Alexandria Sewage Lagoon Facility

Municipal Class 'C' Environmental Assessment

Phase 3 Environmental Study Report

Prepared for:

Corporation of the Township of North Glengarry
63 Kenyon Street West
Alexandria, Ontario K0C 1A0

Prepared by:

McIntosh Perry Consulting Engineers Ltd.
115 Walgreen Road
Carp, ON
K0A 1L0

December 2016

Table of Contents

List of Figures

List of Tables

APPENDICES

1.0 INTRODUCTION

The Township of North Glengarry retained McIntosh Perry Consulting Engineers Ltd. (McIntosh Perry) to conduct a Municipal Class Environmental Assessment (Class EA) for the expansion of the Alexandria Sewage Lagoon Facility.

This project will follow the planning process for a Schedule 'C' Class EA as defined in the Municipal Engineers Association 'Municipal Class Environmental Assessment' document 2000 (2007 and 2011, as amended). McIntosh Perry will guide the Township though Phase 1-4 of the Class EA process. The Class EA process will help identify and evaluate various alternative solutions using sound criteria in efforts to select a technically preferred solution for the expansion of the Alexandria Sewage Lagoon Facility.

1.1 Background

The Township of North Glengarry owns and operates the Alexandria Sewage Lagoon Facility. The Lagoon has served the Urban Town of Alexandria since it was originally constructed in 1962. The Alexandria Sewage Lagoon Facility is an approved 4-cell facultative Lagoon System and has a rated capacity of 3,237 m^3/day according to the currently approved Ministry of the Environmental and Climate Control (MOECC) Amended Environmental Compliance Approval (ECA) Reference Number 9324-8WKJD2, August 2, 2012. On average, the Alexandria Sewage Lagoon Facility is operating over its rated capacity.

Since 2008, the Township of North Glengarry has undertaken various repairs to the Alexandria sewage works network to help reduce and eliminate infiltration into the system in efforts to gain back some working capacity of the Alexandria Sewage Lagoons. However, at this time, improvements have any shown a slight improvement but have not generated any additional capacity.

In 2012, the Township of North Glengarry undertook various studies and investigations in support of re-rating the existing Alexandria Sewage Lagoon Facility from 3,237 m^3/d to 5,500 m^3/d by demonstrating additional treatment capacity above current design flows. An Assimilative Capacity Study and Lagoon Performance Assessment for the Alexandria Sewage Works were completed by AECOM September 2012. In October 2012, Hutchinson Environmental Sciences Limited (HESL) prepared a review of AECOM's report that contained a number of comments on the report, questions regarding modelling calculations, and recommendations for follow up. In November 2012, Hutchinson Environmental Sciences Limited (HESL) undertook a water quality sampling program of the Delisle River and reconsidered the effluent limits proposed. In conclusion, it was determined that re-rating the Alexandria Sewage Lagoon Facility was not a viable option. The Water Quality Assessment and Ammonia Modelling Update in Support of Re-rating the Alexandria Sewage Works report by HESL can be found in Appendix A.

Therefore, the lack of capacity is creating a barrier for growth and economic development within the Township and therefore, it is Council's desire to move forward with addressing the current capacity issue, as well as the Municipality's future needs.

1.2 Study Area

The Alexandria Sewage Lagoon Facility is located east of the Town of Alexandria off of McCormick Road. The Alexandria Sewage Lagoon Facility is located approximately 1.8 km northeast from downtown Alexandria (Figure 1). The legal description of the site is Lots 32 and 33, Concession 2, Township of North Glengarry. The Town of Alexandria consists of roughly 4,000 residents, as well as commercial and industrial development. The lands adjacent to the Alexandria Sewage Lagoons are primarily used for agriculture and dairy farming.

Effluent from the Alexandria Sewage Lagoon Facility discharges on a continuous, year-round basis to the Pilot Drain, an agricultural swale, which conveys approximately 700 meters prior to being discharged into the Delisle River. The Delisle River eventually discharges to the St. Lawrence River near Coteaux-du-lac, Quebec.

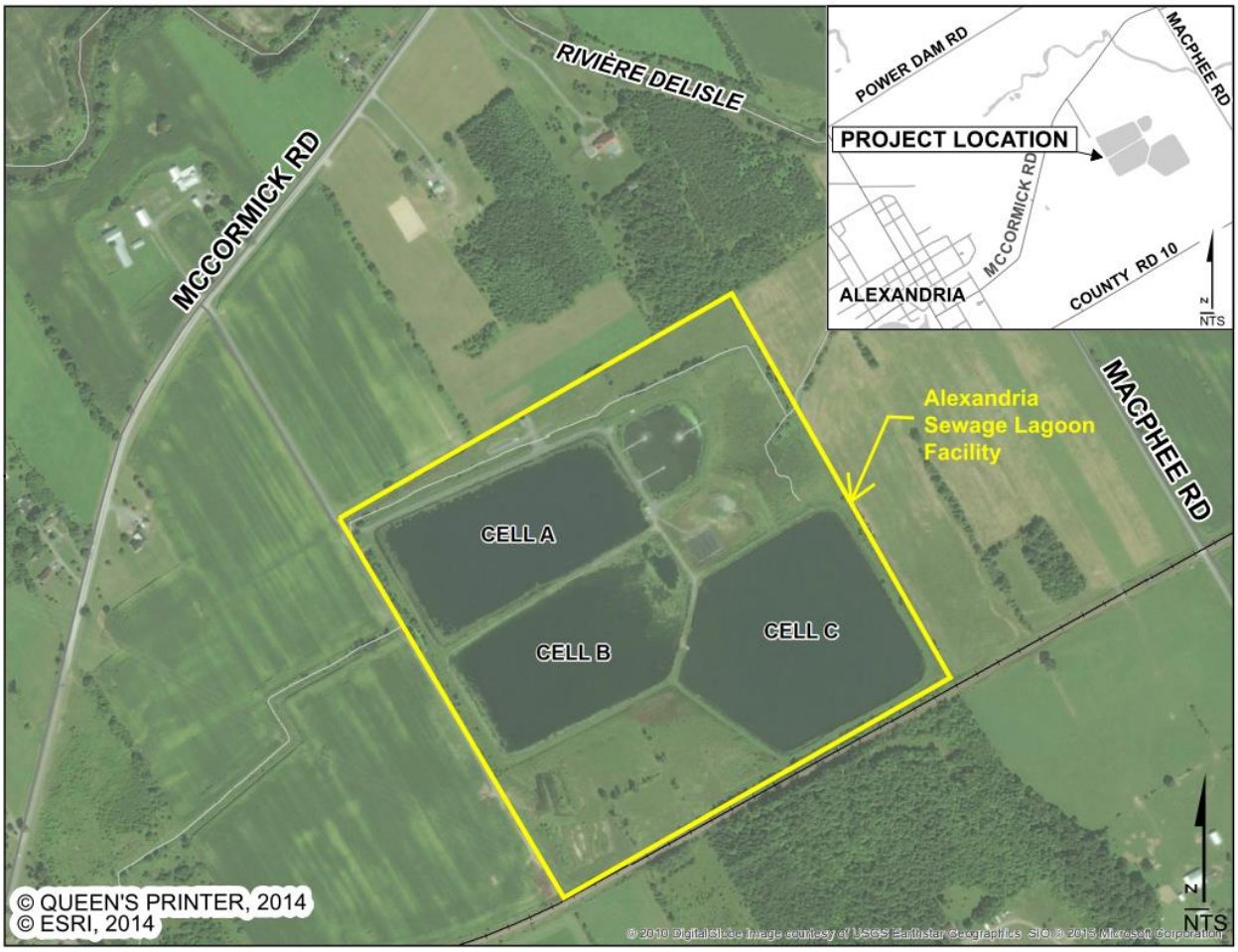


Figure 1-1– Site Location

Figure 1-2– Alexandria Sewage Lagoon Facility

2.0 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Ontario Environmental Assessment Act

The purpose of the Ontario Environmental Assessment Act (EA Act) is to provide for:

> *"… the betterment of the people of the whole or any part of Ontario by providing for protection, conservation and wise of management in Ontario of the Environment. (Part 1 – Section 2)"*

The EA Act requires the documentation, explanation, and studying of the environmental effects that could arise from various types of projects and/or activities. The objective of the EA Act is to determine the effects of these projects early in the planning process to ensure that concerns are addressed early on in the design process. A key objective of the EA Act is to select a preferred alternative with the fewest environmental impacts.

In applying the requirements of the EA Act, two types of environmental assessment planning and approval processes are identified:

1. Individual Environmental Assessments (Part II of the EA Act) – projects for which a Terms of Reference and an Individual Environmental Assessment are carried out and submitted to the Minister of the Environment and Climate Control for review and approval.
2. Class Environmental Assessments (Part II.1 of the EA Act) – projects are approved subject to compliance with an approved Class EA process with respect to the class of undertaking. Providing that the approved process is followed, a proponent has compiled with Section 13(3)a of the EA Act.

The key principals of an environmental assessment planning under the EA Act include:

1. Early consultation with affected parties in and throughout the process
2. Consideration of a reasonable range of alternatives
3. Identification and consideration of the effects of each alternative on all aspects of the environment
4. Evaluation of alternatives to determine their net environmental effect
5. Provide clear and complete documentation of the planning process, to allow for a "traceable" decision-making process

2.2 Municipal Class Environmental Assessment Process

The approved Municipal Class Environmental Assessment (Class EA), October 2000, as amended in 2007 & 2011, documents an approved process under the Ontario EA Act. The Class EA document applies to all municipal infrastructure projects. The Class EA document provides a planning process to deal with projects which are reoccurring, similar, limited in scale and have a predictable range of environmental issues. Due to wide variety of projects being undertaken by different municipalities, projects are classified in terms of "Schedules". The four schedule classifications include Schedule A, A+, B and C and are defined as follows:

- **Schedule A** – projects are those which could be classified as normal activities with minimal adverse effects on the environment. These projects include municipal operations and maintenance activities such as culvert replacement or watermain / sewer extensions with road allowances. Schedule A projects are pre-approved and do not require further Class EA approval.
- **Schedule A+** – projects are similar to Schedule A projects, they include municipal operations and maintenance activities, are pre-approved, but also require public notification.
- **Schedule B** – projects are those which have a greater potential to cause adverse effects on the environment. They require mandatory contact with directly affected parties, such as the public, stakeholders, and relevant government agencies, to ensure they are aware of the project and any concerns are addressed. A screening process is required that involves the assessment of environmental, social and economic conditions as well as an alternative solution evaluation.

- **Schedule C** – projects are those that can pose significant environmental impacts. These projects must follow the full planning and documentation procedures specified in Class EA.

The main elements of the Class EA planning process are incorporated into five separate phases, each involving one or more steps. The level of complexity of the project will affect the manner in which a project proceeds through the planning process and ultimately the Schedule is falls under. The complexity of a project is based on many components, including environmental effects, public and agency input and technical considerations, and how they are interrelated.

The proposed Alexandria Sewage Lagoon Facility expansion is classified as a Schedule C project. The Schedule C process is shown below in Figure 2-1, which follows all phases outlined in the Class EA process. The flow chart incorporates the steps considered essential for compliance requirements under the Environmental Assessment Act, the extent of which are determined by the complexity of the project.

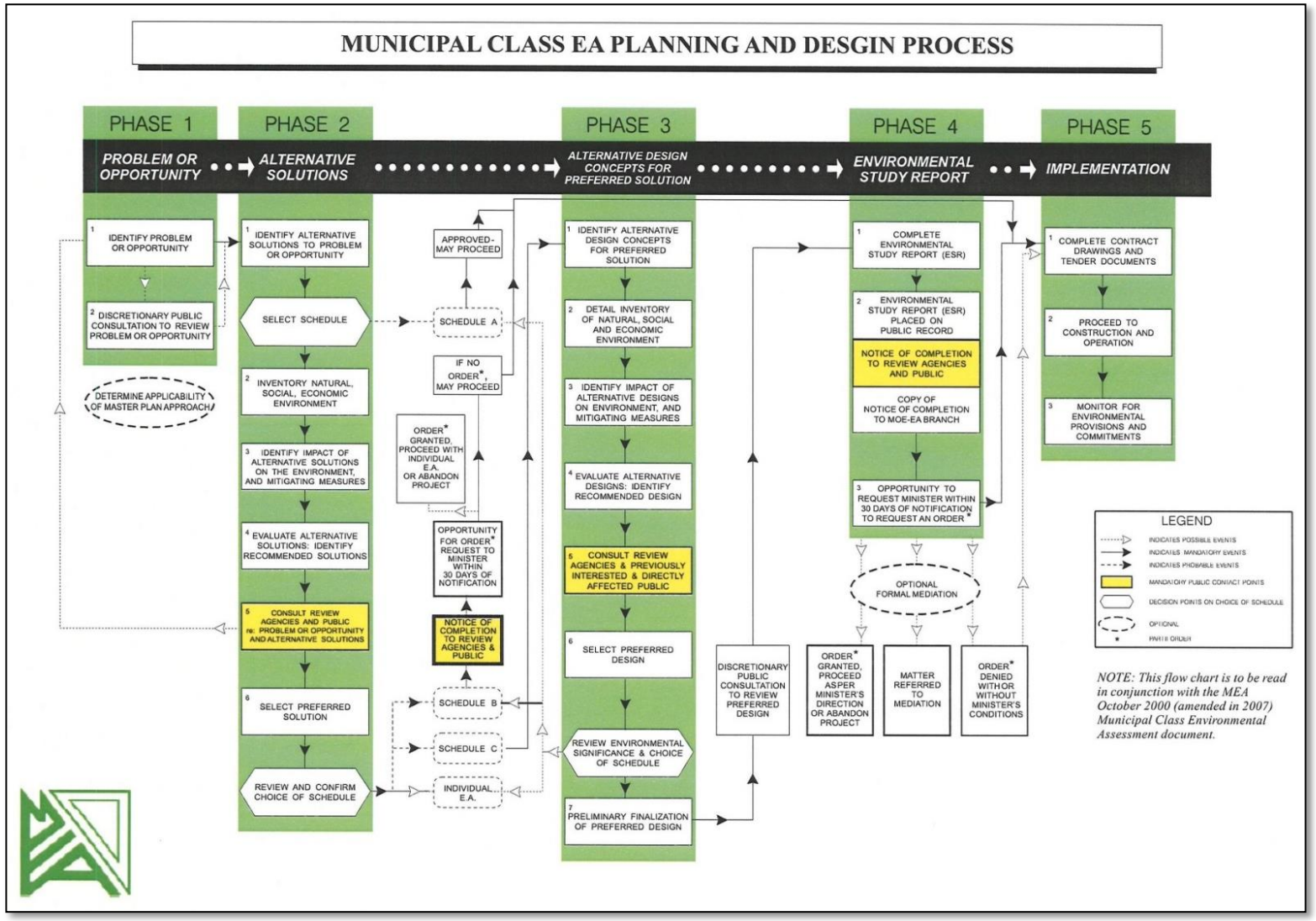


Figure 2-1– Site Location

3.0 PHASE 1 – PROBLEM AND/OR OPPORTUNITY STATEMENT

The Alexandria Sewage Lagoon Facility has currently exceeded its rated capacity. The Township has undertaken many and various actions to help reduce and eliminate infiltration in the system, but the results are not as effective as required. In addition, the Township investigated re-rating the lagoons but it was determined that this route was not feasible. The lack of capacity is creating a barrier for growth and economic development within the Township. Therefore, the Township is planning for the expansion of the existing facility to address current capacity issues and to allow for future growth within the Alexandria community.

4.0 EXISTING TREATMENT FACILITY

4.1.1 *Township's Collection System*

The Urban Town of Alexandria, located approximately 35 km northeast of Cornwall, is currently serviced by approximately 22 km of sanitary collection pipes, varying in size and material type. Pipe size ranges from 150 mm to 600mm, while material types are polyvinyl chloride (PVC), asbestos cement (AC), vitrified clay tile (VCT), and concrete.

The collection system also contains four (4) lift stations, three of which contain 2 pumps and one main lift station containing four pumps rated at 80 l/s each. The collected sanitary sewage is transferred to the Alexandria Sewage Lagoon Facility via the Garry River trunk sewer.

In 2008, the Township of North Glengarry retained the services of McIntosh Perry to undertake a Sanitary System Collection Study within the former Town of Alexandria. The Township suspected that the existing sanitary sewer collection system was under duress, as the sanitary sewage lagoon was treating more sanitary flow than expected based on the records from the water treatment plant. Since 2009 the Township has undertaken many and various corrective actions to help reduce and eliminate infiltration into their sanitary network. However, infiltration and inflow is still an issue and therefore the Township is currently revising the wastewater by-law and identifying households with downspout connections to the sanitary sewer. The Township is continuously looking for ways to reduce and eliminate infiltration into the sanitary network.

4.1.2 *Lagoon Treatment Facility*

The Township of North Glengarry owns and operates the Alexandria Sewage Lagoon Facility. The Township's infrastructure consists of a Class III Surface Water Treatment Facility, Class II Distribution System, Class II Wastewater Treatment Lagoon and Class II Wastewater Collection System.

Various upgrades have taken place over the past 50+ years in efforts to improve and extend the life of the facility. The following is a list of MOECC Approvals (C of A/ECA) presently in place for the Alexandria Sewage Lagoon Facility.

Table 4-1: Current MOECC Certificate of Approvals

MOECC Ref. No. C of A/ECA	Type	Date	Purpose
62-A-877	Sewage Works Approval	October 29, 1962	Original system including three-cell facultative lagoons
2-0277-69-700452	Sewage Works Approval	September 11, 1970	Addition of Aeration Cell
3-0478-93-006	Municipal Sewage	July 16, 1993	Addition of Splitter chamber at Aeration Cell
1960-6FQKK9 (revoked)	Municipal Sewage	2005	Construction of Engineered Wetland
7089-7FFKQN	Municipal Sewage	June 12, 2008	Pilot project using EOS-2000
3962-7Q4LF8	Municipal Sewage	May 27, 2009	Repair to lagoon berms and recognized the addition of chemical phosphorus removal
0388-7TZN9C	Municipal Sewage	August 19, 2009	Approval for continued operation of the EOS-2000 System
3539-85FQKN	Municipal Sewage	June 1, 2010	Extended the deadline for the installation of the disinfection and dechlorination systems
6361-8L7KLL	Municipal Sewage	September 23, 2011	Extended the deadline for the submission of the flow assessment and the application to re-rate the Works
2561-8UZNU3	Municipal Sewage	June 8, 2012	Approval for extension of the compliance date
9324-8WKJD2	Municipal Sewage	August 2, 2012	Removal of condition indicating disinfection required during by-pass flow

The Alexandria Sewage Lagoon Facility is currently operating under MOECC Amended Environmental Compliance Approval (ECA) Reference Number 9324-8WKJD2, August 2, 2012 (Appendix B). Alexandria's municipal wastewater treatment is an approved 4-cell continuous discharge lagoon system with a yearly average flow rated capacity of 3,237 m^3/day. The lagoon system includes one aerated and three facultative lagoons. Flow is directed to the facility through a 450 mm diameter forcemain where it enters the aerated lagoon. If required for operational reasons, the aerated lagoon can be bypassed with influent flow being directed to the first facultative lagoon. Three (3) mechanical aerators each equipped with 11.2 kW (15 Hp) motors are located in the aerated lagoon to enhance oxygen transfer to the water for biological treatment of the wastewater. Effluent from the aerated lagoon flows sequentially through three facultative lagoons (Lagoon C, then Lagoon B and then Lagoon A) before flowing over an adjustable stop log weir. Lagoon effluent flows by gravity through a pipe to the disinfection process. Disinfection is accomplished by chlorination (liquid sodium hypochlorite and prior to discharge the water is dechlorinated. Chemical addition for dechlorination (oxidation-reduction potential (ORP)) is controlled and

accomplished by adding one of the following chemicals; calcium thiosulfate, sodium sulphite or sodium ascorbate. Effluent from the dechlorination chamber flows into a facility perimeter ditch and ultimately to the Delisle River. The Alexandria Sewage Lagoon treatment performance results for 2013 – 2015 can viewed in Appendix C.

To control total phosphorus, alum is added to the effluent flow from the aerated lagoon.

When accumulated biosolids are removed from the lagoons, Geotubes located in a containment area are filled. The containment cell is lined with a non-woven material and impermeable lined. Water from the Geotubes is collected at a sump and pumped back to the lagoons.

4.1.3 *Receiving Watercourse*

Effluent from the Alexandria Sewage Lagoons surface discharges on a continuous and year-round basis to the Pilot Drain, an agricultural swale, which conveys approximately 700 meters prior to being discharged into the Delisle River. The Delisle River eventually discharges to the St. Lawrence River near Coteaux-du-lac, Quebec. The major land use in the watershed within the vicinity of the lagoon is predominantly agriculture and dairy farming.

Flow data from a federal stream flow gauging station on the Delisle River shows that on a number of occasions over the period of record, zero to very low flows have been recorded, which can categorize the Delisle River as a very limited assimilative capacity receiver. Flow data from gauge station 02MC028 can be found in Appendix D.

In addition, the Delisle River is a Policy 2 receiver for total phosphorus, in that concentrations exceed the Provincial Water Quality Objective (PWQO; MOE 1994) of 0.03 mg/L for Protection of Aquatic Life. Policy 2 requirements stipulate that there can be no further degradation of the receiving stream, and that all reasonable measures should be undertaken to improve water quality to the objective. Details of the expanded/upgraded facility's compliance with limited receiver and Policy 2 requirements are detailed in Section 5.1; Design Criteria.

The effluent quality objectives and limits for the Alexandria Sewage Lagoon Facility specified in the existing amended ECA (Ref No. 9324-8WKJD2) are as follows:

Table 4-2: Effluent Objectives from Sewage Works

Effluent Parameter	Concentration Objectives (milligrams per litre unless otherwise stated)
$cBOD_5$*	25
Total Suspended Solids	25
Total Phosphorus	0.4
Total Residual Chlorine	Non-detectable
E. Coli	150 organisms/100 ml (Monthly Geometric Mean Density)
pH	Between 6.0 - 9.0, inclusive

** $CBOD_5$ - Carbonaceous Biochemical Oxygen Demand*

Table 4-3: Effluent Limits from Sewage Treatment Facility

Effluent Parameter	Average Concentration Objectives (milligrams per litre unless otherwise stated)
$cBOD_5$	30
Total Suspended Solids	40
Total Phosphorus	0.5
Total Residual Chlorine	0.02
pH	Between 6.0 - 9.0, inclusive
E. Coli	Monthly Geometric Mean Density 200 organisms per 100 ml

4.1.4 *Lagoon Capacity*

The amended ECA identifies the surface area for the facultative lagoons A, B and C but does not reference the surface area of the aerated lagoons or lagoon depth. Based on depth assumptions of 1.5 m and estimated aerated cell area (1.013 ha.), the approximate lagoon cells volumes for the existing sewage lagoon is as follows:

Table 4-4: Lagoon Capacity

Cell	Area (ha.)	Average Liquid Storage Depth(1) (m)	Approximate Working Volume (m^3)
A	5.5(2)	1.5	82,500
B	5.2(2)	1.5	78,000
C	6.5(2)	1.5	97,500
Aeration	0.89(3)	3	26,700
Total	18.213	n/a	288,381

(1) – Assumed depth
(2) – Provided in ECA
(3) – Based on aerial google map and visible liquid surface

4.1.5 *Raw Sewage Flow*

As per Section 9.0 of the amend ECA, the Township of North Glengarry are required to monitor raw sewage flow rates. The monthly averages and annual flow rates for the past three years (2013-2015) have been summarized in Table 4-5. As previously indicated, since 2008 the Township of North Glengarry has undertaken various repairs/upgrades to the Alexandria sewage works network to help reduce and eliminate infiltration into the system and help reclaim capacity within the treatment facility. Therefore, data collected from 2013-2015 is believed to be more representative of currently improved conditions.

Table 4-5: Raw Sewage Flow Rates (2013-2015)

Month	2013			2014			2015		
	Total Flow (m^3)	Average Day Flow (m^3)	Max. Day Flow (m^3)	Total Flow (m^3)	Average Day Flow (m^3)	Max. Day Flow (m^3)	Total Flow (m^3)	Average Day Flow (m^3)	Max. Day Flow (m^3)
January	135,619	4,374	9,007	106,033	3,420	7,427	78,830	2,505	3,793
February	106,923	3,818	6,085	70,612	2,522	5,883	52,839	1,887	2,244
March	181,048	5,840	12,887	89,325	2,881	5,151	100,563	3,352	6,144
April	260,673	8,689	13,888	343,248	11,442	21,584	198,246	6,608	11,470
May	105,537	3,404	5,616	152,613	4,923	11,049	87,520	2,823	3,584
June	205,832	6,861	14,565	111,980	3,733	8,071	96,011	3,200	5,262
July	108,897	3,512	6,349	101,233	3,266	9,348	74,332	2,398	3,953
August	67,520	2,178	2,908	77,522	2,501	4,941	54,919	1,772	1,955
September	90,578	3,019	7,100	60,403	2,013	2,662	76,774	2,559	3,983
October	82,044	2,646	4,688	74,586	2,406	3,566	91,452	2,950	5,905
November	121,189	4,039	7,227	70,590	2,353	4,883	106,845	3,562	5,068
December	82,420	2,658	3,867	101,640	3,279	8,676	139,979	4,515	6,584
Annual Avg.	-	4,253	-	-	3,728	-	-	3178	-

As summarized in Table 4-5, the annual average raw sewage flows over two of the past three years have exceeded the rated capacity of the sewage lagoon. The facility was in compliance in 2015. The reduction in the annual raw sewage flows have successfully decreased as a result of the Township's ongoing efforts to reduce and eliminate infiltration into the system.

Furthermore, the Township has also experienced a number of by-passes as a result of heavy precipitation and / or snow melt:

Table 4-6: By-Pass Events (2013-2015)

Month	Total By-Pass Flow (m^3)		
	2013	2014	2015
January	-	-	-
February	-	-	-
March	-	-	-
April	-	14,564.80	20.00
May	-	-	-
June	-	27.10	-
July	-	-	-
August	-	-	-
September	-	-	-
October	-	-	-
November	-	-	-
December	2.93	-	-

4.1.6 *Raw Sewage Quality*

The monitoring results for 2013 to 2015 indicated that raw sewage data was analyzed for $CBOD_5$, Total Suspended Solids, Total Phosphorus and Total Kjeldahl Nitrogen (TKN). The annual average concentration levels are summarized in Table 4-7.

Table 4-7: Raw Sewage Quality (2013-2015)

Month	Annual Average (mg/L)		
	2013	2014	2015
$CBOD_5$	59.1	109.1	148.2
Total Suspended Solids	70.8	61.6	77.9
Total Phosphorus	1.3	1.4	1.44
TKN	13.6	15.6	15.65

The Urban Town of Alexandria consists primarily of residential development with minimal commercial and light industrial developments. Therefore, upon review of the above data, the raw sewage can be classified as low to medium strength domestic sewage according to Metcalf & Eddy (2009).

4.1.7 *Treated Effluent Quality*

As per Section 6 and 7 of the amended ECA, performance data from 2013 to 2015 was analyzed for the following key parameters: $CBOD_5$, Total Suspended Solids, Total Phosphorus, Total Residual Chlorine and pH. Tables 4-8 to 4-13 summarize the average monthly concentrations and the annual average performance results.

