Appendix A - Water Modelling Technical Memorandum

75 International Blvd., Suite 304
Toronto, Ontario M9W 6L9
Phone: 416.703.0667 Fax: 416.703.2501
www.blueplan.ca

Memorandum

Organization: The Town of Caledon	**BluePlan Project No:** C001-0021
Attention: File	**Date:** June 18, 2014
Project: Bolton Residential Expansion Study (BRES)	
RE: Hydraulic Water Modelling Analysis	

Introduction

This technical memorandum summarizes the hydraulic water modelling analysis, including the methodology and assumptions utilized to model the alternative water servicing strategies, for the Bolton Residential Expansion Study (BRES) to support residential growth post 2021. The focus of this analysis is on Option 1 and Option 3 growth areas, which were carried forward following the high level screening process undertaken in Phases 1 and 2 of the study.

This infrastructure study has drawn on both historical and recent studies and resources including the following:

- 2013 Water and Wastewater Master Plan (BluePlan & AECOM, Mar 2014)
- North Bolton Elevated Tank and Feedermain Environmental Study Report (AECOM, Oct 2011)
- Water and Wastewater Servicing Plan for the South Albion-Bolton Community Plan Employment Land and North Hill Supermarket Areas (AECOM, Mar 2010)
- Bolton Urban Community Water and Wastewater Analysis (AECOM, Mar 2010)

Objectives

The objective of the hydraulic water modelling analysis was to identify alternatives for servicing the preferred growth option and select a strategy that considers the following key aspects of servicing impacts including:

- Impact of existing level of service
- Impact on water quality
- Provision of security of supply
- System redundancy
- Flexibility of servicing
- Complexity and cost of infrastructure upgrades
- Opportunity to support long term servicing of other growth areas

The technical information contained herein is intended to support the decision making process for the evaluation and selection of the preferred growth option (Option 1 or Option 3).

Water Demand Criteria and Forecasts

The BRES hydraulic water modelling analysis utilized the Region of Peel Master Plan water criteria to estimate future demands within the study area. The Master Plan Water Demand Criteria is summarized in Table 1 below.

Table 1. Region of Peel Master Plan Water Demand Criteria

DESIGN CRITERIA			
Residential	Res Avg Day Demand Criteria	280	L/cap/d
	Max Day Peak Factor (MDF)	2.0	
	Peak Hour Factor (PHF)	3.0	
Non-Residential	Non-Res Avg Day Demand Criteria	280	L/emp/d
	Max Day Peak Factor (MDF)	1.4	
	Peak Hour Factor (PHF)	3.0	

Using the criteria in Table 1, the average day demand (ADD), maximum day demand (MDD), peak hour demand (PHD), and maximum day plus fire demands were determined for the BRES service area. These water demands are summarized in Table 2.

Table 2. BRES Planning and Water Demand Estimates

BRES Land Use	Area (Ha)	Population (persons)[1]	ADD (L/s)	MDD (L/s)	PHD (L/s)	Fire Flow (L/s)
Residential	-	10,348	33.5	67.1	100.6	
Employment	-	2,635	8.5	12.0	25.6	
Total	**190**	**12,983**	**42.1**	**79.0**	**126.2**	**220.0**

[1] *Per direction received from Town of Caledon Council.*

Theoretical demands were also determined for the three (3) rounding out areas using the same approach and are summarized in Table 3.

Table 3. Theoretical Population and Water Demand Estimates for Rounding Out Areas

Rounding Out Area	Area (Ha)	Population (persons)[1]	ADD (L/s)	MDD (L/s)	PHD (L/s)
ROA1	18	1759	7.29	14.57	21.86
ROA2	6	775	2.89	5.78	8.66
ROA3	7	614	2.60	5.20	7.81

[1] *Population estimates for rounding out areas based on available land area and density assumptions, provided by Meridian Planning, and are included in the total BRES population forecast of 10,348.*

Service Levels

To ensure an adequate level of service to the local distribution system, the size of watermains were determined based on Region of Peel standards and practices. Minimum watermain sizes are as follows:

- 150 mm diameter watermain for main lines in residential areas; 50 mm diameter watermains are allowed in cul-de-sacs and shall be looped back to the main line;
- 300 mm diameter watermain for main lines servicing schools and high density residential areas; and,
- 300 mm diameter watermain for main lines servicing industrial/commercial/institutional areas.

As per MOE Guidelines, the water system is to be designed based on maximum day demands with consideration to fire flow and peak hour demand requirements.

Operating pressures within the distribution system are as follows:

- Minimum of 40 psi (275 kPa) and a maximum operating pressure of 100 psi (690 kPa) shall be maintained within the distribution system under maximum day conditions
- A minimum operating pressure of 40 psi shall be maintained under peak hour demand
- Under fire flow conditions, it is permissible to have pressure drop to a minimum of 20 psi (140 kPa).

Water Modelling Analysis

The water modelling analysis was carried out using the Peel Region 2013 Master Plan water model. Existing demands in the model were allocated mainly based on water billing data. Future water demands within the model were allocated based on SGU planning forecasts and Region of Peel Master Plan water demand criteria.

Water Modelling Scenarios

Various water modelling scenario were developed as part of the BRES servicing analysis, including:

- Average Day Demand
- Maximum Day Demand
- Peak Hour Demand
- Max Day Plus Fire Demand

Fire flow runs were carried out where necessary for a specific water pressure zone.

Base Model Existing Capacity Analysis

An assessment of capacity in the existing system without the Bolton Residential Expansion provides a baseline to reference existing and future capacities, issues and constraints.

The existing scenario in the Peel hydraulic model was assumed as the 2012 runs for average day, maximum day, and peak hour demand conditions. As seen in Figure 1, under average day, maximum day, and peak hour conditions, pressures throughout Zones 5 and 6 are within 60 to 80 psi, and considered reasonable with minimal fluctuation due to pressure stabilization provided by the Bolton elevated tank.

Future Water Modelling Analysis & Results

For Option 1, the existing Bolton system was reviewed to determine whether it could support transmission and distribution of the additional demands and fire flows to the new service area. It was determined that the existing Zone 6 feedermains in Bolton and servicing the North Hill are not considered adequate for supplying the required maximum day plus fire flows. As such, the Option 1 servicing strategies were modelled using the B.A.R. alignment.

The water modelling undertaken as part of the BRES was carried out using the full pipe Regional water model in InfoWater (Innovyze). Table 4 below summarizes the pumping, storage, and feedermain requirements, as well as crossings and impacts to level of service for each servicing strategy modelled and evaluated.

Table 4. Summary of Water Servicing Strategies and Level of Service Impacts

Option – Strategy	Pumping / Storage Requirements	Feedermain Requirements	Crossings
Option 1 – Strategy 1	Zone 6A/7 BPS, Capacity = 79.0 L/s Zone 6A/7 ET, Capacity =5.1 ML	Coleraine/B.A.R. Diameter = 400 mm Total Length = 6.5 km	• Major Crossing of Humber River
Option 1 – Strategy 2	Zone 6A/7 BPS, Capacity = 300 L/s Zone 5 in-ground reservoir, Capacity = 5.1 ML	Innis Lake/B.A.R. Diameter = 600 mm Total Length = 15.9 km	• Major Crossing of Humber River • Crossing of C.P.R.
Option 1 – Strategy 3	Zone 6A/7 BPS, Capacity = 79.0 L/s Zone 6A/7 ET, Capacity =5.1 ML	Innis Lake/B.A.R. Diameter = 400 mm Total Length = 15.9 km	• Major Crossing of Humber River • Crossing of C.P.R.
Option 3 – Strategy 1	Zone 7 BPS, Capacity = 79.0 L/s Zone 7 ET, Capacity =5.1 ML	Coleraine/King/Gore Diameter = 400 mm Total Length = 7.8 km	• Crossing of C.P.R.
Option 3 – Strategy 2	Zone 7 BPS, Capacity = 300 L/s Zone 5 in-ground reservoir, Capacity = 5.1 ML	Innis Lake/King/Gore Diameter = 600 mm Total Length = 10.1 km	
Option 3 – Strategy 3	Zone 7 BPS, Capacity = 79.0 L/s Zone 7 ET, Capacity =5.1 ML	Innis Lake/King/Gore Diameter = 400 mm Total Length =13.6 km	

In general, water modelling analyses indicated that system pressures within Option 1 and Option 3 lands were nearly 60 psi under maximum day conditions based on the alternative servicing strategies. This demonstrates that the strategies meet Regional levels of service.

Water modelling analyses indicate that pressures in Rounding Out Area 1, if connected to the existing Zone 6 distribution network, would be near the lower limit of acceptable level of service, at approximately 44 psi. ROA1 is located on higher ground, ranging between 258 m and 265 m in some local spots. As such, ROA1 would best be serviced via the new pressure zone to ensure that service levels are maintained.

Rounding Out Areas 2 and 3 were similar, hovering around 52 psi – 53 psi, assuming connection to the existing Zone 6 distribution system. Pressures to the Rounding Out Areas could be improved by connecting to the new pressure zone system.

Conclusion

The hydraulic modelling analysis carried out helped identify and confirm the sizing of recommended infrastructure to service the potential BRES expansion areas. Results from the modelling analysis show that impacts from the proposed infrastructure to the existing water system are within Regional levels of service. Furthermore, all recommended water infrastructure meets existing Regional design standards and levels of service.

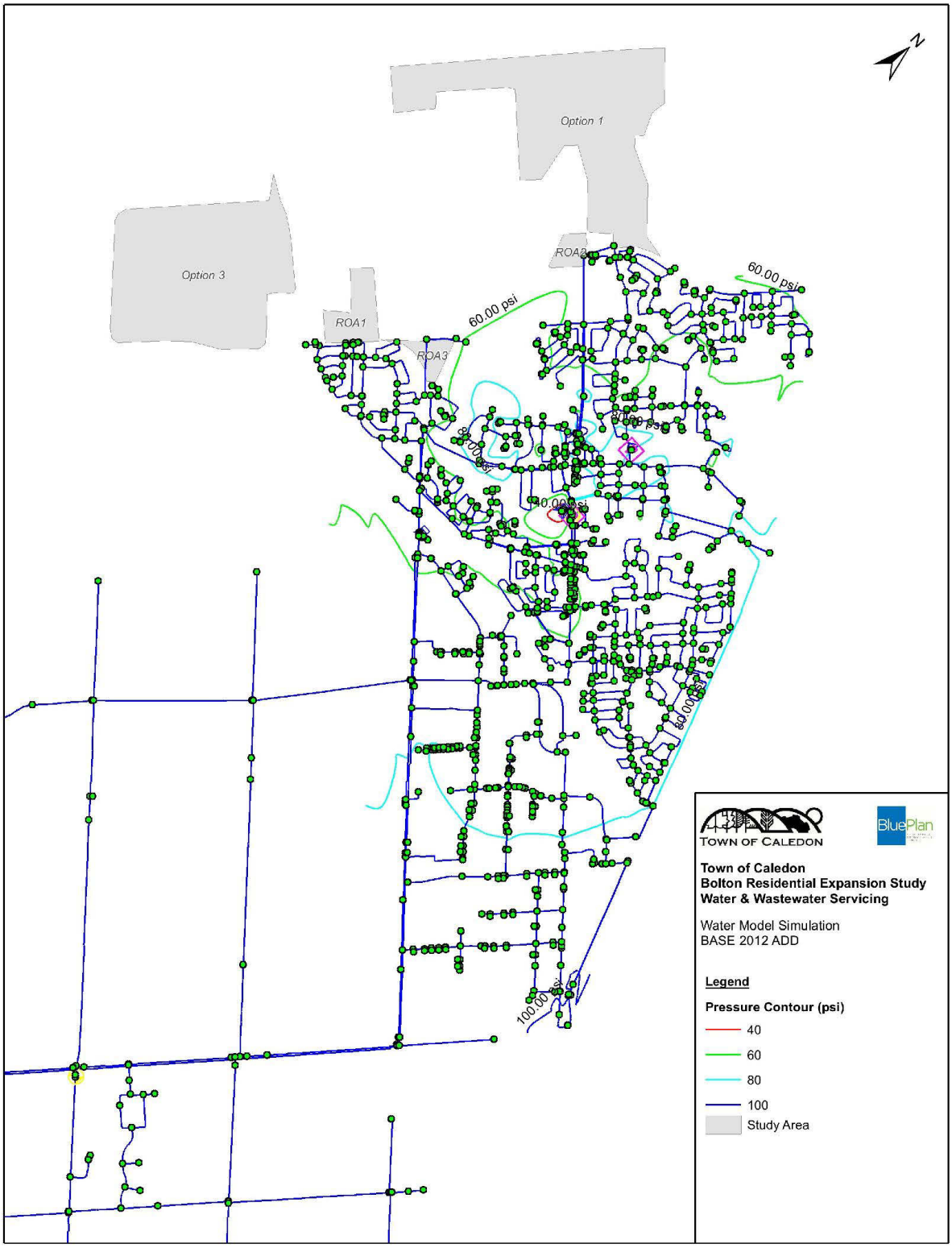


Figure 1. Existing (2012) Average Day Demand Modelling Results (Pressure Contours)

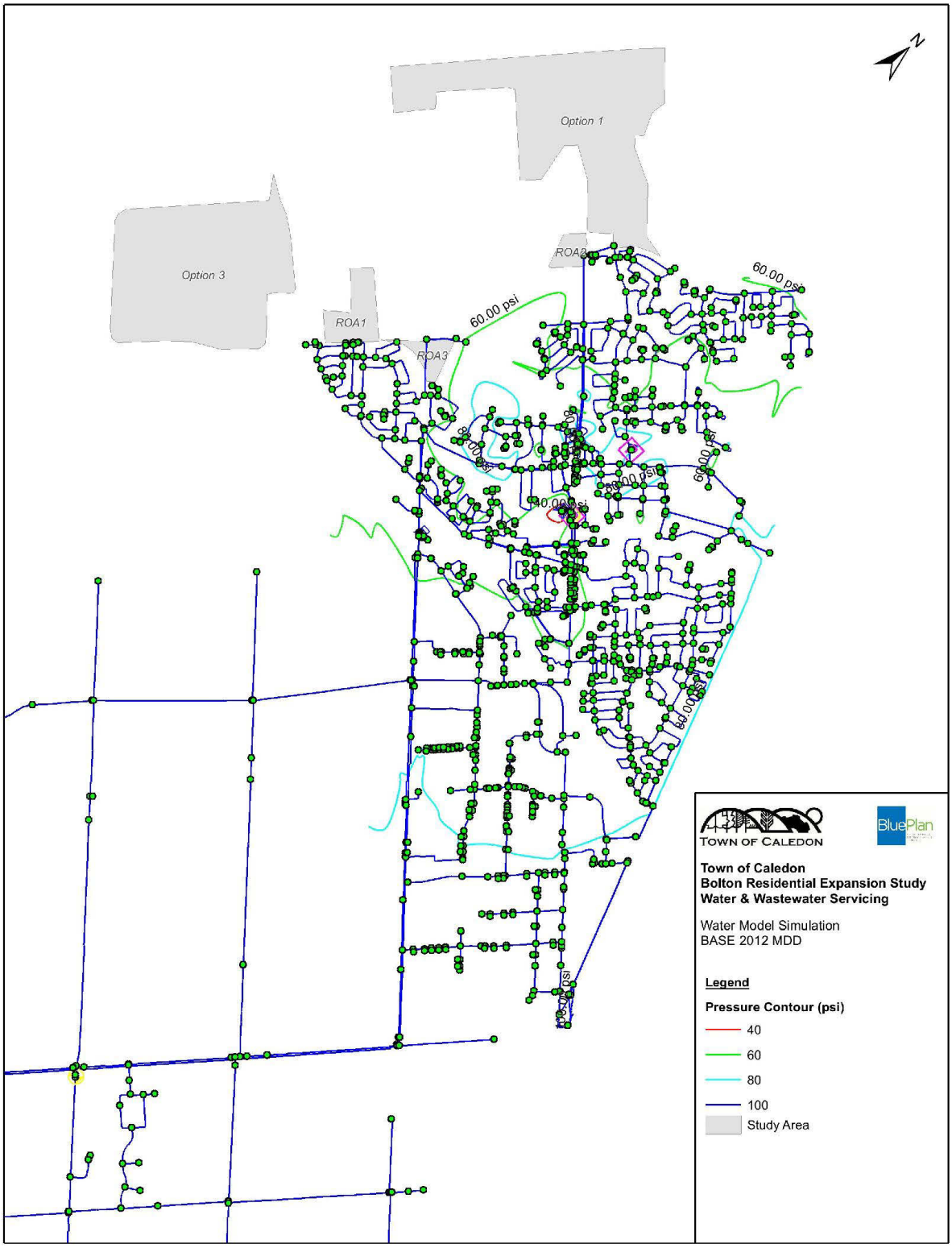


Figure 2. Existing (2012) Maximum Day Demand Modelling Results (Pressure Contours)

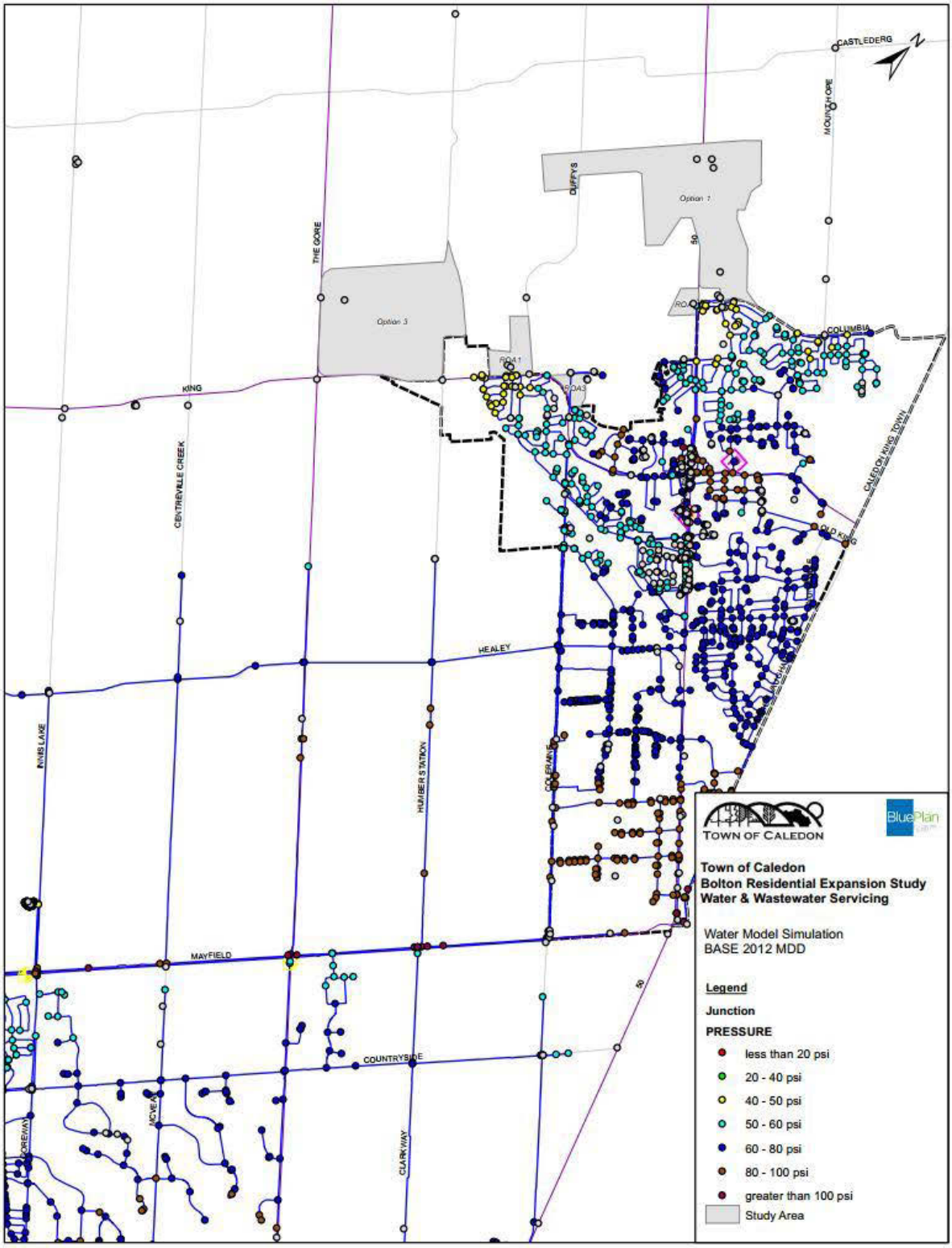


Figure 3. Existing (2012) Maximum Day Demand Modelling Results (Nodal Pressures)

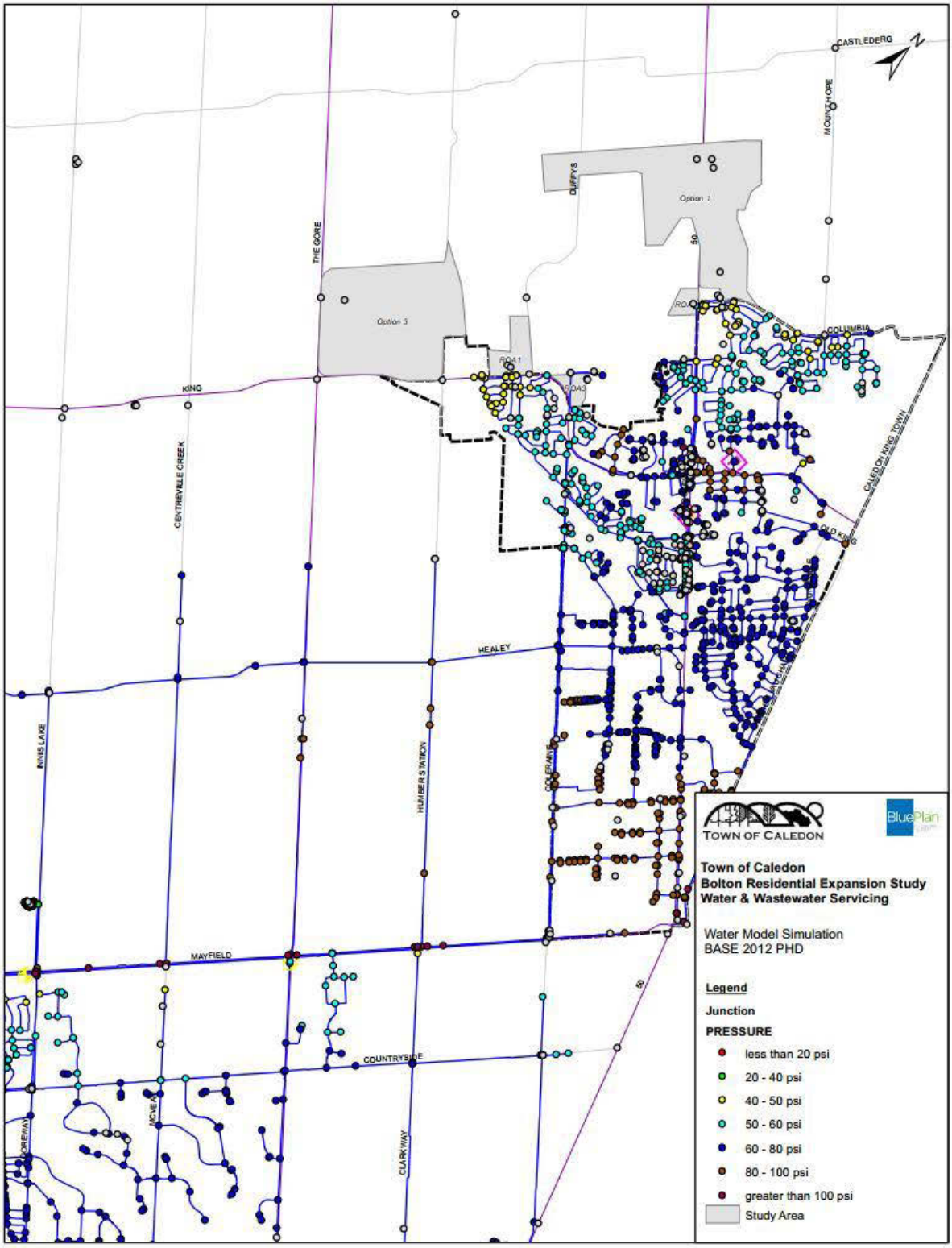


Figure 4. Existing (2012) Maximum Day Demand Modelling Results (Nodal Pressures)

