TO:	**GENERAL COMMITTEE**
SUBJECT:	**BIOSOLIDS STORAGE FACILITY: ELECTRICAL UPGRADES FUNDING REQUEST AND MIXER UPGRADES ADDITIONAL FUNDING REQUEST**
WARD:	**ALL**
PREPARED BY AND KEY CONTACT:	**G. KING, P. Eng. PMP SENIOR PROJECT ENGINEER – ENVIRONMENTAL (4532)**
SUBMITTED BY:	**R. SUTTON, P. Eng. DIRECTOR OF ENGINEERING** **J. THOMPSON, P. Eng., CMM III IP, PMP DIRECTOR OF ENVIRONMENTAL SERVICES**
GENERAL MANAGER APPROVAL:	**D. FRIARY GENERAL MANAGER OF INFRASTUCTURE AND GROWTH MANAGEMENT (ACTING)**
CHIEF ADMINISTRATIVE OFFICER APPROVAL:	**M. PROWSE, CHIEF ADMINISTRATIVE OFFICER**

RECOMMENDED MOTION

1. That a project entitled Biosolids Storage Facility Hydro Upgrades be added to the 2018 Capital Plan with an approved project budget of $3,290,000 and fully funded from the Wastewater Capital Reserve (12-05-0575) with the expected timing of expenditures as per Appendix “G” to Staff Report ENG008-18.

2. That the approved multi-year funding of $3,896,800 for the existing Biosolids Storage Facility Replacement of Mixers Project be increased by an amount of $1,603,200 to be funded from the Wastewater Capital Reserve (12-05-0575), for a total project cost of $5,500,000 with the expected timing of expenditures as per Appendix “H” to Staff Report ENG008-18.

3. That the General Manager of Infrastructure and Growth Management be authorized to enter into an agreement with Hydro One to upgrade the Oro-Medonte Township, 7th Line power line, subject to concurrence from the Director of Legal Services.

PURPOSE & BACKGROUND

4. The purpose of this Staff Report is to respond to the following motion:

> “That motion 17-G-143 of Section “E” of the General Committee Report dated May 29, 2017 concerning the Capital Project Status Report be amended by deleting the words “refer Project 1659 concerning the Biosolids Facility Storage Tank Mixer Replacement to the Community Services Committee for further discussion” in paragraph 2 and replacing them with the words “refer Project 1659 concerning the Biosolids Facility Storage Tank Mixer Replacement to staff for a report back to General Committee”.

5. The Biosolids Storage Facility (BSF) is operated by the City's Wastewater Operations Branch (WWOB) and is considered to be an essential service facility for the City, with strict legislative, regulatory and environmental compliance and permitting requirements. It is located on Barrie owned lands in Oro-Medonte as shown on the Location Plan in Appendix "A". The BSF site and its main components are shown in Appendix "B".

6. It's the responsibility of WWOB to ensure wastewater performance limits and regulatory compliance requirements are met at all times. This includes: performance to rated capacities, treatability requirements, flow rates, mixing suspension, supernatant quality, and solids content since the ultimate biosolids end product is beneficial for agriculture land application in accordance with the Nutrient Management Act. All Biosolids Storage Facilities for municipalities must be equipped with continuous process monitoring and recording devices with alarms as prescribed in Ontario Regulation 170/03.

7. In addition, The Nutrient Management Act (NMA), through Section 52.3 of Ontario Regulation 267/03 General, prohibits the land application of sewage biosolids during the restricted period defined as December 1 in any year to March 31 the following year and at any time the soil is snow covered or frozen. To comply with these requirements, and to allow for the periodic suspension of land application due to wet weather conditions and/or agricultural cropping practices, the facility in Oro-Medonte needs to provide biosolids storage for up to 240 days.

8. The City of Barrie has implemented an extremely successful award winning biosolids land application program and the resulting stabilized biosolids produced through Barrie's wastewater treatment process are in high demand by many farm operators in the surrounding agricultural community.

9. The City of Barrie is committed to developing a long term Biosolids Management Plan that will include additional biosolids storage in relation to the 102MLD expansion, which is anticipated to be needed by approximately 2031.

10. The City's Biosolids Management and Contingency Plan (BMCP) was last updated in 2012 as part of the Secondary Plan and Master Plan work associated with the intensification and annexed lands. A total of ten (10) alternative biosolids management approaches were evaluated including the following:

    - Increase solids concentration and land application
    - Expansion of existing biosolids storage facility and land application
    - Composting
    - Incineration
    - Lystek process
    - N-Viro process

11. The BMCP concluded that increasing the solids concentration of the stabilized biosolids and disposal of the material through a land application program was the preferred solution as the City grows.

12. There is currently a regular BMCP update underway. The research has found that in the foreseeable future that the vast majority of municipalities will continue with their Biosolids land application program. There is no indication that this will change over the foreseeable future. To reduce the chances of this practice changing, a good quality Biosolids must be produced that is in demand for agricultural purposes. In providing the farmers with good quality Biosolids the City will likely avoid larger, much more expensive, disposal processes and equipment (eg. incineration, landfill, etc.).