4.1.7.1 $CBOD_5$

Table 4-8: $CBOD_5$ Effluent Quality

Month	Average Monthly Concentrations (mg/L)		
	2013	2014	2015
January	8.0	20.8	16.3
February	16.3	17.5	34.8
March	14.5	20.8	48.4
April	5.8	10.8	10.4
May	4.5	4.0	6.4
June	3.0	4.2	3.6
July	3.0	6.8	3.2
August	3.0	3.5	3.0
September	3.0	3.0	3.0
October	3.0	3.0	3.3
November	3.2	8.3	3.1
December	5.4	13.8	3.3
Annual Avg.	6.1	9.7	11.6
Maximum Monthly Avg.	16.25	20.8	48.4
Annual Avg. percentage Removal (%)	88	85	89
No. of Months Exceeding ECA Limits	0	0	0

ECA Effluent Objective (mg/L)	25
ECA Effluent Limits (mg/L)	30

Table 4-8 identifies that the annual average and monthly average for Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) concentrations from 2013 to 2015 has generally been in compliance with the effluent limits outlined in the amended ECA with exception to two exceedances in February and March 2015. The annual average percentage removal of $CBOD_5$ was between 88-89% with respect to the average raw influent. Therefore, the facility appears to be adequately performing with respect to the removal of $CBOD_5$.

4.1.7.2 Total Suspended Solids

Table 4-9: Total Suspended Solids Effluent Quality

Month	Average Monthly Concentrations (mg/L)		
	2013	2014	2015
January	7.8	16.8	17.0
February	17.8	17.5	28.8
March	15.8	20.8	41.6
April	8.4	10.8	10.4
May	5.3	4.2	10.6
June	3.0	3.2	3.0
July	3.0	7.0	3.1
August	3.0	3.7	3.1
September	3.0	3.0	3.0
October	3.0	3.2	3.3
November	3.2	10.0	3.2
December	8.6	19.6	3.3
Annual Avg.	6.8	10.0	10.9
Maximum Monthly Avg.	17.8	20.8	41.6
Annual Avg. percentage Removal (%)	89	80	84
No. Months Exceeding ECA Limits	0	0	0
ECA Effluent Objective (mg/L)	25		
ECA Effluent Limits (mg/L)	40		

Table 4-9 identifies that the annual average and monthly average for Total Suspended Solids (TSS) concentrations from 2013 to 2015 were generally in compliance with the effluent limits outlined in the amended ECA with exception to one exceedance in 2015. The annual average percentage removal of TSS was between 80-89% with respect to the average raw influent. Therefore, the facility appears to be adequately performing with respect to the removal of TSS.

4.1.7.3 Total Phosphorus

Table 4-10: Total Phosphorus Effluent Quality

Month	Average Monthly Concentrations (mg/L)		
	2013	2014	2015
January	0.28	0.41	0.37
February	0.43	0.42	0.36
March	0.37	0.43	0.52
April	0.19	0.21	0.25
May	0.21	0.13	0.26
June	0.21	0.14	0.20
July	0.08	0.17	0.11
August	0.09	0.15	0.09
September	0.05	0.11	0.06
October	0.08	0.13	0.05
November	0.11	0.21	0.07
December	0.23	0.39	0.09
Annual Avg.	0.19	0.24	0.20
Maximum Monthly Avg.	0.43	0.43	0.52
Annual Avg. percentage Removal (%)	80	75	84
No. Months Exceeding ECA Limits	0	0	0
ECA Effluent Objective (mg/L)	0.4		
ECA Effluent Limits (mg/L)	0.5		

Table 4-10 identifies that the annual average Total Phosphorus (TP) concentrations from 2013 to 2015 were generally in compliance with the effluent limits outlined in the amended ECA with exception to one exceedance in 2015. The annual average percentage removal of TP was between 75-84% with respect to the average raw influent. Therefore, during 2013 to 2015, the facility appears to be adequately performing with respect to the removal of TP.

4.1.7.4 Total Residual Chlorine

Table 4-11: Total Residual Chlorine Effluent Quality

Month	Average Monthly Concentrations (mg/L)		
	2013	2014	2015
January	0.01	0.01	0.01
February	0.01	0.01	0.00
March	0.01	0.01	0.01
April	0.01	0.01	0.01
May	0.01	0.01	0.04
June	0.02	0.01	0.03
July	0.01	0.01	0.02
August	0.01	0.11	0.01
September	0.01	0.01	0.01
October	0.01	0.01	0.01
November	0.01	0.01	0.01
December	0.01	0.01	0.01
Annual Avg.	0.01	0.02	0.02
Maximum Monthly Avg.	0.02	0.11	0.04
Annual Avg. percentage Removal (%)	-	-	-
No. Months Exceeding ECA Limits	0	1	2
ECA Effluent Objective (mg/L)	Non-detectable		
ECA Effluent Limits (mg/L)	0.02		

Table 4-11 identifies that the annual average Total Residual Chlorine (Cl_2) concentrations from 2013 to 2015 were incompliance with the effluent limits outlined in the amended ECA. However, on a monthly basis, the Cl2 concentrations generally met the ECA criteria, with exception to 1 month in 2014 and 2 months in 2015.

4.1.7.5 pH

Table 4-12: pH Effluent Quality

Month	Average Monthly pH		
	2013	2014	2015
January	7.39	7.1	7.03
February	7.21	7.03	6.90
March	7.09	7.33	6.74
April	7.78	7.33	7.21
May	7.51	7.44	7.52
June	7.25	7.1	7.03
July	7.22	7.23	7.32
August	7.23	7.17	7.40
September	7.26	7.18	7.63
October	7.35	7.36	7.53
November	7.29	7.9	7.43
December	7.17	7.76	7.46
Annual Avg.	7.31	7.33	7.62
Maximum Monthly Avg.	7.78	7.90	7.63
Annual Avg. percentage Removal (%)	-	-	-
No. Months Exceeding ECA Limits	0	0	0
ECA Effluent Objective	6.0 – 9.0		
ECA Effluent Limits	pH of the effluent maintained between 6.0 to 9.5, 6.0– 9.0 inclusive		

Table 4-12 identifies that the annual average and monthly average for pH level from 2013 to 2015 were within the effluent limits outlined in the amended ECA. Therefore, the Alexandria Sewage Lagoons are adequately maintaining the preferred pH level.

4.1.7.6 E. Coli

Table 4-13: E. Coli Effluent Quality

Month	Average Monthly Concentrations (cts/100mL)		
	2013	2014	2014
January	6	2	3
February	2	2	2
March	2	2	2
April	107	3	2
May	5	1	2
June	2	2	3
July	2	5	5
August	2	3	2
September	3	2	2
October	2	2	2
November	2	2	6
December	3	2	2
Annual Avg.	4	2	3
Maximum Monthly Avg.	107	5	6
Annual Avg. percentage Removal (%)	-	-	-
No. Months Exceeding ECA Limits	0	0	0
ECA Effluent Objective	150 organisms / 100 mL		
ECA Effluent Limits	200 organisms per 100 ml		

Table 4-13 identifies that the annual average and monthly average for E. Coli concentration from 2013 to 2015 were incompliance with the effluent limits outlined in the amended ECA.

4.1.8 *Existing Treatment Facility Overview*

In order to accurately identify the technically preferred alternative solution for the Alexandria Sewage Lagoon Facility expansion, Amec Foster Wheeler and McIntosh Perry completed a detail review of the existing facility in Phase 2 of the Class EA process to verify if the existing facility is meeting current MOECC design standards and the amended ECA (Ref No. 9324-8WKJD2), as well as document the facilities ability to treat current rated capacity. The review also provided an opportunity to identify which components of the existing system can be incorporated into the proposed expansion.

Based on the above noted performance data, the following conclusions have been made:

1. The annual average flows over two of the past three years have exceeded the rated capacity of the sewage lagoon (3,237 m^3/day). In 2013, the Alexandria Sewage Lagoon Facility was approximately 131% over rated capacity and 115% in 2014. Therefore, during 2013 and 2014, the facility was not in compliance with the rated capacity identified in the amended ECA. However, over the years the Township has undertaken many and various corrective actions to help reduce and eliminate

infiltration into their sanitary network, which seems to be working as the annual average flow rate for 2015 was below the 3,237 m3/day.

2. Based on depth assumptions and estimated aerated cell area, the total approximate working volume of the sewage lagoon is 284,700 m^3. With a rated capacity of 3,237 m^3/day and continuous discharge, the sewage lagoons have a total retention time of approximately 88 days. Therefore, the Alexandria Sewage Lagoon Facility is in compliance with MOECC current design guidelines which states that aerated facultative lagoons are to provide a minimum total retention time of 30 days.

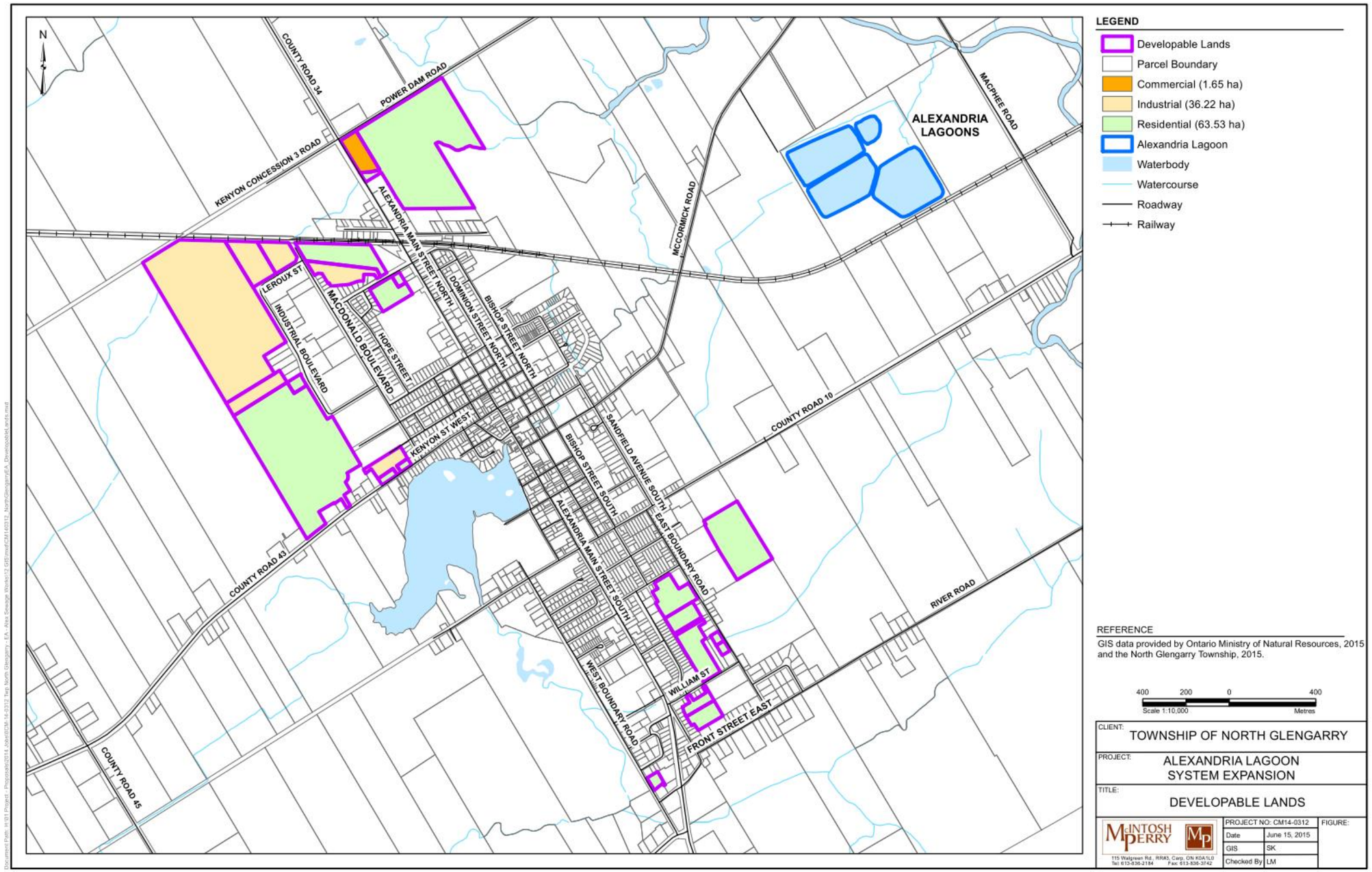
3. The Alexandria Sewage Lagoon Facility has generally been in compliance with amended ECA effluent criteria limits for $CBOD_5$, Total Suspended Solids, Total Phosphorus, Total Residual Chlorine and pH, with exception to a few exceedances in 2014 and 2015 for CBOD5, Total Suspended Solids and Total Phosphorus and Total Residual Chlorine.

5.0 FUTURE SERVICING REQUIREMENTS

5.1 Future Growth Opportunities

The Township of North Glengarry aims to grow at a moderate pace with development taking place primarily in the urban areas, and is directing its efforts at sustaining the existing economic base, as well as seeking new opportunities for economic development (J.L. Richards & Associates, 2009). According to the Township of North Glengarry's Official Plan, the planning horizon is 2026 and will be monitored and reviewed on a regular basis to ensure relevancy. The Alexandria Sewage Lagoon Facility has been operating above or just at its rated capacity over the past three years which is impeding Township growth and economic development. In order to fulfill the Townships plans for development and growth, the Alexandria Sewage Lagoon Facility must be expanded to accommodate future growth, as well as to meet more stringent effluent criteria which have been developed in accordance with MOECC Policies and Guidelines (Section 8.1 – Design Criteria). The Town of Alexandria is currently home to 3300 inhabitants and is planning to develop 63.53 ha of residential lands, 1.65 ha for commercial, and 36.22 ha for industrial in the future.

Figure 5-1: Developable Land within the Township of Alexandria



5.2 Flow Projections

As part of Phase 3 of the Class EA process, a conceptual design is to be established for the proposed treatment facility expansion. Therefore, sewage flow rates have been determined to account for projected growth within the Township in efforts to properly size the proposed expansion. The projected flow rates incorporate existing metered flow data, as well as future flow rates for residential, commercial, industrial and extraneous flows. The projected growth was estimated based on developable land (Figure 5-1) identified by the Township for residential, commercial, and industrial developments. Design criteria set out in the MOECC Design Guidelines for Sewage Works (2008) and the Town of Alexandria's Official Plan, were used to determine the projected flow rates and are summarized in Table 5-1.

Table 5-1: Design parameters used for average and peak flow calculations

Parameter	Design Criteria
Population of Alexandria (from *Statistics Canada*)	3300 residents
Residential Unit Density (from *Statistics Canada*)	2.7 residents / dwelling
New Residential Average Flow	350 L/c/day
Industrial Average Flow	35,000 L/gross ha/day
Commercial Average Flow	50,000 L/gross ha/day
Extraneous Flows – Dry Weather	0.05 L/s/gross ha
Extraneous Flows – Wet Weather	0.28 L/s/gross ha
Harmon Correction Factor	1.0
Official Plan Residential Density (units/ha)	15

The projected average and peak design flow rates discharging to the Alexandria Sewage Lagoon Facility are summarized in Table 5-2.

Table 5-2: Future Total average and Peak Flows

Weather Condition	Total Average Flow		Total Peak Flow	
	L/s	m^3/d	L/s	m^3/d
Dry Weather Flows	75	6,500	196	16,963
Wet Weather Flows	99	8,530	220	18,978

Refer to Appendix E for flow calculations.

6.0 ENVIRONMENT INVENTORY

Determining the existing environmental conditions of the study area is required in order to accurately assess potential impacts that may be associated with the proposed expansion of the Alexandria Sewage Lagoon Facility. The following sections summarize the existing natural, socio-economic and policy and approval conditions within the study areas and surrounding lands.

6.1 Natural Environment

At the time of the field survey, the subject property included a wastewater treatment facility represented by five (5) separate treatment cells (Cell A, Cell B, Cell C, Aeration Cell and Geotube Cell) and an undeveloped cultural meadow and cattail wetland. The subject property was bounded by corn fields and a railway line. Access to the property was from McCormick Road, north of the study area. The property is classified as "Waste Disposal" in the Township of North Glengarry's Official Plan (2013), Schedule "A" and as "AG-4" (General Agricultural – special exception) in the Zoning By-Law 39-2000.

6.1.1 *Geotechnical*

A Geotechnical desktop review was conducted by McIntosh Perry (2015) to assist planning and preliminary design works for the proposed sewage treatment expansion. The existing lagoons are located in a relatively narrow clay deposit formed on an eroded channel floor surrounded by till. The clay is expected to be medium to high plasticity with clay content ranging from 50% to 70%.

The Glengarry till plain, where the lagoons reside, is a region of low relief forming the drainage divide between St. Lawrence River and the Ottawa basin from Prescott to the Quebec boundary. The till has a medium texture and contains a high proportion of limestone mixed with materials derived from 'Precambrian rocks to the north' and from the 'Sandstones of the Nepean Formation'. The depth to bedrock can be greater than 30 m.

A detailed Geotechnical Investigation will take place during the detailed design. Refer to Appendix F to view a copy of the Geotechnical Desktop Review.

6.1.2 *Hydrogeology*

The Alexandria Sewage Works is located in a relatively flat area of Stormont, Dundas and Glengarry County. The overburden in the area consists of gravelly sand, silt till and silty clay based on geotechnical boreholes on site. Soils maps indicate "clay" soils. The bedrock in the area is of the Bobcaygeon Formation, consisting of fossiliferous limestones. The overburden thickness in the vicinity of the lagoons is about 8 to 14 metres based on Well Records for the area.

Private wells in the area range from 15 to 60+ metres in depth and are all completed in the limestone bedrock. The municipal water supply for the Town of Alexandria is from the Garry River, located upstream of the sewage works.

There is one nearby communal bedrock water supply system located about 9.5 km to the east in the Hamlet of Glen Robertson. This is downgradient of the sewage works.

The clay rich overburden in the area provides suitable protection of groundwater supplies from surficial contaminants (e.g. waste water, fertilizers). The silty clay has relatively low permeability and is continuous in the area, providing a reasonable aquitard to protect the bedrock aquifer.

It is anticipated that any proposed upgrades to the sewage lagoon facility will result in no change to potential groundwater impacts. The sewage works treat the wastewater and discharges it to the surface water (Delisle River). The existing lagoons are clay lined and exfiltration is minimal. There are overburden groundwater monitoring wells at the site that have been installed and are monitored for possible sewage impacts.

6.1.3 *Assimilative Capacity Assessment*

A receiving water study/impact assessment of the Delisle River was prepared by Hutchinson Environmental Sciences Limited (HESL) in 2014 (Appendix A), updating a previous study carried out by Aecom in 2012 to support an expansion of the Alexandria sewage works to 5500 m^3/day from the currently approved 3237 m^3/day. The HESL report shows that water quality of the river is typical of that found in agricultural based watersheds, and concluded that there has been little to no impact on the river from the operation of the sewage works. The only parameter exceeding the Provincial Water Quality Objectives (PWQO) in the Delisle River is Total Phosphorus, (PWQO of 0.030 mg/L) which during the study averaged 0.034 mg/L upstream from the effluent, to 0.040 mg/L downstream from the confluence with the discharge. A significant increase in average Total Phosphorus concentrations from 0.034 mg/L to 0.090 mg/L was noted between the last two sampling locations located some 5-6 km downstream, however the report concluded this increase was not attributable to the operation of the Alexandria sewage works.

In the HESL Report, it was recommended that for a design flow of 5500 m^3/day the Total Phosphorus effluent criteria be set at 0.30 mg/L, which would maintain but not reduce the loading approved through the current ECA.

6.1.4 *Environmental Impact Assessment*

McIntosh Perry conducted an Environmental Impact Study (EIS) to accurately assess the potential environmental impacts that may be associated with the proposed expansion of the Alexandria Sewage Lagoon Facility. The findings from the June 1st, 2015 site visit are presented in the EIS report in Appendix G, and are summarized the in the following sections.

6.1.4.1 Surface Water, Groundwater and Fish Habitat

Surface water present on the subject property included water in the wastewater treatment cells and a shallow cattail wetland on the north corner and northeast side of the subject property. The cattail wetland is connected to the Delisle River (~330 m north of the subject property) by an intermittent unnamed tributary. According to background information provided by the MNRF, fish species present within the Delisle River include the following:

Bluntnose Minnow (*Pimephales notatus*), Brassy Minnow (*Hybognathus hankinsoni*), Brook Stickleback (*Culaea inconstans*), Brown Bullhead (*Ameiurus nebulosus*), Carp (*Cyprinus carpio*), Central Mudminnow (*Umbra limi*), Common Shiner (*Luxilus cornutus*), Creek Chub (*Semotilus atromaculatus*), Fathead Minnow (*Pimephales promelas*), Finescale Dace (*Phoxinus neogaeus*), Northern Redbelly Dace (*Chrosomus eos*), Pumpkinseed (*Lepomis gibbosus*), Tadpole Madtom (*Noturus gyrinus*) and White Sucker (*Catostomus commersonii*).

6.1.4.2 Vegetation

The subject property was located in the St-Lawrence Lowlands Ecoregion, within the Mixedwood Plains Ecozone (Ecological Stratification Working Group, 1995). At the time of the field investigation, the subject property contained two main vegetation communities adjacent to the wastewater treatment cells, a Cultural Meadow and Cattail Shallow Marsh. The vegetation survey was completed on June 1st, 2015. No nationally, provincially or regionally rare or endangered plant species were observed during the field survey.

The following section outlines the existing vegetation communities located within the study area. For a detailed map of vegetation communities found within the study area.

Community 1: Cultural Meadow (CUM)

Vegetation Community 1 was located in the south corner of the subject property. It was classified under the Ecological Land Classification (ELC) methodology as a Cultural Meadow (CUM). This community was primarily dominated by various grass species and common meadow-type vegetation species, with sporadic tree saplings and woody shrubs also present. The community was bisected by hedgerows that contained mature burr oak (*Quercus macrocarpa*), American elm (*Ulmus americana*) and hawthorn spp. (*Crataegus* spp.) shrubs. Herbaceous and woody species that characterized Community 1 included: red-osier dogwood (*Cornus sericea*), tartarian honeysuckle (*Lonicera tatarica*), white ash (*Fraxinus americana*), choke cherry (*Prunus virginiana*), nannyberry (*Viburnum lentago*), poison ivy (*Toxicodendron radicans*), red raspberry (*Rubus ideaus*), yarrow (*Achillea millefolium*), Queen Anne's lace (*Daucus carota*), buttercup spp. (*Ranunculus* spp.), grass spp. (*Gaminoid* spp.), goat's beard (*Tragopogon dubius*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*), common burdock (*Arctium minus*), common milkweed (*Asclepias syriaca*), cow vetch (Vicia cracca), yellow hawkweed (*Hieracium* spp.), wild strawberry (*Fragaria vesca*) and ox-eye daisy (*Leucanthemum vulgare*).

Community 2: Cattail Organic Shallow Marsh Type

Vegetation Community 2 was located in the north corner of the subject property. It was classified under the ELC methodology as a Cattail Organic Shallow Marsh Type (MAS3-1). This community was connected to the Delisle River, approximately 330 m north of the site, by an unnamed tributary. At the time of the June 1st field investigation, there was very little water in this community. However, given the vegetation species present and historical aerial photographs, it is evident that it is a seasonally wet vegetation community. The community was dominated by broad-leaved cattail (*Typha latifolia*). Other vegetation species present in Community 2 included the following: nannyberry, shrub willow spp. (*Salix* spp.) and grass spp.

6.1.4.3 Designated Natural Heritage Features

Natural Heritage features identified through background information provided by the MNRF, as present on or within radius of the subject property, include the following: ditch, evaluated wetland (Delisle River – Evaluated – Provincial), pond, Delisle River. No other Natural Heritage features were identified by background information or during the June 1st, 2015 site investigation.

6.1.4.4 Wildlife

The following section outlines the existing wildlife observations from the 2015 field investigation on the subject property, in addition to gathered background information. Wildlife species observed within the study area were identified by sight and through direct evidence, including call, footprints and scat.

The subject property is located in the St. Lawrence Lowlands Ecoregion within the Mixed Plains Ecozone (National Ecological Framework for Canada, 1995). Characteristic wildlife within this Ecoregion includes: black bear, moose, deer, wolf, hare, chipmunk, other small mammals, waterfowl, turtles, snakes and various bird species.

Two mammal species were observed during the 2015 field investigation on the subject property; white-tailed deer (*Odocoileus virginianus*) and red squirrel (*Sciurus vulgaris*). Other mammal species known to be common in the area within habitat observed on and directly adjacent to the subject property included: groundhog (*Marmota monax*), striped skunk (*Mephitis mephitis*), chipmunk (*Tamias striatus*) and meadow vole (*Microtus pennsylvanicus*).

No reptile or amphibian species were observed during the field survey on the subject property. Given the available habitat, the main species with the potential to be present on the subject property are the Eastern Garter Snake (*Thamnophis sirtalis*) and Northern Leopard Frog (*Rana pipiens*).

Bird species observed during the field surveys included: Mallard (*Anas platyrhynchos*), American Crow (*Corvus brachyrhychos*), Song Sparrow (*Melospiza melodia*), Yellow Warbler (*Setophaga petechia*), Killdeer (*Charadrius vociferus*), Red-winged Blackbird (*Agelaius phoeniceus*), Grasshopper Sparrow (*Ammodramus savannarum*), Tree Swallow (*Tachycineta bicolor*), Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Canada Goose (*Branta canadensis*), Eastern Kingbird (*Tyrannus tyrannus*), Brown Thrasher (*Toxostoma rufum*), Black Tern (*Chlidonias niger*) and Bobolink (*Dolichonyx oryzivorus*). Habitat observed on the subject property represented appropriate breeding/nesting/foraging habitat for the Mallard, American Crow, Song Sparrow, Yellow Warbler, Killdeer, Red-winged Blackbird, Grasshopper Sparrow, Tree Swallow, Canada Goose, Eastern Kingbird, Brown Thrasher, Black Tern and Bobolink. Foraging habitat for the Bank Swallow and Barn Swallow was also present. These bird species, (excluding the American Crow and Red-winged Blackbird), and their nests are protected under the Migratory Birds Convention Act, 1994. In addition, habitat for Bank Swallow, Barn Swallow and Bobolink is afforded protection under the Endangered Species Act, 2007 (ESA).

6.1.4.5 Species at Risk

Background information obtained from the MNRF Kemptville District Office (Seabert, 2015), the Natural Heritage Information Centre (NHIC) (2015), Ontario Nature Reptiles and Amphibians of Ontario Atlas (2015), the Ontario Breeding Bird Atlas (2008), in addition to the June 1st, 2015 field observations, indicated that the species listed below in Table 1 have the potential to be present in the area of, or on the subject property. Table 1 also labels what the provincial and federal status of each species is, if habitat for each species was observed on the property or not, and what category of habitat it was (i.e. breeding, nesting, etc.).

