CRD

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GANGES SEWER LOCAL SERVICE COMMISSION
Notice of Meeting on **Friday, October 17, 2014 at 10:00 AM**
School Board Office, 112 Rainbow Road, Salt Spring Island, BC

Gary Utter	Louis Pepin	John Sprague	Rod Scotvold
Kevin Bell	Wayne McIntyre		

AGENDA

Please Note: this meeting will begin at the sewer plant for a tour of the facility and then proceed to the School Board Office for a regular meeting

1. Approval of Agenda

2. Presentations/Delegations

3. Reports

3.1 Ganges Wastewater System Infrastructure Replacement

That the Ganges Sewer Local Service Commission approve:

a) proceeding with a public referendum to seek approval by assent of the electors to secure a loan authorization bylaw for infrastructure improvements as detailed in Appendix B in the amount of $3,900,000, to be completed over the next five years;

b) funding for the Public Engagement strategy in the amount of $3,500 from capital reserves;

c) funding for staff time related to advancing the capital improvements in the amount of $15,000 from capital reserves; and

d) funding for the Referendum process in the amount of $10,000 from capital reserves.

4. Outstanding Business

5. New Business

6. Next Meeting: Annual General Meeting October 23, 2014, at the Community Gospel Church located at 145 Vesuvius Bay Road, from 10:00 am to 12 pm.

7. Adjournment

To ensure a quorum please let Tracey Shaver know if you will not be attending 250 537 4448

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**REPORT TO GANGES SEWER LOCAL SERVICE COMMISSION
MEETING OF FRIDAY, OCTOBER 17, 2014**

SUBJECT **GANGES WASTEWATER SYSTEM INFRASTRUCTURE REPLACEMENT**

ISSUE

A comprehensive plan is required to provide a fiscally responsible approach to replacement of existing infrastructure as many of the major facilities and components of the Ganges wastewater system are at or near end of life.

BACKGROUND

The existing Ganges Wastewater Treatment Plant was built in the early 1980's and upgraded in 1998 by changing the process to a Membrane Bioreactor (MBR) to meet new Ministry of Environment (MOE) discharge requirements. In 2005, the membranes were replaced by the supplier with an expected life of approximately 8-10 years. While some upgrades and repairs/replacements have occurred over time, such as the blowers were re-built, sludge return pumps replaced, recirculation pumps replaced, the pump stations and many components of the wastewater treatment plant are at or past their end of life.

In 2011, Stantec Consulting completed an engineering evaluation, *Ganges Sewer System - Asset Condition Evaluation and Engineering Study* (Appendix A) of the Ganges Sewer system. A complete list of infrastructure replacements was detailed with a recommended replacement year. In general, the Stantec estimates only identified the construction cost. The estimates in Appendix B have been updated; it was necessary to convert the Stantec report estimates to 2017 dollars using 4% compounded yearly and then add allocations for engineering, administration, operation staff and contingency, with the exception of fine screens/membranes and associated work, which are in 2015 dollars. The identified work is required to ensure the Ganges system continues to operate in compliance with its Ministry of Environment operating permit. The CRD approach is to obtain the best value for the Ganges Sewer system, while ensuring the treatment plant is in compliance.

It is important to recognize the Stantec engineering evaluation and its recommendations are based on the current Ganges Sewer system service area and the current zoning to determine estimated capacity and does not consider any future growth through rezoning or system expansion.

As discussed in the Stantec report, the sewer collection system has higher than normal levels of inflow and infiltration (I & I) that, if not reduced, will force an early expansion of the wastewater treatment plant. Groundwater entering sanitary sewers through defective pipe joints and broken pipes is called infiltration. Water entering sanitary sewers from inappropriate connections is called inflow.

Since Stantec issued their report, certain components have deteriorated and require replacement or refurbishment, such as a new roof for the control building, as well as painting, a new fence, and sludge thickening unit. The existing sludge thickening unit takes the sludge from the treatment process membranes and reduces the percent of water in the sludge, thereby reducing the volume of sludge hauled. The effluent from this unit is combined with the treatment plant effluent prior to discharge. As the unit begins to fail, the level of solids in the effluent increases and, in turn, quality of the combined discharge is reduced. As the level of solids increases, the effectiveness of the UV disinfection decreases. As a result, the effluent quality may not meet the Municipal Wastewater Regulation (MWR). Breakthrough of solids from this unit is already occurring and replacement is required within 6 months to a year to avoid compliance issues.

Recently a technical representative from General Electric (GE), the manufacturer of the Membrane Bioreactor membranes, completed an evaluation of the equipment and process at the plant, a copy of the report is included in Appendix C. The report confirmed the need to replace the membranes, as well as the fine screens which protect the membranes. GE noted they now have a newer and more effective membrane, which requires less energy to operate. Numerous other deficiencies were also noted in the report.

The life expectancy of structures and equipment can vary greatly. For example, the pump station building may last 50 years or more, whereas the pumps may last only 10 years; a generator set 50 years; a transformer 50 years, electric breakers 15 years and computer equipment 10 years. A good maintenance program can significantly increase the expected life of certain of equipment. An equipment replacement reserve account is commonly used to replace equipment on well-defined lifecycle standards and has the benefit of a yearly transfer based on future anticipated costs.

With regard to constructability issues, at this point the estimated cost and the contingency added reflects the uncertainty associated with the work and unknowns such as, costs associated with permits to bypass, or trucking of sewage for a couple of days, etc.

ALTERNATIVES

Alternative 1**:** That the Ganges Sewer Local Service Commission approve:

a) proceeding with a public referendum to seek approval by assent of the electors to secure a loan authorization bylaw for infrastructure improvements as detailed in Appendix B in the amount of $3,900,000, to be completed over the next five years;
b) funding for the Public Engagement strategy in the amount of $3,500 from capital reserves;
c) funding for staff time related to advancing the capital improvements in the amount of $15,000 from capital reserves; and
d) funding for the Referendum process in the amount of $10,000 from capital reserves.

Alternative 2: That the Ganges Sewer Local Service Commission approve:

a) proceeding with a public referendum to seek approval by assent of the electors to secure a loan authorization bylaw for infrastructure improvements as detailed in Appendix B in the amount of $1,670,000. If this alternative is selected, recognize the other infrastructure must be replaced or upgraded within the next 2-3 years as per the 2011 Stantec report.
b) funding for the Public Engagement strategy in the amount of $3,500 from capital reserves and;
c) funding for staff time related to advancing the capital improvements in the amount of $15,000 from capital reserves; and
d) funding for the Referendum process in the amount of $10,000 from capital reserves.

Alternative 3: That the Ganges Wastewater Commission not approve the proposed infrastructure improvements at this time.

IMPLICATIONS

Alternative 1 – Many components of the Ganges Treatment Plant, as well as the two pump stations, are at end of life. While some of the replacements are required immediately, i.e. within six months to a year, the timeline for the remaining components is only slightly longer, 2 years. Following completion of these improvements, further upgrades or replacements are not projected until 2025 or later, depending on the actual rate of development and reduction of the I & I, while recognizing the treatment membranes have a projected life of 8-10 years.

Based on a total of 419 taxable folios within the Ganges sewer system, the impact of borrowing $3.9M on the taxpayer using a 15 year MFA loan at 5% is an additional cost of approximately $979 per year including the 5.25% Surveyor of Taxes fee. The average user is paying a User Charge of $128 and a Parcel Tax of $406, for a total of $534. The increase in Parcel Tax would bring the total to $1,513.

Term of Loan	Average User Charge	Existing Parcel Tax	Additional Parcel Tax	Total
15 year	$128	$406	$979	$1,513

The proposed work in this Alternative should result in lower operating and maintenance (O&M) costs by reducing emergency call outs and cleaning frequency. The actual O&M cost will be assessed once the upgrades are completed and staff have had a chance to assess their performance.

Should the Commission approve this alternative, CRD staff will also review any grants and funding opportunities, such as Gas Tax Funding – Community Works Fund, or the Federal-Provincial Small Communities Fund, in order to reduce the overall borrowing required for the project. Information on the Federal-Provincial Small Communities Fund can be found In Appendix D.

Alternative 2 – While Alternative 2 appears to be less expensive, it only delays the replacements required. Within 2 years, another referendum will be required to funds to complete the remaining work. The replacement of the membranes was included in the 2014 Capital Budget and several of the last few years. In May 2014, GE completed an evaluation of the membranes and process to identify improvements required and any opportunities to apply new technology. A copy of the GE report is included in Appendix C. The recommendations of the report included replacement of the fine screens and the membranes, as well as many other items. GE indicated that they no longer make the existing membranes, but they have a new membrane suitable for the process which is more efficient. It should be noted that the fine screens play a vital role in protecting the membranes from objects that could pierce or tear the filaments.

Based on a total of 419 taxable folios within the Ganges sewer system, the impact of borrowing $1.67M on the taxpayer using a 15 year Municipal Finance Authority (MFA) loan at 5% is an additional cost of approximately $419 per year including the 5.25% Surveyor of Taxes fee.

Term of Loan	Average User Charge	Existing Parcel Tax	Additional Parcel Tax	Total
15 year	$128	$406	$419	$953

The proposed work in this alternative should result in lower operating and maintenance (O&M) costs by reducing emergency call outs and cleaning frequency. The actual O&M cost will be assessed once the upgrades are completed and staff have had a chance to assess their performance.

Should the Commission approve this alternative, CRD staff will also review any grants and funding opportunities such as Gas Tax Funding – Community Works Fund, or the Federal-Provincial Small Communities Fund, in order to reduce the overall borrowing required for the project. Information on the Federal-Provincial Small Communities Fund can be found In Appendix D.

Alternative 3 – If the Commission decides not to approve the proposed Capital Works program, the infrastructure will continue to fail creating one emergency after another and a requirement to resolve Ministry of the Environment Out of Compliance orders under the Municipal Sewage Regulations. As we go forward, emergency repair costs, as well as operation and maintenance costs, will increase as the infrastructure fails. A recent example of this is the emergency replacement of the sludge return pumps. Replacement of equipment under emergency conditions is not a cost effective approach and may require staff overtime if after hours or in the evenings. Emergency equipment replacement can be considerably more expensive than planned replacement ,or significant delays in delivery may be encountered, further running the risk of operating out of compliance. As well, failure of certain components will require a treatment bypass and a requirement to register an illegal discharge with the MOE. An emergency bypass will discharge untreated sewage into the local environment with potential environmental and social consequences. Depending on the seriousness of the infraction, there could be fines or legal charges from Ministry of Environment under the Municipal Wastewater Regulation (MWR) for these illegal discharges.

The Commission should recognize that it is the rate payers of the Ganges Sewage system that will be burdened with payment of any fines.

Funding Approval Options

There are insufficient funds in the Capital Reserve for the above-noted capital improvements. There is a projected transfer of approximately $107,000 to Capital Reserve at the end of 2014. Therefore, it is recommended the project be funded through a new loan requiring a new loan authorization bylaw. There are two options for approval of a loan authorization bylaw under the *Local Government Act* to undertake this project. The two options are:

1. Alternative Approval Process
2. Referendum Process

Each of the options has its own merits and is outlined below for the Commission's consideration.

Alternative Approval Process (AAP)

Local/Regional governments can use the Alternative Approval Process under Part 2, Section 801.3 of the *Local Government Act* to obtain participating area approval of a loan authorization bylaw. It is most commonly used in relation to long-term borrowing bylaws, as it is a less expensive option than using a referendum. If more than 10 percent of the affected electors sign a counter-petition opposing the bylaw, a referendum must be held if the Commission still wishes to adopt it.

Based on the above tentative schedule, the AAP would take approximately six (6) months, and would cost approximately $5,000.

Referendum Process

The referendum process is typically used to seek approval by assent of the electors, under Part 2 of Section 801.2 of the *Local Government Act* where, for a participating area; a majority of the valid votes are counted in favour of the bylaw to fund a project. Typically, a referendum question is developed and then reviewed by the Inspector of Municipalities at the Province, requesting the electors to approve the borrowing of a specified amount of funds for the project.

Based on the above tentative schedule, the referendum would take approximately seven (7) months and would cost approximately $10,000.

Implications of Either the AAP or Referendum being Unsuccessful

If the above-noted processes are unsuccessful, the CRD Board shall be requested to authorize borrowing for the work based on the level of risk/liability due to non-compliance when failure occurs and an illegal discharge occurs.

Public Engagement

Due to the significant financial impact of the work program on the individual taxpayers, there is a need for public engagement so those affected can be properly informed. The exact form and extent of this process will need to be developed once the Commission decides on the most appropriate improvement program.

We recommend using the Public Participation method developed by the International Association for Public Participation as a model for developing our public engagement strategy. The spectrum outlines varying levels of public participation: inform, consult, involve, collaborate, and empower. The taxpayers are empowered by default through the referendum process. However, at this point in the public engagement process, we recommend focusing on informing and consulting with the public to provide them with information needed to assist them in making an informed decision, see Appendix E for an overview of the program. During the process, obtaining public feedback is important in order to determine the community understanding of the project and gauge their support.

CONCLUSION

The wastewater treatment plant was built in 1980s and requires a major overhaul to avoid steadily increasing O&M and emergency repair costs, as well as potential non-compliance issues. While the cost of the proposed capital works is significant, a reactive approach will result in higher long term costs to the customers, potential for significant environmental and social impacts and the fallout from Out of Compliance orders from the MOE.

RECOMMENDATION

That the Ganges Sewer Local Service Commission approve:

a) proceeding with a public referendum to seek approval by assent of the electors to secure a loan authorization bylaw for infrastructure improvements as detailed in Appendix B in the amount of $3,900,000, to be completed over the next five years;
b) funding for the Public Engagement strategy in the amount of $3,500 from capital reserves;

c) funding for staff time related to advancing the capital improvements in the amount of $15,000 from capital reserves; and
d) funding for the Referendum process in the amount of $10,000 from capital reserves.

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ATTACHMENTS:

Appendix A	Ganges Sewer System - Asset Condition Evaluation & Engineering Study, 2011, Stantec Consulting
Appendix B	Budget for Alternative 1 & Alternative 2
Appendix C	GE Site Visit Audit Report, May 2014
Appendix D	Grants - Federal New Canada Building Fund – Small Communities Fund
Appendix E	Public Engagement Strategy

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Ganges Sewer Local Service Commission
Meeting Friday, October 17, 2014 at 10:00 am

Report: Ganges Wastewater System Infrastructure replacement

Appendix A

Ganges Sewer System –
Asset Condition Evaluation & Engineering Study, 2011, Stantec Consulting

Ganges Sewer System - Asset Condition Evaluation and Engineering Study

Final Report

November 18, 2011

Stantec

Executive Summary

The Ganges sewage collection and treatment system was initially constructed between 1982 and 1988 and is owned and operated by the CRD. The Ganges sewage collection system consists of approximately 8 km of PVC pipes ranging in size from 150 mm to 250 mm and two lift stations with associated forcemains.

The initial wastewater treatment plant process consisted of rotating biological contactors (RBC). The wastewater treatment plant was upgraded in 1998 when the process was converted to membrane bioreactor (MBR). The reason why the plant was converted to MBR technology was to achieve improved effluent quality in order to meet new Ministry of the Environment discharge requirements. The plant includes an influent pump station, an aerated equalization tank, the MBR tankage and equipment, UV disinfection, an effluent pump station and sludge thickening using flat plate membranes. The disinfected treated effluent is discharged through a 4.8 km long 200 mm diameter high density polyethylene (HDPE) outfall into Ganges Harbour. There are 382 properties connected to the system including residential, institutional, commercial and industrial establishments. When the wastewater treatment was converted from RBC to MBR in 1998, its capacity was initially increased from 400 m^3/day to 800 m^3/day. In 2005 the membranes were replaced and the hydraulic capacity of the new membranes was increased to a maximum day of 1,000 m^3/day.

This study included a condition assessment of the existing equipment with recommendation for repairs and replacement over a 20-year period. The capacity of the system was also examined in order to identify existing capacity bottlenecks, if any, and the need to expand components of the system in order to deal with the projected flow increase.

