

R.M. OF MACDONALD

COMMUNITY OF LA SALLE WASTEWATER FEASIBILITY STUDY

FEBRUARY 20, 2025

FINAL REPORT





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R.M. OF MACDONALD

FINAL REPORT

PROJECT NO.: CA0020151.8333

DATE: FEBRUARY 20, 2025

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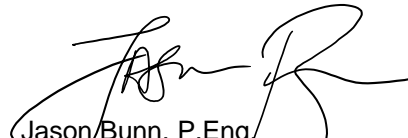
Subject: Community of La Salle Wastewater Feasibility Study

Dear Mr. Hrehirchuk:

WSP Canada Inc. is pleased to submit our final version of the community of La Salle Wastewater Feasibility Study for your use. We acknowledge and appreciate the co-operation and assistance received from the Municipality in completing this feasibility study.

Thank you for another opportunity to provide engineering support for the Municipality's infrastructure. Please contact us should you have any questions.

Kind regards,



Jason Bunn, P.Eng.
Senior Wastewater Engineer

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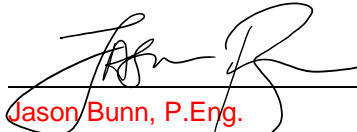
REVISION HISTORY

FIRST ISSUE

January 17, 2025	DRAFT		
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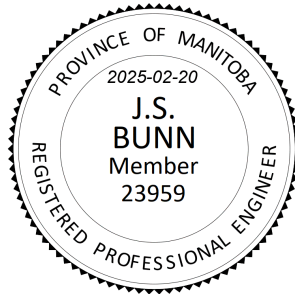
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- B** LIFT STATION DRAWDOWN TESTS

EXECUTIVE SUMMARY

The La Salle lagoon was last expanded in 2014. With the steady growth within the Community, in 2023 the RM of Macdonald requested a wastewater treatment lagoon capacity assessment be completed to determine the current status with regard to the organic (treatment) capacity and the hydraulic (storage) capacity. The assessment concluded that the lagoon currently (2023) operates at 90% of its organic capacity and 77% of its hydraulic capacity, respectively. Additionally, as of 2023, the assessment documented that there were approximately 634 RM-approved lots (or equivalent residential units) of which only about 155 of them could be serviced by the existing lagoon.

The lagoon capacity shortfall prompted the RM to retain WSP to complete a feasibility study to consider five expansion options for the treatment and storage of the La Salle wastewater until the year 2047. The five options deal with conceptual plans for the expansion of the existing lagoon site, construction of a new lagoon at an alternate location, and diversion of the wastewater to the expanded Oak Bluff lagoon facility.

To aid in the population forecasting, WSP met with local developers to discuss their future plans for the La Salle area and in discussions with the RM selected a growth rate of 50 building permits per year over the study period, resulting in a population of 7,501 people for the year 2047.

With the goal of establishing a wastewater generation rate from the community of La Salle, both the lift station data and customer water metering were reviewed. For the lift stations, drawdown tests were completed at the Kingswood lift station and Prairieview 1 lift station. However, the results of these drawdown tests combined with discrepancies and other inconsistencies in the SCADA data ultimately led to a lack of confidence in the data collected and with agreement from the RM, WSP defaulted to using the selected 250 litres per capita per day wastewater generation rate that was used in the 2023 Lagoon Capacity Assessment.

The wastewater loading from each lift station area within the Community was determined and projected for the study period which included the plans for development in the surrounding areas. Of the five options that were considered, Option 1 which is the expansion of the existing La Salle lagoon with an opinion of probable cost of \$6,381,000 was the recommended course of action.

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by the Rural Municipality of Macdonald (RM) in January 2024 to provide engineering services to complete a wastewater feasibility study to evaluate the wastewater treatment and storage options for the community of La Salle.

1.1 PROJECT CONTEXT

The main driver for this project is the sustained growth experienced in the community of La Salle and the need to consider options for the community's wastewater treatment and storage once the existing wastewater treatment lagoon reaches its capacity.

1.2 BACKGROUND

The existing La Salle wastewater treatment lagoon is located east of the Community in 27-8-2 EPM. It is bordered on all sides by agricultural land and the lagoon itself is in an area designated as an Environmental Policy Area as per the Macdonald-Ritchot Planning District Development Plan – Map 2 (February 2023). This map is included in [Appendix A](#).

The 35-hectare lagoon facility receives wastewater from both a gravity sewer system and a low pressure sewer system as well as truck-hauled wastewater from septic tanks all within the community of La Salle (the Oak Bluff lagoon is the designated municipal lagoon to receive outside truck-hauled wastewater and septage). A breakdown of the four lift stations and forcemain network follows:

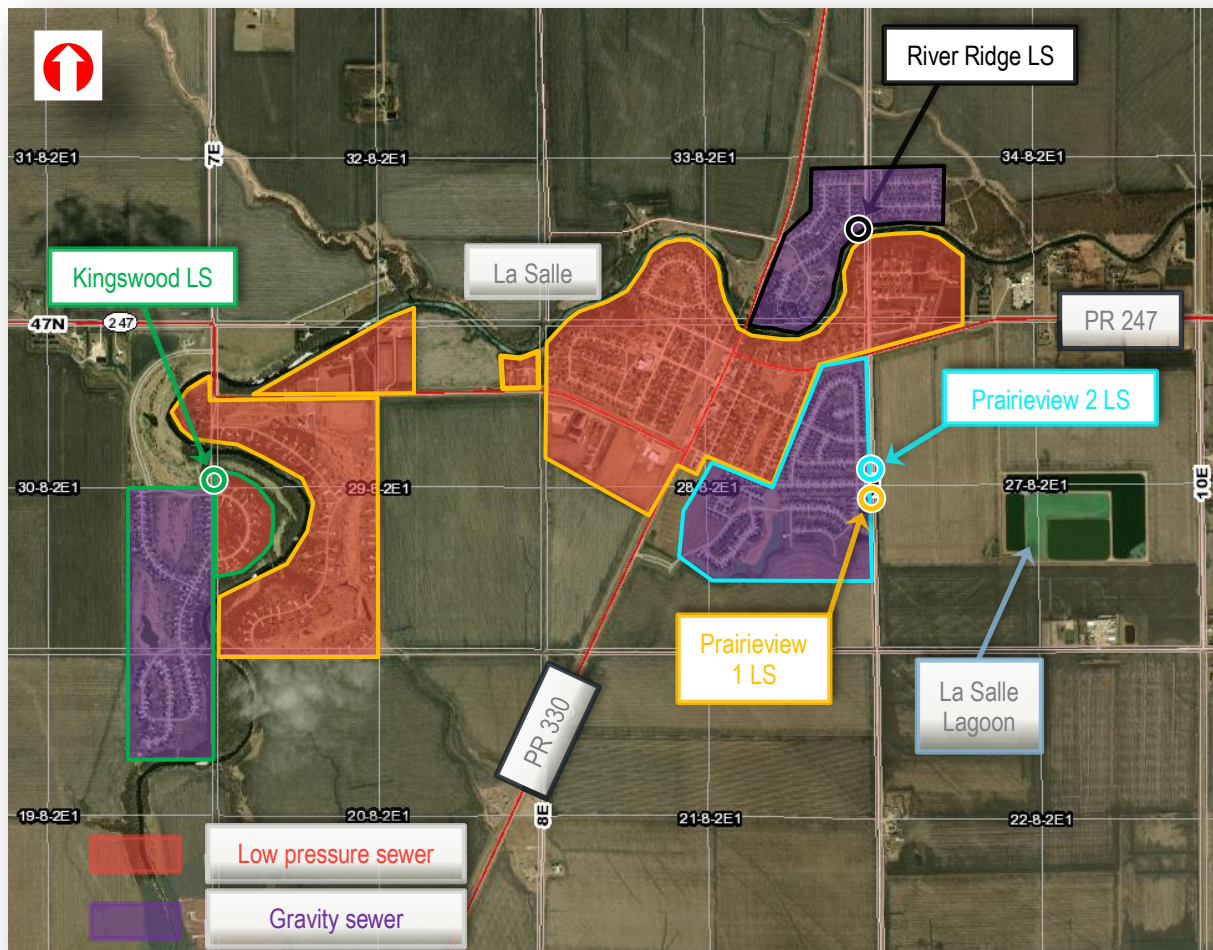
- Prairieview lift station 1 (2438 mm diameter barrel) and forcemain (250 mm diameter) from La Salle.
- Prairieview lift station 2 (2438 mm diameter barrel) and forcemain (150 mm diameter) from La Salle.
- Kingswood lift station (2134 mm diameter barrel) and forcemain (200 mm diameter) from the Kingswood development that discharges into Prairieview lift station 1.
- River Ridge lift station (1524 mm diameter barrel) and forcemain (150 mm diameter) from the River Ridge development.

A recent capacity assessment was completed in September 2023 for the La Salle lagoon. As identified in the assessment, the lagoon is currently (2023) operating at 90% of its organic capacity and 77% of its hydraulic capacity. Under the assumptions and calculations identified in the report, the lagoon can accommodate development until approximately 2026 organically and 2031 hydraulically, based on the growth projections. However, the organic capacity may be extended to 2031 if the RM is able to change the administration of the septic tank emptying program by reducing peak loading conditions.

Residential development steadily continues within the community of La Salle. From discussions with local developers (Pfrimmer Developments and Ventura Land Company Inc.) in April 2024, they have indicated a willingness and the ability to continue this development beyond the 20-year design outlook that will be considered in this Study.

Figure 1-1 illustrates the location of the community of La Salle and the four lift stations (LS) in relation to the wastewater treatment lagoon. The catchment areas of each lift station have borders that are colour-

coordinated with the lift station. The gravity and low pressure sewer areas are shaded to identify their location.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 1-1: Location Map of the Community of La Salle, Lift Stations, Gravity Sewer Areas, Low Pressure Sewer Areas, and the Existing Lagoon

1.3 SCOPE OF STUDY

The following is a brief summary of the study scope and the sections of the study where the information is found.

- 1 (**Section 2.1**) Determination of the existing treatment (organic) and storage (hydraulic) capacities of the La Salle lagoon.
- 2 (**Section 3.0 & 4.0**) Review of the population and loading from all applicable sources to be serviced by the La Salle Lagoon in five-year increments concluding with the 20-year design.
 - a (**Section 3.1.3**) WSP will meet with the area developers to assess their development objectives for a 20-year outlook.

- 3 **(Section 4.2)** Review of the available pump hours, including an updated drawdown test at all four lift stations to confirm the pumping rates if the RM has resolved the lift station issues.
 - 4 **(Section 4.2.5)** Calculation of a wastewater generation rate for the community of La Salle if lift station information is available, otherwise, the previously assumed value will be utilized.
 - 5 **(Section 6.0)** Lift station and forcemain requirements for 20-year design loading.
 - 6 **(Section 6.0)** Review and evaluation of 5 options for expansion:
 - a Option 1: Expansion of the existing lagoon to the north of the current facility.
 - b Option 2: Retaining the existing lagoon and constructing a new lagoon facility in 21-8-2 EPM.
 - c Option 3: Construction of a new lagoon in 21-8-2 EPM and decommissioning of the existing facility.
 - d Option 4: Construction of a new lift station and forcemain to divert the wastewater from the River Ridge developments, Prairieview lift station 2, and Ventura north future developments in La Salle to the proposed expanded lagoon facility in Oak Bluff.
 - e Option 5: Construction of a new lift station and forcemain to divert all of the wastewater from La Salle to the proposed expanded lagoon facility in Oak Bluff and decommissioning of the existing facility.
 - 7 **(Section 6.0)** Opinion of probable costs (Class 4) for each option and recommendation.
-

1.4 INFORMATION REVIEW

In completion of the assessment, WSP reviewed the following information:

- 2023 Community of La Salle Wastewater Treatment Lagoon Capacity Assessment (WSP).
- 2023 Letter from Statistics Canada to the RM of Macdonald regarding the 2021 Census Population Correction.
- 2014 Environment Act Proposal: R.M. of Macdonald – Community of La Salle Wastewater Stabilization Pond Expansion (WSP).
- 2014 La Salle Lagoon Environment Act Licence No. 2674 R.
- 2016 R.M. of Macdonald Community of La Salle Wastewater Stabilization Pond Expansion Record Drawings (WSP).
- 2011 La Salle Lagoon Capacity Assessment (GENIVAR).
- Lift station VTScada data:
 - Kingswood: May 26, 2020 – June 15, 2024.
 - Prairieview Lift Station 1: June 15, 2020 – June 15, 2024.
 - Prairieview Lift Station 2: November 26, 2020 – August 11, 2024.
- RM building permits by year: 2006-2023.
- 2019-2023 Quarterly water consumption information.

2 EXISTING LAGOON

The La Salle wastewater treatment lagoon is a facultative lagoon consisting of one primary treatment and three storage cells and is located in portions of all four quarter sections of 27-8-2 EPM with an approximate area of 35 ha. The lagoon has been expanded several times since it was first constructed and now operates under Environment Act Licence No. 2674 R, issued on April 11, 2014 [1]. The latest licence revision was issued as part of the most recent lagoon expansion which began in the summer of 2014 and was commissioned in the summer of 2015. This construction involved increasing the organic (treatment) and hydraulic (storage) capacities of the lagoon to serve a population of 4,809 by:

- combining and expanding the 2 existing primary cells into one cell to increase the treatment capacity; and
- construction of a new secondary cell to increase the storage capacity.

At the time of the Environment Act Proposal report submission (January 2014) to acquire the licence to expand the lagoon [2], a population of 4,809 equated to 1,551 homes or equivalent residential units (ERU).

2.1 EXISTING LAGOON PARAMETERS

The two main factors to consider for lagoon design are the organic (treatment) capacity and the hydraulic (storage) capacity. For a facultative lagoon, the treatment capacity is determined by the liquid surface area provided by the primary cell, whereas the storage capacity is determined by the volume of the cells. Table 2.1 lists the surface areas, the total volumes and the storage volumes of the existing cells, which were calculated from the 2016 Record Drawings using 4:1 (horizontal : vertical) side slopes and maximum operating depths of 1.5 metres.

Table 2.1 Existing La Salle Wastewater Treatment Lagoon Cell Capacities

Cell	Surface Area [ha]	Total Volume [m ³]	Storage Volume [m ³]
Primary Cell	6.61	92,770	46,385
Secondary Cell 1	2.34	31,930	26,030
Secondary Cell 2	6.02	85,880	69,400
Secondary Cell 3	11.64	164,900	133,475
Total	26.61	375,480	275,290

2.1.1 EXISTING TREATMENT CAPACITY

The ability of a lagoon to treat the incoming wastewater is a measure of organic loading (or treatment) 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 (BOD₅). The organic loading becomes the total mass of BOD₅ in kilograms per day (kg/d) in the wastewater discharged to the lagoon.

According to Manitoba Environment and Climate Change design guidelines, a primary treatment cell requires one hectare of liquid surface area per 56 kg-BOD₅ daily loading [3]. From Table 2.1, the existing

primary cell has a surface area of 6.61 ha and therefore it provides a treatment capacity of **370.16 kg-BOD₅/d**.

