We request that the EAL include clauses to this effect.

The RM desires to have boat ramp access constructed into the new secondary cells. This access will provide redundancy for the removal of phosphorus.

The phosphorus removal system is designed to reduce the total phosphorus in the discharged treated effluent to 1.0 mg/L or less. The design hydraulic loading over the extended lagoon storage period is 1,283.4 m^3/d. If extended over the entire year, which is a conservative estimate, the design phosphorus loading is 468.4 kg/year.

5.2.7 DISCHARGE ROUTE CHANGES

The construction of new aerated primary cells and new secondary cells will not alter the discharge point from existing Secondary Cell #1 (which is to be combined with the existing primary cell).

The new secondary cells will each have a dedicated discharge point on the south side which will flow into a constructed ditch. From the discharge point (end of pipe) of Secondary Cell #3, the effluent will flow 650 m west into the South Lateral Drain. At the point of entry, the new secondary cells' effluent is approximately 400 m upstream of the existing secondary cell's point of entry into the Drain. WSP has submitted a Provincial Waterway Authorization Application to Manitoba Infrastructure for a new culvert into the South Lateral Drain. Approval is pending.

All secondary cells will discharge treated effluent over the course of the allowable discharge period from June 15th to October 31st. The discharge route is illustrated in Figure 5-1 on the following page.

The existing lagoon facility and the proposed expansion are located within the Manning Canal Watershed (No. 7).