<u>System Condition</u>

a) Sewage Collection System

The maximum day flow is 1.75 x the average annual flow and this ratio has been generally constant except for the December 2007 storm which resulted in higher flows. The maximum day flow always occurs during a storm event in the winter months. In the absence of CCTV inspections, it is not possible to provide a condition assessment for the sanitary sewers and to determine the source of inflow and infiltration. It is recommended to undertake an inspection program which would include CCTV inspections, manhole inspection, flow monitoring as well as smoke testing to verify if surface water is directed to the sanitary sewer. Future inspections should occur every 10 years, or if flows indicate unexpected increases in wet weather flows. The main line inspection program is estimated at $70,000 ($130,000 including laterals).

b) Pumping Stations

The pumping stations mechanical, electrical and control systems will reach the end of their life span in 3 to 5 years. When the stations are upgraded, they should also be connected to the CRD SCADA system. The station wet wells can be kept since these have an estimated life span of 50 years. The estimated cost to upgrade the Harbour and Manson Road pumping stations is $180,000 each. The estimated cost to upgrade the plant influent pumping station is 250,000.

c) Treatment Plant

The membranes require replacement approximately every 8 to 9 years. They were last replaced in 2005 and are scheduled to be replaced again in 2014, 2022 and 2030. There are several components of the plant which will have to be replaced because of operational difficulties or they have reached the end of their life span. The list of recommended upgrades for the **next 5 years** includes:

• New fine screens	$200,000
• Remove abandoned RBC component	$35,000
• Use old RBC tank for additional equalization storage	$50,000
• Instrumentation	$13,000
• Blower vibration testing and minor repairs	$10,000
• Replace automatic valves and actuators	$20,000
• Replace 208 V motor control centre	$60,000
• Membrane replacement	$500,000

The three main blowers at the treatment plant were installed in 1998. Blowers have a life span of 20-40 years depending on wear. Depending on the findings of the blower vibration testing, it may be necessary to replace the blower in 2018 at an estimated cost of $150,000.

When the membranes have to be replaced for a third time around 2022, other plant mechanical and electrical equipment such as per permeate pumps, automated valves and electrical panels will also have to be replaced. Treatment plant upgrade costs beyond 5 years are summarized in Section 5.0.

d) Outfall

The outfall was inspected in 2007 and four of the protective concrete casings around the diffusers have yet to be repaired at an estimated cost of $20,000, with an additional $12,000 required for inspection.

System Capacity

a) Sewage Collection System

As part of this study, the ultimate build out scenario was analyzed using the SANSYS modeling software and it was found that the major trunk sewer system would operate at around 75% of its capacity at the ultimate build-out. The majority of the pipes were found to be running at under 50% full, with the system's "pinch-points" located around the Hereford and McPhillips Avenue areas, just before the treatment plant. These pipes are running at 73-75% under peak wet weather flow conditions. No sewage pipes need replacement to accommodate future flows.

b) Pump Stations

The pump stations have sufficient capacity to handle the future flows. However as indicated above, it is recommended to replace the mechanical, electrical and controls components of these stations in 3 to 5 years.

c) Treatment Plant

The design calculations for the wastewater treatment plant indicate that the capacity of the plant is as follows:

- Maximum day flow 1,000 m^3/day
- Organic (BOD) loading 252 kg/d

Based on a growth rate of 20 SFE per year, it is projected that organic loading (quantity of organic matter expressed as BOD) on the plant will reach 250 kg/d in approximately 12 years (2023). At that time, the plant will have to be expanded if Ganges is to continue to grow. The MBR plant consists of two tanks measuring approximately 10 m by 10 m. It is assumed that the plant expansion would consist of adding a third tank in order to expand the capacity of the plant by 50%. The third tank would be located south of the existing tankage.

It should be noted that more detailed wastewater characterization is required to confirm the current organic loading on the plant. Composite samples over a 2-week period during the summer months would allow refinement of the organic loading projections.

The maximum day flow into the plant could exceed the plant rated capacity of 1,000 m^3/day by 2018. However, the excess maximum day flow could be temporarily stored in the equalization tanks. Additional hydraulic capacity could be provided when the plant is expanded in 2023. The cost of expanding the plant is estimated at $2,900,000.

Outfall

The treated effluent cannot flow by gravity into the outfall and it must be pumped. The effluent pumps are undersized to handle the high flows resulting from large storm event and the installation of larger pumps is recommended. The cost is estimated at $50,000 and it is assumed that minor modifications to the piping are required. The outfall is sized for a maximum day flow of 1,900 m3/day provided that this flow is equalized over 24 hours and larger effluent pumps are installed.

The 5 year short term upgrades (2012-2017) are summarized in the following table. This table is further detailed in section 5.0 and indicates which upgrades can be funded through a development cost charge (DCC) and which are to be funded by existing property owners. Capital expenditures related to increased capacity arising from development can be funded through a DCC, while the replacement of existing equipment is funded by the existing property owners and not through a DCC. It should be noted that this table includes an allowance of $100,000 to repair sanitary sewers following the completion of the inspection program. This amount will have to be confirmed following a review of the inspection report. Also it is assumed that the blowers do not have to be replaced until 2018 at the earliest. This will have to be confirmed following the completion of the vibration analysis and an inspection of the internal blower components (shaft and bearing housing).

Table E.1– 5 Year Capital Program

Year	Description	Amounts	Totals (2011$)
2012	• Sanitary sewer inspections • Instrumentation upgrades • Blower vibration analysis and minor repairs • New fine screens • Remove abandoned RBC components • Outfall inspection and repairs • Outfall repairs	• $70,000 • $13,000 • $10,000 • $200,000 • $35,000 • $12,000 • $20,000	$360,000
2013	• Harbour House pumping station upgrade • Convert RBC tanks to equalization • *Provisional item for repairs to sanitary sewers (subject to inspection report)*	• $180,000 • $50,000 • *$50,000*	$280,000
2014	• Membrane replacement	• $500,000	$500,000
2015	• Manson pumping station upgrade • New outfall pumps • Replace 208V motor control centre • *Provisional item for repairs to sanitary sewers (subject to inspection report)*	• $180,000 • $50,000 • $60,000 • *$50,000*	$340,000
2016	• Upgrade influent pump station	• $250,000	$250,000
2017	• Replace automatic valves and actuators	• $20,000	$20,000
	TOTAL		**$1,750,000**

Table of Contents

1.0 Introduction

The Ganges sewage collection and treatment system was initially constructed between 1982 and 1988 and is owned and operated by the CRD. The system discharges high quality disinfected secondary treated effluent into Ganges Harbour through a 4.8 km long outfall.

The Ganges sewage collection system consists of approximately 8 km of PVC pipes ranging in size from 150 mm to 250 mm and two lift stations with associated forcemains. The initial wastewater treatment plant process consisted of rotating biological contactors (RBC). The wastewater treatment plant was upgraded in 1998 when the process was converted to membrane bioreactor (MBR). The plant includes an influent pump station, an aerated equalization tank, the MBR tankage and equipment, UV disinfection, an effluent pump station and sludge thickening using flat plate membranes. The disinfected treated effluent is discharged through a 4.8 km long 200 mm diameter high density polyethylene (HDPE) outfall into Ganges Harbour. There are 382 properties connected to the system including residential, institutional, commercial and industrial establishments. The number of single family equivalent (SFE) connections corresponding to these 382 properties is as follows:

- Residential properties: 508 SFE
- Institutional (school, hospital and pool) 109 SFE
- Commercial & industrial: 184 SFE
- Total SFE: 801 SFE

The boundaries of the Ganges Sewerage Local Service Area (GSLSA) has relatively few vacant parcels remaining for development, but increased density within the GSLSA combined with potential sewer servicing of all the lands within the Ganges Village Containment boundary could result in over 500 additional SFE connected to the sewer system essentially doubling the serviced equivalent population. There are approximately 100 properties in the service area that are currently underdeveloped. By bylaw, all occupied properties within the Ganges Sewerage service area must be connected to the sewage system and individual treatment systems such as septic tanks are not allowed.

When the wastewater treatment was converted from RBC to MBR, its capacity was initially increased from 400 m^3/day to 800 m^3/day. In 2005 the membranes were replaced and the hydraulic capacity of the new membranes was increased to a maximum day of 1,000 m^3/day. The main reason why the plant was converted to MBR technology was to achieve improved effluent quality in order to meet new Ministry of the Environment discharge requirements.

2.0 Condition Assessment

2.1 WASTEWATER TREATMENT PLANT & OUTFALL

This section examines past and proposed future capital upgrades to the wastewater treatment plant due to age and wear of equipment. The hydraulic capacity of the plant and of the outfall and the capital upgrades required resulting from projected increase in flow are examined in Section 4.3. The wastewater treatment plant in its present configuration and capacity was developed in three stages. The influent pump station and the equalization tank were part of the original RBC wastewater treatment plant which was constructed in 1985. An MBR treatment system was installed in 1998 and the original RBC system was abandoned but not removed. In 2005 the membranes were replaced. A significant number of recent upgrades and repairs to the Ganges wastewater treatment plant were carried out since 2008 at a cost of $390,000 and include:

- Control building upgrade and upgrade to electrical system ($187,000);
- Replacement of UV lamps, air diffusers in membrane tank and 12 butterfly control valves in MBR plant ($15,000);
- Cover on sludge thickening system ($11,000);
- Spill containment at influent screen ($5,000);
- Replacement of failed UV controls and new UV system ($75,000). This work is still under way;
- SCADA upgrade ($45,000);
- Replacement of underground air supply piping system ($26,000), and
- Electrical surge suppressor ($5,000).

The current 5-year capital plan for the Ganges Sewer Utility includes the following works:

Table 2.1 – Current Capital Plan for Ganges Sewage System ($1,000)

Capital Works Description	2011	2012	2013	2014	2015
Dissolved Oxygen Instrument replacement		8			
Manson & Harbour House lift station electrical & SCADA upgrades			100		
Major equipment replacement at Ganges WWTP	20	100	100	100	100
Membrane replacement				500	
Removed abandoned RBC components		35			
Replace fine screen system		200			

There is a 30 m long diffuser section at the end of the outfall. In this section, there are six 60 mm diameter diffusers nozzles, spaced 5 m apart. Each nozzle is mounted at the end of a 900 mm long vertical riser. The vertical riser pipe is located inside a 900 mm diameter concrete pipe mounted vertically for protection. The 2007 inspection report by Advanced Subsea Services has indicated that all six diffusers appear to be working. However four of the vertical concrete pipes have been dislodged leaving the diffusers exposed and unprotected.

On June 21, 2011 an inspection of the Ganges treatment plant was carried out by Stantec with CRD staff in attendance. The findings of the condition assessment for the process equipment are detailed in Table 2.2 and the condition assessment for the electrical equipment is discussed in the next section.

Table 2.2 – Ganges Wastewater Treatment Plant & Outfall Condition Assessment

Unit Process	Description	History / Age	Proposed Upgrades
Influent Pump Station	• FRP wet well • 2 – 5HPsubmersible pumps (Monarch) • Floats for pump control • Original piping and valves	• Station constructed in 1982 • One new pump installed 2 yrs ago • Valves maintained annually • Station pumped out and grit removal once a month to prevent grease from entering plant and obstructing membranes	• See Section 2.4 for a detailed discussion on pump stations
Fine Screens	• Or-Tec 1.5 mm fine screen	• Original screen installed in 1998 • 1 mm screen replaced by 1.5 mm because of excessive maintenance • Continuous mechanical repairs to bearings and brushing • Screens continuously plug up due to grease and debris	• Equipment is not functional for intended use and has reached its life span • It is recommended to replace in 2012
Aerated equalization tank	• Two lobe style blowers • 2 3-HP transfer pumps to anoxic tank • Level control with ultrasonic • High level alarm float	• Concrete tank and blowers installed in 1982 • Typically 750 mm of water in tank in summer • Water depth increases by 1 m in winter • Capacity of equalization basin occasionally exceeded during the winter months	• Additional equalization capacity is required • See Section 4.3.2 for a detailed discussion on equalization

Unit Process	Description	History / Age	Proposed Upgrades
Bioreactor Tanks	• Tank # 1 – 50% anoxic and 50% aerobic • One Flygt mixer in corner of anoxic zone • Tank # 2 – 100% aerobic • RAS = 3 x Q • MLSS 10,000 to 12,000 mg/L • 3 m deep tanks • Level control using ultrasonic	• Tank and equipment installed in 1998 • Floating curtain between anoxic and aerobic zones removed • Anoxic zone maintained by turning off air for 30 min • Low ammonia • Nitrite= 0.12 mg/L • Nitrate = 8 mg/L • Some moisture gets into drain traps and freezes in winter • 2 new permeate pumps to be installed shortly	• It is recommended to carry out process optimization to confirm plant capacity. • This could be done in conjunction with next membrane replacement scheduled for 2013 or 2014

Bioreactor Blowers	• 3 centrifugal blowers:
	  ○ 1 for MBR air scour
	  ○ 2 for bioreactor
		• Installed in 1998
		• Operator has reported excessive vibration on the blowers.
		• Anticipated life of blowers in the range of 20 to 30 years.
			• Carry out vibration analysis on blowers.
			• There is a concern that the blowers have experienced vibrations for several years. At a minimum the bearings will likely have to be replaced. However, it is possible that the shaft and the bearing housing have been damaged.
			• It is recommended to replace the blowers in 2018

Membranes	• 6 cassettes ZeeWeed 500c	• Membranes were replaced in 2005 • Anticipated life span of membranes is 8 years	• Membranes to be replaced in 2013 or 2014 depending on performance (funding should be in place in the event performance is not met) • Membranes will have to be replaced again around 2022
UV Disinfection		• Existing UV system to be replaced shortly	• No upgrades recommended
Effluent Flow measurement	• Parshall flume • Ultrasonic level measurement		• Flow meter to be calibrated
Effluent pumping		• Effluent pump was unable to keep up with high flow during a storm on Dec 3, 2007	• The effluent pumps are undersized and should be replaced. • See detailed discussion in

			Section in Section 4.3
Unit Process	**Description**	**History / Age**	**Proposed Upgrades**
Outfall	• 4.8 km long outfall, 200 mm nominal diameter HDPE Sclairpipe (actual diameter of 168 mm and 174 mm)	• Outfall installed in 1982 • Inspection in 2007 indicated that four of six concrete riser pipes protecting the diffusers have been dislodged • Pipeline is protected and weighted • All six diffuser appear to be working	• Protective concrete pipe around diffusers should be replaced to prevent damage to diffuser piping
Sludge thickening	• 150 Kubota flat plate membranes • Sludge pumped from bioreactor to thickener – only one submersible pump • Flow through flat plate by gravity using static head in tank	• Pilot membrane unit supplied by Zenon for thickening not used – flat plate membrane work better than hollow fibre membranes • Thickening achieves solids concentration of 2%	• Consider back-up pump
Instrumentation	• Hach 1720 C turbidity meter • CFM flow meters • Level indicators • 2 compressors with air dryers for process air	• Concern that turbidity meter is old and not accurate	• Replace turbidity meter • Calibrate all instrumentation
Building	• Insulated wood frame building • Slab on grade	• Building upgraded and expanded in 2008	• Consider installation of air conditioning in electrical room (see section 2.2 below)

2.2 ELECTRICAL

An inspection of the electrical system at the Ganges wastewater treatment and the sewage pumping stations was carried out by Stantec on June 21, 2011 and the following was noted.

- The existing BC Hydro service is 400A, 347/600V, 3-phase, 4-wire service. The main service entrance distribution board was built in Sept 1996, and is a Cuttler-Hammer (Westinghouse) Pow-R-Line C model. The Hydro service enters at bottom of main switchboard and consequently the main breaker is located at bottom of board, which is not a common installation, however it is acceptable. The main service entrance distribution board has a remaining lifespan of approximately 15 to 20 years.

- The main service entrance distribution board also contains a 600V power distribution panel. This 600V power distribution panel feeds blowers, a tank heater and a transfer switch.

- A 150kVA, 600V diesel generator provides back-up power for the treatment plant, but excludes back-up power supply for the blowers and tank heater.
- The existing automatic transfer switch was recently upgraded in 2008.
- There is also a 400A, 120/208V 3-phase 4-wire power distribution panel. This panel is supplied from a 600-208V transformer. This panel feeds older motor control centre (MCC) sections and it also feeds a new panel named 'OFC'. This 208V power distribution panel was built in Sept 1996. The 208V distribution board has a remaining lifespan of approximately 15 to 20 years.
- There is an older 600A, 120/208V, 3-phase, 4-wire motor control centre (MCC). It is a Westinghouse 5 Star motor control centre, and it was built in October 1986. It consists of 4 sections containing motor starters (includes 2 panels) plus 2 sections for controls. This older motor control centre is at the end of its useful life.
- There is a 600V splitter and a 112.5kVA transformer, which are located adjacent to the maintenance shop.
- The electrical room is full and there doesn't appear to be capacity for expansion. The older motor control centre (MCC) is close to the end of its useful life. A new motor control centre would consolidate starters and controls. As a result additional space could be freed up within the electrical room.
- The electrical room is very warm and there doesn't appear to be adequate ventilation. The variable frequency drives (VFD's) and the process control cabinets produce a substantial amount of heat. Additional ventilation and additional cooling systems should be considered.
- There are 2 remote sewage lift stations, one at Manson Road and another at Harbour House. Both stations have control cabinets consisting of breakers, controls and a receptacle for plugging in a portable emergency generator. Both stations were built around 1986 and the electrical components of both stations are approaching the end of their useful life.