2.1.2 EXISTING STORAGE CAPACITY

The ability of a lagoon to store the incoming wastewater is a measure of its hydraulic loading (or storage) 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 lagoon facility.

Manitoba Environment and Climate Change stipulates that only half of the total volume of the primary cell contributes to the storage of the facility [3] so in calculating the storage volume from this cell, it was taken as half of the total volume. The storage volumes for the secondary cells were calculated as the volume of liquid the cells contain above the invert of the discharge pipes up to the maximum operating depth of 1.5 metres. From Table 2.1, the La Salle lagoon provides a storage capacity of **275,290 cubic metres (m³)**.

3 EXISTING AND FORECASTED POPULATION

Wastewater treatment lagoons are sized based on the populations and wastewater sources they service. Gaining an understanding of the historical populations and then forecasting a 20-year design population is standard practice for lagoon studies. The community of La Salle has experienced significant growth dating back to at least the 2006 census year. This growth led to the lagoon expansion in 2014 and has triggered this study to consider the future wastewater treatment needs of the Community. It is important to note that the lagoon expansion completed in 2014 was not a 20-year growth projection. The expansion involved utilizing the current land available to provide a balance of treatment and storage capacity with the understanding that the next step would involve purchasing land or diversion of the wastewater to an alternate facility.

For this study, the forecasting will be aligned with a recent study completed for the community of Oak Bluff which was for a 25-year period (2022-2047). Therefore, the population projections and associated capacities will be presented for the year 2047.

3.1 EXISTING WASTEWATER SOURCES

The La Salle lagoon services the wastewater generated by the community of La Salle. Additionally, the Environment Act Proposal report submitted in January 2014 [2] accounted for the bussed-in-students which resulted in a small increase to the overall population (referred to as an equivalent population). There are no known significant industrial or high-strength wastewater contributors to account for within the Community.

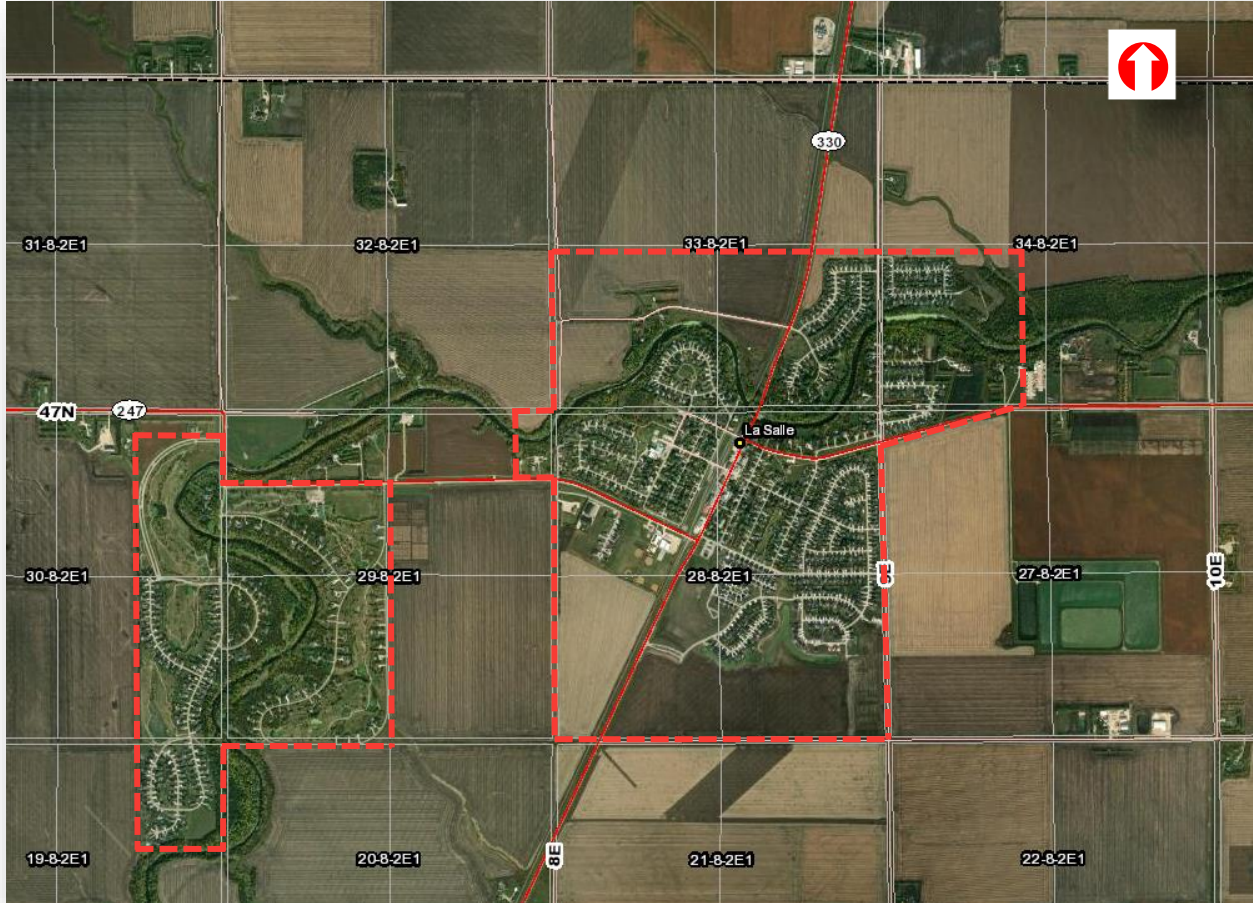
When reviewing the wastewater sources contributing to a lagoon, truck-hauled wastewater must also be considered. Within the RM, the Oak Bluff lagoon is the designated municipal lagoon to receive truck-hauled wastewater and septage. Therefore, apart from the low pressure sewer connections within La Salle which inherently have a septic tank, there is no additional wastewater and septage hauled to the lagoon from the surrounding rural areas of the RM.

3.1.1 BUSSED-IN-STUDENTS

Bussed-in-students are typically calculated separately from the population base because they reside outside of the boundary of the Community that is serviced by the wastewater collection system. The 2014 Environment Act Proposal report numbered the bussed-in-students to be 21 and for the purposes of calculating the wastewater loading from these students, a ratio of 3:1 (3 bussed-in-students equates to 1 person in a dwelling) was used to arrive at the number of 7.

WSP contacted the Transportation Department of the Seine River School Division to inquire about the number of bussed-in-students transported from outside of the urban areas which are identified with a red border in Figure 3-1. For the 2023-2024 school year, there were 10 bussed-in-students from outside the boundary areas. Using the 3:1 ratio, the equivalent population for bussed-in-students is approximately 3.

La Salle is in the Winnipeg Metropolitan Region, and it is known that a segment of the people living in La Salle also commute for work outside of La Salle. For this report, we will assume that commuters offset any potential impact of adding a minimal amount of bussed-in-students and therefore, the population will not be adjusted.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 3-1: Rural Area Bussed-in-students Boundaries for the Community of La Salle

3.1.2 COMMUNITY OF LA SALLE

Since 2011, Statistics Canada has provided detailed census information on the community of La Salle which it lists as an unincorporated urban center [4] [5] [6] [7]. Table 3.1 illustrates the 2006-2021 Statistics Canada census populations, growth percentages, occupied private dwellings and the persons per occupied private dwelling for the community of La Salle.

Table 3.1 Summary of Statistics Census Data for La Salle from 2006-2021

Census Year	Population	5-Year Growth Rate	Occupied Private Dwellings	Persons per Occupied Private Dwelling
2006	1,450	n/a	465	3.12 ^{*1}
2011	1,957	35.0%	606	3.23
2016	2,069	5.7%	637	3.25
2021 Original ^{*2}	2,687	29.9%	854	3.15
2021 Revised ^{*3}	3,406	n/a	1,082	3.15

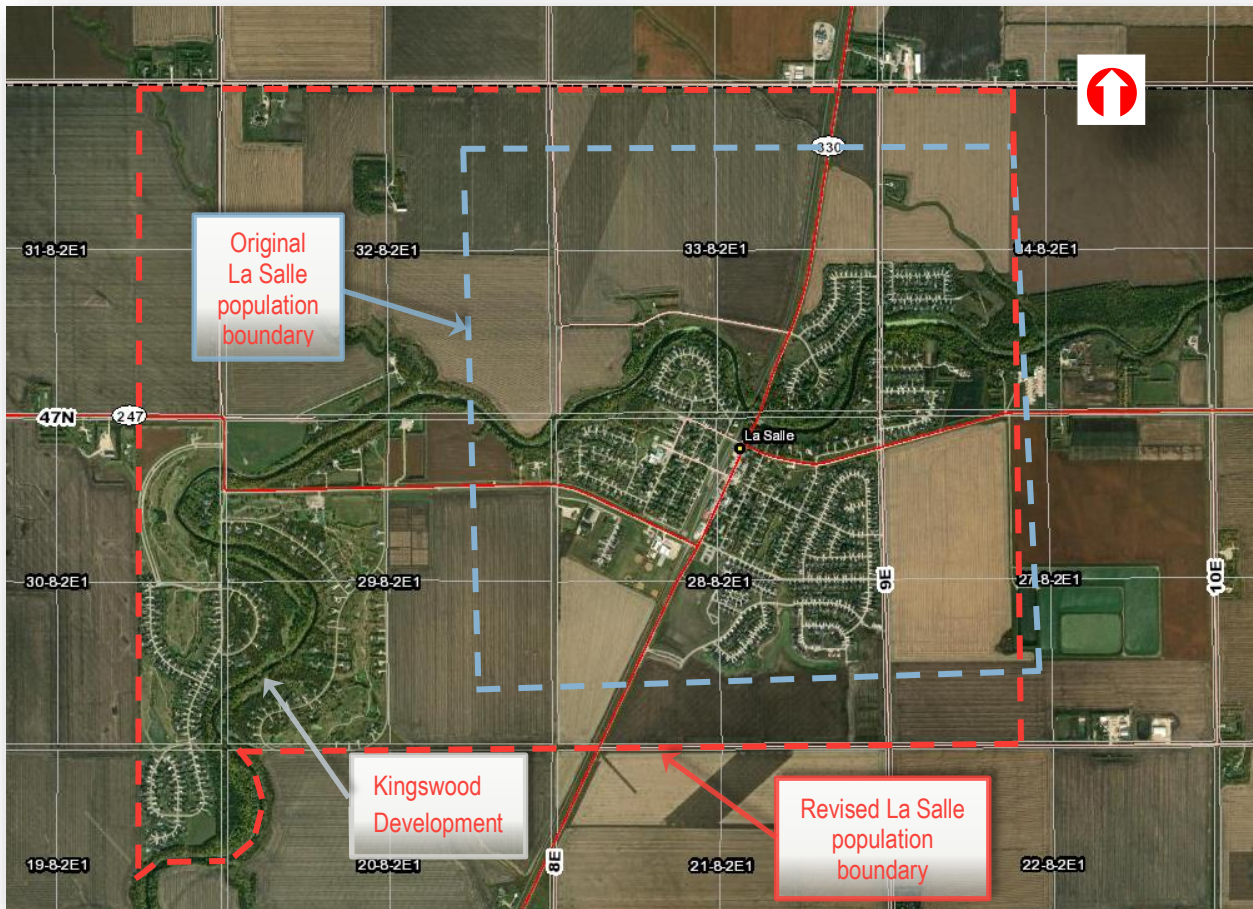
^{*1} Based on data for the entire RM as La Salle specific data was not available for the 2006 census.

^{*2} Based on the original release of the data from Statistics Canada for La Salle.

^{*3} Based on the August 14, 2023 letter from Statistics Canada with revisions to the La Salle population to include Kingswood.

As shown in Table 3.1, the La Salle population in 2021 was 2,687 people along with 854 occupied private dwellings which corresponds to approximately 3.15 persons per dwelling (or per ERU). However, the original release of the Statistics Canada data did not include the La Salle population that resides in the Kingswood area, nor did the previous Census data releases. The original census population boundary for La Salle is illustrated in Figure 3-2.

Table 3.1 also shows the *revised* La Salle population in 2021 as updated by Statistics Canada [8], which totalled 3,406 people along with 1,082 occupied private dwellings which corresponds to approximately 3.15 persons per dwelling. This revised boundary is also shown in Figure 3-2. It is noted that there are several rural residences within the boundary, but they are considered negligible in terms of their impact on the calculations. Of these 1,082 private dwellings, the RM has advised that 537 (49.6%) of these dwellings are connected to the low pressure sewer system and the other 545 (50.4%) dwellings are connected to the gravity sewer system.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 3-2: Original and Later Revised Statistics Canada Population Boundary for the Community of La Salle Population Forecasting

With the fluctuating 5-year growth rate percentages within the Community since at least 2006 (Table 3.1), forecasting the 2047 population is more difficult. Typically, forecasting population growth involves looking at the historical census populations and assigning a probable growth percentage. Before completing a population growth exercise for the community of La Salle, we first reviewed the local developer plans and housing starts in the area to confirm that our projected population growth is congruent.

3.1.3 LOCAL DEVELOPERS

To aid in the population forecasting process, the RM requested that WSP meet with two local developers, Pfrimmer Developments and Ventura Land Company Inc. to discuss their future plans for the La Salle area. Each developer has short, medium and long-term development plans for the area and each area is identified in Figure 3-3 with added detail in Table 3.2.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 3-3: Local Development Plan for the Community of La Salle

Table 3.2 Local Developer Plans for the Community of La Salle

Figure 3-3 Identifier	Quarter Section	Developer	Area, ha (ac)	ERUs (low limit)	ERUs (upper limit)	Timeframe, years
1	NE 29-8-2 E, NW 29-8-2 E	Pfrimmer	23.5 (58)	150 ^{*1}	170 ^{*1}	3-5
2	NE 30-8-2 E	Pfrimmer	4.6 (11.3)	50	50	3-7
3	34-8-2 E, NW 35-8-2 E, SW 35-8-2 E	Pfrimmer	147 (363)	1500	2000	10-15 ^{*2}
4	SW 28-8-2 E	Ventura	19 (47) ^{*3}	150	150	10-15
5	SE 28-8-2 E	Ventura	29.1 (72)	400	400	10-15
6	NE 33-8-2 E	Ventura	9.7 (24)	120	200	10-15
7	NW 34-8-2 E	Ventura	20.2 (50)	175	200	10-15
Total (1-7)			253 (625) ^{*4}	2,545	3,170	
Total (1,2,4-7)			106 (262)^{*4}	1,045	1,170	

^{*1} Does not include the 150 ERUs previously approved for this specific area.

^{*2} The RM is of the opinion that the development of this parcel of land is beyond the study timeframe and therefore it will not be included in the totals used for the study.

^{*3} This area was included in Table 4.2 of the 2023 La Salle Lagoon Capacity Assessment as Prairieview South with 137 lots. Therefore these ERUs are categorized as approved unoccupied lots.

^{*4} Rounded to the nearest hectare and acre

In total, there are 253 hectares (625 acres) targeted for development between these two developers, however, only 106 hectares (262 acres) are believed by the RM to be within the timeframe of this study. The range of ERUs from these 106 hectares of developments is 1,045 – 1,170 ERUs, which equates to an added population of 3,292 – 3,686 (using 3.15 people per ERU).