13. The BMCP will be proposing that the City continue to investigate and implement wholesome solution(s) that increase the biosolids solids concentration at the Wastewater Treatment Facility (WwTF), thereby reducing the biosolids volumes to be transported. Based on the recommendations of BMCP, staff will bring forward future projects for consideration under the capital planning process, which will include business cases, capital costs estimates, operating costs estimates, etc.

14. As a result of implementing the aforementioned projects, due to the reduction in water, there will be reduced haulage volume which is anticipated to lead to a reduction in haulage costs, notwithstanding inflationary pressures and market conditions. A reduction in haulage costs is anticipated in late 2022.

15. At a high level, the following are the essential elements of the implementation plan, subject to funding approval:

    a) Upgrade both Hydro One service and City electrical facilities (Construction 2018 and 2019);

    b) Retrofit BSF storage tanks with new jet mixing system (2019, 2020 and 2021); and,

    c) Install solids reduction equipment at WwTF (Design 2020 and 2021; Construction 2022).

16. It is noted that the BSF Mixer upgrade project has been previously approved, however flexibility has been provided for the anticipated future reduction in biosolids volume.

17. From year to year the process mixing demand and storage requirements varies depending on inclement weather. The table below shows how many days that the 244 day/year spreading seasons have been affected. Specifically for the 2017 year, due to the wet summer, the amount of available days has reduced the season by approximately 18%. This will likely not improve due to factors such as climate change.

YEAR (April 1 to Nov 30)	NO ACCESS TO FIELDS (# DAYS)
2014	36
2015	31
2016	7
2017	44

18. Batch processing has been an acceptable management method over the past 20 years. Each of the storage tanks needs to be separately managed, tested and tracked. Recognizing that there are pressures that are affecting the spreading opportunities, WWOB investigated other strategies to reduce staff effort and to improve biosolids management.

19. New provisions to the NMA permit a continuous processing mode rather than a batch processing mode. The adoption of the continuous processing mode has led to a more consistent homogeneous material. This innovation allows for the biosolids to be blended from each of the storage tanks and therefore reduces the staff effort in managing the tanks separately. The testing of material has been adjusted so there is less opportunity for error while remaining compliant with the NMA and takes advantage of limited spreading opportunities.

20. The continuous processing typically requires the concurrent use of three (and preferably four) storage tanks, from the previous batch process which only needed one tank mixed at a time. To continue implementing this preferred solution, two main concerns need to be addressed. The most critical improvement to address related to the BSF is the current insufficient electrical supply. The second issue that is to be addressed is ensuring adequate biosolids mixing in order to accommodate the current biosolids volumes as well as those attributable to a growing population.

Electrical Supply Upgrades

21. The power supply requirements were reviewed as part of ongoing work at the BSF. The 8.4 KV main supply is owned by Hydro One. It originates from a transformer station east of Highway 11, then traverses over Highway 11, along Line 7 North in Oro to the BSF property line. A distance of approximately 2.4 km. The power is then conveyed overhead from the BSF property line to two-500 kVa transformers. The south transformer services the south portion (post 2007) of the plant and is sized accordingly. The north transformer services the original site and the pre-2007 buildings and structures.

22. Within the BSF, it was found that the north 500 kVa transformer has an operating demand of 600 kVa, which exceeds the best practice design of a 20% buffer (ie. 500 kVa of which the 20% would reduce the recommended operating capacity to 400 kVa) for the transformer loading. Note that the operating demand accounts for a practical sizing approach. For example, it is acknowledged that a stand-by pump will not operate at the same time as a duty pump, therefore only one of these loads is included in the operating demand calculations.

23. The incoming power stresses the existing unprotected equipment and the impacts are exasperated if the transformer has reached its maximum and there is no available buffer (ie. power operating in excess of 80%).

24. In addition, the following two incidents occurred that demonstrated the vulnerability that exists to the facility.

    a) On July 17, 2014 there was a power surge incident that damaged 6 of the 7 VFDs for the pumps and one transient voltage suppressor. The replacement cost was approximately $200,000.

    b) On Oct 23, 2014 a power fuse shut-down on the Hydro One line scorched a variable frequency drive. The replacement cost was approximately $ 42,000.

25. In response, a power quality study was undertaken by Anacom in response to the process equipment damage due to a power supply spike from the Hydro One line. The report identified deficiencies/additional requirements with the existing electrical infrastructure, including dirty power, external grounding, transient filtering surge protection devices and harmonically filtered power factor correction banks.

26. Recognizing there is insufficient power supply available, WWOB has compensated by implementing changes to their planning and operating practices. For example,

    a) Additional diesel pumps are being utilized to transfer biosolids from tank-to-tank.

    b) Maintenance activities (eg. washing tank covers) have to be timed to avoid the truck loading periods.

    c) Supernatant mixing in the lagoons is limited and is done with diesel pumps.

d) Currently using only three storage tanks due to limited power for the mixers. The fourth tank is being used for another purpose that doesn't require mixing however this fourth tank will need to be reactivated for biosolids storage since the biosolids volumes are increasing.

e) Double pumping is required in some instances.

f) Restrictions on process improvement and innovative pilot projects may be placed on hold until additional power is in place.