The findings of the conditions assessment and the recommendations for upgrades are outlined in Table 2.3.

Table 2.3 – Ganges Wastewater Treatment Plant Electrical Condition Assessment

Unit Process	Description	History / Age	Condition / Remarks
Hydro service and Main Service Entrance distribution board	• 400A, 347/600V, 3ph, 4w • Cutler-Hammer (Westinghouse) Pow-R-line service entrance board; also contains 600V distribution panel • Pole mounted transformers located across the road; overhead service to pole on property, underground to service entrance board	Service entrance board was constructed in Sept1996	• The existing hydro service appears to be in good condition. • The existing service entrance distribution board should be upgraded within the next 20 years.
Emergency back-up power	• 150kVA, 600V diesel generator located just outside Operations Building • Provides back-up power for entire treatment plant except for blowers and tank heater	History of the emergency back-up is unknown.	• The existing emergency back-up power appears to be in good condition. • No upgrades are recommended.
Distribution (600V)	• 600V distribution panel is contained in the main service entrance board; this panel feeds blowers, tank heaters and the transfer switch for the diesel generator • Transfer switch feeds 600V splitter which is located in maintenance shop; splitter feeds 600-208V transformer and 600V motor control centre	600V distribution panel was constructed in 1996	• The existing distribution appears to be in good condition. • It is recommended that the existing distribution should be upgraded within the next 20 years.
Distribution (208V)	• 400A, 120/208V, 3ph, 4w distribution panel is fed from 600-208V transformer; this panel feeds 208V motor control centre plus 208V panelboard	208V distribution panel was constructed in Sept 1996	• The existing distribution appears to be in good condition. • It is recommended that the existing distribution should be upgraded within the next 20 years.
Motor control centre (600V)	• 150A, 600V 3ph motor control centre provides starters for a number of 600V motors • Eaton/Cutler-Hammer Freedom Series 2100 • Consists of 2 sections	600V motor control centre was constructed in 2008	• The existing motor control centre appears to be in very good condition. • No upgrades are recommended.
Motor control centre (208V)	• 600A, 120/208V, 3ph, 4w motor control centre • Westinghouse 5 Star • Consists of 4 sections; contains 2 panelboards • Also contains a section for controls	208V motor control centre was constructed in October 1986	• The existing 208V motor control centre is in satisfactory condition, however, it is close to end of its useful life • It also appears as though it contains a lot of unused space. • It is recommended that this equipment be upgraded within the next 3 to 5 years.

2.3 COLLECTION SYSTEM

Condition assessments for underground infrastructure are difficult to perform without video inspecting each pipe within a system, and the CRD should give consideration into carrying out such an investigation to verify the condition of the system.

A cursory inspection of some manholes was carried out in areas where high inflow and infiltration (I&I) is suspected. Except for root infiltration in one location, it was noted that the manholes appeared to be in adequate condition, and no significant deterioration of the concrete was observed. However a detailed inspection of all the manholes should be carried out.

The operator identified some areas of concerns in the collection system that appears to be experiencing a high inflow and infiltration rate. These include the Park Drive area, Kanaka Road and the new sewer line on Fulford-Ganges Road on the hill south of Seaview Avenue. Without a video inspection of the affected area, it is difficult to pinpoint a reason for this, but there could be a number of reasons for it. One could be that the pipe intersects an underground spring or an area of high groundwater table. This could result in a hydrostatic pressure on the sewer pipe and manhole rubber gaskets in excess of the allowable water pressure of 1.2 metres. This may have been noted during construction as a large amount of dewatering would have been required. However there could be significant seasonal variations in ground water tables and excavation carried out in the summer may be below the higher groundwater levels found in the winter months. Another reason could be that the pipe and the porous gravel backfill are acting like a French drain and encouraging water to flow along its alignment due to the high porosity of the backfill and entering the system at the manholes or at pipe joints.

A video inspection should be strongly considered for the entire sewage collection system in addition to smoke testing and manhole inspections. Laterals should also have CCTV performed to investigate the possibility of unauthorized stormwater connections per the CRD Bylaws 2490 and 2922; however the cost of providing lateral CCTV (LAMP) inspection may be prohibitive ($60,000). In addition lateral CCTV may not be possible on laterals serviced by older AC mains as these were often fixed to the main with a bolt on saddle which interferes with the cameras ability to enter the lateral.

2.4 PUMPING STATIONS

The three pump stations were inspected from the surface. The treatment plant influent pump station, the Harbour House and the Manson Road pump stations were installed in 1985, and the vast majority of the original piping and valving is still in place today. It was noted that that check valves within the Harbour House and Manson Road stations had recently been replaced and were therefore considered in good working condition. The process piping of a pump station has a typical lifespan of around 25 years, and the treatment plant influent pump stations and the two

Ganges Village stations are therefore reaching the end of their serviceable life. The structures of the pump stations (i.e. the wet well), although not inspected thoroughly during the site visit, likely have a number of years of serviceable life remaining, as they typically have a 50 year lifespan. It is therefore recommended to keep the fiberglass chambers and replace all mechanical piping within both stations with the exception of the check valves. Although the original piping within the stations was Schedule 40 PVC, it is recommended that the replacement piping be stainless steel, Type 304L. Stainless steel is a more robust material than PVC and provides more reliable service as well as a longer lifespan.

In addition to the replacement of the existing mechanical piping within the station, it is also recommended to replace the existing ball float alarm system currently in place at treatment plant influent pump stations and at the Harbour House and Manson Road stations. Operators from the CRD have made it known to Stantec that a common problem at the stations occurs when the 'pump on' floats become physically 'hung up', resulting in the pumps constantly running and once all sewage has been pumped from the station, continuing to run dry and potentially cause significant damage to the pumps. By replacing the ball floats with pressure transducer, the possibility of the floats catching in the 'on' position is eliminated.

A deficiency noted at both the Harbour House and Manson Road pump stations was the lack of a water service for washdown purposes. This should be rectified by installing a 50mm diameter hose bib water service to both stations.

The major deficiencies noted at the site visit and in subsequent meetings with CRD is the outdated electrical system and the lack of a SCADA system. Although rectifying these deficiencies will be expensive, it is a move that the CRD should strongly consider to maximize the efficiency of the Ganges Sewer System.

The Manson Road and Harbour House pump stations have weatherproof control cabinets consisting of breakers, controls and a heavy duty receptacle for plugging in a portable emergency generator. Both cabinets are close to the end of their useful life and should be replaced within the next 3 to 5 years.

2.5 OPERATING BUDGET

Stantec was asked to comment on the level of staffing for the Ganges wastewater sewage collection and treatment system. The annual operating and maintenance cost is summarized in Table 2.4 below. All the numbers have been rounded.

Table 2.4 – Annual O&M Budget (2011)		
#	**Description**	**Amount**
1	Labour cost – local operators	$186,000
2	Other labour cost – specialized labour from other CRD units	$60,000
3	Vehicles	$19,000
4	Sludge hauling and disposal fee	$128,000
5	Screening and garbage disposal cost	$10,000
6	Electricity	$45,000
7	Internal time recoveries	$45,000
8	Supplies (parts)	$13,000
9	Repairs and maintenance	$10,000
10	Other contract for services	$9,000
11	Permit and testing	$6,000
12	Chemicals	$7,000
13	Other expenses (legal, insurance, communications, travel, office suppy)	$22,000
	Annual O&M Cost (2011)	**$560,000**

The local operator labour cost is based on having 1.4 full time equivalent persons (FTE) to look after the treatment plant, the pumping stations and the sewage collection system. Specialized labour is imported from other CRD operations as required. However the Ganges sewage system must rely on the existing operating staff during the evenings and at night when the ferries are not running. Also because of the delays incurred for traveling by ferry to Salt Spring Island, there is significant reliance on the local operating staff. To ensure full back-up 24 hours per day, it is recommended to increase the local operating staff to 2 FTE. This would result in a 12.5% increase of approximately $70,000 in the annual O&M budget.

Next to labour cost, the most expensive item is sludge hauling and disposal with an annual cost of $128,000. The flat plate membrane system used for sludge thickening produces a sludge with a solids content of 2% to 3%. Any improvement in the efficiency of sludge thickening could have a significant impact on reducing the cost of sludge hauling and disposing. In light of the high cost of sludge thickening, this should only be considered when the plant reaches capacity and is expanded in 2022. If carried out, this would reduce th sludge disposal cost by 50%. Any reduction in disposal cost at Ganges would result in a corresponding reduction of revenue for the Burgoyne Facility. This may require an increase in the rate at Burgoyne to meet the fixed operating costs. A detailed financial analysis should be carried out when the plant is expanded in 2022.

3.0 Review of Wastewater Quality and Flow Data

3.1 SEWAGE FLOWS

The annual average daily flow measured at the Ganges WWTP has experienced a decline since 2006. However, the maximum monthly flows has remained relatively constant since 2006. Because of seasonal variations due to tourism and inflow and infiltration into the system, the maximum monthly flows provides a better measure of the hydraulic load on a plant.

Table 3.1 provides a summary of the annual average, maximum monthly and maximum daily flows for the last five years. The maximum day permitted flow is 1,090 m^3/day even though the maximum day plant capacity is 1,000 m^3/day. The reduction in average annual sewage flows could be the result of lower water consumption and would reflect the trends observed elsewhere in the CRD. On the other hand, the maximum day flow has remained high since it is a function of weather dependent inflow and infiltration.

Table 3.1 – Summary of Flows at Ganges WWTP

Year	Annual Average (m^3/day)	Maximum Month (m^3/day)	Ratio – Annual Ave : Max Month	Maximum Day (m^3/day)	Ratio – Max Day: Annual Ave
Permit				***1,090***	
Plant Capacity				***1,000***	
2006	500	567	1.13	855	1.71
2007	482	526	1.09	1,039 867 - 2nd highest	2.16 1.80 – 2nd highest
2008	475	509	1.07	756	1.59
2009	466	521	1.12	806	1.73
2010	448	509	1.14	792	1.77
Proposed Peaking Factors			1.15		1.75

There are currently 508 residential, 109 institutional and 184 commercial SFE's connected to the sewage system for a total of 801 SFE. The average flow per SFE is 558 L/day while the maximum month and the maximum day flows per SFE are 634 L/day and 936 L/day respectively. Assuming three persons per SFE, the total equivalent population connected to the sewage system is 2,400 persons.

3.2 WASTEWATER CHARACTERISTICS

Raw water sampling is carried out once a month and the annual average TSS and cBOD concentrations are summarized in Table 3.2. As indicated in Table 3.2, the strength of the wastewater is increasing with time. The serviced residential population is increasing at a rate of

13 SFE per year while the sewage flow to the plant is decreasing. The gradual decrease in average sewage flow is likely attributable to the decrease in water consumption as a result of the installation of water efficient fixtures and public awareness on water conservation. However, since the quantity of organic waste per person is constant, the wastewater strength increases as the average flow decreases.

Table 3.2 – Raw Wastewater Characteristics

Year	TSS (mg/L)	BOD (mg/L)
2005	258	287
2006	296	300
2007	357	324
2008	327	305
2009	312	340
2010		
Plant Design Value (June 2004)	***252***	***225***
Proposed Revised Design Value	***325***	***325***

As indicated above, the Ganges wastewater treatment was designed on the basis of a more diluted wastewater. In evaluating the capacity of the plant in conjunction with future growth, it is proposed to use higher concentrations of 325 mg/L for TSS and cBOD. It should be noted that these higher values are based on grab samples taken once a month. Before proceeding with any design for plant expansion, a wastewater characterization study should be done consisting of 24-hour composite samples taken over a one year period on a weekly basis.

3.3 TREATED EFFLUENT QUALITY

The Ganges wastewater treatment plant is regulated under MSR Registration RE-05521, dated April 28, 2005 with the following requirements:

Table 3.3 – Ganges WWTP Effluent Criteria

Parameter	Effluent Criteria
Maximum Daily Flow	1,090 m3/d
Maximum cBOD	25 mg/L
Maximum TSS	25 mg/L
Maximum Fecal Coliform	1000 CFU/100 mL
Toxicity Test	Pass the Rainbow trout 96 hr effluent toxicity test

The treated effluent quality is summarized in Table 3.4. The plant meets the permit requirements for total suspended solids (TSS) and carbonaceous biological oxygen demand (cBOD). The effluent parameter for fecal coliform was exceeded only once in 2010.

Table 3.4 – Summary of Effluent Quality

Year	TSS (mg/L)		CBOD (mg/L)		Fecal Coliform (CFU/100 mL)		Ammonia (mgN/L)	
	Mean	Max	Mean	Max	Mean	Max	Mean	Max
Permit	*25*		*25*		*1000*		*n.a.*	
2006	1	5	2	<4	1	6	0.34	2.31
2007	1	2	2	<4	10	56	6.4	22.2
2008	1	3	2	4	6	35	2.1	9.1
2009	<1	1	<4	<4	14	600	11.7	29.9
2010	1	2	4	5	19 (290)	3000	10.1	23.0

Toxicity Testing

The effluent sample from July 21, 2009 passed the 96 hr acute toxicity test. Fifty percent of the Rainbow trouts survived in undiluted effluent for the 96 hr duration of the test. All previous tests since 2004 have had 100% survival. On that date, the ammonia concentration was 25.5 mg/L which is higher than the recommended guideline of 16.9 mg/L (pH 7.2 and 15^0 C) from the BC Water Quality Guidelines (BCWQG) for the Protection of Aquatic Life. The BCWQG is not based on acute toxicity but provides an indication that at higher ammonia levels, the risk of failing the test increases. The treated plant is designed to remove ammonia (nitrification) to levels in the range of 4 mg/L to 8 mg/L depending on the season. Possible reasons why ammonia levels are high are discussed in Section 4.5.

Proposed new Federal guidelines have defined toxicity as a maximum concentration of un-ionized ammonia of 1.25 mg/L. The concentration of un-ionized ammonia is strongly affected by pH. The acute toxicity relationship between pH and ammonia as per Environment Canada is shown on Figure 2.1. The pH of the effluent from the Ganges WWTP ranges from 6.5 to 7.2. At a pH of 7.2, the maximum allowable concentration of ammonia to prevent acute toxicity is in excess of 100 mg/L. The Provincial requirement of acute toxicity based on the 96 hr Rainbow Trout toxicity test is more stringent than the proposed new Federal guidelines.

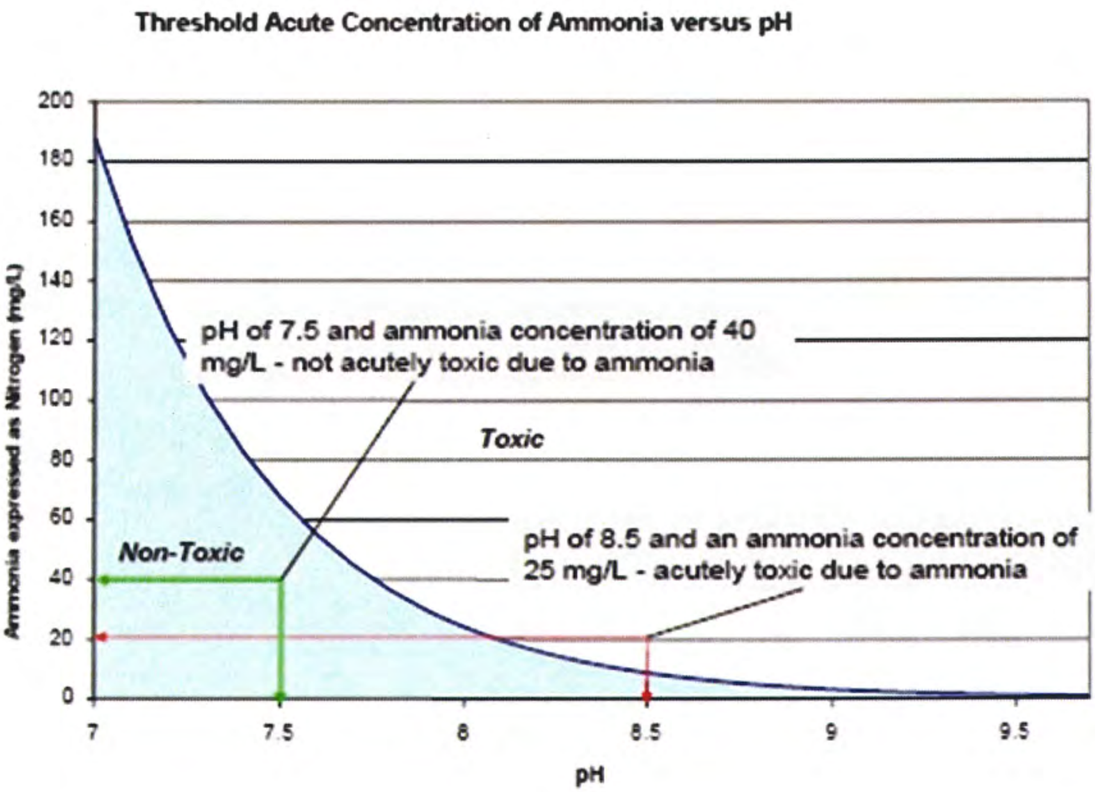

Figure 2.1 – Threshold of Acute Concentration of Ammonia versus pH

4.0 Capacity of Sewage System

4.1 GROWTH SCENARIO

The CRD retained RCL Consulting Ltd to review the use of a development cost charge (DCC) for the Ganges local service area. As part of their work on the DCC, RCL examined the Official Community Plan (OCP) and bylaws of the Islands Trust to determine potential growth scenarios. The report dated February 28, 2011 by RCL Consulting Ltd on the Design of Development Cost Charge Structure indicates a potential increase of 551 single family equivalent (SFE) units that would be connected to the sewer system.