3.1.4 HOUSING STARTS

The RM was consulted on their building permits since 2006 to use this information to guide the forecasting of the future development within La Salle, which includes the Kingswood Development. These building permits, as shown in Figure 3-4, are indicative of the housing starts each year and can be equated to population growth within the Community.

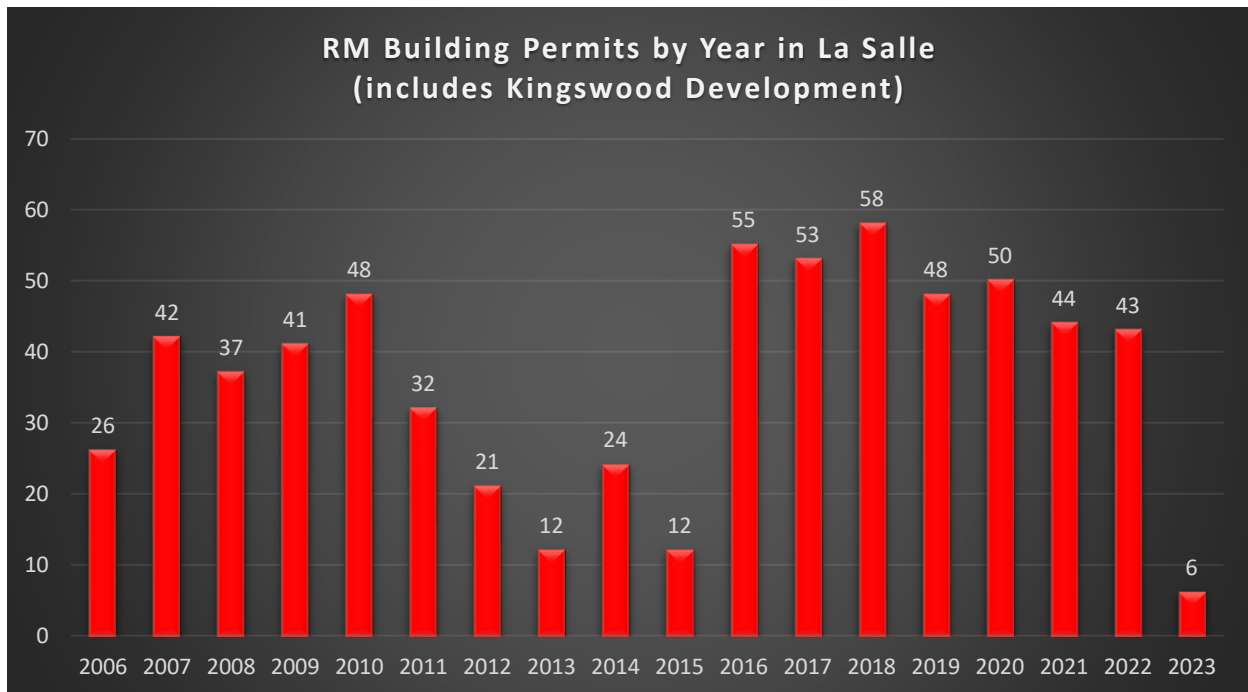


Figure 3-4: Local Development Plan for the Community of La Salle

While there is variability from year-to-year in the building permits, the more recent data from 2016-2022, has a 7-year average of approximately 50.

The Statistics Canada Census data provides insight into the development of *occupied private dwellings* for La Salle, but as previously mentioned, this original data does not include Kingswood, so it is not directly comparable. From Table 3.1, the *occupied private dwellings* grew from 465 in 2006 to 854 in 2021, or an increase of 389 occupied private dwellings. Whereas the data from the building permits over the same period shows an increase of 603. While the Kingswood development will account for a portion of the difference, it is uncertain why the building permits are 55% higher than the increase seen in the *occupied private dwellings*.

3.1.5 POPULATION GROWTH SCENARIOS

In discussions with the RM, WSP developed several scenarios to account for various growth projections. Table 3.3 identifies three growth scenarios that were presented to the RM for consideration. The 2021 revised population (census year) is used as the starting point.

Table 3.3 La Salle 2047 Growth Scenario Options

Year	Scenario 1		Scenario 2		Scenario 3	
	Population	Percent Growth	Population	Percent Growth	Population	Percent Growth
2021	3,406	n/a	3,406		3,406	
2022		18.00%		23.12%		21.57%
2023						
2024						
2025						
2026	4,019		4,194		4,141	
2027		18.00%		18.78%		21.57%
2028						
2029						
2030						
2031	4,743		4,981		5,034	
2032		18.00%		15.81%		21.57%
2033						
2034						
2035						
2036	5,596		5,769		6,120	
2037		18.00%		13.65%		21.57%
2038						
2039						
2040						
2041	6,603		6,556		7,440	
2042		18.00%		12.01%		21.57%
2043						
2044						
2045						
2046	7,792		7,344		9,044	
2047	8,073	3.60%	7,501	2.14%	9,404	3.98%

Scenario 1 assumes a growth rate of 18.0% per 5-year period which reflects the outcome of sustaining the average growth rate experienced in La Salle from 2011-2021 (by percent) over the study period, resulting in a 2047 population of 8,073, or an increase of 4,667 people. This percent increase is based on the original 2021 census population.

Scenario 2 represents the constant growth of 50 building permits per year over the study period. Using 3.15 persons per occupied dwelling equates to an annual increase of 157.5 people per year, for a 2047

population of 7,501, or an increase of 4,095 people. For this scenario, the percent growth rate is steadily decreasing because of a set population increase.

Scenario 3 was of interest because it illustrates the average growth if La Salle was to accommodate the 734 approved lots (year 2021) plus an additional 1,170 lots, which was the upper limit proposed by the local developers. Using 3.15 persons per occupied dwelling equates to an additional 5,998 people by the year 2047, which is an approximate growth of 21.57% per year.

The RM elected to pursue growth Scenario 2 as the most realistic approach to this study, which results in a 2047 population of **7,501**.

4 WASTEWATER GENERATION

With an understanding of the historical, current and forecasted populations, the subsequent step involves calculating a wastewater generation rate attributable to the Community. There are many methods that can be utilized to determine a wastewater generation rate for a population base. In the absence of any data, a rate can be assumed based on the local knowledge of an area as well as its existing infrastructure. Advantageously, the community of La Salle is serviced by both metered water and sewer lift stations. Each data set offers a method for determining a per capita wastewater generation rate and both are explored further in this study.

4.1 CUSTOMER WATER METERING

The RM provided information from 2019-2023 for the metered water usage by the La Salle residences from the Macdonald regional water treatment facility located in Sanford. Figure 4-1 illustrates the La Salle metered water usage in cubic metres by quarter for these years.

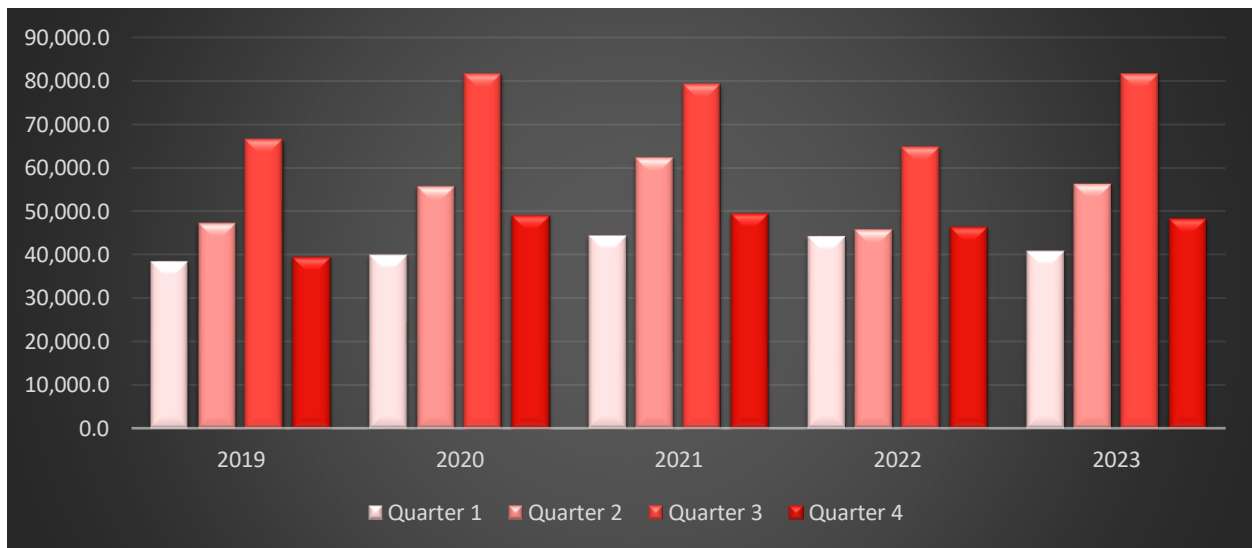


Figure 4-1: La Salle Quarterly Water Usage for 2019-2023 (in cubic metres)

As depicted by the chart, Quarter 1 and Quarter 4 indicate a baseline flow for the population with Quarter 3 and a portion of Quarter 2 accounting for summer usage increases (pools, gardens, lawns, etc.).

Incorporating the population component with the water consumption allows for a determination of a per capita water usage rate which can be used as a comparison against the wastewater generation rate. For the purpose of this study, we are primarily interested in the time period when the lagoon is required to store the wastewater, that being from November 1st through to June 15th of the following year. However, because the data is only available by quarter, we will use Quarters 1, 2 & 4 to represent the lagoon storage period.

Table 4.1 documents the La Salle water usage and population for the community of La Salle and the associated annual water usage rates and the lagoon storage period water usage rates in litres per capita per day [L/c/d].

Table 4.1 2019-2023 La Salle Per Capita Treated Water Usage

Year	Population ^{*1}	Water Usage - Annual [m ³]	Per Capita Water Usage - Annual [L/c/d]	Per Capita Water Usage - Lagoon storage period ^{*2} [L/c/d]
2019	3,091	191,627.0	169.8	148.2
2020	3,249	226,129.7	190.2	163.0
2021	3,406	235,212.2	189.2	167.7
2022	3,564	201,115.1	154.6	140.1
2023	3,721	226,836.5	167.0	143.0
Average	3,406	216,184.1	173.9	152.4

^{*1} Population is based on the census population for 2021 and the growth rate from Scenario 2 (See Table 3.3).

^{*2} Lagoon storage period was approximated using the available information from Quarters 1, 2 & 4.

Generally using the metered water usage as the wastewater generation rate is a conservative approach unless extraneous flows entering the sewer collection system are significant. These extraneous flows are usually the result of groundwater infiltration into septic tanks and gravity sewer collection systems or the connection of weeping tiles into the collection system. From the above table, the average annual per capita water usage is 173.9 L/c/d, with a peak value of 190.2 L/c/d in 2020. The average per capita water usage is 152.4 L/c/d during the approximated lagoon storage period, with a peak of 167.7 L/c/d occurring in 2021. Typically, the starting point for infrastructure design is 250 L/c/d, so these values are lower than anticipated. However as stated previously, La Salle is in the Winnipeg Metropolitan Region, and it is known that a segment of the people living in La Salle also commute for work outside of La Salle and therefore lower per capita usage is reasonable.

4.2 LIFT STATION ANALYSIS

As documented in Section 1.2, the wastewater generated by the population base within the Community is serviced by a gravity sewer system and a low pressure sewer system which discharge into four lift stations and is conveyed to the La Salle lagoon through multiple forcemains.

4.2.1 KINGSWOOD LIFT STATION

WSP conducted a drawdown test at the Kingswood lift station on June 14, 2024. Issued for Construction Drawings (2006-07-11) were obtained for this lift station, which is a duplex setup with Flygt model NP 3153 HT, 11.2 kW (15 HP), 3Ø electrical, submersible pumps operating with 454 impellers. The diameter of the concrete barrel is 2,134 mm. The detailed results of the WSP drawdown test are shown in [Appendix B](#). During the test, WSP confirmed the following information:

- The agreement between Pump 1 and Pump 2 hour meters and the actual pumping time was approximately 83% and 103%, respectively.
- The SCADA setpoints are recorded as:
 - 2.0 m lead pump start
 - 1.1 m lead pump stop (pumping depth of 0.9 m)
- The measured setpoints on site were recorded as (measuring from the top of the lift station):

- 6.70 m lead pump start
- 7.78 m lead pump stop (pumping depth of 1.08 m)
- The calculated pump drawdown rates were reasonably consistent:
 - Pump 1 outflow rate ranged from 22.12 – 22.22 L/s with an average of 22.17 L/s.
 - Pump 2 outflow rate ranged from 22.16 – 22.67 L/s with an average of 22.45 L/s.

Each pump was run through 3 natural cycles to obtain these rates.

4.2.2 PRAIRIEVIEW 1 LIFT STATION

WSP also conducted a drawdown test at the Prairieview 1 lift station on June 14, 2024. WSP was not provided with lift station drawings for this lift station, which is a duplex setup. The pump tags were found in the lift station panel and correspond to Flygt model NP 3127, 7.5 kW (10 HP), 3Ø electrical, submersible pumps operating with a 489 impeller. However, based on the pumping rates, it appears that the pumps currently installed are different from those identified on the pump tags. The pumps shown on the tags are capable of a maximum operating rate of approximately 60 L/s. The concrete barrel is 2,438 mm in diameter. The detailed results of the WSP drawdown test are shown in [Appendix B](#). During the test, WSP confirmed the following information:

- The agreement between Pump 1 and Pump 2 hour meters and the actual pumping time was approximately 68% and 101%, respectively.
- The SCADA setpoints are recorded as:
 - 2.5 m lead pump start
 - 1.5 m lead pump stop (pumping depth of 1.0 m)
- The MultiSmart setpoints are recorded as:
 - 1.76 m lead pump start
 - 1.15 m lead pump stop (pumping depth of 0.61 m)
- The measured setpoints on site were recorded as (measuring from the top of the lift station):
 - 2.17 - 2.27 m lead pump start
 - 3.34 - 3.45 m lead pump stop (pumping depth of ~1.17 m)
- The calculated pump drawdown rates fluctuated:
 - Pump 1 outflow rate ranged from 105.96 – 110.57 L/s with an average of 108.22 L/s.
 - Pump 2 outflow rate ranged from 72.21 – 79.02 L/s with an average of 74.96 L/s.

Each pump was run through 3 natural cycles to obtain these rates.

4.2.3 PRAIRIEVIEW 2 LIFT STATION

A drawdown test was not conducted at the Prairieview 2 lift station on June 14, 2024 because there was little to no incoming wastewater and for the duration of our site visit (~3 hours) the lift station did not operate. Further investigation as to why the incoming flow was negligible is recommended.

4.2.4 RIVER RIDGE LIFT STATION

A drawdown test was not conducted at the River Ridge lift station because it is known that the ability of the lift station to pump to the La Salle lagoon is affected when the pumps operate simultaneously with the Prairieview lift station pumps and therefore the River Ridge pumping data is unreliable. This issue cannot be fixed without upgrading the pumps within the station or construction of an independent forcemain from this lift station to the La Salle lagoon.

