TOWNSHIP OF NORTH DUNDAS

WINCHESTER SEWAGE TREATMENT SYSTEM UPGRADES

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

PHASE 2 REPORT (PROJECT FILE – REV 1)

AUGUST 2019

Prepared for:

TOWNSHIP OF NORTH DUNDAS
636 St. Lawrence Street
PO Box 489
Winchester, ON K0C 2K0

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED
864 Lady Ellen Place
Ottawa, ON K1Z 5M2

JLR 27448

- TABLE OF CONTENTS -

- FIGURES -

- TABLES -

- APPENDICES -

1.0 INTRODUCTION

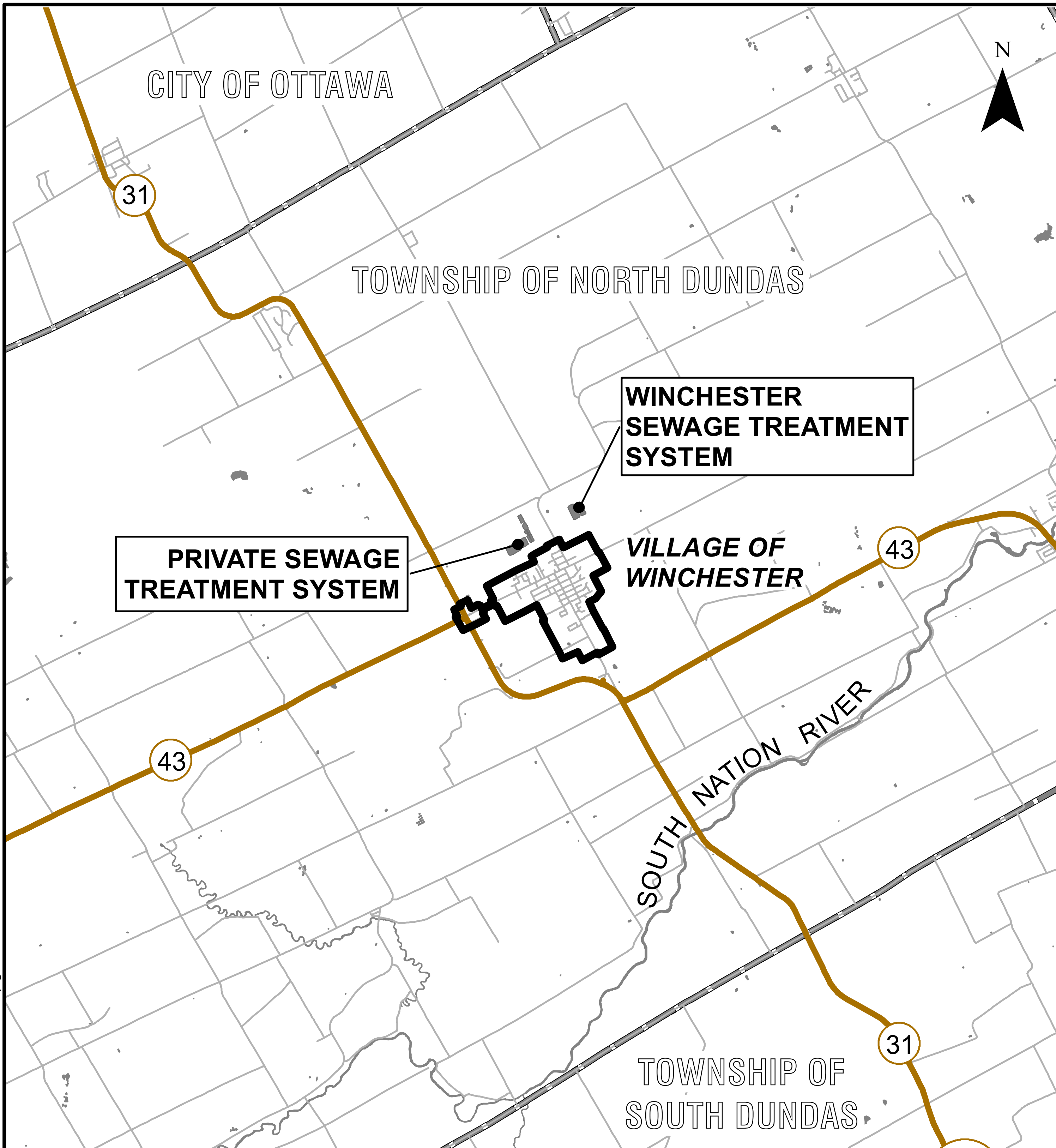
1.1 Background

The Township of North Dundas (Township) initiated a Class Environmental Assessment (Class EA) of their wastewater treatment system in March 2017 to address various operational challenges, such as hydraulic capacity, discharge constraints and treatment capabilities in order to ensure that increased influent flows from future growth can be effectively accommodated. In order to fully define the problems and identify a preferred solution to address these issues, J.L. Richards & Associates Limited (JLR) was retained by the Township to assist in the completion of the Class EA.

The Village of Winchester (Village) is located approximately 55 km southeast of the City of Ottawa in the Township of North Dundas. The Village is situated near the intersection of County Road 43 and County Road 31 (former provincial highways). The entire Village Official Plan urban settlement area covers a total area of approximately 316 hectares, with an estimated population of approximately 2,394 people (2016 Census). Residents of this urban area are serviced by a communal water supply (groundwater wells)/distribution system and a communal wastewater collection/treatment system. Refer to Figure 1-1 for an overview of the study area and location of the sewage treatment system (STS).

The wastewater treatment system consists of a seasonally discharged lagoon based system (the lagoon) including three primary facultative treatment cells operated in parallel (Cells 1, 2 and 3), one polishing cell (Cell No. 4), and one post-aeration cell (Cell No. 5). Aeration within Cell No. 5 is supplied by three centrifugal air blowers to control odours and strip hydrogen sulphide (H_2S) prior to discharge to the South Nation River. There is also an aluminum sulphate building located on-site which is equipped with an alum storage tank and two chemical metering pumps, piping and appurtenance; alum is dosed continuously to control total phosphorous. Seasonal discharge of effluent from the lagoons is permitted within specified times during the fall and spring of each year. Refer to Figure 1-2 for an overview of the Winchester STS.

A Phase 1 Report was completed in August 2017 to evaluate and identify problems with the existing system. Phase 2 of the Class EA involves identifying and evaluating possible alternative solutions to the problems identified in Phase 1. A Receiving Water Assessment was also completed during Phase 2 in order to identify constraints related to the receiving stream.



PROJECT:

WINCHESTER SEWAGE TREATMENT SYSTEM UPGRADES
CLASS ENVIRONMENTAL ASSESSMENT
WINCHESTER, ONTARIO

DRAWING:

LOCATION PLAN

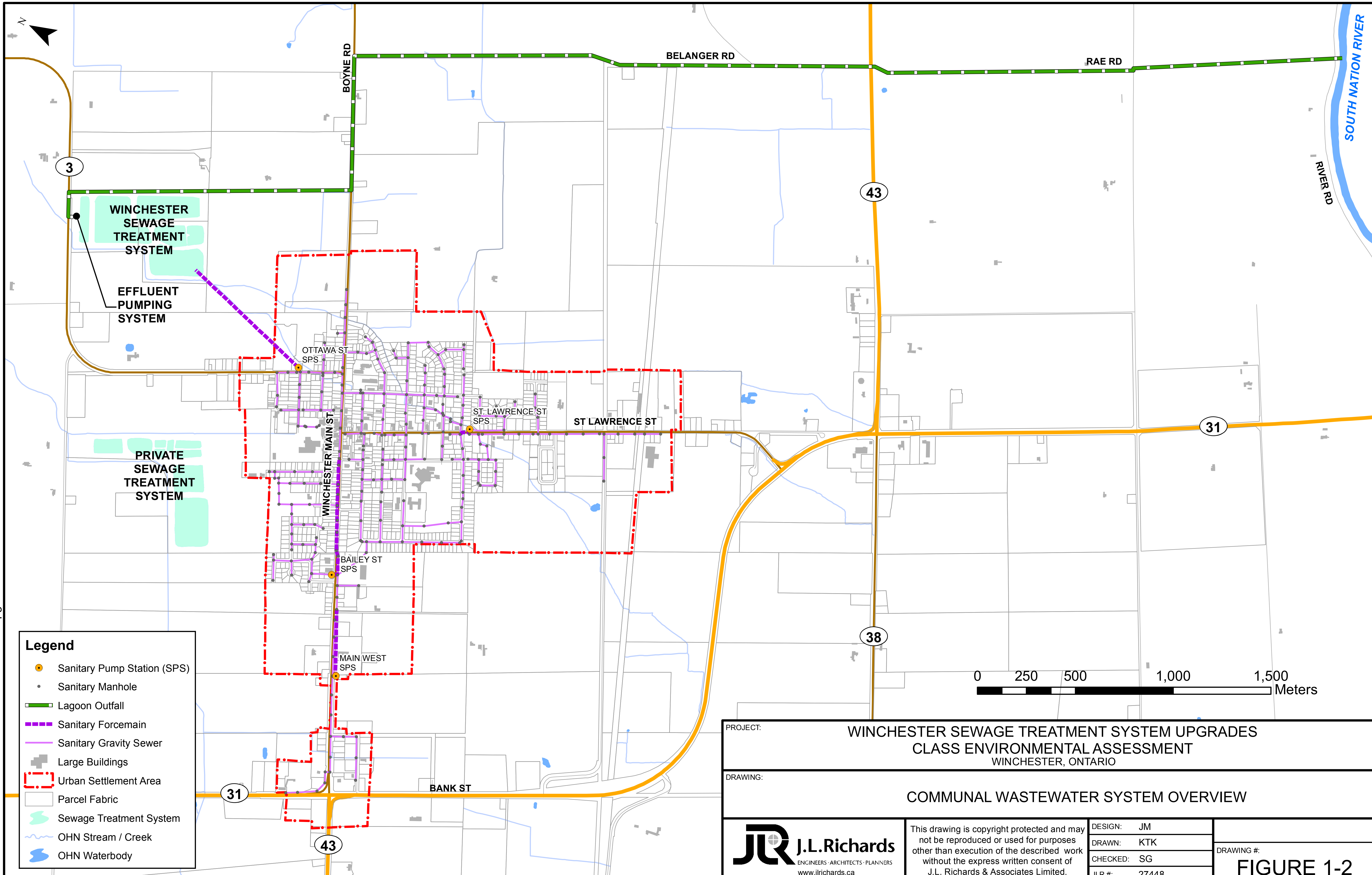
J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

DESIGN:	JM
DRAWN:	KTK
CHECKED:	SG
JLR #:	27448

DRAWING #: FIGURE 1-1

File Location: R:\27000\27448 - Winchester STS Upgrades Class EA\JLR DWG\Civil\27448 LOCATION PLAN.mxd

Plot Date: May 8, 2017 12:35:00 PM



PROJECT:

WINCHESTER SEWAGE TREATMENT SYSTEM UPGRADES
CLASS ENVIRONMENTAL ASSESSMENT
WINCHESTER, ONTARIO

DRAWING:

COMMUNAL WASTEWATER SYSTEM OVERVIEW

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

DESIGN:	JM
DRAWN:	KTK
CHECKED:	SG
JLR #:	27448

DRAWING #:
FIGURE 1-2

File Location: R:\27000\27448 - Winchester STS Upgrades Class EA\JLR DWG\Civil\27448 Outfall.mxd

Plot Date: May 8, 2017 2:21:57 PM

1.2 Class Environmental Assessment Process

The *Ontario Environmental Assessment Act* (Act) sets out a planning and decision-making process so that potential environmental effects are considered before a project begins. The purpose of the Act is to provide for the protection and conservation of the natural environment (R.S.O. 1990, c.E.18, s.2).

The Municipal Class EA process is followed for common types of projects to streamline the review process while ensuring that the project meets the requirements of the Act. It involves detailed site-specific information gathering and studies, as well as consultation with the public and stakeholder agencies. In 1987, the first Class EA document prepared by the Municipal Engineers Association (MEA) on behalf of Ontario Municipalities was approved under the Act. Updates and amendments were subsequently made in 1993, 2000, 2007, 2011 and 2015.

This Class EA was initiated as a Schedule C project under the Class EA process. The schedule designation of a Class EA project is to be reviewed during each subsequent Phase of the Class EA process. The originally anticipated Schedule C project designation was reviewed based on the flow projections and constraints identified in Phase 1, as well as the draft preferred solution identified through the identification and evaluation of various alternatives as presented in this report. Based on a review of the schedule designations provided within the Municipal Class EA document (Municipal Class EA, 2015), the project has been determined to be a Schedule B activity. It is noted that the preferred solution will not require expanding the wastewater treatment system beyond the rated capacity and does not result in an increase to the total mass loading to the receiving waterbody as permitted by the existing Certificate of Approval (C of A). Projects categorized as Schedule 'B' undertakings have the potential for significant environmental effects, and are required to follow Phase 1 and Phase 2 specified under the Municipal Class EA. This includes consultation with all parties that may potentially be affected by the project, and the preparation of a Class EA Project File that documents the Class EA process for the project.

The Class EA framework (refer to Figure 1-3) defines the process for each type of project. For Schedule B projects, the completion of the following Phases of the Class EA process are required:

Phase 1 – Identify the Problem and/or Opportunity

Phase 2 – Identify Alternative Solutions to the Problem and/or Opportunity

The Project File shall be made available for public and agency review at the completion of Phase 2 of the Class EA process for a mandatory 30-day period. If there are no requests to the Ministry of the Environment, Conservation and Parks (MECP) for a ‘Part II Order’ within this 30-day review period, then the project may proceed to implementation (Phase 5).

1.3 Objectives of the Class EA

The objective of this Class EA is to identify the preferred strategies for improvements to the wastewater treatment system, treated effluent pumping station and associated forcemain over a 20-year planning period. The rest of the collection system and upstream pumping stations is also to be generally considered within the context of the overall solution.

The purpose of this Report is to summarize the results of Phase 2 of the Class EA process, including providing a review of the various options that have been considered to address the Problem Statement determined during Phase 1 and to recommend a preferred alternative.

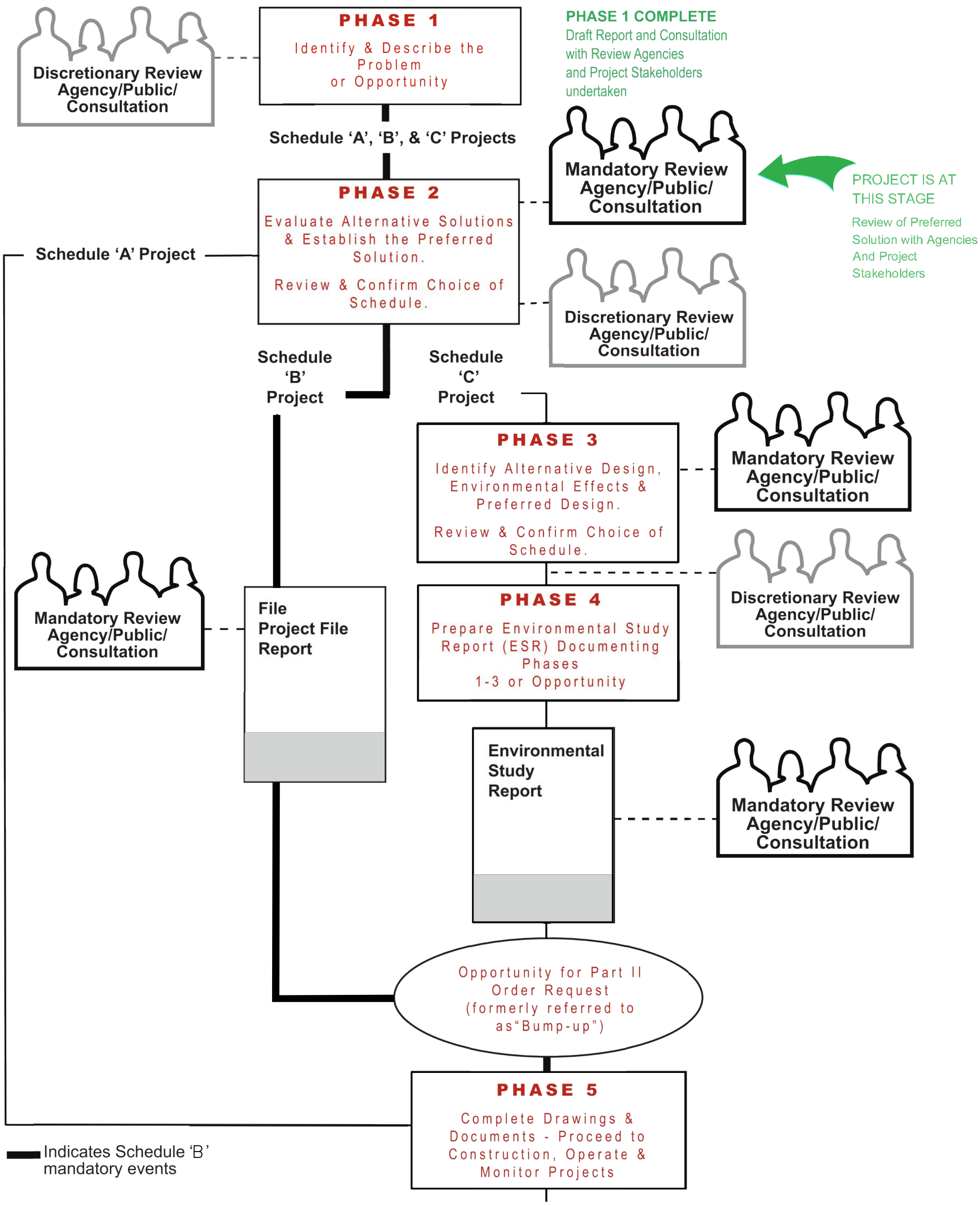
The Report objectives are to:

- Provide a brief summary of the problems and opportunities associated with the wastewater system identified in Phase 1. A detailed description of the sewage system and the problems associated with the system were presented in the Phase 1 Report (JLR, August 2017).

- Identify future wastewater system requirements to service the Village for the 20-year planning period. The Class EA process requires that the alternatives consider at least a 20-year planning period. The alternatives proposed should, therefore, be capable of accommodating projected sewage flows within this time period.

- Identify and evaluate possible alternative solutions to the problems in terms of economic consequences, overall feasibility, ability to address the problem, and the potential impacts on the surrounding environment.

- Provide a discussion of the alternatives and recommend a preferred alternative for consideration by the Township and other interested parties, including review agencies and the public.



PROJECT:

WINCHESTER SEWAGE TREATMENT SYSTEM UPGRADES
CLASS ENVIRONMENTAL ASSESSMENT
WINCHESTER, ONTARIO

DRAWING:

CLASS EA PROCESS

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

DESIGN:	JM
DRAWN:	RW/KTK
CHECKED:	SG
JLR #:	27448

DRAWING #: 27448

File Location: V:\27000\27448 - Winchester STS Upgrades Class EA\JLR DWG\Civil\27280 ClassEAProcess.dwg

PLOT DATE: July 3, 2018 12:48:43 PM

2.0 SUMMARY OF PHASE 1 FINDINGS

2.1 Key Findings

The following are some of the key Phase 1 findings:

- The largest problem is the ability to consistently and effectively discharge the contents of the lagoon (irrespective of incoming flows) during the allotted discharge windows which is affected by several issues the largest of which is treated effluent quality relative to C of A requirements and the requirement to have an ice free cover prior to discharge. Although the C of A permits discharging the lagoon in the spring from March 1 to April 30 and again in the fall from November 1 to December 31, the operator's ability to use the full discharge window is constrained by the requirement to achieve an ice free cover prior to discharge. Treated effluent quality constraints can also affect the operator's ability to use the full discharge window due to high levels of ammonia and/or H_2S typically occurring during early spring months. An assessment of the extended winter storage period illustrated how the shorter discharge windows currently experienced can affect the ability to store an appropriate amount of treated effluent.

- Although the C of A discharge average for total ammonia concentration has not been exceeded, there have been individual samples from the treated effluent which have exceeded the ammonia concentration compliance limits in recent years (2012-2016).

- Average total suspended solids effluent concentration will sometimes be close to or exceed the C of A objective concentration limit (30 mg/L). More stringent future regulations regarding the treated effluent discharge concentrations for total suspended solids (i.e., lowering of the suspended solids C of A compliance concentration limit to 30 mg/L) would make achieving compliance more difficult.

- The C of A requires that the effluent be discharged over a minimum of 21 days for both spring and fall. In order to meet the C of A required discharge window, the spring discharge must begin by April 10th at the latest. If there is ice cover remaining on the lagoon past this date, the discharge window will not be able to meet the minimum 21 day requirement or will not be able to complete the discharge by April 30. The requirement of a minimum 21 day discharge period can also make it challenging for operators to predict how much flow to discharge earlier during the spring or fall because an acceptable amount of treated effluent must be remaining at the end of the 21 day period.

- Based on the C of A river dilution ratios, there are times when low river flows prevent the discharge of treated effluent. Furthermore, the current effluent pumps are equipped with variable frequency drives (VFDs); however, the pumps can only be turned down to approximately 50 L/s which is sometimes too high to maintain the required river dilution ratio. The minimum flowrate is limited by the forcemain and minimum flows to maintain scouring velocities in the pipe.

- The operators have also indicated that blending of the cells prior to discharge can be difficult and may be partially due to the different inlet locations of the transfer pipes into Cell No. 4.

- The existing lagoon cells occupy most of the current site and immediately adjacent lands are not owned by the Township. It was noted that the minimum separation distance of 100 metres between the property/lot line of sensitive land uses and wastewater treatment plants of capacity between 500 m^3/day and 25,000 m^3/day was applied to the existing lagoon site. The lagoon is constructed almost to the property boundary and the 100 m buffer extends into neighbouring land. No other land use and natural environmental constraints were identified for the existing site. If areas for upgrading the works are identified outside of the existing property, additional studies may need to be conducted.

- The Winchester STS discharges to the South Nation River, which has been documented as a Policy 2 receiver with respect to phosphorous. Furthermore, the existing C of A requires the Township to apply dilution ratios during effluent discharge event which are based on water levels in the South Nation River.

2.2 Phase 1 Problem and Opportunity Statement

Based on the information developed and analyzed during Phase 1 of this Class EA, the following problem/opportunity statement was developed for the project:

"A review of the Winchester Sewage Treatment System (STS) suggests that there are operational constraints limiting the capacity of the lagoon as demonstrated by recent challenges in achieving effluent quality requirements as well as discharging effluent within the allotted discharge windows. As a result,

the Township of North Dundas is undertaking a Class Environmental Assessment (Class EA) to evaluate options to upgrade the Winchester STS that consider current and future loadings to the lagoon, address operational issues related to achieving effluent quality, and ensure that the 20-year community growth is adequately planned for and accommodated. The Class EA will consider the level of adequacy of wastewater treatment at the lagoon and will recommend a solution to address the findings in accordance with the Municipal Class EA, 2015 process."

3.0 PUBLIC AND AGENCY CONSULTATION

The Class EA process requires consultation with parties that may potentially be affected by the project. As part of Phase 2, the consultation plan developed in Phase 1 was followed in order to facilitate communication with the public and various agencies and other interested parties. Refer to Appendix 'A' for the updated Phase 2 Public Consultation Summary and supporting documentation.

Key components of Phase 2 stakeholder consultation include:

- Reviewing the Stakeholder Consultation Plan (developed in Phase 1)
- Project Team/Committee Meetings
- Responding to Public Stakeholder Comments
- Responding to Review Agency Comments
- Maintaining Project Mailing List and Contacts
- Public Information Centre

Key consultation correspondence from Phase 2 is included in Appendix 'A'. A brief summary of some of the key results of this consultation is presented below:

- The Ministry of Natural Resources and Forestry (MNRF) –The MNRF provided general information on the databases available. Natural heritage values were identified within the general study area, including municipal drains, South Nation River and a non-sensitive lake. The potential for Bobolink, Eastern Meadowlark, Barn Swallow, American Eel and Butternut (threatened or endangered species) was identified and it was noted that the area may be a suitable habitat for special concern species, including Common Nighthawk, River Redhorse, Snapping Turtle and Eastern Whip-poor-will. An ecological site assessment was recommended to identify the presence of any natural heritage features, any Species at Risk and/or their habitat. If Species at Risk are determined to be present onsite, permits/approvals would be required for any construction upgrades or site alterations. As such, an ecological site assessment is recommended to be completed during preliminary and/or detailed design of the proposed upgrades. Any necessary permits/approvals identified shall be obtained prior to on-site construction activities. Reports prepared as part of an ecological site assessment should be provided to MNRF.

- Nation Huronne-Wendat - No archaeological studies are being undertaken as part of this Class EA. However, if any archaeological work is undertaken as part of future work associated with the Winchester STS Upgrades project; Nation Huronne-Wendat is to be notified.

