CORNWALL WASTEWATER TREATMENT PLANT
ENVIRONMENTAL ASSESSMENT UPDATE

ADDENDUM TO 2005
ENVIRONMENTAL STUDY REPORT

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1.0 INTRODUCTION

The City of Cornwall owns and operates the Cornwall Wastewater Treatment Plant (WWTP), which provides primary treatment with chemical addition for enhanced treatment and phosphorus removal as well as disinfection. The existing WWTP has an average rated capacity of 54 432 m^3/day and a peak design capacity of 108 864 m^3/day. Biosolids are treated onsite in anaerobic digesters and dewatered using centrifuges before being disposed of at the City's landfill. Sewage from the City of Cornwall is collected and transferred by gravity to a pumping station located on Montreal Road near the entrance to the WWTP and is conveyed through a forcemain and into the plant, as shown on Figure 1. Following a plant-wide evaluation in 2003 to determine required upgrades, a Schedule C Class Environmental Assessment (Class EA) was completed in 2005.

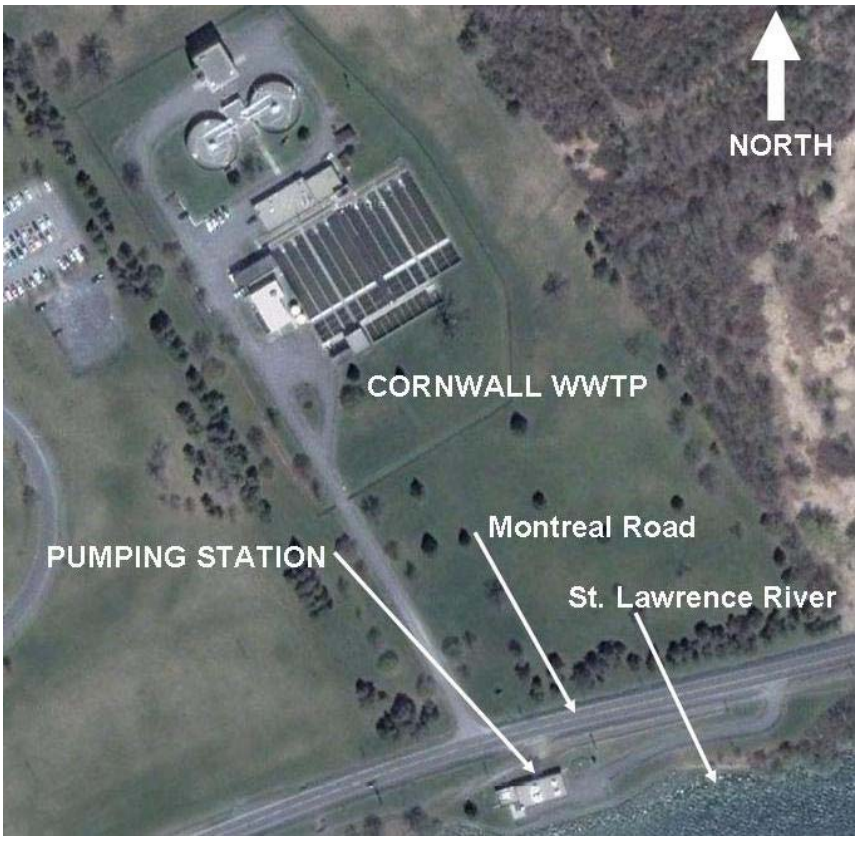

Figure 1 - Satellite photograph of the Cornwall WWTP (courtesy of GoogleMaps)

The Cornwall WWTP was originally constructed in 1968 and has undergone several expansions since that time. The WWTP currently serves approximately 46 000 people, numerous commercial and industrial properties, as well as the leachate from five waste disposal sites. The plant was transferred to MOE ownership in 1970 and to the City of Cornwall in 2000. An expansion completed in 1988 established the plant's current layout and the current Average Day Flow capacity of 54 432 m^3/d.

The Cornwall WWTP is a primary wastewater treatment plant that provides phosphorus removal using chemical addition. Gravity-conveyed sewage first passes through a mechanical fine-screen located at the pumping station. Sewage is then pumped through a forcemain to the treatment plant, where grit is removed in aerated grit tanks. Following degritting, the sewage is conveyed to four primary clarifiers and is then disinfected using chlorine. The treated effluent is discharged to the St. Lawrence River.

Solids that settle in the primary clarifiers are pumped to the two primary anaerobic digesters for stabilization before being dewatered by centrifugation. Dewatered solids are landfilled for final disposal.

A Pollution Control Planning (PCP) study was undertaken in 1995 to address concerns raised as part of the Remedial Action Plan (RAP), which stemmed from the designation of the St. Lawrence River as an Area of Concern (AOC) by the Water Quality Board and the International Joint Commission. The PCP has recently been updated to include a hydraulic assessment of critical sewer infrastructure and to determine compliance with MOE Procedure F-5-5. In addition to other recommendations, the RAP recommended the following upgrades to the Cornwall WWTP:

- Upgrading the existing primary treatment plant to the equivalent of secondary treatment
- Reduce Total Phosphorous in the effluent to 0.5 mg/L
- Increase removal efficiency of other toxic contaminants
- Reduce bacteria levels

These requirements were considered in the 2005 Class EA, and a Biological Aerated Filter (BAF) and Ultraviolet Light (UV) disinfection system were recommended.

In May 2009, the City retained J.L. Richards & Associates Limited, in association with CH2M HILL Canada Limited and XCG Consultants Limited, to review and update the findings and recommendations identified through the 2005 Class EA.

2.0 THE CLASS ENVIRONMENTAL ASSESSMENT PLANNING PROCESS

The Class Environmental Assessment planning process developed by the Municipal Engineers Association (October 2000, as amended in 2007) is a decision-making process approved under the Ontario Environmental Assessment Act (EA Act) for a group of undertakings. Projects included in the Class EA may be implemented without further approval under the EA Act provided that the approved Class EA planning process is followed. Briefly stated, the main elements of the Class EA planning process are incorporated in the following five phases:

TABLE 1: CLASS EA PROCESS

	PHASE 1	**PHASE 2**	**PHASE 3**	**PHASE 4**	**PHASE 5**
	Problem or Opportunity	Alternative Solutions	Alternative Design Concepts for Preferred Solution	Environmental Study Report	Implementation
Consultation Requirements	Optional	Mandatory	Mandatory	Mandatory	Optional

The Class EA process requires:

- Consultation with the general public and agencies potentially affected by the proposed project.
- Consideration of a reasonable range of alternatives.
- A systematic evaluation of alternatives to determine their advantages and disadvantages and their net environmental effects.
- Documentation of the planning process followed to allow "traceability" of the decision-making process and consultation activities.