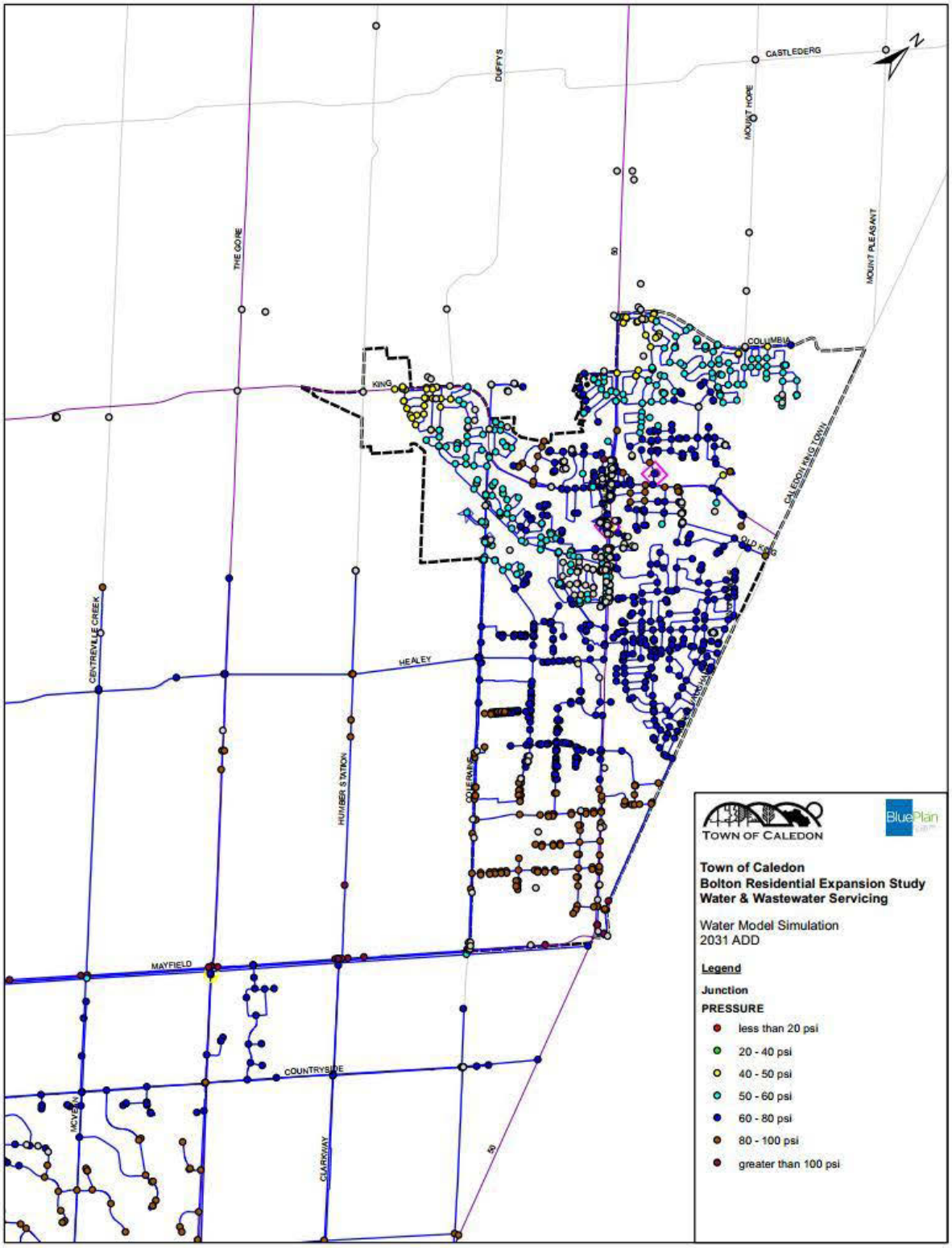


Figure 5. 2031 Average Day Demand Modelling Results (Nodal Pressures)

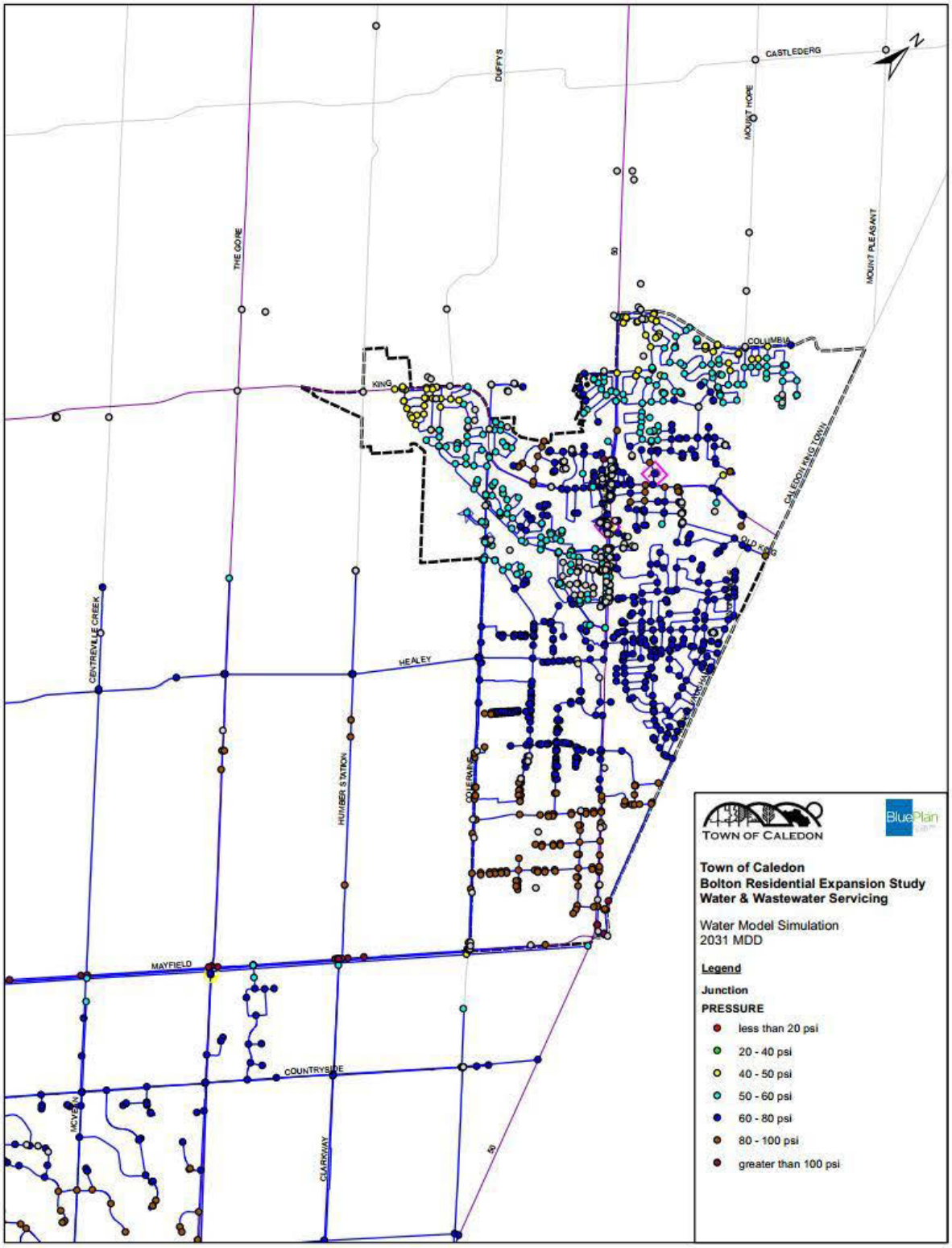


Figure 6. 2031 Maximum Day Demand Modelling Results (Nodal Pressures)

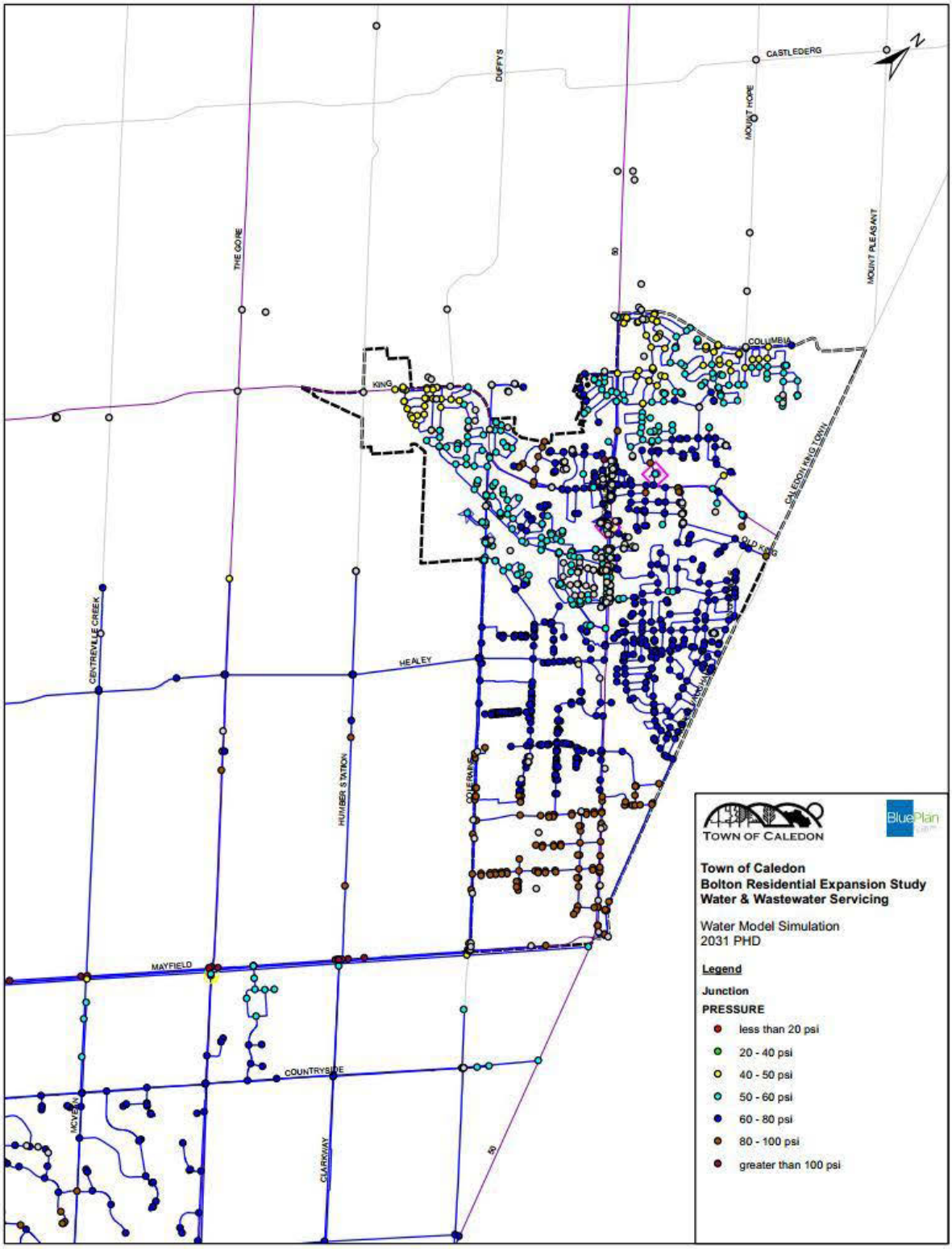


Figure 7. 2031 Peak Hour Demand Modelling Results (Nodal Pressures)

Option 1 – Strategy 2: Supply from Tullamore Zone 6 Pumping Station, via Mayfield Road and Coleraine Drive to a new pumping station at approximately Chickadee Lane and Glasgow Road, storage provided by an elevated tank to service Option 1 lands.

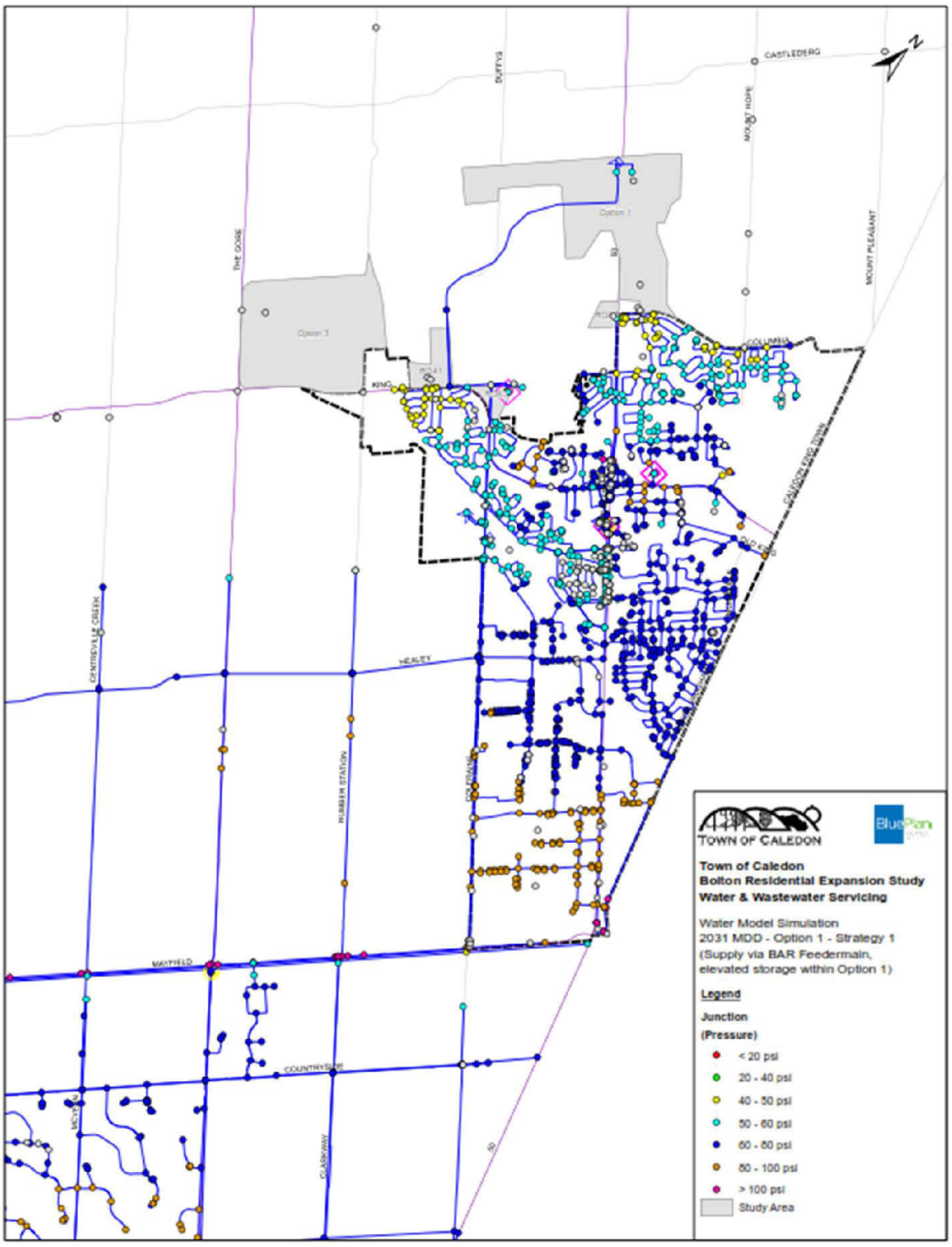


Figure 8. Option 1 – Strategy 1 Modelling Results (Nodal Pressures)

Option 1 – Strategy 2: Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street east of Innis Lake Road, pumped storage provided by in-ground Zone 5 reservoir to service Option 1 lands.

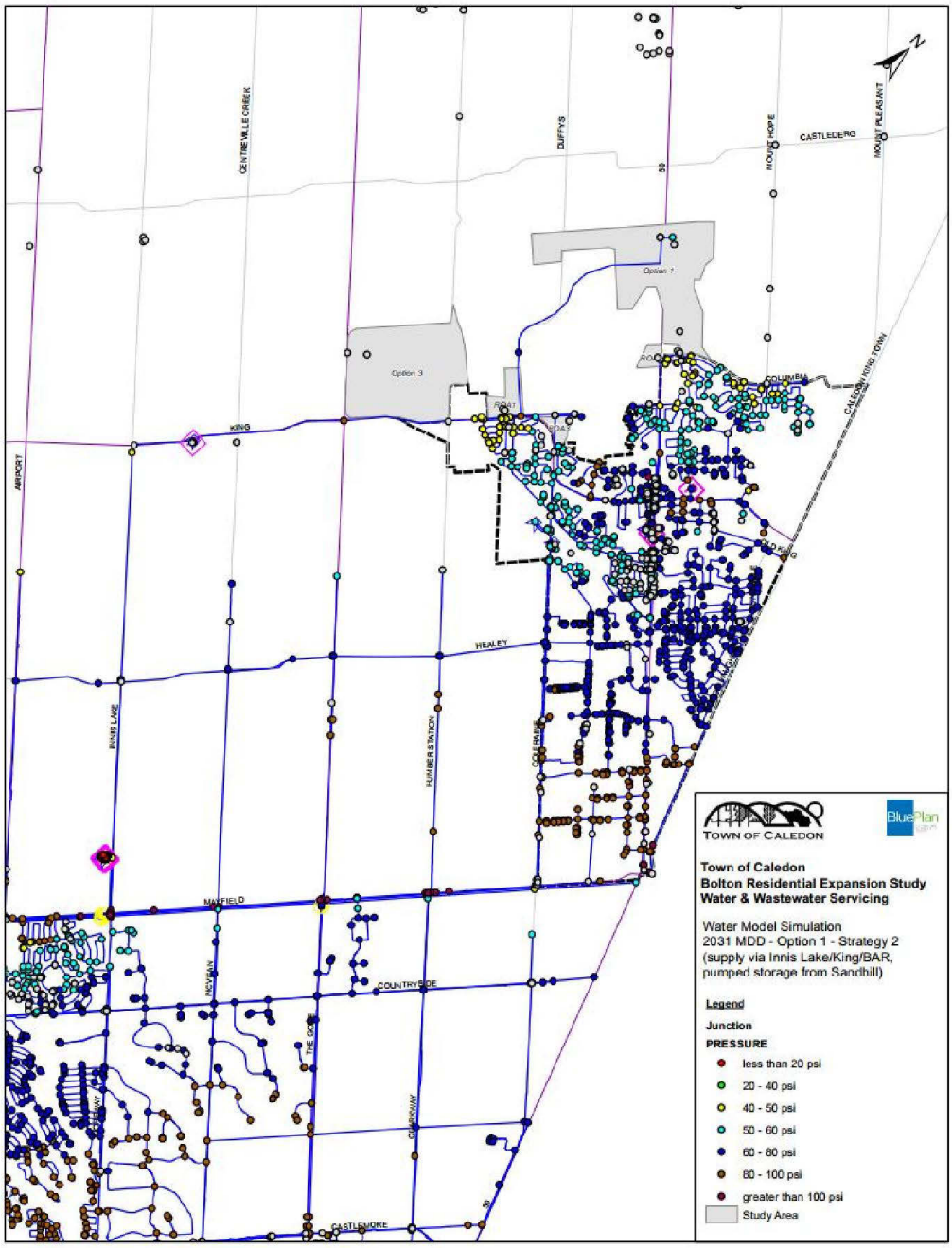


Figure 9. Option 1 – Strategy 2 Modelling Results (Nodal Pressures)

Option 1 – Strategy 3: Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street east of Innis Lake Road, pumped storage provided by in-ground Zone 5 reservoir to service Option 1 lands.

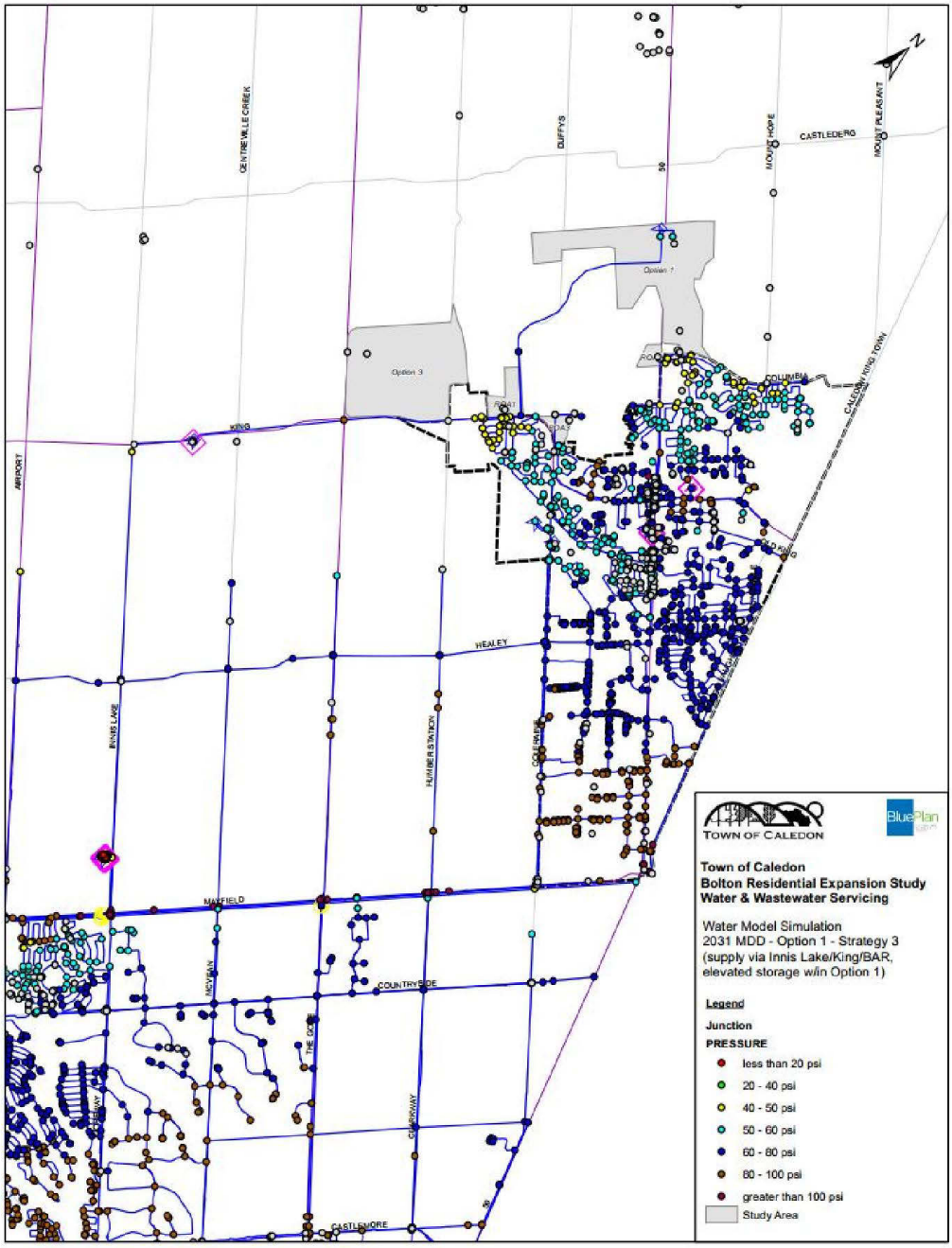


Figure 10. Option 1 – Strategy 3 Modelling Results (Nodal Pressures)

Option 3 – Strategy 1 Supply from Tullamore Zone 6 Pumping Station, via Coleraine Drive/Chickadee Lane to the new booster pumping station to service Option 3, with floating storage provided by an elevated tank located outside Option 3 lands.