Table 6-1: Species at Risk Potentially Present on the Subject Property

Common Name	Scientific Name	Provincial Status	Federal Status	Habitat Present
Bird Species				
Barn Swallow[1,2,3]	*Hirundo rustica*	Threatened	Threatened	Yes (study area represents foraging habitat)
Bobolink [1,2,3]	*Dolichonyx oryzivorus*	Threatened	Threatened	Yes (study area represents breeding/nesting/foraging habitat)
Eastern Meadowlark[1,2]	*Sturnella magna*	Threatened	Threatened	Yes (study area represents breeding/nesting/foraging habitat)
Bank Swallow[3]	*Riparia riparia*	Threatened	Not at Risk (listed as threatened by COSEWIC)	Yes (study area represents foraging habitat)
Least Bittern[2]	*Ixobrychus exilis*	Threatened	Threatened	Yes (study area represents breeding/nesting/foraging habitat)
Grasshopper Sparrow[3]	*Ammodramus savannarum*	Special Concern	Not at Risk (listed as special concern by COSEWIC)	Yes (study area represents breeding/nesting/foraging habitat)
Black Tern[2,3]	*Chlidonias niger*	Special Concern	Not at Risk	Yes (study area represents breeding/nesting/foraging habitat)
Wood Thrush[1]	*Hylocichla mustelina*	Special Concern	Special Concern	No
Eastern Wood-pewee[1]	*Contopus virens*	Special Concern	Not at Risk (listed as special concern by COSEWIC)	Yes (study area represents breeding/nesting/foraging habitat)
Vegetation Species				
Butternut[2]	*Juglans cinerea*	Endangered	Endangered	Yes (none observed)
Fish Species				
Cutlip Minnow[2,5]	*Exoglossum maxilingua*	Threatened	Not at Risk (listed as special concern by COSEWIC)	No

Common Name	Scientific Name	Provincial Status	Federal Status	Habitat Present
Reptile Species				
Blanding's Turtle[4]	*Emydoidea blandingii*	Threatened	Threatened	No
Snapping Turtle[2,4]	*Chelydra serpentina*	Special Concern	Special Concern	Yes (study area represents foraging habitat)

1 – BBA, 2008; 2 – Seabert, 2015; 3 – McIntosh Perry Observation, 2015; 4 – Ontario Nature Reptile & Amphibian Atlas, 2015; 5 – NHIC, 2015

Suitable habitat for the Barn Swallow, Bobolink, Eastern Meadowlark, Bank Swallow, Least Bittern, Grasshopper Sparrow, Black Tern, Eastern Wood-pewee, Butternut and Snapping Turtle was observed to be present on the subject property during the 2015 field survey. Five species at risk (SAR) were observed on the subject property during the 2015 field survey; Barn Swallow, Bobolink, Bank Swallow, Grasshopper Sparrow and Black Tern.

The Barn Swallow prefers to construct its nest on ledges or walls of human-made structures (e.g. barns, other buildings, bridges, large culverts). Foraging habitat includes open farmland, marshes and lakes adjacent to human habitation. The Barn Swallow is a threatened species in Ontario. Therefore, the bird and its habitat are protected under the ESA. During the 2015 field survey, Barn Swallows were observed foraging over the water in Cell 'C' on the east side of the subject property.

The Bank Swallow is a colonial nester that utilizes vertical banks on shorelines and within sand and gravel pit sites. Similar to the Barn Swallow, the Bank Swallow can be found foraging over open fields, marshes and lakes. The Bank Swallow is also a threatened species in Ontario, receiving protection for the species and its habitat through the ESA. During the 2015 field survey, Bank Swallows were observed foraging over the water in Cell 'C' on the east side of the subject property.

The Least Bittern is known to breed in large marshes (> 5ha), in addition to smaller cattail stands along creeks, rivers, ditches and lakes, and farm ponds partially filled with cattails. Appropriate breeding, nesting and foraging habitat was observed for this species within vegetation Community 2, the Cattail marsh, in the north corner of the subject property. As a threatened species in Ontario, the Least Bittern receives species and habitat protection through the ESA.

Habitat preferred by the Grasshopper Sparrow includes short treeless grasslands, unimproved pastures or occasionally cultivated hayfields and cereal crops. As a special concern species, the Grasshopper Sparrow is not afforded protection under the ESA. The species, its eggs, nest and nestlings are, however, protected under the Migratory Birds Convention Act, 1994. During the 2015 field survey, evidence for probable breeding effort was observed (singing males) within the cultural meadow on the south corner of the subject property.

Foraging, nesting and breeding habitat preferred by the Black Tern includes 50:50 open water/emergent vegetation marshes, wet meadows and ponds. As a special concern species, the Black Tern is not afforded protection under the ESA. The species, its eggs, nest and nestlings are, however, protected under the Migratory Birds Convention Act, 1994. During the 2015 field survey, two Black Terns were observed foraging over Cells 'A' and 'B'.

The Eastern Wood-pewee prefers habitat of deciduous and mixed forest with open space near the nest (i.e. forest edges). As a special concern species, the Eastern Wood-pewee is not afforded protection under the ESA. The species, its eggs, nest and nestlings are, however, protected under the Migratory Birds Convention Act, 1994. Although this species was not detected during the 2015 field investigation, potential habitat for the Eastern Wood-pewee was observed within the south corner of the subject property (i.e. treed hedgerows).

Appropriate breeding, nesting and foraging habitat for the Bobolink and Eastern Meadowlark includes open areas of tall grass with a certain amount of thatch (e.g. hay fields and regenerating meadows). As threatened species, the Bobolink and Eastern Meadowlark receive automatic species protection in addition to habitat protection through the ESA. One singing male Bobolink was observed within the Cultural Meadow habitat on the north side of the subject property. Appropriate habitat for both species was also observed within the cultural meadow located in the south corner of the subject property.

Butternuts often grow in open, well-drained sites. Edge habitat between the cultural meadow and treed areas would have been appropriate for this species. They are intolerant of shade. The Butternut is listed as an endangered species due to the fact that it is susceptible to Butternut canker, a lethal fungal disease (ROM, 2009). Butternut canker causes cracks and cankers to form on the branches and trunk of the butternut tree that eventually girdle the tree and kill it. Butternuts are protected by the ESA. No Butternuts were observed on the subject property during 2015 field investigation.

Habitat preferred by the Snapping Turtle includes large bodies of water as well as smaller ponds. As a species of special concern, the Snapping Turtle is not protected by the ESA. It is protected from harm, however, by the Fish and Wildlife Act, 1997. Although no Snapping Turtles were observed during the field survey, the wastewater treatment cells on the subject property and the cattail marsh located in the south corner of the subject property would be considered appropriate habitat for this species.

6.2 Socio-Economic Environment

6.2.1 *Political Jurisdiction*

The Alexandria Sewage Lagoon Facility is located within the Township of North Glengarry, Urban Town of Alexandria.

6.2.2 *Official Plan*

The Township of North Glengarry Official Plan was adopted in 2009 to state policies of Council which will guide and direct future growth and development within the Municipality. It follows the guidelines and principals of the Counties of Stormont, Dundas and Glengarry Official Plan and incorporates the mandates of the Planning Act of Ontario and other legislated requirements.

The adopted Official Plan regulates and controls development and planning policies in the study area and will be updated from time to time as necessary to take into account physical and social changes affecting the community.

6.2.3 *Adjacent Lands*

Land surrounding the study area consists mainly of agricultural land, residential dwellings, undeveloped cultural meadows and cattail wetlands. The Alexandria Sewage Lagoon Facility is in close proximity to the Delisle River.

6.2.4 *First Nations and Metis*

The Mohawks of Akwesasne, as well as the Métis Nation of Ontario Consultation Unit were identified as potentially having an interest in the study area and will be consulted during the Class EA process.

6.2.5 *Communities, Residences and Commercial Development*

There are no residential communities or commercial developments in the immediate vicinity of the study area with exception to a few rural residential dwellings. The closest residential dwelling is approximately 350m from the edge of the aeration cell.

6.2.6 *Noise*

The study area is located within the Township of North Glengarry and therefore follows the Noise By-Law 23-2009 (The Corporation of the Township of North Glengarry, 2009). With respect to construction, the by-law states that no person shall operate any construction equipment that emits noise which disturbs the quiet, peace, rest, enjoyment, comfort or convenience of the inhabitants, in both rural and urban areas between 11pm to 7am (Monday – Friday), 8pm to 8am (Saturday) and 8pm to 9am (Sunday and Statutory holidays).

6.2.7 *Recreation and Tourism*

There are no apparent recreational and tourism activities in the immediate vicinity of the study area at the current time.

6.3 Cultural Environment

6.3.1 *Archaeological Assessment*

A Stage 1 Archaeological Assessment was conducted on April 17th, 2015 by Past Recovery Archaeological Services Inc., to verify the presence or absence of factors influencing archaeological potential. It was determined that the study area exhibits potential for the presence of archaeological resources associated with pre-Contract settlement and/or land uses due to (Past Recovery Archaeological Services Inc., 2015):

- A portion of the study area lies 300 m from a primary water source, the Delisle River.
- A portion of the study area lies 700 m from a secondary water source, the Garry River, which drains into the Delisle River and wetlands occupying the Delisle River floodplain.

The study area also exhibits potential for the presence of archaeological resources associated with post-Contract settlement and/or land uses due to: (Past Recovery Archaeological Services Inc., 2015):

- A portion of the study area lies 300 m from a primary water source, the Delisle River.
- A portion of the study area lies 700 m from a secondary water source, the Garry River, which drains into the Delisle River and wetlands occupying the Delisle River floodplain.
- A portion of the study area lies 100 m from a historical transportation route, being the Canadian Atlantic Railway constructed between 1881 and 1882.
- A portion of the study area contains soils that are classified as loam with good drainage characteristics which provide suitable agricultural land.

Based on the Stage 1 Archeological Assessment findings conducted by Past Recovery Archaeological Services Inc. on April 17th, 2015, a Stage 2 Archaeological Assessment was undertaken. The Stage 2 Archaeological Assessment was conducted on May 13th and 14th, 2015. No artifacts, features, or other cultural deposits of archaeological concern were noted during the Stage 2 Assessment. The Stage 1 and 2 Archaeological Assessment can be viewed under separate cover and can be found in Appendix H.

6.3.2 *Cultural Heritage – Built Heritage and Cultural Heritage Landscape*

The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was reviewed. The Township's Planning Department has indicated that there are no Built and/or Cultural Heritage Landscapes within the study area. As the proposed work includes the expansion of the existing sewage lagoon facility which was built in 1962 and has incurred several expansions over the years such as the addition of treatment buildings, aeration pond, geotubes, there appears to be no associated impact to the cultural heritage resources of the area.

Furthermore, no previously identified cultural heritage resources were found to be located within or immediately adjacent to the present study area (Past Recovery Archaeological Services Inc., 2015).

7.0 PHASE 2 – IDENTIFICATION AND EVALUATION OF ALTERNATIVE SOLUTIONS

7.1 Identification of Alternative Solutions

Phase 2 of the Class EA process consists of the identification and evaluation of alternative solutions to the problem/opportunity statement identified in Phase 1 of the Class EA process. A comparison and evaluation of Alternative Solutions is presented in Section 7.2. The Township requires a solution that will meet short term and long term needs of the Community, as well provide a reliable and cost effective treatment facility.

The alternative solutions identified for the expansion of the Alexandria Sewage Lagoon Facility are as follows:

1. Alternative 1: Do Nothing

2. Alternative 2: Use Existing Lagoon with no Upgrades
    a. Alternative 2a: Off-site treatment of excess flows
    b. Alternative 2b: Excess flow holding basin/additional lagoon
    c. Alternative 2c: Construct a new Mechanical Treatment Facility on a New Site

3. Alternative 3: Upgrade Existing Lagoon
    a. Alternative 3a: Enhance Lagoon Operations Only
    b. Alternative 3b: Post Lagoon Effluent Treatment
    c. Alternative 3c: Primary Treatment with Post Lagoon Treatment
    d. Alternative 3d: Mechanical Treatment Facility Parallel to Lagoon Treatment (on-site)
    e. Alternative 3e: Mechanical Treatment for "Excess Flow" and Polish Lagoon Effluent

4. Alternative 4: Build New Mechanical Facility

7.1.1 *Alternative 1: Do Nothing*

The Class EA process requires the evaluation of a "Do Nothing" alternative solution. Under the "Do Nothing" Approach, the Alexandria Sewage Lagoon Facility would continue to operate in its current condition. No additional treatment or modifications would be made to the system. This alternative provides a benchmark to which all other alternatives can be compared.

7.1.2 *Alternative 2: Use Existing Lagoon with No Upgrades*

7.1.2.1 Alternative 2a: Off-site Treatment of Excess Flows

For alternative 2a, the Alexandria Sewage Lagoon Facility would continue to operate in its current condition; however, a pumping system would be installed to pump the excess flows from the Alexandria Sewage Lagoons (current and future growth) to an existing licensed facility via a proposed forcemain.

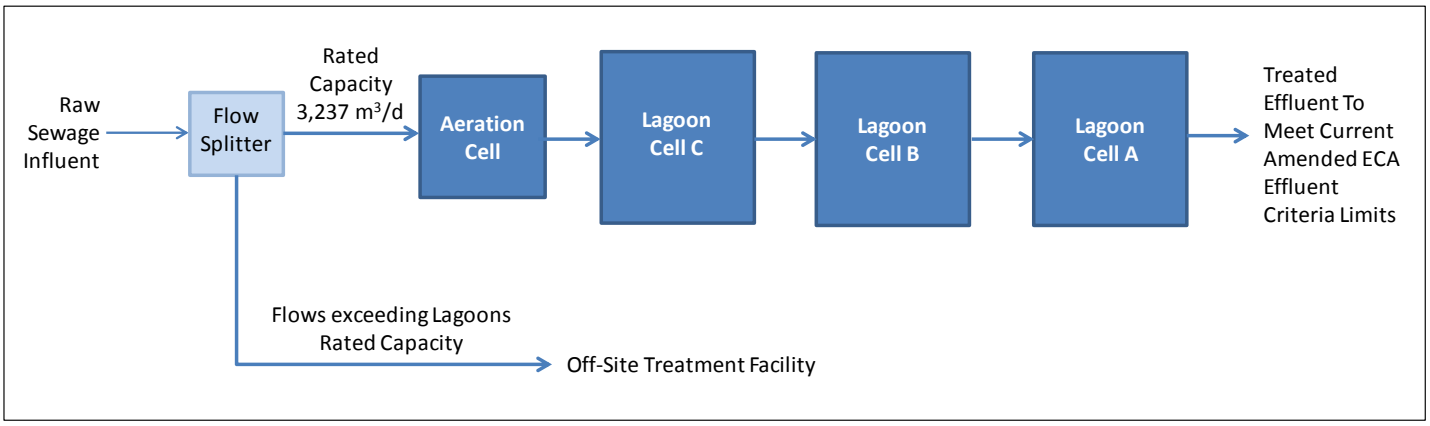


Figure 7-1: Off-Site Treatment of Excess Flow (Alternative 2a)

7.1.2.2 Alternative 2b: Excess Flows to Holding Basin / Additional Lagoon

The lagoons would continue to operate in its current condition; however, flows to the lagoon system would be maintained below amended ECA rated capacity of 3,237 m^3/day. Flows in excess of the current rated capacity and to a maximum of 6,500 m^3/day would then be redirected to a holding basin/additional lagoon cell for storage until capacity became available within the primary treatment process.

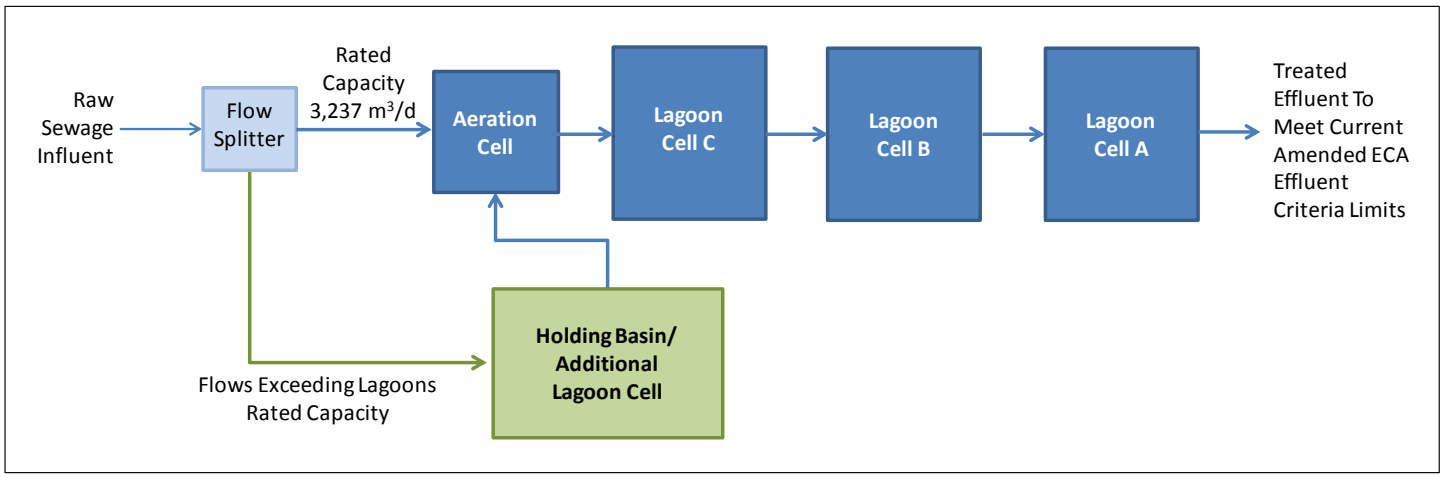


Figure 7-2: Excess Flows to Holding Basin/Additional Lagoon Cell (Alternative 2b)

7.1.2.3 Alternative 2c: Construct a New Mechanical Treatment Facility on a New Site

This new additional treatment facility would be constructed on a newly proposed site. The new Mechanical Treatment Facility would be constructed within the Township's limits to handle design flows that exceed the rated capacity of the Alexandria Sewage Lagoons (3,237m^3/d). The Township's existing infrastructure would need to be retrofitted to redirect flows to the new mechanical treatment facility, as well as consideration would need to be given to future infrastructure design.

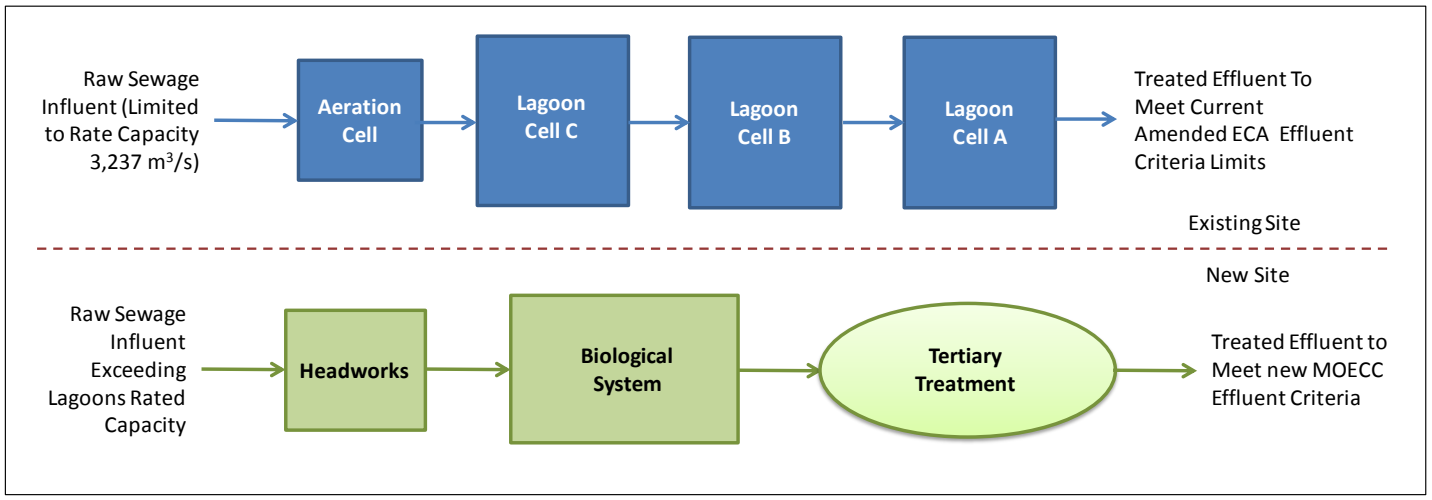


Figure 7-3: New Mechanical Treatment Facility on a New Site (Alternative 2c)

7.1.3 *Alternative 3: Upgrade Existing Lagoon*

7.1.3.1 Alternative 3a: Enhance Lagoon Operations Only

The existing Alexandria Sewage Lagoon Facility would receive upgrades to enhance the treatment capability. Additional treatment systems would need to be added within the lagoon or potentially small compact systems near the edge of the lagoon such as fixed film in-situ systems for ammonia/nitrogen control and filtration systems. The existing lagoons have the hydraulic capacity (30 day retention) to treat the projected design flow of 6,500 m^3/d.

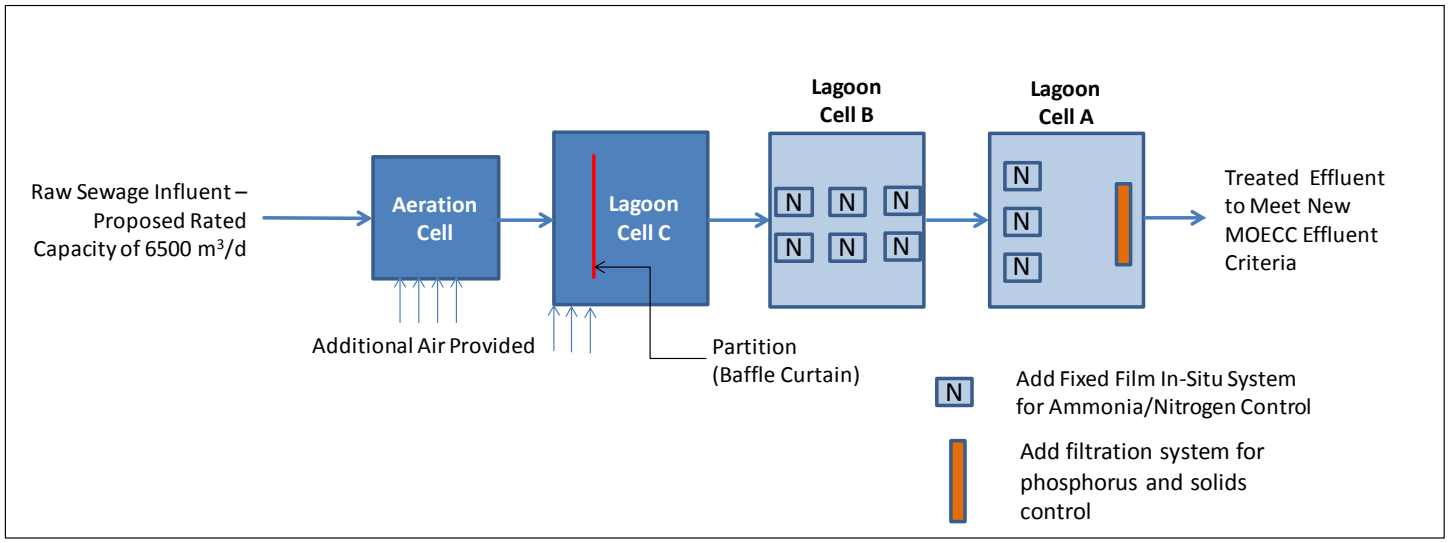


Figure 7-4: Enhance Lagoon Operations (Alternative 3a)

7.1.3.2 Alternative 3b: Post Lagoon Effluent Treatment

The existing lagoons have adequate hydraulic capacity (>30 day retention at 6,500 m^3/d), however they cannot meet the higher level of treatment required by MOECC. The lagoons would be modified and additional treatment systems would be added after the lagoon cells to polish the effluent discharging from the lagoons to meet the newly imposed MOECC effluent criteria. Alternative 3b includes headworks upstream of the aerated cell. The headworks would remove large debris pumped to the system (e.g. rags) and inert easily settleable material (e.g. grit). To remove large debris, bar screens would be provided. To remove easily settleable material, gravity settling or induced settling (i.e. centrifugal forces) could be utilized.

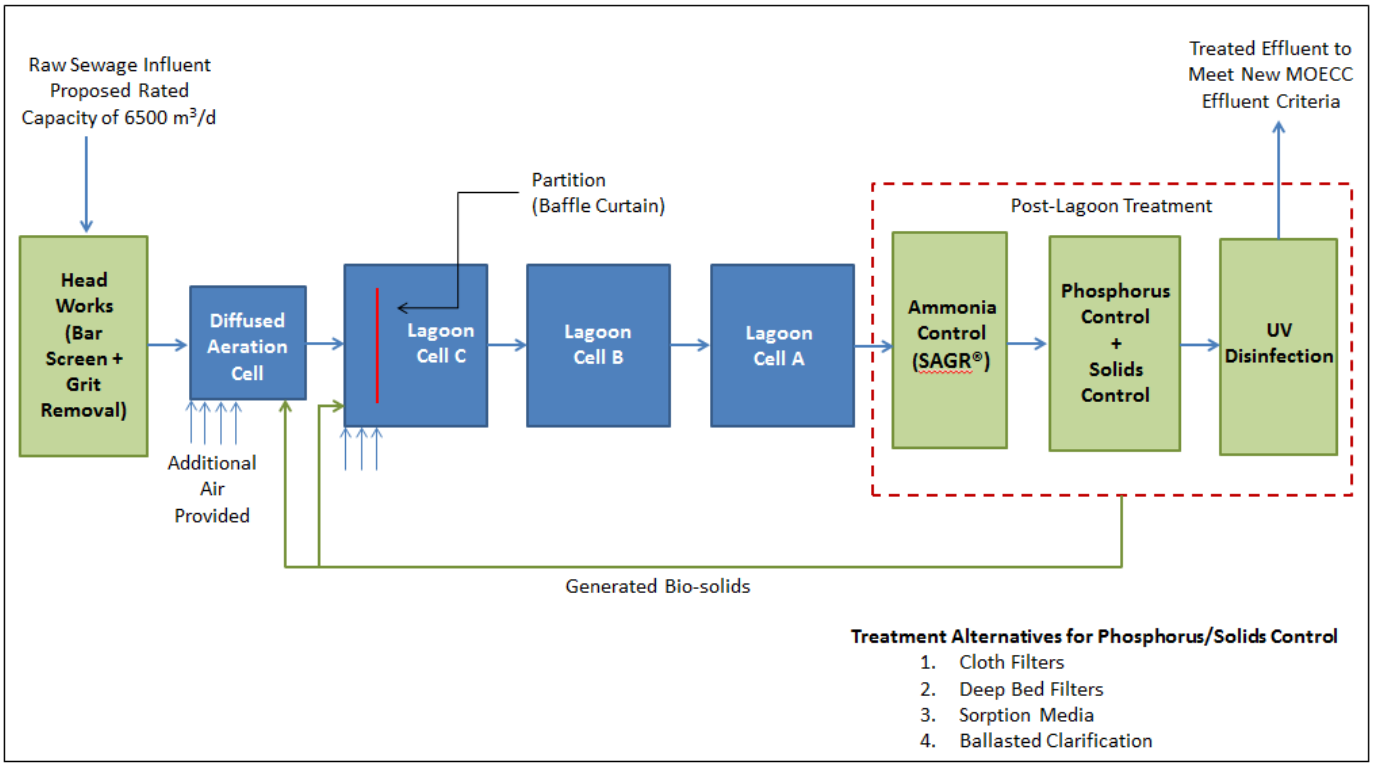


Figure 7-5: Post Lagoon Treatment (Alternative 3b)

7.1.3.3 Alternative 3c: Primary Treatment with Post Lagoon Treatment

Alternative 3c is similar to Alternative 3b – the lagoons would be modified and additional treatment systems would be added after the lagoon cells to polish the effluent. However, Alternative 3c includes headworks upstream of the aerated cell. The headworks would remove large debris pumped to the system (e.g. rags) and inert easily settleable material (e.g. grit). To remove large debris, bar screens would be provided. To remove easily settleable material, gravity settling or induced settling (i.e. centrifugal forces) could be utilized.

