AECOM

Loyalist Township

Ports of Call Developments Inc.

Municipal Class Environmental Assessment of Upgrades to the Heritage Point Sanitary Pump Station #4 at Bath Pre-Design Report

Prepared by:

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Project Number:

108452

Date:

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This Statement of Qualifications and Limitations is attached to and forms part of the Report.

October 30, 2009 Project Number: 108452

Dave Thompson
Director of Engineering Services
Loyalist Township
Box 70, 263 Main Street
Odessa, ON K0H 2H0

Dear Mr. Thompson:

Re: Schedule Class 'B' Environmental Assessment
of Upgrades to the Heritage Point Sanitary Pump Station #4
Pre-Design Report

Please find with this letter a copy of the Pre-Design Report attached for the above mentioned project. This report has been completed as a background document under the Municipal Class Environmental Assessment dated October 2000, as amended in 2007.

It details the existing sanitary drainage area and the proposed drainage area of the proposed Edgewater Estates at Loyalist Cove subdivision and the requirements to upgrade the existing sanitary pump station to MOE standards and provide capacity for future development.

If you have any enquiries please contact this office.

Sincerely,
AECOM Canada Ltd.

Doug Prinsen, P.Eng
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Encl. Pre-design Report
cc: Jim Hinton, Ports of Call Developments Inc.
John Hinton, Ports of Call Developments Inc.
Dave Hinton, Ports of Call Developments Inc.
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Signature Page

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Table of Contents

Statement of Qualifications and Limitations
Letter of Transmittal

page

List of Figures

List of Tables

Appendices

A. Heritage Point Subdivision
   – Sanitary Sewer Drainage Plan
   – Existing Pump Station Drawings
B. Edgewater Estates Subdivision
   – General Plan
   – Sanitary Drainage Areas Plan
C. TDH curve for the existing pumps

1. Introduction

1.1 Background

Edgewater Estates at Loyalist Cove is a 70 lot residential subdivision proposed by Ports of Call Developments Inc. The subdivision is located to the east of the existing Heritage Point subdivision in Bath, Ontario. Both subdivisions are bordered to the south by Lake Ontario and are bordered to the north by Main Street (Highway 33). Edgewater Estates at Loyalist Cove is bordered to the east by Loyalist Cove Marina.

This sanitary pump station serving the Heritage Point subdivision was constructed in 1989 during phase 1 of that development and is located south of the Heritage Drive and Bayshore Drive intersection. A 100mm forcemain extends north from the pump station along Heritage Drive and then continues north along Somerset Avenue until it reaches the intersection with Westbury Avenue / Tower Road where it discharges into the existing sanitary main.

It is proposed that 63 of the 70 lots in the Edgewater Estates at Loyalist Cove subdivision as well as Loyalist Cove Marina will drain into the existing 250mm sanitary sewer presently terminating at the east end of Bayshore Drive and drain to the subject sanitary pump station. There is an existing 150mm diameter sanitary gravity main extending east along the south side of Main Street. It is proposed that the other 7 lots of the Edgewater Estates at Loyalist Cove subdivision fronting on Main Street drain into this existing sewer which does not drain to the subject pump station.

The proposed subdivision is being constructed in four phases. This Report also considers how much of the proposed development can be serviced by the existing pump station prior to any upgrades.

A number of background documents have been prepared on this pump station that detail its capacity and provide recommendations. Information from these documents has been used in this report. The following is a brief summary of the documents.

- The Cumming and Cockburn Limited Report dated July 1992 was prepared for the Village of Bath to confirm that the pump station was built and is operating in accordance with its design. This report was completed as the Village was in the process of assuming ownership of the pump station. This report details capacity of the pump station, construction deficiencies and comments on pump station operations.

- In January 2009, J.L. Richards and Associates Limited prepared a report for Loyalist Township. The report contained a review of the pump station and the required capacity for the proposed Edgewater Estates subdivision. The report recommends that both the pump station and existing electrical system be upgraded.

1.2 Key Plan

Figure 1- Key Plan

1.3 Class EA Status

In accordance with the Municipal Class Environmental Assessment document dated October 2000, as amended in 2007, the Heritage Point Sanitary Pump Station #4 upgrades are a Schedule 'B' undertaking. The document notes that a Schedule 'B' undertaking is required when:

"8. Construct new pumping station or increase pumping station capacity by adding or replacing equipment and appurtenances, where new equipment is located in a new building or structure."

The document notes that Schedule 'B' activities, having completed Phase 1 and 2 of the planning process, are approved subject to screening.