Since projects can vary in terms of scope, complexity, and environmental impact, the Class EA process identifies three levels of planning activities through separate schedules:

- **Schedule A/A+** - generally includes normal or emergency operational and maintenance activities.

  - The environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved and can proceed directly to implementation.

  - As part of the 2007 amendments to the Class EA process, Schedule A+ was introduced, where Schedule A+ projects are pre-approved and can proceed to implementation (similar to Schedule A projects). However, the public affected by the project is to be advised prior to implementation of a Schedule A+ undertaking.

- **Schedule B** - generally includes improvements and minor expansions to existing facilities.

  - There is the potential for some adverse environmental impacts and therefore the proponent is required to proceed through a screening process including consultation with those who may be affected.

- **Schedule C** - generally includes the construction of new facilities and major expansions to existing facilities.

  - These projects proceed through the full environmental assessment planning process in the Class EA.

Upgrading and expanding the existing Cornwall WWTP is considered a Schedule C undertaking and, as a result, must satisfy the full Class EA planning process. This requirement was addressed through an Environmental Study Report (ESR) completed in July 2005 by Hydromantis Inc. A copy of the 2005 ESR is included for review, as a separate Volume to the Addendum.

2.1 Revisions and Addendum to Environmental Study Report

The Class Environmental Assessment process requires the preparation of an Addendum to the ESR, should any significant modification to the project be proposed or change in the environmental setting be encountered.

The Addendum is to describe the circumstances necessitating the change, the environmental implications of that change, and propose mitigation measures to address potential negative impacts. Once completed, the Addendum is to be filed with the ESR and a Notice of Filing of Addendum to be published to advise all potentially affected members of the public and review agencies. In addition, a copy of the Notice of Filing of Addendum is to be sent to those who were notified while preparing the original ESR. A 30-day review period is to be provided following issuance of the Notice of Filing of Addendum. It is important to note that only the changes proposed to the original ESR are open for review.

3.0 BACKGROUND

The City of Cornwall is responsible for the provision of municipal services to approximately 46,000 people. These services include all traditional municipal infrastructure components of water, transportation and recreation. The Cornwall WWTP has been identified through the Great Lakes Water Quality Agreement (GLWQA) as a contributor to the impairment of the St. Lawrence River. The existing plant provides primary treatment only (chemically-assisted treatment process followed by disinfection) and does not meet the minimum level of secondary treatment, which is the Ministry of Environment's objective for WWTPs in the province of Ontario.

The GLWQA is a commitment of both the United States and Canada to restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. The GLWQA defines Areas of Concern (AOCs) as "geographic areas that fail to meet the general or specific objectives of the agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life". These are areas that have shown environmental degradation.

The GLWQA directs the two federal governments to cooperate with state and provincial governments, in consultation with the public, to develop and implement Remedial Action Plans (RAPs) for each AOC. RAPs are being developed to address impairments to any one of 14 beneficial uses (e.g., restrictions on fish and wildlife consumption, dredging activities, or drinking water consumption) associated with these areas. Successful implementation of the RAP will result in the delisting of these areas as beneficial uses are restored.

Since 1971, the Governments of Canada and Ontario have worked together through a series of Canada-Ontario Agreements Respecting the Great Lakes Basin Ecosystem (COA) that have guided their efforts to improve the environmental quality of the Basin and contributed to meeting Canada's obligations under the GLWQA.

The St. Lawrence River at Cornwall is one of the AOCs (also known as Great Lakes hot spots) that has been identified by Canada and Ontario. In the 2007 COA, this AOC is identified as a **Goal 1 AOC**, that is, an AOC where the two levels of government are targeting their efforts and resources to complete all required remedial actions by 2010. Key aspects of the RAP recommendations for this AOC have called for the following:

- A secondary or equivalent upgrade to the existing primary Waste Water Treatment Plant (WWTP)
- Reduction of the effluent phosphorous
- Increase the removal efficiency of other toxic contaminants
- Reduce bacteria; and
- Reduce nuisance aquatic plants.

The Cornwall WWTP provides primary treatment only. This is essentially chemically assisted settling for solids removal with effluent disinfection prior to discharge to the St. Lawrence River. The limits set out in the Certificate of Approval (C of A) for the WWTP (0062-6VJT5C dated Dec. 2006) are 50, 45 and 1 for Biochemical Oxygen Demand (BOD), Suspended Solids (SS), and Total Phosphorus (TP) respectively. While the WWTP is able to marginally meet these limits on a consistent basis, it is not able to meet the E-Coli objective of 200 organisms/100ml.

The Ministry of Environment (MOE) Guideline F-5, and associated procedures, state that all sewage treatment works shall provide secondary treatment or equivalent as the “normal” level of treatment. The Cornwall WWTP is not capable of achieving the levels of treatment that a secondary treatment plant is capable of. These levels are typically 25, 25 and 1.0 mg/l for CBOD, SS and TP respectively (ref: MOE Design Guidelines for Sewage Works – 2008).

Recommendation #19 of “Great lakes, Great River: Remedial Action plan for the St. Lawrence River (Cornwall) Area of Concern, Stage 2 Report November 1997” states: “Upgrade Cornwall Sewage Treatment Plant to Secondary Treatment or equivalent treatment consistent with the MOEE Municipal MISA program”.

Upgrading of the Cornwall WWTP is a major outstanding action to de-list this AOC and meet Federal-Provincial **Goal 1** commitments under the current COA. Cornwall’s WWTP is also one of five primary plants remaining on the Great Lakes. (Others include Nipigon, Iroquois in the Township of South Dundas, Owen Sound, and Red Rock). Upgrading to secondary treatment will meet the MOE guidelines (set in 1982), which stipulate that secondary is the minimum level of treatment required. Further to this, secondary treatment is expected to be the treatment

standard in a proposed federal regulation anticipated in 2010, based on the proposed Canada-wide Strategy for the Management of Municipal Wastewater Effluent developed by the Canadian Council of Ministers of the Environment (CCME).

In addition to meeting Federal-Provincial Great Lakes goals, the Ministry of Environment is concerned with the level of treatment provided by the City's primary plant and has identified a number of concerns with the effluent. The City has complied with a Provincial Officer Order issued on January 11, 2008, requiring the City to submit a work plan and implementation schedule to move towards a secondary treatment facility. The City is committed to this work plan.