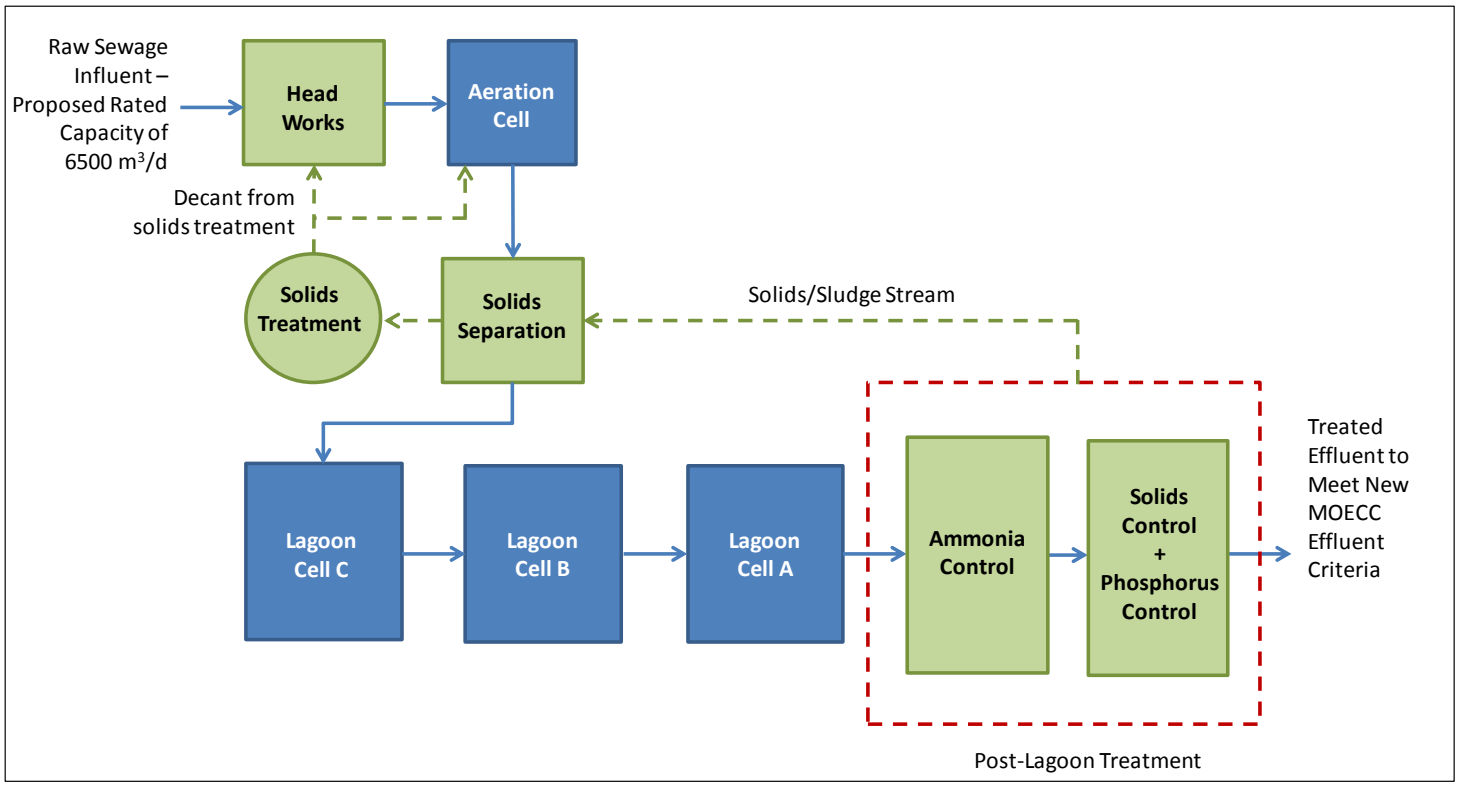


Figure 7-6: Primary Treatment with Post Lagoon Treatment (Alternative 3c)

7.1.3.4 Alternative 3d: Mechanical Treatment Facility Parallel to Lagoon Treatment (on-site)

A "parallel" facility would be constructed adjacent to the existing lagoon on the same parcel of land to treat flows in excess of the rated capacity of the Alexandria Sewage Lagoons. MOECC would potentially consider this configuration to be one facility and would require the combined effluent to meet the more strict MOECC effluent criteria. Therefore, the effluent from the existing Alexandria lagoons would need to be redirected to the proposed tertiary treatment system in efforts to achieve the newly imposed MOECC effluent criteria.

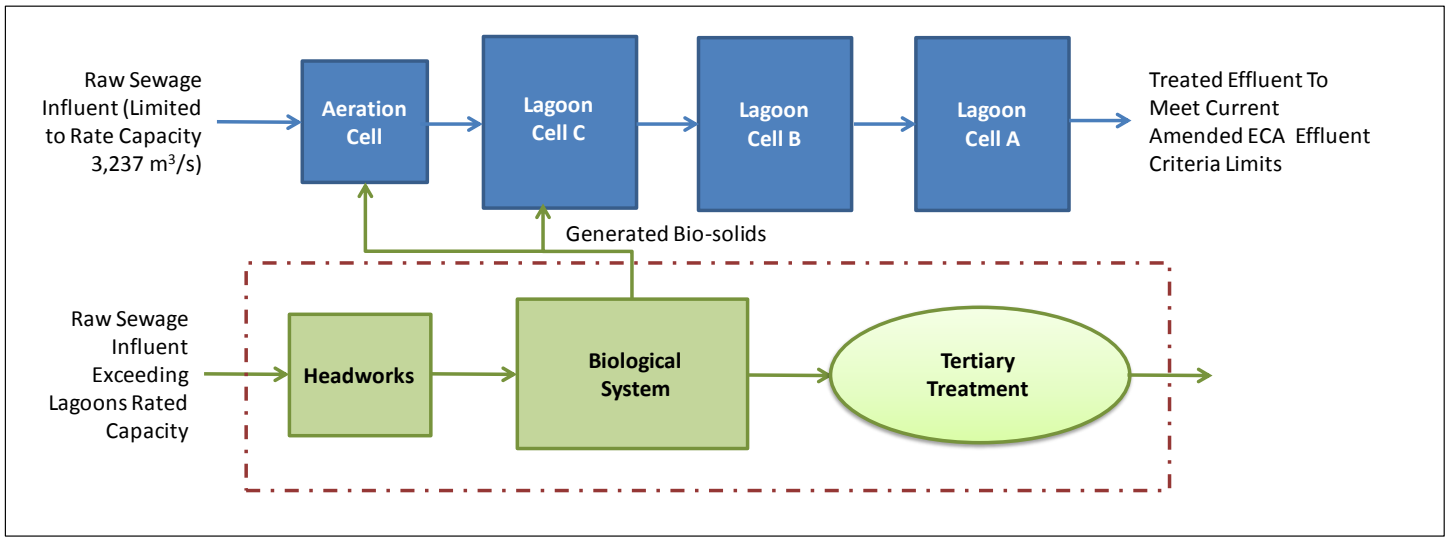


Figure 7-6: Mechanical Treatment Facility Parallel to Lagoon Treatment (on-site) (Alternative 3d)

7.1.3.5 Alternative 3e: Mechanical Treatment for "Excess Flow" and Polish Lagoon Effluent

The existing lagoons have hydraulic capacity but not the ability to adequately treat the increased design flow. The lagoons would be modified (more air for organic control) and a Mechanical system would be added after the lagoons to polish the effluent from the lagoons to meet the newly imposed MOECC effluent criteria.

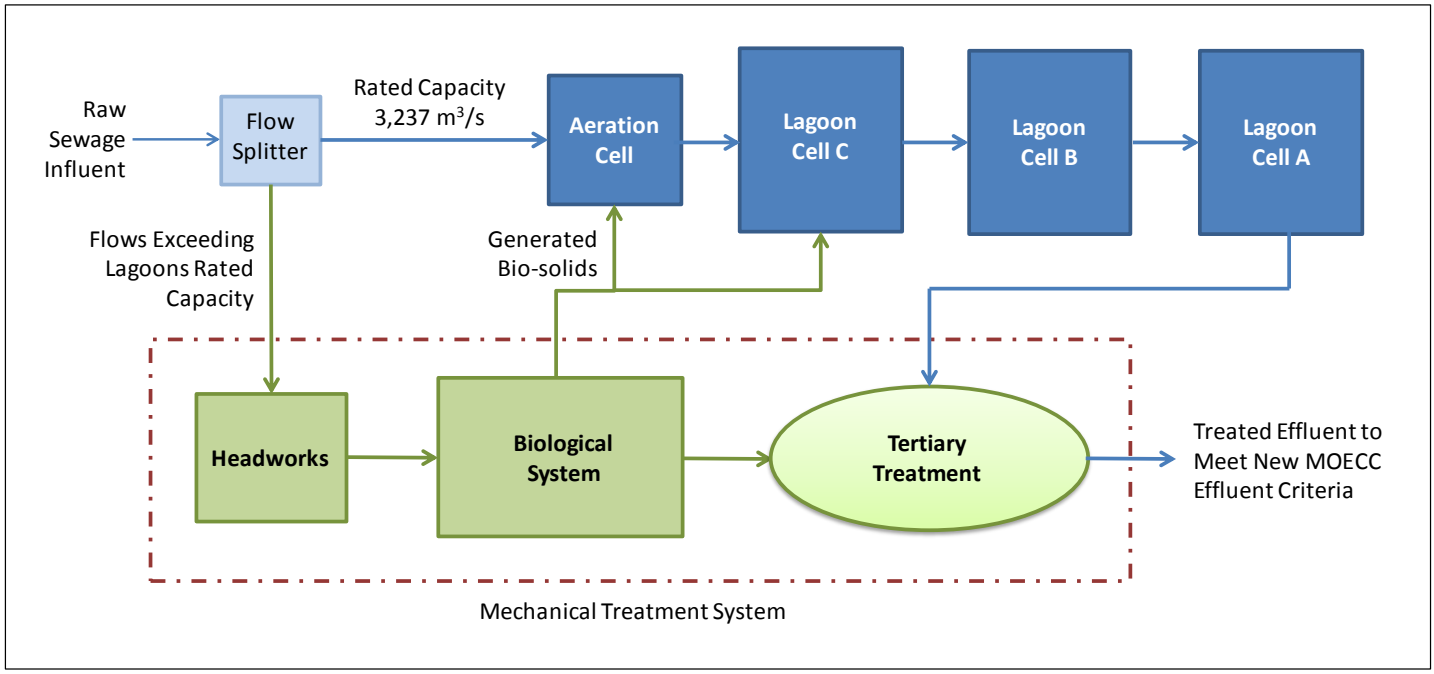


Figure 7-7: Mechanical Treatment for "Excess Flow" and Polish Lagoon Effluent (Alternative 3e)

7.1.4 *Alternative 4: Build New Mechanical Facility*

Decommission the existing Alexandria Sewage Lagoons and constructed a new full scale mechanical treatment plant. The facility would utilize biological and tertiary treatment while using the existing aeration cell for bio-solids storage. The existing lagoons would be decommissioned and repurposed.

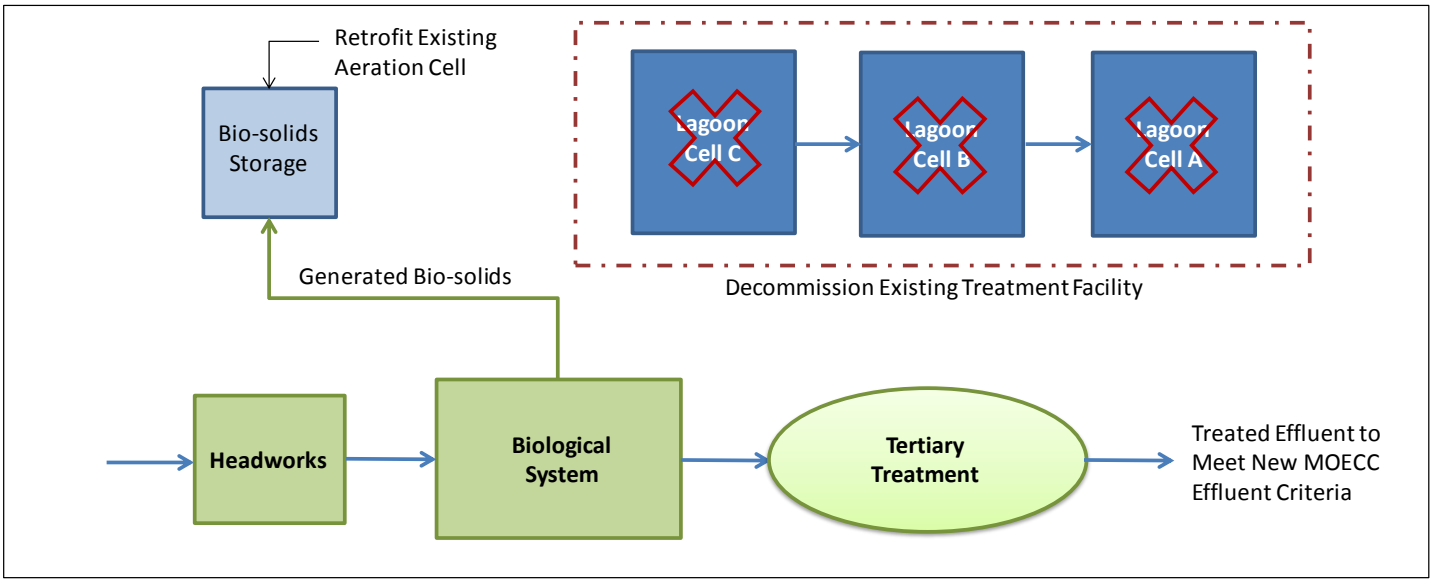


Figure 7-8: New Mechanical Facility (Alternative 4)

7.2 Environmental Impacts and Mitigation Measures

7.2.1 *Socio-Economic Environment*

The Do Nothing alternative involves maintaining the existing sewage lagoon facility and carrying out no improvements, expansions or new works to remedy the identified problems and needs. It eliminates the need for large capital expenditures; however, it does not address the problems and needs of the Township.

Due to the lack of capacity of the existing treatment facility, the Do Nothing alternative will continue to create a barrier for growth and economic development within the Township. Therefore, the Do Nothing alternative is not considered a viable option and will not be considered further in this study; however, it can serve as a benchmark to evaluate the implications if none of the other planning alternatives are implemented.

The remaining Alternative Solutions (Alternatives 2-4 inclusive) represent viable solutions to the identified problem statement from a socio-economic perspective and shall be considered further in this assessment. The following mitigation measures should be implied:

- Notify public, neighbouring owners and agencies of construction activities;
- Prepare emergency response plan to ensure quick resolution to servicing issues;

- Apply dust, noise and vibration control measures;
- Control emissions from construction equipment and vehicles;
- Require compliance with municipal noise bylaws;
- Inconvenience due to temporary loss of property access will be minimized through proper communication and advance notice of disruption.

7.2.2 *Natural Environment*

All of the Alternative Solutions will have some form of impact on the natural environment, whether it is a result of the treatment process, land requirements, and/or construction related activities. Some impacts to the natural environment may be short term, where others may cause long term impacts. Short term impacts are primarily due to construction related activities and can generally be mitigated through the design phase and/or during construction. Long term impacts to the natural environment are highly undesirable. Alternative solutions thought to cause long term impacts will not be carried forward to Phase 3 Design Concepts, nor will stakeholders approve such alternatives.

Table 7-1 provides a summary of potential environmental impacts and proposed mitigating measures that have been considered for all of the Alternative Solutions. The magnitude of impacts to the natural environment is thought to be similar for each Alternative Solution, with exception to the overall footprints of the treatment processes. Therefore, the potential impacts and associated mitigation measures shown in Table 7-1 encompass all Alternative Solutions. If Alternative Solution 2c be selected as the technical preferred alternative soluation, additional investigations will need to be completed to determine the impacts to the natural environment on the newly acquired site. The net positive and negative impacts are further identified in Table 7-2.

The preferred alternative solution will be one that adequately addresses the Alexandria Sewage Lagoon capacity and effluent quality issues while improving and preserving the natural environment. Key factors to be considered are short and long term impacts to terrestrial and aquatic environments, vegetation, heritage culture and the ability to meet MOECC effluent criteria.

Table 7-1: Potential Impacts and Mitigation Measures

Impact	Issues/Concerns/Potential Affects	Mitigation/Protection
Wildlife and Migratory Birds	Construction activities, including excavation, grading and drainage improvements, have the potential to disturb wildlife and bird habitat such as nesting and foraging habitat. The size and placement of the treatment technology could have a potential long term disturbance on wildlife and bird habitat such as the removal of vegetation that is used for nesting and foraging habitat. Reduced terrestrial wildlife habitat quality (i.e., diversity, area, function) and increased fragmentation of habitat.	➢ Prior to any vegetation clearing during the bird nesting window (April 15th to September 1st), a qualified bird specialist should complete an assessment of the site to identify active bird nests, if any ➢ Provide compensation for lost nesting and foraging habitat ➢ If feasible, install exclusionary netting or tarps prior to May 1st to exclude species from nesting within the construction zone, otherwise construction may be delayed until the bird has fledged its young ➢ Detailed design to incorporate exclusion mitigation measures to ensure wildlife and migratory birds do not inhabit the treatment equipment ➢ Achieves the proposed effluent criteria (subject to MOECC acceptance), therefore reducing the impact to the environment
Vegetation	Construction activities may result in temporary and/or long term disturbance of vegetation.	➢ Detail design to strategically place treatment processes away from highly vegetated areas to reduce vegetation/tree removal ➢ Protection of existing trees during the construction phase through the delineation of areas off limits to construction activity ➢ Replacement of disturbed vegetative cover with topsoil and seed, as well as native species to the study area. Where possible, existing vegetation features to be restored to preconstruction conditions ➢ Provide compensation for lost vegetation and trees ➢ Achieves the proposed effluent criteria (subject to MOECC acceptance), therefore reducing the impact to the environment
Species at Risk	Species at risk may be encountered during construction.	➢ The local MNRF office should be contacted if any species at risk are observed during construction ➢ Adhere to specific species at risk timing windows for birds, fish, and reptile species (i.e. staging of work to avoid spawning and breeding periods) ➢ Employee best management practices to ensure species at risk are protected during construction, as well as operation of the treatment facility ➢ Contractor to receive on-site species at risk training by a qualified biologist prior to the start of construction
Fish and Fish Habitat	Construction activities may result in the suspension of sediments within the offtake ditches and watercourses, which may have direct negative effects on resident fish by causing respiratory stress, reduced feeding efficiency, and impairment of physiologic processes such as growth and reproduction.	➢ Natural flows downstream of the study areas should be maintained at all times during construction and post construction ➢ Removal or disturbance of riparian vegetation should be minimized during construction operations in order to prevent unnecessary loss of stream shading, overhead cover or bank stability ➢ Detailed design to connect to the existing outlet ➢ Achieves the proposed effluent criteria (subject to MOECC acceptance), therefore reducing the impact to the environment
Groundwater and Surface Water	Reduced water quality due to construction activities, such as erosion and sedimentation and refuelling, can increase the potential for accidental spillage and subsequent contamination of groundwater and surface water sources. Long term impact to surface water drainage and quality, as well as facility breakages	➢ In order to prevent groundwater contamination, care should be taken to avoid accidental spillage or discharge of chemical contaminants. Furthermore, to protect groundwater resources, proper containment, clean up and reporting, in accordance with provincial requirements, should be completed if a spill occurs ➢ Mobile equipment refuelling should take place no closer than 30 m from any waterbody in order to prevent water contamination due to accidental fuel spills. For non-mobile equipment, refuelling should be carried out in a controlled manner so as to prevent fuel spillage, and drip pans should be located under the equipment at all times ➢ Equipment operating near any waterbody should be in good working condition, properly maintained and free of excess oil/grease to reduce the risk of contaminant leakage. In the event that a spill occurs, proper containment, clean up, and

Table 7-1: Potential Impacts and Mitigation Measures

Impact	Issues/Concerns/Potential Affects	Mitigation/Protection
		reporting, in accordance with provincial requirements, should be completed ➢ Detailed design to provide stormwater management plan ➢ Implementation of monitoring program to ensure effluent criteria (subject to MOECC acceptance), are being meet ➢ Pollution prevention and source control by implementing best management practices during construction and operations ➢ Monitor groundwater levels during construction and take proactive measures if necessary ➢ Prepare an Operation and Maintenance Manual outlining operation procedures and facility storage requirements (i.e. chemicals)
Built Heritage and Cultural Heritage	Since the majority of the study area has previously been disturbed during the initial construction of the treatment facility, it is anticipated that there will be minimal impact on built heritage and cultural heritage.	➢ Should any human remains be encountered during construction, such construction activity shall cease, and the proponent shall immediately contact the following: Ontario Provincial Police, the Registrar of the Cemeteries Regulation Unit of the Ministry of Consumer and Commercial Relations and the Ministry of Culture Development Plans Review Unit. Depending on the antiquity of human remains, certain aboriginal groups may need to be contacted ➢ Should any cultural heritage remains be encountered during construction activities, such activities shall cease, and the proponent shall immediately contact the Ministry of Culture Development Plans Review Unit ➢ Stage 1 and 2 Archaeological Assessment Completed during Class EA
Air Quality	It is anticipated that dust and emissions from machinery will be generated during construction	➢ Odour and fume impacts will be minimized by ensuring that all equipment is properly maintained and that all pollution control devices on the equipment are operational and properly maintained. ➢ Dust to be controlled as per OPSS
Contaminants and Waste	Excavation will be required and thus there may be a requirement to remove materials from the construction site	➢ Soil or water that is to be removed from the site during construction should meet existing O.Reg. 153/04 Standards (Part XV.1 of the EPA) as amended by O.Reg. 511/09 (i.e. most recent version of MOE Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act), if it is to be disposed of as “clean fill”. If these Standards are not met, then the material should be handled as a waste and disposed of in accordance with Ontario Regulations, Standards and Guidelines. In particular, all the requirements of the EPA and OWRA are to be met ➢ Contaminated soil and sediment that is to be removed from the site is to be treated as waste
Erosion and Sediment Control	Disturbance of soils during construction activities may cause increased sedimentation offsite, in ditchlines and watercourse without proper mitigation.	➢ In order to mitigate the transport of sediment along ditchlines as well as from exposed soils adjacent to watercourses, environmental protection measures (such as straw bale/sediment log flow checks, rock flow check dams, silt fence barriers, and erosion control blankets) should be incorporated into the final design and installed during construction. Ontario Provincial Standard Specification (OPSS) and NSP Erosion and Sediment Control – General should be included in the detailed design package in order to provide construction specifications for these measures ➢ The Contractor should prepare a detailed sediment and erosion control plan ➢ Exposed slopes should be protected to limit the time that such areas are exposed prior to final application of topsoil and seed ➢ Removal or disturbance of woody riparian vegetation should be minimized during construction operations in order to prevent the loss of watercourse shading, overhanging cover, or bank stability

Table 7-1: Potential Impacts and Mitigation Measures

Impact	Issues/Concerns/Potential Affects	Mitigation/Protection
Agricultural Lands	Disturbance to agricultural fields and operation	➢ Staging of construction and advance notice to property owners prior to disruption of construction to minimize inconvenience ➢ Locate and design facility in efforts to minimize land acquisitions and construction disturbance ➢ Apply dust, noise and vibration control measures during construction and operation of the treatment facility

7.3 Evaluation Criteria

In order to be considered a viable alternative solution, the alternative must; meet the higher level of effluent requirements imposed by the MOECC; must contribute to achieving the targeted projected design flow; be able to be staffed and maintained locally; minimal impact on the environment and be financially feasible. Therefore, the evaluation criteria were divided up into four categories: Technical/Operation, Natural Environment, Social Environment and Economic. Table 7-1 identifies criterion for each category, as well as a rationale for the criterion.

Table 7-2: Evaluation Criteria

Alternatives	Criterion	Description
Technical/ Operation	Ease of Operation	Complexity of operation and maintenance of treatment facility
	MOE Effluent Criteria	Meets MOECC Effluent Criteria
	Operator Certification Requirements	Qualifications required for operating and maintaining system
	Ease of Construction	Potential for construction related issues such as bedrock-soil-groundwater, conflicts with existing infrastructure, etc.
	System Life Expectancy	Projected life expectancy of the proposed Alternative
	Land Requirement	Need to expropriate new land or develop additional land on the property
	Biosolids Handling	Complexity of bio-solids issues associated with Alternative
	Scheduling/Flexibility (Phasing)	Alternative can be implemented in phases to provide more flexibility with respect to capital budgeting and construction implementation. Complies with Township's Official Plan growth strategy
Natural Environment	Aquatic/Ecological Habitat	Potential impact on existing aquatic/ecological habitat and/or potential to provide for opportunities to protect or create aquatic/ecological habitat are preferred
	Terrestrial Habitat	Potential impact on existing terrestrial habitat and/or potential to provide for opportunities to protect or create habitat are preferred
	Vegetation	Need for tree and vegetation removal and/or ability to preserve vegetation
	Agricultural Land	Impact on agricultural land (loss or sterilization of agricultural land and/or impact on farm operations)
Socio-Economic Environment	Noise, Odour and Visual	Potential noise, odour and visual impacts during operation
	Construction Impacts	Disturbances due to construction noise and dust
	Access to water	Ability for public access to the water area
	Aesthetics / Appearance	Aesthetically appealing, primarily from the land and secondarily from the water
	Affordability	Capital Cost
	Sustainability	Operation and maintenance costs

7.4 Evaluation alternative solutions

As per the requirements in the Environmental Assessment Act of Ontario, alternative solutions to a problem/ opportunity statement must be considered to ensure that there is reasonable justification to proceed with the project. As such, the preceding section outlines and evaluates each proposed alternative solution for the expansion of the Alexandria Sewage Lagoons Facility. The evaluation of alternative solutions was carried out in a two phases approach, Preliminary Screening and Detailed Analysis/Evaluation.

- Preliminary Screening – Alternatives were evaluated for suitability based on their advantages and disadvantages. It was determined at this stage in the process whether or not an alternative solution should be carried forwarded or discarded.
- Detailed Analysis/Evaluation – Alternatives deemed as a potential viable solution were evaluated based on pre-determined criteria (Table 7-2).

The assessment of the alternative solutions and the identification of the preliminary Technically Preferred Alternative Solution(s) were determined through a qualitative analysis.