- Ministry of the Environment, Conservation and Parks (MECP) - The MECP provided initial feedback regarding the Class EA process at the onset of the project. Copies of the Phase 1 Report and Technical Memorandum No. 2 - Receiving Water Assessment were provided to the MECP for review August 31, 2017 and February 20, 2018, respectively. On February 4, 2019, the MECP submitted a memorandum in response to the Receiving Water Assessment, which reviewed the report prepared by JLR and recommended updates to the current Environmental Compliance Approval (ECA). Based on the feedback received and the pH limits presented by the MECP, the Township requested the opportunity to further review the proposed compliance limits for pH prior to the application for ECA. Refining the limits for pH could be considered depending on the expected effluent quality that can be achieved by a specialized treatment system. As such, additional consultation is required with the MECP prior to preliminary design of the proposed upgrades.

- A member of the public also requested to receive updates regarding the project and indicated that the drainage in the north end ditch may need to be investigated. Review of site and perimeter drainage should be undertaken as part of preliminary design. If it is determined that drainage improvements are needed, re-ditching or other works as needed should be considered for implementation as part of this project.

- A mandatory Public Information Centre (PIC) was held on January 16th in advance of finalizing this Phase 2 Report (Project File). Additional input from the public was considered in establishing the final preferred solution. Key feedback from the PIC included suggestions on the best options to proceed with the upgrades and expand the site in the future, and concerns over increased odours and the ability of adjacent property owners to expand their lands in the future. Correspondence associated with the PIC is included in Appendix ‘A’.

4.0 UPDATED SPECIALIZED STUDIES

4.1 Receiving Water Assessment and Effluent Quality Requirements

A Receiving Water Assessment was completed to determine the constraints associated with expanding the allowable release windows and discharging to the South Nation River over the winter months (refer to Appendix ‘D’ for the Technical Memorandum No. 2 – Receiving Water Assessment). The Receiving Water Assessment includes a review of historic treated effluent from the Winchester lagoon, receiving water quantity/quality for the South Nation River, an evaluation of ambient conditions in the receiving water, an analysis of a modified discharge scenario (i.e., extending the discharge period to a semi-continuous feed) and mixing conditions within the South Nation River during specific months. Based on this information, the effluent discharge criteria for an upgraded, expanded discharge scenario for the wastewater treatment system were established.

Two key reference documents for establishing receiving water quality criteria in Ontario are, “Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters” (MOE, July 1994a) and “Water Management - Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy” (MOE, July 1994b). The Provincial Water Quality Objectives (PWQOs) are guidelines for establishing acceptable water quality concentrations for various parameters. The above-noted policies classify receiving waters into two types:

Policy 1 - In areas that have better water quality than the PWQOs, water quality shall be maintained at or above the Objective (evaluated on a parameter by parameter basis).

Policy 2 - Water quality that presently does not meet the PWQOs shall not be further degraded and all practical measures shall be undertaken to upgrade the water quality to the Objectives.

This Receiving Water Assessment assesses historical water quality data to determine whether the receiving waters can be classified as a Policy 1 or Policy 2 receiver for the parameters considered. Table 4.1 provides a summary of the receiving water classifications for key parameters and Table 4.2 presents the current effluent compliance limits for the Winchester STS.

Table 4.1: Receiving Water Classifications for Key Parameters

Parameter	South Nation River[2]
Total Phosphorous (TP)	Policy 2: no additional assimilative capacity available.
Temperature[1]	The temperature difference between the effluent discharge and the 75th percentile temperature of the South Nation River does not exceed 10°C.
pH	The 75th percentile for pH within the South Nation River is between 7.8 and 8.4 which meets the PWQO of 6.5 – 8.5.
Un-Ionized Ammonia	Policy 1: Assimilative capacity available.
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	No PWQO (no increase to the effluent $CBOD_5$ proposed).
Dissolved Oxygen (DO)	The 25th percentile dissolved oxygen concentration is below the PWQO for warm water biota in July, August and September. No information is available for DO for the months of December to February at PWQMN Station ID#1807015002.
Total Suspended Solids (TSS)	No PWQO (No increase to the effluent TSS proposed).
Hydrogen Sulphide (H_2S)	No available information regarding H_2S at PWQMN Station ID#1807015002.

1. Based on effluent discharge sample from Annual Reports (2012-2016).
2. Based on information from PWQMN Station ID#1807015002

Table 4.2: Existing Effluent Compliance Limits (C of A No. 5312-88TK5R)

Effluent Parameter	Seasonal Average Concentration (mg/L)	Total Annual Loading (kg/year)
$CBOD_5$	30.0	24,309
TSS	40.0	32,412
TP	1.0	810.3
Total Ammonia Nitrogen (TAN)	7.0 (Fall Discharge) 15.0 (Spring Discharge)	- -
Undissociated Hydrogen Sulphide (H_2S)	0.02 (Spring Discharge)	-
Dissolved Oxygen (DO)	>10 mg/L	
pH of the effluent to be maintained between 6.0 to 9.5 at all times.		

Although there is no PWQO for $CBOD_5$ or TSS, no change is proposed to the effluent discharge compliance limits or loading for these parameters. In addition, since the South Nation River is considered a Policy 2 receiver with respect to TP, no change to the effluent compliance limit has been proposed for this parameter. Table 4.3 presents the proposed effluent limits for the Winchester STS, based on the analysis presented in the Receiving Water Assessment.

Table 4.3: Proposed Effluent Limits

Effluent Parameter	Design Objective (mg/L)	Effluent Limit (mg/L)	Total Annual Loading (kg/year)
CBOD5	15.0	25.0	20,257
TSS	15.0	25.0	20,257
TP	0.8	1.0	810.3
TAN			
- January 1 to March 31	8.8	11.0	Note 4
- April 1 to April 30	5.1	6.4	Note 4
- November 1 to November 30	4.0	6.0	Note 4
- December 1 to December 31	4.0	6.1	Note 4
Undissociated H_2S	Non detect	0.02	
pH	6.5 – 7.8	6.0 – 7.8	

Notes:

1. It is proposed that the requirement for an “ice free cover” be revised to allow discharge when the water surface in Cell No. 5 is partially free of ice cover.
2. It is proposed that the requirement for a minimum discharge period of 21 days be removed.
3. TAN monthly average concentration is to be provided as mg/L as N-NH3 + NH4.
4. Seasonal loading for TAN will need to be prorated over the discharge months due to differing effluent limits; there is no loading limits in the current C of A.

Other considerations that were presented within Technical Memorandum No. 2 – Receiving Water Assessment included the following:

- Based on an assessment of extended storage conditions, using potential release rates during low flows determined from the receiving water analysis, it was determined that in order for the lagoon effluent to be discharged adequately during low flow for the 20-year design period, the Winchester STS would need to be able to discharge effluent every day throughout each month (i.e., March, April, November and December) during which effluent discharge is permitted by the C of A.

- Start-up of a specialized treatment technology in support of growth of the nitrifying bacteria during warmer fall months will help promote a healthy biomass that can be sustained during the winter months (continuing to nitrify the wastewater) and that will be readily available to nitrify the wastewater during the spring. Without continuous discharge or recirculation, start-up of the specialized treatment technology may be difficult early in the spring as the cold wastewater temperatures (e.g. ice cover until early-April) may impede initial growth of the biomass. With continuous discharge, a healthy biomass would be available in the spring, and therefore, initializing the growth of biomass would not be required.

- The effluent dilution ratio (river flowrate to effluent discharge rate) can be more appropriately controlled with continuous discharge as the instantaneous flowrate of treated effluent to the South Nation River can be reduced overall. With a longer discharge period and same total volume to be discharged, the average daily effluent flowrate to the receiving water can be reduced. Due to existing operational issues (ice cover and ammonia levels); the current discharge period has averaged approximately 27 days in the spring and 23 days in the fall from 2012 to 2016. With a longer discharge window, the volume of treated effluent can be more appropriately controlled.

- The months of January and February can be considered more favourable for discharge of treated effluent from a treatment system as there are fewer uses for the river (e.g. recreational) during this time period resulting in less potential impacts.

- Reduced flowrates over a longer discharge period would provide opportunities to optimize the specialized treatment technology and reduce environmental and financial impacts by reducing the overall footprint required and increasing potential energy conservation through reduced equipment sizing.

- The requirement to maintain discharge over a minimum of 21 days is proposed to be removed from the ECA requirements as the maximum effluent discharge to the river is limited by the dilution ratio. The requirement of a minimum 21 day discharge period can make it challenging for operators to predict/gauge appropriate effluent discharge rates.