2. Sewerage Flows

2.1 Drainage Area

The current drainage area for the Heritage Point sanitary pump station #4 is shown in Appendix A and named Sanitary Sewer Drainage Plan. The drainage area consists of approximately 106 single family homes covering 10.7 hectares of land.

The sanitary drainage area for Edgewater Estates and the Marina is shown in Appendix B, and named Sanitary Drainage Areas. As mentioned previously this area consists of 63 single family homes and 20 single family units and covers a total of 7.75 hectares.

2.2 Design Flows

In order to conduct their review of the current sanitary flows draining to the pump station, J.L. Richards compared the recommended design values from various authorities. Recommendations from Loyalist Township, the City of Kingston and the Ministry of the Environment (MOE), were compared and in most cases a conservative scenario was assumed. These values are:

Population	=	2.7 ppu (persons per unit)
Sanitary generation rates	=	450 L/cap/day
Sanitary Infiltration	=	0.107 L/s/ha
Peaking Factor	=	MOE peaking formula without a maximum limit

Using these values, J.L. Richards calculated that the maximum day flow rate of the Heritage Point subdivision is 7.2 L/s. This is greater than the 5.8 L/s noted in the original Certificate of Approval, the difference being in the assumptions made. The design peak flow from the proposed development is similarly calculated to be 6.2L/s.

Although the sum of the individual contributions is 13.4L/s (i.e. 7.2L/s + 6.2L/s = 13.4L/s), the J.L. Richards Report calculated the design peak flow for the entire drainage area (existing and proposed) as a whole. The peak flow was calculated at 13.1L/s. This actual design flow can also be slightly reduced as the 7 lots fronting Main Street are not draining to the pump station, though this report has adopted 13.1L/s.

The Cumming Cockburn Report compared theoretical results against field results on the pump station and determined that during phase 1 of the Heritage Point subdivision, the design flows were 1.8 times higher than the actual flows. As J.L. Richards calculated flows are greater than the calculated flows by Cumming Cockburn it is similarly predicted that the total design flows will be larger than the actual flows for the entire area.

3. Sewage Pump Station

3.1 General

In this section of the Report, details on the existing pump station and recommendations to upgrade it to increase capacity and conform to MOE Guidelines.

3.2 Wet Well

3.2.1 Existing

The existing circular concrete wet well is 1.8m in diameter and is 6.7m deep.

Currently the low level switch is set at an elevation of 72.00m and the high level switch is set at an elevation of 72.50m. The active volume of the wet well is the volume between the high level switch and the low level switch and is currently 1.27m^3.

Diameter of wet well	1.8m
Area of wet well	2.54m^2
Pump 1 on	72.00
Pump 2 on	72.50
Pump 3 on	73.00
All pumps off	71.50
High water Alarm	73.65
Low water Alarm	71.20
Active Height	0.50m
Active Volume	1.27m^3

3.2.2 Requirements

It is proposed that the pump station be upgraded to a capacity of 13.1L/s.

MOE Guidelines recommend wet wells be a minimum of 2.4m (i.e. area of 4.5m^2) in diameter and have a minimum volume of 0.15 x pumping rate of one pump in L/s. Therefore the volume required by MOE for the proposed 13.1L/s is 1.97m^3 (0.15 x 13.1). The existing wet well does not comply with either of these recommendations. While the recommended capacity can be easily amended by adjusting the high level switch to 72.77 the wet well does not have the recommended area. The small well size makes the pump station a tight fit, creates maintenance issues and limits the size of larger pumps to be installed if required.

3.3 Pumps

3.3.1 Existing

The existing pump station consists of a 1.8 m diameter wet well, which has just enough room for three submersible grinder pumps. From the Cumming Cockburn report, there were originally three Barnes SGV 501 (5 H.P.) pumps placed in the well, with each pump having an operating range up to 5.99L/s.

In 2007, these pumps were reportedly replaced by the Township with three Barnes SGV5022L (5 H.P, 220V, single phase) submersible grinder pumps. As a Total Dynamic Head (TDH) curve has not been provided for these pumps, an approximate TDH curve has been created from the manufacturer's performance curves. It has also been assumed that they are equipped with standard 159mm impellors. The calculated (TDH) curves are shown for both one and two pumps operating and can be found in Appendix C.

Each pump is sized to pump the maximum day peak flow. Based on these system head curves, theoretically one pump running alone can pump 6.5L/s while two pumps running in conjunction can pump a maximum of 8.7L/s. The third pump is a spare and is only used if the other two fail.