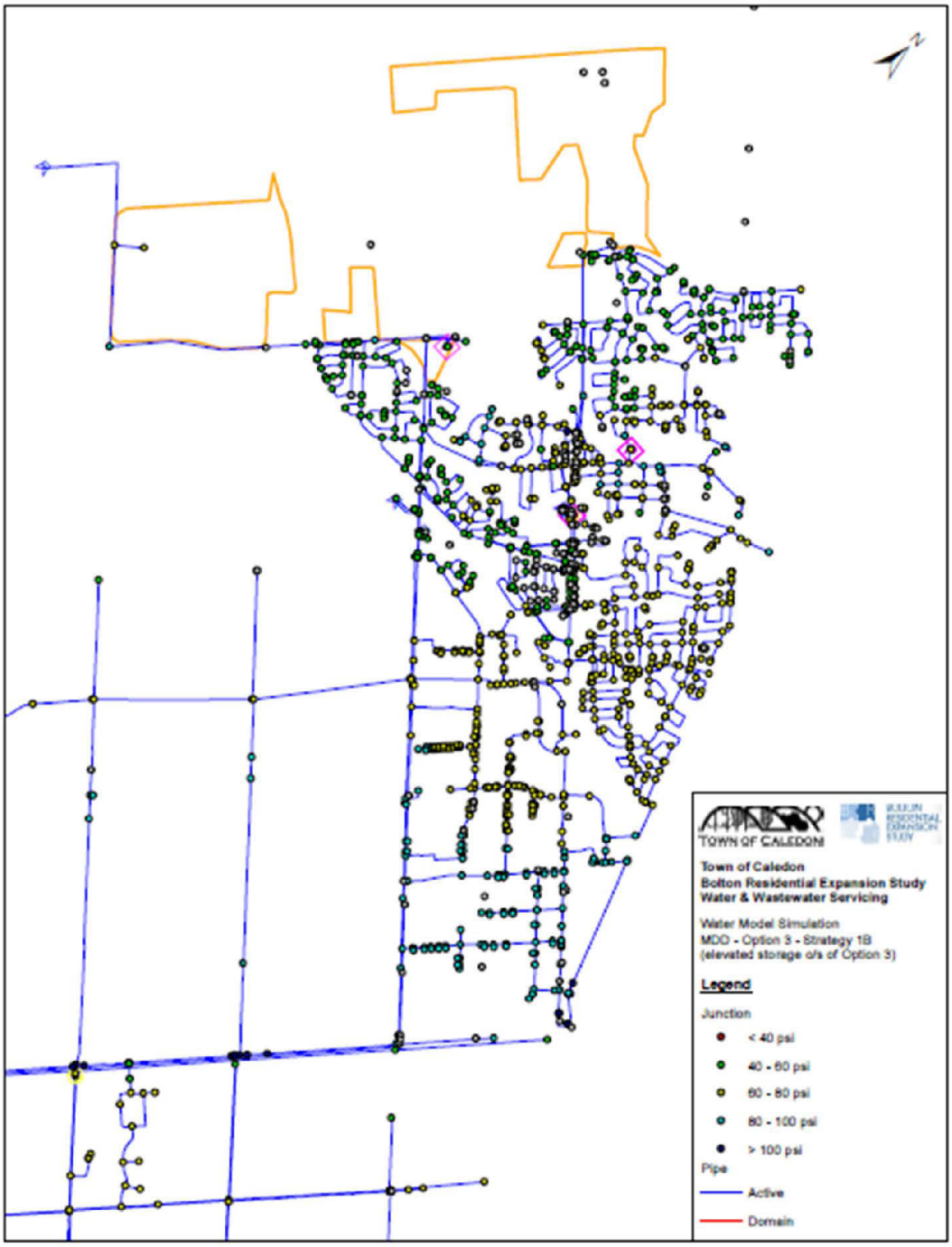


Figure 11. Option 3 – Strategy 1 Modelling Results (Nodal Pressures)

Option 3 – Strategy 2 – Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street, pumped storage provided by in-ground Zone 5 reservoir to service Option 3 lands.

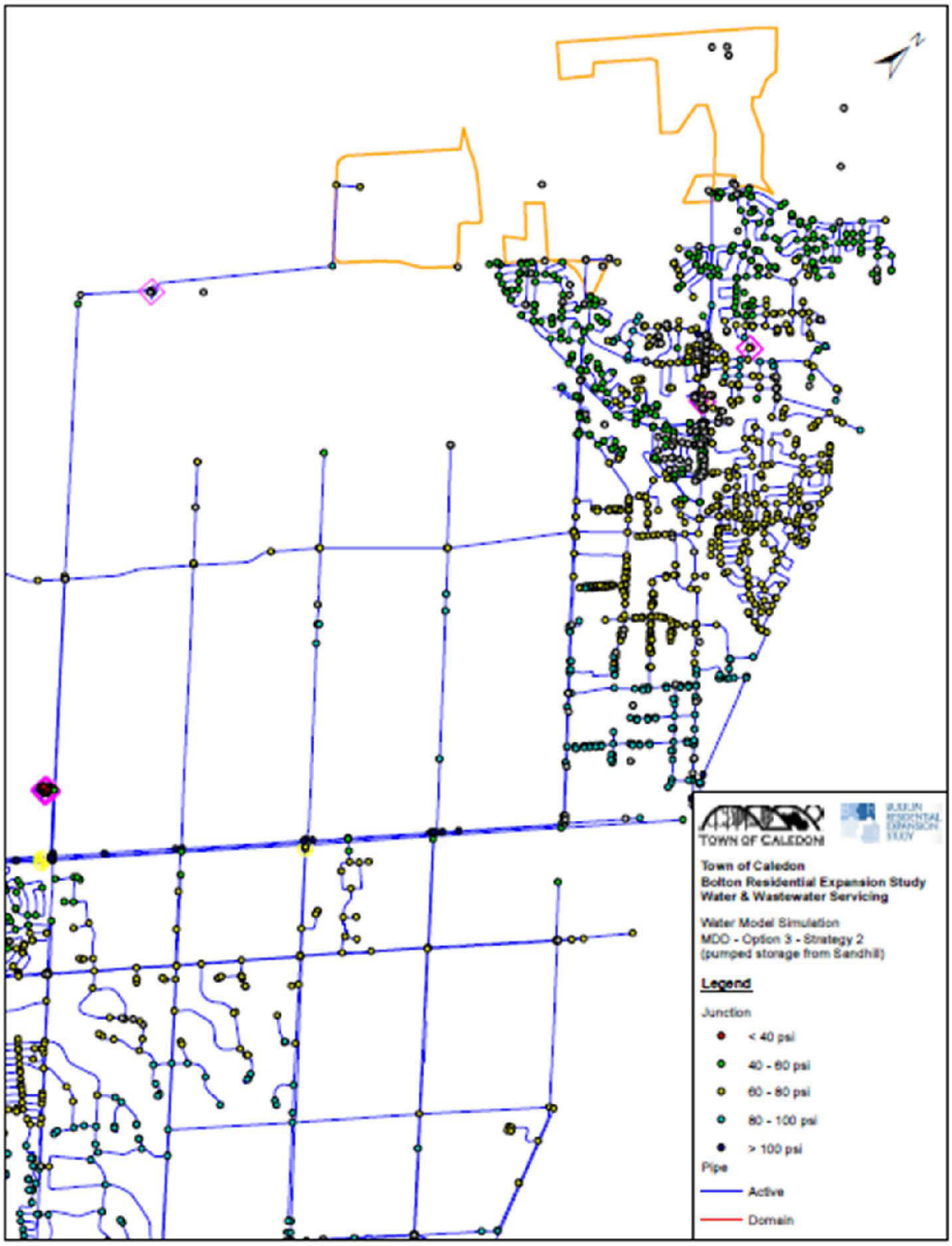


Figure 12. Option 3 – Strategy 2 Modelling Results (Nodal Pressures)

BluePlan
ENGINEERING
CONSULTANTS
LIMITED

Appendix B - Wastewater Modelling Technical Memorandum

Memorandum

Organization: The Town of Caledon	BluePlan Project No: C001-0021
Attention: File	Date: June 18, 2014
Project: Bolton Residential Expansion Study	
RE: Hydraulic Wastewater Modelling Analysis	

Introduction

This technical memorandum presents the hydraulic analysis carried out for the Bolton wastewater collection system as part of the Bolton Residential Expansion Study (BRES), including the methodology and assumptions utilized. The focus of this analysis is on Option 1 and Option 3 growth areas, which were carried forward following the high level screening process undertaken in Phases 1 and 2 of the study.

This infrastructure study has drawn on both historical and recent studies and resources including:

- 2013 Water and Wastewater Master Plan (BluePlan & AECOM, Mar 2014)
- Water and Wastewater Servicing Plan for the South Albion-Bolton Community Plan Employment Land and North Hill Supermarket Areas (AECOM, Mar 2010)
- Bolton Urban Community Water and Wastewater Analysis (AECOM, Mar 2010)

Objectives

The objective of the hydraulic wastewater modelling analysis was to identify alternatives for servicing the preferred growth option and select a strategy that considers the following key aspects of servicing impacts including:

- Existing system conditions
- Flexibility of servicing
- Complexity and cost of infrastructure upgrades
- Opportunity to support long term servicing of other growth areas

The technical information contained herein is intended to support the decision making process for the evaluation and selection of the preferred growth option (Option 1 or Option 3).

Wastewater Flow Criteria and Forecasts

The BRES utilized the wastewater criteria summarized in Table 1 below to estimate future wastewater flows within the expansion area(s).

Table 1. BRES Wastewater Criteria

DESIGN CRITERIA		
Residential Avg Day Wastewater Generation Criteria	300	L/cap/d
Employment Avg Day Wastewater Generation Criteria	300	L/cap/d
Peaking Factor	Harmon	
Inflow and Infiltration Allowance	0.2	L/s/ha

The theoretical average dry weather flow (DWF), peak dry weather flow (PDWF), and peak wet weather flow (PWWF) were determined based on the BRES population and employment and area forecasts provided. The estimated wastewater flows are summarized in Table 2.

Table 2. BRES Wastewater Average DWF Estimates

BRES Land Use	Area (Ha)	Population (persons)[1]	Average DWF (L/s)	Peak DWF (L/s)	Peak WWF (L/s)
Residential	-	10,348	35.9		
Employment	-	2,635	9.1		
Total	**190**	**12,983**	**45.1**	**128.1**	**166.1**
[1] Per direction received from Town of Caledon Council.					

Theoretical average DWF, peak DWF, and peak WWF for the three ROAs were also calculated based on approximate population and areas and the same criteria, and are summarized in Table 3.

Table 3. Wastewater Flow Estimates for Rounding Out Areas

Rounding Out Area	Area (Ha)	Population (persons)[1]	Average DWF (L/s)	Peak DWF (L/s)	Peak WWF (L/s)
ROA1	18	1759	6.11	22.16	26.00
ROA2	6	775	2.69	10.41	12.00
ROA3	7	614	2.13	8.37	10.00
[1] Population estimates for rounding out areas based on available land area and density assumptions, provided by Meridian Planning, and are included in the total BRES population forecast of 10,348.					

Triggers and Performance Criteria

Establishing hydraulic performance criteria is required in determining the need and scope of upgrades required to service future growth within the existing system. Assessing the impact of growth on the existing collection system was undertaken in accordance with the Region of Peel Water and Wastewater Master Plan approach. Triggers for a linear project are based on the following criteria:

- Pipe is surcharged
- Maximum water level is within 1.8 meters of ground level, indicating the potential for basement flooding
- Design storm event

The trigger for a sewage pumping station is based on exceeding the firm capacity of the station. The firm capacity of a pumping station is defined as the sum of all pump capacities (total installed), minus the largest pump capacity.

Any new local pumping station(s) would need to be sized to convey peak wet weather flows (sum of peak flows plus extraneous flows) generated by the total equivalent population tributary to the new pumping station.

Wastewater Modelling Analysis

For the wastewater hydraulic analysis, the Region of Peel's all-pipe model (built in InfoWorks CS and calibrated in 2007) was utilized as the key modelling tool. This model has been updated by the Region of Peel based on new findings and survey data. However, the model has not been re-calibrated since it was originally developed. All of the analysis carried out as part of this project was undertaken using the BRES planning projections provided.

The InfoWorks CS model was calibrated using RTK parameters in conjunction with the Ground Infiltration Module (GIM). The design storm used is a 12 hour SCS Type II Distribution design storm using a 1 in 5 year return period.

The Region of Peel Master Plan utilized the Region's trunk sewer model, built in InfoWorks CS and calibrated in 2010. It should be noted that the Master Plan used a 1 in 5 year AES design storm, while the BRES analysis was undertaken using an all-pipe model that uses a 1 in 5 year SCS Type II design storm. The SCS Type II design storm has a higher peak intensity, which is determined to be applicable for this capacity analysis.

To ensure the validity of the model, flows in the all-pipe model were compared to the more recently calibrated trunk sewer model, as well as to theoretical flows from the Region of Peel Master Plan (2013). Based on this comparison, the all-pipe model was considered the most appropriate model to utilize for the BRES wastewater servicing analysis.

The results also show that the I/I in the calibrated models is significantly higher than the I/I calculated from the design standards, which suggests that 0.2 L/s/ha underestimates extraneous flow in this area.

Base Model Update

An extract of the all-pipe model was taken for the Caledon servicing area. The model was given a free outfall a short distance downstream of McVean SPS, as there was no possibility of flows downstream of McVean SPS hydraulically impacting on the service area that was being analyzed. Reducing the model file size helped speed up the performance of the model so that results could be obtained for a variety of different scenarios.

A thorough review of the subcatchments within the Bolton service area was undertaken. Further updates to the model were carried out to resolve issues in the model that would affect the results of the analysis, largely due to connectivity and level errors. These changes were performed upon agreement with the Region.

Furthermore, a portion of the existing catchment was designated to be re-routed to drain to the Albion-Vaughan Trunk Sewer, in accordance with the current Regional servicing strategy. Therefore, limited flow from the Bolton SPS reaches the Coleraine Trunk Sewer in the future scenarios. The servicing strategy requires diverting flows from two local pumping stations to the Albion-Vaughan Trunk Sewer via gravity connections.

As part of the diversion strategy, the sewer to the west of Landsbridge Street along Queensgate Boulevard will be disconnected, such that all flow will be carried down Landsbridge Street along the existing 675mm diameter sewer to connect to the Albion-Vaughan Trunk Sewer.

The estimated population, area, and flows for the diverted catchment area were compared against the all-pipe model and theoretical calculations based on SGU population and design criteria, and this comparison was shown to correlate relatively well.

Assessment of Existing Wastewater Servicing Capacity

An assessment of capacity in the existing system (with and without any development flows) provides a baseline reference to determine the amount of additional flow that could be accommodated under a 1 in 5 year design storm, and identifies infrastructure that would require upgrades.

Bolton SPS

According to the Certificate of Approval (C of A) for the Bolton SPS, the firm capacity of the pumping station is 380 L/s.

Existing peak flows entering the Bolton SPS were modelled under a 1 in 5 year design storm to determine the available capacity for additional flows.

Upstream of Bolton SPS

There are three primary twinning routes in the North Hill area of Bolton along which the BRES development flow can be conveyed to the Bolton SPS. From review of the potential existing sewers that could receive flows from Option 1, there is no single sewer route or combination of routes that could accommodate the entire 166 L/s required for the Option 1 lands, under a 1 in 5 year design storm. The sewer routes that could potentially convey Option 1 flows are shown in Figure 1.

Downstream of Bolton SPS

For Option 1, downstream of the Bolton SPS, the existing sewers leading to the Coleraine Trunk Sewer and leading to the future decommissioned Albion-Vaughan Pumping SPS cannot accommodate the entire 166 L/s required for the Option 1 lands. As such, it was determined that diversion of additional flows from the Bolton SPS to the east side of Bolton would be required, and a new proposed forcemain to Nunnville Road was modelled.

Coleraine Drive Trunk Sewer

Similarly, the existing Coleraine Trunk Sewer cannot accommodate the entire 166 L/s required for the Option 3 lands. As such, twinning of the Coleraine Trunk Sewer would be necessary from the rail line to north of George Bolton Parkway. However, as a result of the diversion strategy redirecting flows towards the new Albion-Vaughan Trunk sewer on the east side of Bolton, there is available capacity on Coleraine Drive south of McEwen Drive even with the additional flow from the Option 3 lands.

When the initial simulations were performed, it was found that after point loading the 166 L/s inflow from the BRES development area into the existing trunk sewer along Coleraine Drive, surcharging occurred on Coleraine Drive, between Harvest Moon Drive and McEwan Drive. There is a 900 m long stretch of existing sewer along this section where the gradient flattens out and the flow transitions from supercritical to subcritical flow, resulting in a hydraulic jump. This is shown in Figure 2 and Figure 3.

Albion Vaughan Trunk Sewer

The future Nunnville Road sewer and Albion-Vaughan Trunk Sewer, down to the connection point with the Coleraine Trunk Sewer, have sufficient capacity to accommodate the full Option 1 flows. As such, the new proposed forcemain from the Bolton SPS to Nunnville Road has been sized to convey all of Option 1 flows.

BRES Modelling Scenarios

Multiple scenarios were developed to assess servicing strategies for the two BRES growth options, including existing and future conditions under a 1 in 5 year design storm. The alternative wastewater servicing strategies analyzed under the BRES are further described in the BRES Infrastructure Study Report.

Thematic maps showing modelling outputs of d/D with the BRES inflow added, both before and after upgrades are provided at the back of this technical memorandum.

Levels of surcharge in the network are as follows:

- < 0.25
- 0.25-0.50
- 0.50-0.85
- => 1.00 (Surcharged by depth - back water conditions)
- => 2.00 (Surcharge by flow - capacity)

Conclusion

The wastewater modelling analysis carried out identified and confirmed the sizing of recommended infrastructure to service the potential BRES expansion areas. As such, all recommended wastewater infrastructure meets existing Regional design standards and levels of service.

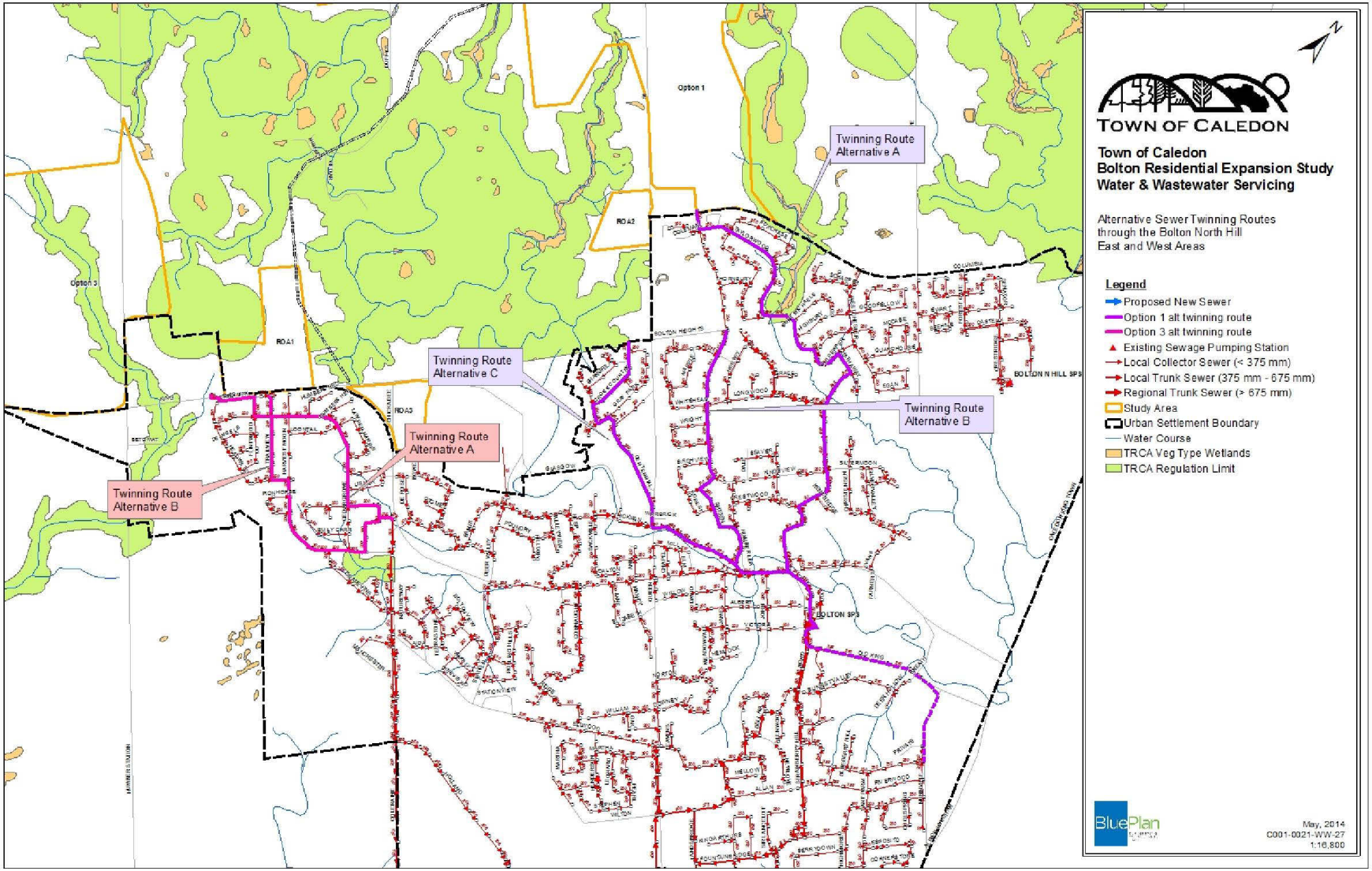
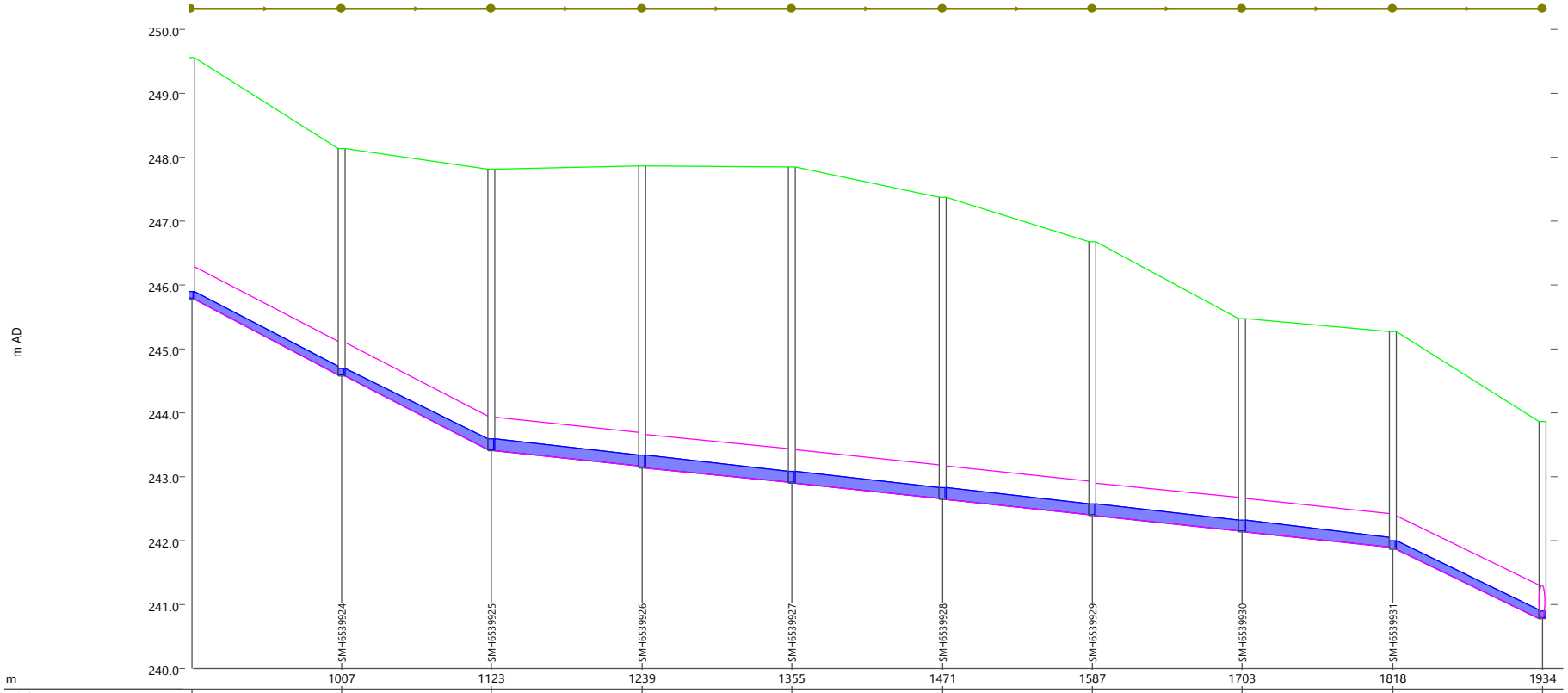