Table 4.1 – Potential New Development Connected to Ganges Sewer System

	Description	SFE
1	28 vacant parcels – max units possible under present zoning	86
2	Rezoning of Jackson parcel from ALR	22
3	Rezone for 3 unit flexible housing	14
4	Potential development of larger parcels to max density	13
5	Add a single family dwelling to each commercial	23
6	Add one secondary suite to 75 single family parcels	75
7	Major redevelopments requiring rezoning of existing parcels	135
8	Add parcels in Ganges Village that are not in the sewer service area	99
9	Parcels in progress of inclusion area	31
	Sub-Total - Density Increase and Expansion of Service Area	**498**
10	Ganges Hill units which have already paid capacity purchase fee	53
	Total – Potential New Development Connected to Sewer	**551**

There are presently approximately 801 SFE connected to the Ganges sewer system including residential, commercial and institutional users. With the potential addition of up to 551 SFE, the equivalent serviced population is projected to increase by 70% The RCL report indicates that new residential connections are added to the system at a rate of approximately 13 per year (2006-2009, 52 SFE). Following this trend, the development period to realize the build out as suggested in Table 4.1 would be in excess of 35 years. The RCL report recommended using an annual increase of 15 SFE per year for the density increase and expansion of service area. This does not include development of the 53 units in the Ganges Hill project or future increase in institutional and commercial establishments. Assuming that Ganges Hill unit will develop at a rate of 5 SFE per year and there will be 5 SFE per year for institutional and commercial establishments, the total number of new units would be 25 SFE per year for the next 10 years and 20 SFE per year after Ganges Hill is developed.

4.2 CAPACITY OF COLLECTION SYSTEM

The existing collection system in the Ganges Sewer Service Area was modeled using the SANSYS Modeling software. Stantec were retained by the CRD in the summer of 2009 to carry out a study of the existing sewer system in the Ganges area to evaluate the capacity of the system with respect to the current loading conditions as they were in 2009. This study has built upon the results of that previous study to provide a capacity review of the system for the ultimate build out loading conditions.

4.2.1 Design Criteria

4.2.1.1 Information Provided by the CRD

The CRD provided GIS information to be imported into Autodesk Land Desktop software for use by Stantec when constructing the model. The information provided included the following:

- Manhole locations and invert elevations.
- Pipe diameters, pipe materials, type of pipe (gravity of pressure), locations of vertical bends in pipes.
- Legal information including public R.O.W's and property lines.
- Pump Station locations.

The CRD also provided the "Design of Development Cost Charge Structure" document, dated February 28 2011, prepared by RCL Consulting, as a reference. This document was used to estimate the ultimate loading on the system, as it details the likely future growth scenarios for the Sewer Serviced Area (SSA). In addition, information was provided regarding all properties currently within the GSLSA by the CRD. This information was used to prepare an existing loading scenario.

4.2.1.2 Modeling Assumptions

In the 2009 study, the physical model of the sewer system was created from GIS information provided by the CRD. The physical model includes all manholes, pipe sizes, pipe grades etc. required to model how the sanitary load would flow through the system. It is assumed that the physical system has not developed in the last two years to a degree where it could affect the model, and therefore the same SANSYS model has been used as was used in the 2009 study.

During construction of the SANSYS model, there were numerous areas where the information provided was incomplete and the information not attainable. In these cases, assumptions had to be made based on the local conditions to ensure the model was as accurate as possible.

- The invert information for some manholes was missing. In these cases, the invert elevations were estimated based on the upstream and downstream invert elevations.

Other assumptions and techniques were needed to be employed in order to make the model operational. These assumptions are listed below:

- Vertical bends in the pipes were modeled using "dummy" manholes to simulate the start and end of the vertical curves, with each manhole being assigned no head loss through it. The slope of the pipe in between the dummy manholes is defined as the average slope of the pipe over the length of the vertical curve.
- As information regarding the service pipes from each property has not been provided, the system has been loaded by judging which trunk main each property service will connect to and then loading the corresponding upstream manhole with the appropriate population based on the number of lots and zoning classification of the connecting services. The upstream manhole is loaded to ensure that the model is considering the "worst case scenario" in terms of maximum flow through the pipe, and therefore there is a factor of safety inbuilt when sizing the pipes within the system.
- The outfall of the collection system has been assumed to be the inlet of the WWTP. The deep sea outfall has not been included in this analysis.

4.2.1.3 Design Flows/Population Densities

The following is a summary of the design criteria used when loading the Existing Condition model:

a) Design Flow Allowances:
    i. Per capita flow of 300L/day
    ii. Infiltration Rate of 45L/mm diameter/km/day
    iii. Peaking factor based on Harmon formula (max of 4)
b) Population Densities (Residential):
    i. Low Density (Single Family Lots): 3 persons per lot
    ii. Multi-family:
        i. Townhomes: 2.4 persons per lot
        ii. Apartments and Senior Housing: 2 persons per lot
c) General Commercial (unknown use): 3 persons per lot

As is typically the case with sewer modeling, a primary problem when loading the model comes from predicting the loadings due to the commercial and industrial properties in the system. These loadings vary dramatically depending on the type of commercial or industrial activity being undertaken on each lot (e.g. a garage, restaurant or launderette would likely have a much higher load than an art gallery, bank etc.). This issue was raised during the 2009 study, and was addressed by obtaining water consumption records from a number of the larger consuming properties in the area such as the supermarkets/pubs etc. It was then assumed that 100% of the water consumed by each of these properties is transferred to a sanitary load. The loadings for these properties were used during the ultimate build out scenario as well as the existing scenario for this study. No growth was assumed for these properties.

4.2.2 SANSYS Model Update

When constructing an accurate computer model of a sewer system, there are two aspects to consider; the hydrological aspect of the system and the loading applied to it. The hydrological aspect is described by the physical properties of the system, such as the manhole locations, pipe sizes and grade, pipe material etc. This aspect of the SANSYS model was constructed during the 2009 study, and as no significant changes have been made to the system, the same model has been reused.

However, the objective of this study varies from the 2009 study in that this study aims to assess the capacity of the collection system when the area has been developed to "Ultimate Build-Out" condition. Therefore the loading applied to the system needed to be updated.

The loading update was done in two stages. First, the 'existing' scenario was updated to better reflect the existing loading on the system. This was done using the billing reports provided by the CRD which detailed the civic address of each taxable property within the GSLSA. This information included the type of property (whether it was residential, commercial or industrial) and when properties were zoned for multi-family housing (apartments or townhomes), the number of units on each property was also given. The loading from each address was then applied to the relevant upstream manhole within the SANSYS model. Loading per property was calculated as per the "Design Flows/Population Densities" section above.

The "Ultimate Build-Out" Scenario was developed as an extension of the existing condition scenario. This was constructed using the loading condition from the existing condition scenario with a future development component added. The future development component was calculated using Table 1 in section 2.7 of the CRD "Design of Development Cost Charge Structure" document. This table is included as table 4.1 of this report for reference, and details the results of RCL Consulting's investigation and talks with the Salt Spring Island Trust regarding proposed future development in the Ganges Sewerage Local Service Area and the Ganges Village Containment Boundary. For the purpose of this study, the additional SFE's generated as a result of the growth detailed in table 4.1 was assumed to be the extent of the future growth in the Sewer Service Area, and the modeling results and conclusions reflect this future growth scenario only. If further future growth beyond that assumed in Table 4.1 occurs, the model should be reviewed to calculate the effect of the additional growth on the collection system.

4.2.3 Modeling Results

4.2.3.1 Collection System

Collection systems are typically designed to accommodate the ultimate build-out condition for the sewer area. This is because the cost to remove and replace large lengths of pipe in the future is far more expensive and disruptive to local residents than installing oversized pipe to begin with in consideration of future growth.

The 2009 study concluded that the existing system still had ample capacity in it to accommodate additional growth from the system. As part of this study, the ultimate build out scenario was analyzed using the SANSYS modeling software and it was found that worst part of the system would operate at around 75% of its capacity at the ultimate build-out. The majority of the pipes were found to be running at under 50% full, with the system's "pinch-points" located around the Hereford and McPhillips Avenue areas, just before the treatment plant. These pipes are running at 73-75% under peak wet weather flow conditions.

It is therefore concluded that the capacity of the existing collection system to accommodate the sanitary loading from the 'Ultimate Build Out' scenario as detailed in the previous section is adequate without any upgrades required. This conclusion is based on the growth not exceeding that detailed in Table 4.1, and the I & I value not exceeding the assumed value of 45L/mm diameter/km of pipe/day.

The accuracy of the model results can be confirmed by implementing a flow testing regime at various key points throughout the system, and the model calibrated to better reflect the actual conditions in the system. However, the SANSYS model reflects the 'worst case' scenario regarding the loading on the system i.e. 900L/day/SFE is a conservative number, and it is therefore likely that the flow through the system is less in reality than the model predicts, and hence the system should be adequate.

An issue that was identified in the 2009 study and should be reiterated was that in two locations, a larger pipe flows into a smaller pipe and then back into a larger one. This is not good engineering practice, and can cause flow problems in the system. Although the smaller pipes are able to handle the flow, blockages may result from large deleterious objects dropped into manholes or entering pipes during construction or repairs could pass unobstructed down the larger pipes, but then not being able to fit down the smaller ones.

4.2.3.2 Pump Stations

The capacity of the existing pump stations has yet to be confirmed. However, the record drawings provided by the CRD indicate that both stations have pumps installed with a capacity of around 5 L/s. Both the Manson Road and Harbour House Pump Stations are located off the main trunk mains on small branches with little potential for development. As there is little potential for development upstream of the pump stations, the flow into the stations should not increase significantly between the existing condition and the ultimate build-out. It is therefore likely that the pump stations will not need replacing in the future for capacity reasons. The replacement of the pump stations will therefore be dependent on the age and condition of the infrastructure.

4.3 CAPACITY OF TREATMENT PLANT AND OUTFALL

4.3.1 Flow and Loading Projections

The capacity of the MBR treatment plant following the installation of new membranes in 2005 as per the design calculation provided by Zenon (manufacturer) is as follows:

- Maximum day flow: 1,000 m^3/day
- Maximum organic loading (BOD): 252 kg/d

Flow and organic loading projections were prepared in order to determine when the capacity of the treatment plant would be reached and a plant expansion required. The design criteria for flows, growth and BOD/TSS loading are as follows:

a) <u>Flow Design Criteria</u>

- Maximum month peaking factor: 1.15 x Annual Average
- Maximum day peaking factor: 1.75 x Annual Average
- Current flow to treatment plant: 450 m^3/day (2010 Annual Average)
- Existing SFE 801 (residential, commercial and institutional)
- Average flow per SFE 560 L/day/SFE

b) <u>Growth Design Criteria</u>

- Growth due to increase in density and expansion of service area: 15 SFE/year
- Growth to development in Ganges Hill (53 SFE total): 5 SFE/year
- Growth in the commercial and institutional sectors 5 SFE/year

c) <u>BOD and TSS</u>

As indicated in Table 3.2 above, the proposed design value for the raw wastewater BOD and the TSS is of 325 mg/L

Based on the above criteria, flow projections for the Ganges wastewater treatment were developed and are shown graphically on Figure 4.1. At the projected rate of growth of 25 SFE per year, the plant hydraulic capacity of 1,000 m^3/day will be reached by 2019 for the maximum day flow unless additional equalization storage is provided or inflow and infiltration is greatly reduced.

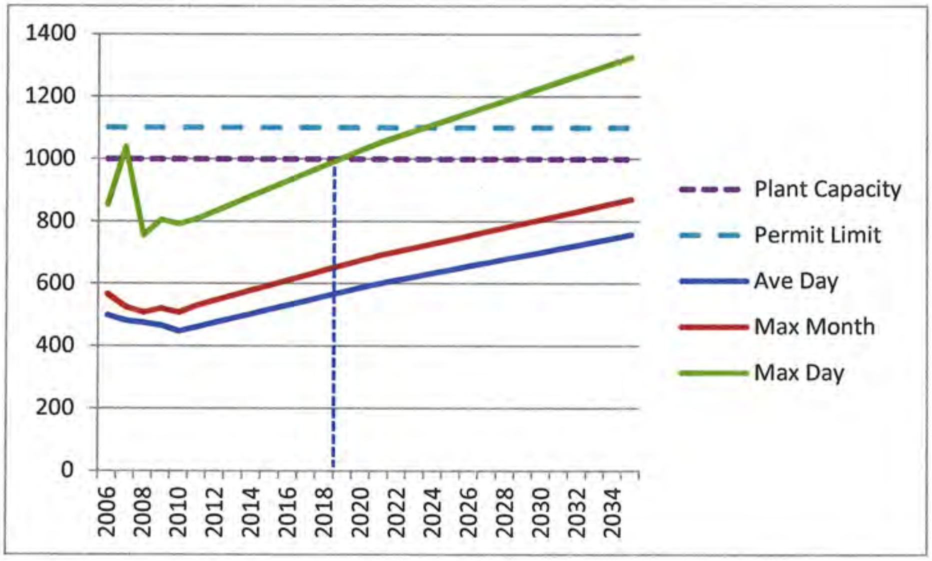

Figure 4.1 – Flow Projections for Ganges WWTP (m^3/day)

As the serviced population increases, the organic (BOD) and TSS loadings on the sewage treatment will increase. The projected increase in organic loading is shown on Figure 4.2. The organic loading projections for the Ganges are based on raw wastewater BOD of 325 mg/L and the maximum month flow. As indicated on Figure 4.2, the organic loading capacity of the plant will be reached by 2023. At that time, it will be necessary to expand the plant in order to maintain the effluent quality.

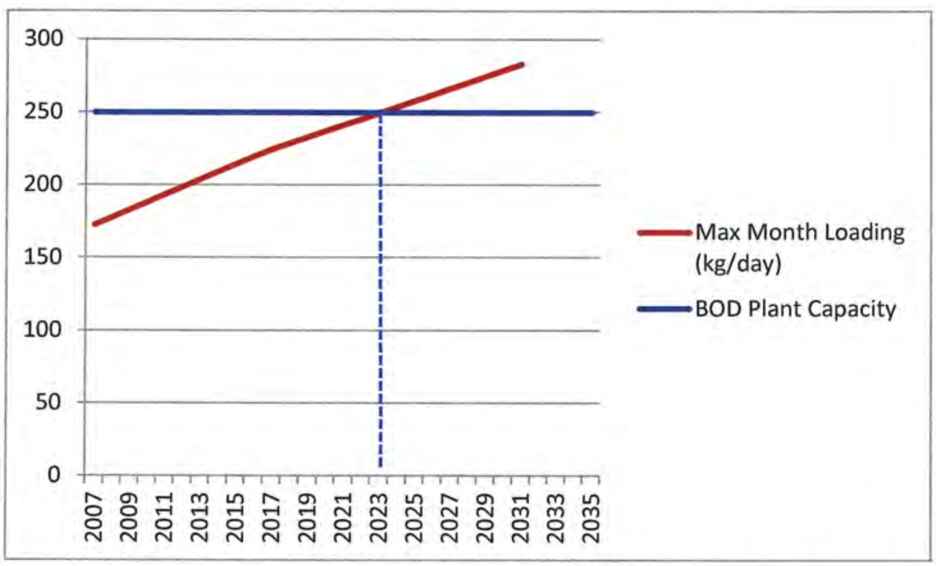

Figure 4.2 – Organic Loading Projections for Ganges WWTP (kg/day)

4.3.2 Capacity of Plant Components

The as-built drawings and the plant design calculations were reviewed in order to determine the design basis and the theoretical capacity of the works.