A Pollution Control Plan (PCP) was completed by the City in 1995 to address RAP concerns. This study focused on improvements to the stormwater and sewage collection systems and on a preliminary investigation of secondary wastewater treatment alternatives. This PCP was updated to reflect conditions in the City in 2004-2005 and again in 2009. The 2009 PCP is discussed further in Section 4.3 and Appendix B.

A study entitled "Waste Water Treatment Plant Optimization and Upgrade Investigation" was completed in 2003. This was followed by a Schedule C Class EA in 2005. The ESR recommended a preferred secondary treatment process for the upgraded WWTP. Based on the overall assessment carried out during the 2005 Class EA process, the preferred alternative to upgrade the Cornwall WWTP was identified as Biological Aerated Filters with:

- Standby Power
- UV Irradiation
- Increased Digester Capacity
- Increased Centrifuge Dewatering Capacity; and
- Additional Stabilization and Sludge Volume Reduction.

4.0 KEY ISSUES REVIEWED

A number of important issues were reviewed while preparing an Addendum to the 2005 ESR through several Technical Memoranda, and a separate Preliminary Geotechnical Subsurface Investigation as summarized below.

4.1 Technical Memorandum No. 1 – Constraints and Project Scope

Technical Memorandum No. 1 (TM1) was prepared to summarize and confirm the existing conditions, constraints, City requirements, and intended Scope of the Class EA Update. This document was essentially a project work plan and execution tool for reference by the City and project team. As a result, TM1 is not directly relevant to the ESR Addendum and therefore not included as an Appendix.

4.2 Technical Memorandum No. 1B – Assimilative Capacity Assessment of the St. Lawrence River

An assimilative capacity assessment of the St. Lawrence River was undertaken to determine appropriate effluent limits for an upgraded Cornwall WWTP. This assessment provides an analysis of in-stream water quality impacts of the existing WWTP, and for an upgraded WWTP, primarily in terms of un-ionized ammonia, total phosphorus, biochemical oxygen demand (BOD), dissolved oxygen (DO), chlorine residual, and suspended solids. Proposed effluent limits for an upgraded system are provided based on results of the assimilative capacity assessment, as well as MOE Guidelines F-5, and the Canadian Environmental Protection Act (CEPA) requirement for ammonia and chlorine in wastewater effluents, and the Remedial Action Plan (RAP) for this area. Refer to Appendix A for details.

Key findings of this assimilative capacity assessment analysis are:

- Based on available water quality records for stations near Cornwall, this portion of the St. Lawrence River is MOE Policy 1 with respect to TP, un-ionized ammonia, BOD_5, DO, and TSS during all months.
- The St. Lawrence River has the capability to provide assimilative capacity for loadings of all parameters assessed in this study: TP, un-ionized ammonia, BOD_5, DO, and TSS from the Cornwall WPCP.
- There are currently no ammonia limits for the Cornwall WPCP. The predicted non-acutely lethal concentration (NALC) for effluent ammonia ranges from 5 – 8 mg/L, based on the season. The NALC was solved iteratively using 75th percentile effluent pH and

temperature values to calculate an un-ionized ammonia concentration that approached the criteria of 0.1 mg/L; the resulting NALCs for ammonia are considered conservative. Effluent objectives for total ammonia nitrogen should be less than the predicted NALC concentrations, and it is anticipated compliance would be addressed by a C of A requirement that the effluent be non-acutely lethal.

- Mixing zone analysis was conducted for TP and total ammonia for winter, spring, summer and fall scenarios. The results indicated that the predicted mixing zones for TP and total ammonia are reasonable in extent for existing and proposed future conditions.
- The proposed effluent TP compliance limit of 0.8 mg/L is 20% lower than MOE Guideline F-8, which recommends 1.0 mg/L. This is however, consistent with the St. Lawrence River (Cornwall area) RAP recommendations. An effluent TP concentration of 0.5 mg/L is considered a suitable objective for secondary treatment and is also consistent with the RAP recommendations for this area.

Table 2 presents proposed effluent limits and objectives for the upgraded plant.

Table 2 - Existing and Proposed Objective and Compliance Limits

Rated Capacity	**Existing C of A (54,432 m^3/d)**		**Proposed (65,318 m^3/d)**		
Parameter	**Objective (mg/L)**	**Compliance (mg/L)**	**Objective (mg/L)**	**Compliance (mg/L)**	**Loading Limit (Kg/day)**
$CBOD_5$ (Note 1)	40.0	50.0	15.0	25.0	1,633
Total Supplied Solids (Note 1)	30.0	45.0	15.0	25.0	1,633
Total Ammonia as N					
January – March (Note 1)	--	--	7.0	9.0	588
April – September (Note 1)	--	--	5.0	7.0	457
October-December (Note 1)	--	--	9.0	11.0	718
				Non-acutely lethal to Rainbow Trout and Daphnia Magna	
Total Phosphorous (Note 1)	1.0	1.0	0.5	0.8	52
E. coli (CFU/100ml) (Note 3)	200		100	200	n/a
Total Residual Chlorine (Note 2)		1.0	0.02	0.04	2.6
pH of the effluent shall be maintained between 6.0 and 9.5, inclusive, at all times					

Notes:
1) Based on Monthly Average Concentration
2) Never to exceed. Chlorine residual would be eliminated with Ultraviolet Disinfection
3) Based on Monthly Geometric Mean Density.

It should be noted that the proposed Objective and Compliance Limits summarized above have been approved by the Ministry of the Environment. Refer to MOE's correspondence, dated November 3, 2009, in Appendix A.

4.3 Technical Memorandum No. 2 – Raw Waste Water Characterization

Technical Memorandum No. 2 (TM2) was prepared to confirm the projected flows and raw wastewater characteristics for the upgraded plant. It includes a summary of 2009 PCP update as well as a discussion of significant industrial wastewater and landfill leachate sources which contribute hydraulic and organic leaching to the existing Cornwall WWTP. Refer to Appendix B for details.

Based on the findings presented in TM2, the updated design for proposed plant upgrades are summarized in Table 3.

A review of recent plant operating data (from January 1, 2006, to December 31, 2008) suggests that the average day flow capacity of 65,318 m³/day recommended in the 2005 ESR remains appropriate. This will result in a 20% increase of the plant's current rated capacity.

The 2009 Pollution Control Plan Update demonstrates that the City of Cornwall is in compliance with MOE's F-5-5 Guideline. However, the 2009 PCP update suggests that it would be an effective strategy to maximize the treatment of wet-weather flows at the upgraded WWTP to reduce potential combined sewer overflows.