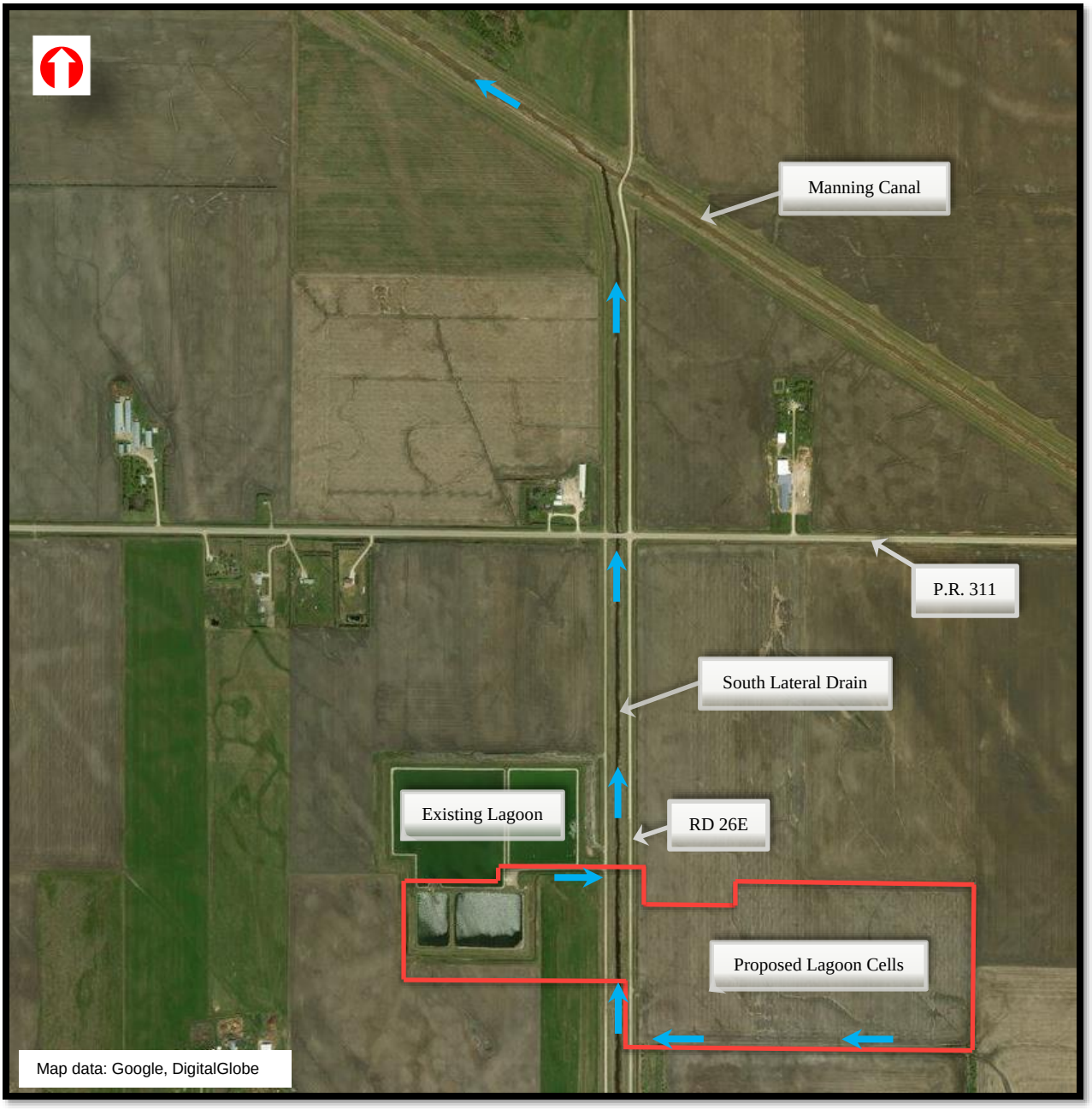

Figure 5-1: Effluent Discharge Route from the Proposed and Existing New Bothwell Lagoon Secondary Cells

5.2.8 CONSTRUCTION DETAILS

The expansion construction is based on the information and recommendations provided in the Geotechnical Report. According to the subsurface profiles in the Report, the depth of topsoil in the proposed area was approximately 75 to 200mm. Organic soil from the development area will be stripped, stockpiled and reapplied on the applicable disturbed areas at the end of construction.

Construction will be as detailed in the drawings. The dykes will be constructed with in-situ material in 150mm lifts compacted to 95% Standard Proctor density. The moisture content of the material should be minus two percent (-2%)

to plus three percent (+3%) of optimum moisture, as determined by the Standard Proctor test. Any unsuitable material such as coarse gravel and boulders should be removed. The top of the dykes will be at a minimum 3.0 m wide.

A perimeter drainage ditch will be constructed around the new cells, if required. Other ditching will be located as shown on the drawings. For disturbed areas where sediment or erosion control is deemed necessary, the contractor will be required to employ appropriate measures.

Rip rap or an alternative engineered armoring product is proposed for the dyke interiors and the inlet and outlet areas of the discharge piping. A perimeter fence will surround the new cells complete with main and secondary access gates and signage.

6 ENVIRONMENTAL IMPACTS

6.1 ODOUR CONSIDERATIONS

It is expected that the expanded facility will operate without causing any significant odour problems. The primary cells will provide the aeration and treatment necessary for the domestic and industry wastewater, as well as the truck hauled septage. The only time of the year that some minor odours may be present is during the spring while the ice thaws. In this regard, the odour present should be an improvement from the current facultative lagoon operation.

The closest residence to the lagoon is located approximately 340 m away (to the south), which meets the Manitoba Sustainable Development minimum setback distance of 300 m.

6.2 LAND IMPACT

The land selected for development is currently utilized for agriculture. No undeveloped land will be disturbed in the construction.

Section 2.3 should be consulted for additional information.

6.3 SURFACE WATER

From the discharge point into the South Lateral Drain, the treated effluent will flow approximately 1.8 to 2.2 km (depending on the discharge from the existing or new cells) before reaching the Manning Canal, and an additional 12.4 km in this Canal to the Seine River Diversion.

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

The existing lagoon and expanded lagoon facility are in the Manning Canal Watershed (No. 7).

Figure 5-1 illustrates the beginning of the discharge route in the specified watershed.

The Water Licensing Branch of Manitoba Water Stewardship was consulted to provide a list of water users along the drainage route. There are no licensed water users on the South Lateral Drain or Manning Canal. Correspondence is included in Appendix 5.

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 5.1.3 for information relating to groundwater.

6.5 SPECIES IMPACT

A file search with the Wildlife and Fisheries Branch of Manitoba Sustainable Development resulted in no occurrences in 28-7-5 EPM and 29-7-5 EPM. Within a 2-km boundary of these sections, Barn Swallow (*Hirundo rustica*) were documented. The search also commented on a broader area with similar habitat review that returned Bobolink (*Dolichonyx oryzivorus*). Correspondence is included in Appendix 5.

6.6 FISHERIES

According to the 2013 Milani Report, the receiving watercourse (South Lateral Drain) is considered type D habitat (simple habitat, no indicators present). The applicable section of the Manning Canal is type B habitat (simple habitat, indicators present). A map of the area is included in Appendix 5.

In order to protect any potential fish in the critical springtime spawning season, when effluent un-ionized ammonia tends to be high, the lagoon will discharge after June 15th and will allow for significant conversion of toxic un-ionized ammonia into relatively benign nitrates.

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.

The Forestry and Peatlands Branch of Manitoba Sustainable Development was contacted regarding forestry in the proposed area. The following information was supplied by the Regional Forester for the Eastern Region.