Influent Pump Station and Screening

The as-built drawing for the treatment plant prepared by Hill, Murray & Associates and dated June 3, 1998 indicate that the sewage flow from the collection system is pumped to the treatment works through an influent pump station. The as-built drawing indicates the maximum capacity of the station is 400 USGPM (25.2 L/s; 2,180 m^3/day). From the influent pump station, the raw wastewater is pumped to the fine screen. Because of continuing operational difficulties with the existing screen, it is proposed to replace this unit in 2012. When replacing the screens, additional capacity should be provided to ensure that the unit is sized for future flows.

Equalization Tanks

From the fine screen, the wastewater flows by gravity to an aerated equalization tank. The as-built drawings show that the capacity of the equalization tank is 36,400 IG (165 m^3) and the capacity of the transfer pump is 400 USGPM (25.2 L/s). The transfer pumps convey the screened wastewater from the equalization tank to the MBR treatment unit. The purpose of the equalization tank is to temporarily store for a few hours any excess flow to ensure the capacity of MBR plant is not exceeded. This includes peak domestic flows in the morning and evenings and wet weather flow.

During the storm of December 3, 2007 when the total flow to the plant reached 1,039 m3/day, additional equalization volume would have been required to store excess flow for a period of one or two days since the MBR treated plant can only accept a maximum flow of 1,000 m^3/day. As shown on Figure 4.2, excluding the unusual storm event of December 2007, the maximum day flow is projected to reach 1,000 m^3/day by 2019. Additional equalization storage should be provided to allow for extreme storm events and to postpone the MBR plant expansion by three to four years until the organic (BOD) capacity of 252 kg/d has been reached. The existing tanks housing the old RBC equipment and the clarifier have a capacity of 135 m^3 and could be converted to storage. This would require the installation of overflow piping from the existing tank to the additional tanks as well as pumps to transfer the liquid back to the existing aerated equalization tank. This would provide a total equalization volume of 300 m^3.

MBR Treatment Plant

As indicated in Section 4.3.1 above, the design calculation provided by Zenon indicate the capacity of the MBR treatment plant following the installation of new membranes in 2005 as follows:

- Maximum day flow: 1,000 m^3/day
- Maximum organic loading (BOD): 252 kg/d

In a conventional wastewater treatment plant, excess flow beyond the rated plant capacity can still be added to the plant, however this results in a progressive deterioration of effluent quality. With MBR plants, it is not possible to introduce a flow that exceeds the capacity of the permeate pumps. The permeate pumps are a rigid bottleneck that limit the hydraulic capacity of an MBR plant. The role of the permeate pumps is to draw clear liquid by suction through the 0.04 micron pores of the membranes. The membranes are submerged into the bioreactor which has solids concentration of 10,000 to 12,000 mg/L. As the membranes ages, usually after 8 years, some pores become permanently blocked reducing the hydraulic capacity and the entire membrane assembly has to be replaced. The current membranes which were installed in 2005 should be replaced in 2013 or 2014 in order to maintain the current plant hydraulic capacity of 1,000 m^3.

As shown in Figures 4.1 and 4.2 the maximum day flow of 1,000 m^3/d is projected to be reached in 2019 while the plant maximum organic loading of 252 kg/d is projected to be reached by 2023. Providing additional flow equalization would extend the hydraulic capacity of the plant by a few years until the organic loading capacity is reached. Additional flow equalization would also provide an added safety factor in case a severe storm, similar to the event in December 2007, occurs again.

In summary, the capacity of the plant will be reached in approximately 10 years at the projected rate of growth and the membranes should be replaced in 2013. When the membranes are replaced, it is recommended to carry out a process optimization study to confirm the hydraulic and organic capacity of the plant and to determine if there are other bottlenecks in the treatment system.

An expanded program using composite sampling to better characterize the raw wastewater should be done in conjunction with the process optimization study. This expanded sampling should be done during the summer months (June, July and August) when the seasonal population and organic loading is highest.

4.3.3 Outfall

Capacity of Outfall Pipe

The MBR permeate pumps convey the treated effluent through the UV disinfection and into the effluent lift station wet well. In turn, the effluent lift station pumps the effluent through the 4.8 km long marine outfall pipe. The land portion of the outfall adds another 150 m of pipe for a total distance of 4,950 m.

The as-built drawings of the outfall prepared by H.A. Simons International Limited and dated April 1982, indicate that the capacity of the 200 mm nominal diameter marine portion outfall pipe is 22 L/s (1,900 m^3/d). At this flow, the drawings indicate that the head losses in the marine portion of the outfall pipe will be 20.5 m. The marine portion of the outfall consists of 1.8 km long section of 200 mm nominal diameter HDPE Series 125 (ID = 168 mm; 6.6 in.) and 3 km long section of HDPE Series 100 (ID = 174.7 mm; 6.9 in.). It should be noted that the inside diameter of polyethylene is smaller than the nominal pipe size. Head losses through these two sections of pipes were verified for C factors (roughness coefficient) of 140 and 150. The calculated head losses are 24.9 m at a roughness coefficient of 140 and 21.9 m for a roughness coefficient of 150. This is similar to the 20.5 m head losses indicated on the as-built drawings. As pipelines age, the roughness increases due to growth of biofilm and abrasion and it is likely the roughness factor is now 140.

The as-built drawings also indicate that the design includes an allowance of 4.4 m for a combination of extreme high tides, storm surge and density head (difference between density of fresh water and sea water). This allowance of 4.4 m is conservative and the additional head require for extreme high tide, storm surge and density is estimated at 3.2 m as follows:

• Extreme high tide	1.8 m
• Storm surge	1.0 m (to be confirmed by modeling)
• Density	0.4 m
Total	3.2 m

It is concluded that the total head of the outfall based on a flow of 22 L/s (1,900 m^3/d) is approximately 28 m. Since the influent pump station into the plant has a slightly higher capacity of 25.3 L/s, peak flows have to be handled through flow equalization.

At the previously recorded maximum day flow which has ranged between 750 m^3/day and 1,040 m^3/day (8.7 L/s to 12 L/s), the head losses through the outfall would be less than half of the head losses of 28 m at 1,900 m^3/day assuming the total daily flow is equalized over a 24-hour period. The outfall pipe has the necessary capacity to handle current peak flows as well as the 20-year projected maximum day flow 1,450 m3/day as long as equalization is provided to attenuate the peak flow.

Capacity of Outfall Pumps

The treated effluent from the plant has to be pumped into the outfall pipe. The plant is not high enough to allow gravity flow into the ocean. The as-built drawings indicate that the effluent pump is a 20 HP pump. However the existing effluent pump is a 10 HP pump rated for a flow of 28.3 L/sec at a head of 13.7 m. As indicated above, the existing outfall is rated for a flow of 22 L/sec at a head of 28 m. The existing effluent pump is undersized and cannot provide enough head at high flows. It can pump a maximum flow of 18 L/sec into the 4.95 km long outfall.

This may explain the incident of December 3rd, 2007 when the effluent lift station could not pump all the treated effluent and approximately 44 m^3 of treated effluent overflowed to a nearby ditch. On that date, there was a combination of events which includes high inflow into the system during an intense rainstorm in combination with a storm surge at high tide and a long duration snow melt. As a result of having a 10 HP effluent pump instead, the peak flow into the plant likely exceeded the capacity of the effluent pump.

5.0 Upgrading and Expansion Plan

The Ganges sewage system will require upgrading to ensure the facilities continue to operate in a satisfactory manner and expansion to provide the required capacity for the projected future growth. Capital expenditures related to increased capacity requirements arising from further development can be funded through a development cost charge (DCC). Capital expenditures for the replacement of existing equipment are to be funded for by the existing area property owners and not through a DCC.

In the previous sections, work required to upgrade the facilities and those needed to expand the capacity have been identified. In this section, a 5-year and a 20-year capital program is outlined. Table 5.1 outlines all the work required to upgrade the existing system and to expand the wastewater treatment plant because of the projected increase in population. Some of the components of the plant that require replacement such as the fine screens and effluent pumps should be sized for the 25-year flow.

Table 5.1 – 20 Year Capital Program

Year	Component	Project Description	Estimated Cost (2011$)	Funding Source
2012	Sanitary Sewers	• CCTV inspection • Smoke/dye testing • Manhole inspections • Flow monitoring	• $25,000 • $21,000 • $9,000 • $15,000 $70,000	Existing Owners
2012	WWTP – Instrumentation	• Replace dissolved oxygen probe • Replace turbidity meter	• $8,000 • $5,000	Existing Owners
2012	WWTP – Bioreactor blowers	Vibration analysis on 3 blowers and replace bearings	$10,000	Existing Owners
2012	WWTP - Screening	Replace 2 mm preliminary screening system	$200,000	Existing Owners
2012	WWTP - Equalization	Remove abandoned RBC components	$35,000	Existing Owners
2012	Outfall	• Outfall inspection (last inspection in 2007) • Replace protective concrete culvert at diffusers (4 locations) and flush diffuser section	• $12,000 • $20,000	Existing Owners
2013	WWTP - Equalization	Convert existing RBC tank and clarifier into overflow equalization tank by adding transfer pumps and piping	$50,000	Existing Owners and DCC

2013	Sanitary Sewers Repairs – Phase 1	***Provisional Items – Subject to findings of sewer inspection program.*** Allowance to repairs deficiencies identified in inspection program.	$50,000	Existing Owners
2013	Harbour House Pumping Station	• Electrical, controls and SCADA upgrades • Replace pumps, gate valves, piping (with stainless steel) and ball floats in conjunction with electrical upgrades	• $55,000 • $125,000	Existing Owners
2014	WWTP – Bioreactor	Membrane replacement	$500,000	Existing Owners
2015	Manson Pumping Station	• Electrical, controls and SCADA upgrades • Replace pumps, gate valves, piping (with stainless steel) and ball floats in conjunction with electrical upgrades	• $55,000 • $125,000	Existing Owners
2015	WWTP- Outfall pumps	Install new outfall pumps to increase capacity	$50,000	DCC
2015	Sanitary Sewers Repairs – Phase 2	***Provisional Items – Subject to findings of sewer inspection program*** Allowance to repairs deficiencies identified in inspection program.	$50,000	Existing Owners
2015	WWTP – Electrical	Replace 208V motor control centre	$60,000	Existing Owners
2016	WWTP – Influent Pump Station	• Electrical, controls and SCADA upgrades • Replace one pump and valves in conjunction with electrical upgrades	$250,000	Existing Owners
2017	WWTP – Bioreactor	Replacement of automated valves and actuators	$25,000	Existing Owners
2018	WWTP – Bioreactor	Replacement of 2- 25 HP and 1-30 HP blowers supplied with original MBR plant	$150,000	Existing Owners
2021	WWTP – Expansion to increase capacity by 50%	• Design	$200,000	DCC
2022	WWTP – Expansion to increase capacity by 50%	• Construction	$2,900,000 (under review)	DCC
2022	WWTP - Bioreactor	Membrane replacement in original bioreactor	$500,000	Existing Owners
2022	WWTP - Bioreactor	Replace permeate pumps in original bioreactor	$10,000	Existing Owners
2022	WWTP – Bioreactor	Replacement of automated valves and actuators (original MBR plant)	$25,000	Existing Owners

2027	WWTP – Bioreactor	Replacement of automated valves and actuators (original MBR plant)	$25,000	Existing Owners
2030	WWTP - Bioreactor	Membrane Replacement (original and expanded plant)	$750,000	Existing Owners
2030	WWTP- Electrical Upgrade	Replace 208V and 600V distribution panels and service entrance boards	$60,000	Existing Owners

Table 5.2 summarizes the components that require replacement in the next five years which total $1.7 million. Approximately 35% of this sum is for the upgrading of the pumping stations. To improve the cash flow, it may be possible to postpone the upgrading the Harbour House and Manson pumping stations to 2016 or 2017. Also it should be noted that the cost of repairs that may be required to the sanitary sewer cannot be determined until the inspection program is completed. At this time, an allowance of $50,000 has been included for sewer repairs in 2013 and in 2015. This estimate will have to be reviewed.

Table 5.2 – 5 Year Capital Program

Year	Description	Amounts (2011$)	Totals
2012	• Sanitary sewer inspections • Instrumentation upgrades • Blower vibration analysis and repairs • New fine screens • Remove abandoned RBC components • Outfall repairs	• $70,000 • $13,000 • $10,000 • $200,000 • $35,000 • $32,000	$360,000
2013	• Harbour House pumping station upgrade • Convert RBC tanks to equalization • Provisional item for repairs to sanitary sewers (subject to inspection report)	• $180,000 • $50,000 • $50,000	$280,000
2014	• Membrane replacement	• $500,000	$500,000
2015	• Manson pumping station upgrade • New outfall pumps • Replace 208v motor control centre • Provisional item for repairs to sanitary sewers (subject to inspection report)	• $180,000 • $50,000 • $60,000 • $50,000	$340,000
2016	• Upgrade influent pump station	• $250,000	$250,000
2017	• Replace automatic valves and actuators	• $20,000	$20,000
	TOTAL		**$1,750,000**

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Meeting Friday, October 17, 2014 at 10:00 am

Report: Ganges Wastewater System Infrastructure replacement

Appendix B

Budget for Alternative 1 & Alternative 2

GANGES SEWER UTILITY
CAPITAL REPLACEMENT REQUIREMENTS
ALTERNATIVE 1

Description	Estimated Construction Cost	Contingency (%)	Contingency	Construction Budget	Engineering	Admin	Operations Staff	Total Budget
	2016							
Fine Screens, Membrane Replacement, Effluent Piping and Pumps, Recirculation Piping & Cleaning Tank Heater	705,000	25	172,000	877,000	189,050	43,850	64,000	1,173,900
I & I Program Phase 1	72,956	10	7,296	80,252	20,063	4,013	4,013	108,340
I & I Program Phase 2 & Collection System Repairs	108,243	30	32,473	140,716	35,179	7,036	7,036	189,967
Harbour House Pump Sta & (SCADA added)	268,335	30	80,500	348,835	87,209	17,442	17,442	470,928
Manson Pump Station & (SCADA added)	268,335	30	80,500	348,835	87,209	17,442	17,442	470,928
Instrumentation - Turbidity Meter (2)	7,407	30	2,222	9,629	963	481	1,926	12,999
Blower Vibration Testing & Repairs (3 Blowers)	12,682	10	1,268	13,951	1,395	698	1,395	17,438
Remove old RBC components	21,649	30	6,495	28,143	1,407	1,407	1,407	32,365
Outfall Repairs	43,297	30	12,989	56,286	8,443	2,814	2,814	70,358
Convert RBC Tanks to Equalization Tanks	54,122	30	16,236	70,358	17,590	3,518	3,518	94,983
Replace 208V Motor Control Centre	107,486	30	32,246	139,731	34,933	6,987	34,933	216,583
Influent Pump Station & Piping	162,365	50	81,182	243,547	60,887	12,177	12,177	328,789
Replace Automatic Valves & Actuators	25,437	10	2,544	27,981	1,399	1,399	1,399	32,178
Sludge Thickening Tank & Membranes (New)	238,135	50	119,068	357,203	89,301	17,860	35,720	500,084
Replace Flow Meters with Mag Meters (New)	58,451	15	8,768	67,219	10,083	3,361	16,805	90,045
Replace Roofing, Paint Building, Replace Fence (New)	43,297	50	21,649	64,946	16,236	3,247	6,495	90,924
TOTALS								**3,900,809**
							BUDGET	**3,900,000**

2014.10.07
C. Gottfred, P.Eng.

GANGES SEWER UTILITY
CAPITAL REPLACEMENT REQUIREMENTS
ALTERNATIVE 2

Description	Estimated Construction Cost	Contingency (%)	Contingency	Construction Budget	Engineering	Admin	Operation Staff	Total Budget
	2016							
Replace Fine Screens	160,000	30	48,000	208,000	52,000	10,400	20,800	291,200
Membrane Replacement & Cleaning Tank Heater	395,000	20	79,000	474,000	94,800	23,700	23,700	616,200
Crane Chain Hoist	50,000	30	15,000	65,000	9,750	3,250	6,500	84,500
Effluent Piping & Pumps (New)	75,000	30	22,500	97,500	24,375	4,875	9,750	136,500
Recirculation Piping	25,000	30	7,500	32,500	8,125	1,625	3,250	45,500
Sludge Thickening Tank & Membranes (New)	238,135	50	119,068	357,203	89,301	17,860	35,720	500,084
TOTALS								**1,673,984**
							BUDGET	**1,670,000**

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Report: Ganges Wastewater System Infrastructure replacement

Appendix C

GE Site Visit Audit Report, May 2014

AUDIT REPORT

SR/File: 543690/500302

Title: Ganges WWTP
Location: Ganges, BC
Persons Contacted: Denis Perreault
Distribute To: Dennis Favret, Anthony Amendola

Traveler: John Zupancic
Trip Date: May 7-9, 2014
Reporting Date: May 12, 2014
Reported By: John Zupancic

Plant Overview

OBJECTIVES

Evaluate the condition of the plant related to membrane plant operation, including:

- Current state of prescreening
- Current cleaning protocols, both MC and RC.
- Current state of preventive maintenance on equipment: pumps, valves, instrumentation.