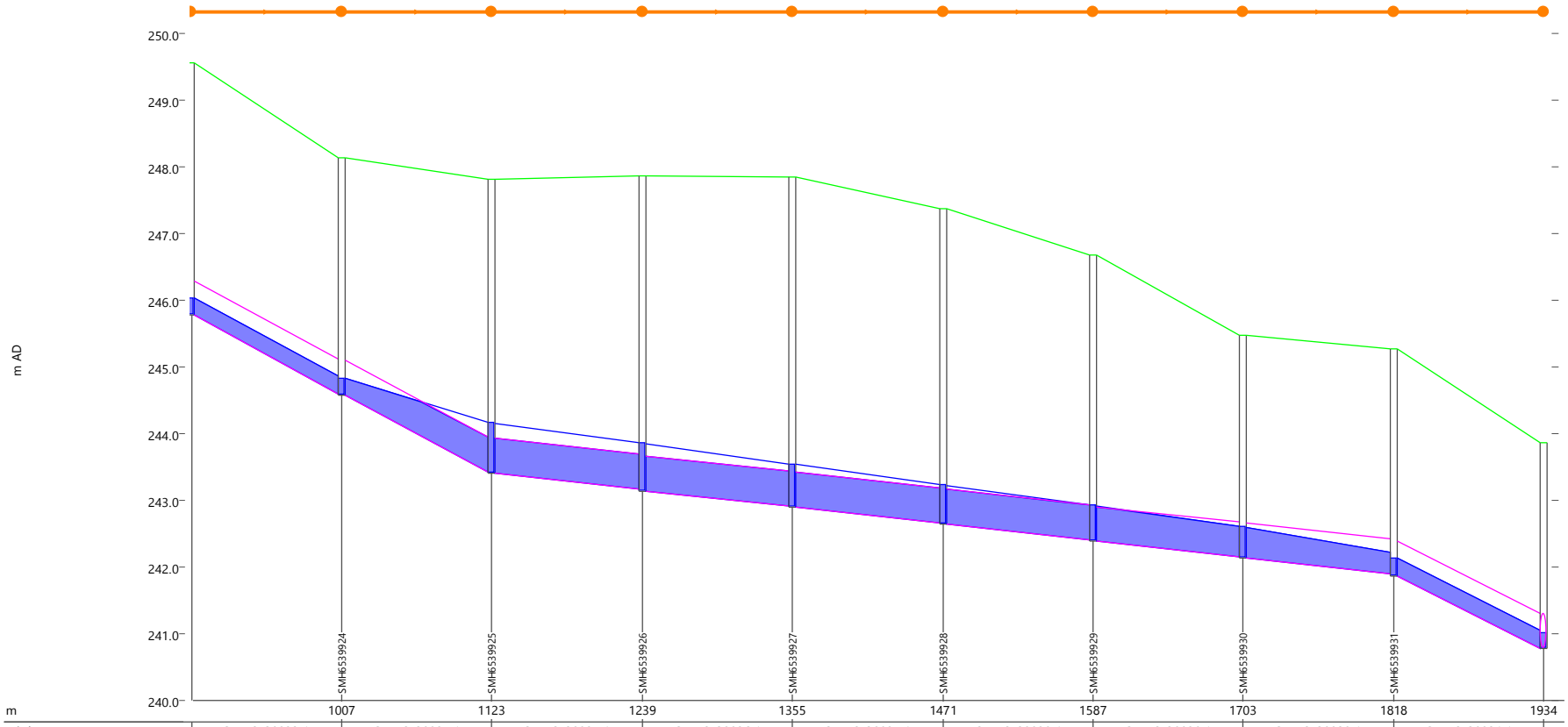
Figure 1. Alternative Sewer Twinning Routes for Conveying Option 1 or Option 3 lands



Link	SMH6539923.1	SMH6539924.1	SMH6539925.1	SMH6539926.1	SMH6539927.1	SMH6539928.1	SMH6539929.1	SMH6539930.1	SMH6539931.1	
length (m)	115.9	115.9	115.9	115.9	115.9	115.9	115.9	115.9	115.9	
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	
width (mm)	525	525	525	525	525	525	525	525	525	
Bottom Roughness Manning	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	
us inv (m AD)	245.780	244.580	243.410	243.150	242.900	242.650	242.390	242.140	241.880	
ds inv (m AD)	244.610	243.430	243.180	242.930	242.670	242.420	242.160	241.910	240.790	
grad (%)	1.010	0.992	0.198	0.190	0.198	0.198	0.198	0.198	0.941	
surc	0.26	0.32	0.36	0.36	0.36	0.36	0.36	0.36	0.24	
r.pfc (m3/s)	0.432	0.429	0.192	0.187	0.192	0.192	0.192	0.192	0.417	
DS Depth (m)	0.134	0.169	0.160	0.159	0.169	0.159	0.169	0.151	0.128	
DS Flow (m3/s)	0.05231	0.05231	0.05230	0.05229	0.05229	0.05228	0.05228	0.05227	0.05227	
DS Froude number	1.235	1.041	0.973	0.979	0.940	0.979	0.940	0.985	1.373	
DS Velocity (m/s)	1.195	0.872	0.934	0.948	0.872	0.948	0.872	1.015	1.284	

Node	539923	SMH6539924	SMH6539925	SMH6539926	SMH6539927	SMH6539928	SMH6539929	SMH6539930	SMH6539931	-
ground (m AD)	.562	248.140	247.828	247.879	247.848	247.373	246.687	245.485	245.274	243.872
Chamber Floor Level (m AD)	.780	244.580	243.410	243.150	242.900	242.650	242.390	242.140	241.880	240.790
level (m AD)	.914	244.706	243.599	243.340	243.089	242.839	242.579	242.329	242.008	240.911

Figure 2. HGL along surcharged section of existing Coleraine trunk sewer without BRES flows

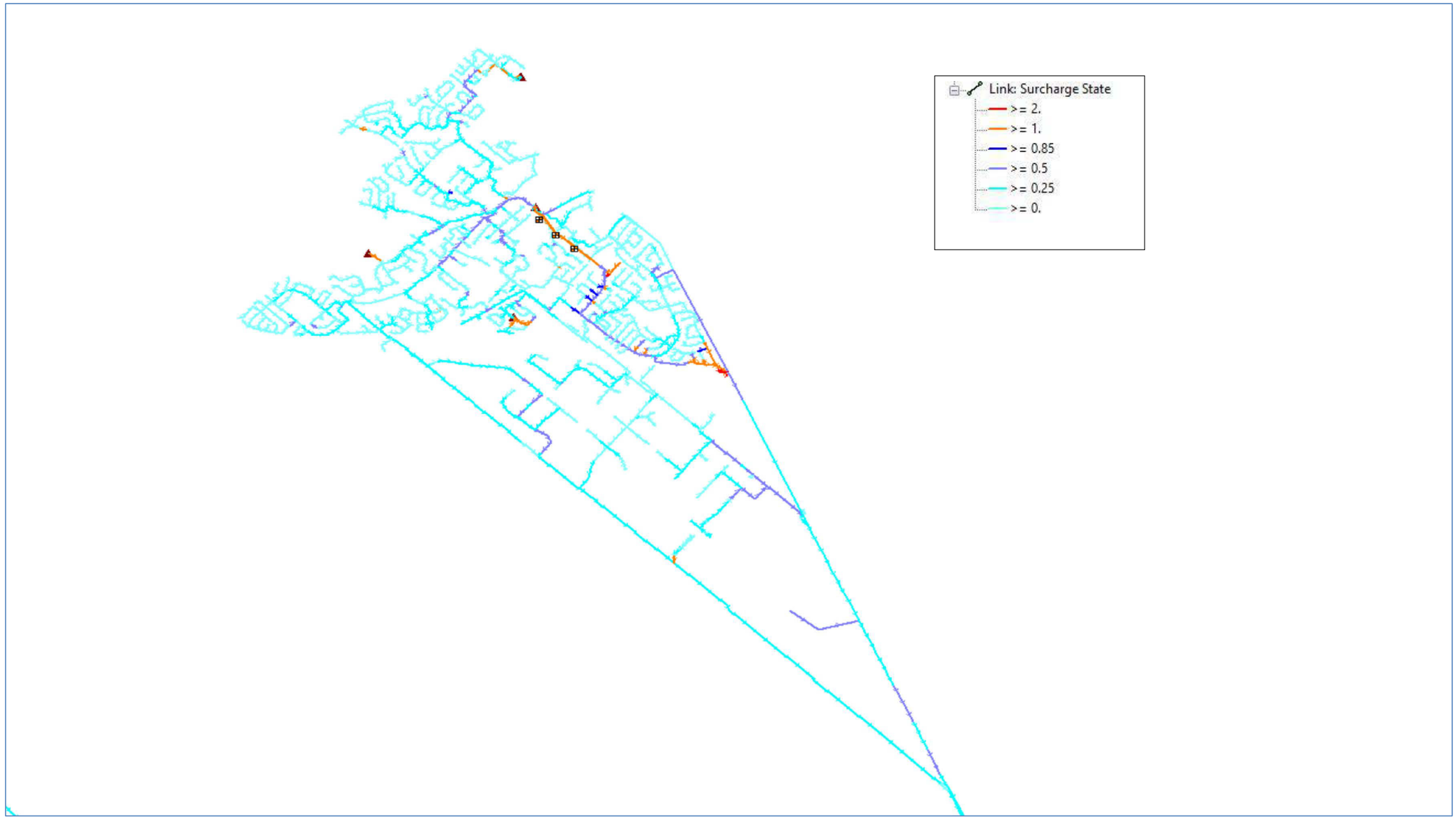


Link	SMH6539923.1	SMH6539924.1	SMH6539925.1	SMH6539926.1	SMH6539927.1	SMH6539928.1	SMH6539929.1	SMH6539930.1	SMH6539931.1
length (m)	115.9	115.9	115.9	115.9	115.9	115.9	115.9	115.9	115.9
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	525	525	525	525	525	525	525	525	525
Bottom Roughness Manning	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
us inv (m AD)	245.780	244.580	243.410	243.150	242.900	242.650	242.390	242.140	241.880
ds inv (m AD)	244.610	243.430	243.180	242.930	242.670	242.420	242.160	241.910	240.790
grad (%)	1.010	0.992	0.198	0.190	0.198	0.198	0.198	0.198	0.941
surc	0.51	1.00	2.00	2.00	2.00	2.00	2.00	0.89	0.51
r.qfc (m3/s)	0.432	0.429	0.192	0.187	0.192	0.192	0.192	0.192	0.417
DS Depth (m)	0.269	0.749	0.686	0.625	0.575	0.514	0.453	0.315	0.269
DS Flow (m3/s)	0.21814	0.21791	0.21790	0.21789	0.21787	0.21784	0.21782	0.21781	0.21781
DS Froude number	1.370	0.588	0.602	0.619	0.590	0.621	0.609	0.996	1.378
DS Velocity (m/s)	1.958	1.070	1.084	1.101	1.072	1.104	1.111	1.603	1.952

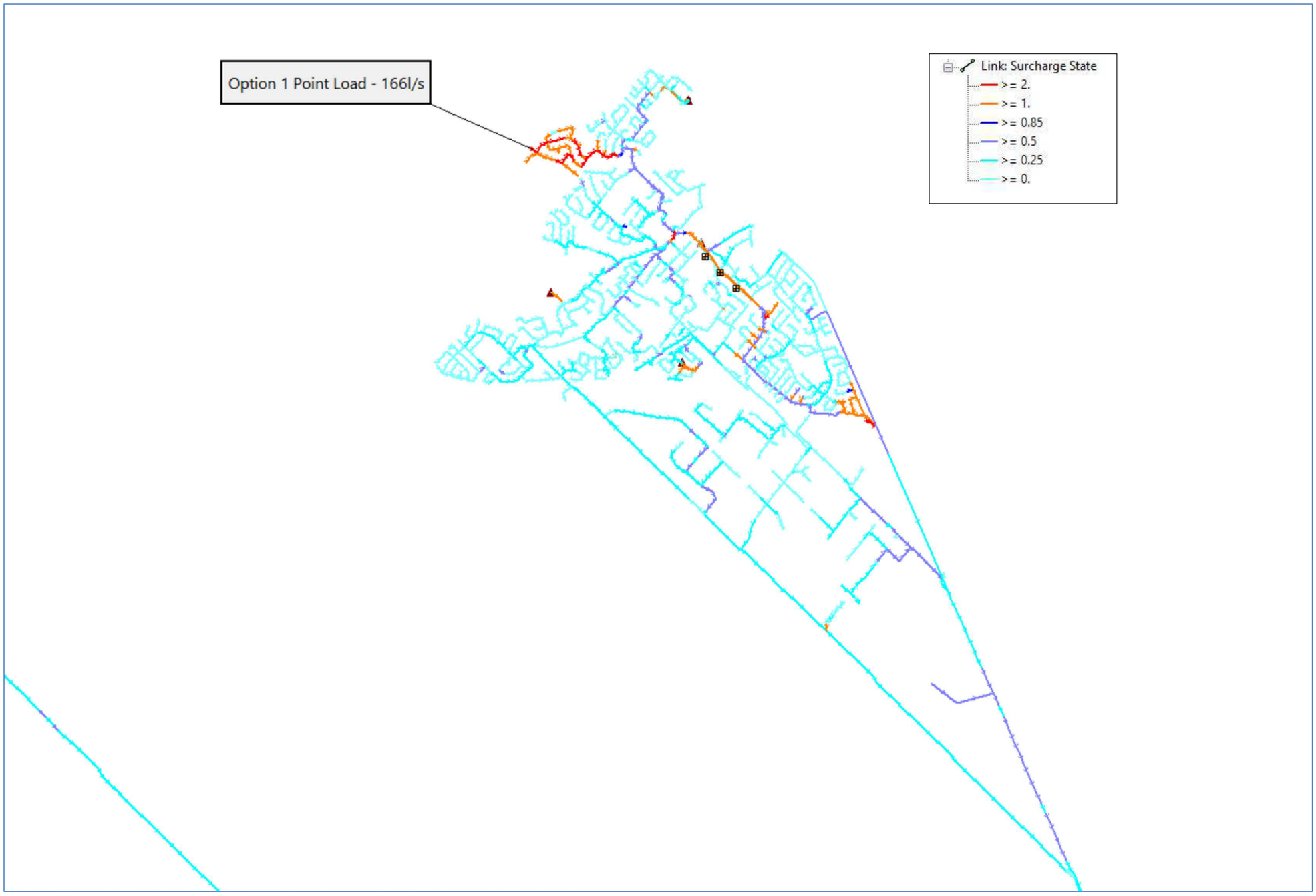
Node	539923	SMH6539924	SMH6539925	SMH6539926	SMH6539927	SMH6539928	SMH6539929	SMH6539930	SMH6539931	-
ground (m AD)	.562	248.140	247.828	247.879	247.848	247.373	246.687	245.485	245.274	243.872
Chamber Floor Level (m AD)	.780	244.580	243.410	243.150	242.900	242.650	242.390	242.140	241.880	240.790
level (m AD)	.049	244.847	244.178	243.865	243.554	243.244	242.933	242.613	242.150	241.029

Figure 3. HGL along surcharged section of existing Coleraine trunk sewer with BRES flows added

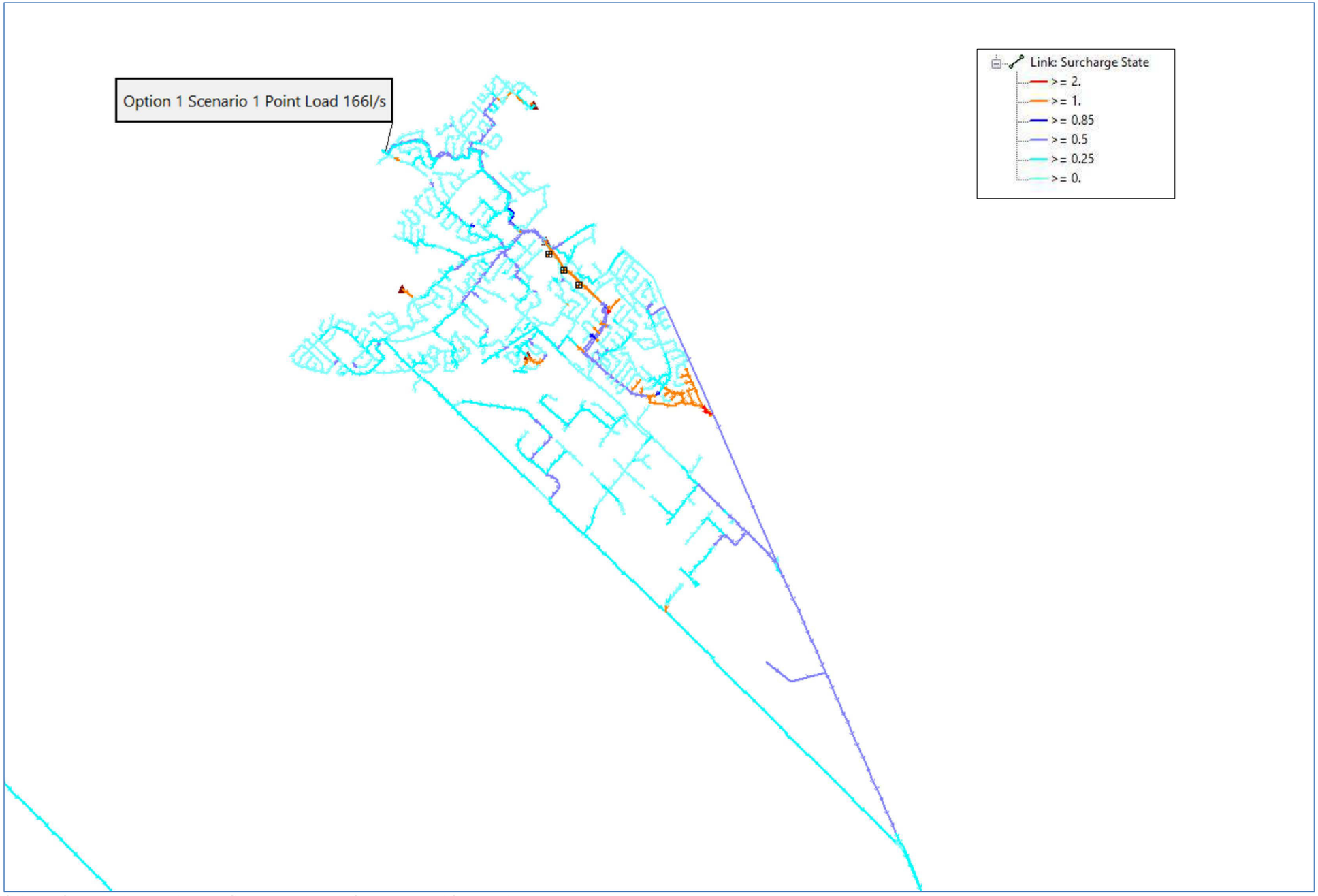
Wastewater Modelling Mapping



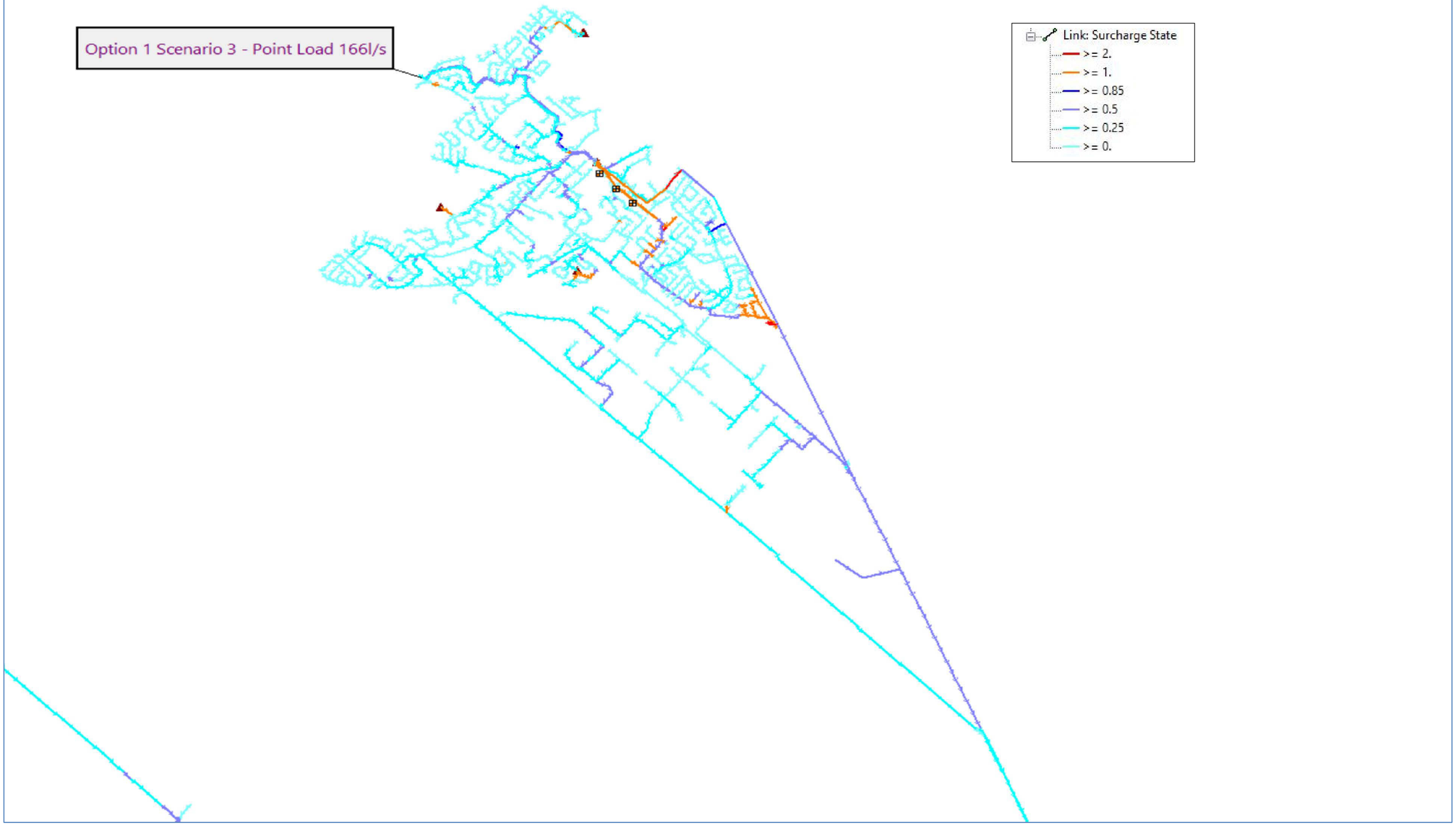
Base Model – Thematic map showing d/D



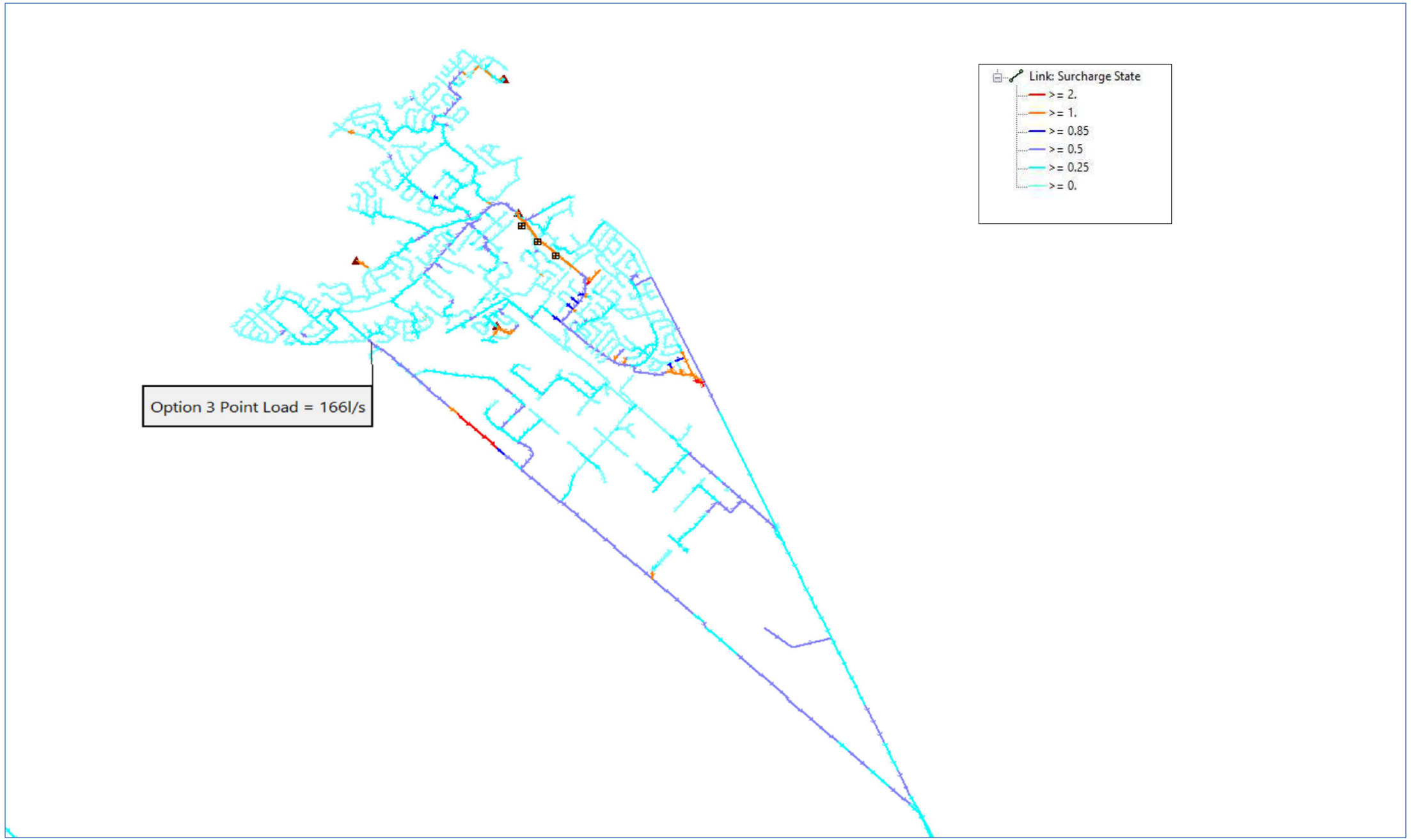
Option 1 Thematic Map Showing d/D – BRES Development Flow Point Loaded – No Upgrades