4.2.5 DATA ANALYSIS

The RM monitors the lift stations through a supervisory control and data acquisition (SCADA) system. WSP was granted access to the RM's SCADA system data. Specifically, daily data on run time and pump starts were analysed from May/June 2020 through to June 15, 2024 for the Kingswood and Prairieview 1 lift stations. The data was combined with the pumping rates from the drawdown tests to determine a wastewater generation rate for the population serviced by both lift stations. Using the Kingswood population, which averaged 500 people over the May 26, 2020 – June 15, 2024 period, this area was determined to have a wastewater generation rate of 311 litres per capita per day (L/c/d). The Kingswood lift station pumps directly into Prairieview 1 lift station. Using the Prairieview 1 population area, which averaged 2,019 people over the June 15, 2020 – June 15, 2024 period, this area (which included the 500 people from Kingswood) was determined to have a wastewater generation rate of 139 L/c/d. If we remove the 500 people contributing from Kingswood, the Prairieview 1 population of 1,519 was calculated to have a wastewater generation rate of 82 L/c/d.

A wastewater generation rate of 311 L/c/d seems high for a relatively new development with collection from both gravity sewer and low pressure sewer areas. On the other hand, 82 L/c/d for a low pressure sewer area is quite low. This discrepancy along with other inconsistencies in the SCADA data suggests that further investigation is required before this data can be accepted for design purposes. One such inconsistency involves the pumping rates and average pump cycle run times for the Prairieview 1 lift station. While pump 1 operates at 69% the outflow rate of pump 2, the SCADA data shows that each pump has a near identical pump cycle run time. In reality, pump 1 would operate for a longer cycle time because it has a slower rate.

WSP is aware that the RM is considering a lift station review project that would further investigate each lift station which would provide further insight into each lift station's operation and data collection. Analysis beyond what is provided in Section 4.2 is outside of the scope of this feasibility study.

Due to the lack of confidence in the data collected, with agreement from the RM, WSP will default to using the selected 250 L/c/d wastewater generation rate that we used in the 2023 Lagoon Capacity Assessment and prior to that in the 2014 Lagoon Expansion Project. This wastewater generation rate includes a component for extraneous flows (inflow and infiltration) into the Community's wastewater infrastructure.

5 WASTEWATER LOADING

In calculating the wastewater loading to a lagoon system, there are two important factors to consider: organic (treatment) capacity and storage capacity. Other than the variance experienced from inflow and infiltration, the wastewater volumes conveyed from a piped wastewater collection system are generally consistent on a year-round basis for smaller communities with mainly domestic wastewater. In areas serviced by the combination of low pressure sewer and septic tanks, there is a separation of the solids portion that remains in the septic tanks and the liquid portion that is regularly pumped to the lagoon. The RM administers an annual septic tank emptying program for all property owners within the Community that are connected to the low pressure sewer and the wastewater (solids portion) from each septic tank is generally emptied over the course of a two-month period (July and August) into the lagoon. As a result, the organic loading of the wastewater from the areas serviced by low pressure sewer and septic tanks will be considered separately from the gravity sewer serviced area to account for this difference. Notably, separate calculations were not required for the 2014 EAP, but Manitoba Environment and Climate Change has since begun to require this loading calculation breakdown.

Before calculating the wastewater loading for the 2047 design population, we will first calculate the 2021 loading. The loading from 2021 was selected because it is the date when the last census population was determined and therefore the most accurate population data to project from.

5.1 2021 WASTEWATER LOADING

5.1.1 ORGANIC LOADING

On the basis of accepted practice, the daily BOD₅ production (i.e., the organic loading) for the domestic wastewater for the gravity sewer and low pressure sewer serviced areas is 0.077 kilograms per person. For the gravity sewer areas, the wastewater that is generated collectively flows to the lagoon. Since the gravity sewer wastewater is not separated (as compared to the low pressure sewer wastewater), the organic loading is calculated by multiplying the population by the daily BOD₅ production value.

However, for the low pressure sewer we need to calculate the organic loading differently based on the separation of the solids portion and the liquid portion of the wastewater. The liquid portion of the wastewater conveyed through the low pressure sewer system is assumed to contain approximately 50% of average values of BOD₅ for domestic wastewater [9], with the solids portion of the wastewater containing the remaining fraction.

The RM has advised that as of 2021 there are 537 low pressure sewer connections. For these 537 dwellings, we will convert them to a population and assess the liquid portion of the wastewater loading at 50% of the daily BOD₅ production:

$$537 \text{ dwellings} * 3.15 \text{ persons/dwelling} * 0.077 \text{ kg-BOD}_5/\text{person} * 50\% = 65.1 \text{ kg-BOD}_5/\text{day}$$

Truck-hauled wastewater from septic tanks can be as much as 30 to 50 times more concentrated than typical domestic wastewater, with an average BOD₅ concentration of 6,500 mg/L, an EPA mean of 5,000 mg/L and a suggested design value of 7,000 mg/L [10]. To validate and select a design value in past projects, WSP conducted septic truck sampling programs for two municipalities in southeastern Manitoba

in 2016 and 2022. The programs spanned from May through October and from October through November, respectively. According to the results of the laboratory analysis, the average wastewater strength from both programs was 4,992 and 4,736 mg-BOD₅/L for truck-hauled domestic wastewater (septage). Accordingly, 5,000 mg/L is selected as the design value to estimate BOD₅ strength for truck-hauled domestic wastewater. In addition, it is assumed the average volume of the septic tanks in the community of La Salle is 2,590 L (570 imperial gallons). From these numbers we can calculate the loading per tank:

$$5,000 \text{ mg-BOD}_5/\text{L} * 2,590 \text{ L per tank} / 1,000,000 \text{ mg/kg} = 12.95 \text{ kg-BOD}_5 \text{ per tank}$$

It is known that the 537 low pressure sewer dwellings are hauled and emptied to the lagoon generally over two months from July through August (62 days) and therefore we can calculate the daily BOD₅ loading to the lagoon during this period:

$$537 \text{ dwellings} * 12.95 \text{ kg-BOD}_5 \text{ per tank} / 62 \text{ days} = 112.2 \text{ kg-BOD}_5/\text{day}$$

Table 5.1 documents the organic loading for the 2021 La Salle population based on the differences between the gravity sewer wastewater and the low pressure sewer wastewater.

Table 5.1 2021 Organic Loading from the Existing Population within the Community of La Salle

Wastewater Source	Equivalent Population	Organic Loading [kg-BOD ₅ /d]
La Salle Population - gravity sewer	1,716	132.1
La Salle Population - low pressure sewer - liquid portion	1,690	65.1
La Salle Population - low pressure sewer - solids portion		112.2 ^{*1}
Total	3,406	309.4

^{*1} Loading applicable to July and August only.

5.1.2 HYDRAULIC LOADING

As concluded in Section 4, a wastewater generation rate of 250 L/c/d will be assessed to the community of La Salle in order to determine the hydraulic loading.

Table 5.2 2021 Hydraulic Loading from the Existing Population within the Community of La Salle

Wastewater Source	Equivalent Population	Hydraulic Loading [m ³ /d]	Hydraulic Loading (227 days) [m ³]
La Salle Population	3,406	851.5	193,290.5

5.2 2047 WASTEWATER LOADING

The design population for the year 2047 was determined to be 7,501 as shown in Table 3.3. For the study, it is assumed that all of the new developments will be connected via gravity sewer. Therefore, the liquid and solids portion from the 2021 loading will remain the same in the 2047 loading.

Some of the expansion options that follow in Section 6 require that the wastewater from specific areas within the Community be directed to different treatment facilities. Thus, in the calculation of the projected organic and hydraulic loading, the wastewater sources are detailed by the lift station they direct their wastewater to.

5.2.1 ORGANIC LOADING

Table 5.3 documents the projected organic loading for the 2047 La Salle population by the wastewater source.

Table 5.3 Projected 2047 Organic Loading from within the Community of La Salle

Wastewater Source	Type	Lift station	ERU	Equivalent Population	Organic Loading [kg-BOD ₅ /d]
Kingswood (2023)	Gravity	Kingswood	141	444	34.2
Kingswood (2023)	LPS - liquid portion	Kingswood	21	66	2.5
	LPS - solids portion				4.4 ^{*1}
Kingswood (2023)	LPS - liquid portion	Prairieview 1	69	217	8.4
	LPS - solids portion				14.4 ^{*1}
Prairieview 1 (2023)	LPS - liquid portion	Prairieview 1	447	1,408	54.2
	LPS - solids portion				93.4 ^{*1}
River Ridge (2023)	Gravity	River Ridge	151	476	36.6
Prairieview 2 (2023)	Gravity	Prairieview 2	343	1,080	83.2
Approved Unoccupied Lots	Gravity	Prairieview 1 & 2	634	1,997	153.8
Expansion Potential	Gravity	TBD	565	1,812	139.5
Total				7,501	624.6

^{*1} Loading applicable to July and August only.

5.2.2 HYDRAULIC LOADING

Table 5.4 documents the projected hydraulic loading for the 2047 La Salle population by the wastewater source.

Table 5.4 Projected 2047 Hydraulic Loading from the Community of La Salle

Wastewater Source	Type	Lift station	ERU	Population	Hydraulic Loading [m ³ /d]	Hydraulic Loading (227d) [m ³]
Kingswood (2023)	Gravity	Kingswood	141	444	111.0	25,206
Kingswood (2023)	LPS	Kingswood	21	66	16.5	3,754
Kingswood (2023)	LPS	Prairieview 1	69	217	54.3	12,335
Prairieview 1 (2023)	LPS	Prairieview 1	447	1,408	352.0	79,907
River Ridge (2023)	Gravity	River Ridge	151	476	118.9	26,993
Prairieview 2 (2023)	Gravity	Prairieview 2	343	1,080	270.1	61,316
Approved Unoccupied Lots (2023)	Gravity	Prairieview 1 & 2	634	1,997	499.3	113,335
Expansion Potential	Gravity	TBD	575	1,812	453.0	102,837
Total				7,501	1,875.1	425,683

6 EXPANSION OPTIONS

We will evaluate five expansion options to provide treatment and storage for the community of La Salle's wastewater up to the year 2047 based on the population and loading projections. For each option, the opinions of probable cost presented are considered Class 4 (-30 to +50%), however, the costing does not include land acquisition or potential resale. These opinions of probable costs use the class system established by the Association for the Advancement of Cost Engineering International. The costs, as shown, are meant to be used to evaluate the various options and are in no way meant to present the full costs of a given work. These costs have been prepared from the information available at the time it was prepared. The costs presented are based on calculated quantities (e.g., earthworks volumes, linear metre piping, etc.) and associated rates from recent similar project tenders. The following key assumptions apply:

- Opinions of probable costs are presented in 2024 dollars.
- A typical Design-Bid-Build (DBB) project delivery method applies.
- No additional costs were assumed for construction scheduling or construction complexity associated with a project that takes place within existing infrastructure that remains in use.
- Costs for engineering by the Owner or third parties has been set at 10%.
- Project contingency has been set at 15%.
- GST has been excluded.
- It was assumed that a competitive bidding environment would be present at the time of tendering and that the economy of Manitoba is stable.

For each option, the costs of the construction of any new lift stations or upgrades and associated forcemains would need to be evaluated further to determine what portion of these costs is attributable to the developers. For the purposes of this report, the costs of these infrastructure developments and upgrades are fully included in the opinion of probable costs.

The five options are as follows:

- Option 1: Expansion of the existing lagoon to the north of the current facility.
- Option 2: Retaining the existing lagoon and constructing a new lagoon facility in 21-8-2 EPM.
- Option 3: Construction of a new lagoon in 21-8-2 EPM and decommissioning of the existing facility.
- Option 4: Construction of a new lift station and forcemain to divert the wastewater from the River Ridge developments, Prairieview lift station 2 and Ventura north future developments in La Salle to the proposed expanded lagoon facility in Oak Bluff.
- Option 5: Construction of a new lift station and forcemain to divert all of the wastewater from La Salle to the proposed expanded lagoon facility in Oak Bluff and decommissioning of the existing facility.

Options 2 and 4 are somewhat complex in the calculations to determine the ideal breakdown of which wastewater sources get directed to which of the two different treatment facilities. This feasibility study provides a high-level evaluation and consideration of the options and therefore further analysis is recommended should Option 2 or 4 be pursued further. Regardless of the selected option, WSP recommends further evaluation through the completion of a preliminary design report.

Options 1 through 3 involve the expansion of the existing lagoon facility and/or the construction of a new lagoon facility south of the community of La Salle. The lagoon cells considered in these options are all facultative cells, which have no mechanical inputs, such as aeration. While aerated lagoon cells would be an option for any lagoon expansion, they are typically employed in situations where the community has a wet industry contributing wastewater to the lagoon. Industrial wastewater generally comes with wastewater parameters in excess of regular domestic wastewater which provides the justification for treatment by an aeration system. While aerated lagoons allow a smaller footprint for the cells because they can operate at liquid levels above 1.5 m, they come with the requirement of 3Ø electrical power being brought to the lagoon site, monthly operating expenses and increased operational input and complexity. A past lagoon upgrading assessment for the community of La Salle (completed in 2011, prior to the 2014 expansion) considered aerated cells but due to cost considerations these options were not selected.

6.1 ASSUMPTIONS

Prior to presenting the expansion options it is important to review the main assumptions made in the process of arriving at this point in the study. Assumptions are common in these types of studies because of the various information gaps and forecasting required. These assumptions, while typical, can have a considerable impact on the options that are presented.

6.1.1 DESIGN POPULATION

Population forecasting as presented in this study is an attempt to project the Community's population 25 years into the future. For a relatively stagnant population base, the forecasting is generally simpler, although not without risk. However, the community of La Salle has experienced significant growth since at least 2006. Therefore, forecasting is made more complex when considering the factors that go into this determination and these factors include assumptions as well. There are known developers and land available to see the population increase well beyond the projected 2047 population, so there is potential for the Community to grow larger than the assumed 50 lots/dwellings per year which has been the standard rate for the period from 2016-2022.

6.1.2 WASTEWATER GENERATION RATE

Typically, the best way to calculate the wastewater generation rate is to use the lift station records combined with a drawdown test. Since this method was determined to be unreliable, the wastewater generation rate was assumed to be 250 L/c/d.

6.1.3 EXPANSION AREAS

Options 1, 2 and 3 rely on the acquisition of land that is currently outside of the RM's ownership. The assumption has been made that this land can be acquired and developed for these purposes. Also, without a topographic survey of these areas, WSP assumed elevations for this land. If the land elevation is higher or lower than assumed, it would have cascading effects on the design and the opinion of probable costs.

6.1.4 GEOTECHNICAL ASSUMPTIONS

A geotechnical investigation has not been conducted as part of this study. Based on information from a review of the Manitoba soil survey data and the previous geotechnical investigations for the existing lagoon, WSP assumed that suitable in-situ clay soils are consistent in the development areas.