As discussed in Technical Memorandum No. 3, it is possible to increase the pumping station capacity, up to approximately 186,000 m³/day, while maintaining a forcemain velocity of 3.0 m/s or less. As discussed in Technical memorandum No. 5 and 6, the existing primary clarifiers can be used for co-thickening of waste-activated sludge, up to 169,500 m³/day based on the MOE's 2008 Design Guideline. As a result, and following discussions with City staff, it is recommended that consideration be given to increasing the peak day and peak instantaneous flow for the upgraded plant up to 160,000 m³/day. This will be reviewed further during the design phase based on value engineering and a comprehensive cost-benefit analysis. In any event, the peak flow design basis shall be 130,000 m^3/d, as a minimum, consistent with the 2005 ESR. It should be noted that the collection system is such that peak flows can be sustained for extended periods during wet weather events. Given that all flows to the plant are pumped, the recommended peak day and peak instantaneous flow capacity are the same.

Table 3 - Updated Cornwall WWTP Design Basis

Parameter	Updated Design Basis	2005 ESR
Average Day Flow	65,318 m^3/d	65,318 m^3/d
Peak Flow (Note 1)	Up to 160,000 m^3/d [2]	130,000 m^3/d
Peak Flow Factor (Note 1)	Up to 2.45	2.0
BOD_5 Concentration	110 mg/L	180 mg/L
TSS Concentration	165 mg/L	200 mg/L
TP Concentration	4.0 mg/L	5.0 mg/L
TKN Concentration	26 mg/L	n/a

Notes:
n/a – not available
1. Peak Day and Peak Instantaneous
2. Peak Day and Peak Instantaneous shall be 130,000 m^3/d, as a minimum, consistent with the 2005 ESR.

4.4 Technical Memorandum No. 3 – Sewage Pumping Station and Forcemain Review

Technical Memorandum No. 3 (TM3), a copy of which is included in Appendix C, provides a review of the existing sewage pumping station and recommendations for improvements to be included as part of this project. TM3 was discussed with City Staff on August 27, 2009. It was agreed that the following upgrades should be considered for implementation as part of this project.

- Replace all existing pumps with new pumps to provide a firm capacity of 160 000 m^3/day (possibly up to 186 000 m^3/day) and taking into account that minimum flows can be as low as about 16 000 m^3/day. Preliminary modeling indicates that a four pump arrangement with two smaller pumps using VFD's and two larger pumps with constant speed motors will provide the required flow range. Firm capacity would be provided with one large pump out of service. The smaller pumps on VFD would be approximately 257 HP, and the larger pumps approximately 308 HP. Pipe fittings to accommodate the new pumps would require changing. Pump sizes and fittings will be finalized during the next

phase of design for the station upgrades. Sample pump information is included in the Appendix to this memorandum. An opinion of probable cost for replacement of the pumps including modification to fittings to accommodate the larger pump sizes is $337,000 per pump ($225,000 equipment cost plus 50% for installation). This is for pump equipment only and does not include electrical, wiring, or instrumentation and control upgrades.

- Replace the existing screen with a new "coarse" screen to simply protect the pumps. The new screen must be easier to maintain and have a hydraulic capacity of at least 160,000 m^3/day. The new screen is to have 25 mm openings, and may be selected from a number of products for this application including the Flex Rake by Duperon, a back raked bar screen such as the Mahr Bar Screen from Headworks Inc., or a climber type screen such as Degremont's. Finalization of product will be completed through discussions with Cornwall during preliminary design in order to determine the desired screen to minimize maintenance. An opinion of probable cost for replacement of the existing screen including removal of the existing screen ranges from $147,000 to $304,000 depending on screen selection for equipment cost, and with removal of existing screen and installation costs for the new screen, would range from $377,000 to $534,000 overall cost. The three screens previously mentioned were priced. The highest price option for the Climber Screen requires very high head clearance above floor level so may be impractical, but final screen selection will be considered during preliminary design. This is the screen equipment only and does not include electrical, wiring, or instrumentation and control upgrades.
- Replace the existing sluice gate. An opinion of probable cost for replacement of the gate is $37,000 ($25,000 plus 50% installation). This is the gate, stem and actuator only and does not include electrical, wiring, or instrumentation and control upgrades.
- Implement a new fine screening facility at the plant.
- Replace the existing instrumentation and control systems. An opinion of probable cost for replacement is $187,000 including supply and installation costs. This cost assumes that the existing motor starters and most variable speed drives would be replaced. This cost also includes supply and installation of a new PLC panel, all new field wiring and replacement of critical instrumentation. As agreed, costs include programming of the station PLC and the overall integration of the SCADA system by the Contractor, with the associated HMI programming being completed by City staff.

It should be noted that the challenges and costs associated with implementing a bypass around the existing screen are deemed to outweigh the net benefits particularly with the implementation

of a new (and easier to maintain) screen. Therefore, the City does not wish to pursue implementation of a screen bypass at the pumping station as part of this project.

4.5 Technical Memorandum No. 4 – Facility Condition Assessment

Technical Memorandum No. 4 (TM4), included in Appendix D, provides a condition assessment of the existing facility including the pumping station. Repairs and upgrades, which should be undertaken as part of the City's ongoing annual maintenance program over the next several years, are identified in Table 4. The City's annual repair and maintenance budget is approximately $350,000. This should be continued to permit completion of the repairs identified in Table 4 over the next 7 to 10 years.

Table 4 – Repairs to be Undertaken as Part of Ongoing Maintenance Program

Item	**Cost**
Civil	
Roads and Parking	$250 000
Fences	$20 000
CCTV of Existing Sewers	$10,000
Structural and Architectural	
Foundation Walls, Curbs and Cracks	$25 000
Exterior Brick Walls	$25 000
Chlorine Building Roof	$30 000
Decking between Clarifiers	$20 000
Digester Membrane	$250 000
Caulking (Site Wide)	$50 000
Doors	$10 000
Miscellaneous Metals	$100 000
Replace Scum Collection System	$300,000
Mechanical and Process	
Existing Process Piping and Valving	$100 000
Digester Mixing	$400 000
Chemical Systems	$50 000
Raw Sewage Pumping Station Boiler	$85 000
Total	$1,725,000

Repairs and upgrades, which should be undertaken as part of the proposed plant expansion and upgrade, are summarized in Table 5.