27. The consultant determined that:

> "The current BSF 500 kVA transformer and the existing MCC (MCC-BS-1) electrical system is not suitably sized for operating four biosolids storage tanks mixing systems (four tanks x four mixers) concurrently along with the additional station ancillary loads."

28. Hydro One advised that the current 8.4 KV supply could not provide the additional power that is needed to support the current BSF needs and therefore a new 44 KV transmission feeder and associated sub-station would need to be constructed.

29. Once it was determined that there is insufficient power, it was anticipated that the needed electrical upgrade would be considered as part of the mixer upgrades project. However as the projects developed it was concluded that the insufficient power issue was the most critical of the two projects to be resolved and therefore the projects were separated.

30. The electrical upgrades are needed to address the current power requirements. In addition proposed projects will not be able to move forward such as: The Mixer Upgrades; Lagoon Hydraulic upgrades and overflow protection; and Pilots for Innovative projects. Power is not only needed for the installed works but for contractors' construction equipment.

31. The cost estimate of the electrical upgrades is $3,290,000 (including capital, engineering, non-fundable HST, contingencies and agreements) with the scope of work as follows:

a) Upgrades to the Hydro One Power Supply – The power supply line needs to be upgraded by Hydro One, which will have to be paid for by the City. It would then be the City's responsibility to upgrade the 1 km length of internal power line including a new upsized substation. These upgrades are required in 2018 to support the current and future power requirements of the BSF.

Biosolids Mixing Upgrade

32. Aside from the four (4) circular concrete storage tanks (circa 1999), the main pieces of equipment are the four mixers per tank, for a total of 16 mixers. The purpose of the mixer equipment is to create a homogenous slurry by keeping the heavier solids from settling to the bottom of the storage tanks. If this is not achieved, the heavier solids cannot be pumped out of the tank without an increase in effort and adding additional water which reduces the total available operating storage volume.

33. The 16 original mixers were originally installed in 1999, making them 18 years old. Their life is approximately 12-15 years and they are requiring increased maintenance due to the harsh environment that they are immersed in. Since they were at the end of their life cycle, it provided opportunity to holistically review the mixing system and to modernize.

34. Eight mixers have been replaced due to failure in the years as indicated below:

	# of Mixer Replacements	# of Maintenance calls
2012	1	56
2013	2	35
2014	1	1
2015	1	5
2016	2	3
2017	1	2

35. As seen in the above table, failures have been reduced as a result of changes to operational practices after 2013, however this reduced the biosolids storage tank mixing performance. In doing so, this results in additional costs and inefficiencies.

36. The WWOB is continuously undertaking successful process improvements including initiating strategies to increase the concentration of stabilized biosolids (ie. reduce the amount of water in the raw sludge) at the WwTF. By reducing the amount of water hauled in the biosolids that are transported to the BSF, the City can minimize the operational haulage costs which were budgeted at $1,620,000 in 2017.

37. The objectives of the Biosolids Mixer project, coupled with the WWOB projects, are to install an effective mixing system so that there is a:

    a) Consistency in quality biosolids being applied to the fields;

    b) An opportunity to implement future sludge dewatering projects to reduce haulage costs, which in turn reduces overall operating costs; and,

    c) Improvements to maintenance activities, including health and safety, longevity of equipment, etc.

38. In 2016, the pre-design phase for the Biosolids Storage Facility Replacement of Mixers was conducted by the engineering consulting firm GHD. Their scope included detailed studies, condition assessments, operational input, constructability, capital costs refinements, and a life cycle analysis.

39. During the study phase assumptions were made that were subsequently developed and refined. The computational fluid dynamics modelling concluded that vertical mixing was the most critical deficiency that was preventing homogeneous mixing with the existing mixers. Further evaluation was undertaken with several potential solutions such as, submersible mixers, draft-tube mixing, and a new innovative linear motion mixing. A pumped (jet) mixing type of system was selected as the preferred solution due to factors such as:

    a) Proven mature technology

    b) Operator familiarity

    c) Variable operating depth

    d) Equipment access

    e) Mixing effectiveness

f) Roof modifications due to increased equipment loads

40. Construction estimates were developed with the information that was known at the time and included reasonable percentage allowances for contingencies.

41. As more details became known and options investigated, it became apparent that several components of the study estimate needed to be adjusted to reflect the overall project scope, such as:

a) Additional 600 mm diameter interconnecting pipe and valving will allow increased opportunities for optimization and energy efficiencies. This increase is estimated to be $750,000.

b) It was found that original study estimate could not support the consolidated project needs after considering the studies, options, evaluations, computer analyses, technical memos, health & safety mitigations, operator's input, maintenance inputs, flexibilities, energy considerations (ie. variable frequency drives), cost cutting, value analysis and market feedback. In this case the scope refinements are beyond the typical contingencies that were carried. The increase for the scope refinements is estimated to be $900,000.

42. Currently the detail design is ongoing, however due to the above noted cost estimate adjustments there is a need to seek additional funding at this time through this Staff Report.

ANALYSIS

43. Although the mixer project was previously approved, it was recognized that the additional costs may affect the intended benefits of the project. To confirm that the project remains beneficial a strengths/ weakness/ opportunities/ threats (SWOT) analysis was undertaken.