In terms of general comments the Rm of Hanover falls within Forest Management Unit 1 which has limited forest management activities at this time. Crown land parcels are typically reviewed on an as needed basis and comments would be provided for each request. Typically if timber exists on a Crown parcel where development is planned the route of disposition would be as follows:

- *Commercial Auction*
- *Timber Damage Appraisal to the applicant if no uptake on the Auction process.*

6.8 HERITAGE RESOURCES

From correspondence dated January 9, 2019 from the Historic Resources Branch of the Sport, Culture and Heritage Department of the Government of Manitoba (Appendix 5), it was stated that the potential to impact significant heritage resources has been deemed low in the area, therefore, the Historic Resources Branch has no immediate concerns with the proposed development.

It is understood that if heritage resources or human remains are encountered during any phase of development, work is to stop and the Manitoba Historic Resources Branch is to be contacted immediately. In the case of human remains, the RCMP will be notified.

6.9 SOCIO-ECONONIC 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 R.M. of Hanover.

6.10 PUBLIC INVOLVEMENT

Comments from concerned members of the public will be solicited as part of the Manitoba Sustainable Development review, prior to issuing a Licence.

7 MANAGEMENT PRACTICE

After expansion, the New Bothwell lagoon will be a six-cell facility. Three (3) aerated primary cells will provide adequate treatment for the projected 20-year needs of the Community, surrounding RM and BCI. One (1) [combined] existing secondary cell (1.5 m operating depth) plus the two (2) new secondary cells (2.1 m operating depths) will provide storage for beyond the 20-year projection as the RM has elected to construct the second storage cell to fill the area of SW 28-7-5 EPM that was purchased.

In total, the new lagoon facility will provide treatment for 641.38 kg-BOD_5/d and storage for 391,387 m^3.

Phosphorus reduction will be achieved by chemical injection and settling of the precipitate in Primary Cell #3.

The facility will be discharged during the allowable period from June 15th to October 31st.

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

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 of Hanover must also be in compliance with *Wastewater Systems Effluent Regulations* (WSER) and the associated reporting.

7.1.1 COMMISSIONING

After the construction involved in expanding the lagoon is completed, all of the new or modified systems will be commissioned. Commissioning will involve the aeration system, phosphorus removal system, overall lagoon system operation and lift station.

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 metres of the liquid.

Commissioning of the phosphorus removal system will occur once the cells are approved to receive wastewater from the Community (through the forcemain and LPS piping). 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.

The overall lagoon system and the lift station will be commissioned once all components are fully installed and operational.

7.1.2 DISCHARGE

The expanded lagoon facility will be capable of storing the wastewater from the discussed wastewater sources for 305 days at the design hydraulic loading (2040). Until the design loads are reached, the RM of Hanover will have considerable flexibility in discharging the treated wastewater. At the 2018 wastewater generation rates, the lagoon will provide storage capacity for the incoming wastewater for three (3) years.

The planned seasonal discharge from any of the secondary cells will be from June 15th through to October 31st. With three (3) secondary cells, the RM of Hanover has considerable flexibility in the management of the liquid levels in the cells in preparation for the first discharge. Even though it is preferable to lengthen a cells isolation time as much as circumstances allow, valve manipulation to isolate one (1) or more of the secondary cells must take place a minimum of three (3) weeks prior to June 15th. This schedule allows cell isolation for two (2) weeks (min.) prior to testing, and one (1) week to obtain the laboratory results. The other non-isolated secondary cells will continue to receive the primary treated effluent. Testing shall be conducted according to the current Environment Act Licence and the *Wastewater Systems Effluent Regulation* as outlined in Section 5.2.5.

Manitoba Sustainable Development generally requires treated effluent to have total suspended solids < 25 mg/L, BOD_5 < 25 mg/L, fecal coliform MPN of < 200 organisms/100 mL, and some nutrients removal requirements, which will be tested within the isolated cell(s). Once the test results of the effluent meet or exceed all requirements that should be satisfied prior to discharge, instituted by the new Environment Act Licence, the discharge of the isolated cell(s) will begin, no earlier than June 15th. The discharge of the secondary cells will be stopped at or before the November 1st deadline.

7.1.3 MAINTENANCE, RECORD KEEPING AND INSPECTION

The RM of Hanover already has a routine maintenance, record keeping and inspection schedule in place. There will be supplemental maintenance activities with the expansion of the lagoon. Generally, the maintenance list will include, but is not limited to, the following:

1. Lift station: regular operational checks along with routine pump maintenance.
2. Gate valves: exercised on an annual basis.
3. Aeration blowers: weekly operational checks along with routine maintenance and servicing.
4. Aeration diffusers: weekly sight checks to make sure bubble patterns are similar.
5. Cleaning of the aeration building intakes, as required.
6. Chemical: daily check on dosing system and weekly tank level check; reordering of chemical.
7. Level control manhole: weekly check during winter to remove any ice build up.
8. Maintaining the supply of spare consumable parts, accessories and equipment (filters, diffusers, etc.).