7.4.1 *Preliminary Screening of Alternatives*

The Qualitative Assessment Method is often referred to as a "Reasoned Argument" trade-off method of evaluation. This method subjectively considers the advantages and disadvantages of each alternative and the relative significance of the impacts. This method is based on:

- Documenting the existing conditions associated with each alternative (based on secondary sources, field investigations and communications);
- Confirming the indicators (evaluation criteria) to be used to evaluate each alternative; and
- Identifying the potential effects of each alternative by measuring the indicators either qualitatively or quantitatively.

The "Reasoned Argument" method then presents a clear and thorough evaluation of the trade-offs between various categories/factors/indicators, and the reasons why one alternative is preferred over another.

Table 7-3 provides lists of advantages and disadvantages for each alternative solution. It may be obvious that some alternatives are not plausible for the current problem/opportunity. However, these alternatives were still subject to the Preliminary Screening process to illustrate that all feasible alternatives were considered.

The Do Nothing alternative involves maintaining the existing sewage lagoon facility and carrying out no improvements, expansions or new works to remedy the identified problems and needs. It eliminates the need for large capital expenditures; however, it does not address the problems and needs of the Township. Therefore, the Do Nothing alternative is not considered a viable option and will not be considered further in this study; however, it can serve as a benchmark to evaluate the implications if none of the other planning alternatives are implemented.

7.4.2 *Detailed Evaluation*

Four (4) alternatives were carried forward (3b, 3d, 3e and 4) and were subject to a detailed evaluation to assess "favourability" with respect to the criteria listed in table 7-2. The criteria in Table 7-2 are intended to assist in determining the overall impact of the alternatives on a technical, natural, social, and economic environment. The Alternative Solution with the most favourable evaluation was selected at the preferred alternative solution. The detailed evaluation is illustrated in Table 7-4.

Table 7-3: Preliminary Evaluation

Alternatives	Advantages	Disadvantages	Carry Forward/Set Aside	
Alternative 1: Do Nothing	• Continues use of existing assets	• Unable to achieve the amended ECA rated capacity for the Alexandria Sewage Lagoon Facility • Current issues pertaining to hydraulic capacity, sludge accumulation and effluent quality will continue to occur • Potential health risks due to periodical by-passes from the lack of capacity within the Alexandria Sewage Lagoon Facility • Hinders future growth within Township • On-going costly maintenance requirements to reduce short-circuiting and remove solids build-up	**X**	NOT CARRIED FORWARD
Alternative 2a: Use Existing Lagoon with no Upgrades, Excess Flows to be directed Off-Site for Treatment	• The existing facility can meet the current amended ECA effluent criteria if flow is controlled to the approved rated capacity • Opportunity to remove solids build-up to enhance lagoon operability and reduce short-circuiting	• Off-site treatment options are limited due to limited receivers (i.e. Maxville) • Off-site treatment facilities may not have the capacity to accept flows in excess of 3,300 m^3/d	**X**	NOT CARRIED FORWARD
Alternative 2b: Use Existing Lagoon with no Upgrades, Excess Flows to Holding Basin / Additional Lagoon	• The existing facility can meet current ECA effluent criteria if raw sewage flows regulated to the rated capacity • Opportunity to remove solids build-up to enhance lagoon operability and reduce short-circuiting • Low energy and easy operating process that is typically suited for smaller rural communities • Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure) • Utilizes natural oxygen	• Large footprint associated with holding basin or additional lagoon • Land acquisition maybe required to construct additional holding cell • Potential odour issues associated with stagnant sewage in storage cell • Potentially unable to accommodate future flows and therefore limiting the growth within the Township • This option is only viable if there are periods when the flows are less than 3237 m^3/d. This will not be the case when flows increase as development occurs within the Township • Oxygen transfer efficiency is lower than a mechanical system since the liquid depth is low versus a mechanical system	**X**	NOT CARRIED FORWARD
Alternative 2c: Use Existing Lagoon with no Upgrades and construct a new Mechanical Treatment Facility on a new site	• The existing facility can meet the current amended ECA effluent criteria if flows are controlled to the approved rated capacity • Mechanical treatment facilities are proven treatment options in Ontario • Effective and robust treatment option • Allows for additional growth within Township. Does not cap growth • Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure) • Utilizes natural oxygen	• Higher energy consumption due to mechanical plant addition • New mechanical facility on another parcel of land within the Township may require the acquisition of additional land • Would need to retrofit the Townships sewer network to redirect flows to the new mechanical treatment facility • The potential to require another pump station and sewer network to supply sewage to mechanical facility • Projected growth is not in one central location making it difficult to direct flows to new mechanical treatment facility • Sludge treatment and removal requirements with mechanical treatment facilities maybe slightly greater than biosolids/sludge generated in a lagoon system • Requires an on-site trained operator • Higher complexity of operation and maintaining compared to other passive	**X**	NOT CARRIED FORWARD

Table 7-3: Preliminary Evaluation

Alternatives	Advantages	Disadvantages	Carry Forward/Set Aside	
		wastewater treatment systems. • Will require the Township to maintain two separate facilities		
Alternative 3a: Upgrade Existing Lagoon - Enhance Lagoon Operations Only	• In-situ filter system (e.g. use part of lagoon system for filter area (berm the area within the lagoon) will minimize pumping requirements • Lower energy consumption in comparison to a Mechanical Treatment Plant option • Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure) • Minimizes the need to develop land beyond the existing lagoon boundaries • Utilizes natural oxygen	• Unaware of any existing in-lagoon ammonia treatment systems that can meet all of the strict effluent criteria. In-situ lagoon ammonia control systems have not had long term winter testing to prove successful • Increasing aeration would increase operating costs • Ice in lagoon during winter will need to be managed (prevent ice build-up at in-situ units)	**X**	NOT CARRIED FORWARD
Alternative 3b: Upgrade Existing Lagoon - Post Lagoon Effluent Treatment	• Achieves the proposed effluent criteria (subject to MOECC acceptance) and therefore reducing the impact to the environment (Aquatic/Ecological and Terrestrial) • Based on preliminary observations and design work, it is unlikely additional land will be required to construct the expansion • Alternative includes technologies that have low capital and O&M • Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure) • Utilizes natural oxygen	• Increased generation of solids • Increasing aeration will increase energy consumption • Oxygen transfer efficiency may be lower than a mechanical system since the liquid depth is low versus a mechanical system	**√**	CARRIED FORWARD
Alternative 3c: Primary Treatment with Post Lagoon Effluent Treatment	• Same as Alternative 3b • Reduced inert solids will be collected in lagoon system	• Same as Alternative 3b • More handling processes added to the system	**√**	CARRIED FORWARD
Alternative 3d: Upgrade Existing Lagoon - Mechanical Treatment Facility Parallel to Lagoon Treatment (on the same site)	• Reduces the impact to the environment (Aquatic/Ecological and Terrestrial) as noted in Alternative 3b • Mechanical treatment facilities are proven treatment option in Ontario • Effective and robust treatment option • Upgrade lagoons to help remove solids build-up to enhance lagoon operability and reduce short-circuiting. • Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure) • Utilizes natural oxygen	• If “two” plants are located on the same site, MOECC will potentially consider this configuration to be one facility and will require the combined effluent to meet the more strict MOECC effluent criteria. • High energy consumption associated with the Mechanical Facility • The potential to require another pump station and sewer network to supply sewage to Mechanical facility • More extensive sludge handling requirements • Requires on-site trained operator • Higher complexity of operation and maintaining compared to other passive wastewater treatment systems. • Will require the Township to maintain two separate facilities	**√**	NOT CARRIED FORWARD

Table 7-3: Preliminary Evaluation

Alternatives	Advantages	Disadvantages	Carry Forward/Set Aside	
Alternative 3e: Upgrade Existing Lagoon - Mechanical Treatment for "Excess Flow" and Polish Lagoon Effluent	• Achieves the proposed effluent criteria (subject to MOECC acceptance) and therefore reducing the impact to the environment (Aquatic/Ecological and Terrestrial) • Mechanical facility is a proven treatment option in Ontario • Effective and robust treatment option • Utilizes natural oxygen	• Requires trained operator for the mechanical treatment • Potentially may require another pump station and sewer network to supply sewage to mechanical facility • Extensive sludge treatment and removal requirements with mechanical treatment facilities • Higher complexity of operation and maintaining compared to other passive wastewater treatment systems	√	CARRIED FORWARD
Alternative 4: Build New Mechanical Facility (Abandon Existing Sewage Lagoon)	• Water temperatures do not drop significantly in process relative to temperature drop in existing lagoon system (increased options for ammonia control) • Mechanical facility is a proven treatment option in Ontario • Effective and robust treatment option • Option to convert existing lagoons into a natural vegetated area • Smaller footprint than alternatives which include the existing lagoons • Low performance risk and offers reliable treatment • Allows to construct new facility while still providing service to the Township • Achieves the proposed effluent criteria (subject to MOECC acceptance) and therefore reducing the impact to the environment (Aquatic/Ecological and Terrestrial)	• Higher complexity of operation and maintaining compared to other passive wastewater treatment systems. • More extensive sludge handling requirements • Requires on-site trained operator	√	CARRIED FORWARD

Table 0-4: Detailed Evaluation

Impact	Evaluation Criteria	Alternative 3b: Upgrade Existing Lagoon – Post Lagoon Effluent Treatment	Alternative 3c: Primary Treatment with Post Lagoon Effluent Treatment	Alternative 3e: Upgrade Existing Lagoon – Mechanical Treatment for "Excess Flow" and polish Lagoon Effluent	Alternative 4: Build new Mechanical Facility
Technical/ Operation	Addresses current capacity constraints	Yes	Yes	Yes	Yes
	Achieves Effluent Design Objects set by MOECC	Yes	Yes	Yes	Yes
	Treatment Reliability and Ability to Handle Cold Weather Climate	Yes – Technologies exist for cold climates	Yes – Technologies exist for cold climates	Yes	Yes
	Ability to Treat Effluent Year Round	Yes	Yes	Yes	Yes
	Adequately Services Project Design Flow	Yes	Yes	Partially – Requires a more complex mechanical treatment system to handle excess flows	Yes
	Ability to Process Varying Design Flows	Yes - Can be designed to accommodate current and future flows	Yes - Can be designed to accommodate current and future flows	Yes - Can be designed to accommodate current and future flows	Yes - Can be designed to accommodate current and future flows
	Utilizes of Existing Assets	Yes - Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure)	Yes - Utilizes all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure)	Partially - Still requires a more complex mechanical treatment plant to handle excess flows	No – Does not maximize the use of existing infrastructure. Existing system will need to be decommissioned
	Complexity of Operation of Treatment Technology	Moderate - Less complex operations than a mechanical system.	Moderate - Not a conventional set up with primary treatment	Higher complexity of operation and maintaining compared to other passive wastewater treatment systems. Requires trained operator for the mechanical treatment	Higher complexity of operation and maintaining compared to other passive wastewater treatment systems. Requires on-site trained operator
	Complexity of Maintenance of Treatment Technology	Yes - Less maintenance requirements than mechanical systems. Reliable and mechanically simple	Yes - Less maintenance requirements than mechanical systems. Reliable and mechanically simple	More complex – Need to maintain two different treatment systems.	Higher complexity of maintaining compared to other passive wastewater treatment systems.
	Does it Fit within the Existing Property Limits	Yes - Based on preliminary observations and design work, it is unlikely additional land will be required to construct the expansion	Yes - Based on preliminary observations and design work, it is unlikely additional land will be required to construct the expansion	Potentially – Dependent on site layout and size of treatment units. Requires two systems to be placed on a parcel of land.	Potentially – Dependent on site layout and being able to abandon existing system and gain useable space
	Overall Evaluation of Technical/Operation				
Natural Environment	Effect on Aquatic/Ecological Habitat - Construction and Operation	Potential impact – Achieves the proposed effluent criteria (subject to MOECC acceptance), however, may have a harder time achieving desired treatment objectives during winter.	Potential impact – Achieves the proposed effluent criteria (subject to MOECC acceptance), however, may have a harder time achieving desired treatment objectives during winter.	Minimal impact – Achieves the proposed effluent criteria (subject to MOECC acceptance) and therefore reducing the impact to the Aquatic/Ecological habitat.	Minimal impact – Achieves the proposed effluent criteria (subject to MOECC acceptance) and therefore reducing the impact to the Aquatic/Ecological habitat.

Impact	Evaluation Criteria	Alternative 3b: Upgrade Existing Lagoon – Post Lagoon Effluent Treatment	Alternative 3c: Primary Treatment with Post Lagoon Effluent Treatment	Alternative 3e: Upgrade Existing Lagoon – Mechanical Treatment for "Excess Flow" and polish Lagoon Effluent	Alternative 4: Build new Mechanical Facility
	Effect on Terrestrial Habitat- Construction and Operation	Potential impact to Terrestrial Habitat and SAR. Mitigation measure will need to be implemented in the detail design. The proposed system utilizes existing assets and post treatment systems will have a smaller foot print. Therefore, reducing the impact to terrestrial habitat.	Potential impact to Terrestrial Habitat and SAR. Mitigation measure will need to be implemented in the detail design. The proposed system utilizes existing assets and post treatment systems will have a smaller foot print. Therefore, reducing the impact to terrestrial habitat.	Higher impacts due the complexity of the system (i.e. requiring two treatment trains), additional space will be required which has a higher potential to impact the terrestrial habitat including SAR.	Potential impacts due the complexity of the system. Site will need to be decommissioned and repurposed for the mechanical treatment facility. Potential impacts to SAR.
	Effect on Vegetation - Construction and Operation	Minimal impact as the proposed system utilizes existing assets. Post treatment systems will have a smaller foot print and will be strategically place treatment units to reduce impact on vegetation and SAR.	Minimal impact as the proposed system utilizes existing assets. Post treatment systems will have a smaller foot print and will be strategically place treatment units to reduce impact on vegetation and SAR.	Potential impacts due the complexity of the system (i.e. requiring two treatment trains), additional space will be required which has a higher potential for removal of vegetation during construction.	Potential impacts due the complexity of the system. Site will need to be decommissioned and repurposed for the mechanical treatment facility. Potential impacts to SAR.
	Effect on Surface Water Quality	Improved	Improved	Improved	Improved
	Effect on Groundwater Quality	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water
	Effect on Surrounding Agricultural Land	Lower impacts on adjacent landowners since the proposed system is utilizing existing assets. Mitigation measures to be put in place during detail design	Lower impacts on adjacent landowners since the proposed system is utilizing existing assets. Mitigation measures to be put in place during detail design	Moderate impacts on adjacent landowners due to increased noise/odour associated with mechanical treatment processes.	Moderate impacts on adjacent landowners due to increased noise/odour associated with mechanical treatment processes.
	Overall Evaluation of Natural Environment				
Socio-Economic Environment	Ability to Meet Existing Community Wastewater Servicing Needs	Yes	Yes	Yes	Yes
	Ability to Meet Projected Community Growth Wastewater Servicing Needs	Yes	Yes	Yes	Yes
	Affordability (Capital and Operating Costs)	Moderate	Moderate	High	Highest
	Overall Evaluation of Socio-Economic Environment				

Less Favourable Impact **More Favourable Impact**

7.5 Preferred Alternative Solution

Based on the above evaluation, the preliminary preferred alternative solution at this time is Alternative 3b: Upgrade Existing Lagoon with Post Lagoon Effluent Treatment. Alternative 3b should be able to achieve the proposed effluent criteria (subject to MOECC acceptance) and therefore reducing the impact to the environment (Aquatic/Ecological and Terrestrial), technologies are proven to be efficient and effective at treating wastewater effluent, and utilize all of the existing assets at the site (no decommissioning required; maximize use of existing infrastructure). Based on preliminary observations and design work, it is unlikely additional land will be required to construct the expansion

Alternative 3c: Primary Treatment with Post Lagoon Effluent Treatment is also another viable option but since it is not standard practice in Ontario, the Township has decided not to carry it forward to the conceptual design phase. However, the Township has elected to incorporate headworks (i.e. screening and grit removal) within Alternate 3b.

8.0 PHASE 3 - IDENTIFICATION AND EVALUATION OF ALTERNATIVE DESIGN CONCEPTS

Phase 3 of the Class EA process consists of the identification and evaluation of alternative design concepts for the technically preferred alternative solution identified in Phase 2 of the Class EA process for the expansion of the Alexandria Sewage Lagoon Facility. The technically preferred alternative solution carried forward from Phase 2 is: Alternative 3b Post Lagoon Effluent Treatment

Please note that this Class EA is solely for the expansion of the expansion of the Alexandria Sewage Lagoon Facility. Therefore, the Town of Alexandria sewage collections system including pumping stations and forcemains will on continue operate in its current condition. However, as previously noted, the Township of North Glengarry has plans to continue to undertake various repairs to the Alexandria sewage works network to help reduce and eliminate infiltration into the system in efforts to gain back some working capacity of the Alexandria Sewage Lagoons.

8.1 Design Criteria

The selection and evaluation of process options were based on the flows, loadings, and effluent criteria as identified below. Table 8.1 provides a summary of anticipated future design flows and Table 8.2 summarizes the design raw wastewater and lagoon effluent characteristics which were based on historical data typical lagoon effluents.

Table 8-1: Design Flows

Weather Condition	Total Average Flow		Total Peak Flow	
	L/s	m^3/d	L/s	m^3/d
Dry Weather Flows	75	6,515	196	16,963
Maximum Day Flow		39,000		

Table 8-2: Existing Raw Wastewater Quality

Parameter	Raw Wastewater	Lagoon Effluent
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	110 mg/L	30 mg/L
Total Suspended Solids (TSS)	100 mg/L	20 mg/L
Total Kjeldahl Nitrogen (TKN)	16 mg/L	--
Total Ammonia Nitrogen (TAN)	--	16 mg/L
Total Phosphorus	2 mg/L	0.8 mg/L
Minimum Temperature (Winter)	--	1^0C

The above noted design flows and loadings were used to develop the alternative design concepts as part of this study. It is recommended that these values (flows, concentrations, and loadings) be reviewed and confirmed during preliminary and detail design phase.

Effluent requirements help to control and maintain the water quality in Ontario water systems and help to ensure that aquatic life such as fish and aquatic invertebrates, in both the water column and sediment, are free of toxic exposure. The Ministry of Environment and Climate Change (MOECC) enforces effluent criteria to ensure the health and well-being of aquatic life and maintain water quality for recreational use.

As previously indicated the effluent from the Alexandria lagoons is directed to the Pilot Drain, where it flows 700 metres before discharging into the Delisle River, a receiver that is characterized by lower flows during the summer and fall resulting in a more limited assimilative capacity. Flow data for the Delisle River near Alexandria is continuously recorded at two Federal Water Survey of Canada Flow Gauging Stations, 02MC028 upstream from the village, and Station 02MC036 located further downstream near Glen Robertson. The period of record for Station 02MC028 extends from 1985 to 1998 and from 2006 to 2016. Station 02MC036 has been in continuous operation since 2003. A copy of the annual extremes recorded during those periods is included in Appendix D.

A receiving water study/impact assessment of the Delisle River was prepared by Hutchinson Environmental Sciences Limited (HESL) in 2014 (Appendix A), updating a previous study carried out by Aecom in 2012 to support an expansion of the Alexandria sewage works to 5500 m^3/day from the currently approved 3237 m^3/day. The HESL report shows that water quality of the river is typical of that found in agricultural based watersheds, and concluded that there has been little to no impact on the river from the operation of the sewage works. The only parameter exceeding the Provincial Water Quality Objectives (PWQO) in the Delisle River is Total Phosphorus, (PWQO of 0.030 mg/L) which during the study averaged 0.034 mg/L upstream from the effluent, to 0.040 mg/L downstream from the confluence with the discharge. A significant increase in average Total Phosphorus concentrations from 0.034 mg/L to 0.090 mg/L was noted between the last two sampling locations located some 5-6 km downstream, however the report concluded this increase was not attributable to the operation of the Alexandria sewage works.

Parameters that exceed their respective PWQO classify the receiver as a Policy 2 water course for that parameter, which means that no further degradation of the receiver is permitted, and that all reasonable and practical measures shall be taken to upgrade to the Objective. In the HESL Report, it was recommended that for a design flow of 5500 m^3/day the Total Phosphorus effluent criteria be set at 0.30 mg/L, which would maintain but not reduce the loading approved through the current ECA. Since the preparation of the HESL Report, the design flow for the expanded works has been increased from 5500 m^3/day to 6500 m^3/day, requiring a further decrease in Total Phosphorus effluent limits in accordance with Policy 2.

The increase in design flows led to further pre-consultation with MOECC Regional staff in a meeting July 10, 2015, also attended by the municipality, AMEC, Hutchinson Environmental Sciences, and McIntosh Perry. The agenda included discussions on the existing sewage system, efforts undertaken by the municipality to reduce infiltration

and extraneous flows, effluent criteria, and nutrient offsetting if needed, to reduce phosphorus loadings to the Delisle River.

The HESL study was based on design sewage treatment flows of 5500 m^3/day and proposed the following effluent criteria:

Table 8-3: MOECC Effluent Limits

Parameter	Effluent Criteria
Total Ammonia Nitrogen	1 mg/L (May – October) 3 mg/L (November – April)
Total Phosphorus	0.1 – 0.3 mg/L
No criteria were provided/recommended for $CBOD_5$ or TSS	

MOECC indicated that with the increase in rated flows, there would need to be a reduction in the effluent limit for Total Phosphorus; that they were satisfied with proposed TAN criteria; effluent concentration ranges for $CBOD_5$ of 10 – 15 mg/L, and TSS of 10 – 20 mg/L would be acceptable for the expanded works.

Accordingly, proposed effluent criteria and design objectives for the expansion of the Alexandria sewage works for a design flow of 6500 m^3/day are as follows:

Table 8-4: MOECC Effluent Limits

Parameter	Effluent Limits	Compliance	Design Objectives
$cBOD_5$	10 – 15 mg/L	10 mg/L	8 mg/L
TSS	10 – 20 mg/L	15 mg/L	10 mg/L
Total Ammonia Nitrogen Summer Winter	1 – 3 mg/L	 1 mg/L 3 mg/L	 1 mg/L 2 mg/L
Total Phosphorus	0.1 – 0.3 mg/L	0.2 mg/L	0.1 mg/L
E-coli	Counts/100mL	150 organisms/100mL	100 organisms/100mL

An impact assessment of the discharge was carried out with the revised sewage plant flow of 6500 m^3/day and lower Total Phosphorus limit of 0.2 mg/L through mass balance calculations using the river flows developed from gauge station 02MC036 and water quality data, both from the HESL Report. The results show that in spite of the higher effluent flow, the more restrictive effluent concentration of 0.2 mg/L will actually result in lower in-stream Total Phosphorus concentrations than those for a design flow of 5500 m^3/day and effluent limit of 0.3 mg/L Total Phosphorus (0.104 mg/L vs. 0.135 mg/L). With the currently approved sewage flows of 3237 m^3/day and effluent limit of 0.5 mg/L for Total Phosphorus, the resulting in-stream mass balance concentration is 0.154 mg/L. These results confirm that an expansion of the Alexandria sewage works will be in complete compliance with Policy 2 receiver as there will be no further degradation of the Delisle River with respect to Total Phosphorus; there will in fact be a lower loading from the facility and potentially, slight improvements to Total Phosphorus water quality in the river.

The proposed compliance limits for Total Ammonia Nitrogen of 1 mg/L during the summer months and 3 mg/L during the winter months are in accordance with those recommended in the HESL Report and those discussed with MOECC during pre-submission consultation. The increase in design flows will not affect these limits, which will continue to ensure that the discharge to the Delisle River will be non-toxic with respect to un-ionized ammonia.

The proposed limits for CBOD5 of 10 mg/L and 15 mg/L for TSS are reflective of enhanced treatment levels and within acceptable ranges to MOECC Technical Support staff for this project. These limits are significantly lower than the currently stated ECA limits of 30 mg/L $CBOD_5$ and 40 mg/L TSS.

During the July 2015 pre-consultation, the concept of nutrient offsets was brought up for discussion in the event that the required effluent criteria couldn't be achieved from the new works; MOECC agreed that they could consider the use of Total Phosphorus offsets from other point or diffuse sources. Offset ratios are calculated on the basis of a 4:1 ratio for both municipal point source controls, for example, storm-water treatment/storm-water management; and for rural diffuse sources, for example, runoff/erosion control and nutrient management practices. In the event Total Phosphorus offsets need ever be considered, the timing and requirements for the submission of offset proposals, their acceptance, approvals and implementation would be achieved through conditions attached to the sewage works ECA.

MOECC also requested that consideration be given to incorporating new innovative technology that will aid in the reduction of ammonia and phosphorus concentration levels being discharged to the Delisle River. ***The above noted proposed effluent discharge limits stated in Table 8-4 still need to be confirmed and approved by MOECC.***

8.2 Identification of Alternative Solutions

The technically preferred alternative solution for the expansion of the Alexandria Sewage Lagoon Treatment Facility developed in Phase 2 consists of upgrading existing and implementing new treatment technologies. It is being proposed that the treatment facility consists of:

- Pre-lagoon treatment for the removal of large objects;
- Aeration for organics removal; and
- Post-lagoon treatment for ammonia, phosphorus and solids control and disinfection.

Numerous treatment technologies (alternative design concepts) exist that are thought to be viable/feasible options for the expansion of the Alexandria Sewage Lagoon Treatment Facility. The following alternative design concepts were chosen to be evaluated based on their adaptability at the Alexandria Sewage Lagoons, as well as their ability to achieve the preliminary effluent objectives set by MOECC, presented in Table 8-4.

8.2.1 *Pre-Lagoon Treatment*

One of the first steps in wastewater treatment is the removal of material that can damage or inhibit processes. This area of treatment is often referred to as headworks. Large materials such as rags, paper, plastic, metals and other inert material (i.e. grit,) are often targeted for removal in the headworks in order to prevent damage and clogging of downstream equipment. Pre-lagoon treatments considered in this Class EA including screening and aeration.

8.2.1.1 Screening

Screening of the influent wastewater is required to remove large objects that might damage or clog downstream equipment. Screens come in various configurations including bars, mesh and perforated drums. The selection of type is often dictated by the needs of downstream treatment. For example, membrane systems downstream of the screens need a high degree of protection (e.g. rotating perforated hole drums are used). For the Alexandria lagoon upgrade, it has been concluded that only coarse material needs to be removed and therefore a bar screening would be considered adequate treatment (e.g. 15mm spacing between bars). This technology is widely used and simple. The headworks screening treatment alternatives being proposed for the wastewater facility are:

1. Alternative 1: Manually Cleaned Bar Screens - rely on operators to removal the material collected on the screen using a rake. Collected material is manually lifted to a collection bin for periodic removal.

2. Alternative 2: Mechanically Cleaned Bar Screens - are cleaned on an automatic basis (e.g. predetermined head drop across the screen) and include chain-driven screens, reciprocating rake (climber screens), catenary screens (front-cleaned, front-return, chain-driven screen but with no submerged sprockets), and continuous belt screens. The raking system lifts the collected material in a bin for periodic removal. As an option, screenings may be dewatered prior to discharge to the collection bin.