Table 5 – Repairs and Upgrades to be Undertaken as Part of the Plant Upgrade/Expansion

Mechanical and Process	
Flow Meter	$50 000
Automatic Grit Removal	$2 000 000
Aeration Blower for Influent Channels and Aerated Grit Tanks	$100 000
New Drives for Chain and Flight Sludge Collectors	$275 000
Sludge Pumping	$125 000
Centrifuges	$750 000
Automatic Cake Conveyor System	$50 000
Electrical	
Service Entrance Duct-Bank	$120 000
MCCs (supply only)	$600 000
Branch Circuit Panels	$60 000
Lighting	$85 000
Grounding	$30 000
Hydro Meter	$20 000
Standby Generators (pumping station and plant)	$600 000
Instrumentation and Controls	
Screening/Raw Sewage Pumping	$187 000
Grit Removal/Chemical Systems	$426 000
Sludge/Scum	$196 000
Digester /Sludge Heating /Boilers /Gas Mixing /Flare	$269 000
Raw Sewage Pumping Station	$85 000
Dewatering Centrifuge/ Centrate/ Conveyors	$246 000
Secondary Treatment Systems	$203 000
Total	$6 392 000

4.6 Technical Memorandum No. 5 – Liquid Train

Technical Memorandum No. 5 (TM5) included in Appendix E, examines and evaluates the existing treatment processes as well as possible secondary treatment technologies for the upgraded plant. These technologies were compared and evaluated to determine a recommended alternative for the upgraded plant. The findings of the 2005 ESR were taken into account, as well as the updated information summarized in TM2. In addition to the primary and secondary treatment process evaluation, a comparison between ultraviolet irradiation (UV) and chlorination/dechlorination technologies was undertaken as they would be applied to the Cornwall Plant.

Based on the results of a preliminary evaluation of liquid treatment train alternatives, both conventional activated sludge (CAS) and biological aerated filters (BAF) were identified to be the top ranked feasible alternatives for the upgraded secondary treatment process. Both alternatives are compatible with the existing unit processes at the current facility and would maximize the use of existing tankage while minimizing the need to retrofit existing equipment. The suitability of both technologies was compared and discussed in detail during a Value Engineering workshop held with Cornwall staff on November 6, 2009. It was determined that because of similar life cycle costing, comparable capital costs, and a more automated system and significantly smaller footprint for BAF, that the BAF technology best addresses the needs of the City of Cornwall, consistent with the preferred secondary treatment technology identified in the 2005 ESR. It was recognized that the CAS process may offer more operational parameters that are adjustable for operators, but this, in the opinion of operators and management for the City of Cornwall, is outweighed by the automated and efficient operation of the BAF process. It was also noted that the BAF process may be more “robust” than CAS during hydraulic loading fluctuations. The BAF supplier, Maximum Daily Flow and Peak Instantaneous Flow design capacity and number of cells required will need to be reviewed and confirmed during design while considering life-cycle costs (including supply and installation costs) and other implementation, operational and maintenance considerations.

It should be noted that both John Meunier and Degremont have confirmed that piloting of their respective BAF technology is not required for this project given the parallel piloting of both the BIOSTYR and BIOFOR technologies carried out in 2004 for similar influent characteristics at the Ravensview WWTP in Kingston. Both suppliers have confirmed that they will provide the necessary Performance Guarantee for the Cornwall WWTP project without piloting. This will enable Cornwall to save approximately $300,000 to $500,000 in piloting costs in addition to saving potential escalation costs associated with a 6-month timeframe delay required to undertake piloting.

Ultraviolet disinfection was recommended as the preferred disinfection alternative due to the simple operation and minimal health risk posed to operations staff and the environment. This recommendation is consistent with the preferred disinfection technology identified in the 2005 ESR. Sizing of the UV disinfection system should be confirmed based on the results of collimated beam testing conducted during the pre-design phase.

4.7 Technical Memorandum No. 6 – Solids Train

The purpose of Technical Memorandum No. 6 (TM6) included in Appendix F, was to conduct a full review of the existing plant's solids stream (primary sludge handling) and to confirm the existing anaerobic digester and centrifuge capacity. Future sludge production rates with the recommended alternative from TM5 were developed and compared to current digester and centrifuge capacities to determine the required solids train improvements. City Staff have affirmed previous indications that maintaining the current dewatering and disposal of biosolids at local landfill is the preferred biosolids disposal strategy.

Based on the results of the preliminary solids treatment train evaluation, one additional digester and additional dewatering capacity is required in order to meet the estimated sludge generation at the updated design basis flows and loadings. These upgrades may potentially be implemented in phases to reduce near term capital costs of the WWTP upgrade. It is recommended that related findings of the facility condition assessment (TM4), and that options relating to a new digester, additional centrifuge(s), and other associated solids train systems and potential staging be evaluated further during design.

4.8 Preliminary Geotechnical Investigation

In July 2009, the City of Cornwall retained St. Lawrence Testing Co. Ltd. to undertake a preliminary geotechnical investigation. This report is included in Appendix G. Key findings include:

- Soil conditions across the site are expected to be consistent and predominantly a gravelly silt and sand with occasional cobbles and boulders. Rock was not encountered at any of the 3 boreholes advanced to elevation 49.5 m±.
- Excavation using conventional construction equipment should be feasible.
- Temporary dewatering using standard sump and pump methods should be adequate. Groundwater infiltration is expected to be minimal. This should be reviewed further during the design phase. It should be noted that a Permit to Table Water (PTTW) from the Ministry of the Environment under the Water Resources Act will be required if the

groundwater volume to be managed during construction is anticipated to exceed 50,000 L/day. This will need to be reviewed further during design.

- The need to anti buoyancy measures is expected to be minimal. It may be possible to control uplift pressures through a permanent dewatering system established at an appropriate elevation. The need for anti buoyancy measures or permanent dewatering arrangements is to be reviewed further during design.
- The bearing capacity at elevation 50 m is 400 KPa at Boreholes 1 and 2, and 200 KPa at Borehole 3, all S.L.S. The U.L.S. values are 50% higher. Assuming that the structures normally rest on a gravel pad, a minimum of 300 mm of Granular "A", compared to 100% Standard Proctor Density is recommended. The bearing on the surface is 200 KPa S.L.S. A geotextile should be provided to separate the glacial till surface from the Granular "A" base.
- The existing soils should not be used as backfill against the proposed tanks. The backfill against the tanks should be quarry stone, either Granular "B" Type 2 or Granular "A", and compacted in maximum 300 mm lifts to 95% Standard Proctor Density. The width of the granular fill should be 1.0 m minimum, placed in 300 mm lifts.
- The K factors of the glacial till at this site are Ka (active) 0.25 and Kp (passive) 7.0. The site class of the glacial till for seismic design is Site Class C.