- Membrane condition – sludging, updates on slack adjustment, cassette frame condition
- Aeration patterns
- Alarm history
- Piping/equipment leaks
- State of lifting device(s).
- Complete PM checklist
- Complete MBR retrofit tool

ACTIONS FROM TRIP

Prescreening

The plant uses an OR-TEC Rotary brush type with a fine screen of 3 mm. No visible issues were observed during inspection, although a fine screen of 2 mm is recommended by GE Water.

Fig. 1

Fig. 2

Cleaning protocols, both MC and RC

The membrane tank is combined with the aeration basin. With this configuration a traditional maintenance clean cannot be performed. The plant is designed to do its maintenance cleans by back washing the membranes infused with .12 ppm hypochlorite residual. The FSR did not witness the hypo injection pump functioning at any time during the visit. A plant staff member had stated that the pump did not work. The FSR recommends that the pump be repaired to help ensure proper MCs are conducted.

Recovery cleans (RC) are conducted biannually at a hypo concentration of 500 ppm. The last RC was done in October 2013. The next RC is now overdue and should be conducted as soon as practical. RCs schedules should be followed thoroughly to help prevent membrane fouling and extend membrane life. In addition, the concentration for the cleans can be increased to 1000 ppm

The RC dip tank has severe erosion on the cement tank walls due to the chemical cleans. The plant may want to consider relining the tank walls to inhibit further erosion and prevent fine cement particles from lodging within cassette fibers.

Preventive maintenance on equipment: pumps, valves, instrumentation, etc.

It was stated to the FSR that the instrumentation is typically calibrated on an annual basis. At the time of this visit, instruments have exceeded this time frame. All analytical instruments, ie: flow meters, turbidimeters etc. have different time frames or intervals for recalibrating and equipment inspections, as well as performing preventative maintenance tasks according to manufacturer's recommendations. Maintenance schedules should be found in the vendor data folders/binders or can be acquired by contacting the respective manufacturers. A critical spare parts cache should be on hand and maintained should an unexpected failure occur. This would prevent extended down time and would benefit the plant in the long run, reducing costs of acquiring equipment in an emergency situation as well as other costs incurred by a plant shut down.

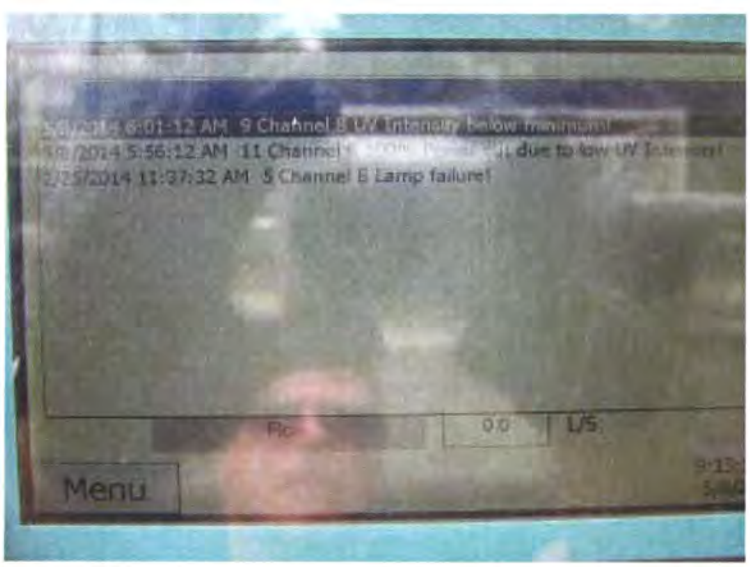
The system does not have a vacuum pump installed. One recommendation is to install an air ejector system to help prevent pump airlocks, as well as preventing pump failure due to dry running the permeate pumps.

The plant runs using 2 RAS pumps. At the time of this visit one pump was not functioning due to a seal leak. It was also stated to the FSR that the RAS pump piping inside the MBR was also deteriorating and in need of repair/replacement.

The cyclic valves appeared to working without any issues. The plant was having many issues with the originally installed Stealth actuators, and has subsequently changed over to Bray, which have been performing well, according to plant staff.

The UV system is running, but currently there are 3 separate faults displayed on the screen which require attention. (See figure 3)

Fig. 3



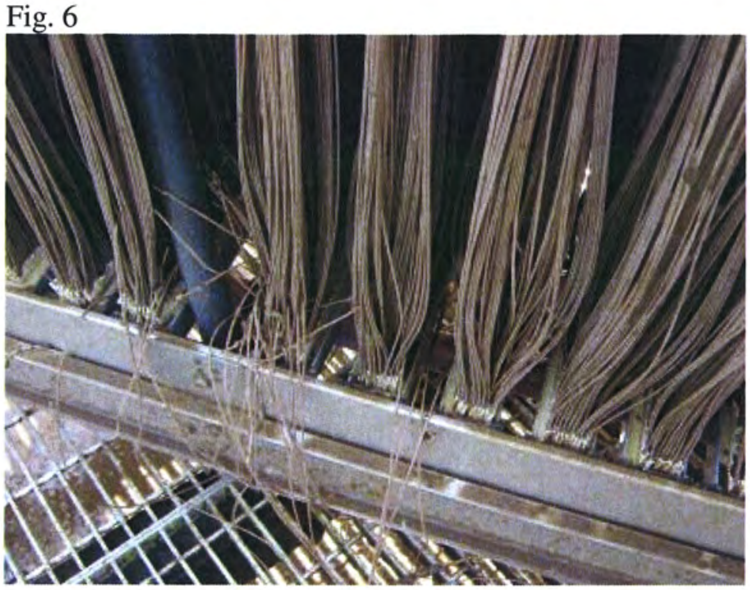
Membrane/Cassette Condition – sludging, updates on slack adjustment, cassette frame condition

The plant MBR tank is currently running at ~15,000 MLSS and producing ~500 m3/day. There was no significant sludging found within the cassettes, although patches of hair and debris were found, predominantly near the top headers of the modules (figure 4). The bottom headers contained significantly less sludging and debris. The FSR could not determine if the debris was from a breach in the prescreening, or from debris getting into the open air MBR tanks. A significant number of broken fibers were found in several cassettes, which could be attributed to the debris in the tank. The fibers were predominantly broken closer to the top headers (figure 5). The plant performs fiber repairs by tying knots (figure 6) in the affected fibers, rather than properly repairing them with the Shin-Etsu silicone. The tied fiber strands can wear away at the membranes, causing further damage to more fibers.

Fig. 4

Fig. 5

Fig. 6



Slack was found to be at 2" – 2 ½" on most of the cassettes (figure 7), which is essentially the least amount of operating slack. It was evident that previous slack adjustments had already been made. The slack adjustment bolts are at their limit and no further adjustments can be made (figure 8). Insufficient slack will cause stress on the fibers, causing pulled/broken fibers, as well as stress on the cassette frames, and also insufficient slack for effective aeration.

Fig. 7

Fig. 8

All the cassette frames are in extremely poor condition. The top module headers have worn through the C-channels and are being supported by additional SS angle iron supports installed by plant staff (figure 9). On some cassette you can see where/how the header is wearing away through the channels, as well as erosion of the C-channels (figures 10, 11).

Figure 9

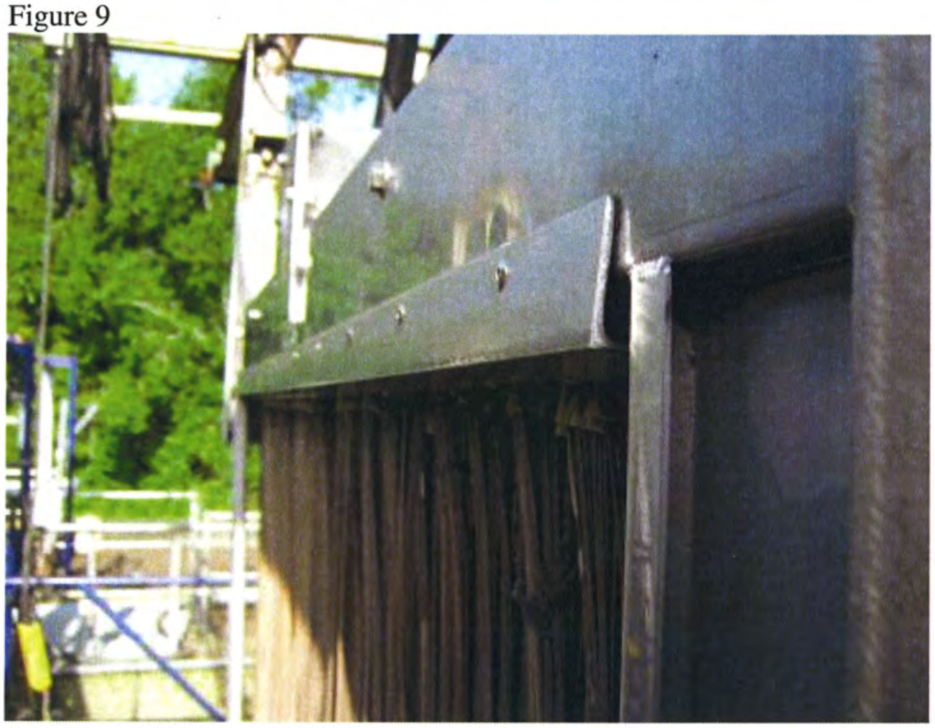


Fig. 10

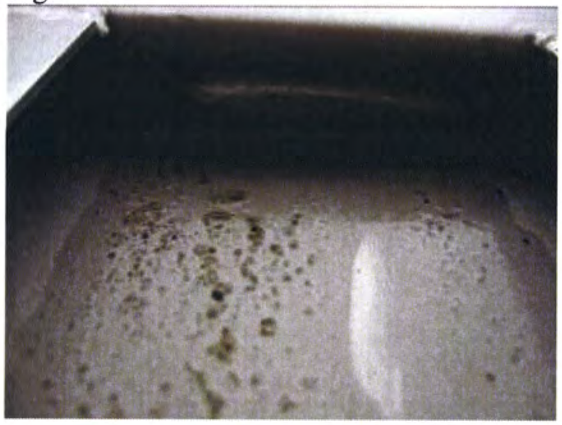
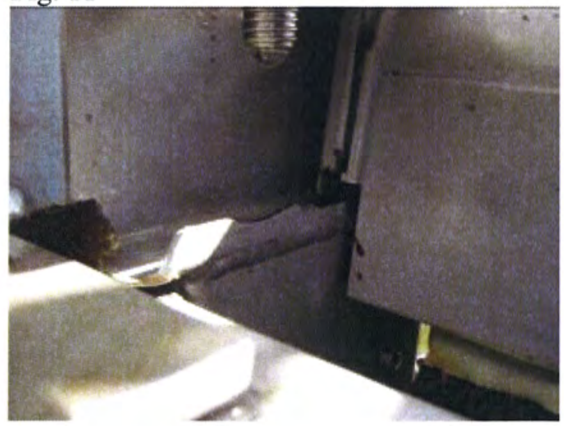


Fig. 11



Although no SS hardware was missing, the hanger arm support bolts were found to be worn, causing the hanger arms to lean (figure 12), and put stress on the hardware when in production. Numerous cracks in the cassette frame were also found (figure 13).

Fig. 12

Fig. 13

Wear was also discovered on the bottom module spacers. There is about 3 inches of play on the bottom module headers. The spacers are so worn that they provide no spacing at all, allowing the bottom headers to swing back and forth and further wear damage (figures 14, 15).

Fig. 14

Fig. 15

Aeration

The aeration pattern appeared even, although it seemed somewhat vigorous. The membrane aeration flow is manually set at ~750 scfm. Although the aerator tubes were all found to be clear of any obstructions, they are severely worn to the point of breaking. Several had been replaced by tubes made up of materials purchased from the local hardware store, and one aerator tube was missing completely. The tubes must be checked regularly for wear and replaced as needed. Tubes that break off of the cassettes can become lodged within the modules and cause severe fiber damage. See figures 16, 17, 18.

Fig. 16

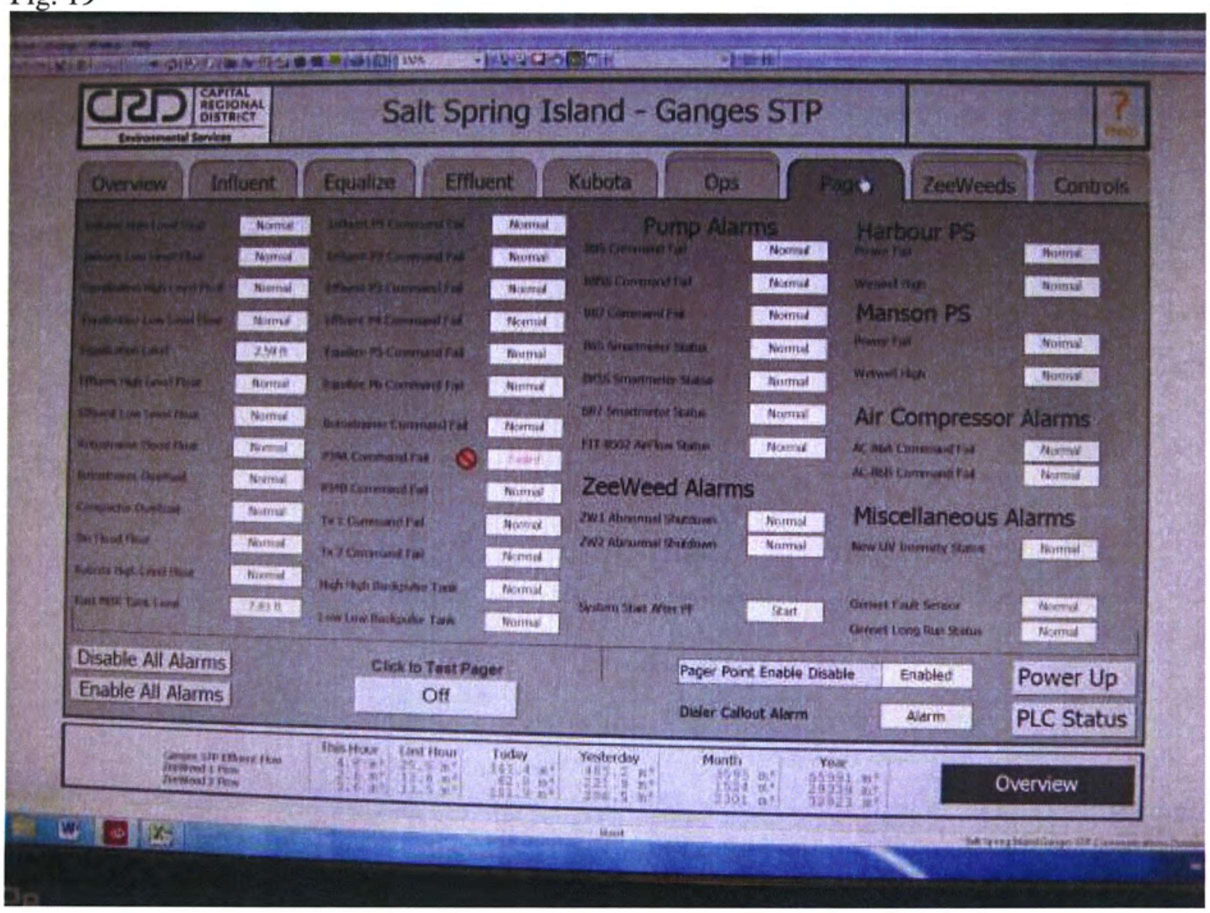
Fig.17

Fig. 18

Alarms

Only one alarm was present on the alarm history page, as noted in the PM checklist. Call outs are made via a paging system to the operators. Below is a screen shot of the alarm call out page (figure 19)

Fig. 19



Piping/equipment leaks

No piping or equipment leaks were observed, other than the previously mentioned deteriorating RAS pump piping which was conveyed by plant staff, but not visually seen.

State of lifting device(s)

The cassette lifting bracket appears to be in good condition, with no visible signs of wear or damage. Both the crane and the bridge are rated for 1 ton (figure 20). The weight of a heavily sludged ZW 500c cassette is 3,700 pounds, which is more than the capacity of the crane. Therefore, it is not recommended to lift any cassettes out of the tank without confirmation of the cassette weight using a load cell or other means. It is recommended that the bridge crane capacity be increased to 2 tons.

The bridge of the crane does not extend completely over the dip tank. This would only allow an operator to insert one cassette into the dip tank for RCs, where there is ample room in the dip tank for 2 cassettes.