The receiving water assessment was circulated to the MECP on February 20, 2018. A letter was provided to the MECP to outline the similarities between the Winchester STS Class EA and the recently completed Casselman Wastewater Treatment System (WWTS) Class EA. Similar to the Winchester STS, the Casselman WWTS consists of seasonal discharge lagoons that outlet to the South Nation River, extending discharge windows during winter months and removal of ice cover constraints were also part of the Casselman WWTS Class EA (refer to correspondence in Appendix A). The MECP submitted a memorandum in response to Technical Memorandum No. 2 (refer to correspondences in Appendix A). The Township requested the opportunity to further review the proposed compliance limits for pH prior to the application for ECA. Refining the limits for pH could be considered depending on the expected effluent quality that can be achieved by a specialized treatment system. As such, additional consultation is required with the MECP prior to preliminary design of the proposed upgrades.

5.0 IDENTIFICATION OF WASTEWATER TREATMENT ALTERNATIVES

5.1 Evaluation and Selection Methodology

The main objective of Phase 2 of a Class EA is to identify and evaluate possible alternative solutions to the problem(s) (and/or opportunities) identified in Phase 1. All reasonable potential solutions to the problem(s), including the 'Do Nothing' option, are considered. Class EAs for wastewater projects generally result in the identification and review of a broad range of solutions. It is also important to note that the objective of Phase 2 is to focus on determining an overall "generalized solution" to the problem and not necessarily all of the intricate details which are typically further explored and developed during Phase 5 of a Schedule B Class EA referred to as Implementation (i.e., preliminary and detailed design stage).

In order to facilitate the evaluation and selection of the preferred solutions during Phase 2, a transparent and logical three part assessment process was established. This process included:

- Initial screening of alternatives;
- Detailed evaluation of screened alternatives; and
- Selection of a preferred alternative.

The first evaluation stage considers the overall feasibility of the potential solutions and identifies those alternatives that fully address the problem statement. This step ensures that unrealistic alternatives are not carried forward to a more detailed evaluation stage.

Based on the initial screening, a detailed assessment of the short list of alternatives is conducted. Evaluation criteria were developed based on a review of the background information, experience on similar assessments and in consultation with Township and OCWA staff. The evaluation was conducted using criterion in the following four major criteria categories:

- Natural Environment and Archaeology
- Engineering and Technical Considerations
- Social and Community Well Being
- Financial Impacts

Once the detailed evaluation was completed, a recommended preferred alternative or alternative(s) was identified for presentation to stakeholders and to solicit input prior to finalizing a preferred alternative.

5.2 Initial Screening of Alternatives

Several alternatives are presented in Table 5.1 along with a summary of the review carried out to support a recommendation to either carry the alternative forward for further evaluation or not.

Table 5.1: Description and Preliminary Evaluation of Wastewater Treatment Alternatives

Alternative	Review/Recommendation
Option 1: Do Nothing	
1) Do nothing	**Review:** This option would have a negative effect on the environment as it does not mitigate the operational challenges related to Winchester STS's allowable release windows and effluent quality issues. This option does not address the problem; however, it will be carried forward as a baseline option for comparison. **Recommendation: Carry Forward, as a Baseline only.**
Option 2: Optimize/Modify Current Lagoon	
2A) Increasing the dimensions of the primary facultative cells	**Review:** The existing lagoon cells already occupy most of the current site; therefore, expanding the surface area is not possible without obtaining additional property. The current effective depths of the primary lagoon cells range between 2.5 m and 3.0 m, which is greater than the maximum recommended sewage depth in facultative lagoons of 1.8 m per the MECP Design Guidelines (MECP, 2008); storage related issues are due to discharge constraints rather than the effective storage volume available. Increasing the depth or surface area of primary facultative cells will not address the issues associated with discharge constraints or sufficiently address the effluent quality issues, and therefore, this option is not recommended to be carried forward. **Recommendation: Do not carry forward.**
2B) Modify the primary facultative lagoon cells to aerated cells	**Review:** In order to modify the primary cells to include aeration equipment (e.g. aeration diffusers), deepening of the cells would be required to maintain the effective storage volume and protect equipment from freezing. The conversion of the existing primary facultative lagoon cells to partial mix aerated cells will not address the issues associated with discharge constraints or sufficiently address the effluent quality issues. Purchasing of additional land would also be required. Although this option can help to reduce ammonia in the primary cells, it is not sufficient to meet the proposed effluent criteria, and therefore, this option is not recommended to be carried forward. **Recommendation: Do not carry forward.**
2C) Add baffles to Cell No. 4 – (Polishing Cell)	**Review:** The addition of baffles within Cell No. 4 will not address all the identified problems on its own, but it should provide some additional treatment by improving lagoon retention time (i.e., prevents short circuiting). It is noted that flow velocity through the lagoon will

	not be significantly impacted by the addition of baffles. This alternative should only be considered in combination with other options. **Recommendation: Carry forward but only as an option to be considered in combination with other alternatives.**
2D) New transfer pipe to improve blending of primary facultative cells into Cell No. 4 – (Polishing Cell)	**Review:** The adjustment of the inlet locations of the transfer pipes into Cell No. 4 could improve the blending of primary facultative cells prior to discharge. Modeling to determine flow patterns and mixing efficiency may be required during design to confirm improvement. Although this alternative results in more consistent effluent quality during discharge (i.e. reduces fluctuations in effluent grab samples), it will not address the issues associated with discharge constraints or address the effluent quality issues, and therefore, this alternative should only be considered in combination with other options. **Recommendation: Carry forward but only as an option to be considered in combination with other alternatives.**
2E) pH adjustment	**Review:** Lowering the pH of the lagoon to a value within an optimal range for lagoon nitrification will not address all the identified problems on its own, but it could help to improve nitrifier growth rates and subsequently ammonia removal. Lowering pH within the lagoon prior to discharge may help to lower the fraction of unionized ammonia (UIA), but does not affect the TAN concentration. However, lowering the pH would also increase the fraction of undissociated hydrogen sulphide. This alternative should only be considered in combination with other options to improve treatment performance. **Recommendation: Carry forward but only as an option to be considered in combination with other alternatives.**
Option 3: New Specialized Treatment System and Existing Discharge Windows	
3) Install specialized treatment system and maintain existing discharge windows	**Review:** With the advancement of specialized treatment technologies, more consistent and improved effluent quality can be maintained over longer periods including winter months. Specialized treatment technologies that can be implemented within Township owned lands have the potential to meet the proposed effluent criteria and address the ammonia, hydrogen sulphide and total suspended solids effluent quality issues. It is noted that the total effluent volume under minimum stream flows is less than the total volume required to be discharged based on an average day flow of 2,220 m^3/d and including for average net precipitation for this option. Therefore, if it is determined that minimum flows within the South Nation River begin to occur more frequently within the 20-year period, discharging effluent within the existing discharge windows could become challenging. Nevertheless, since this option has the ability to meet the proposed effluent criteria and is able to meet the MECP design guidelines without accounting for precipitation under the current receiving water assessment, it has been carried forward for further evaluation. **Recommendation: Carry forward.**

Option 4: New Specialized Treatment System and New Discharge Windows	
4) Install specialized treatment system and operate within new discharge windows	**Review:** With the advancement of specialized treatment technologies, more consistent and improved effluent quality can be maintained over longer periods including winter months. Specialized treatment technologies that can be implemented within Township owned lands have the potential to meet the proposed effluent criteria and address the ammonia, hydrogen sulphide and total suspended solids effluent quality issues. This option allows for increased flexibility to discharge treated effluent over the winter months thereby reducing the amount of total effective storage required within the 20-year period and increased flexibility to discharge the annual required effluent volume during periods of low flow in the river. **Recommendation: Carry forward.**
Option 5: New Mechanical Treatment Plant	
5) Replace lagoon completely with a new mechanical treatment plant	**Review:** This option has the proven ability to meet the current effluent criteria and address the key issues in the problem statement; however, the costs are anticipated to be much higher than the other options and significant changes to the site and operations would be required. Costs are estimated to be $15M to $20M with annual operating costs in the $750,000 range. This option has not been considered further as the lagoon is built almost to the property boundary making it difficult and costly to obtain land if expansion was required. **Recommendation: Do not carry forward.**

5.3 Detailed Evaluation of Screened Wastewater Treatment Alternatives

A detailed evaluation of the alternatives carried forward is provided below. Each screened wastewater treatment alternative, with the exception of Option 2, was assigned a score based on its relative anticipated impact (positive or negative) to the established criteria. The alternatives carried forward from Option 2 were not assigned a score, as these alternatives are to be considered only as part of the other options (i.e., Option 3 and 4). An estimate of the construction and operational costs was also established to determine the feasibility of each alternative. Refer to Appendix B for a conceptual overview of each alternative.