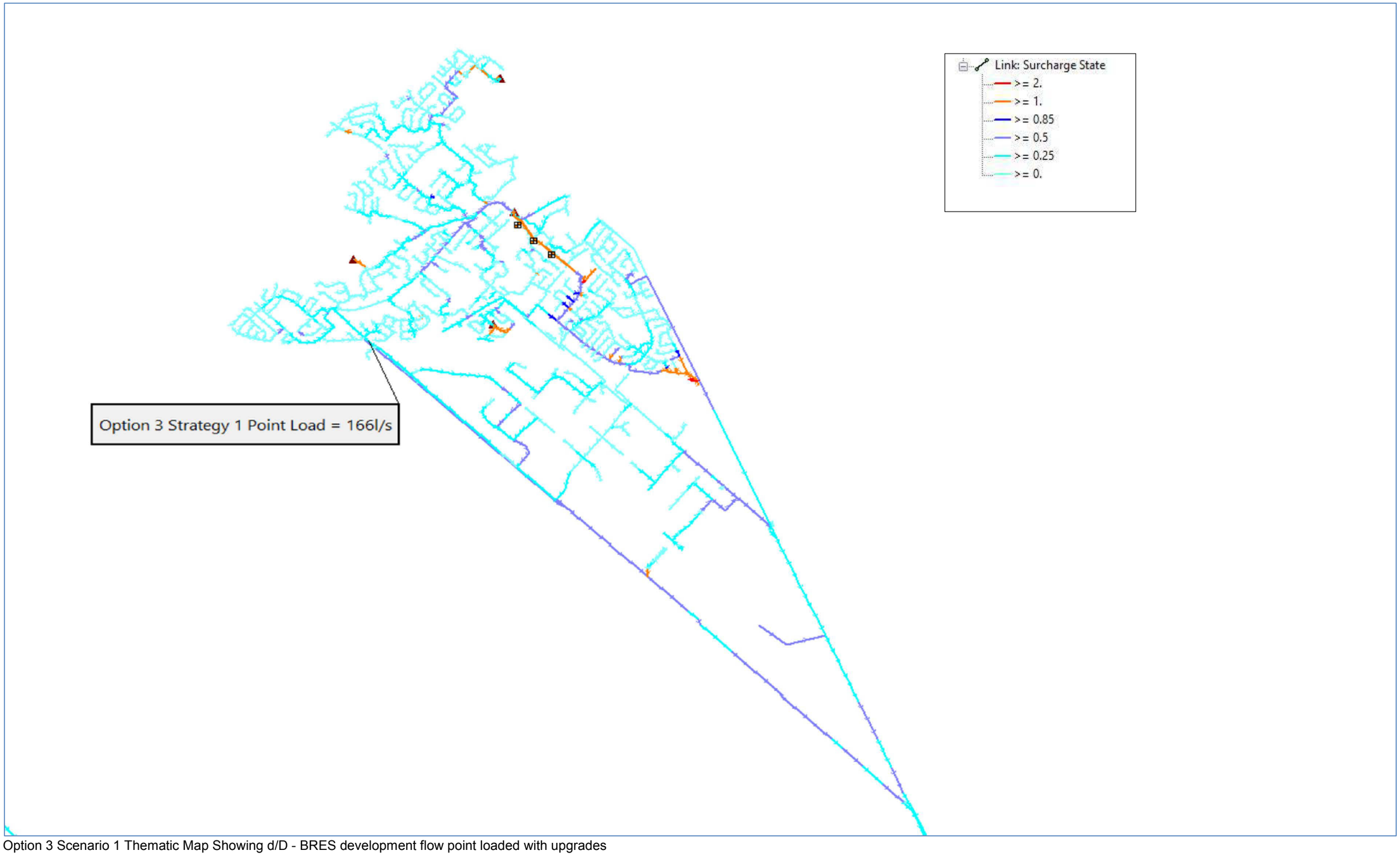
Option 1 Scenario 1 Thematic Map Showing d/D - BRES development flow point loaded with upgrades



Option 1 Scenario 3 Thematic Map Showing d/D - BRES development flow point loaded with upgrades



Option 1 Thematic Map Showing d/D – BRES Development Flow Point Loaded – No Upgrades



Option 3 Scenario 1 Thematic Map Showing d/D - BRES development flow point loaded with upgrades

BluePlan
ENGINEERING
CONSULTANTS
LIMITED

Appendix C - Water & Wastewater unit Costs

75 International Blvd., Suite 304
Toronto, Ontario M9W 6L9
Phone: 416.703.0667 Fax: 416.703.2501
www.blueplan.ca

Memorandum

Organization: The Town of Caledon	**BluePlan Project No:** C001-0021
Attention: File	**Date:** June 16, 2014
Project: Bolton Residential Expansion Study	
RE: Unit Costs for Water & Wastewater Servicing	

Introduction

This technical memorandum summarizes the methodology and assumptions utilized to derive the costs for the Bolton Residential Expansion Study (BRES) water and wastewater servicing strategies. Costs were derived in 2013 dollars. It should be noted that these costs reflect BRES trunk infrastructure only and do not include internal servicing. The costs also do not include trunk infrastructure related to the Region of Peel Master Servicing Plan and Development Charge Programs. As such, the infrastructure is not currently carried in the Region capital plan.

Base Costs

Base costs for linear infrastructure were calculated based on length and unit cost. Unit costs varied based on diameter, depth of installation (for sewers), and nature of crossing. Vertical infrastructure such as pumping stations, elevated tanks, and reservoirs were calculated based on capacity (L/s) and or volume (ML or m^3).

Construction Uplift

An uplift to the total base cost was applied for projects where constructability challenges were foreseeable due to physical or environmental constraints.

Urban Uplift

An uplift was applied to the base cost for projects in built-up areas. Depending on the existing land use, and proximity to residential / downtown areas, the uplift varied from 25% to 100%.

Crossings

An additional lump sum was added to the base cost for any crossings, including minor creeks, Regional Roads, railways, major creeks, and trenchless crossings.

Construction Sub-Total

The Construction Sub-Total was based on the sum of: Base Cost + Construction Uplift + Urban Uplift + Valves + Crossings.

Construction Contingency

Construction Contingency was based on proximity to environmental crossings, etc.

Construction Total

Construction Total was based on the sum of Construction Sub-Total + Construction Contingency.

Geotechnical / Hydrogeological

A factor of 2% of the Total Construction Cost was applied as the Geotechnical / Hydrogeological component.

Property / Easement Acquisition

Property / Easement Acquisition was determined based on an approximation of land value in Bolton. A value of $278,000 per hectare was utilized. A 30 m width is used for the easements required.

Additional Costs

Additional Costs represent the sum of construction uplift, urban uplift, valves, crossings, construction contingency, geotechnical/hydrogeological and property/easements.

Sub-Total Cost

The Sub-Total Cost represents the sum of the base cost and additional costs.

Engineering / Contingency

A value of 35% is utilized for Engineering / Contingency. This is further comprised of: 15% Consulting Engineering, 10% for In-House Fees, and 10% for Project Contingency.

Non-Refundable HST

Non-Refundable HST is calculated as 1.76% of the sum of the Sub-Total Cost, Consulting Engineering, and Project Contingency costs.

Total Estimated Cost

The Total Estimated Cost is the sum of the Sub-Total Cost, Engineering / Contingency, and the Non-Refundable HST.

Summary of Costing Categories:

- Base Cost:
    - Linear = Unit Cost * Length
    - Vertical = Unit Cost * Capacity/Volume
- Construction Uplift = % Uplift * Base Cost
- Urban Uplift = % Uplift * Base Cost
- Crossings = Minor Creeks + Regional Road/Rail + Major Creek + Trenchless
- Construction Sub-Total = Base + Construction Uplift + Urban Uplift + Valves + Crossings
- Construction Contingency = % Contingency * Construction Sub-total
- Construction Total = Construction Sub-Total + Construction Contingency
- Geotechnical / Hydrogeological = % Geo/Hydro * Total Construction
- Property / Easement Acquisition = $ value
- Additional Costs = Construction Uplift + Urban Uplift + Valves + Crossings + Construction Contingency + Geotech/HydroG + Property/Easement
- Sub-Total = Base + Additional Costs
- Engineering / Contingency = 35% of Sub-Total
    - Consulting Engineering = 15% of Sub-Total
    - In-House Fees = 10% of Sub-Total
    - Project Contingency = 10% of Sub-Total
- Non-Refundable HST = 1.76% of (Sub-Total + Consulting Engineering + Project Contingency)
- Total Estimated Cost = Sub-Total + Engineering / Contingency + HST

** Assume trenchless or open cut for base cost (i.e. base cost = open cut cost + trenchless cost)

Vertical Unit Costs Water / Wastewater

Water

Facility	Cost 2013$	Unit
New Pumping Station (Greenfield)	$48,000	per L/s
Pumping Station Upgrade	$12,000	per L/s
Elevated Tank	$1,000,000	per ML
In-Ground / Partially In-Ground Reservoir	$1,000,000	per ML

Wastewater

Facility	Cost 2013$	Unit
New Pumping Station (Greenfield)	$48,000	per L/s
Pumping Station Upgrade	$12,000	per L/s
Offline Storage Tank	$2,000	per m3

General

Facility	Cost 2013$	Unit
Property Acquisition	$278,000	per ha
Extra Factor (Rock Excavation)	$433	per MLD

BluePlan ENGINEERING CONSULTANTS LIMITED

BOLTON RESIDENTIAL EXPANSION STUDY
WATER LINEAR UNIT COSTS

May 15, 2014

Water Linear Unit Costs

Water Pipes

Inflation 0.00%

Pipe Diameter (mm)	Cost 2012$	Cost 2013$
250	$916	$916
300	$1,018	$1,018
400	$1,131	$1,131
450	$1,260	$1,260
500	$1,434	$1,434
600	$1,584	$1,584
750	$1,835	$1,835
900	$2,176	$2,176
1050	$2,548	$2,548
1200	$3,961	$3,961
1350	$4,500	$4,500
1500	$5,383	$5,383
1650	$6,034	$6,034
1800	$7,083	$7,083
2100	$7,715	$7,715
2400	$8,191	$8,191

Valves

Inflation 0%

Diameter (mm)	Cost 2012$	Cost 2013$	Spacing	
250	27,703	$27,703	300	*
300	30,781	$30,781	300	*
400	34,201	$34,201	300	*
450	36,565	$36,565	600	*
500	41,746	$41,746	600	*
600	54,320	$54,320	600	*
750	75,595	$75,595	600	*
900	80,675	$80,675	600	*
1050	107,935	$107,935	600	*
1200	138,012	$138,012	2,000	1
1350	161,148	$161,148	2,000	1
1500	195,550	$195,550	2,000	1
1650	223,816	$223,816	2,000	1
1800	282,059	$282,059	2,000	1
2100	327,728	$327,728	2,000	1
2400	373,396	$373,396	2,000	1

Trenchless Crossings, all include a valve at each side of crossing

For Creeks & Trans Canada
Length = 20

Diameter (mm)	Cost 2013$
250	$140,130
300	$155,700
400	$173,000
450	$185,000
500	$203,000
600	$243,000
750	$308,000
900	$341,000
1050	$419,000
1200	$501,000
1350	$570,000
1500	$662,000
1650	$741,000
1800	$880,000
2100	$1,017,000
2400	$1,154,000

For Regional Roads, Rail and Hydro Corridors
Length= 60

Diameter (mm)	Cost 2013$
250	$308,610
300	$342,900
400	$381,000
450	$408,000
500	$442,000
600	$512,000
750	$623,000
900	$701,000
1050	$824,000
1200	$952,000
1350	$1,067,000
1500	$1,204,000
1650	$1,328,000
1800	$1,513,000
2100	$1,741,000
2400	$1,968,000

For Freeways, Major Creek Crossings
Length= 150

Diameter (mm)	Cost 2013$
250	$688,500
300	$765,000
400	$850,000
450	$911,000
500	$979,000
600	$1,117,000
750	$1,330,000
900	$1,511,000
1050	$1,736,000
1200	$1,967,000
1350	$2,183,000
1500	$2,422,000
1650	$2,649,000
1800	$2,936,000
2100	$3,369,000
2400	$3,801,000

Trenchless Rates

Inflation 0%

Diameter (mm)	Cost 2012$	Unit Rate 2013$
250	$4,220	$4,220
300	$4,689	$4,689
400	$5,210	$5,210
450	$5,588	$5,588
500	$5,967	$5,967
600	$6,725	$6,725
750	$7,861	$7,861
900	$8,997	$8,997
1050	$10,134	$10,134
1200	$11,270	$11,270
1350	$12,406	$12,406
1500	$13,543	$13,543
1650	$14,679	$14,679
1800	$15,815	$15,815
2100	$18,088	$18,088
2400	$20,360	$20,360

Valve Spacing

Diameter (mm)	Valve Spacing (m)	
150	300	*
200	300	*
250	300	*
300	300	*
400	300	*
450	600	*
500	600	*
600	600	*
750	600	*
900	600	*
1050	600	*
1200	2000	1
1350	2000	1
1500	2000	1
1650	2000	1
1800	2000	1
2100	2000	1
2400	2000	1

* Based upon Region of Peel Design Criteria
[1] Taken from MOE maximum spacing

BluePlan

BOLTON RESIDENTIAL EXPANSION STUDY
WASTEWATER LINEAR UNIT COSTS

May 15, 2014

Wastewater Linear Unit Costs

Rate

Depth 5m

Pipe Diameter (mm)	Cost 2013$
200	$0
250	$625
300	$657
375	$692
450	$735
525	$780
600	$865
675	$1,086
750	$1,190
825	$1,239
900	$1,517
975	$2,349
1050	$2,693
1200	$3,006
1350	$3,383
1500	$3,794
1650	$4,202
1800	$4,742
2100	$5,355
2400	$6,960
3000	$9,509

= 300 mm costs x 95%
= 375 mm costs x 95%

Depth 10m

Pipe Diameter (mm)	Cost 2013$
200	$0.00
250	$2,111
300	$2,222
375	$2,339
450	$2,394
525	$2,454
600	$2,903
675	$3,191
750	$3,313
825	$3,358
900	$3,720
975	$3,785
1050	$4,449
1200	$4,693
1350	$5,044
1500	$5,758
1650	$6,165
1800	$6,733
2100	$7,378
2400	$8,986
3000	$11,533

Forcemains

Pipe Diameter (mm)	Cost 2013$
150	$564
200	$608
250	$656
300	$713
350	$910
400	$1,072
450	$1,232
500	$1,402
600	$1,784
750	$1,900
900	$2,211
1050	$2,597
1200	$2,987

Note: Unit rates for sewers include manholes.
Assumptions are:

Diameter	Spacing
375-750	100 m
825 - 900	125 m
975 - 3000	150 m

Taken from MOE Guidelines but compliant with Peel DC

Sewer Trenchless Crossings Assumed Length Stated on table and incldes manhole each side of crossing

For Creeks & Trans Canada
Length = 20

Diameter	Cost 2013$
200	$64,000
250	$64,000
300	$64,000
375	$142,000
450	$153,000
525	$165,000
600	$176,000
675	$212,000
750	$223,000
825	$235,000
900	$295,000
975	$306,000
1050	$332,000
1200	$355,000
1350	$378,000
1500	$400,000
1650	$423,000
1800	$483,000
2100	$528,000
2400	$574,000
3000	$664,000

For Regional Roads, Rail and Hydro Corridors
Length = 60

Diameter	Cost 2013$
200	$108,000
250	$108,000
300	$108,000
375	$343,000
450	$377,000
525	$411,000
600	$445,000
675	$504,000
750	$538,000
825	$572,000
900	$655,000
975	$689,000
1050	$737,000
1200	$806,000
1350	$874,000
1500	$942,000
1650	$1,010,000
1800	$1,115,000
2100	$1,252,000
2400	$1,388,000
3000	$1,661,000

For Freeways, Major Creek Crossings
Length = 150

Diameter	Cost 2013$
200	$207,000
250	$207,000
300	$207,000
375	$795,000
450	$880,000
525	$965,000
600	$1,050,000
675	$1,160,000
750	$1,245,000
825	$1,330,000
900	$1,464,000
975	$1,550,000
1050	$1,649,000
1200	$1,820,000
1350	$1,990,000
1500	$2,161,000
1650	$2,331,000
1800	$2,539,000
2100	$2,879,000
2400	$3,220,000
3000	$3,902,000

Manhole Costs For Trenchless Crossings
Inflation 0.00%

Diameter	Manhole Size	Cost 2012$	Cost 2013$
200	1500	$20,752	$20,752
250	1500	$20,752	$20,752
300	1500	$20,752	$20,752
350	1500	$20,752	$20,752
375	1500	$20,752	$20,752
450	1500	$20,752	$20,752
525	1500	$20,752	$20,752
600	1500	$20,752	$20,752
675	1800	$32,983	$32,983
750	1800	$32,983	$32,983
825	1800	$32,983	$32,983
900	2400	$57,446	$57,446
975	2400	$57,446	$57,446
1050	3000	$64,702	$64,702
1200	3000	$64,702	$64,702
1350	3000	$64,702	$64,702
1500	3000	$64,702	$64,702
1650	3000	$64,702	$64,702
1800	Special Construction	$83,153	$83,153
2100	Special Construction	$83,153	$83,153
2400	Special Construction	$83,153	$83,153
3000	Special Construction	$83,153	$83,153

Data from Peel Final Linear Unit Costs July 2011
Assuming for Crossings all Manholes are 5-10m deep

Trenchless **Compound Inflation** 0%

Diameter	Cost 2012$	Cost 2013$
150	$ 1,100	$ 1,100
200	$ 1,100	$ 1,100
250	$ 1,100	$ 1,100
300	$ 1,100	$ 1,100
325	$ 1,100	$ 1,100
350	$ 1,100	$ 1,100
375	$ 5,020	$ 5,020
400	$ 5,210	$ 5,210
450	$ 5,588	$ 5,588
500	$ 5,967	$ 5,967
525	$ 6,156	$ 6,156
600	$ 6,725	$ 6,725
675	$ 7,293	$ 7,293
750	$ 7,861	$ 7,861
825	$ 8,429	$ 8,429
900	$ 8,997	$ 8,997
975	$ 9,565	$ 9,565
1050	$ 10,134	$ 10,134
1200	$ 11,270	$ 11,270
1350	$ 12,406	$ 12,406
1500	$ 13,543	$ 13,543
1650	$ 14,679	$ 14,679
1800	$ 15,815	$ 15,815
2100	$ 18,088	$ 18,088
2400	$ 20,360	$ 20,360
3000	$ 24,906	$ 24,906

Forcemain Trenchless Crossings Assumed Length Stated on table and includes valve each side of crossing

SED's
For Creeks & Trans Canada
Length = 20

Diameter	Cost 2013$
150	$25,000
200	$26,000
250	$26,000
300	$32,000
350	$39,000
400	$174,000
450	$186,000
500	$205,000
600	$245,000
750	$312,000
900	$345,000
1050	$423,000
1200	$507,000

For Regional Roads, Rail and Hydro Cc
Length= 60

Diameter	Cost 2013$
150	$69,000
200	$70,000
250	$70,000
300	$76,000
350	$83,000
400	$382,000
450	$410,000
500	$443,000
600	$514,000
750	$626,000
900	$705,000
1050	$828,000
1200	$958,000

For Freeways, Major Creek Crossings
Length= 150

Diameter	Cost 2013$
150	$168,000
200	$169,000
250	$169,000
300	$175,000
350	$182,000
400	$851,000
450	$913,000
500	$980,000
600	$1,120,000
750	$1,333,000
900	$1,514,000
1050	$1,740,000
1200	$1,972,000

Valve Costs For Forcemain
Inflation 0%

Diameter (mm)	Cost 2012$	Cost 2013$
150	$1,445	$1,445
200	$1,779	$1,779
250	$1,996	$1,996
300	$5,199	$5,199
350	$8,403	$8,403
400	$34,907	$34,907
450	$37,319	$37,319
500	$42,607	$42,607
600	$55,440	$55,440
750	$77,154	$77,154
900	$82,339	$82,339
1050	$110,161	$110,161
1200	$140,859	$140,859

Data from Peel Final Linear Unit Costs July 2011

BRES SERVICING COSTS - WATER SERVICING STRATEGIES

Option 1 - North of Columbia Way

Water
OPT 1 - STRAT 1 **PREF (Tunnel on B.A.R. w/ E.T.)** — Supply from Tullamore Z6 PS via Coleraine & BAR (OPEN CUT), new BPS to service Option 1, floating storage provided by new E.T. in Option 1

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z6 Feedermain, from ex. 1050 mm at Coleraine-King to Z6A BPS	WM	400	mm	$ per m	1,038	$ 1,173,978	$ 1,173,978	$ -	$ 171,006	$ 173,000	$ 2,691,962	$ 269,196	$ 2,961,158	$ 59,223	$ -	$ 1,846,403	$ 3,020,381	$ 1,057,133	$ 4,150,000	1 minor creek,100% constr. conting. due to narrow road along Chickadee
2	Z6A BPS, at King & Coleraine (greenfield)	PS	79.0	L/s	$ per L/s	79.03	$ 3,793,440	$ -	$ -	$ -	$ -	$ 3,793,440	$ 379,344	$ 4,172,784	$ 83,456	$ 173,750	$ 636,550	$ 4,429,990	$ 1,550,496	$ 6,080,000	25% uplift for property proximity to Coleraine Dr.
3	Z6A Feedermain on BAR, from Z6A BPS to E.T. in Option 1	WM	400	mm	$ per m	4,360	$ 4,931,160	$ 1,232,790	$ -	$ 547,219	$ 5,972,273	$ 12,683,442	$ 6,341,721	$ 19,025,162	$ 380,503	$ -	$ 14,474,506	$ 19,405,666	$ 6,791,983	$ 26,630,000	2 minor creeks, 1080m trenchless @ 400mm diameter on BAR
4	E.T. for Option 1 (TWL = 315m)	ET	5.1	ML	$ per ML	5.1	$ 5,100,000	$ -	$ -	$ -	$ -	$ 5,100,000	$ 510,000	$ 5,610,000	$ 112,200	$ 521,250	$ 1,143,450	$ 6,243,450	$ 2,185,208	$ 8,570,000	50% uplift for property proximity to Hwy 50
5	Z6A Feedermain, from E.T. to distribution (south & west)	WM	400	mm	$ per m	1,113	$ 1,258,803	$ -	$ -	$ 171,006	$ 381,000	$ 1,810,809	$ 181,081	$ 1,991,890	$ 39,838	$ -	$ 772,925	$ 2,031,728	$ 711,105	$ 2,790,000	1 RR crossing (Hwy 50)
	Sub-Total Water Option 1 - Strategy 1					**6,511**	**$ 16,257,381**	**$ 2,406,768**	**$ -**	**$ 889,230**	**$ 6,526,273**	**$ 26,079,652**	**$ 7,681,342**	**$ 33,760,994**	**$ 675,220**	**$ 695,000**	**$ 18,873,833**	**$ 35,131,214**	**$ 12,295,925**	**$ 48,220,000**	

Water
OPT 1 - STRAT 1 (Open cut on B.A.R. w/ E.T.) — Supply from Tullamore Z6 PS via Coleraine & BAR (TUNNELING), new BPS to service Option 1, floating storage provided by new E.T. in Option 1