5.0 VALUE ENGINEERING WORKSHOP

A Value Engineering (VE) Workshop with City Staff and the Ontario Clean Water Agency (OCWA) took place on November 5, 2009. The principle objective was to review the findings from all Technical Memoranda and the preliminary geotechnical investigation with a view of optimizing the overall program and phasing of the works. The following information related to the VE Workshop is included in Appendix H for reference purposes:

- Agenda and Summary Notes
- Preliminary concept drawings for both the Conventional Activated Sludge and Biological Aerated Filter options, based on Average Day Flow of 65,318 m^3/d and a Peak Day Flow of 160,000 m^3/d. The BAF option presented at the workshop was for the BIOSTYR process by John Meunier Inc.
- Preliminary Opinion of Probable cost with the proposed upgrades delineated in two Phases, is summarized below:

	BAF	**CAS**
Phase 1:	$62,184,000[1]	$60,965,000
Phase 2:	$6,846,000	$6,846,000
Total:	**$69,030,000[1] + GST/HST**	**$67,847,000 + GST/HST**

Note 1: The OPC for BAF included an allowance for a redundant cell in addition to the number of cells required for an ADF of 65,318 m^3/d and a PDF of 160,000 m^3/d.

Key decisions made at the VE workshop include:

- Confirmation that BAF (implemented by gravity – no intermediate pumping required) and Ultraviolet Irradiation are the preferred secondary treatment and disinfection technologies to be implemented. Refer to Technical Memorandum No. 5 for details.
- Delete the provision for a redundant BAF cell and reduce the Peak Day and Peak Instantaneous Flow from 160,000 m^3/d to 135,000 m^3/d for the BIOSTYR BAF option, resulting in significant savings.
- Implement new screening facility and associated odour capture and treatment at the plant as part of Phase 1 instead of Phase 2. The new Screening Facility is to include special provisions for a new automated degritting process which may be implemented as part of Phase 2.
- A tunnel is to be provided linking the existing primary clarifier gallery with the BAF Facility. The proposed tunnel location was optimized by relocating it from east of the existing primary clarifiers to directly south of the existing tunnel. This option was deemed to be significantly more cost effective despite construction sequencing and phasing challenges. The proposed tunnel to the new digester complex was also shortened by 10 m.
- The BAF Facility should be implemented as close as possible to the existing chlorine contact tank, consistent with the preliminary BAF concept presented during the VE workshop, to reduce the tunnel length required recognizing that the height of perimeter walls for the BAF cells will need to be increased by approximately 3 to 3.5 m to act as a

retaining wall for the surrounding backfill. This was deemed to be more cost effective rather than moving the BAF Facility south to take advantage of the sloping topography.

- An allowance of $300,000 should be included to replace the existing transformer at the pumping station as part of Phase 1. In addition, the allowance for the new transfer switch at the pumping station was increased from $50,000 to $75,000.
- Various items were either deleted or reduced, such as:
  - No elevator to be provided at BAF
  - No allowance for LEED Certification
  - The allowance to address potential groundwater uplift pressures at the BAF Facility was reduced from $400,000 to $100,000 (plus applicable mark-ups)
  - The $100,000 allowance for temporary shoring between the proposed BAF Facility and the existing Chlorine Contact Tank was deleted.
- Two items were moved from Phase 1 to Phase 2, namely:
  - Replacing the existing flare
  - Installation of a new boiler, if required, as a result of increased heat load.

6.0 PROJECT DESCRIPTION

6.1 Overview

Briefly stated, the works proposed include:

- Various upgrades to the existing Pumping Station to provide a firm capacity of up to 160,000 m^3/d.
- A new screening facility.
- Various modifications to improve the performance and operation of the grit removal system.
- Upgrades to four existing primary clarifiers.
- New Biological Aerated Filters to provide secondary treatment rated for an Average Day Flow of 65,318 m^3/d and a Peak Day/Peak Instantaneous Flow of up to 160,000 m^3/d. This will be reviewed further during design. In any event, the Peak Day/Peak Instantaneous Flow capacity shall be a minimum of 130,000 m^3/d, consistent with the 2005 ESR.

- New Ultraviolet Irradiation Disinfection.
- Implement a 3rd anaerobic digester and associated digester complex expansion.
- New sludge dewatering equipment.
- New Site-wide Electrical, Instrumentation / Control and SCADA system.
- Emergency Back-up Generation System at the Pumping Station and at the Plant.
- Various site improvements.

It should be noted that the plant's average day capacity will be increased by 20% from 54,432 to 65,318 m^3/d to accommodate future growth. Some of the reserve capacity could be used for the Glen Walter Area in the Township of South Glengarry, subject to the necessary approvals being obtained. The average day flow from this area could range from 525 to 1,050 m^3/d based on an Environmental Study Report completed by Totten Sims Hubicki Associates in March 2009 for the Township of South Glengarry. A copy of relevant correspondence from South Glengarry related to this possibility is included in Appendix N.

6.2 Preliminary Site Layout

Figures "BIOSTYR BAF" and 'BIOFOR BAF", included in Appendix I provide preliminary site layout options for both potential suppliers.

A Preliminary Budget Proposal from both John Meunier Inc. for the BIOSTYR BAF is included in Appendix J, whereas the Preliminary Budget Proposal from Degremont Inc. for the BIOFOR BAF is included in Appendix K.

6.3 Potential Effects on the Environment, Mitigation Measures, and Net Effects

A description of possible effects on the environment, caused by the proposed works, as well as proposed mitigation and anticipated net effects are summarized in Table 6:

Table 6: Potential Effects Caused by Proposed Works

POTENTIAL EFFECTS	NOT PROBABLE	PROBABLE	EFFECT	MITIGATION MEASURES	NET EFFECTS
AGRICULTURAL • removal of productive farm land • disruption of field access from public roads • disruption of tile and surface drainage • effect of crops, trees, and vegetation • effect on climate that specialty crops may depend on • effect of property loss (physical) • effect on agricultural area	✔ ✔ ✔ ✔ ✔ ✔ ✔			None required.	
RESIDENTIAL/COMMERCIAL/ INSTITUTIONAL • effects on safety • effects of temporary disruption during construction (e.g. dust, noise, vibration, detours, temporary loss of business, etc.) • effects of property loss (physical and financial) • effects of social stress re: loss of home/business	✔ ✔ ✔	✔	-tive	Dust control measures to be implemented during construction; equipment will have proper exhaust system to reduce noise emissions.	Minimized and mitigated to an acceptable level.
TERRESTRIAL VEGETATION AND WILDLIFE • effect of mortality/stress of vegetation by construction equipment/sedimentation • effect on wildlife habitat and breeding activity • changes in vegetation composition as a result of environmental changes • effect of removal or disturbance of significant woody and herbaceous vegetation and/or rare and endangered flora and/or fauna • possible effects of roadway contaminants on vegetation • new or increased exposure of forest edge with resultant effects of windrow of trees	 ✔ ✔ ✔ ✔	✔	-tive	Vegetation to be maintained is to be protected during construction; measures include sediment and erosion controls.	None anticipated with mitigation proposed.
HERITAGE RESOURCES • disruption and/or destruction of sites, structures, or cultural heritage landscapes having archaeological , historical, architectural or cultural/heritage significance	✔				