SWOT Analysis

44. A SWOT Analysis was undertaken by the City and the Consultant on March 17, 2017 to consider Non-monetary factors. Two options were analyzed:

a) Option 1 - Upgrade Hydro and mixers now

b) Option 2 - Upgrade Hydro in 2018 and then subsequently upgrade mixers

45. The SWOT analysis summary is found in Appendix "C". A sample of the pertinent findings from the SWOT analysis include:

a) Existing mixing system does not meet operational requirements, as the typical practice is to mix more than one tank at a time. This can't be done now because of limited power however the operators have developed work-arounds but it requires increased time and effort.

b) As confirmed by the computer modelling the new mixing system provides complete mixing under "non-settled" conditions. A consistent good quality product has to be supplied to the farmers so that the City preserves access to these privately owned fields and meet our regulatory requirements.

c) Currently at the end of the application season, each of the four circular 9,600 m3 tank has 2500-3000 m3 of sludge that needs to be cleaned out manually due to high solids concentrations that have settled and can't be re-suspended. The loss of a mixer would worsen this situation. This reduction in operating volume equates to approximately 1 full storage tank. This heavier material cannot be applied to the fields and therefore has to go through an extra step that includes the combination of the following: Screening, landfilling, disposal at a specialized Environmental recycling facility and remixing. The aforementioned extra steps for each of the four tanks all require additional effort, costs and reduce volume in the landfill.

d) Since the proposed mixers are mounted externally to the tank, confined space entries by personnel are reduced thus reducing potential health and safety issues associated with the operation of the facility.

e) Due to the well mixed biosolids the maintenance shutdowns, cleaning, and tank offline periods will decrease.

f) Revised piping and valving configuration will allow for streamlined transferring of biosolids from tank-to-tank.

46. The SWOT analysis concluded that Option 1 would provide the best value for the City, thus reinforcing the life cycle analysis and the operating cost avoidance.

47. It is therefore recommended that the Biosolids Storage Facility Replacement of Mixers project, should continue to move forward as it meets the previously stated objectives, which are:

a) Consistency in quality biosolids being applied to the fields;

b) An opportunity to implement future sludge dewatering projects to reduce haulage costs, which in turn reduces overall operating costs; and,

c) Improvements to maintenance activities, including health and safety, longevity of equipment, etc.

ENVIRONMENTAL MATTERS

48. The following environmental matters have been considered in the development of the recommendation:

a) Biosolids land application provides the greatest environmental benefits when compared to other alternatives such as, incineration or land filling.

b) Biosolids land application is a publically accepted environmental practice that benefits agricultural landowners, noting however that they require biosolids that are high quality, free from debris and homogeneous.

c) The City is strategically planning its infrastructure so that future projects can consistently reduce transportation and energy costs (ie. future operational cost avoidance).

d) The proposed hydraulic jet mixing system will incorporate variable frequency drives that allow the BSF operators to adjust and optimize the power requirements as needed. This will reduce the energy impacts.

ALTERNATIVES

49. The following alternatives are available for consideration by General Committee:

Alternative #1 General Committee could choose to approve the funding for the Electrical Upgrades, not approve the additional funding for the Mixer Upgrades and replace the remaining aging mixers with the same technology in 2018. The following would need to be undertaken:

a) Complete design of approved mixer upgrade project however postpone construction phase to a later date.
b) Replace the remaining aging mixers in 2018/19 at a cost of $400,000 to be added to the 2018 Business Plan since they are continuing to fail at this time and thus reducing the mixing system effectiveness.
c) Install larger pumps/mixers to boost mixing however this solution was previously investigated and it was determined that it would not solve the insufficient mixing.

This alternative is not recommended as the mixer upgrade project will **not meet** its objectives of:

a) Consistency in quality biosolids being applied to the fields.
b) Reduction of haulage costs, which in turn reduces overall operating costs.
c) Improvements to maintenance activities, including health and safety, longevity of equipment, etc.

Alternative #2 General Committee could choose to postpone the BSF Electrical Upgrades to 2028 (ie. future 102 MLD Expansion) and thereby also postponing the mixer upgrades. The following would need to be undertaken:

a) Complete design of approved mixer upgrade project however postpone construction phase to a later date.
b) Replace the remaining aging mixers with the same technology in 2018 at a cost of $400,000 to be added to the 2018 Business Plan.
c) Implement an Electrical Holding Strategy under a separate project at a cost of $750,000.
d) Construct electrical upgrades in approximately 2027 prior to the future 102MLD WwTF Expansion

This alternative is not recommended as the insufficient electrical supply issues will continue. The Electrical Holding Strategy will only assist in protecting the BSF but will not address the lack of electricity being supplied. In addition, the following will likely be experienced:

a) The potential of several more variable frequency drive failures, potentially to total in excess of $500,000.
b) Failure on one or more occasions to meet regulatory requirements.
c) Generators will need to be leased and electrical modifications made to the internal electrical infrastructure to ensure the electrical demands are met. This would be a long term lease until 2027.