6.2 OPTION 1 - EXPANSION OF THE EXISTING LAGOON

The first option evaluated is expanding the existing lagoon facility. While the lagoon is surrounded by agricultural land, the surrounding residences to the south and east prevent the lagoon from expanding further in these directions because of the 300 m setback requirement as documented in the Design Objectives for Wastewater Treatment Lagoons [3]. The previous expansion in 2014 expanded the lagoon as far to the east as possible given the current setback requirement. While it is possible to expand the lagoon to the west, that area situates the lagoon closer to the Prairieview development. As such, the most preferential option is to expand the lagoon to the north.

For this option, the design organic loading and hydraulic loading are shown in Table 6.1.

Table 6.1 Option 1 – Expansion of the Existing Lagoon – Design Loading

Wastewater Source	Equivalent Population	Organic Loading [kg-BOD ₅ /d]	Hydraulic Loading [m ³ /d]	Hydraulic Loading (227 days) [m ³]
La Salle Population	7,501	624.6	1,875.3	425,682

For an organic loading of 624.6 kg-BOD₅/d, a facultative primary cell with a liquid surface area of 11.15 ha is required. The existing La Salle Lagoon primary cell is 6.61 ha. Secondary Cell #3 has a surface area of 11.6 ha and could be converted into a primary cell. Another option would be to combine the existing Primary Cell with Secondary Cell #2, which would result in a surface area of 12.63 ha, if a small section of the shared dyke were to be removed to join the cells. Converting Secondary Cell #3 into a primary cell was the selected option for the following reasons:

- Secondary Cell #3 better matches the sizing required for the 2047 design.
- Secondary Cell #3 has valved connections with each of the other existing cells and the new storage cell that would be required.
- The road used for dosing liquid aluminum sulphate into the primary cell traverses the entire perimeter of Secondary Cell #3.
- The incoming forcemains can feasibly be diverted into Secondary Cell #3.

Converting Secondary Cell #3 into a primary cell affects the current storage capacity of the existing facility. See Section 2.1.2 for information on how the storage of a lagoon is calculated based on whether the cell is a primary cell or a secondary cell.

Table 6.2 updates the storage capacity of the existing facility with this change.

Table 6.2 Option 1 – Updated La Salle Wastewater Treatment Lagoon Cell Capacities

Cell	Convert to	Surface Area [ha]	Total Volume [m³]	Storage Volume [m³]
Primary Cell	Secondary Cell	6.61	92,770	75,245
Secondary Cell 1	n/a	2.34	31,930	26,030
Secondary Cell 2	n/a	6.02	85,880	69,400
Secondary Cell 3	Primary Cell	11.64	164,900	82,450
Total		26.61	375,480	253,125

The existing lagoon, with the conversion of these cells, would provide a treatment capacity of 651.8 kg-BOD₅/d and storage capacity of 253,125 m³. Therefore, a new secondary cell would need to be constructed with a capacity of:

$$425,682 \text{ m}^3 - 253,125 \text{ m}^3 = 172,557 \text{ m}^3$$

This new secondary cell would be constructed to the north of the existing cells. Taking into account a 300 m setback from the existing residence north of the lagoon, there is suitable room to construct a cell with cell bottom dimensions of 330 m x 680 m, which would provide a storage capacity of 249,300 m³, which is more than required. A cell with cell bottom dimensions of 203 m x 680 m is sufficient. This option is viable provided that the RM can acquire the land to the north of the existing lagoon (~18.0 ha) and it doesn't impact future residential development. If development is to occur in NW 27-8-2 EPM, there is room to move the new cell to the east and north. Figure 6-1 illustrates a conceptual expansion of the existing lagoon.

Two new lift stations and forcemains will be required to service the Pfrimmer development (Area 1) and the Venture north developments (Areas 6 & 7) and lift station upgrades will be required for River Ridge. Further, a new low pressure sewer will be required from the Pfrimmer development (Area 2) to the Kingswood lift station.

The RM's method of lowering total phosphorus concentrations in the existing secondary cells involves dosing aluminum sulphate from a truck tanker. For this option, we have assumed this treatment approach continues and therefore no additional infrastructure costs have been added.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 6-1: Option 1 Existing La Salle Lagoon Expansion

6.2.1 OPTION 1 OPINION OF PROBABLE COST

Item	Description of Work	Unit of Measurement	Estimated Total Quantity	Unit Price	Total Price
1	Insurance, bonding	l.s.	1	\$120,000.00	\$120,000.00
2	Mobilization and demobilization	l.s.	1	\$120,000.00	\$120,000.00
3	Topsoil stripping and stockpiling	cu.m.	25,000	\$9.00	\$225,000.00
4	Excavation and embankment - general	cu.m.	42,000	\$14.00	\$588,000.00
5	Excavation and embankment - clay core	cu.m.	5,500	\$16.00	\$88,000.00
6	Forcemain from Pfrimmer development (Area 1) to Kingswood forcemain	lin.m.	300	\$200.00	\$60,000.00
7	Low pressure sewer from Pfrimmer development (Area 2) to Kingswood lift station	lin.m.	1,000	\$150.00	\$150,000.00
8	Forcemain from Ventura north developments (Area 6 & 7) to existing lagoon	lin.m.	2,500	\$300.00	\$750,000.00
9	250 mm PVC forcemain with splash pad and connection to existing 250 forcemain	l.s.	1	\$40,000.00	\$40,000.00
10	300 mm HDPE DR 17 wws intercell pipe	lin.m.	28	\$400.00	\$11,200.00
11	350 mm HDPE DR 17 wws discharge pipe	lin.m.	23	\$500.00	\$11,500.00
12	Forcemain gate valve	each	3	\$10,000.00	\$30,000.00
13	250 mm gate valve	each	1	\$10,000.00	\$10,000.00
14	300 mm gate valve	each	1	\$12,000.00	\$12,000.00
15	350 mm gate valve	each	1	\$17,500.00	\$17,500.00
16	Rip rap with geotextile fabric	sq.m.	13,400	\$50.00	\$670,000.00
17	Granular base and subbase course surfacing with geotextile fabric	sq.m.	700	\$45.00	\$31,500.00
18	Concrete truck-dump station	l.s.	1	\$40,000.00	\$40,000.00
19	Decommission existing concrete dump stations	l.s.	2	\$8,000.00	\$16,000.00
20	Ditching	lin.m.	960	\$20.00	\$19,200.00
21	Perimeter fencing	lin.m.	1,225	\$27.00	\$33,075.00
22	Signage	l.s.	1	\$7,000.00	\$7,000.00
23	Finish grading, topsoil and seeding	l.s.	1	\$40,000.00	\$40,000.00
24	Drilling rig and hydraulic conductivity testing	l.s.	1	\$15,000.00	\$15,000.00
25	Pfrimmer development (1) lift station	l.s.	1	\$900,000.00	\$900,000.00
26	Ventura north development (6&7) lift station	l.s.	1	\$1,000,000.00	\$1,000,000.00
27	River Ridge lift station pump upgrade	l.s.	1	\$100,000.00	\$100,000.00
	Sub-Total				\$5,104,975.00
	Engineering (10%)				\$510,497.50
	Contingency (15%)				\$765,746.25
	TOTAL OPINION OF PROBABLE COST (Rounded to nearest \$1,000)				\$6,381,000.00

6.3 OPTION 2 - RETAINING THE EXISTING LAGOON AND CONSTRUCTING A NEW SUPPLEMENTARY LAGOON IN AN ALTERNATE LOCATION

The second option evaluated involves retaining the existing lagoon, without expanding or modifying it and constructing a new lagoon to provide the balance of the treatment and storage capacity necessary for the 2047 design population. This option would involve dividing and setting boundaries for the residential development in the community of La Salle allowing for a population up to 4,198 or 1,333 ERUs to be serviced by the existing lagoon and then diverting the wastewater from any additional developments beyond this ERU quantity to the new lagoon. For more information on the existing lagoon capacity, the 2023 report entitled, *Community of La Salle Wastewater Treatment Lagoon Capacity Assessment* should be consulted. The new lagoon would be constructed to serve a population of:

$$7,501 - 4,198 = 3,303$$

For this option, the design organic loading and hydraulic loading are shown in Table 6.3 for both the existing lagoon and the new lagoon.

Table 6.3 Option 2 – Existing Lagoon plus a New Supplementary Lagoon

Wastewater Source	Lagoon	Equivalent Population	Organic Loading [kg-BOD ₅ /d]	Hydraulic Loading [m ³ /d]	Hydraulic Loading (227 days) [m ³]
La Salle Population up to 1,333 ERU	Existing Lagoon	4,198	370.1	1,049.5	238,237
La Salle Population from 1,334 to 2,381 ERUs	New Lagoon	3,303	254.3	825.8	187,445
Total		7,501	624.4	1,875.3	425,682

Section 21-8-21 EPM was identified as an area to construct the new lagoon facility. There are existing residents to the west and east of this section and the Prairieview development borders it to the north. While the exact location of the lagoon and the cell configuration within the section would be further developed during the preliminary design, Figure 6-2 shows a conceptual three-cell lagoon located in the SE 21-8-2 EPM. For a facility of this size, the RM would need to purchase approximately 30.0 ha of land. Table 6.4 lists the new lagoon details and capacities. For an organic loading of 254.3 kg-BOD₅/d, a facultative primary cell with a liquid surface area of 4.54 ha is required.

Table 6.4 Option 2 – Supplementary La Salle Wastewater Treatment Lagoon Details & Cell Capacities

Cell	Cell Floor Dimensions [m]	Surface Area [ha]	Total Volume [m ³]	Storage Volume [m ³]
Primary Cell	149 x 272	4.56	64,567	32,284
Secondary Cell 1	225 x 272	6.72	96,259	77,713
Secondary Cell 2	225 x 272	6.72	96,259	77,713
Total		18.00	257,085	187,710

The lagoon could be discharged into the drain along Floodway Road, although this route would need to be evaluated further to confirm. From a manure management perspective, the land is class 2 and there would be no restrictions for the construction of a lagoon.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 6-2: Option 2 New La Salle Lagoon Location and Sizing

While the divisions and boundaries to be set within the community of La Salle involve a level of detail beyond the scope of this feasibility study, we will discuss a scenario that could be explored further in detail should this option be selected.

Table 6.5 provides the details of this scenario where different areas within the community continue to be routed to the existing lift station and others are rerouted to the new lagoon facility.

Table 6.5 Conceptual Scenario of Wastewater Divisions within La Salle

Wastewater Source	Type	Lift station	ERU Existing Lagoon	ERU New Lagoon
Kingswood (2023)	Gravity	Kingswood	141	
Kingswood (2023)	LPS	Kingswood	21	
Kingswood (2023)	LPS	Prairieview 1	69	
Prairieview 1 (2023)	LPS	Prairieview 1	447	
River Ridge (2023)	Gravity	River Ridge	151	
Prairieview 2 (2023)	Gravity	Prairieview 2		343
Approved Unoccupied Lots (2023)	Gravity	Prairieview 1/2	176 ^{*1}	458 ^{*2}
Expansion Potential	Gravity	TBD	150	247
Total			1,155	1,048

^{*1} Includes 150 lots from Pfrimmer Development, 21 lots from Touchwood Homes and 5 lots from Kingswood South Phase 6 which eventually flows to Prairieview 1 lift station.

^{*2} Includes PVL Phase 2D & 2E, PVL Phase 4A, 4B & 4C, PVL Phase 5-7, PVL Phase 9, PVL Phase 16 and Prairieview South (which is an overlap with Area 4 – Table 3.2)

In this scenario, two new lift stations and forcemains are required to service the Pfrimmer development (Area 1) and the Ventura north developments (Areas 6 & 7). An additional forcemain will be required to direct the wastewater from Prairieview 2 lift station to the new lagoon. Lift station upgrades will be required for River Ridge and Prairieview 2. Further, a new low pressure sewer will be required from the Pfrimmer development (Area 2) to the Kingswood lift station. If this option is selected, the location and development areas that it would service would be further explored.

The low pressure sewer areas are all serviced by the existing lagoon and therefore, truck hauling of septage would continue to be directed to the existing lagoon. The new lagoon facility would therefore not require infrastructure to accommodate truck dumping.

The RM's method of lowering total phosphorus concentrations in the existing secondary cells involves dosing aluminum sulphate from a truck tanker. We have assumed a similar approach for the new lagoon but have not priced in widening the dykes to 5.0 m to accommodate a 300 mm thick granular base topping on the dykes. Approximately \$400,000 - \$450,000 can be added to the opinion of probable cost if wider dykes and granular material are added.

6.3.1 OPTION 2 OPINION OF PROBABLE COST

Item	Description of Work	Unit of Measurement	Estimated Total Quantity	Unit Price	Total Price
1	Insurance, bonding	l.s.	1	\$150,000.00	\$150,000.00
2	Mobilization and demobilization	l.s.	1	\$150,000.00	\$150,000.00
3	Topsoil stripping and stockpiling	cu.m.	32,300	\$9.00	\$290,700.00
4	Excavation and embankment - general	cu.m.	70,000	\$14.00	\$980,000.00
5	Excavation and embankment - clay core	cu.m.	5,800	\$16.00	\$92,800.00
6	Forcemain from Pfrimmer development (Area 1) to Kingswood forcemain	lin.m.	300	\$200.00	\$60,000.00
7	Low pressure sewer from Pfrimmer development (Area 2) to Kingswood lift station	lin.m.	1,000	\$150.00	\$150,000.00
8	Forcemain from Ventura north developments (Area 6 & 7) to existing lagoon	lin.m.	4,630	\$300.00	\$1,389,000.00
9	Forcemain from Prairievew 2 to new lagoon	lin.m.	3,300	\$300.00	\$990,000.00
10	300 mm HDPE DR 17 wws intercell pipe	lin.m.	46	\$400.00	\$18,400.00
11	350 mm HDPE DR 17 wws discharge pipe	lin.m.	42	\$500.00	\$21,000.00
12	Forcemain gate valve	each	4	\$10,000.00	\$40,000.00
13	300 mm gate valve	each	2	\$12,000.00	\$24,000.00
14	350 mm gate valve	each	2	\$17,500.00	\$35,000.00
15	Rip rap with geotextile fabric	sq.m	21,700	\$50.00	\$1,085,000.00
16	Ditching	lin.m.	2,030	\$20.00	\$40,600.00
17	Perimeter fencing	lin.m.	2,100	\$27.00	\$56,700.00
18	Signage	l.s.	1	\$10,000.00	\$10,000.00
19	Finish grading, topsoil and seeding	l.s.	1	\$70,000.00	\$70,000.00
20	Drilling rig and hydraulic conductivity testing	l.s.	1	\$15,000.00	\$15,000.00
21	Pfrimmer development (Area 1) lift station	l.s.	1	\$900,000.00	\$900,000.00
22	Ventura north development (Area 6 & 7) lift station	l.s.	1	\$1,000,000.00	\$1,000,000.00
23	River Ridge lift station pump upgrade	l.s.	1	\$100,000.00	\$100,000.00
24	Prairievew 2 lift station pump upgrade	l.s.	1	\$200,000.00	\$200,000.00
	Sub-Total				\$7,868,200.00
	Engineering (10%)				\$786,820.00
	Contingency (15%)				\$1,180,230.00
	TOTAL OPINION OF PROBABLE COST (Rounded to nearest \$1,000)				\$9,835,000.00

6.4 OPTION 3 - CONSTRUCTION OF A NEW LAGOON AND DECOMMISSIONING OF THE EXISTING FACILITY

The third option evaluated is for the construction of a new lagoon in 21-08-2 EPM to service the entire 2047 design population. The existing lagoon facility would be decommissioned after the new facility is operational. For this option, the design organic loading and hydraulic loading are shown in Table 6.6.