5.3.1 Option 2C – Add Baffles to Cell No. 4

Three alternatives from Option 2 (i.e., Optimize/Modify Current Lagoon) were carried forward to be considered in combination with other alternatives. Although the installation of baffles to Cell No. 4 (Polishing Cell) would not result in adequate treatment enhancement to address the issues associated with TSS and TAN on its own, it could be considered in combination with Option 3 or Option 4. It is expected that the baffles would provide some additional treatment by increasing the retention time in the system by reducing short circuiting through the cells. Working within Cell No. 4 could be challenging as the wastewater system needs to be maintained in operation during construction. This being said, it may be possible to isolate the Polishing Cell for a short duration during the summer once the cells have been emptied following the spring discharge period and storing within the primary cells. Minimal impact to the environment is anticipated from the installation of baffles within Cell No. 4.

5.3.2 Option 2D – pH Adjustment

Option 2D is not sufficient to meet the proposed effluent criteria alone and should only be considered in combination with Options 3 or 4. As noted previously, lowering the pH will improve nitrification rates in the lagoon thus reducing ammonia in effluent discharge. Reducing pH also reduces the fraction of unionized ammonia which decreases the level of toxicity associated with ammonia at the point of discharge. Although implementation of a specialized treatment system is expected to decrease the pH through the consumption of alkalinity during nitrification (minimal pH change of 0.1 to 0.2 units but depends on TAN removal and alkalinity), additional pH adjustment could be required. Potential methods for pH adjustment that could be considered during design if needed include sulphuric acid addition, carbon dioxide addition, etc. This option is recommended to be carried forward for further review during preliminary design stage.

5.3.3 Option 2E – Improve Blending of Primary Facultative Cells into Cell No. 4

Altering the inlet location of the transfer pipe from Cell No. 3 into Cell No. 4 to be closer to that of the other two primary cells should improve the blending of primary facultative cells prior to discharge. This may help prevent the large fluctuations that currently occur in grab samples and produce a more consistent effluent discharge quality. New transfer piping from Cell No. 3 to Cell No. 4 and a new transfer structure (similar to other existing transfer structures between cells) may need to be constructed. Further review of mixing from transfer piping should be considered during preliminary design. Furthermore, as the majority of the work would be completed within the existing property boundary for this option, it is not expected that altering the inlet location would have significant impact on the natural environment. The MNRF did identify the potential for threatened species and species of concern on-site, and therefore, consideration during design and construction for protection of these species and their habitat, if present, would be required.

5.3.4 Option 3 – New Specialized Treatment System and Existing Discharge Windows

Option 3 is based on providing a new specialized treatment system downstream of the post-aeration cell and maintaining the existing discharge windows of the current C of A.

Specialized treatment systems were reviewed as part of this Class EA to determine whether improved effluent quality (particularly ammonia) could be achieved within the existing discharge windows set by the current C of A and for new discharge windows that extend through the winter months. The two technologies that are being considered for the Winchester WWTS are the submerged attached growth reactor (SAGR®) process and the moving bed biofilm reactor (MBBR) process.

The SAGR® treatment technology is a patented process that uses an aggregate media bed to treat wastewater which flows through the cell to a collection chamber at one end. The cells are typically horizontal and aeration is provided through the floor of the SAGR® to provide the aerobic conditions necessary for nitrification. Peat or mulch is added above the granular cell to protect the cell from freezing. The granular material provides a surface within the cell for the nitrifying bacteria to attach themselves and nitrify the wastewater.

The MBBR process is a fully submerged biofilm technology that uses specially designed polyethylene carriers within an aerated reactor. The carriers provide surface area for the nitrifying bacteria and remain in constant movement within the reactor due to the bubbles produced from the aeration grid. A biofilm is produced on the carriers and this biofilm is regulated by collisions occurring within the tank which helps to maintain a healthy biomass.

Each of these treatment technologies have been demonstrated to provide nitrification under cold weather conditions. Both treatment technologies have different advantages and disadvantages depending on the criteria being evaluated. Table 5.2 provides a review of the SAGR® and MBBR treatment technologies.

As the existing footprint of the lagoon occupies most of the current site; a portion of the lagoon would need to be retrofitted to permit installation of the specialized treatment system. It is conceptually envisioned that the specialized treatment system would be located at the west side of Cell No. 5 away from the inlet structure or alternatively at the west side of Cell No. 4.

5.3.5 Option 4 – New Specialized Treatment System and New Discharge Windows

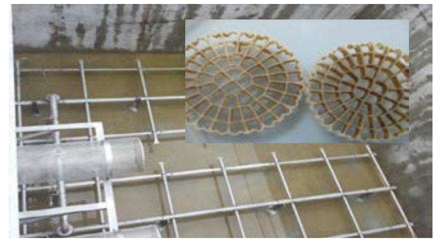
Option 4 is based on providing a new specialized treatment system downstream of the post-aeration cell and modifying the discharge windows to allow discharge during winter months. With the advancement of specialized treatment technologies, more consistent and improved effluent quality can be maintained over longer periods including winter months. The above-noted specialized treatment systems have been demonstrated to be effective during cold weather.

Longer discharge periods would provide opportunities to optimize the specialized treatment technology and reduce environmental and economic impact by reducing the overall footprint required and increasing potential energy conservation through reduced equipment sizing.

This option decreases the volume of wastewater that must be stored in the lagoon between discharge periods. Another advantage of this option is that the effluent dilution ratio (river flowrate to effluent discharge rate) can be more appropriately controlled with continuous discharge as the flowrate of treated effluent to the South Nation River can be reduced overall. With a longer discharge window, the flow of treated effluent discharged can be more appropriately controlled. This option would provide a high quality effluent and sufficient storage for the 20-year design period.

An evaluation of the screened alternatives is provided in subsequent sections.

Table 5.2: Review of Specialized Treatment Systems

Criteria	Submerged Attached Growth Reactor (SAGR)	Fixed Film Biological Process (MBBR)
		
Proven Cold Weather Installations	POSITIVE: Numerous Canadian/ and cold weather installations, however, extreme environmental conditions have the potential for operational upset.	POSITIVE: Numerous Canadian/ and cold weather installations, extreme environmental conditions have the potential for operational upset.
Ability to Meet Effluent Criteria	POSITIVE: Effluent will be produced that can meet the proposed effluent limits for all parameters.	POSITIVE: Effluent will be produced that can meet the proposed effluent limits for all parameters.
Degree of Process Control	NEGATIVE: Submerged attached growth reactors have a higher degree of control then a lagoon alone, however, process control is limited and the system may be slow to respond.	POSITIVE: There are a number of factors that can be controlled in the fixed film biological process; however, the lagoon is still required for treatment.
Ease of Operation	POSITIVE: Limited operator input is required once established. Some maintenance required on insulating layer of mulch or wood chips, and annual maintenance on blowers.	NEGATIVE: Automated process that may require periodic operator input. Additional operation of filter type system to remove TSS prior to discharge would be required. Annual maintenance on blowers and cleaning of disc filter cloth.
Compatibility with Existing Site	NEGATIVE: New relatively large cells are required. Pumping to or from the new cells may be required. Part of the existing lagoon area would be reduced to accommodate the SAGR system.	NEGATIVE: New tankage is required. Although the process requires minimal area, pumping to or from the new tankage may be required. Part of the existing lagoon area would be reduced to accommodate the MBBR system. Additional area would be required for filters.
Opportunities for Future Expansion	NEGATIVE: The number of process cells could be increased; however, the level of effort would be relatively high and additional land would be required.	POSITIVE: If a treatment capacity increase is required the quantity of the media in the basin can be increased at a low cost without the need for additional basins.
Impacts During Construction	MINIMAL IMPACT: Construction is limited to a footprint within the existing lagoon area and impacts to the area during construction would cause minimal disruption. Coordination would be required during construction to ensure adequate lagoon capacity is maintained.	MINIMAL IMPACT: Construction is limited to a footprint within the existing lagoon area and impacts to the area during construction would cause minimal disruption. Coordination would be required during construction to ensure adequate lagoon capacity is maintained.
Compatibility with Surrounding Land Use	MINIMAL IMPACT: Limited work would be required exterior to the existing lagoon footprint. The SAGR would be located within the existing lagoon footprint.	MINIMAL IMPACT: Limited work would be required exterior to the existing lagoon footprint. Tankage would be located within the existing lagoon footprint.
Noise and Odour Effects during Operation	POSITIVE: Noise and odour will be similar to the current operations. May be minor odour improvements due to enhanced treatment.	POSITIVE: Noise and odour will be similar to the current operations. May be minor odour improvements due to enhanced treatment.