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

1. Daily Records: lift station flowmeter records should be collected and retained for future estimation of flows to the WWTL. Septic hauling records (dates and volumes) from the individual haulers trucking to the lagoon should also be collected and retained.
2. Weekly Records:
    a. The summer inspection would consist of recording the following:
        i. the water level;
        ii. presence of odours and their source; and
        iii. presence of floating objects (removal).

        The summer maintenance should also include grass cutting on the dykes, if necessary, elimination of emergent vegetation, extermination of burrowing animals, repair of the dykes and rip rap if damaged by wind erosion and wave action, and repair of the fence and gate.
    b. Year-round inspection would consist of recording the following:
        i. levels in the chemical and water supply tankage;
        ii. blower hour readings; and
        iii. appearance of aeration bubbles.
3. Periodic winter inspection is confined to inspecting for frozen piping, checking if the water level in the cells is as it should be.
4. 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 July of 2019, and tendering of the project will begin immediately afterwards (Figure 8-1). Construction is proposed for 2019-20 with decommissioning of the oldest lagoon cells taking place in 2020-21.

The project funding will be a joint effort between BCI and the RM of Hanover through designated municipal reserves. The RM of Hanover has reached out to the Manitoba Water Services Board as a potential project funder to no avail. Any other grant funding that may be available will also be pursued.

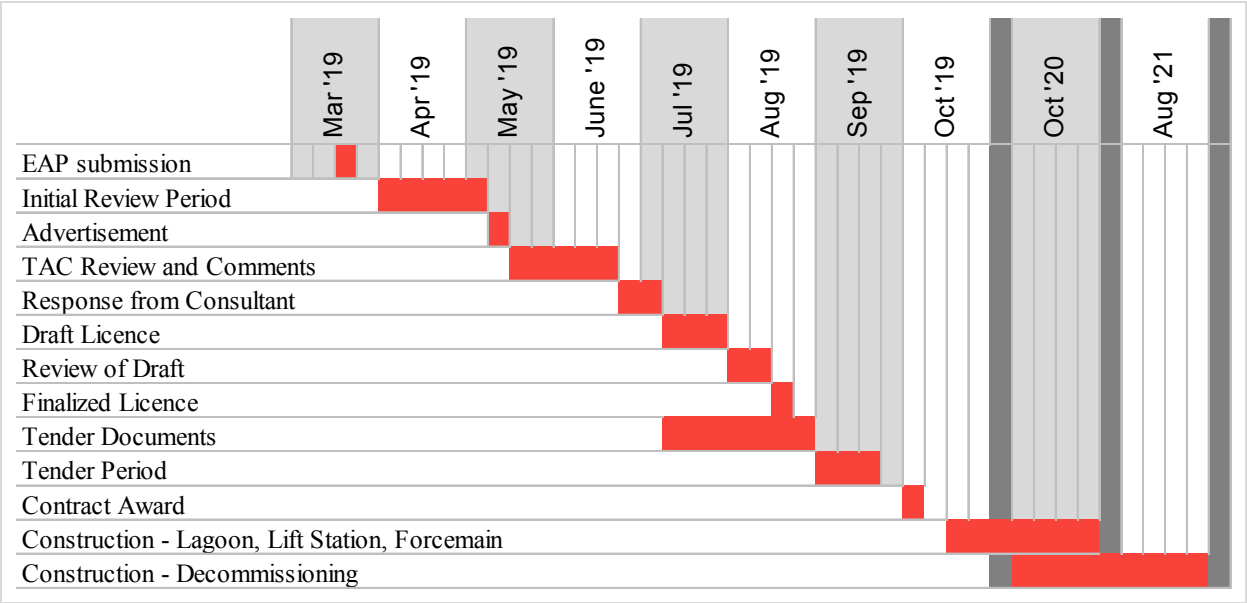

Figure 8-1: Schedule - EAP Submission to End of Construction

9 REFERENCES

- Government of Canada, 2015. *Wastewater Systems Effluent Regulations*. Minister of Justice. SOR/2012-139. 80 p.
- Milani, D.W. 2013. *Fish community and fish habitat inventory of streams and constructed drains throughout agricultural areas of Manitoba (2002-2006)*. Can. Data Rep. Fish. Aquat. Sci. 1247: xvi + 6,153 p.
- United States Environmental Protection Agency, 2002. *Onsite Wastewater Treatment Systems Manual*
- Statistics Canada. 2017. *Hanover, RM [Census subdivision], Manitoba and Division No. 2, CDR [Census division], Manitoba* (table). *Census Profile*. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed January 10, 2019).
- Government of Canada, 2015. *Fisheries Act*. Minister of Justice. R.S.C., 1985, c. F-14. 61 p.