Table 6.6 Option 3 – New Lagoon – Design Loading

Wastewater Source	Equivalent Population	Organic Loading [kg-BOD ₅ /d]	Hydraulic Loading [m ³ /d]	Hydraulic Loading (227 days) [m ³]
La Salle Population	7,501	624.6	1,875.3	425,682

For an organic loading of 624.6 kg-BOD₅/d, a facultative primary cell with a liquid surface area of 11.15 ha is required. While the new facility could be a two-cell lagoon, a minimum of two secondary cells are preferred to provide the municipality operational flexibility during discharge.

Section 21-8-21 EPM is the same development area as selected in Option 2. As such, the commentary on the specifics of the area remains the same. For a facility of this size, the RM would need to purchase approximately 56.0 ha of land. Table 6.7 lists the new lagoon details and capacities and Figure 6-3 shows the conceptual construction location and cell sizes.

Table 6.7 Option 3 – New La Salle Wastewater Treatment Lagoon Details & Cell Capacities

Cell	Cell Floor Dimensions [m]	Surface Area [ha]	Total Volume [m ³]	Storage Volume [m ³]
Primary Cell	290 x 358	11.16	161,548	80,774
Secondary Cell 1	290 x 358	11.16	161,548	130,176
Secondary Cell 2	334 x 520	18.40	268,192	215,788
Total		40.72	591,288	426,738



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 6-3: Option 3 New La Salle Lagoon Location and Sizing

While there are options in how the wastewater from the La Salle developments, both existing and proposed, are serviced and directed to the new lagoon, for the purpose of determining costing we have included the following discussion on the infrastructure developments and changes. In this option, two new lift stations and forcemains are required to service the Pfrimmer development (Area 1) and the Ventura north developments (Areas 6 & 7). The pumping issues with the River Ridge lift station can be resolved by constructing a new forcemain to the Ventura north lift station. A common forcemain could be constructed to direct the wastewater from Prairieview 1 & 2 lift stations to the new lagoon. Lift station upgrades will be required for Prairieview 1 & 2. Further, a new low pressure sewer will be required from the Pfrimmer development (Area 2) to the Kingswood lift station. Further analysis and examination of the infrastructure developments are required should this option be selected for development.

The new lagoon facility would be designed to receive the septage hauling from the low pressure sewer areas. As such, a truck dump station would be required at the new lagoon.

The RM's method of lowering total phosphorus concentrations in the existing secondary cells involves dosing aluminum sulphate from a truck tanker. We have assumed a similar approach for the new lagoon but have not priced in widening the dykes to 5.0 m to accommodate a 300 mm thick granular base topping on the dykes. Approximately \$300,000 - \$350,000 can be added to the opinion of probable cost if wider dykes and granular material are added.

The existing lagoon would be decommissioned. The accumulated wastewater solids ("sludge") that have settled on the bottom of the cells require removal, typically, this material is incorporated into the surrounding

agricultural land if there are nearby landowners who agree to receive it as a soil nutrient supplement. Generally, decommissioning of the lagoon involves removing the piping and appurtenances, fencing, concrete structures, granular material, and rip rap. There are cost efficiencies to be explored as the granular material and the rip rap would be available for use in the construction of the new lagoon. These efficiencies will be explored in more detail in the context of a preliminary design report if this option is selected. To account for these efficiencies the unit price of these two items in the opinion of probable costs have been reduced by 50% to approximate the savings. Once the construction materials are removed, the dykes will be levelled and the area will receive topsoil from what is available on site. The decommissioned site is approximately 35.0 ha and this land could be used by the RM for other purposes or resold as residential or agricultural land. However, it is typical for Manitoba Environment and Climate Change to include several land usage restrictions on a decommissioned lagoon site.

6.4.1 OPTION 3 OPINION OF PROBABLE COST

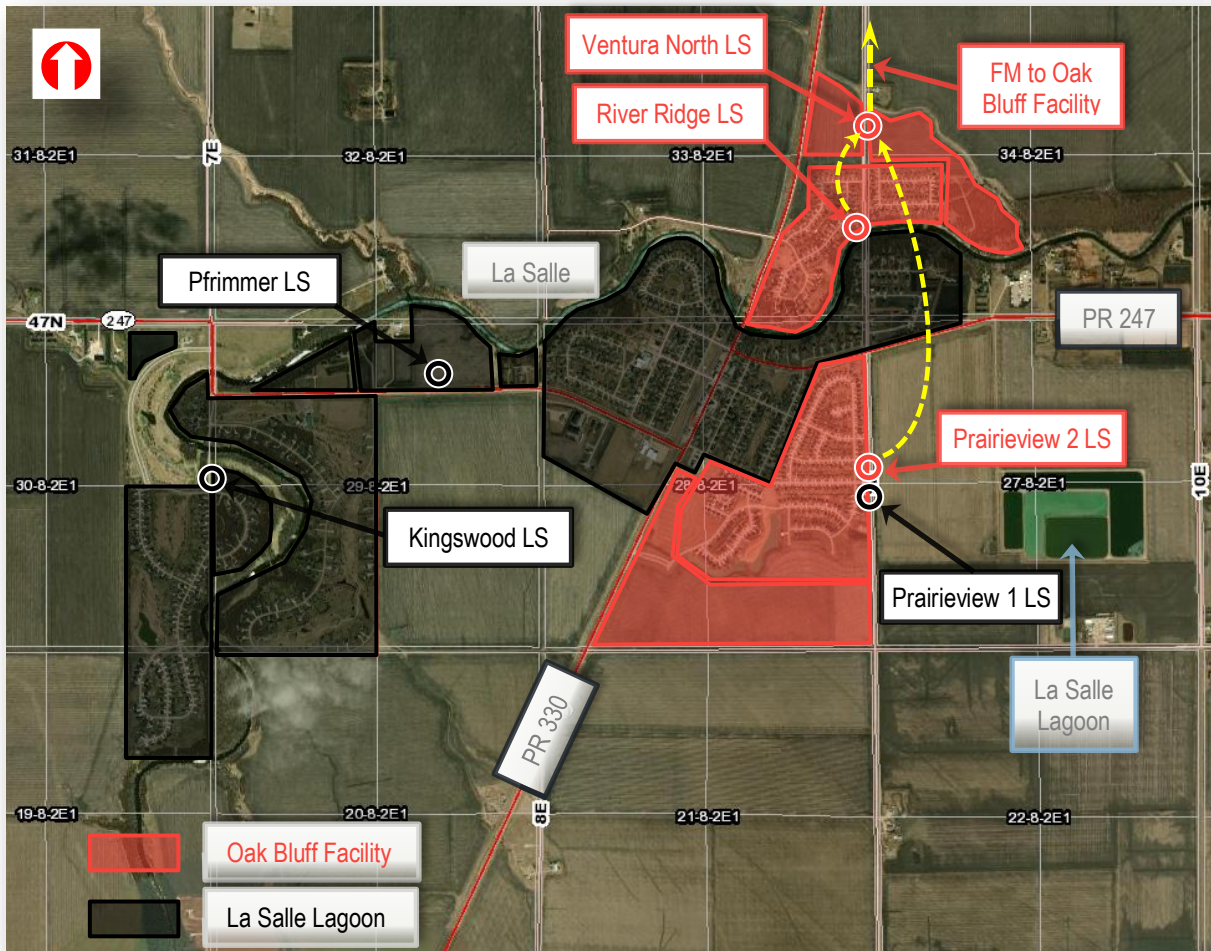
Item	Description of Work	Unit of Measurement	Estimated Total Quantity	Unit Price	Total Price
1	Insurance, bonding	l.s.	1	\$200,000.00	\$200,000.00
2	Mobilization and demobilization	l.s.	1	\$200,000.00	\$200,000.00
3	Topsoil stripping and stockpiling	cu.m.	69,000	\$9.00	\$621,000.00
4	Excavation and embankment - general	cu.m.	116,000	\$14.00	\$1,624,000.00
5	Excavation and embankment - clay core	cu.m.	8,500	\$16.00	\$136,000.00
6	Forcemain from Pfrimmer development (Area 1) to Kingswood forcemain	lin.m.	300	\$200.00	\$60,000.00
7	Low pressure sewer from Pfrimmer development (Area 2) to Kingswood lift station	lin.m.	1,000	\$150.00	\$150,000.00
8	Forcemain from Ventura north developments (Area 6 & 7) to new lagoon	lin.m.	5,500	\$300.00	\$1,650,000.00
9	Forcemain from River Ridge lift station to Ventura north lift station	lin.m.	450	\$200.00	\$90,000.00
10	Common forcemain from Prairieview 1 & 2 lift stations to new lagoon	lin.m.	3,300	\$350.00	\$1,155,000.00
11	300 mm HDPE DR 17 wws intercell pipe	lin.m.	78	\$400.00	\$31,200.00
12	350 mm HDPE DR 17 wws discharge pipe	lin.m.	42	\$500.00	\$21,000.00
13	Forcemain gate valve	each	4	\$10,000.00	\$40,000.00
14	300 mm gate valve	each	3	\$12,000.00	\$36,000.00
15	350 mm gate valve	each	2	\$17,500.00	\$35,000.00
16	Rip rap with geotextile fabric	sq.m.	32,800	\$25.00	\$820,000.00
17	Granular base and subbase course surfacing with geotextile fabric	sq.m.	3,400	\$22.50	\$76,500.00
18	Concrete truck-dump station	l.s.	1	\$40,000.00	\$40,000.00
19	Ditching	lin.m.	2,950	\$20.00	\$59,000.00
20	Perimeter fencing	lin.m.	3,040	\$27.00	\$82,080.00
21	Signage	l.s.	1	\$12,000.00	\$12,000.00

22	Finish grading, topsoil and seeding	I.s.	1	\$100,000.00	\$100,000.00
23	Drilling rig and hydraulic conductivity testing	I.s.	1	\$15,000.00	\$15,000.00
24	Pfrimmer development (Area 1) lift station	I.s.	1	\$900,000.00	\$900,000.00
25	Ventura north development (Area 6 & 7) lift station	I.s.	1	\$1,000,000.00	\$1,000,000.00
26	Prairieview 1 lift station pump upgrade	I.s.	1	\$200,000.00	\$200,000.00
27	Prairieview 2 lift station pump upgrade	I.s.	1	\$200,000.00	\$200,000.00
28	Decommission existing lagoon	I.s.	1	\$3,000,000.00	\$3,000,000.00
	Sub-Total				\$12,553,780.00
	Engineering (10%)				\$1,255,378.00
	Contingency (15%)				\$1,883,067.00
	TOTAL OPINION OF PROBABLE COST (Rounded to nearest \$1,000)				\$15,692,000.00

6.5 OPTION 4 – PARTIAL LA SALLE WASTEWATER DIVERSION TO THE PROPOSED EXPANDED OAK BLUFF LAGOON FACILITY

The fourth option evaluated involves retaining the existing lagoon, without expanding or modifying it, and diverting a portion of the wastewater generated within the community of La Salle to the expanded Oak Bluff lagoon facility. Originally, the conceptual plan for this option involved diverting wastewater from the Kingswood development (served by the Kingswood lift station) and the River Ridge development, but the logistics of combining the wastewater from these two areas required an additional lift station. The revised conceptual plan involves diverting wastewater collected in the Prairieview 2 lift station instead of the Kingswood development as well as diverting the wastewater from the River Ridge development. Under this scenario, a new lift station would be constructed to service the Ventura north developments (Area 6 & 7) and the wastewater from the Prairieview 2 lift station and the wastewater from the River Ridge lift station would be diverted into this new lift station. A new forcemain would be constructed from each of these 2 existing lift stations into the new Ventura north lift station. Prairieview 2 lift station would require an upgrade as the loading increases with the development area it serves. This development area includes approved unoccupied lots and the Area 5 developments). The Ventura north lift station would require a new forcemain to pump the wastewater to the Oak Bluff lagoon facility, which is approximately 8.0 kilometres away.

Figure 6-4 illustrates the areas of the community proposed to be diverted to Oak Bluff lagoon facility and those continuing to be serviced by the La Salle lagoon.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 6-4: Map of the Community of La Salle Identifying the Option 4 Areas Served by the Oak Bluff Lagoon Facility and those Areas Served by the Existing Lagoon

While Table 5.4 provides a breakdown of the wastewater loading in La Salle by source for the year 2047, Table 6.8 summarizes the data specific to the wastewater diverted to the Oak Bluff facility, including a summary of the organic and hydraulic loading projections.

Table 6.8 Projected 2047 Organic and Hydraulic Loading to the Oak Bluff Facility from the Applicable Areas within La Salle

Wastewater Source	Type	Lift station	ERU	Equivalent Population	Organic Loading [kg-BOD₅/d]	Hydraulic Loading [m³/d]
Prairieview 2 (2023)	Gravity	Prairieview 2	343	1,080	83.16	270.0
River Ridge (2023)	Gravity	River Ridge	151	476	36.65	119.0
Approved Unoccupied Lots (2023)	Gravity	Prairieview 2	458	1,443	111.11	360.8
Ventura (Areas 5-7)	Gravity	New	375 ^{*1}	1,181	90.94	295.3
Total			1,327	4,180	321.86	1,045.1

^{*1} Under the 2047 design population of 7,501 people, only approximately 375 ERUs would be anticipated for construction from the Ventura developments, whereas the full buildout of these areas is an upper limit of 800 ERUs.

Table 6.9 summarizes the data specific to the wastewater still serviced by the La Salle lagoon under this diversion option. Wastewater from Kingswood and Prairieview 1 lift stations would continue to be treated at the La Salle lagoon as well as future wastewater from approved lots to be serviced by the Prairieview 1 lift station and the new Pfrimmer developments (Areas 1 & 2). As the low pressure sewer areas are still serviced by the La Salle lagoon, the septage hauling from these areas would continue to be hauled to the La Salle lagoon.

The Pfrimmer development (Area 1) would require a new lift station and forcemain. Further, a new low pressure sewer will be required from the Pfrimmer development (Area 2) to the Kingswood lift station. The costs of the construction of any new lift stations or upgrades and associated forcemains would need to be evaluated further to determine what portion of these costs is attributable to the developers.

Table 6.9 Projected 2047 Organic and Hydraulic Loading to the La Salle Lagoon from the Applicable Areas within La Salle

Wastewater Source	Type	Lift station	ERU	Equivalent Population	Organic Loading [kg-BOD ₅ /d]	Hydraulic Loading [m ³ /d]
Kingswood (2023)	Gravity	Kingswood	141	444	34.2	111.0
Kingswood (2023)	LPS	Kingswood	21	66	6.9 ¹	16.5
Kingswood (2023)	LPS	Prairieview 1	69	217	22.8 ¹	54.3
Prairieview 1 (2023)	LPS	Prairieview 1	447	1408	147.6 ¹	352.0
Approved Unoccupied Lots (2023)	Gravity	Prairieview 1	176	554	42.7	138.5
Pfrimmer Developments – Area 1	Gravity	New	150	473	36.4	118.3
Pfrimmer Developments – Area 2	LPS	Kingswood	50	158	12.2	39.5
Total			1,054	3,320	302.8	830.1

¹ Loading applicable to July and August only.