The Edgewater Estates development will increase the total pump inflow to 13.1L/s which is greater than the capacity of two pumps operating together. Therefore larger pumps will be required.

Draw down tests on the existing pump station were completed on site Thursday October 22, 2009 by the Township and AECOM. These tests were completed to confirm the maximum pump flow for each pump and the pump combinations. The pump station was filled before each test, the time and volume was then measured when each pump or pumps were turned on. Average pump flows were then calculated from these results assuming an inflow of approximately 1 L/sec. These results are summarised in a table below and confirm that the theoretical maximum pump flows are reasonable.

Pump Combination	Average Pump Capacity (L/sec)
Pump 1 (only)	4.8
Pump 2 (only)	6.0
Pump 3 (only)	5.4
Pump 1 & 2	8.2
Pump 1 & 3	7.6
Pump 2 & 3	8.8

Table 1 - Existing Pump Capacities from Draw Down Tests

3.3.2 Requirements

The J.L. Richards report recommends that the existing pump times be increased to ensure pump life; this can be completed by increasing the active volume.

Consequently if the proposed Edgewater Estates development and Marina development is to progress to full build out, the pumps are required to be upgraded to larger pumps that have an increased pumping capacity of 13.1L/s. The majority of larger pumps will have trouble fitting into the existing wet well which is currently undersized.

3.4 Electrical

3.4.1 Existing

The current pump station is currently powered by a 220V single phase electrical service and does not have a back-up generator on-site. It is understood that the Township uses a portable generator in times of a power outage.

3.4.2 Requirements

The majority of larger pumps cannot run on a 220V single phase Hydro service and will require a 600V, 3-phase service to operate. During the Edgewater Estates at Loyalist Cove subdivision design, Hydro was informed of the requirements and a pad mounted transformer for normal power supply is proposed in this area.

An on-site back-up generator is also proposed.

3.5 Mechanical System

There are a number of other mechanical elements of the existing pump station which do not currently comply with MOE Guidelines or may be modified to enhance the existing pump station. Some of these elements include:

- Elevation of the low and high level switches,
- Discharge piping with check, isolation and air/vacuum valves for each pump,
- Access hatches,
- Safety platforms and
- Vents

Not all of these elements will be required for each alternative. The selection of these items will be confirmed during the detailed design component of this study.

4. Alternatives

There are a number of alternative options to upgrade the existing sanitary pump station to MOE Guidelines and increase the pump capacity.

The alternatives include:

- Do Nothing
- Minor Upgrade
- Major Upgrade
- New Pump station

It is proposed that all alternatives utilise the existing 100mm forcemain. J.L. Richards calculated that this forcemain will have a velocity of 1.87m/s when pumping 13.1L/s - a value which is acceptable.

4.1 Do Nothing

This option considers leaving the existing pump station as it stands. While this is the least expensive option, the pump station still does not comply with MOE guidelines and does not have capacity for the full build-out of Edgewater Estates at Loyalist Cove.

4.2 Minor Upgrade

A minor upgrade includes completing minimal modifications to the existing pump station to ensure that it works appropriately and has capacity for the future development.

As a minor upgrade, the existing three grinder pumps maybe replaced with two larger grinder pumps to gain a pump flow of 13.1L/s. Possible pumps include the Flygt Model No. NP3153.181 SH – 275 and Flygt Model No. NP3153.181 SH – 276). These pumps were chosen as they are also able to fit into the existing wet well.

The existing pump station can be modified to include these pumps and an upgraded electrical service. This will allow the Edgewater Estates at Loyalist Cove development to proceed as pump capacity will be increased however the pump station will still not comply with MOE guidelines. This work would take approximately 1 week and will require a temporary pumping system to be put in place. Possibly the existing by-pass chamber could be used during this time.

This option would require no other upgrades.

4.3 Major Upgrade

A number of modifications to the existing pump station are required to allow it to pump 13.1L/s and better comply with MOE Guidelines.

The list of upgrade works includes:

- Two (2) Flygt or ABS submersible sewage grinder pumps (duty/standby) complete with discharge elbows and guiderails for pump removal. Pumps should also include VFD's or equipped with a soft start.
- 100 mm discharge piping with check, isolation and air / vacuum valves for each pump
- Aluminum access hatches, safety platforms, vent pipes and ladders
- 600V 3-phase hydro service to the site including pad mounted transformer for normal power supply
- Automatic transfer switch and small Standby 600V 3-phase generator for emergency power supply
- Local free standing stainless steel electrical/control panel/cabinet with auto dialer oversized to provide for future SCADA and back-up power.
- A totalizer or flow meter for recording flow rates.
- Hydro-static pressure transmitter or Ultrasonic level control with backup floats for alarming of LWL, HWL and Overflow
- Class 1 Division 1 rated equipment in wet well
- A new external water hydrant located close to the pump station for maintenance purposes.