Table 6: Potential Effects Caused by Proposed Works

POTENTIAL EFFECTS	NOT PROBABLE	PROBABLE	EFFECT	MITIGATION MEASURES	NET EFFECTS
OUTDOOR RECREATION					
• effects on environmental conditions in a recreation area	✔				
• temporary disruption due to construction	✔				
• effects on operations	✔				
• effects on quality of user experience	✔				
AESTHETICS					
• effects on removal of vegetation/cultural elements	✔				
• changing of compatibility with surroundings					
• adjacent residents exposed to new view	✔				
	✔				
COMMUNITY EFFECTS					
• change in tax base (loss / gain of business)	✔				
• change to water rates to upgrade existing plant		✔	-tive	Impact is being reduced by securing financial assistance from the Federal and Provincial governments.	Impact can be reduced but is not avoidable.
• change to impost rates to recover cost for expanding plant capacity		✔	-tive	None proposed.	Cost to expand plant will be funded through future development.
• effects on quality of life		✔	+tive	None required; Upgraded plant will improve effluent.	
NOISE					
• effects of changes in noise levels due to operation of facility	✔				
• effects of construction		✔	-tive	Construction equipment to have proper exhaust system to reduce noise impacts, construction activities to talk place during time periods stipulated in the local Noise By-law.	Potential impact mitigated to acceptable level.
SURFACE DRAINAGE					
• diversion and/or channelization of watercourses	✔				
• effects on floodplain	✔				
• contamination of surface water		✔	-tive	Erosion and sediment control measures to be implemented to mitigate potential impacts; refueling precautions to be taken to avoid spills	Potential impact mitigated to acceptable level.
• sedimentation of surface water		✔	-tive	Stormwater Management Plan as required to be developed during design and implemented during construction.	Potential impact mitigated to acceptable level.
• increased runoff from new impermeable surfaces		✔	-tive	Stormwater Management Plan to be developed during design and implemented during construction.	Potential impact mitigated to acceptable level.
• effects on downstream users	✔				
• effects on downstream development (i.e. flooding potential)	✔				

Table 6: Potential Effects Caused by Proposed Works

POTENTIAL EFFECTS	NOT PROBABLE	PROBABLE	EFFECT	MITIGATION MEASURES	NET EFFECTS
GROUNDWATER • quantity, quality, and interference with flows and levels	✔				
SOILS GEOLOGY • erosion during construction • erosion after construction		✔ ✔	-tive -tive	Erosion and sediment control measures to be implemented during construction to mitigate potential impacts. Stormwater Management Plan to be developed during design and implemented during construction.	Potential impact mitigated to acceptable level. Potential impact mitigated to acceptable level.
TOPOGRAPHY/LANDFORMS • scarring of unique land forms	✔				
CLIMATIC EFFECTS • effect of vegetation removal on snow accumulations adjacent to facility • change in air quality through addition or removal of particulates, gases, odours	✔ ✔				
FISH, AQUATIC WILDLIFE, AND VEGETATION • effect of vegetation removal • change in water quality/temperature • effects of timing of construction activities on spawning and breeding periods	✔ ✔ ✔				
TRAFFIC • effect of traffic during construction • effect of traffic after construction	 ✔	✔	-tive	Potential traffic impacts to be assessed during design. Construction access will be limited to Montreal Street.	Potential impact is unavoidable but acceptable; Montreal Street is a major City roadway.

6.4 Opinion of Probable Capital Cost

A Preliminary Opinion of Probable Cost to upgrade and expand the existing Cornwall WWTP is included in Appendix L. As summarized below, the works can be implemented in two Phases. Phasing is to be reviewed further during design and will be subject to the City's budgetary constraints.

Phase 1:	$60,715,000
Phase 2:	$3,983,000
Total:	**$64,698,000**

The above is considered between a Class D and Class C estimate and should be considered accurate to within + 50%/-30%. A Class D estimate is based on little to no site information and indicates the approximate magnitude of cost to meet the client's broad requirements. A Class D estimate should be used to obtain project approval in principle and for discussion purposes.

A Class C estimate is prepared with limited site information and is based on probable conditions affecting the project. It represents the summation of all identifiable project component costs. It is used for program planning, to establish a more specific definition of client needs, and to obtain approval-in-principle. The estimate above is expressed in 2009 dollars. It includes a 10% Contingency Allowance but excludes the proposed 13% Harmonized Sales Tax which is scheduled to take effect on July 1, 2010. It also does not include the City's internal costs.

6.5 Implementation Schedule

Subject to the City of Cornwall securing the necessary pre-construction approvals and the necessary funds, the proposed works will be implemented over the next several years, as summarized below:

	TENTATIVE (subject to funding being secured)
• Preliminary Design & Preselection of Major Equipment Suppliers	March 1 – Dec. 31/10
• Detailed Design & Preparation of Contract Drawings & Specs	Jan. 1 – Dec. 31/11
• Tendering and Contract Award:	Jan. 1 – Apr. 30/12
• Construction:	May 1/12–Aug. 31/14
• Start-up of Operations:	September 1, 2014

7.0 MONITORING/RECOMMENDED UPGRADES AND OPINION OF PROBABLE COST

7.1 During Construction

All construction activities are to be monitored to ensure adherence to the drawings and specifications including implementation of various mitigation measures identified for the proposed works.

7.2 After Construction

A Certificate of Approval issued under the Ontario Water Resources Act by the Ministry of the Environment will be required prior to constructing the proposed works. In addition, a Certificate of Approval issued under the Environmental Protection Act will be required for the proposed emergency back-up generation systems.