8.2.1.2 Grit Removal

Grit includes sand, gravel, cinder, or other solids other than organic biodegradable solids in wastewater. Grit removal will help prevent the accumulation of heavy deposits in lagoon cells, pipelines, channels, and conduits, and to protect moving mechanical equipment from abrasion and abnormal wear. Currently, no grit removal system is incorporated into the plant and so, grit accumulates in the lagoons. The grit accumulation is not considered to impact the performance of the lagoon system but its removal (or partial removal) will increase the operating time before sludge is required to be removed. The grit removal alternatives being proposed for the wastewater facility are:

1. Alternative 1: Gravity Settling - Gravity settling devices include horizontal flow grit chambers and detritus tanks. For these systems, influent wastewater flows through channels/chambers where the high-density grit separates via gravity from the wastewater. Horizontal flow grit chambers utilize elongated channels to provide the necessary time for the dense grit (specific gravity near 2.6) to settle in collection wells downstream of the influent point. Detritus tanks are designed to operate at lower velocities through their system and as a result, collect organics. A washing system can be incorporated to separate the organics from the inert material. Based on discussions with the Township, should gravity settling be used, manual removal of the grit without washing will be practiced.

2. Alternative 2: Centrifugal Systems - Centrifugal systems increase the settle ability of grit by providing centrifugal forces. Common systems include aerated grit and vortex type systems. In both cases, a circular water flow pattern is developed accelerating the particles. For aerated grit systems, air is used along one side of a tank to induce a roll pattern with the particles dropping to the bottom of the tank. For vortex type systems, flow enters one side of a vertically oriented cylindrical tank creating a circular flow pattern. The grit pushed to the outside and settles to the bottom. The circular pattern can be assisted using paddles mounted to a motor. Collected grit for both the aerated and vortex system is removed by a grit pump of air lift pump.

8.2.2 *Aeration Cell*

The addition of air in the existing partially mixed aeration cell would ensure adequate oxygen for organic removal ($CBOD_5$) as flow to the facility increases. Three alternatives are being proposed for the aeration cell. For the first two options, the existing mechanical aerators (3@11.2 kW; 15 HP each) would remain in service. For the third option, the mechanical aerators would be replaced. For all of the alternatives, provision for a diffused system in the first facultative lagoon is included, should future operation show oxygen deficiency. The aeration alternatives being proposed for the wastewater facility are:

1. Alternative 1: Upgrade the aeration system by increasing number of mechanical aerators - additional mechanical aerators would be added to the aerated cell in order to meet future oxygen demands.

2. Alternative 2: Upgrade the aeration system by augmenting its capacity with fine bubble diffusers – a diffused aeration system would augment the oxygen supply currently provided by the mechanical aerators. The diffused aeration system may consist of five to ten floating laterals chains, with a minimum distance of approximately five meters between two chains. Two new 15 HP blowers (one in duty, one stand-by) would be required and housed in the headworks building in a separate blowers room.

3. Alternative 3: Upgrade the aeration system by replacing mechanical aerators with fine bubble diffusers - The diffused aeration system may consist of approximately twenty floating laterals chains, with a minimum distance of approximately five meters between two chains. Two new 60 HP blowers (one in duty, one stand-by) would be required and housed in the headworks building in a separate blowers room.

8.2.3 *Post-Lagoon Treatment*

In order to meet the total ammonia nitrogen, and total phosphorus stringent effluent limits being proposed (Table 8-4), post-lagoon treatment was recommended for the Alexandria Sewage Lagoon Facility.

8.2.3.1 Ammonia Control Treatment Alternatives

To meet the total ammonia nitrogen effluent criteria year-round, the lagoon effluent will need to be treated by a biological nitrification treatment that has proven to achieve nitrification at cold water temperatures. The ammonia control treatment alternatives being proposed for the wastewater facility are:

1. Alternative 1: Sequencing Batch Reactor (SBR) - The Sequencing Batch Reactor (SBR) is a fill-and-draw activated sludge system. All treatment steps (equalization, aeration, clarification) are achieved within the same tank using a timed control sequence. SBRs systems have been successfully used to treat industrial and municipal wastewater, for BOD_5 removal and ammonia nitrogen removal (nitrification and denitrification). They are particularly suited for wastewater treatment applications characterized by low or intermittent flow conditions. A variant of the SBR is the Intermittent Cycle Extended Aeration System (ICEAS), where influent wastewater flows into the reactor on a continuous basis. SBRs/ICEAS have been proven to achieve full nitrification but at water temperatures below 4^{o}C, the nitrification rate drops considerably (as for all activated sludge processes).

2. Alternative 2: Aerobic Submerged Fixed-Bed Reactors - Aerobic submerged fixed-bed reactors consist of three phases (packing bed, biofilm and liquid). Depending on the media density, aerobic submerged fixed-bed reactors are classified into submerged settled fixed bed reactors, and submerged floating bed reactors. A wide variety of aerobic submerged fixed-bed reactors have been used with various hydraulic configurations. Aerobic submerged fixed-bed reactors have been used for BOD_5 and ammonia nitrogen removal (nitrification and denitrification) removal. The most common configurations are:

    - Upflow submerged settled fixed-bed reactors with a high-density medium supported by a structural floor (e.g. Biofor® process by Degrémont Technologies);

- Upflow submerged floating bed reactors with a low-density medium confined in the reactor by a structural ceiling (e.g.Biostyr® process by Veolia Water Technologies); and
- Downflow submerged settled fixed-bed reactors (e.g. Biocarbone® and Biodrof process®).

Aerobic submerged fixed-bed reactor technology has been employed at the Cornwall Wastewater treatment plant for secondary treatment, but it should be noted that there are currently no ammonia limits for the Cornwall WWTP.

3. Alternative 3: Membrane Bioreactor - A membrane bioreactor consists of a biological reactor with suspended biomass and solids separation by immersed microfiltration or ultrafiltration membranes. Membrane bioreactors have been used for advanced BOD_5 removal and nitrification. The membranes are subjected to a vacuum which draws water through the membranes while retaining the solids within the reactor. A dedicated aeration system placed below the membrane surface provides air for membrane scouring to control membrane fouling and maintain filtrate flux. To provide adequate oxygen, air is supplied separately through fine-bubble diffusers. The membrane flux rate (defined as the mass or volume rate of transfer through the membrane surface expressed as $L/m^2/h$) is an important design and operating parameter which affects the process economics.

4. Alternative 4: Rotating Biological Contactor (RBC) - A rotating biological contactor (RBC) consists of a series of closely spaced circular disks of synthetic media, bundle mounted on a horizontal shaft partially submerged (typically at 40% submergence). Mechanical or air-driven units are used to rotate the biological contactor. Aeration is accomplished by exposure to the atmosphere as the RBC disks rotate out of the wastewater. As wastewater flows down through the disks, a biofilm layer develops along the train of the synthetic media and achieves the level of biological treatment needed. Excess solids from the biofilm are sloughed off during operation on a continuous or periodic basis. RBC systems require secondary treatment for solids/liquid separation. RBC systems have been used for BOD_5 removal and nitrification.

5. Alternative 5: Submerged Attached Growth Reactor (SAGR) - The submerged attached growth reactor consists of a clean aggregate media bed with evenly distributed wastewater flow across the width of the cell, and a horizontal collection chamber at the end of the treatment zone. Multiple SAGR cells can be operated in parallel with piping allowing each cell to be isolated and bypassed. The SAGR reactor includes more than one influent distribution point. In addition to the influent distribution point located at the front end of the reactor, there is an additional point downstream of the first distribution point for the

introduction of influent into the reactor. This configuration allows the development of nitrifying bacteria in a physically discrete part of the reactor. Coarse bubble diffusers are located on the reactor floor to provide aeration to achieve the required nitrification. The SAGR process is a patented process designed to provide post-secondary treatment of ammonia (nitrification) in cold climates. The gravel bed is covered with a layer of peat or mulch to prevent freezing. Extensive data collected from demonstration and full-scale facilities have shown that the SAGR system can reliably nitrify year-round consistently meeting ammonia nitrogen effluent levels of < 1.0 mg/L. For additional information provided by Nelson Environmental Inc on the SAGR process, refer to Appendix I.

6. Alternative 6: Moving Bed Biofilm Bioreactor (MBBR) - The Moving Bed Biofilm Bioreactor (MBBR) consists of a continuously aerated operating system with light weight biofilm carriers, which do not require backwashing or recirculated sludge flows. A coarse bubble aeration system (for aerobic conditions) ensures that the carriers are kept in suspension in the reactor and provides agitation to prevent excessive sludge accumulation on the media. Most of the active biomass develops on the biofilm carriers but the reactor effluent must be treated by a secondary clarifier or flotation unit to separate the treated effluent from the sloughed biomass.

7. MBBR systems have been used for BOD_5 removal and ammonia nitrogen removal (nitrification and denitrification). MBBR processes have been used for industrial and municipal applications, however, for post-lagoon cold temperature nitrification, only pilot studies have been tested. Extensive data collected from a pilot study in the Masson-Angers (Quebec) aerated lagoon facility (as part of study performed by the University of Ottawa), have shown that MBBR systems can reliably nitrify year-round, consistently meeting ammonia nitrogen effluent levels of < 1.0 mg/L.

8.2.3.2 Phosphorus and Solids Control Alternatives

To meet the stringent Total Phosphorus (TP) effluent design and limit objectives, tertiary treatment will be required to polish the effluent. The anticipated TP design objective (0.1 mg/L) and effluent limit (0.2 mg/l) is achieved by converting soluble phosphorus to particulate phosphorus, and by reducing the effluent total suspended solids (TSS) to 2 - 5 mg/L. Therefore, this treatment process is required to combine a chemical precipitation/adsorption step to remove soluble phosphorus with a filtration step to remove TSS and particulate phosphorus. The phosphorus and solids control treatment alternatives being considered for the proposed wastewater facility are:

1. Alternative 1: Surface Filters - Surface filtration involves the removal of particulate material in suspension by mechanical sieving by passing the liquid through a thin septum (i.e.: filter material). Surface filter mediums typically have openings ranging from 5 to 30 µm. Surface

filtration has been used as a replacement for depth filtration for removal of suspended solids from secondary effluent. A variety of surface filters exist, such as:

- The Cloth Media Filter (CMF) - wastewater flows by gravity from the exterior of the disks (comprised of six equal segments) through the filter medium to an internal collection system. Typically, two types of filter clothes are used: a needle felt cloth made of polyester or a synthetic pile cloth. A vacuum system is used to remove the accumulated solids by drawing filtrate water from the filtrate header back through the cloth media while the disk is rotating. A predetermined amount of headloss triggers backwashing to remove embedded solids.
- The disk filter which consists of a series of disks comprised of two vertically mounted parallel disks used to support the filter cloth;
- The UltraScreen® which consists of two continuously rotating circular screens of woven stainless steel mesh;
- The drum filter where the liquid flows through the periphery of the drum, through a filter cloth of polyester or polypropylene or stainless steel, as the drum rotates slowly.

For the Alexandria Sewage lagoon facility, the proposed surface filter system is the cloth filter, which is the most commonly found technology for municipal wastewater applications. The cloth filters would be installed downstream of a rapid mix chamber where a phosphorus binding compound (e.g. alum) would be dosed to react with soluble phosphorus. This is followed by a slow mix chamber allowing the small flocs to aggregate into larger particles. The wastewater exiting the flocculation tank would then enter the disk filter tank. The disc filters would continuously operate and wastewater would continue to be treatment during the backwash cleaning sequence. Backwash water will be directed to the head of the treatment plant. For additional information, refer to Appendix J.

2. Alternative 2: Loose Media Filters - Loose media filters consist of passing the wastewater effluent through a filtering medium that can be used to strain out the colloidal particles. The filtering media may be fine sand, anthracite, mixed media or diatomaceous earth. The filtration system may be gravity or pressure induced. A wide variety of sand based filters have been used including conventional, deep bed sand filtration, shallow bed sand filtration, pulsed bed filters, fuzzy filters, traveling bridge filters, and pressure filters. The filter operation can be continuous or semi-continuous. Chemical phosphorus removal could be implemented in rapid mix coagulation chambers and show mix flocculation chambers upstream of the sand filter. Two types of sand filters are described below (conventional downflow sand filters and deep-bed upflow continuous backwash sand filters).

a. Conventional Down-flow Sand Filters - In conventional downflow sand filters, chemical conditioning occurs upstream of the filter to enhance phosphorus removal. Water flows by gravity through the filter and drains at the bottom of the sand media. The media depth is typically 300mm. To remove solids captured in the media, portions of the filter are locally backwashed to suspend the captured solids. The fast settling sand quickly separates from the captured solids, which are then pumped out and directed to the head of the plant. Localized cleaning of the bed allows the cleaning filter to remain in service during cleaning cycles

b. Deep-bed up-flow continuous backwash filters - In deep-bed up flow continuous backwash filters, chemical conditioning occurs upstream of the filter to enhance phosphorus removal. Wastewater to be filtered is introduced into the bottom of the filter where if flows upward through a series of riser tubes and is distributed evenly into the sand bed through the open bottom of an inlet distribution hood. The wastewater then flows upward through the downward moving sand. Clean filtrate exits from the sand bed, overflows a weir, and is discharged from the filter. At the same time, sand particles, along with trapped solids, are drawn downward into the suction of an airlift pipe which is positioned in the centre of the filter. A small volume of compressed air, introduced into the bottom of the airlift, draws sand, solids, and wastewater upward through the pipe by creating a fluid with a specific gravity less than one. Impurities are scoured (abraded) from the sand filters during the turbulent upward flow. Upon reaching the top of the airlift, the dirty slurry spills over into the central reject compartment. A steady stream of clean filtrate flows upward, counter current to the movement of sand, through the washer section. The upflow liquid carries away the solids and reject water. As the sand has a higher settling velocity than the removed solids, it is not carried out of the filter. As it moves down through the washer, the sand is cleaned further. The cleaned sand is redistributed onto the top of the sand bed, allowing for a continuous uninterrupted flow of filtrate and reject water. For additional information, refer to Appendix K.

3. Alternative 3: Adsorption Media System - In this process, there is no chemical conditioning upstream of the system; chemical sorption of the phosphorus occurs within the filter media. An example is provided by the patented system, Blue PRO® Phosphorus Removal System, which uses a continuous backwash gravity sand filter with a coated media that provides reactive phosphorus sorption sites. The filtration process provides reactive surface sites within the media bed, resulting in forced contact of chemical species with high adsorptive capacity. The adsorptive surface's continuously regenerates hydrous ferric oxide (HFO) coating that forms on the surface of the sand media. Phosphorus and solids are removed

from the filter through the backwash or reject stream. All filter backwash water is returned upstream to the aerated lagoon cell. For additional information, refer to Appendix L.

4. Alternative 4: High Rate Ballasted Clarification - A high rate ballasted clarification process is based on a package plant configuration that incorporates coagulation, polymer injection, floc formation, dosage of microsand/ballast material, and finally settling. Prior to the wastewater entering the clarification unit, a coagulant is added to the wastewater. The wastewater enters a rapid mix chamber within the clarification unit where a polymer is injected. The mixing chamber allows for the coagulant and polymer to come in contact with and destabilize particles. Flocculation of particles is allowed to take place in a maturation chamber. Ballasted material (microsand) is added to the wastewater to weigh down flocs and promote settling. Moderate mixing is used to accelerate the formation of poly bridges between pin flocs, suspended solids and microsand. The settle solids are collected through a series of troughs beneath a baffle wall in the clarification chamber. The collected solids are pumped to a hydrocyclone, which separates the ballasted material (microsand) and recovered solids. The ballasted material is injected back into the system and the waste stream is discharged from the system. For additional information, refer to Appendix M.

8.2.3.3 Disinfection

To meet the E.Coli count objective of 150 organisms/100 mL and limit of 200 organisms/100 mL (monthly geometric mean density), a disinfection process will be required downstream of the tertiary treatment. Two disinfection alternatives being considered are:

1. Alternative 1: Chlorination/Dechlorination - For this alternative, disinfection would be accomplished by chlorination (i.e. application of sodium hypochlorite). A dechlorination process would then remove residual chlorine prior to discharge to the natural environment. This process is currently being used at the Alexandria Sewage Lagoon Facility.
2. Alternative 2: Ultraviolet Disinfection - In this system, UV light penetrates the microorganisms' cell wall, which prevents replication or causes death to the cell. The effectiveness of the UV system is a function of water characteristics, UV intensity and exposure time to the light.

8.3 Evaluation Criteria

A comparative evaluation was completed for each treatment process and the proposed alternative design concepts. The alternative design concepts were evaluated based on their advantages and disadvantages, as well as evaluation criteria presented in Table 7-2 and key criteria stipulated below:

1. **Ability to remove desired constituents as per treatment level objectives**
   - Is the alternative design concept capable and efficient at removing constituents that the technology was designed to remove?
   - If applicable, does the alternative design concept achieve effluent design objects set by MOECC outlined in Table 8-3?
2. **Treatment Reliability on full-scale applications and ability to handle cold weather climate?**
   - Given that the Alexandria WWTS resides in a northern climate, cold weather is expected during the winter months. Can the alternative design concepts, more specifically alternative design concepts for nitrification, achieve desired constituent removals (as per Table 8-3) in a low temperature environment?
3. **Ability to process varying design flows?**
   - Can the alternative design concepts accommodate future sewage flows?
4. **System complexity and maintenance of treatment facility?**
   - What is the level of operational/procedural complexity associated with the select alternative design concept?
   - What level and ease of maintenance is required for the select alternative design concept?
   - Are there other operational/procedural aspects of the alternative design concept that must be considered, such as accommodating and treating the reject stream from backwash cycles?
5. **Footprint of treatment system?**
   - Is the select alternative design concept reasonably sized? Does it fit within the existing property limits?
   - Does the select alternative design concept "fit" with existing technology and infrastructure on-site?
6. **Use of existing assets (for the aeration cell upgrade)**
   - Is the select alternative design concept making use of the existing assets (these criteria applies only to the aeration cell upgrade)?
7. **Effects on the Environment?**
   - Terrestrial Impacts during Construction and Operation? Are there potential impacts to the existing terrestrial habitat and/or potential to provide for opportunities to protect or create habitat?
   - Aquatic/Ecological Habitat Impacts during Construction and Operation? Are there potential impacts to the existing aquatic/ecological habitat and/or potential to provide for opportunities to protect or create aquatic/ecological habitat are preferred?
   - Vegetation Impacts during Construction and Operation? Need for tree and vegetation removal and/or ability to preserve vegetation?

8.4 Evaluation of Alternative Design Concepts

8.4.1 *Pre-Lagoon Treatment Evaluation*

8.4.1.1 Screening

The evaluation of the alternative design concepts for ***Screening*** is presented in Table 8-5.

Based on the screening evaluation (Table 8-5), the automated cleaning and/or mechanical bar screens systems have similar disadvantages and advantages with respect to potential environmental (natural and social) impacts. However, the mechanical system will have a higher capital and operational cost, whereas the manual system will be more labour intensive to operate. Based on the screening evaluation, the automated cleaning and/or mechanical bar screens are both appropriate treatments for the proposed facility and therefore, at this time both systems have been elected to be carried forward to the detail design stage to allow for flexibility in the design.

8.4.1.1.1 Grit Removal

The gravity and centrifugal based systems have similar disadvantages and advantages with respect to potential environmental (natural, social and economic) impacts. The evaluation of the alternative design concepts for ***Grit Removal*** is presented in Table 8-6.

Based on the grit removal evaluation (Table 8-6), the Gravity Settling system was carried forward based on the Township's desire to keep the system as simple as possible. It is understood that some of the finer grit may be carried into the aerated lagoons; however, a significant amount of the inert granular material in the raw wastewater will be removed in the grit system.

Table 8-5: Evaluation for Bar Screen

Impact	Consideration	Alternative 1: Manually Cleaned Bar Screens	Alternative 2: Mechanically Cleaned Bar Screens
Technical/ Operation	Ability to Remove the Desired Constituents as per Treatment Level Objectives	Effectively removes large objects	Effectively removes large objects
	Achieves Effluent Design Objects set by MOECC	-	-
	Treatment Reliability and Ability to Handle Cold Weather Climate	Equipment would be housed inside building for operator comfort and prevention of screening material freezing.	Equipment would be housed inside building for operator comfort and prevention of screening material freezing.
	Ability to Treat Effluent Year Round	Yes	Yes
	Adequately Services Project Design Flow	Yes	Yes
	Ability to Process Varying Design Flows	Design for average and peak flows through adequate redundancy and overflow weirs.	Mechanical screens can accommodate varying flows due to raking mechanism being initiated as a result of set water level differential between influent and effluent side of screen.
	Utilizes of Existing Assets	No	No
	Complexity of Operation of Treatment Technology	Simple to operate and no additional skills required for operations/maintenance staff. No risk of mechanical breakdowns.	System requires power to operate. Additional skills are required for operation staff compared to the manual bar screen.
	Complexity of Maintenance of Treatment Technology	Continuous monitoring is required with a manual system due to the potential plugging with no immediate means of cleaning. Recommend the potential installation of alarms should a large volume of material bind to bar screen.	Yes - Cleaning of bar screens automatically initiated. Automatically lifts collected materials into bins. Maintenance required on mechanical equipment.
	Does it Fit within the Existing Property Limits	Yes - Compact system	Yes - Compact system. Mechanical screens do not require a larger area than other screens.
	Overall Evaluation of Technical/Operation		
Natural Environment	Effect on Aquatic/Ecological Habitat - Construction and Operation	Improved	Improved
	Effect on Terrestrial Habitat- Construction and Operation	Minimal – use of the existing site and system to be placed in previously cleared area. If terrestrial habitat is to be removed during construction mitigation measure are to be implemented to protect SAR.	Minimal – use of the existing site and system to be placed in previously cleared area. If terrestrial habitat is to be removed during construction mitigation measure are to be implemented to protect SAR.
	Effect on Vegetation - Construction and Operation	Minimal – use of the existing site and system to be placed in previously cleared area. Mitigation measures to be implemented to reduce impact SAR.	Minimal – use of the existing site and system to be placed in previously cleared area. Mitigation measures to be implemented to reduce impact SAR.
	Effect on Surface Water Quality	Improved	Improved
	Effect on Groundwater Quality	Minimal Impact during construction. Mitigation measure to be implemented during construction.	Minimal Impact during construction. Mitigation measure to be implemented during construction.
	Effect on Surrounding Agricultural Land	None/Minimal Impact	None/Minimal Impact
	Overall Evaluation of Natural Environment		
Socio-Economic Environment	Ability to Meet Existing Community Wastewater Servicing Needs	Yes	Yes
	Ability to Meet Projected Community Growth Wastewater Servicing Needs	Potential Noise and Odour impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design	Potential Noise and Odour impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design
	Effects on Adjacent Landowners/Residence	Minimal	Minimal
	Effects on Archaeological Recourses	None	None
	Effects on Cultural Heritage Landscapes and Building Heritage	None	None
	Capital Coast	Lower that mechanical system	Approximately $400k greater than manual (including grit removal)
	Operational Costs	Moderate – increased cost for more periodic maintenance	Moderate - due electrical supply
	Overall Evaluation of Socio-Economic Environment		

Less Favourable Impact **More Favourable Impact**

Table 8-6: Evaluation for Grit Removal

Impact	Consideration	Alternative 1: Gravity Settling	Alternative 2: Centrifugal Systems
Technical/ Operation	Ability to Remove the Desired Constituents as per Treatment Level Objectives	Grit removal requirements are not stringent and gravity settling considered capable of removing larger grit material	Centrifugal assisted systems can easily achieve desired grit removal.
	Achieves Effluent Design Objects set by MOECC	-	-
	Treatment Reliability and Ability to Handle Cold Weather Climate	Cold temperatures not considered detrimental to grit removal.	Cold temperatures not considered detrimental to grit removal.
	Ability to Treat Effluent Year Round	Yes	Yes
	Adequately Services Project Design Flow	Yes	Yes
	Ability to Process Varying Design Flows	Design to accommodate peak and varying flow conditions	Design to accommodate peak and varying flow conditions
	Utilizes of Existing Assets	No	No
	Complexity of Operation of Treatment Technology	Simple system requiring no mechanical equipment; however it is a manually intensive system to operate. Hydraulic sensitivity; some solids carry over may occur (not considered detrimental to downstream processes).	Relatively simple system to operate
	Complexity of Maintenance of Treatment Technology	Continuous monitoring is required with a manual system due to the potential plugging with no immediate means of cleaning. Recommend the potential installation of alarms should a large volume of material bind to bar screen.	Maintenance required for system accessories (e.g. pumps, paddles). No hidden and minimal submerged components
	Does it Fit within the Existing Property Limits	Yes - Compact system	Yes - Compact system. Mechanical grit systems do not require a larger area than other screens.
	Overall Evaluation of Technical/Operation		
Natural Environment	Effect on Aquatic/Ecological Habitat - Construction and Operation	Improved	Improved
	Effect on Terrestrial Habitat- Construction and Operation	Minimal – use of the existing site and system to be placed in previously cleared area. If terrestrial habitat is to be removed during construction mitigation measure are to be implemented to protect SAR.	Minimal – use of the existing site and system to be placed in previously cleared area. If terrestrial habitat is to be removed during construction mitigation measure are to be implemented to protect SAR.
	Effect on Vegetation - Construction and Operation	Minimal – use of the existing site and system to be placed in previously cleared area. Mitigation measures to be implemented to protect/reduce impact SAR.	Minimal – use of the existing site and system to be placed in previously cleared area. Mitigation measures to be implemented to protect/reduce impact SAR.
	Effect on Surface Water Quality	Improved	Improved
	Effect on Groundwater Quality	Minimal Impact during construction. Mitigation measure to be implemented during construction.	Minimal Impact during construction. Mitigation measure to be implemented during construction.
	Effect on Surrounding Agricultural Land	None/Minimal Impact	None/Minimal Impact
	Overall Evaluation of Natural Environment		
Socio-Economic Environment	Ability to Meet Existing Community Wastewater Servicing Needs	Yes	Yes
	Ability to Meet Projected Community Growth Wastewater Servicing Needs	Yes	Yes
	Effects on Adjacent Landowners/Residence	Potential Noise and Odour impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design	Potential Noise and Odour impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design
	Effects on Archaeological Recourses	None	None
	Effects on Cultural Heritage Landscapes and Building Heritage	None	None
	Capital Coast	Lower that mechanical system	Approximately $400k greater than manual (including screening)
	Operational Costs	Moderate – increased cost for more periodic maintenance	Moderate - due electrical supply
	Overall Evaluation of Socio-Economic Environment		

Less Favourable Impact **More Favourable Impact**

8.4.2 *Aeration Cell Evaluation*

The addition of air in the existing partially mixed aeration cell would ensure adequate oxygen for organics removal (CBOD5) as flow to the facility increased. The evaluation of the alternative design concepts for the ***Aeration Cell*** is presented in Table 8-7 below.

Based on the evaluation (Table 8-7), Alternative 2 is the preliminary preferred design concept for aeration. Alternative 2 makes use of the existing mechanical aerators and reduces the footprint of the required blowers' room to be located in the headworks building. The flexibility of the system allows for the addition of additional blowers as required.

8.4.3 *Post-Lagoon Treatment Evaluation*

8.4.3.1 Ammonia Control

The evaluation of the alternative design concepts for ***Ammonia Control*** is presented in Table 8-8 below.