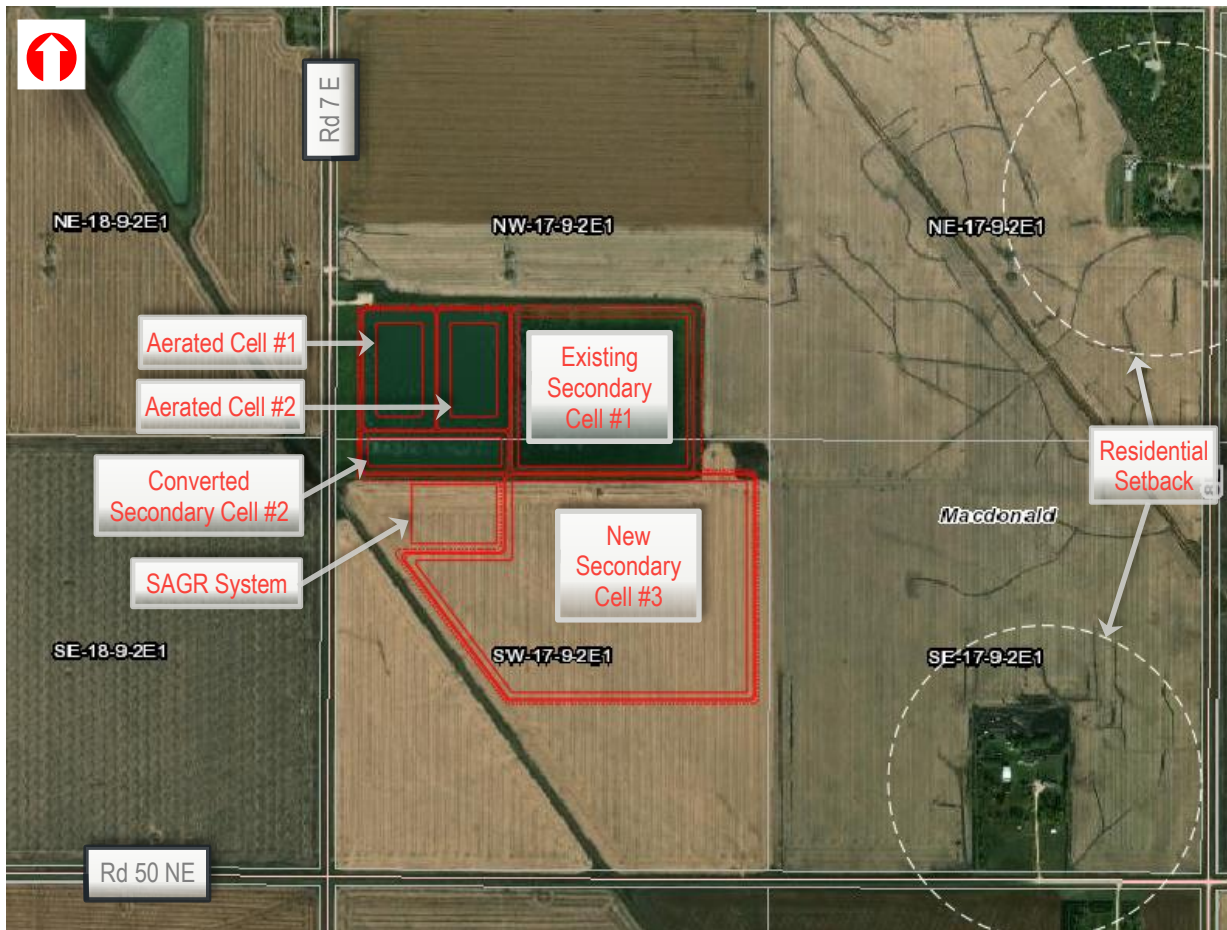
With a partial wastewater diversion to the expanded Oak Bluff facility, the study provides a cursory overview of the implications of this additional wastewater on the expanded facility. The RM of Macdonald – Oak Bluff Forcemain and Lagoon Study recommended the RM proceed with upgrading the existing Oak Bluff lagoon with two aerated primary cells and a new secondary cell [11]. The proposed Oak Bluff facility upgrade was designed for an equivalent population of 9,555, which includes truck haul from the RM. Truck haul from the RM accounts for approximately 11% of the equivalent population. Therefore, the equivalent population from Oak Bluff is 8,600. With the additional population contributing to the Oak Bluff lagoon from La Salle as detailed in Option 4, the resulting equivalent population in the design year 2047 will be 13,735. As the design population exceeds the 10,000 people threshold, nitrogen limits on the effluent quality will be included in the new Environment Act Licence. Therefore, additional treatment of the wastewater will be required to meet a total nitrogen limit of 15 mg/L. This level of treatment can be accomplished through the construction of a SAGR (submerged attached growth reactor) process (Option 3 – Oak Bluff Preliminary Design Report). While not part of the current expansion plans, it has been assumed that the Oak Bluff lagoon expansion will include aerated primary cells with a SAGR system for this study.

The proposed expansion has been based on the Oak Bluff Preliminary Design Report’s discussion on Option 3 – Aerated Lagoon Expansion with SAGR. The addition of the SAGR process will allow for a longer discharge period (e.g. May 1st to November 1st) which results in a shorter storage period of approximately 180 days. The storage capacity requirement as detailed in the Oak Bluff report will need to be increased by 191,664 m³ to accommodate the diverted wastewater from La Salle. The storage capacity can be increased

through the construction of a new secondary cell (#3), and by converting the south section of the existing primary cell to a secondary cell (#2). Table 6.10 lists the new Oak Bluff lagoon details and capacities and Figure 6-5 illustrates a conceptual site configuration. The cell sizes (aerated and SAGR cells) shown in Figure 6-5 were enlarged by approximately 50% (from what is shown in the Oak Bluff preliminary design report) to account for the added population from La Salle.

Table 6.10 Option 4 - Oak Bluff Lagoon Details and Cell Capacities

	Cell Floor Dimensions	Total Volume	Storage Volume
New Aerated Primary Cell #1	89.5 m x 180.0 m	88,030 m ³	-
New Aerated Primary Cell #2	89.5 m x 180.0 m	88,030 m ³	-
Existing Secondary Cell #1	325.0 m x 288.0 m	207,600 m ³	179,300 m ³
Converted Primary to Secondary Cell #2	256.6 m x 54.7 m	45,900 m ³	30,800 m ³
New Secondary Cell #3	Irregular	450,900 m ³	388,650 m ³



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 6-5 Option 4 – Oak Bluff Lagoon Expansion Configuration and Sizing

6.5.1 OPTION 4 – OPINION OF PROBABLE COST

Item	Description of Work	Unit of Measure	Estimated Total Quantity	Unit Price	Total Price
1	Insurance, bonding	l.s.	1	\$140,000.00	\$140,000.00
2	Mobilization and demobilization	l.s.	1	\$100,000.00	\$100,000.00
3	Forcemain from Prairieview 2 to Ventura north lift station	lin.m.	1,820	\$300.00	\$546,000.00
4	Forcemain from River Ridge lift station to Ventura north lift station	lin.m.	520	\$200.00	\$104,000.00
5	Forcemain from Ventura north developments (Area 6 & 7) to Oak Bluff	lin.m.	8,000	\$400.00	\$3,200,000.00
6	Forcemain from Pfrimmer development (Area 1) to Kingswood forcemain	lin.m.	300	\$200.00	\$60,000.00
7	Low pressure sewer from Pfrimmer development (Area 2) to Kingswood lift station	lin.m.	1,000	\$150.00	\$150,000.00
8	Forcemain gate valve	each	4	\$10,000.00	\$40,000.00
9	Pfrimmer development (Area 1) lift station	l.s.	1	\$900,000.00	\$900,000.00
10	Ventura north development (Area 6 & 7) lift station	l.s.	1	\$1,200,000.00	\$1,200,000.00
11	Prairieview 2 lift station pump upgrade	l.s.	1	\$200,000.00	\$200,000.00
12	Oak Bluff Lagoon Upgrades ^{*1}	l.s.	1	\$4,667,000.00	\$4,667,000.00
	Sub-Total				\$11,307,000.00
	Engineering (10%)				\$1,130,700.00
	Contingency (15%)				\$1,696,050.00
	TOTAL OPINION OF PROBABLE COST (Rounded to nearest \$1,000)				\$14,134,000.00

^{*1} Oak Bluff Lagoon Upgrades reflect the additional costs to the Oak Bluff development based on the addition of 4,259 from La Salle and therefore does not reflect the full cost of the expansion.

6.6 OPTION 5 - LA SALLE WASTEWATER DIVERSION TO THE PROPOSED EXPANDED OAK BLUFF LAGOON FACILITY AND DECOMMISSIONING OF THE EXISTING FACILITY

The fifth option evaluated involves constructing a new lift station and forcemain to divert all the wastewater generated by the community of La Salle to the expanded Oak Bluff lagoon facility. A component of this work would involve decommissioning the existing lagoon. Under this scenario, a new lift station would be constructed to service the Ventura north developments (Areas 6 & 7), and this lift station would also be sized to receive the wastewater from all of the other lift stations (directly or indirectly) within the community of La Salle. A common forcemain would be constructed from Prairieview 1 and 2 lift stations to the new Ventura north lift station and a new forcemain would be required to pump the wastewater from the River Ridge lift station. As in the other scenarios, a new lift station and forcemain are required in the Pfrimmer

development (Area 1) and a new low pressure sewer is required from the Pfrimmer development (Area 2) to connect with the Kingswood lift station.

For this option, the design organic loading and hydraulic loading from the community of La Salle are shown in Table 6.11.

Table 6.11 Option 5 – Design Loading from La Salle to the Oak Bluff Lagoon Facility

Wastewater Source	Equivalent Population	Organic Loading [kg-BOD₅/d]	Hydraulic Loading [m³/d]
La Salle Population	7,501	624.6	1,875.3

With a complete wastewater diversion to the expanded Oak Bluff facility, the study provides a cursory overview of the implications of this additional wastewater on the facility. Like Option 4, a SAGR process will need to be implemented to meet the triggered nitrogen limits. In this scenario, the population serviced by the expanded Oak Bluff lagoon has increased by approximately 79% (9,555 to 17,056), which is in the same order of magnitude as a population doubling. Therefore, at a conceptual level of detail, it is assumed that both the aerated primary cells and SAGR cells will need to be doubled in size. The storage capacity requirement as detailed in the Oak Bluff report will need to be increased by 337,554 m³ to accommodate the diverted wastewater from La Salle. This storage increase involves constructing an additional secondary cell (#2). The proposed expansion has been based on the Oak Bluff Preliminary Design Report’s discussion on Option 3 – Aerated Lagoon Expansion with SAGR. The addition of the SAGR process will allow for a longer discharge period (e.g. May 1st to November 1st) which results in a shorter storage period of approximately 180 days. Table 6.12 lists the new lagoon details and capacities and Figure 6-6 shows the proposed site configuration.

Table 6.12 Option 5 - Oak Bluff Lagoon Details and Cell Capacities

	Cell Floor Dimensions	Total Volume	Storage Volume
New Aerated Primary Cell #1	89.5 m x 250.0 m	118,500 m ³	-
New Aerated Primary Cell #2	89.5 m x 250.0 m	118,500 m ³	-
Existing Secondary Cell #1	325.0 m x 288.0 m	207,600 m ³	179,300 m ³
New Secondary Cell #2	Irregular	648,300 m ³	558,200 m ³



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Figure 6-6 Option 5 – Oak Bluff Lagoon Expansion Configuration and Sizing

In this option, since all of the wastewater is being diverted to Oak Bluff, the existing lagoon in La Salle would be decommissioned. The accumulated wastewater solids (“sludge”) that have settled on the bottom of the cells require removal, typically, this material is incorporated into the surrounding agricultural land if there are landowners who agree to receive it as a soil nutrient supplement. Generally, decommissioning of the lagoon involves removing the piping and appurtenances, fencing, concrete structures, granular material, and rip rap. There are cost efficiencies to be explored as the granular material and the rip rap would be available for use in the construction of the Oak Bluff facility. These efficiencies would be explored in more detail in the context of a preliminary design report because they are outside of the scope of this report. Once the construction materials are removed, the dykes would be levelled and the area would receive topsoil from what is available on site. The decommissioned site is approximately 35.0 ha and this land could be used by the RM for other purposes or resold as agricultural land. However, it is typical for Manitoba Environment and Climate Change to include several land usage restrictions on a decommissioned lagoon site.

6.6.1 OPTION 5 – OPINION OF PROBABLE COST

Item	Description of Work	Unit of Measurement	Estimated Total Quantity	Unit Price	Total Price
1	Insurance, bonding	l.s.	1	\$150,000.00	\$175,000.00
2	Mobilization and demobilization	l.s.	1	\$100,000.00	\$100,000.00
3	Common forcemain from Prairieview 1 & 2 lift stations to Ventura north lift station	lin.m.	1,820	\$300.00	\$546,000.00
4	Forcemain from River Ridge lift station to Ventura north lift station	lin.m.	520	\$200.00	\$104,000.00
5	Forcemain from Pfrimmer development (Area 1) to Kingswood forcemain	lin.m.	300	\$200.00	\$60,000.00
6	Low pressure sewer from Pfrimmer development (Area 2) to Kingswood lift station	lin.m.	1,000	\$150.00	\$150,000.00
7	Forcemain from Ventura north developments (Area 6 & 7) to Oak Bluff	lin.m.	8,000	\$450.00	\$3,600,000.00
8	Forcemain gate valve	each	4	\$10,000.00	\$40,000.00
9	Pfrimmer development (Area 1) lift station	l.s.	1	\$900,000.00	\$900,000.00
10	Ventura north development (Area 6 & 7) lift station	l.s.	1	\$1,500,000.00	\$1,500,000.00
11	Prairieview 1 lift station pump upgrade	l.s.	1	\$200,000.00	\$200,000.00
12	Prairieview 2 lift station pump upgrade	l.s.	1	\$200,000.00	\$200,000.00
13	Decommission existing lagoon	l.s.	1	\$3,000,000.00	\$3,000,000.00
14	Oak Bluff Lagoon Upgrades ^{*1}	l.s.	1	\$8,220,000.00	\$8,220,000.00
	Sub-Total				\$18,795,000.00
	Engineering (10%)				\$1,879,500.00
	Contingency (15%)				\$2,819,250.00
	TOTAL OPINION OF PROBABLE COST (Rounded to nearest \$1,000)				\$23,494,000.00

^{*1} Oak Bluff Lagoon Upgrades reflect the additional costs to the Oak Bluff development based on the addition of 7,501 from La Salle and therefore does not reflect the full cost of the expansion.