Fig. 20

Observational Summary

The main issues with the plant are the conditions of the membrane cassettes. Cracked welds, eroding frames and modules could pose for an up and coming plant failure. Safety of the staff that are lifting and working on these cassettes must be considered. Resources for developing and following a meticulous and concise maintenance prevention program would benefit the plant immensely. The plant could also benefit with GE "InSight" monitoring. Upgrading to updated digital instruments such as flow meters would give the plant more accurate readings, as would regularly calibrated instruments.

Recommendations

- Taking into consideration the condition of the membranes and frames at the plant, replacement of all cassettes should be considered. A regular visual inspection program should also be implemented on the new cassettes so that any missing or damaged components on the membranes themselves or the cassettes can be documented, reported, and addressed on a timely basis.
- Modify/upgrade prescreening to meet current 2 mm GE Water specification.
- Increase crane capacity to 2 tons, and do not lift any cassettes out of the membrane tanks with the current crane without first verifying that the cassette weight is below 1 ton.
- Biannual sodium hypochlorite recovery cleaning can be performed at a 1000 ppm concentration if necessary.
- Consider an appropriate chemical resistant liner to be installed in the dip tank to prevent abrasive solids from sloughing off the tank and entering the fiber bundle.
- Review vendor data for ancillary equipment to verify manufacturer's recommended service intervals and tasks.
- If system priming is a problem following extended OFF or standby periods, the feasibility of an ejector system can be further investigated.
- Repair seal leak on RAS pump currently out of service.
- Address faults on UV system to ensure proper effluent post-treatment.
- Consider GE Water technical service offerings for ongoing plant operational support. 24/7 technical support and remote process monitoring using InSight are available.

CRD

Making a difference...together

Ganges Sewer Local Service Commission
Meeting Friday, October 17, 2014 at 10:00 am

Report: Ganges Wastewater System Infrastructure replacement

Appendix D

Grants - Federal New Canada Building Fund – Small Communities Fund

New Building Canada Fund: Provincial-Territorial Infrastructure Component Small Communities Fund

PDF Version (Size: 1.05 MB)

Help on accessing alternative formats, such as PDF, PPT and ZIP files, can be obtained in the alternate format help section.

What is it?

The $10-billion Provincial-Territorial Infrastructure Component (PTIC) provides support for projects of national, local or regional significance. This includes the Small Communities Fund (PTIC-SCF) that will provide $1 billion for projects in municipalities with fewer than 100,000 residents.

Why is it important?

Smaller communities will be able to build projects that deliver on local needs. Through the Small Communities Fund, our Government continues to provide dedicated funding for small communities, building on the successful practices established under the 2007 Building Canada Fund and the Infrastructure Stimulus Fund. In addition, communities can use the Gas Tax Fund towards a wider range of projects, including highways, disaster mitigation, broadband, brownfield redevelopment, recreation, culture, tourism and sport.

How does it work?

To ensure that small communities receive funding opportunities, ten per cent (10%) of the PTIC allocation of each province and territory will be set aside for the PTIC-SCF.

Infrastructure Canada will enter into funding agreements with the provinces and territories who will be responsible for identifying and proposing projects for consideration.

Projects funded through the PTIC-SCF must meet the following program objectives:

- Economic growth;
- A clean environment; and
- Stronger communities.

Eligible recipients under the PTIC-SCF:

Eligible recipients are restricted to those whose projects are situated within or are for the benefit of, communities with a population of fewer than one hundred thousand people (100,000) as determined by Statistics Canada — Final 2011 Census.

The following are eligible recipients for the purposes of the PTIC-SCF:

a. A municipal or regional government established by or under provincial or territorial statute;

b. A provincial or territorial entity (e.g., a department, corporation or agency) that provides municipal-type infrastructure services to communities, as defined in provincial or territorial statute;

c. A band council within the meaning of section 2 of the *Indian Act*; or a government or authority established pursuant to a Self Government Agreement or a Comprehensive Land Claim Agreement between Her Majesty the Queen in right of Canada and an Aboriginal people of Canada, that has been approved, given effect and declared valid by federal legislation;

d. A public sector body that is established by or under provincial or territorial statute or by regulation or is wholly owned by a province, territory, municipal or regional government which provides municipal-type infrastructure services to communities; and

e. A private sector body, including for-profit organizations and not-for-profit organizations, whose application is supported by a municipal or regional government referred to above. Such support could take the form of a resolution from the municipal or regional government council.

Eligible Categories under the PTIC–SCF:

- Public transit
- Drinking water
- Wastewater
- Solid waste management
- Green energy
- Innovation
- Connectivity and broadband
- Brownfield redevelopment
- Disaster mitigation infrastructure
- Local and regional airports
- Short-line rail
- Short-sea shipping
- Highways and major roads
- Northern infrastructure (applies to Yukon, Nunavut and Northwest Territories only)

More information on Sub-Category and expected outcomes and benefits.

Federal Cost-Sharing and Stacking

In the provinces, most projects will be federally cost-shared on a one-third basis. In the case of provincially-owned highways and major roads, as well as public transit projects, the maximum federal contribution to any single project will be 50 per cent. The maximum contribution is 25 per cent for projects with for-profit private sector proponents.

For projects located in the Northwest Territories, Yukon and Nunavut, the federal government will fund up to 75 per cent of total eligible costs. For projects with a for-profit private sector proponent, however, the cap would be 25 per cent. More information on cost-sharing and stacking.

How to apply?

Canada will enter into Funding Agreements (FA) with each province and territory for the implementation of the PTIC–SCF. In turn, provinces and territories will manage the project identification process in keeping with PTIC–SCF program parameters.

All proposed projects must provide basic information that includes the name of the municipality, title of the project, the eligible category and subcategory, a brief description of the project, financial information, project location as well as planned start and end dates.

If you are an eligible recipient and would like to have your project considered for funding under the PTIC, and to determine the process for submitting project proposals and deadlines, you are encouraged to contact your respective provincial or territorial ministry responsible for infrastructure as outlined below. You can also learn more about how the Small Communities Fund works by reading the Program Overview.

Contact Information

- **British Columbia**
  - Ministry of Transportation and Infrastructure
- **Alberta**
  - Alberta Infrastructure
- **Saskatchewan**
  - Ministry of Government Relations
- **Manitoba**
  - Manitoba Municipal Government
- **Ontario**
  - Ministry of Economic Development, Employment and Infrastructure
- **Quebec**
  - Secrétariat du Conseil du Trésor-Sous-secrétariat aux infrastructures publiques
- **New Brunswick**
  - Regional Development Corporation
- **Nova Scotia**
  - Finance and Treasury Board
- **Prince Edward Island**
  - Department of Transportation and Infrastructure Renewal
- **Newfoundland and Labrador**
  - Department of Transportation and Works
- **Yukon**
  - Department of Community Services
- **Northwest Territories**
  - Department of Municipal and Community Affairs
- **Nunavut**
  - Community and Government Services

Infrastructure Canada contact information

General questions and comments on the PTIC program can be addressed to Infrastructure Canada:

Email: info@infc.gc.ca
Telephone Infrastructure Canada: 613-948-1148
Toll Free Number: 1-877-250-7154
Mailing Address:
Provincial-Territorial Infrastructure Component
180 Kent Street, Suite 1100
Ottawa, ON K1P 0B6

Date modified: 2014-07-15

Government of Canada Gouvernement du Canada

Canada

Infrastructure Canada

New Building Canada Fund: Provincial-Territorial Infrastructure Component, Small Communities Fund

Program Overview

Purpose

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To ensure that small communities receive funding opportunities, ten per cent (10%) of the **New Building Canada Fund - Provincial-Territorial Infrastructure Component - (PTIC)** envelope in each jurisdiction will be set aside for the **Small Communities Fund (PTIC–SCF)**. This $1 billion available under **PTIC-SCF** will provide contribution funding for locally significant projects in small communities with populations of 100,000 or less.

PTIC–SCF has been designed to leverage the resources and existing processes of the provinces and territories in managing local projects, while ensuring federal accountability and oversight of the funding envelope.

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New Building Canada Fund: Provincial-Territorial Infrastructure Component, Small Communities Fund
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Governance

- Canada will enter into Funding Agreements (FA) with each province and territory for the implementation of the SCF.
- The provinces and territories will in turn, enter into agreements with eligible ultimate recipients to manage individual projects. Canada will not enter into a FA with any party other than a province or territory.
- An Oversight Committee (OC) composed of both federal and provincial or territorial representatives will be established to monitor the implementation of the program in each jurisdiction.

Project Identification and Approval

- Provinces and territories will be responsible for identifying potential projects and submitting them to Infrastructure Canada (INFC) for approval.
- All proposed projects must provide basic information, including the name of the municipality, title of the project, the eligible category and subcategory, a brief description of the project, financial information, project location, as well as planned start and end dates. ***Please refer to Annex A for a full list of eligible investment categories and related subcategories.***

Eligible Recipient(s)

- Eligible recipients are restricted to those whose projects are situated within, and/or are for the benefit of, communities with a population of less than one hundred thousand people (100,000) as determined by Statistics Canada - Final 2011 Census. ***Please refer to Annex B for a complete listing of eligible recipients.***

Cost-sharing, Stacking and Limits to Federal Contribution

For projects located in provinces, the maximum federal contribution from all sources will be one-third (33.33%) of the total eligible costs of a project (*see Annex C for details of eligible and ineligible expenditures*), with the following exceptions:

a. For traditionally-procured projects in the Highways and Major Roads category where the asset is provincially-owned, and those in the Public Transit category, the maximum federal contribution from all sources will be fifty per cent (50%) of the total eligible costs; and
b. For all projects that are delivered as public-private partnerships or where the recipient is from the for-profit private sector, the maximum federal contribution from all sources will be twenty-five per cent (25%) of the total eligible costs.

For projects located in the territories, the maximum federal contribution from all sources will be three-quarters (75%) of the total eligible costs of a project, with the following exception:

- For all projects where the recipient is from the for-profit private sector, the maximum federal contribution from all sources will be twenty-five per cent (25%) of the total eligible costs.

The provincial government contribution will be no less than the federal contribution.

Contributions to for-profit, private sector bodies through the SCF will be considered only when these projects will be for public use or benefit. In these cases, recipients will be required to demonstrate the broader public benefits of the project.

For projects advanced by a First Nations recipient, with regard to financial support that the First Nation receives from Aboriginal Affairs and Northern Development Canada (AANDC), only funding received from the First Nations Infrastructure Fund would be counted towards the federal stacking limits for PTIC. All other sources of funds the First Nation receives from AANDC would not count towards the stacking limits.

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New Building Canada Fund: Provincial-Territorial Infrastructure Component, Small Communities Fund
Program Overview
Annex A - Overview of Eligible SCF Categories

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Highways and Major Roads

I. Objective

To invest in highways and major roads, including bridges that have broad public benefits, and that contribute to economic growth, to a clean environment, and stronger communities.

II. Subcategories

New construction, additional capacity, or rehabilitation or safety-related improvements on highways and major roads, including bridges and tunnels that are:

- Part of the National Highway System (including core, feeder and northern categories);
- Highways and roads (e.g., freeways, expressways, collectors or arterials) that carry or are projected to carry significant volumes (see note a) of freight and/or passenger traffic;
- Highways and roads related to natural resource development opportunities; or
- Road/rail grade separations on one of the above highways or major roads.

Notes:

a. *Significant volumes' will be defined as an average annual daily traffic (AADT) value of at least 3,000.*
b. *Rehabilitation projects must meet the definition of 'rehabilitation' as agreed upon by the Council of Ministers.*
c. *Projects under this category could include: Intelligent Transportation Systems (ITS), and/or active transportation infrastructure (e.g. sidewalks, bicycle lanes, pedestrian/bike/multi-use pathways) components as a part of the overall project.*

III. Outcomes and Benefits for Canadians

These benefits support one or more of the following outcomes:

- Increasing efficiency and mobility by supporting efforts to reduce congestion, effectively manage traffic volume, and reduce travel time;
- Improving safety;
- Improving access for remote areas affected by resource development-related activity, and/or improved social and economic outcomes in affected communities; or
- Extending the life of the existing asset.

Public Transit

I. Objectives

To invest in public transit infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Transit infrastructure and rolling stock, including but not limited to bus rapid transit (BRT), light rail transit (LRT), subways, buses, urban passenger ferries and regional commuter rail.
- Transit facilities and supporting infrastructure including but not limited to transit queue-jump lanes, reserved bus lanes, turning lanes or other related enhancements in support of public transit, streetcar/trolley infrastructure, storage and maintenance facilities, security enhancements, and transit passenger terminals.
- Intelligent Transportation Systems (ITS) in support of public transit services.

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Supporting efforts to reduce urban congestion;
- Increasing transit ridership;
- Improving safety; or
- Improving mobility (e.g., improved access, reduced travel times).

Disaster Mitigation Infrastructure

I. Objectives

To invest in disaster mitigation infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Construction, modification, reinforcement or relocation of public infrastructure that protects from, prevents, reduces the impact and/or likelihood of, or mitigates the potential damage resulting from natural hazards, including impacts or events related to climate change.

Notes:

a. *Construction, modification or reinforcement of public infrastructure excludes normal routine, maintenance and operational work (e.g., dredging of sediment, gravel removal, debris traps, etc.). The relocation of entire communities is also excluded.*

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Reducing the social, physical and/or economic risks associated with natural hazards and/or adverse effects related to climate change
- Improving the resiliency of public infrastructure to natural hazards and/or adverse effects related to climate change
- Supporting an all-hazard risk assessment and related mitigation plan to address disaster risks

Connectivity and Broadband

I. Objectives

To invest in broadband infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- High-speed backbone
- Point of presence
- Local distribution within communities
- Satellite capacity

Notes:

a. *In Canada, broadband service refers to download speeds of 1.5 Mbps or greater. In Telecom Regulatory Policy 2011-291, the CRTC established a universal broadband Internet access target download speed of 5 Mbps.*

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Increasing in geographical area, to account for industrial/resource development investments, with access to broadband speeds of 1.5 Mbps or higher, contributing to improved economic development in remote areas; or
- Increasing in number of Canadians with access to broadband speeds of 1.5 Mbps or higher, contributing to improving the quality, accessibility and effectiveness of public services.

Innovation

I. Objectives

To invest in infrastructure at post-secondary institutions that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Post-secondary research and development laboratories and centres, and related teaching facilities.
- Office space for the purpose of conducting research and development.
- Research libraries associated with the research laboratories and centres.

Notes:

a. *Eligible investments under each sub-category could include installation of underlying connective infrastructure as necessary (e.g. water/sewer connections, electricity connections, new technologies and implementation of approaches for improved energy efficiency in laboratories, telecommunications infrastructure).*

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Enhancing capacity of post-secondary institutions to develop and transfer new knowledge through leading-edge basic and applied research and teaching;
- Increasing opportunities for collaboration between public institutions and the private sector supporting the transfer of innovative technologies and research to market; and,
- Developing a highly-skilled workforce driving innovation in sectors that support increased diversification or competitiveness of the national, regional, or local economy and contribute to sustained long-term growth.

Wastewater

I. Objective

To invest in wastewater infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Wastewater treatment facilities or systems
- Wastewater collection systems
- Separation of combined sewers and/or combined sewer overflow control, including real-time control and system optimization
- Separate storm water collection systems and/or storm water treatment facilities or systems
- Wastewater sludge treatment and management systems

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Measurably and quantifiably reducing the volume and/or improvement in the level of treatment of wastewater effluent;
- Increasing the number of households, industries, commercial establishments, and institutions with untreated wastewater connected to sanitary wastewater systems;
- Reducing the volume and incidents of discharge of untreated wastewater effluent as a result of sanitary sewer and combined sewer overflow events;
- Improving quality of treated stormwater effluent;
- Improving the reliability or performance of the wastewater collection and/or treatment system;
- Improving wastewater sludge treatment and management.

Green Energy

I. Objectives

To invest in energy infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Reinforcement, expansion of existing and construction of new transmission grids to transmit clean electricity, including smart grid technologies.
- Renewable Electricity Generation facilities (e.g., wind energy, solar energy, small scale hydro).
- Thermal heat/cooling delivery system (i.e. district energy systems) using renewable or combined heat/power plants.
- Projects for new or material rehabilitation or expansion of carbon transmission and storage infrastructure;
- Electric vehicle infrastructure.
- Clean coal facilities.

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Increasing the security of Canada's clean electricity supply;
- Increasing installation of clean energy technologies that improve air quality and/or reduce greenhouse gases;
- Increasing the number of private sector and public sector installations and/or use of clean-energy technologies;
- Increasing electricity trade connections between provinces/territories that facilitate the transfer of clean electricity.