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z6 Feedermain, from ex. 1050 mm at Coleraine-King to Z6A BPS	WM	400	mm	$ per m	1,038	$ 1,173,978	$ 1,173,978	$ -	$ 171,006	$ 173,000	$ 2,691,962	$ 269,196	$ 2,961,158	$ 59,223	$ -	$ 1,846,403	$ 3,020,381	$ 1,057,133	$ 4,150,000	1 minor creek,100% constr. conting. due to narrow road along Chickadee
2	Z6A BPS, at King & Coleraine (greenfield)	PS	79.0	L/s	$ per L/s	79.03	$ 3,793,440	$ -	$ -	$ -	$ -	$ 3,793,440	$ 379,344	$ 4,172,784	$ 83,456	$ 173,750	$ 636,550	$ 4,429,990	$ 1,550,496	$ 6,080,000	25% uplift for property proximity to Coleraine Dr.
3	Z6A Feedermain on BAR, from Z6A BPS to E.T. in Option 1	WM	400	mm	$ per m	4,360	$ 4,931,160	$ 1,232,790	$ -	$ 547,219	$ 1,542,000	$ 8,253,169	$ 4,126,584	$ 12,379,753	$ 247,595	$ -	$ 7,696,188	$ 12,627,348	$ 4,419,572	$ 17,330,000	4 minor creeks, 1 major creek (open cut @400mm on BAR)
4	E.T. for Option 1 (TWL = 315m)	ET	5.1	ML	$ per ML	5.1	$ 5,100,000	$ -	$ -	$ -	$ -	$ 5,100,000	$ 510,000	$ 5,610,000	$ 112,200	$ 521,250	$ 1,143,450	$ 6,243,450	$ 2,185,208	$ 8,570,000	50% uplift for property proximity to Hwy 50
5	Z6A Feedermain, from E.T. to distribution (south & west)	WM	400	mm	$ per m	1,113	$ 1,258,803	$ -	$ -	$ 171,006	$ 381,000	$ 1,810,809	$ 181,081	$ 1,991,890	$ 39,838	$ -	$ 772,925	$ 2,031,728	$ 711,105	$ 2,790,000	1 RR crossing (Hwy 50)
	Sub-Total Water Option 1 - Strategy 1					**6,511**	**$ 16,257,381**	**$ 2,406,768**	**$ -**	**$ 889,230**	**$ 2,096,000**	**$ 21,649,379**	**$ 5,466,205**	**$ 27,115,585**	**$ 542,312**	**$ 695,000**	**$ 12,095,515**	**$ 28,352,896**	**$ 9,923,514**	**$ 38,920,000**	

Water
OPT 1 - STRAT 2 (via Innis Lake, no E.T.) — Supply from Tullamore Z5 PS through Innis Lake-King, through new BPS (Sandhill), pumped storage provided by in-ground Z5 Res (Sandhill)

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z5 Feedermain on Innis Lake, from Tullamore Z5 PS to Z5 Res Sandhill	WM	400	mm	$ per m	6,810	$ 7,702,110	$ -	$ -	$ 820,828	$ 346,000	$ 8,868,938	$ 886,894	$ 9,755,832	$ 195,117	$ -	$ 2,248,838	$ 9,950,948	$ 3,482,832	$ 13,660,000	2 minor creeks
2	Z5 In-ground reservoir at Sandhill	RES	7.0	ML	$ per ML	7.0	$ 7,000,000	$ -	$ -	$ -	$ -	$ 7,000,000	$ 700,000	$ 7,700,000	$ 154,000	$ 834,000	$ 1,688,000	$ 8,688,000	$ 3,040,800	$ 11,920,000	does not include rock excavation
3	Z6A BPS, at Sandhill (greenfield)	PS	126.2	L/s	$ per L/s	126.2	$ 6,057,600	$ -	$ -	$ -	$ -	$ 6,057,600	$ 605,760	$ 6,663,360	$ 133,267	$ 208,500	$ 947,527	$ 7,005,127	$ 2,451,795	$ 9,620,000	
4	Z6A Feedermain on King St, from Z5 Res Sandhill to BAR	WM	600	mm	$ per m	4,316	$ 6,836,544	$ -	$ -	$ 488,876	$ 3,454,000	$ 10,779,420	$ 1,077,942	$ 11,857,361	$ 237,147	$ -	$ 5,257,965	$ 12,094,509	$ 4,233,078	$ 16,600,000	10 minor creeks, 2 RR crossings (King St & The Gore Rd)
5	Z6A Feedermain on BAR, from King St to Option 1	WM	600	mm	$ per m	3,697	$ 5,856,048	$ 1,464,012	$ -	$ 434,556	$ 7,748,577	$ 15,503,193	$ 7,751,596	$ 23,254,789	$ 465,096	$ -	$ 17,863,837	$ 23,719,885	$ 8,301,960	$ 32,550,000	2 minor creeks, 1080m trenchless @ 600mm diameter on BAR
6	Z6A Feedermain, from E.T. to distribution (south & west)	WM	600	mm	$ per m	1,113	$ 1,762,992	$ -	$ -	$ 162,959	$ 512,000	$ 2,437,951	$ 243,795	$ 2,681,746	$ 53,635	$ -	$ 972,388	$ 2,735,380	$ 957,383	$ 3,760,000	1 RR crossing (Hwy 50)
	Sub-Total Water Option 1 - Strategy 2					**15,936**	**$ 35,215,294**	**$ 1,464,012**	**$ -**	**$ 1,907,218**	**$ 12,060,577**	**$ 50,647,101**	**$ 11,265,987**	**$ 61,913,088**	**$ 1,238,262**	**$ 1,042,500**	**$ 28,978,556**	**$ 64,193,850**	**$ 22,467,847**	**$ 88,110,000**	
												2.052									

Water
OPT 1 - STRAT 3 (via Innis Lake, w/ E.T.) — Supply from Tullamore Z5 PS through Innis Lake-King, through new BPS (Sandhill), in-ground Z5 Res (Sandhill), floating storage provided by new E.T. in Option 1

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z5 Feedermain on Innis Lake, from Tullamore Z5 PS to Z5 Res Sandhill	WM	400	mm	$ per m	6,810	$ 7,702,110	$ -	$ -	$ 820,828	$ 346,000	$ 8,868,938	$ 886,894	$ 9,755,832	$ 195,117	$ -	$ 2,248,838	$ 9,950,948	$ 3,482,832	$ 13,660,000	2 minor creeks
2	Z5 In-ground reservoir at Sandhill	RES	7.0	ML	$ per ML	7.0	$ 7,000,000	$ -	$ -	$ -	$ -	$ 7,000,000	$ 700,000	$ 7,700,000	$ 154,000	$ 834,000	$ 1,688,000	$ 8,688,000	$ 3,040,800	$ 11,920,000	does not include rock excavation
3	Z6A BPS, at Sandhill (greenfield)	PS	79.0	L/s	$ per L/s	79.03	$ 3,793,440	$ -	$ -	$ -	$ -	$ 3,793,440	$ 379,344	$ 4,172,784	$ 83,456	$ 208,500	$ 947,527	$ 7,005,127	$ 2,451,795	$ 9,620,000	
4	Z6A Feedermain on King St, from Z5 Res Sandhill to BAR	WM	400	mm	$ per m	4,316	$ 4,881,396	$ -	$ -	$ 547,219	$ 2,492,000	$ 7,920,615	$ 792,061	$ 8,712,676	$ 174,254	$ -	$ 4,005,534	$ 8,886,930	$ 3,110,425	$ 12,200,000	10 minor creeks, 2 RR crossings (King St & The Gore Rd)
5	Z6A Feedermain on BAR, from King St to E.T. in Option 1	WM	400	mm	$ per m	4,360	$ 4,931,160	$ 1,232,790	$ -	$ 547,219	$ 5,972,273	$ 12,683,442	$ 6,341,721	$ 19,025,162	$ 380,503	$ -	$ 14,474,506	$ 19,405,666	$ 6,791,983	$ 26,630,000	2 minor creeks, 1080m trenchless @ 400mm diameter on BAR
6	E.T. for Option 1 (TWL = 315m)	ET	5.1	ML	$ per ML	5.1	$ 5,100,000	$ -	$ -	$ -	$ -	$ 5,100,000	$ 510,000	$ 5,610,000	$ 112,200	$ 521,250	$ 1,143,450	$ 6,243,450	$ 2,185,208	$ 8,570,000	
7	Z6A Feedermain, from E.T. to distribution (south & west)	WM	400	mm	$ per m	1,113	$ 1,258,803	$ -	$ -	$ 171,006	$ 381,000	$ 1,810,809	$ 181,081	$ 1,991,890	$ 39,838	$ -	$ 772,925	$ 2,031,728	$ 711,105	$ 2,790,000	1 RR crossing (Hwy 50)
	Sub-Total Water Option 1 - Strategy 3					**16,599**	**$ 34,666,909**	**$ 1,232,790**	**$ -**	**$ 2,086,271**	**$ 9,191,273**	**$ 47,177,243**	**$ 9,791,101**	**$ 56,968,344**	**$ 1,139,367**	**$ 1,563,750**	**$ 25,004,552**	**$ 59,671,461**	**$ 20,885,011**	**$ 81,900,000**	

Option 3 - North Hill West

Water
OPT 3 - STRAT 1 **PREF (King-Gore WM, w/ E.T.)** — Supply from Tullamore Z6 PS through Coleraine to new Zone 7 BPS, floating storage provided by new Z7 E.T. outside of Option 3

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z6 Feedermain, from ex. 1050 mm at Coleraine-King, east to Future Z7 BPS	WM	400	mm	$ per m	1,038	$ 1,173,978	$ 1,173,978	$ -	$ 171,006	$ 173,000	$ 2,691,962	$ 269,196	$ 2,961,158	$ 59,223	$ -	$ 1,846,403	$ 3,020,381	$ 1,057,133	$ 4,150,000	1 minor creek, 100% constr. uplift due to narrow rd along Chickadee & Gl
2	Z7 BPS, at King & Coleraine (greenfield)	PS	79.0	L/s	$ per L/s	79.03	$ 3,793,440	$ -	$ -	$ -	$ -	$ 3,793,440	$ 379,344	$ 4,172,784	$ 83,456	$ 173,750	$ 636,550	$ 4,429,990	$ 1,550,496	$ 6,080,000	25% uplift for property proximity to Coleraine Dr.
3	Z7 Feedermain on King/Gore, from Z7 BPS to E.T. outside Option 3	WM	400	mm	$ per m	5,176	$ 5,854,056	$ -	$ -	$ 649,822	$ 1,800,000	$ 8,303,878	$ 830,388	$ 9,134,266	$ 182,685	$ 537,096	$ 3,999,991	$ 9,854,047	$ 3,448,917	$ 13,520,000	6 minor creeks, 2 RR crossings (King St & The Gore Rd)
4	E.T. for Option 3 (TWL = 327.7m)	ET	5.1	ML	$ per ML	5.1	$ 5,100,000	$ 510,000	$ -	$ -	$ -	$ 5,610,000	$ 561,000	$ 6,171,000	$ 123,420	$ 347,500	$ 1,541,920	$ 6,641,920	$ 2,324,672	$ 9,120,000	10% constr. uplift due to taller pedestal
5	Z7 Feedermain, from E.T. to distribution	WM	400	mm	$ per m	1,570	$ 1,775,670	$ -	$ -	$ 239,408	$ 381,000	$ 2,396,078	$ 239,608	$ 2,635,686	$ 52,714	$ -	$ 912,730	$ 2,688,400	$ 940,940	$ 3,690,000	1 RR crossing (The Gore Rd)
	Sub-Total Water Option 3 - Strategy 1					**7,784**	**$ 17,697,144**	**$ 1,683,978**	**$ -**	**$ 1,060,236**	**$ 2,354,000**	**$ 22,795,358**	**$ 2,279,536**	**$ 25,074,894**	**$ 501,498**	**$ 1,058,346**	**$ 8,937,594**	**$ 26,634,738**	**$ 9,322,158**	**$ 36,560,000**	

Water
OPT 3 - STRAT 2 (via Innis-Lake, no E.T.) — Supply from Tullamore Z5 PS through Innis Lake-King, through new BPS (Sandhill), pumped storage provided by in-ground Z5 Res (Sandhill)

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z5 Feedermain on Innis Lake, from Tullamore Z5 PS to Z5 Res Sandhill	WM	600	mm	$ per m	6,810	$ 10,787,040	$ -	$ -	$ 706,154	$ 486,000	$ 11,979,194	$ 1,197,919	$ 13,177,113	$ 263,542	$ -	$ 2,653,615	$ 13,440,655	$ 4,704,229	$ 18,450,000	2 minor creeks
2	Z5 In-ground reservoir at Sandhill	RES	7.0	ML	$ per ML	7.0	$ 7,000,000	$ -	$ -	$ -	$ -	$ 7,000,000	$ 700,000	$ 7,700,000	$ 154,000	$ 556,000	$ 1,410,000	$ 8,410,000	$ 2,943,500	$ 11,540,000	does not include rock excavation
3	Z7 BPS, at Sandhill (greenfield)	PS	126.2	L/s	$ per L/s	126.2	$ 6,057,600	$ -	$ -	$ -	$ -	$ 6,057,600	$ 605,760	$ 6,663,360	$ 133,267	$ 139,000	$ 878,027	$ 6,935,627	$ 2,427,470	$ 9,520,000	
4	Z7 Feedermain on King/Gore, from Z7 BPS to Option 3	WM	600	mm	$ per m	3,266	$ 5,173,344	$ -	$ -	$ 380,237	$ 2,239,000	$ 7,792,581	$ 779,258	$ 8,571,839	$ 171,437	$ -	$ 3,569,931	$ 8,743,275	$ 3,060,146	$ 12,000,000	5 minor creeks, 2 RR crossings (King St & The Gore Rd)
	Sub-Total Water Option 3 - Strategy 2					**10,076**	**$ 29,017,984**	**$ -**	**$ -**	**$ 1,086,390**	**$ 2,725,000**	**$ 32,829,374**	**$ 3,282,937**	**$ 36,112,311**	**$ 722,246**	**$ 695,000**	**$ 8,511,574**	**$ 37,529,558**	**$ 13,135,345**	**$ 51,510,000**	

Water
OPT 3 - STRAT 3 (via Innis-Lake, w/ E.T.) — Supply from Tullamore Z5 PS through Innis Lake-King, through new BPS (Sandhill), in-ground Z5 Res (Sandhill), floating storage provided by new E.T. Option 3

Project #	Project Description	Type	Size	Unit	Unit	Length (m) or Capacity (L/s or ML)	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	Valves ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($2013)	Engineering / Contingency ($)	Total Estimated Cost (2013$)	Comments
1	Z5 Feedermain on Innis Lake, from Tullamore Z5 PS to Z5 Res Sandhill	WM	600	mm	$ per m	6,810	$ 10,787,040	$ -	$ -	$ 706,154	$ 486,000	$ 11,979,194	$ 1,197,919	$ 13,177,113	$ 263,542	$ -	$ 2,653,615	$ 13,440,655	$ 4,704,229	$ 18,450,000	2 minor creeks
2	Z5 In-ground reservoir at Sandhill	RES	7.0	ML	$ per ML	7.0	$ 7,000,000	$ -	$ -	$ -	$ -	$ 7,000,000	$ 700,000	$ 7,700,000	$ 154,000	$ 556,000	$ 1,410,000	$ 8,410,000	$ 2,943,500	$ 11,540,000	does not include rock excavation
3	Z7 BPS, at Sandhill (greenfield)	PS	79.0	L/s	$ per L/s	79.03	$ 3,793,440	$ -	$ -	$ -	$ -	$ 3,793,440	$ 379,344	$ 4,172,784	$ 83,456	$ 139,000	$ 601,800	$ 4,395,240	$ 1,538,334	$ 6,040,000	
4	Z7 Feedermain on King/Gore, from Z7 BPS to E.T. outside Option 3	WM	400	mm	$ per m	5,176	$ 5,854,056	$ -	$ -	$ 649,822	$ 1,627,000	$ 8,130,878	$ 813,088	$ 8,943,966	$ 178,879	$ 537,096	$ 3,805,885	$ 9,659,941	$ 3,380,979	$ 13,260,000	5 minor creeks, 2 RR crossings (King St & The Gore Rd)
5	Z7 Feedermain on Gore Rd, from E.T. to distribution	WM	400	mm	$ per m	1,570	$ 1,775,670	$ -	$ -	$ 239,408	$ 381,000	$ 2,396,078	$ 239,608	$ 2,635,686	$ 52,714	$ -	$ 912,730	$ 2,688,400	$ 940,940	$ 3,690,000	1 RR crossing (The Gore Rd)
6	E.T. for Option 3 (TWL = 327.7m)	ET	5.1	ML	$ per ML	5.1	$ 5,100,000	$ 510,000	$ -	$ -	$ -	$ 5,610,000	$ 561,000	$ 6,171,000	$ 123,420	$ 347,500	$ 1,541,920	$ 6,641,920	$ 2,324,672	$ 9,120,000	10% constr. uplift due to taller pedestal
	Sub-Total Water Option 3 - Strategy 3					**13,556**	**$ 34,310,206**	**$ 510,000**	**$ -**	**$ 1,595,384**	**$ 2,494,000**	**$ 38,909,590**	**$ 3,890,959**	**$ 42,800,549**	**$ 856,011**	**$ 1,579,596**	**$ 10,925,950**	**$ 45,236,156**	**$ 15,832,655**	**$ 62,100,000**	

1. All costs expressed in 2013$ dollars.
2. Costs do not include internal servicing.
3. Costs do not include DC level trunk infrastructure.

BRES SERVICING COSTS - WASTEWATER SERVICING STRATEGIES

Option 1 - North of Columbia Way

Wastewater

OPT 1 - STRAT 1 (twin ex. Bolton FM) — **Convey flows through urban core to Bolton SPS, upgrade Bolton SPS, twin existing FM, twin downstream sewer to Queensgate & Landsbridge St**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	Twinning of local collection sewers through North Hill (Alt A)	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	2454	841	$ 3,816,455	$ 1,908,228	$ 2,862,342	3	$ 459,000	1	$ 377,000	0	$ -	110	$ 614,711	$ 1,450,711	$ 10,037,736	$ 1,003,774	$ 11,041,510	$ 220,830	$ -	$ 7,445,885	$ 11,262,340	$ 3,941,819	15,451,930	$ 15,460,000
2	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	0	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	290,850	$ 300,000
3	Bolton SPS upgrade	SPS-UPG	166	L/s	$ 48,000	$ -	$ per L/s	166		$ 7,972,800	$ -	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 7,972,800	$ 797,280	$ 8,770,080	$ 175,402	$ -	$ 972,682	$ 8,945,482	$ 3,130,919	12,273,201	$ 12,280,000
4	Twinning of ex. Bolton SPS forcemain from Bolton SPS	FM-UPG	400	mm	$ 1,072	$ -	$ per m	975	-	$ 1,045,276	$ -	$ 783,957	0	$ -	0	$ -	0	$ -	120	$ 625,141	$ 625,141	$ 2,454,374	$ 245,437	$ 2,699,812	$ 53,996	$ -	$ 1,708,532	$ 2,753,808	$ 963,833	3,778,224	$ 3,780,000
5	Twinning of downstream trunk sewer, from 150m north of Fountainbridge Dr to Queensgate Blvd & Landsbridge	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	416	579	$ 1,691,667	$ -	$ 845,834	0	$ -	0	$ -	0	$ -	100	$ 558,829	$ 558,829	$ 3,096,330	$ 309,633	$ 3,405,963	$ 68,119	$ -	$ 1,782,415	$ 3,474,082	$ 1,215,929	4,766,441	$ 4,770,000
6	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	0	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	876,156	$ 880,000
	Sub-Total Wastewater Option 1 - Strategy 1							**4,492**	**1,420**	**$ 14,930,310**	**$ 2,161,188**	**$ 4,593,160**	**3**	**$ 459,000**	**1**	**$ 377,000**	**0**	**$ -**	**330**	**########**	**$ 2,634,682**	**$ 24,319,340**	**$ 2,431,934**	**$ 26,751,274**	**$ 535,025**	**$ -**	**$ 12,355,989**	**$ 27,286,299**	**$ 9,550,205**	**$ 37,436,803**	**$ 37,470,000**

Wastewater

OPT 1 - STRAT 2A **PREF (via Taylorwood)** — **Convey flows through urban core to Bolton SPS, twin existing sewers in North Hill (AltA), upgrade Bolton SPS, install new FM to divert flows east to Albion-Vaughan sewer**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	Twinning of local collection sewers through North Hill (Alt A)	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	2454	841	$ 3,816,455	$ 1,908,228	$ 2,862,342	3	$ 459,000	1	$ 377,000	0	$ -	110	$ 614,711	$ 1,450,711	$ 10,037,736	$ 1,003,774	$ 11,041,510	$ 220,830	$ -	$ 7,445,885	$ 11,262,340	$ 3,941,819	15,451,930	$ 15,460,000
2	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	0	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	290,850	$ 300,000
3	Bolton SPS upgrade	SPS-UPG	166	L/s	$ 48,000	$ -	$ per L/s	166.1	-	$ 7,972,800	$ -	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 7,972,800	$ 797,280	$ 8,770,080	$ 175,402	$ -	$ 972,682	$ 8,945,482	$ 3,130,919	12,273,201	$ 12,280,000
4	New forcemain from Bolton SPS east to Albion-Vaughan Trunk Sewer	FM-NEW	400	mm	$ 1,072	$ -	$ per m	1,242	-	$ 1,331,521	$ 665,760	$ 665,760	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 2,663,041	$ 266,304	$ 2,929,345	$ 58,587	$ -	$ 1,656,412	$ 2,987,932	$ 1,045,776	4,099,443	$ 4,100,000
5	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405.0	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	876,156	$ 880,000
	Sub-Total Wastewater Option 1 - Strategy 2A							**4,343**	**841**	**$ 13,524,888**	**$ 2,826,948**	**$ 3,629,130**	**3**	**$ 459,000**	**1**	**$ 377,000**	**-**	**$ -**	**110**	**$ 614,711**	**$ 1,450,711**	**$ 21,431,677**	**$ 2,143,168**	**$ 23,574,845**	**$ 471,497**	**$ -**	**$ 10,521,454**	**$ 24,046,342**	**$ 8,416,220**	**$ 32,991,581**	**$ 33,020,000**
									3,295																						

Wastewater

OPT 1 - STRAT 2B (via Kingsview) — **Convey flows via new sewer on Hwy 50 to Bolton Heights/Cross Country, twin existing sewers in North Hill (AltB), upgrade Bolton SPS, install new FM to divert flows east to Albion-Vaughan sewer**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on Hwy 50, from Columbia Way to Bolton Heights Dr. & west to Cross Country Blvd	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	806	-	$ 592,292	$ 296,146	$ 444,219	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 1,332,657	$ 133,266	$ 1,465,922	$ 29,318	$ -	$ 902,949	$ 1,495,241	$ 523,334	2,051,470	$ 2,060,000
2	Twin existing sewers east of Hwy 50, from Kingsview/Bolton Heights to Bolton SPS (Alt B)	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	1844	600	$ 2,791,306	$ 1,395,653	$ 2,093,480	0	$ -	2	$ 754,000	0	$ -	110	$ 614,711	$ 1,368,711	$ 7,649,151	$ 764,915	$ 8,414,066	$ 168,281	$ -	$ 5,791,041	$ 8,582,347	$ 3,003,822	11,774,980	$ 11,780,000
3	Bolton SPS upgrade	SPS-UPG	166	L/s	$ 48,000	$ -	$ per L/s	166.1	-	$ 7,972,800	$ -	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 7,972,800	$ 797,280	$ 8,770,080	$ 175,402	$ -	$ 972,682	$ 8,945,482	$ 3,130,919	12,273,201	$ 12,280,000
4	New forcemain from Bolton SPS east to Albion-Vaughan Trunk Sewer	FM-NEW	400	mm	$ 1,072	$ -	$ per m	1,242	-	$ 1,331,521	$ 665,760	$ 665,760	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 2,663,041	$ 266,304	$ 2,929,345	$ 58,587	$ -	$ 1,656,412	$ 2,987,932	$ 1,045,776	4,099,443	$ 4,100,000
5	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405.0	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	876,156	$ 880,000
	Sub-Total Wastewater Option 1 - Strategy 2B							**4,297**	**600**	**$ 12,940,879**	**$ 2,610,520**	**$ 3,266,699**	**-**	**$ -**	**2**	**$ 754,000**	**-**	**$ -**	**110**	**$ 614,711**	**$ 1,368,711**	**$ 20,186,809**	**$ 2,018,681**	**$ 22,205,490**	**$ 444,110**	**$ -**	**$ 9,708,721**	**$ 22,649,600**	**$ 7,927,360**	**$ 31,075,251**	**$ 31,100,000**