6.7 SUMMARY

In summary, five options were evaluated as a means of providing treatment and storage for the wastewater generated by the community of La Salle up to the year 2047. Within the framework of a feasibility study, the nuances and evaluations of each option are not explored beyond a conceptual basis and as such, the selected option(s) should be further refined and explored in the context of a preliminary design report. Using the class system established by the Association for the Advancement of Cost Engineering International, the opinions of probable cost presented are considered Class 4 (-30 to +50%) and are summarized in Table 6.13 along with the land acquisition requirements. Class 4 cost estimates are typically based on a 15% level of the project definition.

Table 6.13 Summary of the Opinion of Probable Costs for each of the Five Wastewater Options Evaluated

Option	Details	Land Acquisition Requirements [ha]	Opinion of Probable Cost (Rounded to nearest \$1,000)
1	Expansion of the existing lagoon	18.0	\$6,381,000.00
2	Retaining the existing lagoon and constructing a new supplementary lagoon in an alternate location	30.0	\$9,835,000.00
3	Construction of a new lagoon and decommissioning of the existing facility	56.0 ^{*1}	\$15,692,000.00
4	Partial La Salle wastewater diversion to the proposed expanded Oak Bluff lagoon facility	none ^{*2}	\$14,134,000.00 ^{*3}
5	La Salle wastewater diversion to the proposed expanded Oak Bluff lagoon facility and decommissioning of the existing facility	none ^{*1*2}	\$23,494,000.00 ^{*3}

^{*1} Existing lagoon land would become available after decommissioning the site.

^{*2} The RM has already purchased land for the expansion of the Oak Bluff facility.

^{*3} This opinion of probable costs only reflects the additional costs to the Oak Bluff development based on the addition of people from La Salle and therefore does not reflect the full cost of the expansion.

7 RECOMMENDATION

The expansion options considered all provide sufficient capacity for the 2047 design year wastewater loading. From a consideration of each of these options, WSP recommends Option 1, at an opinion of probable cost of \$6,381,000. As discussed in Section 6.0, this cost does not include any of the costs associated with land acquisition. These additional costs will need to be considered before a decision is selected. Option 1 was selected because it:

- is the lowest capital cost;
- makes the best use of the existing lagoon and infrastructure; and,
- involves the least lift station upgrades/construction.

One drawback to consider with the selection of Option 1 is that beyond 2047, there would be minimal land available for further expansion and likely a new site would need to be considered for future expansion. A second drawback is that maintaining/expanding the existing lagoon could limit the residential development in the areas south and east of the community of La Salle.

8 FUTURE PLANNING

This section provides a brief commentary on future planning beyond the year 2047 in terms of wastewater treatment for the community of La Salle. A key threshold in wastewater treatment is reached when a population reaches 10,000 people. From the Manitoba Water Quality Standards, Objectives and Guidelines, Tier 1 Water Quality Standards, wastewater treatment facilities that service a population of 10,000 people (or equivalent due to industrial loadings) or greater are required to meet a total nitrogen limit of 15 mg/L. Additionally, if the facility is continuously discharging or if the facility discharges outside of the June 15th to November 1st window, site-specific total ammonia limits are applied. Implementation of the SAGR process or upgrading to a mechanical wastewater treatment plant would be options for the community when it reaches this threshold population. Therefore, if the population projections hold, the community would be able to grow from 7,501 people to 10,000 people beyond the year 2047 before major changes would be required in the treatment systems employed, as per the current Environment Act Licence requirements.

8.1 OPTION 1

If Option 1 is selected, a future expansion of the existing lagoon will be limited by the available land and the setbacks from residential development and existing rural residences. After the year 2047, the RM may need to consider flow diversion to a new lagoon or to the Oak Bluff facility.

8.2 OPTION 2

The existing lagoon remains unchanged in this option and the wastewater exceeding the existing lagoon's capacity is diverted to a new lagoon. As such, the most likely option beyond the year 2047 is to expand the newer lagoon to service the wastewater from the growing population. As of now, there is sufficient land in 21-8-3 EPM for expanding the newer lagoon.

8.3 OPTION 3

This option involves the construction of a new lagoon to replace the existing lagoon. This new lagoon could be expanded after the population of 7,501 is reached in 2047. As of now, there is sufficient land in 21-8-3 EPM for expanding the Option 3 lagoon.

8.4 OPTION 4

Expanding for additional population within the community of La Salle beyond the year 2047 in this option would mean that more flow would be diverted to the Oak Bluff facility. There would be no change required for the existing lagoon facility.

8.5 OPTION 5

In Option 5, all of the wastewater is being pumped to the Oak Bluff facility and any growth beyond the design population in the community of La Salle would mean an upgrade at the Oak Bluff facility.

9 REFERENCES

- [1] Manitoba Conservation and Water Stewardship, "Environment Act Licence No. 2674 R". <https://www.gov.mb.ca/sd/eal/registries/2471.5mcdonaldlasalle/2674r.pdf> (access April 3, 2023)
- [2] WSP Canada Inc., "Environment Act Proposal – R.M. of Macdonald – Community of La Salle – Wastewater Stabilization Pond Expansion," WSP Canada Inc., Winnipeg, MB, 2014.
- [3] Manitoba Environment, Climate and Parks, "Information Bulletin - Design Objectives for Wastewater Treatment Lagoons," Manitoba Environment, Climate and Parks, Winnipeg, MB, 2022.
- [4] Statistics Canada. 2007. Macdonald, Manitoba (Code4610035) (table). 2006 Community Profiles. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13, 2007. <https://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E> (accessed April 3, 2023).
- [5] Statistics Canada. 2012. La Salle, Manitoba (Code 460066) and Canada (Code 01) (table). Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. <http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E> (accessed April 3, 2023).
- [6] Statistics Canada. 2017. La Salle, UUC [Designated place], Manitoba and Manitoba [Province] (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 April 3, 2023).
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- [8] Statistics Canada. August 14, 2023, "2021 Census Population and Dwelling Counts – La Salle, MB (Designated place # 460066)" Letter
- [9] U.S. EPA, "Wastewater Technology Fact Sheet - Sewers, Pressure," U.S. EPA, Pennsylvania, 2002.
- [10] Government of Ontario. "Design Guidelines For Sewage Works", Ministry of the Environment, Conservation and Parks. 2019 <https://www.ontario.ca/document/design-guidelines-sewage-works/co-treatment-septage-and-landfill-leachate-sewage-treatment-plants> (accessed April 3, 2023).
- [11] WSP Canada Inc., "RM of Macdonald – Oak Bluff Forcemain & Lagoon Study," WSP Canada Inc., Winnipeg, MB, 2023.

APPENDIX

A





MACDONALD-RITCHOT
PLANNING DISTRICT
DEVELOPMENT PLAN –
MAP 2 (FEBRUARY 2023)

Macdonald-Ritchot Planning District




Development Plan
BY-LAW No. 2/22

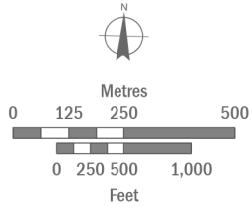
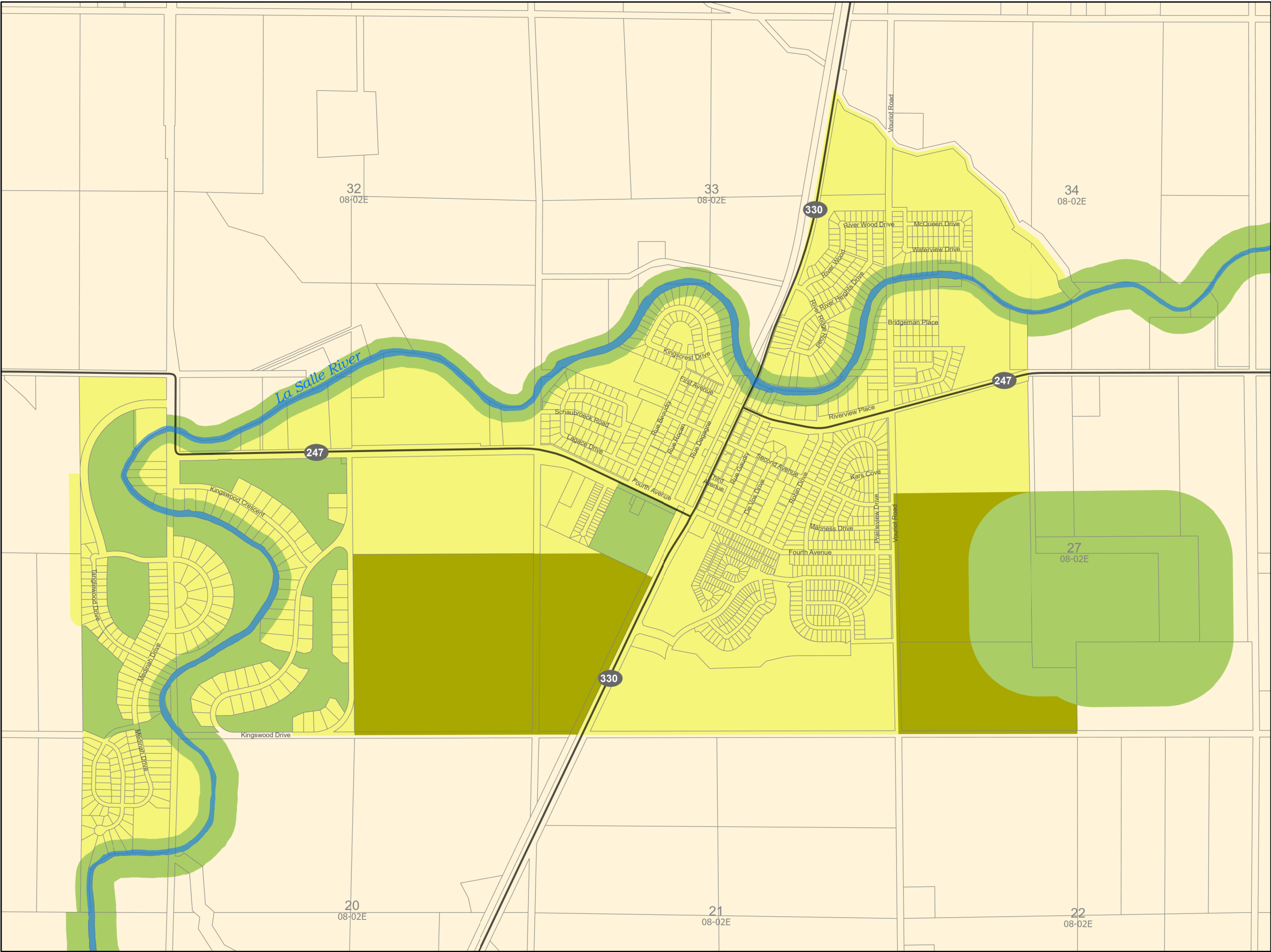
MAP 2 La Salle

Development Plan Designations

-  Agricultural Policy Area
-  Rural Centre Policy Area
-  Environmental Policy Area
-  Rural Centre Hold Policy Area

Other Features

-  Provincial Road
-  Assessment Parcel
-  Water Body



APPENDIX

B

LIFT STATION DRAWDOWN TESTS

Pump Draw Down Calculator

Project: La Salle Feasibility Study
 Project No: CA0020151.8333
 Date: June 14, 2024
 Completed by: BL



Input Data

Lift station: Kingswood
 Wet well diameter [m] 2.134 m
 Wet well dimensions [m] n/a m, length
 n/a m, width
 Wet well area [sq.m.] 3.577 sq.m.
 Number of pumps 2

Pump	Start time	Start depth [ft]	Start depth [m]	End time	Ending depth [ft]	Ending depth [m]	Run Time [s]	Fill Time [s]	Uncorrected Pumped Volume [cu.m.]	Uncorrected Pumping Rate [L/s]	Inflow Rate [L/s]	Corrected Pumping Rate [L/s]	Corrected Pumped Volume [L]
2	8:58:39		6.70	9:01:47		7.78	188		3.86	20.55		22.51	4,231.06
								1972			1.96		
1	9:34:39		6.70	9:37:51		7.78	192		3.86	20.12		22.12	4,247.78
								1883			2.05		
2	10:09:14		6.70	10:12:21		7.78	187		3.86	20.66		22.67	4,239.25
								1956			1.97		
1	10:44:57		6.70	10:48:06		7.78	189		3.86	20.44		22.21	4,198.29
								2452			1.58		
2	11:28:58		6.70	11:32:05		7.78	187		3.86	20.66		22.16	4,144.76
								2682			1.44		
1	12:16:47		6.70	12:19:53		7.78	186		3.86	20.77		22.22	4,133.13
								2634			1.47		
2	13:03:47		6.70										

	Measured	Totalizer	Commissioning
Pump 2 Average [L/s]	22.45 L/s	0.00 L/s	
Pump 1 Average [L/s]	22.17 L/s	0.00 L/s	

Comparison of actual recorded pump run time and the hour meters

Pump	Actual	Actual	Hour Meters	Meters/Actual
2	562 s = 0.156 h	0.160	102.5%	
1	567 s = 0.158 h	0.130	82.5%	

	Hour meters P2	Hour meters P1
Start time	1482.99	1383.99
End time	1483.15	1384.12
	0.16	0.130
	576	468.0

Pump Draw Down Calculator

Project: La Salle Feasibility Study
 Project No: CA0020151.8333
 Date: June 14, 2024
 Completed by: BL



Input Data

Lift Station: Prairieview 1
 Wet well diameter [m] 2.438 m
 Wet well dimensions [m] n/a m, length
 n/a m, width
 Wet well area [sq.m.] 4.668 sq.m.
 Number of pumps 2

Pump	Start time	Start depth [ft]	Start depth [m]	End time	Ending depth [ft]	Ending depth [m]	Run Time [s]	Fill Time [s]	Uncorrected Pumped Volume [cu.m.]	Uncorrected Pumping Rate [L/s]	Inflow Rate [L/s]	Corrected Pumping Rate [L/s]	Corrected Pumped Volume [L]
2	13:42:24		2.27	13:43:17		3.45	53	900	5.51	103.94		110.57	5,860.46
1	13:58:17		2.17	13:59:32		3.34	75	1586	5.46	72.83	6.64	77.72	5,828.97
2	14:25:58		2.27	14:26:52		3.45	54	1256	5.51	102.01	3.15	105.96	5,722.06
1	14:47:48		2.17	14:49:08		3.34	80	1608	5.46	68.27	4.76	72.21	5,776.44
2	15:15:56		2.27	15:16:49		3.45	53	1134	5.51	103.94	3.11	108.12	5,730.53
1	15:35:43		2.17	15:36:56		3.34	73	1596	5.46	74.82	5.27	79.02	5,768.45
2	16:03:32		2.27								3.13		

Pump 2 Average [L/s]	Measured 108.22 L/s	Totalizer 0.00 L/s	Commissioning L/s
Pump 1 Average [L/s]	74.96 L/s	0.00 L/s	

Comparison of actual recorded pump run time and the hour meters

Pump	Actual	Actual	Hour Meters	Meters/Actual
2	160 s =	0.044 h	0.045	101.3%
1	228 s =	0.063 h	0.043	67.9%

	Hour meters	
	P1	P2
Start time	613.317	635.845
End time	613.36	635.89
	0.043	0.045
	154.8	162.0

Something appears amiss with the Pump 1 hour meter.