Additional information regarding the SAGR and MBBR technologies was obtained based on discussion with operations staff from a full scale SAGR treatment system in Sundridge, Ontario and from the results of an ongoing MBBR pilot scale project at the Village of Casselman lagoon. The SAGR system was noted to be operating continuously year round and running well at the Sundridge STS (refer to Appendix A – SAGR System Meeting Minutes No. 5 for details). A technical memorandum was also prepared to provide the Village with JLR's review of available information for the ongoing MBBR pilot test at the Village of Casselman lagoon (refer to Appendix E for a copy of the technical memorandum for the MBBR Village of Casselman Pilot Test Results). The pilot plant demonstrated that it was capable of significant ammonia removal during periods with very cold air and lagoon temperatures. Additional treatment such as filtration would likely be required following a MBBR system as the pilot plant showed a nominal increase in TSS after the MBBR process. Both treatment technologies have demonstrated their ability to reduce ammonia during cold temperatures, and as such, SAGR or MBBR with filtration are considered viable solutions to address the current issues associated with the Village of Winchester STS.

5.3.6 Opinion of Probable Costs of Screened Alternatives – Capital, Operational and Lifecycle

An OPCC with a Class 'D' (Indicative Estimate) level of accuracy was developed for each of the alternatives and includes allowances for design elements that have not fully been developed. The OPCCs were developed based on past experience on similar projects, professional judgment, and equipment costs provided by suppliers.

- The estimated costs for various items are order-of-magnitude only and are based on the experience and current (2018) unit prices in the construction industry.
- All costs, including those for future years, are expressed in 2018 dollars. If these costs are to be used for long-range cash-flow projections, the implications for potential future trends of inflation and interest must be applied accordingly.
- Conceptual level of order-of-magnitude OPC may range from ± 30%. The scope of the design upgrades are to be further refined during preliminary and detailed design; costs will vary depending on the scope considered for implementation.

The OPC for the preferred system is estimated to be $6.5 M (excluding HST). Additional costs for engineering and contingency would be added to this construction capital cost. Refer to the below table identifying estimated capital cost for the wastewater treatment alternatives.

Table 5.3: Estimated Capital Cost of Wastewater Treatment Alternatives

Option	Estimated Capital Cost (2018 $)[1]
Option 1: Do Nothing	-
Option 2: Optimize/Modify Current Lagoon	
2c. Add baffles to Cell No. 4	$0.2 M
2d. pH adjustment	$0.1 M
2e. New transfer pipe to improve blending of primary cells	$0.15 M
Option 3: New Specialized Treatment System and Existing Discharge Windows	$6.5 M
Option 4: New Specialized Treatment System and New Discharge Windows	$6.5 M
1. Conceptual level of order-of-magnitude OPC may range from ± 30%. The estimated capital cost excludes HST.	

Based on the cost of existing operations and information from suppliers and similarly sized facilities, the annual operating costs of each particular treatment alternative have been summarized in Table 5.4. For the purposes of establishing operational costs it has been assumed that the treatment system is operating at the projected design flow. Costs include electricity costs for blowers and pumps of new equipment as well as chemical costs associated with the existing operations of the lagoon (phosphorous removal system).

Table 5.4: Estimated Operational Cost of Wastewater Treatment Alternatives

Option	Estimated Operational Cost
Option 1: Do Nothing	-
Option 3: New Specialized Treatment System and Existing Discharge Windows	$70,000 - $80,000
Option 4: New Specialized Treatment System and New Discharge Windows	$70,000 - $80,000
Note: Option 2 has not been included as it is only being considered in combination with other options. SAGR system would be expected to operate at the lower range of the estimated operational cost and the MBBR system at the higher range.	

Based on information from MBBR suppliers, the cost to fully replace the MBBR media for this scale of operation may range from $400,000 - $600,000. Replacement of the media is not expected to occur within the 20-year planning period, but may be considered within the overall life-cycle costs of implementing this technology. Other life cycle costs to consider for the MBBR technology may include the replacement/upgrade of process blowers at the end of their useful life, or upgrades to the MBBR's external structural components, internal sieves or transfer piping.

Based on information from SAGR suppliers and operations staff, the addition of wood chips for insulating layer above the SAGR system is required over the 20-year planning period. Other life cycle costs to consider for the SAGR technology may include the replacement/upgrade of process blowers at the end of their useful life, or upgrades to the SAGR's internal piping or transfer piping.

5.3.7 Evaluation Overview of Screened Alternatives

Each option was assigned an evaluation impact level and score (refer to Table 5.5). This method provides an overall assessment of the positive and negative impacts of each alternative. Table 5.6 summarizes the detailed evaluation of the screened alternatives for the treatment system, for the detailed evaluation refer to Table 5.7.

Table 5.5: Evaluation Impact Level and Scoring System

Evaluation Impact Level	Score
Potential for High Positive Impact	4
Potential for Moderate Positive Impact	3
No Anticipated Impact	2
Potential for Moderate Negative Impact	1
Potential for High Negative Impact	0

Table 5.6: Summary of Detailed Evaluation of Screened Alternatives

Option	Score	Rank
Option 1: Do Nothing	25	3
Option 3: New Specialized Treatment System and Existing Discharge Windows	32	2
Option 4: New Specialized Treatment System and New Discharge Windows	34	1

Table 5.7: Detailed Evaluation of Screened Alternatives

MAJOR CRITERIA	MINOR CRITERIA	Option 1: Do Nothing		Option 3: New Specialized Treatment System and Existing Discharge Windows		Option 4: New Specialized Treatment System and New Discharge Windows	
		Comment	Score	Comment	Score	Comment	Score
Natural Environment and Archaeology	Effect on Fish and Aquatic Habitat	MODERATE NEGATIVE: Quality of effluent discharged to surface water does not improve and may degrade as influent flows continue to increase.	1	MODERATE POSITIVE: Quality of effluent discharged to surface water will improve. No in-water works are anticipated.	3	MODERATE POSITIVE: Quality of effluent discharged to surface water will improve. No in-water works are anticipated.	3
	Effect on Wildlife Habitat	NO IMPACT: No construction will occur at the lagoon site.	2	MODERATE NEGATIVE: The MNRF identified the potential for Bobolink, Eastern Meadowlark, Barn Swallow, American Eel, and Butternut (threatened species) on the site or in proximity to it. Construction activities will need to consider the protection of these species and their habitat. This will also apply to other species of concern potentially present (e.g. Common Nighthawk, River Redhorse, Snapping Turtle and Eastern Whip-poor-will).	1	MODERATE NEGATIVE: The MNRF identified the potential for Bobolink, Eastern Meadowlark, Barn Swallow, American Eel, and Butternut (threatened species) on the site or in proximity to it. Construction activities will need to consider the protection of these species and their habitat. This will also apply to other species of concern potentially present (e.g. Common Nighthawk, River Redhorse, Snapping Turtle and Eastern Whip-poor-will).	1
	Archaeological Potential Impacts	NO IMPACT: No construction will occur at the lagoon site.	2	NO IMPACT: The lagoon is located within a previously disturbed site, and therefore, there is not anticipated to be potential for archaeological impacts as a result of construction within the Township property.	2	NO IMPACT: The lagoon is located within a previously disturbed site, and therefore, there is not anticipated to be potential for archaeological impacts as a result of construction within the Township property.	2
	Effect on Receiving Water	MODERATE NEGATIVE: No improvements to the effluent quality; as flows increase C of A effluent limits may become more difficult to achieve.	1	MODERATE POSITIVE: High quality effluent will be produced that can meet the proposed C of A effluent limits for total ammonia nitrogen and total suspended solids. Discharge over longer periods (i.e. within the existing full discharge windows) can provide opportunities to optimize the new treatment technology and dilution ratios can be more appropriately controlled.	3	HIGH POSITIVE: High quality effluent will be produced that can exceed the proposed C of A effluent limits for total ammonia nitrogen and total suspended solids. Discharge over longer periods (i.e. during winter months) can provide opportunities to optimize the new treatment technology and dilution ratios can be more appropriately controlled. Semi-continuous discharge can assist in maintaining a healthy biomass throughout winter months.	4
Engineering and Technical Considerations	Proven Cold Weather Installations	MODERATE NEGATIVE: No change to lagoon operation; difficulty in discharging effluent in early spring to meet effluent quality.	1	MODERATE POSITIVE: Numerous Canadian/ and cold weather installations, however, subject to extreme environmental conditions.	3	MODERATE POSITIVE: Numerous Canadian/ and cold weather installations, however, subject to extreme environmental conditions.	3
	Ability to Meet Effluent Criteria	MODERATE NEGATIVE: There have been difficulties in meeting the ammonia and total suspended solids effluent objectives over the review period.	1	HIGH POSITIVE: High quality effluent will be produced that is better than the C of A limits for all parameters.	4	HIGH POSITIVE: High quality effluent will be produced that is better than the C of A limits for all parameters.	4
Engineering and Technical Considerations	Impact to Existing Infrastructure	NO IMPACT: No changes will occur to the existing infrastructure.	2	MODERATE NEGATIVE: Part of the existing lagoon area will need to be reduced to permit construction of the new specialized treatment system. Other existing infrastructure will continue to be utilized, and therefore, previous investments in the lagoon infrastructure are carried forward with this option.	1	MODERATE NEGATIVE: Part of the existing lagoon area will need to be reduced to permit construction of the new specialized treatment system. Other existing infrastructure will continue to be utilized, and therefore, previous investments in the lagoon infrastructure are carried forward with this option.	1
	Ease of Operation and Operational Flexibility	MODERATE NEGATIVE: There have been operational challenges and concerns at the end of the discharge period with attaining the established dilution ratio.	1	MODERATE POSITIVE: Limited operator input is required for various treatment technologies once the system is established.	3	HIGH POSITIVE: Limited operator input is required for various treatment technologies once the system is established. Longer discharge periods can reduce storage requirements and lower more consistent discharge rates can be maintained relative to the existing discharge windows.	4
	Opportunities for Future Expansion	NO IMPACT: There are available technologies that can be installed within the existing footprint of the lagoon to improve effluent quality.	2	MODERATE POSITIVE: If a treatment capacity increase is required in the future, the type of treatment technology selected could affect the ease of expansion. Some treatment technologies are modular and able to increase capacity by increasing the quantity of media and limit the need to provide additional basins.	3	MODERATE POSITIVE: If a treatment capacity increase is required in the future, the type of treatment technology selected could affect the ease of expansion. Some treatment technologies are modular able to increase capacity by increasing the quantity of media and limit the need to provide additional basins.	3