Drinking Water

I. Objective

To invest in water infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Drinking water treatment infrastructure.
- Drinking water distribution systems (may include metering as part of a larger project).

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Improving the quality of drinking water, and where possible, alignment with the Guidelines for Canadian Drinking Water Quality;
- Increasing the number of households, industries, commercial establishments, and institutions provided with access to safe drinking water;
- Improving the efficiency and service reliability of water treatment facilities and/or distribution systems, as demonstrated by a reduction in water leakage or loss, use of treatment chemicals, energy use and/or number of boil water advisories;
- Improving water conservation (i.e. increased number of households equipped with residential metering, and decreased daily per capita water use);
- Improving the protection and/or management of drinking water sources.

Solid Waste Management

I. Objective

To invest in solid waste infrastructure that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Waste diversion infrastructure (e.g., recycling, composting, anaerobic digestion, eco centers).
- Waste disposal infrastructure (e.g., thermal processes, landfill gas recovery).

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Increasing the quantity (kg/capita) of solid waste diverted from disposal;
- Reducing environmental impacts from landfills (e.g. greenhouse gas emissions, leaching of liquid waste, soil contamination); or
- Increasing energy recovery from solid waste management activities.

Brownfield Redevelopment

I. Objective

To invest in the remediation and redevelopment of public infrastructure and associated properties that contribute to economic growth, a clean environment and stronger communities.

II. Subcategories

Remediation or decontamination and redevelopment of a brownfield site within municipal boundaries, where the redevelopment includes:

- The construction of public infrastructure as identified in the context of any category under the New Building Canada Fund; and/or
- The construction of municipal use public parks and affordable housing.

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Removing or neutralizing the negative effects of brownfields on communities and the environment by remediating and redeveloping these properties in a sustainable manner;
- Reducing the environmental and health risks posed by contaminated sites within municipal boundaries;
- Increasing local or regional economic development and competitiveness;
- Increasing the supply of affordable housing; and
- Increasing the sustainability of municipal development and encouragement of more efficient and the intensification of land use.

Local and Regional Airports

I. Objectives

To invest in airport infrastructure that has broad public benefits, and contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

Construction projects that enhance airports that are accessible all year-round, through the development, enhancement or rehabilitation of aeronautical and/or non-aeronautical infrastructure:

- Aeronautical infrastructure includes, but is not limited to: runways, taxiways, aprons, hangars, lighting, aids to navigation (Navaids), maintenance sheds, airside mobile equipment and associated shelters, air terminal buildings, and groundside safety-related infrastructure;
- Non-aeronautical infrastructure such as groundside access, inland ports, parking facilities, and commercial and industrial activities.

Notes:

a. *Local and regional airports are defined as those sites having scheduled passenger traffic, not located in the national capital or a provincial/territorial capital and not classified by Transport Canada as an Arctic or remote airport.*

b. *Federally-owned airports and federal assets are not eligible for funding.*
c. *Safety and security projects that are eligible for funding under Priorities 1 and 2 of Transport Canada's Airports Capital Assistance Program (ACAP) are funded under that program, and are not eligible for funding unless they are part of a larger project.*

   ACAP priorities 1 and 2 may be described as:

   Priority 1: Safety-related airside projects required to accommodate the aircraft providing year-round, regularly scheduled passenger service such as rehabilitation of runways, taxiways, aprons, associated lighting, visual aids, sand storage sheds, utilities to service eligible items, related site preparation costs including directly associated environmental costs, aircraft firefighting equipment and equipment shelters which are necessary to maintain the airport's level of protection as required by regulation.

   Priority 2: Heavy airside mobile equipment (safety-related) such as runway snow blowers, runway snowplows, runway sweepers, spreaders, winter friction testing devices, and heavy airside mobile equipment shelters.

III. Outcomes and Benefits for Canadians

Proponents must demonstrate the economic advantages and the broader public benefits of the project.

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Improving efficiency (e.g., increased traffic volumes, passenger volume, cargo etc.);
- Increasing regional or local economic development (e.g., number of new carriers, new businesses operating at the airport, increased volume of interprovincial/territorial and international trade such as in the resource sector);
- Improving safety; or
- Increasing accessibility of local and regional airports (e.g., to remote and northern communities, to larger population centres).

Short Line Rail

I. Objective

To invest in improvements to existing short line rail infrastructure that contribute to economic growth, a clean environment and stronger communities.

II. Subcategories

New construction, additional capacity or rehabilitation of rail infrastructure including:

- Industrial branch lines to allow a railway to serve a group of companies, an industrial park, a logistic park, an intermodal yard, a multimodal facility, a port, a transfer facility, or a marine terminal;
- Tracks and structures, excluding regular or deferred maintenance, to ensure travel at speeds deemed acceptable for safe and efficient operations;
- Facilities to improve the interchange of goods between modes; or
- Capitalized equipment for loading/unloading required for expansion of short line rail.

Notes:

a. *Short line rail is typically defined as a Class III railway that provides regional service to a small number of towns or industries and/or serves as a feeder line for one or more larger railroads.*
b. *Projects under this category could include Intelligent Transportation Systems (ITS) components as part of the overall project.*

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Improving efficiency (e.g., increased traffic volumes, new shippers, increased speed, etc.);
- Increasing freight capacity of short-line railways (e.g., heavier traffic loads and volume, etc.); or
- Improving safety.

Short Sea Shipping

I. Objective

To invest in improvements to short sea shipping infrastructure that contribute to economic growth, a clean environment and stronger communities.

II. Subcategories

New construction, additional capacity, and rehabilitation of the following capitalized and fixed port infrastructure that increases short sea shipping capacity:

- Wharves and associated infrastructure;
- Intermodal facilities, multi-modal, or transfer facilities; or
- Capitalized and fixed equipment for loading/unloading required for expansion of short sea shipping.

Notes:

a. *Short sea shipping is defined as the movement of cargo by water over relatively short distances, excluding trans-oceanic voyages.*
b. *Projects under this category could include Intelligent Transportation Systems (ITS) components as part of the overall project.*
c. *The purchase of vessels, infrastructure that supports passenger-only ferry services, maintenance of existing facilities, as well as maintenance activities including dredging, are not eligible for funding.*

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Improving efficiency (e.g., reduced traffic congestion, increased freight capacity and speed, results in new shippers and trade movements);
- Improving safety;
- Reducing the environmental footprint and providing environmental benefits such as air quality improvement; or
- Improving integration between transportation modes.

Northern Infrastructure

I. Objective

To invest in the construction and maintenance of infrastructure in the Northwest Territories, Yukon and Nunavut that contributes to economic growth, a clean environment and stronger communities.

II. Subcategories

- Fixed capital assets of public benefit

Notes:

a. *Investments in health infrastructure (hospitals, nursing stations, convalescent and senior centers) are not eligible.*
b. *Projects which would be considered eligible for funding under another category of investment will be required to meet the overview requirements for that category.*

III. Outcomes and Benefits for Canadians

The project must demonstrate how it provides benefits to Canadians in support of one or more of the following outcomes:

- Improving accessibility to and from remote, communities in the North;
- Improving access for Canadians in the north to basic public services, including emergency services;
- Improving the quality of life of Northern Canadians; or
- Supporting competitiveness, and sustainable economic and resource development in the North.

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Infrastructure Canada

New Building Canada Fund: Provincial-Territorial Infrastructure Component, Small Communities Fund
Program Overview
Annex B - Eligible Recipients

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Initial recipients will be the provinces and territories. It will be the province or territory that will enter into an agreement with the ultimate recipient. Federal entities, including federal Crown Corporations, are not eligible recipients.

The following are eligible ultimate recipients for the purposes of the SCF:

a. A municipal or regional government established by or under provincial or territorial statute;
b. A provincial or territorial entity (e.g., a department, corporation or agency) that provides municipal-type infrastructure services to communities, as defined in provincial or territorial statute;
c. A band council within the meaning of section 2 of the *Indian Act*; or a government or authority established pursuant to a Self Government Agreement or a Comprehensive Land Claim Agreement between Her Majesty the Queen in right of Canada and an Aboriginal people of Canada, that has been approved, given effect and declared valid by federal legislation;
d. A public sector body that is established by or under provincial or territorial statute or by regulation or is wholly owned by a province, territory, municipal or regional government which provides municipal-type infrastructure services to communities; and
e. A private sector body, including for-profit organizations and not-for-profit organizations, whose application is supported by a municipal or regional government referred to above. Such support could take the form of a resolution from the municipal or regional government council.

Please note:

Eligible ultimate recipients are those entities listed above and are restricted to those whose projects are situated within, and/or are for the benefit of, communities with a population of less than one hundred thousand (100,000) people, as determined by Statistics Canada - Final 2011 Census. A community in this section shall be defined as the legal entity of the local government pursuant to applicable provincial or territorial legislation, that is, having the legal status of a local government pursuant to provincial or territorial legislation in that province or territory.

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New Building Canada Fund: Provincial-Territorial Infrastructure Component, Small Communities Fund Program Overview Annex C - Eligible and Ineligible Expenditures

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Eligible expenditures are limited to the following:

a. The capital costs of acquiring, constructing or renovating a tangible asset, as defined and determined according to accounting principles generally accepted in Canada;
b. Expenditures directly associated with joint federal communication activities (press releases, press conferences, translation, etc.) and with federal project signage;
c. All planning (including plans and specifications) and assessment costs specified in the agreement such as the costs of environmental planning, surveying, engineering, architectural supervision, testing and management consulting services. Canada will contribute no more than 15% of its contribution to this cost;
d. The costs of engineering and environmental reviews, including environmental assessments and follow-up programs as defined in the *Canadian Environmental Assessment Act 2012* and the costs of remedial activities, mitigation measures and follow-up identified in any environmental assessment;
e. Costs of Aboriginal consultation;
f. Recipient audit and evaluation costs as specified in the agreement;
g. The incremental costs of the eligible or ultimate recipient's employees or leasing of equipment may be included as eligible expenditures under the following conditions:
    i. The recipient is able to demonstrate that it is not economically feasible to tender a contract;
    ii. The employee or equipment is engaged directly in respect of the work that would have been the subject of the contract; and
    iii. The arrangement is approved in advance and in writing by the province or territory.

h. Leasing of equipment related to the construction of the project; and,
i. Other costs that, in the opinion of Canada, are considered to be direct and necessary for the successful implementation of the Project and have been approved in writing prior to being incurred.

The following are deemed ineligible expenditures:

a. Expenditures incurred prior to the approval of the project by Canada;
b. Expenditures incurred after the project completion date with the exception of expenditures related to audit and evaluation requirements pursuant to the agreement;
c. Expenditures related to developing a business case or proposal for funding;
d. Expenditures related to purchasing land, buildings and associated real estate and other fees;
e. Financing charges and interest payments on loans;
f. Leasing land, buildings, equipment and other facilities;
g. Furnishing and non-fixed assets which are not essential for the operation of the asset/project.
h. General repairs and maintenance of a project and related structures, unless they are part of a larger capital expansion project;
i. Services or works normally provided by the recipient, incurred in the course of implementation of the project, except those specified as eligible expenditures;

j. Expenditures related to any goods and services which are received through donations or in kind;
k. Any overhead costs, including salaries and other employment benefits of any employees of the recipient, its direct or indirect operating or administrative costs of ultimate recipients, and more specifically its costs related to planning, engineering, architecture, supervision, management and other activities normally carried out by its staff, except in accordance with b) and g) of the list of eligible expenditures above;
l. Taxes for which the ultimate recipient is eligible for a tax rebate and all other costs eligible for rebates;
m. Legal fees.

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Government of Canada Gouvernement du Canada Canada

Infrastructure Canada

How to Apply for Funding Under the New Building Canada Fund

PDF Version (Size: 161.95 KB)

Help on accessing alternative formats, such as PDF, PPT and ZIP files, can be obtained in the alternate format help section.

✔ **Checklists:**

New Building Canada Fund:
What you need to know to apply for funding

- National Infrastructure Component (NIC)
- Provincial-Territorial Infrastructure Component, National/Regional Projects (PTIC-NRP)
- Provincial-Territorial Infrastructure Component, Small Communities Fund (PTIC-SCF)

The New Building Canada Fund was officially launched on March 28, 2014. The Minister of Infrastructure, Communities, and Intergovernmental Affairs has also provided provinces and territories with the information required to start identifying priority projects and apply for funding — including detailed program guides, which are available below.

The National Infrastructure Component and the Provincial-Territorial Infrastructure Component have different processes. You can find details on both processes below.

National Infrastructure Component

The $4-billion National Infrastructure Component (NIC) provides funding for projects of national significance, that have broad public benefits, and that contribute to long-term economic growth and prosperity. The project submission process is currently open (i.e. without a deadline). To apply for funding, proponents must submit a detailed business case to Infrastructure Canada that demonstrates how the project meets the program's objectives, as well as category specific outcomes and criteria.

- Business Case Guide for Project Proponents (NIC) (HTML | PDF (Size: 370.64 KB))

Current calls for proposals

Infrastructure Canada is now accepting completed business cases for projects within all seven eligible categories:

- Highways and major roads
- Public transit
- Rail infrastructure
- Disaster mitigation
- Local and regional airports
- Port infrastructure
- Intelligent Transportation Systems

Completed project business cases should be emailed to: nic-vin@infc.gc.ca

Provincial-Territorial Infrastructure Component

The $10-billion Provincial-Territorial Infrastructure Component (PTIC) provides funding to support infrastructure projects of national, regional and local significance that contribute to objectives related to economic growth, a clean environment and stronger communities. To support a wide range of infrastructure needs, the PTIC is divided into two sub-components:

National and Regional Projects (PTIC–NRP): $9 billion for projects that are nationally and regionally significant, and are predominantly medium- and large scale in nature. If you are an eligible recipient and would like to have your project considered for funding under the PTIC–NRP, you are encouraged to contact your provincial or territorial ministry responsible for infrastructure to determine the process for submitting project proposals and deadlines.

An Initial Review Guide and a Business Case Guide are available to assist in the development of project proposals and detailed business cases respectively. Detailed business cases under the PTIC–NRP will only be requested for projects that have been jointly identified by Canada and provincial and territorial partners, and that are deemed eligible under the program terms and conditions.

Learn more about how to submit your project for funding consideration.

Small Communities Fund (PTIC–SCF): $1 billion for projects in communities with fewer than 100,000 residents through the Small Communities Fund. This will ensure that small communities have access to significant funding to support economic prosperity.

All proposed projects must provide basic information that includes the name of the municipality, title of the project, the eligible category and subcategory, a brief description of the project, financial information, project location as well as planned start and end dates. If you are an eligible recipient and would like to have your project considered for funding under the PTIC, and to determine the process for submitting project proposals and deadlines, you are encouraged to contact your respective provincial or territorial ministry responsible for infrastructure. You can also learn more about how the Small Communities Fund works by reading the Program Overview.

Date modified: 2014-07-15

Making a difference...together

Ganges Sewer Local Service Commission
Meeting Friday, October 17, 2014 at 10:00 am

Report: Ganges Wastewater System Infrastructure replacement

Appendix E

Public Engagement Strategy

PUBLIC ENGAGEMENT STRATEGY OVERVIEW FOR GANGES WASTEWATER SYSTEM IMPROVEMENT PROGRAM

Purpose

1. To consult with Salt Spring Island residents who are on the Ganges Wastewater system about the proposed infrastructure upgrades.

2. To inform residents and stakeholders who are on the Ganges Wastewater system about the scope, implications and cost of the planned infrastructure upgrades. Education will cover basic information on the upgrades, preparing the public for a referendum vote on whether to undertake the improvement program.

Proposed Strategy

The strategy includes hosting an open house on a weekday evening in the New Year. This timing will allow the majority of residents who work during the day to attend to session. At the open house, there will be display boards and take-away fact sheets explaining the work program and its scope and implications. Experts will attend the session to answer any questions and hear any concerns that attendees express with the goal to have meaningful conversations about the project. We will also make use of the session to gather feedback through a survey that questions how they would vote in a referendum and what factors are influencing that decision. The open house will be promoted using the CRD website, posters at public bulletin boards, a media release distributed to local news outlets and print advertisements run in the Island Tides and Driftwood newspapers. The strategy should also include a means of engaging with residents who are unable to attend the open house through providing information and comment forms at the CRD Island Office and on the website.

Budget – Ganges Wastewater System Capital Replacements

Materials (Boards, FAQ Sheet, Survey, Signage)	$1,000
Open House (Rental, 5 hours)	$180
Accommodations (last ferry 7:50 pm)	$250
Travel	$70
Refreshments (Coffee, Tea, Water, Pastries)	$600
Media – Advertising	$750
Staff Time	$650
Total	**$3,500**

Detailed Public Engagement Plan

To be created once Commission decides on most appropriate improvement program and approves funding for public engagement activities.