FINANCAL

Electrical Supply Upgrades

50. The total capital cost for the BSF Electrical Upgrades project is $3,290,000 and includes Hydro One Works and the internal power design, construction administration, construction, contingencies, and non-refundable HST. The budget breakdown is provided in Appendix "D".

51. There is a potential for a cost sharing arrangement with the adjacent property owners to contribute to the costs for the proposed new upgrades to the Hydro One 7th Line Power Line. If cost contributions are achieved, the proceeds would be directed to the funding sources originally used to fund the project.

52. The 102 MLD Expansion Works planned for 2029 will be eligible for development charges (DC). As such, the associated electrical upgrades on the 7th Line should be also be DC eligible. The electrical upgrades were not considered in the 2014 Development Charges Background Study but will be included in the upcoming study revision.

Biosolids Mixing Upgrade

53. The total 2018 approved budget to date is $1,948,000 and current spent to date is $ 339,370. Total approved budget including futures year budget is $3,896,800. The project also has $55,413 of commitments outstanding.

54. The current costs associated with the BSF Mixer Upgrade project have been included in the 2018 Business Plan of $3,896,800. However, the total capital cost for this project is $5,500,000 and includes design, construction administration, construction, contingencies, and non-refundable HST. The new budget breakdown is provided in Appendix "E".

55. This project was submitted for consideration under the Municipal Green House Gas Challenge Fund. As an update, the City was advised that we were unsuccessful.

56. The current funding sources for these projects that are to be applied to this project are identified in Appendix "F".

57. The proposed cash flows for Hydro Upgrades and Mixer Upgrades projects are provided in Appendix "G and "H", respectively.

LINKAGE TO 2014-2018 STRATEGIC PLAN

58. The recommendation(s) included in this Staff Report support the following goals identified in the 2014-2018 Strategic Plan:

☒ Responsible Spending

59. By continuing to meet regulatory requirements the City will not be subject to fines and/or charges.

60. By continuing to provide quality biosolids for land application to the agricultural landowners the City can:

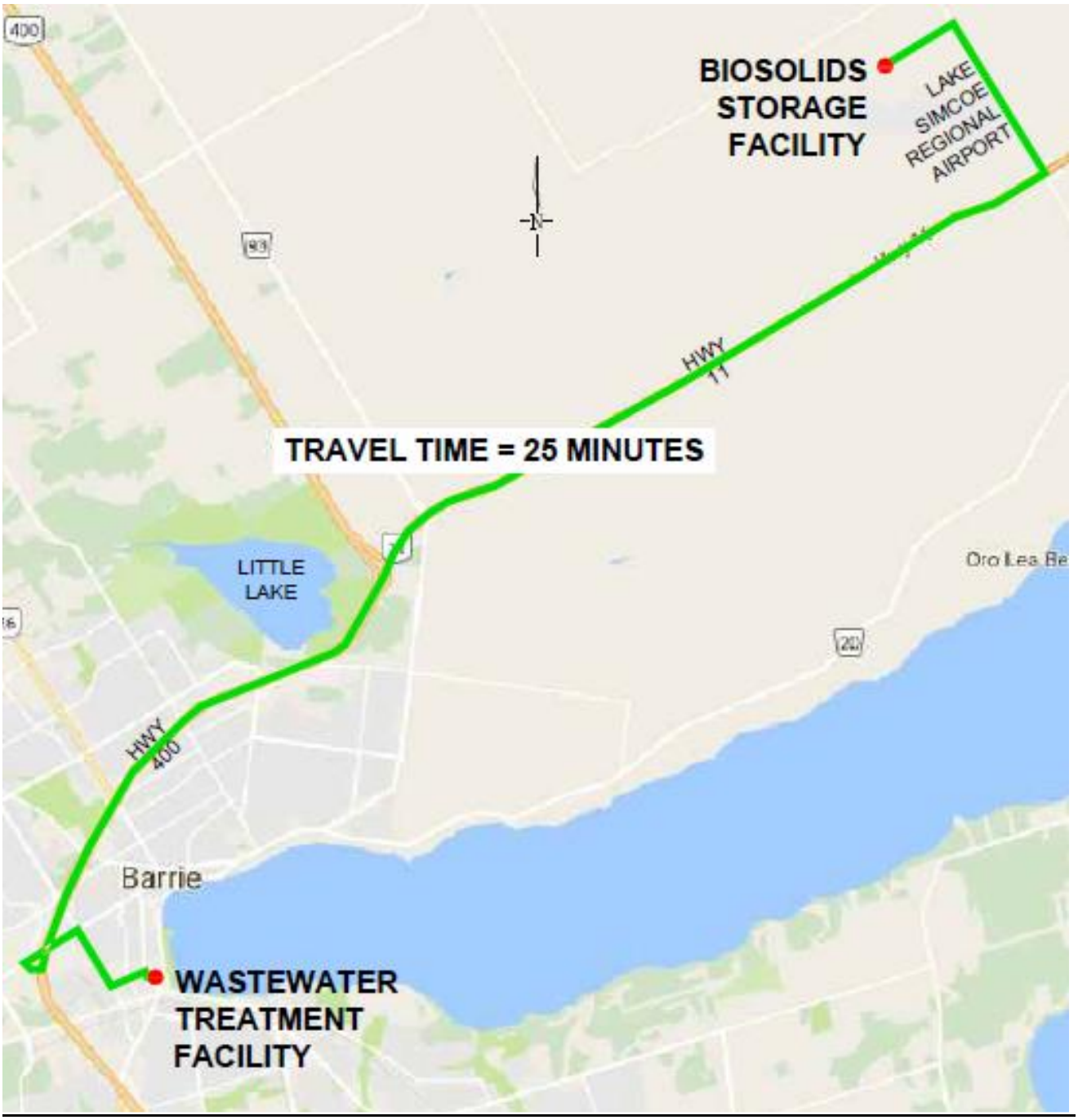
a) Dispose of the Biosolids in the most cost effective manner;