Wastewater

OPT 1 - STRAT 2C (via Cross Country) — **Convey flows via new sewer on Hwy 50 to Bolton Heights/Kingsview, twin existing sewers in North Hill (AltC), upgrade Bolton SPS, install new FM to divert flows east to Albion-Vaughan sewer**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on Hwy 50, from Columbia Way to Bolton Heights Dr.	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	806	-	$ 592,292	$ 296,146	$ 444,219	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 1,332,657	$ 133,266	$ 1,465,922	$ 29,318	$ -	$ 902,949	$ 1,495,241	$ 523,334	2,051,470	$ 2,060,000
2	Twin existing sewers west of Hwy 50, from Cross Country Blvd to Bolton SPS (Alt C)	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	1299	1186	$ 3,793,536	$ 1,896,768	$ 2,845,152	0	$ -	1	$ 377,000	0	$ -	110	$ 614,711	$ 991,711	$ 9,527,167	$ 952,717	$ 10,479,884	$ 209,598	$ -	$ 6,895,946	$ 10,689,481	$ 3,741,319	14,665,969	$ 14,670,000
3	Bolton SPS upgrade	SPS-UPG	166	L/s	$ 48,000	$ -	$ per L/s	166.1	-	$ 7,972,800	$ -	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 7,972,800	$ 797,280	$ 8,770,080	$ 175,402	$ -	$ 972,682	$ 8,945,482	$ 3,130,919	12,273,201	$ 12,280,000
4	New forcemain from Bolton SPS east to Albion-Vaughan Trunk Sewer	FM-NEW	400	mm	$ 1,072	$ -	$ per m	1,242	-	$ 1,331,521	$ 665,760	$ 665,760	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 2,663,041	$ 266,304	$ 2,929,345	$ 58,587	$ -	$ 1,656,412	$ 2,987,932	$ 1,045,776	4,099,443	$ 4,100,000
5	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405.0	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	876,156	$ 880,000
	Sub-Total Wastewater Option 1 - Strategy 2C							**3,752**	**1,186**	**$ 13,943,108**	**$ 3,111,634**	**$ 4,018,371**	**-**	**$ -**	**1**	**$ 377,000**	**-**	**$ -**	**110**	**$ 614,711**	**$ 991,711**	**$ 22,064,825**	**$ 2,206,483**	**$ 24,271,308**	**$ 485,426**	**$ -**	**$ 10,813,626**	**$ 24,756,734**	**$ 8,664,857**	**$ 33,966,239**	**$ 33,990,000**

Wastewater

OPT 1 - STRAT 3 (bypasses urban area) — **Convey flows along Columbia Way to connect to future gravity sewer on Albion/Vaughan Rd**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer from Option 1 to SPS on Columbia Way west of Albion-Vaughan	WWM-NEW	525	mm	$ 780	$ 2,454	$ per m	920	920	$ 2,973,439	$ 1,486,720	$ 743,360	1	$ 165,000	1	$ 411,000	0	$ -	110	$ 677,209	$ 1,253,209	$ 6,456,728	$ 645,673	$ 7,102,401	$ 142,048	$ -	$ 4,271,010	$ 7,244,449	$ 2,535,557	9,939,384	$ 9,940,000
2	New SPS#1 to pump flows across river valley (greenfield)	SPS-NEW	166	L/s	$ 48,000	$ -	$ per L/s	166.1		$ 7,972,800	$ -	$ -		$ -		$ -		$ -		$ -	$ -	$ 7,972,800	$ 797,280	$ 8,770,080	$ 175,402	$ 278,000	$ 1,250,682	$ 9,223,482	$ 3,228,219	12,654,617	$ 12,660,000
3	New forcemain from SPS #1 to future Albion/Vaughan Rd Trunk Sewer	FM-NEW	400	mm	$ 1,072	$ -	$ per m	760	760	$ 814,779	$ 407,390	$ -	1	$ 174,000		$ -		$ -		$ -	$ 174,000	$ 1,396,169	$ 139,617	$ 1,535,786	$ 30,716	$ -	$ 751,722	$ 1,566,501	$ 548,275	2,149,240	$ 2,150,000
4	New gravity sewer on Albion Vaughan Rd to south of Old King Rd	WWM-NEW	525	mm	$ 780	$ 2,454	$ per m	685	685	$ 2,215,123	$ 1,107,562	$ -	2	$ 330,000	0	$ -	0	$ -	110	$ 677,209	$ 1,007,209	$ 4,329,894	$ 432,989	$ 4,762,884	$ 95,258	$ -	$ 2,643,018	$ 4,858,141	$ 1,700,349	6,665,370	$ 6,670,000
5	New SPS#2 to pump flows across river valley (greenfield)	SPS-NEW	166	L/s	$ 48,000	$ 48,000	$ per L/s	166.1		$ 7,972,800	$ -	$ -		$ -		$ -		$ -		$ -	$ -	$ 7,972,800	$ 797,280	$ 8,770,080	$ 175,402	$ 278,000	$ 1,250,682	$ 9,223,482	$ 3,228,219	12,654,617	$ 12,660,000
6	New forcemain from SPS #2 to future Albion/Vaughan Rd Trunk Sewer	FM-NEW	400	mm	$ 1,072	$ -	$ per m	105	105	$ 112,568	$ 56,284	$ -	1	$ 174,000	0	$ -	0	$ -	0	$ -	$ 174,000	$ 342,852	$ 34,285	$ 377,137	$ 7,543	$ -	$ 272,112	$ 384,680	$ 134,638	527,781	$ 530,000
7	New gravity sewer on Albion Vaughan Rd, from south of Old King Rd to future Albion/Vaughan Trunk Sewer	WWM-NEW	525	mm	$ 780	$ 2,454	$ per m	303	303	$ 978,211	$ 489,106	$ -		$ -		$ -		$ -		$ -	$ -	$ 1,467,317	$ 146,732	$ 1,614,049	$ 32,281	$ -	$ 668,118	$ 1,646,330	$ 576,215	2,258,765	$ 2,260,000
8	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	0	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	290,850	$ 300,000
9	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405.0	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	876,156	$ 880,000
	Sub-Total Wastewater Option 1 - Strategy 3							**3,419**	**2,772**	**$ 23,443,833**	**$ 3,800,021**	**$ 844,388**	**5**	**$ 843,000**	**1**	**$ 411,000**	**0**	**$ -**	**220**	**########**	**$ 2,608,418**	**$ 30,696,660**	**$ 3,069,666**	**$ 33,766,326**	**$ 675,327**	**$ 556,000**	**$ 11,553,820**	**$ 34,997,653**	**$ 12,249,179**	**$ 48,016,780**	**$ 48,050,000**

Option 3 - North Hill West

Wastewater

OPT 3 - STRAT 1 (via easement) — **Convey flows southeast via new sewer along future easement from King St W to Coleraine Dr. Twin Coleraine Trunk Sewer, from south of rail to just north of George Bolton Pkwy.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on future easement, from Option 3 to ex. Coleraine Trunk Sewer south of rail	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	1,941	-	$ 1,426,350	$ 713,175	$ -	1	$ 153,000	2	$ 754,000	0	$ -	0	$ -	$ 907,000	$ 3,046,526	$ 304,653	$ 3,351,178	$ 67,024	$ 1,348,995	$ 3,340,846	$ 4,767,197	$ 1,668,519	$ 6,540,594	$ 6,550,000
2	Twinning of Coleraine Trunk Sewer, from south of rail to 700 m north of George Bolton Pkwy	WWM-UPG	525	mm	$ 780	$ 2,454	$ per m	1385	1,240	$ 4,122,969	$ -	$ 824,594	1	$ 165,000	0	$ -	0	$ -	0	$ -	$ 165,000	$ 5,112,563	$ 511,256	$ 5,623,819	$ 112,476	$ -	$ 1,613,326	$ 5,736,295	$ 2,007,703	$ 7,870,197	$ 7,880,000
3	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	$ 876,156	$ 880,000
4	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	0	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 1							**3,973**	**1,240**	**$ 5,953,431**	**$ 966,135**	**$ 925,622**	**2**	**$ 318,000**	**2**	**$ 754,000**	**0**	**$ -**	**0**	**$ -**	**$ 1,072,000**	**$ 8,917,188**	**$ 891,719**	**$ 9,808,907**	**$ 196,178**	**$ 1,348,995**	**$ 5,400,649**	**$ 11,354,080**	**$ 3,973,928**	**$ 15,577,798**	**$ 15,610,000**

Wastewater

OPT 3 - STRAT 2 (King-Coleraine, twin @450, ex. prof.) — **Convey flows via new sewer along King/Coleraine. Twin Coleraine Trunk Sewer (450mm) south of rail line, from south of rail to just north of George Bolton Pkwy.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on King & Coleraine, from Option 3 to ex. Coleraine Trunk Sewer south of rail	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	1,498	1,126	$ 3,796,148	$ 949,037	$ -	4	$ 612,000	2	$ 754,000	0	$ -	0	$ -	$ 1,366,000	$ 6,111,185	$ 611,118	$ 6,722,303	$ 134,446	$ -	$ 3,060,602	$ 6,856,750	$ 2,399,862	$ 9,407,460	$ 9,410,000
2	Twinning of Coleraine Trunk Sewer, from south of rail to 700 m north of George Bolton Pkwy	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	712	2,196	$ 5,779,842	$ -	$ 1,155,968	1	$ 153,000	1	$ 377,000	0	$ -	0	$ -	$ 530,000	$ 7,465,810	$ 746,581	$ 8,212,392	$ 164,248	$ -	$ 2,596,797	$ 8,376,639	$ 2,931,824	$ 11,492,749	$ 11,500,000
3	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	-	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 2							**2,452**	**3,322**	**$ 9,727,142**	**$ 949,037**	**$ 1,193,756**	**5**	**$ 765,000**	**3**	**########**	**0**	**$ -**	**0**	**$ -**	**$ 1,896,000**	**$ 13,765,935**	**$ 1,376,593**	**$ 15,142,528**	**$ 302,851**	**$ -**	**$ 5,718,237**	**$ 15,445,379**	**$ 5,405,883**	**$ 21,191,060**	**$ 21,210,000**

Wastewater

OPT 3 - STRAT 2 **PREF (King-Coleraine twin @525, new prof.)** — **Convey flows via new sewer along King/Coleraine. Twin Coleraine Trunk Sewer (525mm), from south of rail to just north of George Bolton Pkwy.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on King & Coleraine, from Option 3 to ex. Coleraine Trunk Sewer	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	1,498	1,126	$ 3,796,148	$ 949,037	$ -	4	$ 612,000	2	$ 754,000	0	$ -	0	$ -	$ 1,366,000	$ 6,111,185	$ 611,118	$ 6,722,303	$ 134,446	$ -	$ 3,060,602	$ 6,856,750	$ 2,399,862	9,407,460	$ 9,410,000
2	Twinning of Coleraine Trunk Sewer, from south of rail to 700 m north of George Bolton Pkwy	WWM-UPG	525	mm	$ 780	$ 2,454	$ per m	1644	1,264	$ 4,383,896	$ -	$ 876,779	1	$ 165,000	1	$ 411,000	0	$ -	0	$ -	$ 576,000	$ 5,836,675	$ 583,667	$ 6,420,342	$ 128,407	$ -	$ 2,164,853	$ 6,548,749	$ 2,292,062	8,984,884	$ 8,990,000
3	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	-	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 2 (Coleraine @ 450mm)							**3,384**	**2,390**	**$ 8,331,195**	**$ 949,037**	**$ 914,567**	**5**	**$ 777,000**	**3**	**########**	**0**	**$ -**	**0**	**$ -**	**$ 1,942,000**	**$ 12,136,799**	**$ 1,213,680**	**$ 13,350,479**	**$ 267,010**	**$ -**	**$ 5,286,294**	**$ 13,617,489**	**$ 4,766,121**	**$ 18,683,195**	**$ 18,700,000**

Wastewater

OPT 3 - STRAT 3A (via Cedargrove) — **Convey flows via twinning of existing sewers in the North Hill West system (via Cedargrove). Twin Coleraine Trunk Sewer from Harvestmoon Dr. to north of George Bolton Pkwy.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New sewer on King St, connect on Tarquini	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	557	88	$ 619,961	$ 309,981	$ 464,971	0	$ -	2	$ 754,000	0	$ -	0	$ -	$ 754,000	$ 2,148,913	$ 214,891	$ 2,363,804	$ 47,276	$ -	$ 1,791,119	$ 2,411,081	$ 843,878	3,308,003	$ 3,310,000
2	Twin sewers in North Hill West (Alt A) via Cedargrove to railway connection on Coleraine	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	595	1,162	$ 3,218,750	$ 1,609,375	$ 2,414,062	4	$ 612,000	0	$ -	0	$ -	0	$ -	$ 612,000	$ 7,854,187	$ 785,419	$ 8,639,605	$ 172,792	$ -	$ 5,593,648	$ 8,812,397	$ 3,084,339	12,090,609	$ 12,100,000
3	Twinning of Coleraine Trunk Sewer, from Harvestmoon Dr to 700 m north of George Bolton Pkwy	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	1,385	1,523	$ 4,663,420	$ -	$ 932,684	1	$ 153,000	1	$ 377,000	0	$ -	0	$ -	$ 530,000	$ 6,126,103	$ 612,610	$ 6,738,714	$ 134,774	$ -	$ 2,210,069	$ 6,873,488	$ 2,405,721	9,440,426	$ 9,440,000
4	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	$ 876,156	$ 880,000
5	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	-	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 3A							**3,184**	**2,773**	**$ 8,906,242**	**$ 2,172,316**	**$ 3,912,745**	**5**	**$ 765,000**	**3**	**########**	**0**	**$ -**	**0**	**$ -**	**$ 1,896,000**	**$ 16,887,303**	**$ 1,688,730**	**$ 18,576,033**	**$ 371,521**	**$ -**	**$ 10,041,312**	**$ 18,947,554**	**$ 6,631,644**	**$ 25,996,044**	**$ 26,030,000**

Wastewater

OPT 3 - STRAT 3B (via Harvest Moon) — **Convey flows via twinning of existing sewers in the North Hill West system (via Harvestmoon Dr). Twin Coleraine Trunk Sewer from Harvestmoon Dr. to north of George Bolton Pkwy.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New sewer on King St, connect on Tarquini	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	557	88	$ 619,961	$ 309,981	$ 464,971	0	$ -	2	$ 754,000	0	$ -	0	$ -	$ 754,000	$ 2,148,913	$ 214,891	$ 2,363,804	$ 47,276	$ -	$ 1,791,119	$ 2,411,081	$ 843,878	3,308,003	$ 3,310,000
2	Twin sewers in North Hill West (Alt B) via Harvest Moon to railway connection on Coleraine	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	1,651	396	$ 2,161,159	$ 1,080,580	$ 1,620,869	5	$ 765,000	0	$ -	0	$ -	0	$ -	$ 765,000	$ 5,627,608	$ 562,761	$ 6,190,369	$ 123,807	$ -	$ 4,153,017	$ 6,314,176	$ 2,209,962	8,663,050	$ 8,670,000
3	Twinning of Coleraine Trunk Sewer, from Harvest Moon Dr to 700 m north of George Bolton Pkwy	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	1,385	1,523	$ 4,663,420	$ -	$ 932,684	1	$ 153,000	1	$ 377,000	0	$ -	0	$ -	$ 530,000	$ 6,126,103	$ 612,610	$ 6,738,714	$ 134,774	$ -	$ 2,210,069	$ 6,873,488	$ 2,405,721	9,440,426	$ 9,440,000
4	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	$ 876,156	$ 880,000
5	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	-	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 3B							**4,240**	**2,007**	**$ 7,848,652**	**$ 1,643,521**	**$ 3,119,552**	**6**	**$ 918,000**	**3**	**########**	**0**	**$ -**	**0**	**$ -**	**$ 2,049,000**	**$ 14,660,725**	**$ 1,466,072**	**$ 16,126,797**	**$ 322,536**	**$ -**	**$ 8,600,681**	**$ 16,449,333**	**$ 5,757,267**	**$ 22,568,485**	**$ 22,600,000**

Wastewater

OPT 3 - STRAT 4 (Humber Stn-Healey-Coleraine) — ****SCREENED OUT**Convey flows southeast via new sewers along Humber Stnd Rd and Healey Rd. Twin Coleraine Trunk Sewer, from south of rail to just north of George Bolton Pkwy.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on Humber Stn Rd, from King St to Healey Rd.	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	712	-	$ 523,216	$ -	$ -	1	$ 153,000	2	$ 754,000	0	$ -	0	$ -	$ 907,000	$ 1,430,216	$ 143,022	$ 1,573,237	$ 31,465	$ -	$ 1,081,486	$ 1,604,702	$ 561,646	2,201,651	$ 2,210,000
2	New gravity sewer on Healey Rd, from Humber Stn Rd to Coleraine Dr.	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	2,700	2,700	$ 8,447,169	$ 2,111,792	$ -		$ -		$ -		$ -		$ -	$ -	$ 10,558,962	$ 1,055,896	$ 11,614,858	$ 232,297	$ -	$ 3,399,986	$ 11,847,155	$ 4,146,504	16,254,297	$ 16,260,000
3	Twinning of Coleraine Trunk Sewer, Healey Rd to north of George Bolton Pkwy.	WWM-NEW	525	mm	$ 780	$ 2,454	$ per m	1,000	916	$ 3,027,647	$ -	$ 605,529	1	$ 165,000		$ -		$ -		$ -	$ 165,000	$ 3,798,177	$ 379,818	$ 4,177,994	$ 83,560	$ -	$ 1,233,907	$ 4,261,554	$ 1,491,544	5,846,852	$ 5,850,000
4	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	$ 876,156	$ 880,000
5	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	-	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 4							**5,059**	**3,616**	**$ 12,402,144**	**$ 2,364,753**	**$ 706,557**	**2**	**$ 318,000**	**2**	**$ 754,000**	**0**	**$ -**	**0**	**$ -**	**$ 1,072,000**	**$ 16,545,454**	**$ 1,654,545**	**$ 18,199,999**	**$ 364,000**	**$ -**	**$ 6,161,855**	**$ 18,563,999**	**$ 6,497,400**	**$ 25,469,807**	**$ 25,500,000**

Wastewater

OPT 3 - STRAT 5A (via easement-Mayfield) — **Convey flows south via new primary collector along a potential future easement west of Coleraine Dr, to Mayfield Rd and west to future sewer at Clarkway Dr and Mayfield Rd.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New gravity sewer on future easement, from King St east along railway, and south along concession limit	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	2,307	4,055	$ 11,401,873	$ 5,700,937	$ -	3	$ 459,000	1	$ 377,000	0	$ -	0	$ -	$ 836,000	$ 17,938,810	$ 1,793,881	$ 19,732,691	$ 394,654	$ 4,421,590	$ 13,147,062	$ 24,548,935	$ 8,592,127	33,681,139	$ 33,690,000
2	New gravity sewer on Mayfield, from Concession limit to future sewer on Clarkway Dr.	WWM-NEW	525	mm	$ 780	$ 2,454	$ per m	370	459	$ 1,414,868	$ -	$ 353,717	1	$ 165,000	1	$ 411,000	0	$ -	0	$ -	$ 576,000	$ 2,344,585	$ 234,459	$ 2,579,044	$ 51,581	$ -	$ 1,215,756	$ 2,630,624	$ 920,719	3,609,217	$ 3,610,000
3	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	$ 876,156	$ 880,000
4	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	0	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 5A							**3,324**	**4,514**	**$ 13,220,853**	**$ 5,953,897**	**$ 454,745**	**4**	**$ 624,000**	**2**	**$ 788,000**	**0**	**$ -**	**0**	**$ -**	**$ 1,412,000**	**$ 21,041,495**	**$ 2,104,149**	**$ 23,145,644**	**$ 462,913**	**$ 4,421,590**	**$ 14,809,294**	**$ 28,030,147**	**$ 9,810,552**	**$ 38,457,362**	**$ 38,480,000**

Wastewater

OPT 3 - STRAT 5B (via Humber Stn) — **Convey flows south via new primary collector along Humber Stn Rd, from King St to Mayfield Rd, and west along Mayfield Rd to connect to future sewer at Clarkway Dr.**

Project #	Project Description	Type	Size	Unit	Unit Cost ($/m) < 5m, or $/L/s)	Unit Cost ($/m) > 5 m depth	Unit	Length (m) < 5m depth or Capacity (L/s)	Length (m) > 5m depth	Base Cost ($)	Construction Uplift ($)	Urban Uplift ($)	# Creek Crossings	Creek Crossing ($)	# Regional Rd / Rail Crossing	Regional Rd / Rail Crossing ($)	# Major Creek Crossing	Major Creek Crossing ($)	Trenchless Length (m)	Trenchless Cost ($)	Crossings ($)	Construction Sub-Total ($)	Construction Contingency ($)	Construction Total ($)	Geotech / Hydrog Requirements ($)	Property / Easement ($)	Additional Costs ($)	Sub-Total Cost ($)	Eng / Conting ($)	Total Estimated Cost (2013$)	Total Estimated Cost (2013$)
1	New sewer on King St, connect on Tarquini	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	557	88	$ 619,961	$ 309,981	$ 464,971	0	$ -	2	$ 754,000	0	$ -	0	$ -	$ 754,000	$ 2,148,913	$ 214,891	$ 2,363,804	$ 47,276	$ -	$ 1,791,119	$ 2,411,081	$ 843,878	3,308,003	$ 3,310,000
2	Twin sewers in North Hill West (Alt B) via Harvest Moon to railway connection on Coleraine	WWM-NEW	450	mm	$ 735	$ 2,394	$ per m	1,651	396	$ 2,161,159	$ 1,080,580	$ 1,620,869	5	$ 765,000	0	$ -	0	$ -	0	$ -	$ 765,000	$ 5,627,608	$ 562,761	$ 6,190,369	$ 123,807	$ -	$ 4,153,017	$ 6,314,176	$ 2,209,962	8,663,050	$ 8,670,000
3	Twinning of Coleraine Trunk Sewer, from Harvest Moon Dr to 700 m north of George Bolton Pkwy	WWM-UPG	450	mm	$ 735	$ 2,394	$ per m	1,385	1,523	$ 4,663,420	$ -	$ 932,684	1	$ 153,000	1	$ 377,000	0	$ -	0	$ -	$ 530,000	$ 6,126,103	$ 612,610	$ 6,738,714	$ 134,774	$ -	$ 2,210,069	$ 6,873,488	$ 2,405,721	9,440,426	$ 9,440,000
4	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	405	-	$ 252,960	$ 252,960	$ 63,240	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 569,160	$ 56,916	$ 626,076	$ 12,522	$ -	$ 385,638	$ 638,598	$ 223,509	$ 876,156	$ 880,000
5	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 625	$ 2,111	$ per m	242	-	$ 151,152	$ -	$ 37,788	0	$ -	0	$ -	0	$ -	0	$ -	$ -	$ 188,939	$ 18,894	$ 207,833	$ 4,157	$ -	$ 60,838	$ 211,990	$ 74,197	$ 290,850	$ 300,000
	Sub-Total Wastewater Option 3 - Strategy 5B							**4,055**	**2,714**	**$ 9,405,070**	**$ 252,960**	**$ 1,901,220**	**2**	**$ 306,000**	**2**	**$ 754,000**	**0**	**$ -**	**0**	**$ -**	**$ 1,060,000**	**$ 12,619,249**	**$ 1,261,925**	**$ 13,881,174**	**$ 277,623**	**$ 500,000**	**$ 5,253,728**	**$ 14,658,798**	**$ 5,130,579**	**$ 20,111,870**	**$ 20,130,000**

1. All costs expressed in 2013$ dollars.
2. Costs do not include internal servicing.
3. Costs do not include DC level trunk infrastructure.
4. Costs do not include manhole costs for trenchless and/or valve costs for forcemains.

75 International Blvd., Suite 304
Toronto, Ontario M9W 6L9
Phone: 416.703.0667 Fax: 416.703.2501
www.blueplan.ca

Memorandum

Organization: The Town of Caledon	**BluePlan Project No:** C001-0021
Attention: File	**Date:** June 18, 2014
Project: Bolton Residential Expansion Study	
RE: Servicing Evaluation Considerations	

Introduction

This technical memorandum is intended to further enhance the evaluation process presented in the BRES Infrastructure Study Report, including further considerations that factored into the decision making of the preferred growth option (Option 1 vs Option 3).

Objectives

The identification and evaluation of servicing strategies is a critical component of the infrastructure planning process because it will enable a comprehensive review of a reasonable range of alternatives while documenting the process in a transparent manner.

Servicing Evaluation Approach

The BRES Infrastructure Servicing evaluation follows a similar approach as the Municipal Engineers Association (MEA) Class EA process typically used in master planning projects. Principles taken from the overall BRES evaluation criteria evaluation criteria have been integrated within the five-point evaluation, such as:

- making best use of existing infrastructure;
- minimizing the cost of new infrastructure;
- considering operation and maintenance costs to ensure financial sustainability;
- ensuring the long term reliability and security of the water and wastewater systems; and,
- performing financial evaluation including lifecycle costing.

Evaluation Matrices

Each servicing strategy, as it was developed, is considered a complete solution. Detailed evaluation matrices supporting the evaluation of each servicing strategy were developed and are included in the BRES Infrastructure Study.