Based on the Ammonia Control evaluation (Table 8-8), the only alternative that has proven too effectively and efficiently treat lagoon effluent at low temperatures and provide ammonia control is the Submerged Attached Growth Reactor System (SAGR). Therefore, the preliminary preferred design concept for ammonia control is Submerged Attached Growth Reactor System (SAGR).

8.4.3.2 Phosphorus and Solids Control

The evaluation of the alternative design concepts for ***Phosphorus and Solids Control*** is presented in Table 8-9 below.

Chemicals are utilized in each of the systems to control phosphorus. They control phosphorus by chemically binding the soluble phosphorus ions and then removing the particulates formed or by removing the carrier onto which the chemical is bound. The effluent phosphorus compliance limit being imposed is strict, however, the following four design alternatives are all considered capable with respect to meeting the design criteria and controlling phosphorus and solids. Therefore, based on the evaluation (Table 8-9), it is being recommended that the following treatment technologies be carried forward to the detail design phase to allow for flexibility in the design:

1. Alternative 1: Surface Filters
2. Alternative 2: Deep bed filtration
3. Alternative 3: Adsorption
4. Alternative 4: Ballasted Clarification

The above identified design concepts are all considered well established technologies of similar scale and have proven to reliable forms of phosphorus and solids control treatment options in colder climates. All four

alternatives will be constructed at the same location and will generally have the same overall footprint. As such, it is believed that the environmental impacts will comparable for all four alternatives.

8.4.3.3 Disinfection

As for disinfection, both the Chlorination/dechlorination and UV treatment are reliable and effective treatment processes for removing a wide spectrum of pathogenic organisms. The systems can be designed to accommodate cold water systems and peak flow conditions, as well as lower peak flows are easily accommodated.

However, chlorination/dechlorination treatment has a number of disadvantages. Chlorine is highly corrosive and toxic, which poses a risk during shipping, storage and handling. Chemical dechlorination can be difficult to control, especially when near zero levels of residual chlorine are required (typically excess dosing is utilized). Significant overdosing of sulfite can lead to sulfate formation, suppressed dissolved oxygen concentration, and lower pH of the finished effluent. Long-term effects of discharge dechlorinated compounds into the environment are unknown. Chlorination/dechlorination is currently being used at the Alexandria Sewage Lagoon Facility; however, the system is causing operation and maintenance issues and is causing severe corrosion of the building. Therefore, the Township would like to cease using this form of treatment at the facility.

Therefore, the preliminary preferred design concept is UV disinfection. UV disinfection is effective at inactivating most viruses, spores, and cysts, as well it provides a friendlier working environment.

Table 8-7: Evaluation for Aeration Cell

Impact	Consideration	Alternative 1: Upgrade the Aeration System by Increasing Number of Mechanical Aerators	Alternative 2: Upgrade the Aeration System by Augmenting its Capacity with Fine Bubble Diffusers	Alternative 3: Upgrade the Aeration System by Replacing Mechanical Aerators with Fine Bubble Diffusers
Technical/ Operation	Ability to Remove the Desired Constituents as per Treatment Level Objectives	Yes - Will supply adequate oxygen for removal of organics (CBOD5).	Yes - Will supply adequate oxygen for removal of organics (CBOD5)	Yes - Will supply adequate oxygen for removal of organics (CBOD5)
	Achieves Effluent Design Objects set by MOECC	Yes	Yes	Yes
	Treatment Reliability and Ability to Handle Cold Weather Climate	Yes - Known to be reliable in cold weather climates.	Yes - Blowers will be housed indoors and therefore not susceptible to weather. Diffuser systems are designed for exterior use and cold weather.	Yes - Blowers will be housed indoors and therefore not susceptible to weather. Diffuser systems are designed for exterior use and cold weather.
	Ability to Treat Effluent Year Round	Yes	Yes	Yes
	Adequately Services Project Design Flow	Yes	Yes	Yes
	Ability to Process Varying Design Flows	Yes - Can be designed to accommodate current and future flows	Yes - Can be designed to accommodate current and future flows	Yes - Can be designed to accommodate current and future flows
	Utilizes of Existing Assets	Yes, with the addition of a mechanical aerator. However, existing mechanical aerators may need replacement.	Yes	No - Does not make use of existing assets. Existing mechanical aeration system to be either discontinued and/or system removed.
	Complexity of Operation of Treatment Technology	No - adding mechanical aerators would not be energy-efficient in the long-run and would require increasing maintenance requirements in cold weather with no building protection. Additional mechanical support platforms will need to be designed and constructed (could use floatable type).	Flexibility to add blowers as required. Permits ability to increase air supply with minimal infrastructure changes. Existing mechanical motors may need replacement in future due to their current long term operation.	Only one type of aeration to operate.
	Complexity of Maintenance of Treatment Technology	Less maintenance requirements than other aeration systems. Only one type of system to maintain. Reliable and mechanically simple	Two different types of aeration systems to maintain but blowers and diffusers easy to maintain. Blower equipment typically housed in a structure providing comfortable maintenance access for staff. Building will need to be provided (blowers could be housed in a separate room located in the headworks building).	Only one type of aeration system to maintain. Blower equipment typically housed in a structure providing comfortable maintenance access for staff. Building will need to be provided (blowers could be housed in a separate room located in the headworks building).
	Does it Fit within the Existing Property Limits	Yes, system would be located in aerated lagoon; no impact on footprint requirements with respect to buildings	Requires a separate room in the headworks building to house two 15 HP blowers. Size requirements are considered modest	Yes, indoor aeration equipment blowers would require an additional 20 m^2 equivalent footprint compared to aeration cell alternative 2.
	Overall Evaluation of Technical/Operation			
Natural Environment	Effect on Aquatic/Ecological Habitat - Construction and Operation	Minimal impact – using existing site and outfall	Minimal impact – using existing site and outfall	Minimal impact – using existing site and outfall
	Effect on Terrestrial Habitat- Construction and Operation	Minimal impact as system would be placed in existing aerated lagoon	No impact anticipated as system would be placed in existing aerated lagoon, however, minor terrestrial impacts maybe incurred due to the construction of the headworks building.	No impact anticipated as system would be placed in existing aerated lagoon, however, minor terrestrial impacts maybe incurred due to the construction of the headworks building.
	Effect on Vegetation - Construction and Operation	Minimal impact as system would be placed in existing aerated lagoon	No impact anticipated as system would be placed in existing aerated lagoon, however, minor vegetation impacts maybe incurred due to the construction of the headworks building.	No impact anticipated as system would be placed in existing aerated lagoon, however, minor vegetation impacts maybe incurred due to the construction of the headworks building.
	Effect on Surface Water Quality	Improved	Improved	Improved
	Effect on Groundwater Quality	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water	No Impact Anticipated - the sewage works treat the wastewater and discharges it to the surface water

Impact	Consideration	Alternative 1: Upgrade the Aeration System by Increasing Number of Mechanical Aerators	Alternative 2: Upgrade the Aeration System by Augmenting its Capacity with Fine Bubble Diffusers	Alternative 3: Upgrade the Aeration System by Replacing Mechanical Aerators with Fine Bubble Diffusers
	Effect on Surrounding Agricultural Land	Minimal impacts on adjacent landowners due to increased noise associated with aeration. Noise attenuating measures and odour control mitigation measures to be put in place during detail design	Minimal impacts on adjacent landowners due to increased noise associated with aeration. Noise attenuating measures and odour control mitigation measures to be put in place during detail design	Minimal impacts on adjacent landowners due to increased noise associated with aeration. Noise attenuating measures and odour control mitigation measures to be put in place during detail design
	Overall Evaluation of Natural Environment			
Socio-Economic Environment	Ability to Meet Existing Community Wastewater Servicing Needs	Yes	Yes	Yes
	Ability to Meet Projected Community Growth Wastewater Servicing Needs	Yes	Yes	Yes
	Effects on Adjacent Landowners/Residence	Potential Noise and Air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design.	Potential Noise and Air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design	Potential Noise and Air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design
	Effects on Archaeological Recourses	None	None	None
	Effects on Cultural Heritage Landscapes and Building Heritage	None	None	None
	Capital Coast	Moderate – Approx. 150K	Moderate – Approx. 163K	
	Operational Costs	Higher - operational costs than other alternatives	Moderate – operating two different systems	Lower - Only one type of aeration to operate which will be more energy efficient
	Overall Evaluation of Socio-Economic Environment			

Less Favourable Impact **More Favourable Impact**

Table 8-8: Evaluation of Ammonia Control

Impact	Consideration	Alternative 1: Sequencing Batch Reactor (SBR)	Alternative 2: Aerobic Submerged Fixed-Bed Reactors	Alternative 3: Membrane Bioreactor (MBR)	Alternative 4: Rotating Biological Contactor (RBC)	Alternative 5: Submerged Attached Growth Reactor (SAGR)	Alternative 6: Moving Bed Biofilm Bioreactor (MBBR)
Technical/ Operation	Ability to Remove the Desired Constituents as per Treatment Level Objectives	Yes – Operational and control flexibility allows for the system to satisfy different treatment objectives by modifying the application and duration of mixing, aeration and settling all within a single tank.	Yes – System can meet ammonia limits at operating temperatures for biological processes.	Yes – An advanced activated sludge process that is capable of achieving tertiary-quality effluent.	Yes – System can meet ammonia limits at operating temperatures above 4°c for biological processes.	Yes – Treatment objectives for ammonia and carbon are achievable.	Yes – Modular system, therefore degree of treatment depends upon medial volume fraction.
	Achieves Effluent Design Objects set by MOECC	Yes	Yes	Yes	Yes	Yes	Yes
	Treatment Reliability and Ability to Handle Cold Weather Climate	Cold temperature nitrification (below 4°C) may not be guaranteed and risk of losing biomass.	Cold temperature nitrification (below 4°C) may not be guaranteed (not a typical application).	Cold temperature nitrification (below 4°C) may not be guaranteed (not a typical application). Membrane flux highly temperature sensitive – low flux expected at low temperatures.	Cold temperature nitrification (below 4°C) may not be guaranteed. Will likely require clarification to control solids discharge.	Full-scale installations have been shown to reliably nitrify year-round at low temperatures.	Testing has shown this system to be reliable treatment process year-round at low temperatures (1°c), according the pilot studies. However, no full-scale systems have been tested with similar conditions.
	Ability to Treat Effluent Year Round	No	No	No	No	Yes	Potentially
	Adequately Services Project Design Flow	Yes	Yes	Yes	Yes	Yes	Yes
	Ability to Process Varying Design Flows	Yes – Is able to handle unsteady conditions such as peak flows and shock loads, without significant degradation in the effluent quality.	Yes – System design can accommodate flow variation.	No – Low flux expected at low temperatures.	Yes – Continuous flow reactor capable of handling flow variations. Modular process and therefore has the potential for expanding in the future.	Yes – System is designed for peak flow conditions; reduced flows can be accommodated.	Yes – Multiple treatment trains can provide adequate hydraulic retention time to accommodate flow variation.
	Utilizes of Existing Assets	Yes – SBR system will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.
	Complexity of Operation of Treatment Technology	More complex control system and requires concrete work.	Not a typical application for continuous discharge and post-lagoon treatment.	Relatively complex operational requirements; requires membranes to be cleaned with chemicals. Not a typical application for continuous discharge and post-lagoon treatment.	Relatively simple operation with low power requirements. Full-scale facilities exist as part of conventional activated sludge facilities.	Relatively simple operation, but does require multiple blowers and longer pipes.	Relatively simple operation, but requires concrete work. Requires continuous mixing to keep the carries in suspension and also requires fine screens upstream of treatment.
	Complexity of Maintenance of Treatment Technology	Higher level of maintenance	No – As excess solids are “trapped” within the system, they must be periodically removed, which requires a backwashing system.	High energy and maintenance (membrane replacement) requirements.	Potential for disk freezing in the winter if units are not housed in a building enclosure.	Relatively low maintenance requirements.	Relatively low maintenance requirements.
	Does it Fit within the Existing Property Limits	Yes – Minimal foot print	Yes – Minimal footprint	Yes – Minimal footprint	This system has a relatively	Requires both land and	Compact system.

Impact	Consideration	Alternative 1: Sequencing Batch Reactor (SBR)	Alternative 2: Aerobic Submerged Fixed-Bed Reactors	Alternative 3: Membrane Bioreactor (MBR)	Alternative 4: Rotating Biological Contactor (RBC)	Alternative 5: Submerged Attached Growth Reactor (SAGR)	Alternative 6: Moving Bed Biofilm Bioreactor (MBBR)
		(useful when land area is not available)	(useful when land area is not available).	(useful when land area is not available).	large footprint. It is possible that it could be incorporated within the existing property limits.	building space and small interior requirements to house blowers and related equipment. However, outdoor requirements for treatment area are well within what is available at the site.	
	Overall Evaluation of Technical/Operation						
Natural Environment	Effect on Aquatic/Ecological Habitat - Construction and Operation	Minimal impact during the summer months as system will be effective at treating ammonia. The likelihood of negative impacts increase in the winter as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impact during the summer months as system will be effective at treating ammonia. The likelihood of negative impacts increase in the winter as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impact during the summer months as system will be effective at treating ammonia. The likelihood of negative impacts increase in the winter as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impact during the summer months as system will be effective at treating ammonia. The likelihood of negative impacts increase in the winter as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impacts during the summer and winter months.	Minimal impact during the summer months as system will be effective at treating ammonia. Impacts during the winter months for full-scale systems are unknown.
	Effect on Terrestrial Habitat- Construction and Operation	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR.	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR	Potential impact as system has a relatively large footprint. Mitigation measures to be implemented to protect/reduce impact SAR.	Moderate impacts are anticipated with respect to the size of proposed footprint of the SAGR cells. However, this will be mitigated by placing the proposed SAGR cells where the geotubes reside to minimize loss of Terrestrial Habitat and mitigation measures will be implemented to protect/reduce impact SAR.	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR
	Effect on Vegetation - Construction and Operation	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR.	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR.	Minimal impact as system does not have a large footprint. Mitigation measures to be implemented to protect/reduce impact SAR.	Potential impact as system has a relatively large footprint. Mitigation measures to be implemented to protect/reduce impact SAR.	Moderate impacts are anticipated with respect to the size of proposed footprint of the SAGR cells. However, this will be mitigated by placing the proposed SAGR cells where the geotubes reside to minimize loss of Terrestrial Habitat and mitigation measures will be implemented to protect/reduce impact SAR.	Minimal impact as system does not have a large footprint.

Impact	Consideration	Alternative 1: Sequencing Batch Reactor (SBR)	Alternative 2: Aerobic Submerged Fixed-Bed Reactors	Alternative 3: Membrane Bioreactor (MBR)	Alternative 4: Rotating Biological Contactor (RBC)	Alternative 5: Submerged Attached Growth Reactor (SAGR)	Alternative 6: Moving Bed Biofilm Bioreactor (MBBR)
	Effect on Surface Water Quality	Minimal impacts to surface water quality during the summer months. The likelihood of negative impacts to surface water (Delisle River) increase in the winter months as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impacts to surface water quality (Delisle River) during the summer months. The likelihood of negative impacts to surface water (Delisle River) increase in the winter months as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impacts to surface water quality (Delisle River) during the summer months. The likelihood of negative impacts to surface water (Delisle River) increase in the winter months as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impacts to surface water quality (Delisle River) during the summer months. The likelihood of negative impacts to surface water (Delisle River) increase in the winter months as this system may not be able to achieve desired treatment objectives for ammonia.	Minimal impacts to surface water quality (Delisle River) during the summer and winter months	Minimal impacts to surface water quality (Delisle River) during the summer months. The likelihood of negative impacts to surface water (Delisle River) may or may not increase in the winter months.
	Effect on Groundwater Quality	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated
	Effect on Surrounding Agricultural Land	Minimal	Minimal	Minimal	Potential for impact as this treatment has a relatively large footprint.	Minimal	Minimal
	Overall Evaluation of Natural Environment						
Socio-Economic Environment	Ability to Meet Existing Community Wastewater Servicing Needs	Yes	Yes	Yes	Yes	Yes	Yes
	Ability to Meet Projected Community Growth Wastewater Servicing Needs	Yes	Yes	Yes	Yes	Yes	Yes
	Effects on Adjacent Landowners/Residential	Minimal noise and air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design.	Minimal noise and air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design.	Minimal noise and air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design.	Potential for impact as this treatment has a relatively large footprint. Lands may have to be purchased.	Minimal noise and air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design.	Minimal noise and air impacts. Noise attenuating measures and odour control mitigation measures to be implemented during detail design.
	Effects on Archaeological Recourses	None	None	None	Archaeological Assessment would be required to determine impacts.	None	None
	Effects on Cultural Heritage Landscapes and Building Heritage	None	None	None	None	None	None
	Capital Coast – In Relation to each alternative	Moderate – comparable to the MBBR option	Moderate	Highest	Lowest	Low to Moderate	Moderate – comparable to the SBR option
	Operational Costs	Comparable	Comparable	Comparable	Comparable	Comparable	Comparable
	Overall Evaluation of Socio-Economic Environment						

Less Favourable Impact **More Favourable Impact**

Table 8-9: Evaluation of Phosphorus and Solids Control Treatment

Impact	Consideration	Alternative 1: Surface filters	Alternative 2a: Loose Media Filter (Conventional Down-flow Sand Filters)	Alternative 2b: Loose Media Filter (Deep-bed up-flow continuous backwash filters)	Alternative 3: Phosphorus Adsorption Media System	Alternative 4: High Rate Ballasted Clarification
Technical/ Operation	Ability to Remove the Desired Constituents as per Treatment Level Objectives	Yes – Particulate removal adequate; ensures that effluent phosphorus concentrations meet treatment objectives.	No – Difficulty continuously maintaining TP < 0.1mg/L.	Yes – Particulate removal is adequate; phosphorus objectives are achievable.	Yes – Phosphorus and solids significantly removed.	Yes – Particulate removal is adequate; phosphorus objectives are achievable.
	Achieves Effluent Design Objects set by MOECC	Yes	Yes	Yes	Yes	Yes
	Treatment Reliability and Ability to Handle Cold Weather Climate	Influence of cold weather can be accommodated by media.	System can treat cold water – slower chemical kinetics are considered in the design.	Cold climate capable	Chemical reaction rates, based on water temperature, are a function of the design.	Chemical reaction times for the system are considered during design.
	Ability to Treat Effluent Year Round	Yes	Yes	Yes	Yes	Yes
	Adequately Services Project Design Flow	Yes	Yes	Yes	Yes	Yes
	Ability to Process Varying Design Flows	Yes – Media can accommodate variation in flow.	Yes – Filter designed for peak flow conditions and reduced flows do not inhibit removal.	Yes – System is designed based on peak flows.	Yes – System is designed for peak flows. Reduced flows do not impair the ability to meet effluent criteria.	Yes – Flow rate capacity is based on number of units in operation.
	Utilizes of Existing Assets	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.	Yes – System will polish effluent from existing lagoon system.
	Complexity of Operation of Treatment Technology	Relatively simple operation and less water required for backwash in comparison to sand filters. Proven technology for plants of a similar size.	Relatively simple operation. However, potential operational problems such as turbidity breakthroughs, mudball formation, development of cracks and contraction of the filter bed. There is also the possibility of loss of medium and media.	No shutdown required during backwashing operations – continuous filtration. Relatively simple operation. The stream of continuous backwash water needs to be recycled and treated, and the system requires air.	No shutdown required during backwashing operations – continuous filtration. Phosphorus is chemically bound and leaves with the sludge. Needs concrete structure to house the filters. Filter installation requires deep excavation or lift pumps.	Short start-up time. Requires several chemicals (coagulant, polymer and ballast material) which lead to increased operational costs. Relatively complex system to operate.
	Complexity of Maintenance of Treatment Technology	Relatively simple maintenance.	Relatively simple maintenance.	Relatively simple maintenance.	Relatively low consumption of chemicals (as backwash water is recycled upstream in the lagoon).	Requires close monitoring and maintenance is required for mixers, chemicals and microsand.
	Does it Fit within the Existing Property Limits	Yes – Compact system	Large footprint and must be housed in a building.	Relatively small footprint.	System extends vertically – small footprint. However, building must consider system height.	Relatively compact system.
	Overall Evaluation of Technical/Operation					
Natural Environment	Effect on Aquatic/Ecological Habitat - Construction and Operation	With respect to Total Phosphorus; there will in fact be a lower loading from the facility and potentially, slight improvements to Total Phosphorus water quality in the river.	Will be difficult to meet TP effluent criteria which may increase the TP loading within the Delisle River, which is a policy 2 receiver for TP.	With respect to Total Phosphorus; there will in fact be a lower loading from the facility and potentially, slight improvements to Total Phosphorus water quality in the river.	With respect to Total Phosphorus; there will in fact be a lower loading from the facility and potentially, slight improvements to Total Phosphorus water quality in the river.	With respect to Total Phosphorus; there will in fact be a lower loading from the facility and potentially, slight improvements to Total Phosphorus water quality in the river.

Impact	Consideration	Alternative 1: Surface filters	Alternative 2a: Loose Media Filter (Conventional Down-flow Sand Filters)	Alternative 2b: Loose Media Filter (Deep-bed up-flow continuous backwash filters)	Alternative 3: Phosphorus Adsorption Media System	Alternative 4: High Rate Ballasted Clarification
	Effect on Terrestrial Habitat- Construction and Operation	Minimal impact as system does not have a large footprint.	Potential for impact as this treatment has a relatively large footprint. Lands may have to be purchased and clearing/grubbing may take place.	Minimal impact as system does not have a large footprint.	Minimal impact as system does not have a large footprint.	Minimal impact as system does not have a large footprint.
	Effect on Vegetation - Construction and Operation	Minimal impact as system does not have a large footprint.	Potential for impact as this treatment has a relatively large footprint. Lands may have to be purchased and clearing/grubbing may take place.	Minimal impact as system does not have a large footprint.	Minimal impact as system does not have a large footprint.	Minimal impact as system does not have a large footprint.
	Effect on Surface Water Quality	Minimal impacts to surface water quality, and may improve water quality when compared to current TP loading.	Will be difficult to meet TP effluent criteria which may increase the TP loading within the Delisle River, which is a policy 2 receiver for TP.	Minimal impacts to surface water quality, and may improve water quality when compared to current TP loading.	Minimal impacts to surface water quality, and may improve water quality when compared to current TP loading.	Minimal impacts to surface water quality, and may improve water quality when compared to current TP loading.
	Effect on Groundwater Quality	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated	No Impact Anticipated
	Effect on Surrounding Agricultural Land	Minimal	Potential for impact as this treatment has a relatively large footprint. Agricultural lands may have to be purchased.	Minimal	Minimal	Minimal
	Overall Evaluation of Natural Environment					
Socio-Economic Environment	Ability to Meet Existing Community Wastewater Servicing Needs	Yes	Yes	Yes	Yes	Yes
	Ability to Meet Projected Community Growth Wastewater Servicing Needs	Yes	Yes	Yes	Yes	Yes
	Effects on Adjacent Landowners/Residence	Minimal – Potential Chemical odour associated with operation. Odour control mitigation measures to be implemented during detail design.	Potential for impact as this treatment has a relatively large footprint. Lands may have to be purchased.	Minimal – Potential Chemical odour associated with operation. Odour control mitigation measures to be implemented during detail design.	Minimal – Potential Chemical odour associated with operation. Odour control mitigation measures to be implemented during detail design.	Minimal – Potential Chemical odour associated with operation. Odour control mitigation measures to be implemented during detail design.
	Effects on Archaeological Recourses	None	None	None	None	None
	Effects on Cultural Heritage Landscapes and Building Heritage	None	None	None	None	None
	Capital Coast	Approx. $1.5 million	Approx. $1.7 million	Approx. $1.7 million	Approx. $1.1 million	Approx. $2.0 million
	Operational Costs	Comparable	Comparable	Comparable	Comparable	Comparable
	Overall Evaluation of Socio-Economic Environment					

Less Favourable Impact **More Favourable Impact**

8.4.4 *Summary of Preliminary Preferred Design Concepts*

A summary of the preliminary preferred design concept (s) are being recommended to be carried forward to the detail design are as follows:

Table 8-10: Summary of Technologies Carried Forward

Location/Objective	Treatment Process	Technology
Headworks	Screening	Manually Cleaned Bar Screens
		Automatically Cleaned Bar Screens
	Grit Removal	Gravity Settling System
Aeration Cell	Additional Air	Diffused Aeration (Supplement to Existing Mechanical)
Post-Lagoon Treatment	Ammonia Control	Submersible Attached Growth Reactor (SAGR®)
	Phosphorus/Solids Control	Cloth Filters
		Deep Bed Filters
		Sorption Media
		Ballasted Clarification
	Disinfection	UV

Please refer to the Process Flow Diagram (Figure 8-1) and Conceptual Site Plan (Figure 8-2) for the preliminary preferred design concept.

Figure 8-1: Process Flow Diagram

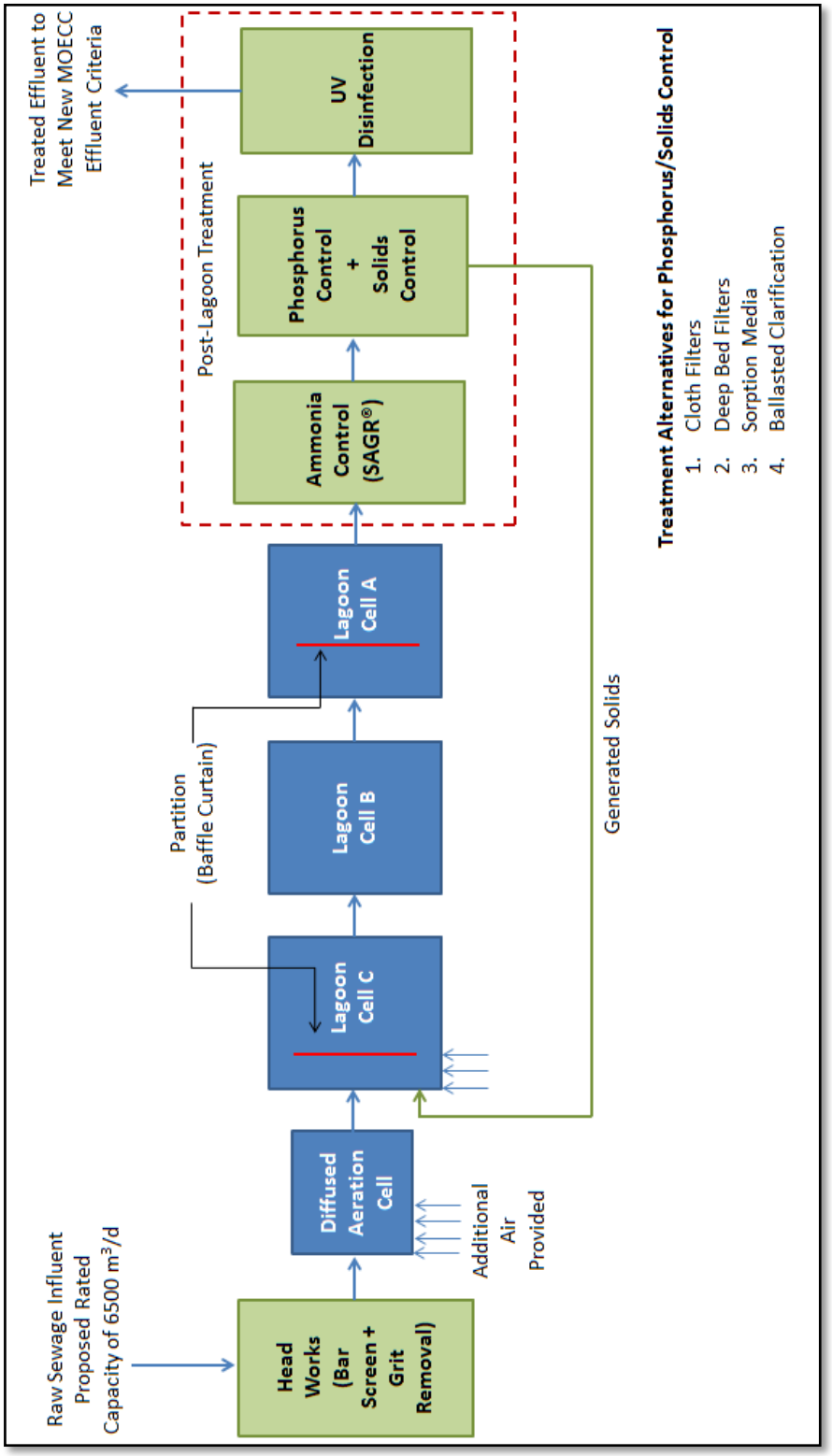


Figure 8-2: Preliminary Preferred Design Concept Site Layout

8.4.5 *Cost Evaluation*

8.4.5.1 Capital Cost

The total estimated capital cost, including contingencies and engineering, for the proposed upgrades to the Alexandria Sewage Lagoon is summarized in Table 8-11. The budget level total project costs range from $10.6 million to $12.4 million. For each of the options, capital costs are the same for the headworks, upgrades to the aeration cell and the SAGR process. There are differences in the tertiary building capital costs due to variations in building size requirements. In the tertiary treatment building, space was allocated for a laboratory/office, electrical room, chemical storage area and UV disinfection. For both the headworks and tertiary treatment building, masonry walls with a brick veneer were considered.