b) Avoid the depletion of its valuable landfill space or; and,

c) Avoid having to implement incineration.

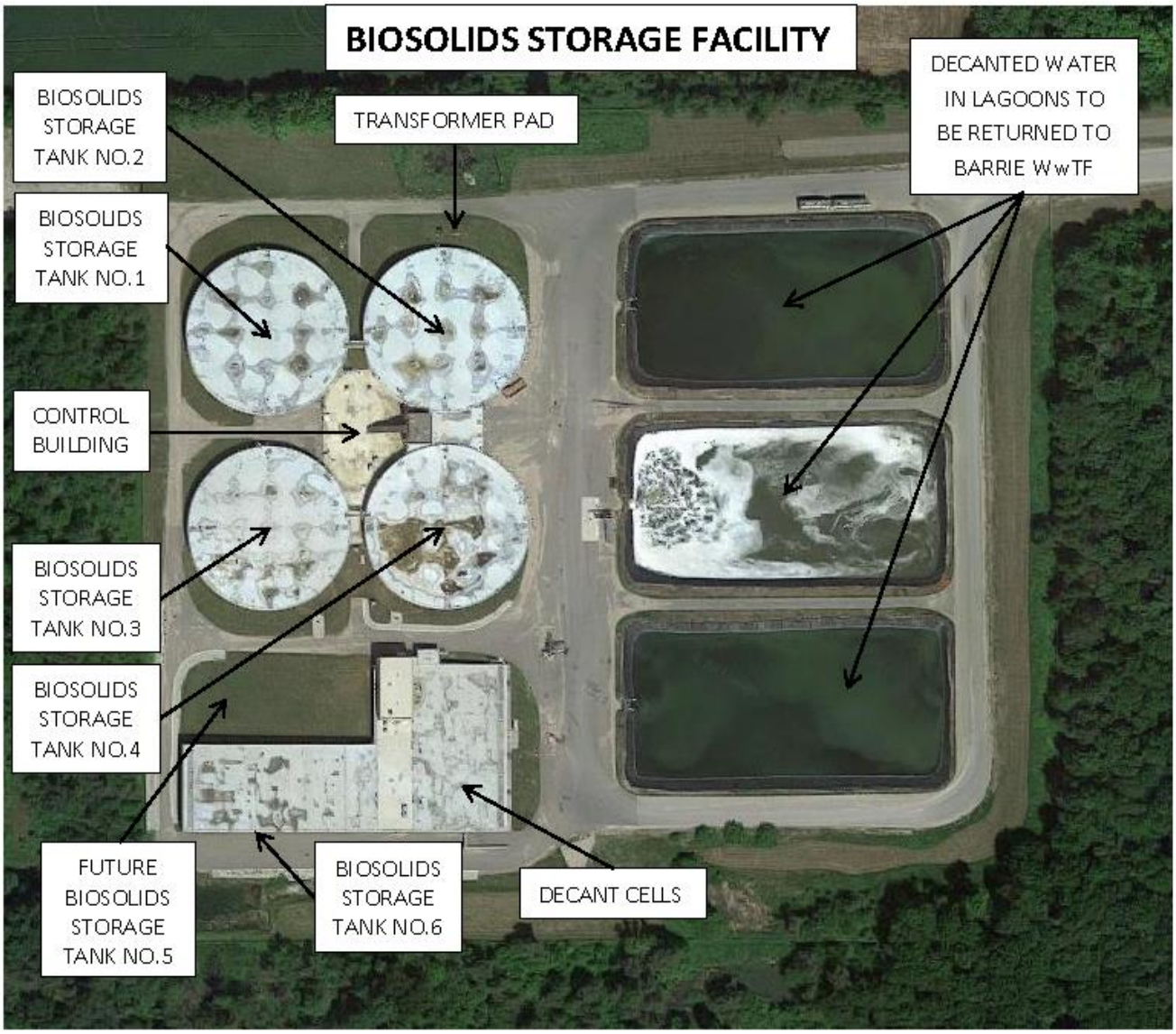
APPENDIX "A"

Location Plan



APPENDIX "B"

Biosolids Storage Facility Site Map



APPENDIX "C'