These Certificates of Approval will include a number of requirements related to plant operation, monitoring, performance, and reporting to ensure that the plant's performance is in accordance with applicable requirements and the various pre-construction approvals obtained. An annual report will be prepared to document the plant's performance and monitoring results for review by the Ministry of the Environment.

8.0 PRE-CONSTRUCTION APPROVALS

A number of approvals are required prior to implementing the proposed works. These include:

- Obtaining a Certificate of Approval (Sewage) from the Ministry of the Environment pursuant to the Ontario Water Resources Act.
- Obtaining a Certificate of Approval (Air) from the Ministry pursuant to the Ontario Environmental Protection Act.
- Site Plan Approval from the City pursuant to the Ontario Planning Act.
- Building Permit from the City pursuant to the Ontario Building Code.
- Screening of the project in accordance with the requirements of the Canadian Environmental Assessment Act may be required, given the proposed Federal Funding.

9.0 CONSULTATION ACTIVITIES

Various Consultation activities were carved out with the public, appropriate agencies and First Nations while preparing the 2005 Environmental Study Report.

A Public Information Centre was hosted by the City on January 21, 2010 to provide an overview of the proposed works in light of the ESR Addendum. Notice for this meeting was published in the local newspaper and sent to all stakeholders who were on the contact list when the original Environmental Study Report was completed in 2005. Display Panels, an Information Handout, and a Questionnaire/Comment Sheet were available at the PIC. A total of 12 individuals signed the meeting attendance record. A copy of the relevant information for the PIC and the only Comment Sheet received is included in Appendix M.

It should be noted that the Township of South Glengarry requested that the ESR Addendum include a provision for the connection and the assigning of capacity to South Glengarry pursuant to recommendations developed through the Glen Walter Area Water and Wastewater Servicing Master Plan. A copy of the relevant correspondence from the Township of South Glengarry is included in Appendix N.

10.0 OUTSTANDING ISSUES/CONCERNS AND POSSIBLE COURSE OF ACTION – REQUEST FOR PART II ORDER

Changes to the 2005 ESR as a result of this Addendum are specifically:

- The Peak Day and Peak Instantaneous flow capacity for the pumping station and upgraded treatment plant may be increased from 130,000 up to 160,000 m^3/d. This will be reviewed further during the design phase based on Value Engineering and a Comprehensive Cost-benefit analysis.
- Effluent Objectives and Limits were clarified, as summarized in Section 4.2 and approved by the Ministry of the Environment.
- The anticipated Capital Cost to implement secondary treatment, non-toxic disinfection and various directly related improvements is $60.7 Million + Taxes, as Phase 1 of the Project. Other improvements, at an estimated cost in the order of $4 Million + Taxes, may be undertaken as part of Phase 2 at the City's discretion, subject to funding and budgetary constraints. The City has secured approximately $37 Million in funding from the Federal and Provincial governments combined.

If concerns regarding the specific changes cannot be resolved through discussions with the City of Cornwall, a person or party may request that the Minister of the Environment make an order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which addresses individual environmental assessment. Request for consideration of a Part II Order must be received by the Ministry of the Environment (MOE) during the 30-day public review period of the ESR Addendum. The Minister determines whether or not a Part II order is necessary, with the Minister's decision being final.

It is important to note that the Minister will not consider requests made or received after the 30-calendar day review period. It is recognized that resolution of concerns directly between the City and the party/person raising the concern is always preferable to having the Minister make a decision to issue a Part II Order. If serious concerns are raised late during the 30-day review period, the City will attempt to resolve and address the issues, even if it means that the 30-day review period for this particular party/person may be exceeded. This is consistent with the pre-approved Class EA process. As part of the discussions in this case, the City and the party/person should agree to attempt to achieve a satisfactory resolution of the issues/concerns for a specified period of time. Should the issues remain unresolved after the agreed period of time, a request for Part II Order by the particular person/party can be made to the MOE within a further 7 days.

The MOE's Environmental Assessment and Approvals Branch have 45 days to review the information and prepare a report for the Minster's consideration. The 45-day period commences after the 30-day public review period lapses. In the event that additional information is required to assist the Minister in making a decision, the remainder of the 45-day time limit no longer applies. In this case, within 21 calendar days of receiving the additional information satisfactory to the MOE, a recommendation by the MOE's Environmental Assessment and Approvals Branch shall be made to the Minister.

The Minister is required to issue its decision within 21 calendar days of receiving a recommendation from the MOE's Environmental Assessment and Approvals Branch.

In making a decision, the Minister has three options:

1. Deny the request. In some cases the request may be denied with conditions which must be satisfied while implementing the project.
2. Refer the matter for Mediation.
3. Issue a Part II Order.

Anyone who has concerns about this project should provide written comments to:

Morris McCormick, P. Eng.
Division Manager
City of Cornwall, Environmental Services
861 Second Street West
P.O. Box 877, Cornwall, ON K6H 5T9

If concerns cannot be resolved, a request for a Part II Order may be sent to:

Minister of the Environment
135 St. Clair Avenue West, 10th Floor
Toronto, Ontario M4V 1P5

APPENDIX A

TECHNICAL MEMORANDUM NO. 1B

ASSIMILATIVE CAPACITY ASSESSMENT OF THE ST. LAWRENCE RIVER

APPENDIX B

TECHNICAL MEMORANDUM NO. 2

RAW WASTE WATER CHARACTERIZATION

APPENDIX C

TECHNICAL MEMORANDUM NO. 3

SEWAGE PUMPING STATION & FORCEMAIN REVIEW

APPENDIX D

TECHNICAL MEMORANDUM NO. 4

FACILITY CONDITION ASSESSMENT

APPENDIX E

TECHNICAL MEMORANDUM NO. 5

LIQUID TRAIN

APPENDIX F

TECHNICAL MEMORANDUM NO. 6

SOLIDS TRAIN

APPENDIX G

PRELIMINARY GEOTECHNICAL INVESTIGATION

APPENDIX H

VALUE ENGINEERING WORKSHOP

APPENDIX I

PRELIMINARY SITE PLAN LAYOUTS

APPENDIX J

JOHN MEUNIER INC. BUDGET PROPOSAL

(BIOSTYR BAF)

APPENDIX K

DEGREMONT INC. BUDGET PROPOSAL

(BIOFOR BAF)

APPENDIX L

PRELIMINARY OPINION OF PROBABLE COST (POST VALUE ENGINEERING)

APPENDIX M

JANUARY 21, 2010, PUBLIC INFORMATION CENTRE

APPENDIX N

CORRESPONDENCE FROM THE TOWNSHIP OF SOUTH GLENGARRY