Existing system components which will be retained as part of the upgraded system include the following:

- 1800 mm concrete wet well
- 100 mm PVC forcemain
- 250 mm incoming sewer
- 200 mm overflow pipe to storm sewer
- 1200 mm bypass pumping chamber

Upgrading the existing pump station requires a temporary pumping system to be put in place while construction occurs. The existing bypass chamber will be utilised during construction to isolate the existing wet well in order for the work to proceed. It is anticipated the temporary pumping system will be required for approximately two weeks to accommodate removals, installation of equipment/controls and a performance run.

The maximum design capacity of the station will be realized at the time of construction, there is no additional expansion or increase in capacity anticipated for the pump station.

4.4 New Pump Station

This option involves constructing a new pump station including a new 2.4m diameter wet well. Although larger pumps capable of pumping the increased peak flows will be able to fit into the existing wet well, the size of the wet well still does not comply with MOE guidelines. Constructing a new pump station will allow the pump station to be completely upgraded in accordance with MOE guidelines.

The new station should also contain the following new system components:

- Two (2) Flygt or ABS submersible sewage pumps (duty/standby) complete with discharge elbows and guiderails for pump removal. Pumps should also include VFD's or equipped with a soft start.
- A new wet well 2.4m in diameter
- 100 mm discharge piping with check valve
- An external isolation valve
- Aluminum access hatches and vent pipes
- 600V 3-phase hydro service to the site including pad mounted transformer for normal power supply
- Automatic transfer switch and small Standby 600V 3-phase generator for emergency power supply
- Local free standing stainless steel electrical/control panel/cabinet with auto dialer oversized to provide for future SCADA and back-up power.
- A totalizer or flow meter for recording flow rates.
- Hydro-static pressure transmitter or Ultrasonic level control with backup floats for alarming of HWL.
- Class 1 Division 1 rated equipment in wet well
- A small mixer or small low-head pump to reduce grease build-up
- The existing bypass pumping chamber can be reused or the existing 1.8m pump station can be transformed into this.
- A new external water hydrant located close to the pump station for maintenance purposes.

Existing system components which will be retained as part of the upgraded system include the following:

- 100 mm PVC forcemain
- 250 mm incoming sewer
- 200 mm overflow pipe to storm sewer
- 1200 mm bypass pumping chamber or the 1800mm existing wet well can be used as the bypass pumping chamber

The new pump station should be adjacent to the existing pump station so that it can be easily connected to the existing sanitary sewer and sanitary force main. Unlike the major upgrades option, this option does not require a temporary pumping system to be set up. The existing pump station can still function as normal while the new pump station is being built. Once built, the pump stations can be easily swapped over.

5. Phasing of Edgewater Estates at Loyalist Cove

Phase 1 of Edgewater Estates at Loyalist Cove starts with the construction of the 7 lots along Main Street and drains to the existing 150mm sanitary main in Main Street. As sewerage from these lots does not drain to the subject pump station, this phase can be constructed without impact on the pump station.

Phase 2 of Edgewater Estates at Loyalist Cove is the extension of Bayshore Drive to the Marina. This phase will include the construction of 14 lots which will drain to the pump station. Peak sanitary sewerage from these 14 lots is approximately 1.0 L/s. and therefore these lots can be drained to the existing pump station as it has reserve capacity.

Phase 3 of Edgewater Estates at Loyalist Cove consists of the construction of Windermere Boulevard from Main Street to Bayshore Drive and Mariner's Court. This phase consists of 29 lots which will produce an additional flow of approximately 1.9 L/s to the pump station. This is more than the remaining capacity in the current sanitary pump station. As such, sanitary pump station upgrades or replacement will be required concurrent with the development of Phase 3.

Phase 4 of Edgewater Estates at Loyalist Cove consists of the construction of Admiral's Court extending north from Bayshore Drive. This phase consists of 20 lots which will produce an additional 1.3 L/s of flow to the subject sanitary pump station.

6. Summary

The existing sanitary pump station in its current condition is too small to handle the additional drainage flows from full build-out of the proposed Edgewater Estates at Loyalist Cove subdivision and Loyalist Cove Marina. The existing sanitary pump station also does not comply with all of the MOE guidelines for pump stations.

As a result various alternatives to upgrade the existing pump station to MOE standards and provide additional capacity for future development will be looked at during this EA process.