	Strength Going Forward:	Weakness Going Forward:	Opportunity Going Forward:	Threats Going Forward:
Technical	• Jet mixing technology employs a series of strategically placed nozzles throughout the tank, with a mixing pump to provide the energy to heterogeneously mix the tank contents. • The Jet Mixing system provides complete mixing under "non-settled" conditions (as shown in CFD model). • Mixing is effective for tank geometry (Diameter/Height > 6) and internal tank interferences (columns, piping) are accommodated. • Jet mixing accommodates tank level variations which occur during Biosolids and supernatant withdrawal. • Jet mixing pump is mounted externally to the tank, in the basement Pump Room. • Jet mixing is a proven mixing technology that is suitable for the tanks at the BSF. • Jet mixing is familiar to WWOB. • No external tank or roof structural modifications are required. • Existing propeller mixers do not perform adequately resulting in additional operating, maintenance and cleaning expenses. • Existing mixing system is overloaded in current situation with risk of emanate failure. Upgrading electrical supply protects and minimizes City risk. • Piping and valve arrangements will allow for easy transferring capability from tank to tank.	• The existing facility electrical system does not have sufficient capacity to handle the existing electrical loads at the BSF. Electrical upgrades are required prior to commissioning and operation of the first jet mixing system.	• Opportunity to provide required electrical infrastructure well in advance of the next BSF expansion when capital cost is lower. Any future expansion to the BSF will require electrical upgrades as the facility is currently serviced to its maximum capacity by Hydro One. • Improved Biosolids mixing, handling and removal processes due to enhanced mixing. • Improved Biosolids mixing capabilities for varied Biosolids product coming from the WWTF. • With the new proposed BSF sludge mixing system upgrades being completed, this will allow the City WWTP operations the ability to optimize and provide a more consistent thickened sludge for transportation to the BSF facility for further processing. The more consistent thicken sludge being hauled to the BSF will yield lower sludge haulage transportation costs and will improve consistency of the Biosolids for field application. • Better mixing of the BSF Biosolids makes the ultimate NMA approved Biosolids more desirable and marketable for field application use which could allow the city to market additional application capacity in the future.	• Council does not approve of additional funding request for the electrical upgrades. • Design/construction delays associated with permitting and external agencies. • Construction sequencing to consider maintaining operational status of the BSF. • If the existing system fails there is a threat of MOECC permit non-compliance and fines. • If existing systems fail NMA requirements may fall out of compliance. • Regulatory compliance risk for facility operations and Operators licencing requirements. • New sub-station sizing upgrade to allow the capacity 102MLD sludge and facility processing capacity. • Without the proposed enhanced Biosolids mixing, the BSF sludge processing will be inefficient efficient and will require additional supernatant to dilute existing densified Biosolids so that NMA Biosolids may be completed. • Double handling of sludge and mixing in supernatant will be required to attain the correct NMA approved Biosolids for land application. • The existing propane tanks for the BSF North have been removed and thus the North Facility heat load has now been added as a new additional electrical load requirement for the North Facility.
Contractual	• Non-Standard Procurement to select the Jet Mixing System – Mixing system conforms to City purchasing by-law for NSP. City will receive jet mixing system with continuance and conformity to existing.	• Scope of work may decrease pool of available contractors to complete the work.	• Opportunity to package the electrical upgrades with the jet mixing upgrades. • Will allow for improved flexibility in setting up NMA sludge processing and arrangements / sequencing of Biosolids for fields application with the haulage and spreading contractor.	• The contractors' price will increase significantly if the City proceeds with required electrical upgrades during construction instead of now.

	Strength Going Forward:	Weakness Going Forward:	Opportunity Going Forward:	Threats Going Forward:
Schedule	• Incorporating the electrical upgrades now will accelerate project schedule vs. completing a separate project in the future, or risking change order during construction.	• The construction schedule will be extended by at least six months to build the required electrical upgrades. • Construction sequencing and staging needs to be carefully planned.	• The construction schedule is phased over 3 years which allows time to construct all required electrical upgrades in year 1 while still maintaining existing system operations until the first jet mixing system is ready for service.	• New electrical upgrades must be installed before first tank Jet Mixing system is installed due to limitations of existing electrical system.
Costs	• Maintenance, cleaning, and overall operational costs will decrease as a result of the improved mixing and transfer capability.	• Increased design and construction costs to upgrade the electrical system. • Operating costs will go up due to higher loads during peak hours. • And/or increased electrical system demand.	• By including electrical upgrades in this contract, opportunity for overall capital costs to be decreased. The more consistent thicken sludge being hauled to the BSF will yield lower sludge haulage transportation costs. • Reduce O & M cost for potential implementation of the Biosolids Contingency Management Plan temporary measures, eliminating the need for portable generators to implement the BMP.	• The contractors' price (capital net present value) will increase significantly if the City defers the project. • Potential for fines by MOECC for non-compliance due to potential future existing system failure.
Relationship/ Reputation	• Jet mixing is a proven technology and is currently used at the BSF – relationship with supplier is already there.		• Opportunity to install similar technology from the same manufacturer – spare parts will be "off the shelf", and potential for volume discount agreements for increased savings. • The installation of the proposed new 44 kv transmission line on the 7th line of Oro Medonte is a benefit and marketable feature for possible additional development charge commercial growth in vicinity of the Lake Simcoe airport and other local businesses.	• Challenges from other manufacturers/suppliers over procurement. • Possible loss of sludge application land use agreements.