Table 8-11: Capital Cost Estimates

Process	Design Concept #1 SAGR® + Cloth Filter	Design Concept #2 SAGR® + Phosphorus Adsorption Media System	Design Concept #3 SAGR® + Deep Bed Sand Filter	Design Concept #4 SAGR® + High rate ballasted clarification processes
Headworks				
Building[1]	$619,000	$619,000	$619,000	$619,000
Process Equipment[2][2a]	$420,000	$420,000	$420,000	$420,000
Aeration cell upgrade with fine bubble diffusers [3]	$163,000	$163,000	$163,000	$163,000
Ammonia Control - SAGR [4]	$3,396,000	$3,396,000	$3,396,000	$3,396,000
Tertiary treatment				
Building[5]	$1,093,000	$1,199,000	$1,947,000	$1,606,000
Phosphorus Control[6]	$1,484,000	$1,131,000	$1,722,000	$1,995,000
UV Disinfection[6]	$289,000	$289,000	$289,000	$289,000
Site Works and Miscellaneous[7]	$629,000	$629,000	$629,000	$629,000
SUBTOTAL	**$8,093,000**	**$7,846,000**	**$9,185,000**	**$9,117,000**
Contingency (20%)	$1,619,000	$1,569,000	$1,837,000	$1,823,000
Engineering (15%)	$1,214,000	$1,177,000	$1,378,000	$1,368,000
TOTAL	**$10,926,000**	**$10,592,000**	**$12,400,000**	**$12,308,000**

Notes:

(1) Including gravel access, modify forcemain at site, electrical upgrades, building mechanical, rooms for: process, blowers, electrical

(2) Cost provided for mechanically cleaned bar screens and grit systems

(2a) Selecting manually cleaned bar screens (opposed to mechanical) will reduce the headworks process equipment cost, displayed in the table above, by $400,000

(3) Blowers, diffusers, air lines

(4) Process equipment and civil work for process

(5) Including electrical, building mechanical, rooms for: process, blowers, electrical, lab/office, washrooms with lockers

(6) Process equipment with installation

(7) Including general site works, emergency power supply, fire control systems

8.4.5.2 Operational Costs

Budgetary operating costs for the facility operating at its rated capacity are provided in Table 8-12. Cost estimates are provided for maintenance, labour, chemical and electricity. The total operating costs for the options range from $430,000 to $480,000.

Maintenance costs were based on providing service to all of the items at the facility including building mechanical and process components. Due to the similarity of the operations, identical costs were provided for each option. This was estimated to provide items such replacement parts equipment, disposable laboratory items, for the facility. The largest single item is the replacement of the UV bulbs which were estimated to be $9,000 per year.

Labour costs were based on anticipated man-hours required for an operator to be on-site. The four alternatives are similar with respect to operations and it is estimated for all of the alternatives that an operator will need to be on-site 40% of the time. That is, operators will be on-site approximately 16 hours per week. This will include duties such as routine sampling, maintenance and operator walk-about. Operator presence and costs are expected to be greater than current levels due to the increase mechanization required for ammonia and phosphorus control. Although ammonia control is achieved through a biological process, monitoring and maintenance of the system is required to ensure continued compliance.

Chemical costs are largely related to the control of phosphorus. The stricter effluent criteria from current levels and the increase in treatment flow both increase chemical use beyond their current levels.

Electrical costs include equipment operations, secondary pumping to lift the water to the tertiary treatment building, heating and ventilation and lighting. Since the headworks building will contain raw wastewater, special provisions are required. As part of this, adequate ventilation for the building is required to prevent the potential build-up of explosive gases. As a result, heating energy consumption will be elevated. The cost of electricity

includes both the actual use of the power and other charges such as delivery and regulatory charges. As a result, the effective electrical rate is higher than the charge for using the electricity. Based on historical electrical use, the effective rate of electrical is $0.21/kWh. For this work, to reflect a potential reduction in the effective rate at higher energy usage, an effective rate of $0.15 was used.

Table 8-12: Operating Cost Estimates ($/yr)

Cost Element	Design Concept #1 SAGR® + Cloth Filter	Design Concept #2 SAGR® + Phosphorus Adsorption Media System	Design Concept #3 SAGR® + Deep Bed Sand Filter	Design Concept #4 SAGR® + High rate ballasted clarification processes
Labour	$45,000	$45,000	$45,000	$45,000
Maintenance	$35,000	$35,000	$35,000	$35,000
Chemical	$140,000	$150,000	$140,000	$150,000
Electrical	$210,000	$210,000	$240,000	$250,000
TOTAL	**$430,000**	**$440,000**	**$460,000**	**$480,000**

9.0 TECHNICALLY PREFERRED DESIGN CONCEPT

Final recommendation of the preferred design concept is pending the final Technical Advisory Committee meeting and Public Information Centre to be held on December 20th, 2016.

10.0 PROPOSED MITIGATION MEASURES AND MONITORING

The expansion of the Alexandria Sewage Lagoon Treatment Facility is not expected to result in any significant adverse environmental effects provided the proposed mitigation measures are adhered to. Areas of environmental sensitivity or concern, the sources of those concerns and the mitigation measures associated with the preliminary preferred design concept are outlined in Table 10-1.

Table 100-1: Summary of Environmental Concerns and Potential Mitigation Measures

Impact	Issues/Concerns/Potential Effects	Potential Mitigation Measures
Natural Environment	**Terrestrial Habitat** Construction activities, including excavation, grading and installation of treatment equipment/buildings, have the potential to disturb wildlife and bird habitat such as nesting and foraging habitat.	Vegetation clearing during the breeding bird nesting window (timing window to be confirmed with MNRF), shall not occur. Should vegetation clearing be required during the timing restriction, a qualified bird specialist should complete an assessment of the site to identify active bird nests, if any. Removal of nests must be completed prior to May 1st of any given year. Active nests may not be disturbed. Preventative bird nesting measures may be implemented during the detail design based on construction timing windows. Employee sediment and erosion control measures.
	Vegetation Construction activities may result in temporary disturbance of vegetation.	Vegetation removal should be kept to a minimum and only be disturbed where required for necessary construction activities. During the detail design, woodland areas will be avoided by selecting suitable areas for the placement of treatment equipment and buildings. If any tree or shrub removal is required, ensure that the work is not done during prohibited timing windows (April 15 to July 15th) Any exposed soils remaining post construction, should be re-vegetated as soon as possible to reduce erosion.
	Fish and Fish Habitat Outlet modified or replaced has the potential to impact fish and fish habitat present within the study area.	No in-water works should occur from April 1st to July 15th of any year. Minimize duration of in-water work. When possible, schedule work to avoid wet and rainy periods that may increase the risk of erosion and sedimentation. All in-water work shall be conducted in the dry to avoid introducing suspended sediment into the watercourse. Fish rescue should be carried out as prior to any work within the watercourse. Disturbance of riparian vegetation should be minimized. Equipment shall arrive on site in clean condition free of fluid leaks. Equipment shall not enter the watercourse. Equipment shall be

Impact	Issues/Concerns/Potential Effects	Potential Mitigation Measures
		operated on dry land in a way that minimizes the disturbance of waterbody banks and riparian vegetation.
	Species at Risk Species at risk may be encountered during construction. SAR have been identified in the study area (SAR turtles, Birds, Vegetation and Fish).	SAR Awareness Training should be provided for the Contractor and all staff working on site. All employees involved in construction activities should be trained in the identification and life habits of the SAR that may be encountered during road improvements. The training should focus on identification of SAR. The locations where specific SAR may be encountered will be detailed in the detail design package to ensure the contractor is informed of sensitive work areas. Daily site inspections prior to commencing work activities to ensure no SAR turtles and/or birds have entered the construction area between May 1 and October 15 of any year. Should a turtle be encountered, construction activities that disturb or could harm the turtle must stop within 10 m of a turtle. If the turtle appears to be moving through the area, the turtle should be allowed to move out of harm's-way on their own accord. In situations where a turtle is at imminent risk of injury or death, the contractor should safely move the turtle out of harm's way following the procedure listed in "Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders". If turtle eggs are encountered or unearthed during the project works all operations must immediately stop within 30 m of the turtle eggs and MNRF – Sudbury District be contacted, for advice on how to proceed (705-755-2001). Temporary turtle exclusion barrier OR geotextile should be installed by May 15 prior to the turtle nesting season (May 21 to July 7 inclusive) at specified locations and around stockpiled materials (i.e. sand, gravel, topsoil, etc.). This will reduce the likelihood of construction work harming or killing turtle eggs, by preventing turtles from accessing and nesting within the work zone. Temporary turtle exclusion measures should be maintained until July 15 (i.e. the end of the turtle nesting period). Ensure all approval and permitting are in place prior to commencing construction and operation.
	Surface Water/Groundwater and Debris Accumulation	Mobile equipment refuelling should take place no closer than 30 m from any waterbody, watercourse or wetland in order to prevent water contamination due to accidental fuel spills. For non-mobile

Impact	Issues/Concerns/Potential Effects	Potential Mitigation Measures
	Exposed soils and/or stockpiles of excess material may potentially result in sediment and waste transport to down gradient to watercourses. Construction activities, such as refueling, may increase the potential for accidental fuel or lubricant spillage and subsequent contamination to surface and or groundwater. Construction activities may also result in litter and debris accumulation within the study area.	equipment, refuelling should be carried out in a controlled manner so as to prevent fuel spillage, and drip pans should be located under the equipment at all times. Equipment operating near any waterbody, watercourse or wetland should be in good working condition, properly maintained and free of excess oil/grease to reduce the risk of contaminant leakage. In the event that a spill occurs, proper containment, clean up, and reporting, in accordance with provincial requirements, should be completed. In the event that a spill occurs, proper containment, clean up, and reporting, in accordance with provincial requirements, should be completed. The Contractor should take all necessary precautions to prevent the accumulation of litter and construction debris within any waterbody, watercourse or wetland. All waterbodies, watercourses and wetlands be off limits to any construction equipment, outside of that of the detailed design drawings. Excess materials shall not be stored within 30 m of watercourses. Monitoring will continue on site according to the requirements of the approved amended ECA by MOECC. Regular reporting will take place according to intervals set by MOECC.
Socio-Economic Environment	**Communities and Residences** Although the project works will be confined to the existing site, there are rural residential homes located and agricultural lands immediately adjacent to the study area. Noise and odour concerns during construction and operation. Improper maintenance of construction equipment and	Operation of a large waste disposal system has the ability to generate unfavourable noise and odour for adjacent residence, famers and businesses. Therefore, the detailed design shall incorporate noise attenuation measures and odour mitigation measures within the design. Regular schedule maintenance should be completed on the wastewater treatment facility. During construction, contractor to adhere to the Township of North Glengarry noise by-law. Restrictions will be confirmed during the detail design.

Impact	Issues/Concerns/Potential Effects	Potential Mitigation Measures
	wastewater operation can cause excessive noise that may disturb neighbouring residents	Construction equipment should be in good working condition, with effective muffling devices to reduce noise.
	Cultural Heritage – Archaeology/Built Heritage Study has been cleared of Archaeological and Cultural Heritage. However, should buried archaeological and/or cultural heritage material be discovered during construction	If the proposed design expands beyond the current Archaeological Assessment boundaries, the Stage 1 & 2 Archaeological Assessment should be updated. If during construction buried archaeological materials are encountered, the Contractor shall immediately stop all construction activities in the area, and contact the office of the Heritage Operations Unit, Ministry of Culture (416-314-7159). If unmarked human remains are uncovered, the provisions of the Ontario Cemeteries Act apply. The Contractor shall immediately stop all construction activities in the area and contact the office of the Heritage Operations Unit, Ministry of Tourism, Culture and Sport (416-314-7159), the Registrar of Cemeteries (416-326-8394), the local OPP, the local Coroner and the MTO.
Construction/ Operation	**Erosion and Sediment Control** Disturbance of soils during construction activities may cause increased suspension of sediments in ditches leading to watercourses, which may have negative effects on terrestrial and fish habitat.	In order to mitigate the transport of sediment along ditch-lines as well as from exposed soils adjacent to watercourses, environmental protection measures (such as straw bale/sediment log flow checks, rock flow check dams, silt fence barriers, and erosion control blankets) should be installed prior to the start of, and maintained throughout, construction. Exposed slopes should be protected to limit the time that such areas are exposed prior to final application of topsoil and seed.
	Management of Excess Materials Stockpiled construction materials such as aggregate, concrete, and earth may potentially contaminate the study area without proper containment and environmental protection measures.	No stock piles shall be located closer than 30 m from any waterbody, watercourse or wetland. Waste generated on-site which requires off-site removal will be in accordance with Ontario Regulation 347 under the Environmental Protection Act, which provides for the transportation and processing of hazardous and non-hazardous waste.
	Emergency Spill Response In the event that a spill occurs, proper containment, clean up and reporting, in accordance	Any spill shall be immediately reported to the Ontario Ministry of Environment and Climate Change Spills Action Centre (1-800-288-6060).

Impact	Issues/Concerns/Potential Effects	Potential Mitigation Measures
	with provincial requirements, will be completed.	The Contractor shall have a spill kit available on site at all times. All spills that may have an adverse effect are reported. Develop a spill response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance.
	Air Quality Generation of dust may be created during construction by machinery working within the study limits.	Odour and fume impacts are to be minimized by ensuring that all equipment is properly maintained and that all pollution control devices on the equipment are operational and properly maintained.

11.0 CONSULTATION PLAN

McIntosh Perry has prepared this 'Consultation Plan' for implementation throughout the process. Consultation early and throughout the process is a key feature of the Municipal Class Environmental Assessment process. The purpose of the Consultation Plan is to describe the timing and means of communicating with the public, governing agencies, and other stakeholders throughout the Class EA process.

Consultation will occur throughout the planning of the project and will be carried out in accordance with engineering and environmental protection principles. The objectives of public consultation are:

- to provide sufficient information to the public and Governing Agencies to promote effective participation and to ensure that all stakeholders are informed of the project and have the opportunity to provide input;
- to promote public participation in the decision making process;

There is a minimum of three (3) mandatory points of contact during a Schedule 'C' Class EA process. McIntosh Perry will provide the Township with the appropriate level of consultation to satisfy the Schedule 'C' Class EA public consultation requirements, including:

- Notice of Study Commencement;
- Notice of Public Information Centre; and
- Notice of Completion of Environmental Study Report (ESR).

McIntosh Perry has prepared this Consultation Plan to ensure that a thorough, coordinated and transparent consultation process is in place and properly documented for the duration of the project.

11.1 Notice of Study Commencement

The first mandatory point of contact, the Notice of Study Commencement will be distributed to inform Stakeholders of this project. Included in the notice will be a description of the project and the processes to be completed. Lisa Marshall (McIntosh Perry) and Ryan Morton (Township Project Manager) will be listed as the primary contact personnel.

Stakeholders were given an opportunity to provide comments and review the background information, sewage lagoon expansion alternatives solutions, evaluation process, and the preliminary section of technically preferred alternative solution.

The Notice of Commencement was published by the Township of North Glengarry in the Glengarry News on January 20th and 27th, 2016. Correspondence received during the Notice of Commencement is summarized in Section 11.4, Table 11-1. A copy of the Notice of Study Commencement can be viewed in Appendix N.

11.2 Notice of Public Information Centre

11.2.1 *Public Information Centre #1*

The public and governing agencies were given an opportunity to provide input and review the background information, sewage lagoon expansion alternatives solutions, assist with the selection of preferred alternative solution during the Public Information Centre #1.

A Notice of Public Information Center was published by the Township of North Glengarry in the Glengarry News on November 17th and 24th, 2016. The advertisement was placed in the newspaper approximately 2 weeks in advance of the actual date of the PIC #1, November 28th, 2016. The PIC allowed residence and governing agencies to view displays boards highlighting the Municipal Class EA process and the alternative solutions selected during the process, as well as ask any questions. A comment sheet and an information package will also be handed out.

Comments received during the Notice of Public Information Centre are summarized in Section 11.4, Table 11-1.

11.2.2 *Public Information Centre #2*

The public and governing agencies will be given an opportunity to provide input and review the background information, review sewage lagoon expansion alternative design concepts, and assist with the selection of preferred alternative design concept.

A second Notice of Public Information Center will be published by the Township of North Glengarry in the Glengarry News on December 7th, 2016 and 14th, 2016. The advertisement was placed in the newspaper approximately 2 weeks in advance of the actual date of the PIC #2, December 20th, 2016. The PIC allowed residence and governing agencies to view displays boards highlighting the Municipal Class EA process and the alternative design concepts during the process, as well as ask any questions. A comment sheet and an information package will also be handed out.

11.3 Notice of Completion

The third mandatory point of contact is the Notice of Completion of 'Environmental Study Report' (ESR), which will advise the public, particularly those who have expressed an interest and desire to stay involved, where the ESR may be seen and reviewed and the manner in which public comment is to be received. This Notice will advise the public and review agencies of their rights with regard to requesting a Part II Order and will clearly state the review period and the date by which submission and/or requests are to be received by the Minister of the Environment and Climate Change. If no request for an Order is received by the Minister of the Environment within the 30 day review period then the process is complete. A copy of the Notice of Study Completion can be viewed in Appendix N.

Work in pending

11.4 Consultation Response

A summary of consultation responses are provided in Table 8.1 and will be updated as the assignment progresses.

Consultation responses, including emails received by the project team, can be found in Appendix O.

Table 11-1: Stakeholder Responses

Contact Type	Comment / Concern Raised
Ministry of Tourism, Culture and Sport	The Ministry of Tourism, Culture and Sport provided Environmental Assessment (EA) requirements with respect to archaeological resources, built heritage resources, and cultural heritage landscapes. **Response/Action:** No response or action is required by McIntosh Perry.
Ministry of the Environment and Climate Change (MOECC) – EA Coordinator	The MOECC Kingston Regional Office has requested that they receive two copies of information packages, supporting technical reports, any intermediate reports, and the Environmental Study Report. The MOECC Kingston Regional Office will ensure that the information is circulated to the appropriate reviewers in the Regional and District offices. MOECC has also requested that intermediate reports, such as the Phase 1 and 2 Report or Technical Memoranda, be prepared and circulated for comment prior to the Environmental Study Report (ESR). **Response/Action:** McIntosh Perry will ensure that the MOECC Kingston District Office receives all information and documentation described above. The MOECC provided a technical review outlining

Contact Type	Comment / Concern Raised
	the following recommendations: • "Impacts to surface water due to increased volumes or concentrations of sewage effluent should be evaluated as soon in the Municipal Class EA process as possible. A site-specific receiving water assessment must be conducted to determine the effluent requirements based on the waste assimilative capacity of the receiver…" • "The Class EA study should consider the need for an adequate buffer area between the sewage facility and residence, and should identify the separation distances between the facility and nearest residences…" **Response/Action:** McIntosh Perry has/will address the above noted recommendations for impacts to surface water and buffer area. MOECC has highlighted the requirement and outlined the process for consulting with First Nation and Metis Communities. **Response/Action:** No further response or action is required by McIntosh Perry.
Canadian Environmental Assessment Agency	Letter identified that this project is not subject to a federal environmental assessment and therefore please remove them from the mailing list. **Response/Action:** No further response or action is required by McIntosh Perry.
Ministry of the Environment and Climate Change (MOECC) – EA Coordinator	Provide direction and guidance through the Municipal Class EA process. Requested that a Public Information Centre be held for Phase 2 prior

Contact Type	Comment / Concern Raised
	to proceeding to Phase 3. **Response/Action:** The Township and McIntosh Perry obliged with the request and hosted a PIC on November 28th, 2016 to finalize Phase 2 of the Class EA process.
Transport Canada	Please note Transport Canada does not require receipt of all individual or Class EA related notifications. **Response/Action:** No further response or action is required by McIntosh Perry.
The Counties of Stormont – Dundas – Glengarry	Request to update contact information. **Response/Action:** McIntosh Perry updated contact information accordingly.
	Laura Melvin is away from the office on a leave and I am backfilling her position until April 2017. I have received the letter regarding the invitation for public comment and PIC #1 related to the above-noted project and dated November 14, 2016. The MNRF would like to participate in this project and comments will follow. **Response/Action:** Waiting for comments.
Local Resident	Request to update contact information. **Response/Action:** McIntosh Perry updated contact list accordingly
Local Resident - PIC	Informed the Township that for the first time this summer 2016 an odour was detected from the lagoon.

11.5 Technical Advisory Committee Meeting

11.5.1 *Technical Advisory Committee Meeting #1*

On February 9th, 2016, McIntosh Perry along with the Ryan Morton, Project Manager for the Township, hosted a Technical Advisory Committee meeting. The meeting provided agencies with an opportunity to gain a greater understanding of the study, as well as <provide input and advice into the advancement of study to ensure agency buy in and approval.

Agencies in attendance at the meeting were MOECC and Raisin Region Conservation Authority. The general consensus of the agencies was that they agreed with the identified alternatives. However, MOECC indicated that effluent quality limits will need to be reviewed more in depth during Phase 3 once a conceptual design has been generated for the Technically Preferred Alternative. At that time, MOECC will review the conceptual design and establish the proposed effluent quality limits for the expansion of the Alexandria Sewage Lagoon Treatment Facility.

11.5.2 *Technical Advisory Committee Meeting #2*

McIntosh Perry along with the Ryan Morton, Project Manager for the Township, will be hosting a second Technical Advisory Committee meeting on December 8th, 2016 with MOECC. The meeting will provide MOECC with an opportunity to gain a greater understanding of the study, as well as to discuss the proposed preliminary preferred design concept for expanding Alexandria Sewage Lagoon Facility and establish the proposed effluent quality limits for the expansion of the Alexandria Sewage Lagoon Treatment Facility.

During the TAC meeting, MOECC agreed with the preliminary preferred design concept and supported the proposed effluent limits for the expansion of the Alexandria Sewage Lagoon Treatment Facility. MOECC indicated that they would provide a letter of support for the preliminary preferred design concept and effluents limits to be included in the detail design MOECC.

11.6 Council Update

On March 21st, 2016, McIntosh Perry along with the Ryan Morton, Project Manager for the Township, presented the background information and alternatives identified for the expansion of the Alexandria Sewage Lagoon Facility to Council. Council agreed with the alternatives identified for the expansion of the lagoons and agreed that utilizing the existing lagoons would be the preferred alternative, ***Alternative 3b***.

12.0 ESR CONCLUSION

Work in pending

13.0 REFERENCES

Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier (eds.). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario ministry of Natural Resources, and Ontario Nature, Toronto, xxii+706 pp.

City of Ottawa. 2012. Sewer Design Guidelines. Second Edition, October 2012, SDG002.

Ecological Stratification Working Group (1996) A National Ecological Framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research, and Environment Canada. State of the Environment Directorate; Ecozone Analysis Branch, Ottawa/Hull.

Endangered Species Act, 2007 (S.O. 2007, c. 6)

Fish and Wildlife Act, 1997 (S.O. 1997, c. 41)

Lee, HT, WD Bakowsky, J Riley, J Bowles, M Puddister, P Uhlig and S McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, South Central Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

Matthews, B.C., Richards, N.R., Wicklund, R.E. May 1957. Soil Survey of Glengarry County Report No. 24 of the Ontario Soil Survey. Canada Department of Agriculture, Ottawa, and the Ontario Agricultural College, Toronto.

Migratory Birds Convention Act, 1994. (S.C. 1994, c. 22)

Ontario Ministry of the Environment. 2008. Design Guidelines for Sewage Works.

Ontario Ministry of Natural Resources. March 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

Past Recovery Archaeological Services Inc. 2015. Stage 1 & 2 Archaeological Assessments for the Alexandra Lagoon System Class EA 20596 McCormick Road Part of Lots 32 and 33, Concession 2 Geographic Township of Lochiel now Township of North Glengarry United Counties of Stormont, Dundas and Glengarry.

Provincial Policy Statement. 2005. Toronto: Ministry of Municipal Affairs and Housing.

Seabert, E. Resource Management Tech, Ministry of Natural Resources and Forestry Kemptville District. Personal Communications June 22, 2015.

The Corporation of the Township of North Glengarry. May 2009. By-Law 23-2009. http://www.northglengarry.ca/uploads/35/Doc_634516121394710900.pdf

APPENDIX A

HUTCHINSON ENVIRONMENT SERVICES REPORT (2014)

APPENDIX B

MOECC AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

APPENDIX C

WASTEWATER TREATMENT OPERATIONAL DATA (2013-2015)

APPENDIX D
GAUGE STATION 02MC028 FLOWS
DELISLE RIVER

APPENDIX E

SEWAGE FLOW DESIGN CALCULATIONS

APPENDIX F

GEOTECHNICAL DESKTOP REVIEW

APPENDIX G

ENVIRONMENTAL IMPACT STUDY

APPENDIX H

STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENT

APPENDIX I

AERATED SUBMERSIBLE ATTACHED GROWTH REACTOR (SAGR)

APPENDIX J

SURFACE FILTERS

APPENDIX K

DEEP-BED UP-FLOW CONTINUOUS BACKWASH FILTERS

APPENDIX L

PHOSPHORUS ADSORPTION MEDIA SYSTEM

APPENDIX M

HIGH RATE BALLASTED CLARIFICATION

APPENDIX N

CONSULTATION NOTICES AND LETTERS

APPENDIX O

CONSULTATION CORRESPONDENCE