MAJOR CRITERIA	MINOR CRITERIA	Option 1: Do Nothing		Option 3: New Specialized Treatment System and Existing Discharge Windows		Option 4: New Specialized Treatment System and New Discharge Windows	
		Comment	Score	Comment	Score	Comment	Score
Social / Community Well Being	Impacts During Construction	NO IMPACT: No construction is to occur.	2	MODERATE NEGATIVE: Construction is limited to the existing lagoon site and impacts to neighboring properties would be minimal. Existing system will operate during construction.	1	MODERATE NEGATIVE: Construction is limited to the existing lagoon site and impacts to neighboring properties would be minimal. Existing system will operate during construction.	1
	Compatibility with Surrounding Land Use	NO IMPACT: The minimum separation distance from sensitive land use is 100m per MECP guidelines. The 100m buffer from the current lagoon footprint extends onto private lands. Current compatibility is not affected with this option.	2	NO IMPACT: Construction of a new specialized treatment system within the Township owned property will not cause the 100m buffer to be extended further onto private lands.	2	NO IMPACT: Construction of a new specialized treatment system within the Township owned property will not cause the 100m buffer to be extended further onto private lands.	2
	Visual Impact	NO IMPACT: No visual changes.	2	NO IMPACT: All changes will be within the existing lagoon property, visible changes will be minor.	2	NO IMPACT: All changes will be within the existing lagoon property, visible changes will be minor.	2
	Noise and Odour Effects during Operation	NO IMPACT: No noise and odour changes.	2	MODERATE POSITIVE: Noise and odour will be similar the current operations. May be minor odour improvements due to enhanced treatment.	3	MODERATE POSITIVE: Noise and odour will be similar the current operations. May be minor odour improvements due to enhanced treatment.	3
Financial Impacts	Capital Costs	NO IMPACT: No construction is to occur.	2	HIGH NEGATIVE: Construction capital costs will be in the order of $6,500,000 (excluding HST). Conceptual level of order-of-magnitude OPC may range from ± 30%.	0	HIGH NEGATIVE: Construction capital costs will be in the order of $6,500,000 (excluding HST). Conceptual level of order-of-magnitude OPC may range from ± 30%.	0
	Operational Costs	NO IMPACT: Current operational costs are maintained.	2	MODERATE NEGATIVE: An increase in the operational costs is anticipated. Annual operational costs are estimated to range from $70,000 to $80,000.	1	MODERATE NEGATIVE: An increase in the operational costs is anticipated. Annual operational costs are estimated to range from $70,000 to $80,000.	1
Total Score / Rank		**Rank 3**	**25**	**Rank 2**	**32**	**Rank 1**	**34**

6.0 PREFERRED SOLUTION

Based on the evaluation methodology utilized, it was determined that Option 4 - New Specialized Treatment System and New Discharge Windows provided the highest overall net benefit to the Township. In order to mitigate risk and ensure appropriate treatment redundancy and to take advantage of existing facilities/infrastructure (i.e., the existing lagoon), this option should be completed in combination with Option 2C (add baffles to polishing cell No.4) and Option 2D (new transfer pipe to improve blending of primary facultative cells into Cell No. 4) as being part of the overall preferred solution. Option 2E (pH adjustment) should be further evaluated during preliminary design with consideration to alkalinity consumption from nitrification and the type of specialized treatment system selected.

The main benefits of installing a specialized treatment system and operating within new discharge windows are the following:

- Proven full scale Canadian and cold weather installations available;
- Ability to meet current effluent criteria, with quality that is better than current C of A limits;
- Controlled process that can be adjusted to achieve consistent effluent quality;
- Easily expandable process with minimal capital cost to increase treatment capacity;
- Moderate upfront capital costs and ongoing operational costs;
- Winter storage requirements are reduced, limiting the need for expansion of the lagoon;
- Discharge throughout winter months can help to reduce the flowrate to the South Nation River and assist in controlling the effluent dilution ratios required; and
- Reduced flowrates over a longer discharge period provide opportunities to optimize the specialized treatment technology and reduce the environmental and economic impact by reducing the overall footprint required.

Table 6.1 provides an opinion of probable cost for the preferred solution. Appendix 'C' contains a conceptual layout of the preferred solution and where a specialized treatment system could be integrated into the existing lagoon.

Table 6.1: Opinion of Probable Cost of Preferred Solution

Item Description	Estimated Capital Cost (2018 $)[3]
Install Specialized Treatment System	$6,500,000[2]
Add baffles to Cell No. 4	$200,000[1]
New Transfer Pipe, Maintenance Structure and Valve to Improve Blending into Cell No. 4	$150,000[1]
pH Adjustment	$100,000[1]
Grand Total (rounded)	**$7,000,000**

1. Work associated with installation of new baffles and new transfer pipe to Cell No. 4 may be considered as a future phase of work.
2. Design and implementation of the specialized treatment system and intermediate pumping should be completed in the short term (0-5 years) due to the current operational constraints and quality issues experienced.
3. Conceptual level of order-of-magnitude OPC may range from ± 30%. The estimated capital cost excludes HST.

7.0 COMPLETION OF PHASE 2 ACTIVITIES

A Public Information Centre was held on January 17, 2019 to inform the general public, project stakeholders, and review agencies of the preliminary findings of the Phase 1 and Phase 2 reports and to obtain input on the recommendation of the preferred alternative. Following the PIC, comments received from affected parties and agency stakeholders were reviewed and the preferred alternative was confirmed. The Class EA Project File that documents the Class EA process will be posted for a 30-day review period. After the 30-day period for comment closes, the Township will be in a position to implement the preferred option and proceed directly into preliminary design. The design would be based on the analysis presented within this Schedule B Class EA and the conceptual layouts for the preferred alternatives identified in Phase 2 that take the environmental factors into consideration.

8.0 REFERENCES

1. J.L. Richards & Associates Limited, Township of North Dundas – Winchester Sewage Treatment System Upgrades – Municipal Class Environmental Assessment – Phase 1 Report, August, 2017.

2. Ministry of the Environment and Climate Change, D-2 Compatibility between Sewage Treatment and Sensitive Land Use, August 1996.

3. Ministry of the Environment, Design Guidelines for Sewage Works, 2008.

4. Municipal Class Environmental Assessment, Municipal Engineers Association, 2015.