APPENDIX "D"

Proposed Budget Breakdown
Biosolids Storage Facility Upgrades - Hydro

REQUEST FOR ADDITIONAL FUNDS UNDER STAFF REPORT ENG018-18 PROPOSED BUDGET		
Total Approved Project Budget	*$0*	
Request under S/R ENG018-18	*$3,290,000*	
Total Proposed Revised Budget		***$3,290,000***
CONSTRUCTION COSTS		
Consultants Estimate (April 5, 2018)		
Hydro One Upgrades	$970,000	
Internal Power Upgrades	$1,813,000	
Non-refundable HST	$49,000	
Sub-Total Hard Costs		**$2,832,000**
DESIGN COSTS		
Engineering - Design Remaining	$107,000	
Design Contingency (7%)	$8,000	
Non-refundable HST	$3,000	
Staff time (5%) Design Remaining	$6,000	
Approvals	$2,000	
Sub-total Engineering Design		**$126,000**
CONTRACT ADMIN / FIELD SERVICES COSTS		
Contract Admin / Field Services (8%)	$145,000	
CA/FS Contingency (20%)	$41,000	
Non-refundable HST	$4,000	
Staff Time - Construction (2%)	$56,000	
Sub-total Engineering Construction		**$246,000**
Sub-Total Project		**$3,204,000**
Project Contingencies (approx 3%)		$86,000
TOTAL OVERALL PROJECT		**$3,290,000**

APPENDIX "E"

Proposed Budget Breakdown
Biosolids Storage Facility Upgrades – Mixers

REQUEST FOR ADDITIONAL FUNDS UNDER STAFF REPORT ENG018-18 PROPOSED BUDGET		
Total Approved Project Budget	*$3,896,800*	
Request under S/R ENG018-18	*$1,603,200*	
Total Proposed Revised Budget		***$5,500,000***
CAPITAL CONSTRUCTION COSTS		
Consultants Estimate (April 19, 2017)		
Construction Costs	$4,201,000	
Non-refundable HST	$74,000	
Sub-Total Hard Costs		**$4,275,000**
DESIGN COSTS		
Spent to Date	$340,000	
Engineering - Design Remaining	$79,000	
Design Contingency (7%)	$43,000	
Non-refundable HST	$3,000	
Staff time (5%) Design Remaining	$8,000	
Approvals	$2,000	
Sub-total Engineering Design		**$475,000**
CONTRACT ADMIN / FIELD SERVICES COSTS		
Contract Admin / Field Services (8%)	$337,000	
CA/FS Contingency (20%)	$51,000	
Non-refundable HST	$7,000	
Staff Time - Construction (2%)	$85,000	
Sub-total Engineering Construction		**$480,000**
Sub-Total Project		**$5,230,000**
Project Contingencies (approx 5%)		$270,000
TOTAL OVERALL PROJECT		**$5,500,000**

APPENDIX "F"

Funding Tables

CAPITAL BUDGET FUNDING

Component	Total Hydro Upgrades	Total Mixer Upgrades
	No Account	**14-16-2515-1659**
Debenture	$0	$3,548,000
Wastewater Rate	$0	$348,800
TOTAL	**$0**	**$3,896,800**

PROPOSED FUNDING

Component	Total Hydro Upgrades	Total Mixer Upgrades
	No Account	**14-16-2515-1659**
Debenture	$0	$3,548,000
Wastewater Rate	$3,290,000	$1,952,000
TOTAL	**$3,290,000**	**$5,500,000**

FUNDING ADJUSTMENT

Component	Total Hydro Upgrades	Total Mixer Upgrades
	No Account	**14-16-2515-1659**
Debenture	$0	$0
Wastewater Rate	$3,290,000	$1,603,200
TOTAL	**$3,290,000**	**$1,603,200**

APPENDIX "G"

Biosolids Storage Facility Upgrades – Hydro
Proposed Multi-Year Approval Cash Flow

	Approval Status	Adjusted Project Budget	Major Tasks
2018	Proposed New Cash Flow	$3,090,000	- Agreement - Hydro One - Agreement for Line 7 Power upgrades (Note that this is to be paid up front) - Interior electrical upgrades, including pole upgrades, substation, and upgraded wiring to Main electrical panels
2019	Proposed New Cash Flow	$200,000	Restoration and Warranty Period
	TOTAL	**$3,290,000**	

APPENDIX "H"

Biosolids Storage Facility Upgrades – Mixers
Proposed Multi-Year Approval Cash Flow

	Approval Status	Adjusted Project Budget	Major Tasks
2015	Approved	$348,400	Design
2016	Approved	$800,000	Design
2017	Proposed New Cash Flow	Nil	
2018	Proposed New Cash Flow	$1,351,000	Tank 1 + Upfront piping
2019	Proposed New Cash Flow	$1,700,000	Tank 2 + 3
2020	Proposed New Cash Flow	$900,000	Tank 4 + Clean up
2021	Proposed New Cash Flow	$401,000	Warranty
	TOTAL	**$5,500,000**	