These matrices describe each servicing strategy and provides a break down into its servicing components as follows:

- Pumping requirements
- Storage requirements
- Length of watermain, sewermain/twinning requirements
- Number and nature of environmental crossings (major creeks, minor creeks, Greenbelt areas)
- Number of Regional Road and/or railway crossings

- Land acquisition requirements for proposed facilities (pumping stations, elevated tanks, easements)
- Visual impacts caused by new facilities
- Transportation impacts (due to construction of infrastructure)
- Permit requirements (TRCA approvals, C.N. Railway)
- Financial cost
- Key issues and constraints

This helped highlight key differences between the strategies as there were lots of commonalities shared between each servicing strategy for each growth option. Where the only difference between some of the servicing strategies was alignment, a separate alignment evaluation was undertaken to present the evaluation in a clear and concise manner.

Key Issues and Considerations

In addition to cost, other key issues and considerations that factored into the decision making process included:

- Opportunity to service future potential growth areas (identified through the BRES process or not)
- Impact of the additional flows on the existing system and extent of upgrade requirements
- Foreseeable construction challenges that could be presented with the various alignments/sites
- Impact to local residents and traffic due to construction

Table 16. Water Servicing Strategies (Option 1) Evaluation Table

OPTION 1	WATER SERVICING STRATEGY DESCRIPTION	PUMPING REQUIREMENTS	STORAGE REQUIREMENTS	FEEDERMAIN / WATERMAIN REQUIREMENTS	ENVIRONMENTAL CROSSINGS	REGIONAL ROAD / RAIL CROSSINGS	LAND ACQUISITION REQUIREMENTS	VISUAL IMPACTS	TRANSPORTATION IMPACTS	PERMIT REQUIREMENTS	FINANCIAL COST	KEY ISSUES / CONSTRAINTS	OVERALL RATING
STRATEGY 1	**Supply from Tullamore Zone 6 Pumping Station, via Coleraine Dr / Chickadee Ln to the new booster pumping station to service Option 1, supply along Coleraine Dr / B.A.R., with floating storage provided by an elevated tank located within the Option 1 lands.**	Zone 6A/7 BPS, Cap=80 L/s	Zone 6A E.T. - TWL @ 315m - Cap = 5.1 ML (potential for shorter pedestal height than Option 3).	400mm, on Coleraine / B.A.R., requires total of **6.11km** of feedermain.	One (1) major creek crossing, Four (4) minor creek crossings. One (1) Greenbelt crossing.	No rail crossings. One (1) Regional Rd crossing (King).	PS ~ 0.50 ha E.T. ~ 1.25 ha Total ~ 1.75 ha	Potential for perceived visual impact caused by elevated tank within service area.	Construction could cause temporary traffic disruption to the following roads: Coleraine Dr (north limit), King St, and the B.A.R.	B.A.R. feedermain will potentially require permitting and approvals from TRCA.	**$38.92M (open-cut)** **$48.22 M (trenchless)**	Ability to augment existing Zone 6 local Northwest area and potentially North Hill. High contingency related to B.A.R. feedermain and Humber River crossing. B.A.R. feedermain will likely require trenchless (~1080m) installation.	**High**
STRATEGY 2	**Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street, supply along King St / B.A.R., with pumped storage provided by in-ground Zone 5 reservoir to service Option 1 lands.**	Zone 6A/7 BPS, Cap=300 L/s	Zone 5 RES - Cap = 7.0 ML (potential for low turnover, which could lead to water quality issues).	**600mm**, on Innis Lake / King / B.A.R., requires total of **15.94km** of feedermain.	One (1) major creek crossing, Fourteen (14) minor creek crossings. Two (2) Greenbelt crossings.	One (1) rail crossing. Two (2) Regional Rd crossings (King, Gore & Hwy 50)	PS ~ 0.50 ha RES ~ 2.00 ha Total ~ 2.50 ha	None.	Construction could cause temporary traffic disruption to the following roads: Innis Lake Rd, King St, and the B.A.R.	B.A.R. feedermain will potentially require permitting and approvals from TRCA.	**$88.11 M**	Leverages opportunity to service future potential west Caledon expansion areas. Pumped storage not considered favourable from a storage and life cycle standpoint.	**Low**
STRATEGY 3	**Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street, supply along King St / B.A.R., with in-ground storage provided by Zone 5 reservoir and floating storage provided by an elevated tank located within the Option 1 lands.**	Zone 6A/7 BPS, Cap=80 L/s	Zone 5 RES - Cap = 7.0 ML Zone 6A E.T. - TWL @ 315m - Cap = 5.1 ML (potential for shorter pedestal height than Option 3).	400mm, on Innis Lake Rd / King St / B.A.R., requires total of **16.60km** of feedermain.	One (1) major creek crossing, Fourteen (14) minor creek crossings. Two (2) Greenbelt crossings.	One (1) rail crossing. Two (2) Regional Rd crossings (King & Gore)	PS ~ 0.50 ha E.T. ~ 1.25 ha RES ~ 2.00 ha Total ~ 3.75 ha	Potential for perceived visual impact caused by elevated tank within service area. If reservoir is partially in-ground, minimal potential for visual impact.	Construction could cause temporary traffic disruption to the following roads: Innis Lake Rd, King St, and the B.A.R.	B.A.R. feedermain will potentially require permitting and approvals from TRCA.	**$81.90 M**	Leverages opportunity to service future potential west Caledon expansion areas.	**Medium**

OPTION 1 - WATER - SUMMARY OF SCORING

STRATEGY 1	Good	Good	Good	Good	Good	Good	Good	Neutral	Neutral	Poor	Overall Good
STRATEGY 2	Good	Neutral	Neutral	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Overall Poor
STRATEGY 3	Good	Neutral	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Overall Poor

Table 19. Wastewater Servicing Strategies (Option 1) Evaluation Table

OPTION 1	DESCRIPTION	PUMPING REQUIREMENTS	SEWERMAIN / TWINNING REQUIREMENTS	ENVIRONMENTAL CROSSINGS	REGIONAL ROAD / RAIL CROSSINGS	LAND ACQUISITION REQUIREMENTS	VISUAL IMPACTS	TRANSPORTATION IMPACTS	PERMIT REQUIREMENTS	FINANCIAL COST	KEY ISSUES / CONSTRAINTS	OVERALL RATING
STRATEGY 1	**Growth flows from the BRES area would be conveyed via twinned sewers in the existing system to the Bolton SPS. A major expansion at the Bolton SPS would be required, in addition to twinning of existing forcemain, and twinning of existing sewers to Queensgate Blvd and Landsbridge St.**	One (1) internal SPS required & major expansion required at Bolton SPS, Cap=100 L/s	3.3 km of sewer twinning (450mm, Taylorwood Ave) in North Hill, 0.98km of forcemain twinning (400mm), 1.0 km of downstream sewer twinning (450mm), 0.24km of local sewer extension (250mm) on Columbia Way **Total 5.43km (sewer & forcemain)**	Three (3) minor creek crossings, and crossing of Humber River north of King St.	No rail crossings. One (1) Regional Rd crossing, >200m trenchless crossing.	None.	Potential for perceived visual impact caused by new local SPS.	Construction could cause temporary traffic disruption to numerous residential roads in the North Hill, Columbia Way, and other local roads such as Bond St, Strawberry Hill Ct, and Fountainbridge Dr.	Sewer twinning across Humber River, north of King St, will require permitting and approvals from TRCA.	**$37.47 M**	Longest sewer twinning route. Twinning of existing forcemain crosses residential area. Upgrades would benefit growth areas north of Columbia Way only.	**Medium**
STRATEGY 2A	**Growth flows from the BRES area would be conveyed via twinned sewers in the existing system (via Taylorwood Ave) to the Bolton SPS. A major expansion at the Bolton SPS would be required, in addition to a new forcemain to convey flow east to the future Albion-Vaughan Trunk Sewer at Nunnville Rd and Bateman Ln.**	One (1) internal SPS required & major expansion required at Bolton SPS, Cap=100 L/s	3.3 km of sewer twinning (450mm, Taylorwood Ave) in North Hill, 1.24km of new forcemain (400mm) on Old King Rd, 0.24km of local sewer extension (250mm) on Columbia Way **Total 4.95km (sewer & forcemain)**	Three (3) minor creek crossings, and crossing of Humber River north of King St.	No rail crossings. One (1) Regional Rd crossing, ~110m trenchless crossing.	None.	Potential for perceived visual impact caused by new local SPS.	Construction could cause temporary traffic disruption to numerous residential roads (Kingsview Dr/Taylorwood Ave) in the North Hill, Columbia Way, Old King Rd, and Nunnville Rd.	Sewer twinning across Humber River, north of King St, will require permitting and approvals from TRCA.	**$33.02 M**	Longest sewer twinning route. Upgrades would benefit growth areas north of Columbia Way only.	**High**
STRATEGY 2B	**Growth flows from the BRES area would be conveyed via a new sewer along Hwy 50 and Bolton Heights Dr, twinning of existing sewers east of Hwy 50 (Kingsview Dr), and twinning of sewers along the Humber River to the Bolton SPS. A major expansion at the Bolton SPS would be required, in addition to a new forcemain to convey flow east to the future Albion-Vaughan Trunk Sewer at Nunnville Rd and Bateman Ln.**	One (1) internal SPS required & major expansion required at Bolton SPS, Cap=100 L/s	0.80km of new sewer (450mm) on Queen St N, 2.44km of sewer twinning (450mm, Kingsview Dr) in North Hill, 1.24km of new forcemain (400mm) on Old King Rd **Total 4.66km (sewer & forcemain)**	Crossing of Humber River north of King St.	No rail crossings. One (1) Regional Rd crossing, ~110m trenchless crossing.	None.	Potential for perceived visual impact caused by new local SPS.	Construction could cause temporary traffic disruption to Queen Street North, as well as numerous residential roads (starting from Kingsview Dr) in the North Hill, Columbia Way, Old King Rd, and Nunnville Rd.	Sewer twinning across Humber River, north of King St, will require permitting and approvals from TRCA.	**$31.10 M**	New sewer on Queen Street North (Highway 50) could cause significant disruption and delays to local traffic. Upgrades would benefit growth areas north of Columbia Way only.	**High**
STRATEGY 2C	**Growth flows from the BRES area would be conveyed via a new sewer along Hwy 50 and Bolton Heights Dr, twinning of existing sewers west of Hwy 50 (Cross Country Blvd), and twinning of sewers to the Bolton SPS. A major expansion at the Bolton SPS would be required, in addition to a new forcemain to convert flow east to the future Albion-Vaughan Trunk Sewer at Nunnville Rd and Bateman Ln.**	One (1) internal SPS required & major expansion required at Bolton SPS, Cap=100 L/s	0.80km of new sewer (450mm) on Queen St N, 2.49km of sewer twinning (450mm, Cross Country Blvd) in North Hill, 1.24km of new forcemain (400mm) on Old King Rd **Total 4.70km (sewer & forcemain)**	Crossing of Humber River north of King St.	No rail crossings. Two (2) Regional Rd crossings, ~110m trenchless crossing.	None.	Potential for perceived visual impact caused by new local SPS.	Construction could cause temporary traffic disruption to Queen Street North, as well as numerous residential roads (in the North Hill, Columbia Way, Old King Rd, and Nunnville Rd.	Sewer twinning across Humber River, north of King St, will require permitting and approvals from TRCA.	**$33.99 M**	New sewer on Queen Street North (Highway 50) could cause significant disruption and delays to local traffic. Upgrades would benefit growth areas north of Columbia Way only.	**High**
STRATEGY 3	**Growth flows from the BRES area would be conveyed via new sewers along Columbia Way to Albion Vaughan Rd. Flow to the existing system would be bypassed. Two pumping stations and forcemains would be required to overcome topography on Columbia Way and Albion Vaughan Rd.**	One (1) internal SPS required, and two (2) new pumping stations required on Columbia Way & Albion-Vaughan Rd	3.8km of new sewer (450mm), 1.73km of new forcemain (400mm) **Total 5.88km (sewer& forcemain)**	Five (5) minor creek crossings.	No rail crossings. One (1) Regional Rd crossings, ~220m trenchless crossing.	PS ~ 0.50 ha x 2 Total ~ 1.00 ha	Potential for perceived visual impact caused by new local SPS, and two new SPS on Columbia Way and Albion Vaughan Rd.	Construction could cause temporary traffic disruption to Columbia Way and Albion-Vaughan Rd.	Sewer twinning across Humber River, north of King St, will require permitting and approvals from TRCA.	**$48.05 M**	Requires several pumping stations and involves more Humber River crossings.	**Low**

OPTION 1 - WASTEWATER - SUMMARY OF SCORING

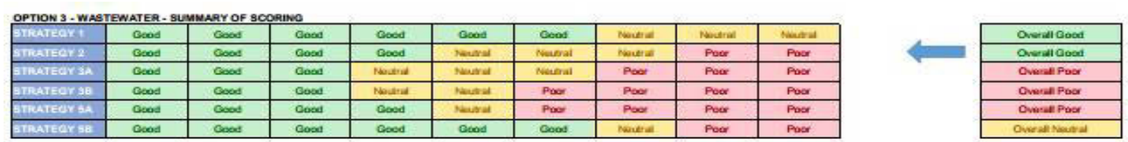
STRATEGY 1	Good	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Poor	Poor	Overall Neutral
STRATEGY 2A	Good	Good	Good	Neutral	Neutral	Neutral	Neutral	Neutral	Poor	Overall Good
STRATEGY 2B	Good	Good	Good	Good	Neutral	Neutral	Neutral	Poor	Poor	Overall Good
STRATEGY 2C	Good	Good	Good	Good	Good	Neutral	Neutral	Neutral	Poor	Overall Good
STRATEGY 3	Good	Neutral	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Overall Poor

Table 17. Water Servicing Strategies (Option 3) Evaluation Table

OPTION 3	WATER SERVICING STRATEGY DESCRIPTION	PUMPING REQUIREMENTS	STORAGE REQUIREMENTS	FEEDERMAIN / WATERMAIN REQUIREMENTS	ENVIRONMENTAL CROSSINGS	REGIONAL ROAD / RAIL CROSSINGS	LAND ACQUISITION REQUIREMENTS	VISUAL IMPACTS	TRANSPORTATION IMPACTS	PERMIT REQUIREMENTS	FINANCIAL COST	KEY ISSUES / CONSTRAINTS	OVERALL RATING
STRATEGY 1	**Supply from Tullamore Zone 6 Pumping Station, via Coleraine Dr/Chickadee Ln to the new booster pumping station to service Option 3, supply along King St/Gore Rd, with floating storage provided by an elevated tank located outside Option 3 lands.**	Zone 6A/7 BPS, Cap=80 L/s	Zone 7 E.T. - TWL @ 327.7m - Cap = 5.1 ML (potential for taller pedestal height than Option 1).	400mm, on Coleraine / King / Gore, requires total of **7.78km** of feedermain.	No major creek crossings. Seven (7) minor creek crossings. No Greenbelt crossings.	One (1) rail crossing. Two (2) Regional Rd crossings (King St & The Gore Rd).	PS ~ 0.50 ha E.T. ~ 1.25 ha Easement ~ 2.00 ha Total ~ 3.75 ha	Potential for perceived visual impact caused by elevated tank on surrounding landowners. Closest potential site is just west off Gore Rd.	Construction could cause temporary traffic disruption to the following roads: Coleraine Dr (north limit), King St, and Gore Rd.	None.	**$36.56 M**	Ability to augment existing Zone 6 local Northwest area. Opportunity to service existing land uses, specifically industrial lands adjacent to Option 3 area.	**High**
STRATEGY 2	**Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street, supply along King St/Gore Rd, pumped storage provided by in-ground Zone 5 reservoir to service Option 3 lands.**	Zone 6A/7 BPS, Cap=300 L/s	Zone 5 RES - Cap = 7.0 ML (potential for low turnover, which could lead to water quality issues).	600mm, on Innis Lake / King St / Gore, requires **10.08km** of feedermain.	No major creek crossings. Seven (7) minor creek crossings. One (1) Greenbelt crossing.	No rail crossings. One (1) Regional Rd crossing (King).	PS ~ 0.50 ha RES ~ 2.00 ha Total ~ 2.50 ha	None.	Construction could cause temporary traffic disruption to the following roads: Innis Lake Rd, King St, and Gore Rd.	None.	**$51.51 M**	Leverages opportunity to service future potential west Caledon expansion areas. Pumped storage not considered favourable from a storage and life cycle standpoint.	**Medium**
STRATEGY 3	**Supply from Tullamore Zone 5 Pumping Station, via Innis Lake Rd to a new pumping station on King Street, supply along King St/Gore Rd, in-ground storage provided by Zone 5 reservoir, with floating storage provided by an elevated tank located within the Option 3 lands.**	Zone 6A/7 BPS, Cap=80 L/s	Zone 5 RES - Cap = 7.0 ML Zone 7 E.T. - TWL @ 327.7m - Cap = 5.1 ML (potential for taller pedestal height than Option 1).	400mm, on Innis Lake / King / Gore, requires **13.56km** of feedermain.	No major creek crossings. Seven (7) minor creek crossings. One (1) Greenbelt crossing.	No rail crossings. Two (2) Regional Rd crossings (King St & The Gore Rd).	PS ~ 0.50 ha E.T. ~ 1.25 ha RES ~ 2.00 ha Easement ~2.00 ha Total ~ 5.75 ha	Potential for perceived visual impact caused by elevated tank on surrounding landowners. Closest potential site is just west off Gore Rd. If reservoir is partially in-ground, minimal potential for visual impact.	Construction could cause temporary traffic disruption to the following roads: Innis Lake Rd, King St, and Gore Rd.	None.	**$62.10 M**	Leverages opportunity to service future potential west Caledon expansion areas.	**Low**

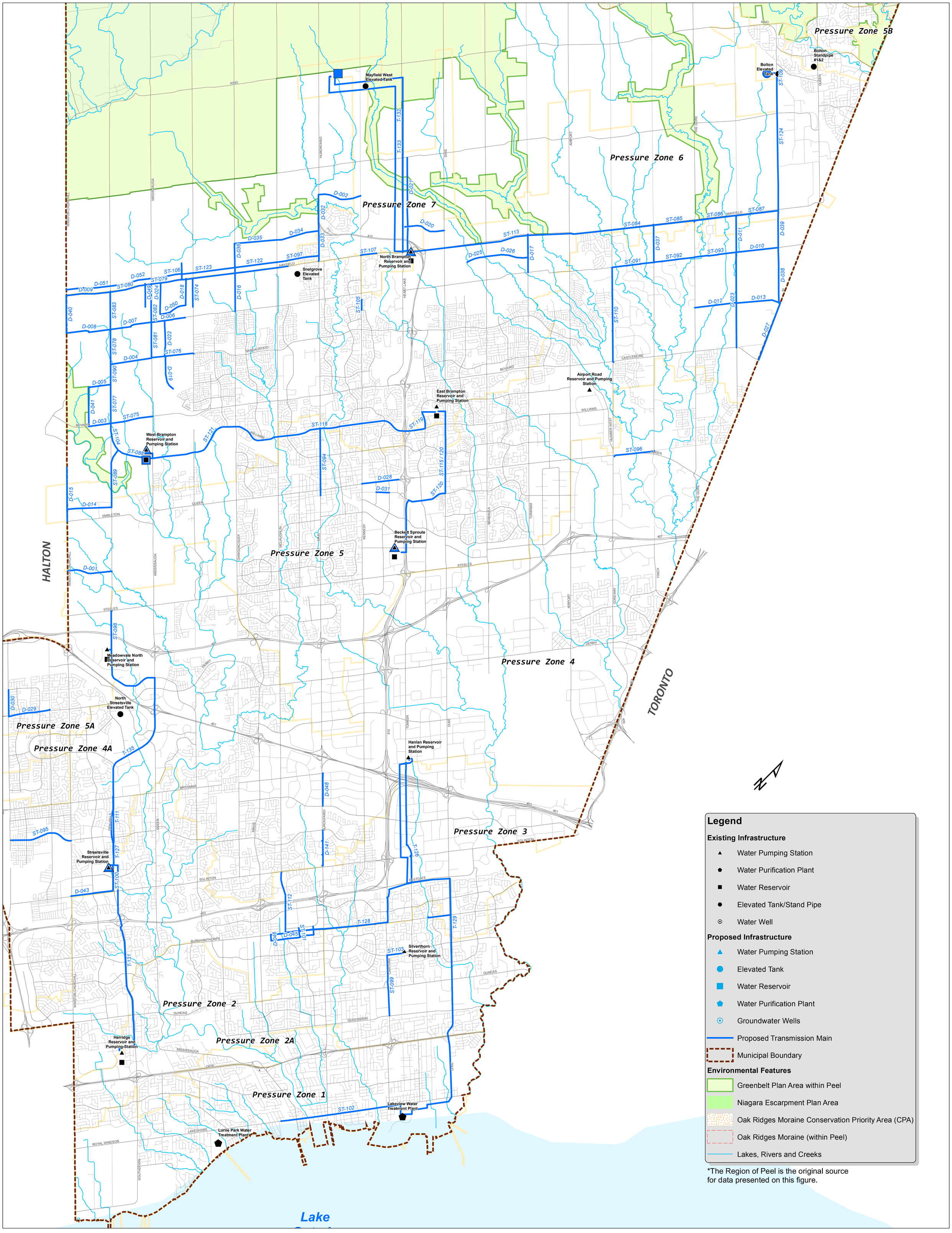
Table 20. Wastewater Servicing Strategies (Option 3) Evaluation Table

OPTION 3	DESCRIPTION	PUMPING REQUIREMENTS	SEWERMAIN / TWINNING REQUIREMENTS	ENVIRONMENTAL CROSSINGS	REGIONAL ROAD / RAIL CROSSINGS	LAND ACQUISITION REQUIREMENTS	VISUAL IMPACTS	TRANSPORTATION IMPACTS	PERMIT REQUIREMENTS	FINANCIAL COST	KEY ISSUES / CONSTRAINTS	OVERALL RATING
STRATEGY 1	**Growth flows from the BRES area would be conveyed via new sewer along future easement from King St W to Coleraine Drive. Twinning of the existing Coleraine Trunk Sewer would also be required from the rail line to just north of George Bolton Pkwy.**	None.	1.94km of new sewer (450mm) on easement, 2.63km of sewer twinning on Coleraine (525mm) **Total 4.57km (sewer & forcemain)**	Two (2) minor creek crossings.	One (1) rail crossing. One (1) Regional Rd crossing. No trenchless crossings.	Easement ~ 4.85 ha	None.	Construction could cause temporary traffic disruption to Coleraine Drive and King St (to lesser extent than Strategy 2).	None.	**$15.61 M**	Future easement required south of C.N. railway, narrow working conditions could present signicant construction challenges. Coleraine Trunk Sewer twinning could provide greater flexibility to coordinate with post-period servicing needs.	**High**
STRATEGY 2	**Growth flows from the BRES area would be conveyed via new sewers along King St W and Coleraine Dr. Twinning of the existing Coleraine Trunk Sewer would also be required from the rail line to just north of George Bolton Pkwy.**	None.	2.62km of new sewer (450mm) on King/Coleraine, 2.91km of sewer twinning on Coleraine (525mm) **Total 5.53km (sewer & forcemain)**	Five (5) minor creek crossings.	Two (2) rail crossings. One (1) Regional Rd crossing. No trenchless crossings.	None.	None.	Construction could cause temporary traffic disruption to Coleraine Drive and King St (to greater extent than Strategy 1).	Sewer alignment across King St rail crossing and Coleraine Drive rail crossing will require permitting and approvals from C.N.R.	**$18.70 M**	Facilitates servicing of Rounding Out Areas 1 and 3. Coleraine Trunk Sewer twinning could provide greater flexibility to coordinate with post-period servicing needs.	**High**
STRATEGY 3A	**Growth flows from the BRES area would be conveyed via twinning of existing sewers in the North Hill West system. Twinning of the existing Coleraine Trunk Sewer would also be required from the rail line to just north of George Bolton Pkwy.**	None.	2.40km of new/twinned sewers (450mm) on King/Cedargrove/Harvest Moon/Coleraine, 2.91km of sewer twinning on Coleraine (525mm) **Total 5.31km (sewer & forcemain)**	Five (5) minor creek crossings.	Two (2) rail crossings. One (1) Regional Rd crossing. No trenchless crossings.	None.	None.	Construction could cause temporary traffic disruption to Coleraine Drive and King St (to lesser extent than Strategy 2), as well as local residential roads including Cedargrove Ave.	Sewer alignment across King St rail crossing and Coleraine Drive rail crossing will require permitting and approvals from C.N.R.	**$26.03 M**	Crosses through residential area. Coleraine Trunk Sewer twinning could provide greater flexibility to coordinate with post-period servicing needs.	**Medium**
STRATEGY 3B	**Growth flows from the BRES area would be conveyed via twinning of existing sewers in the North Hill West system. Twinning of the existing Coleraine Trunk Sewer would also be required from the rail line to just north of George Bolton Pkwy.**	None.	2.40km of new/twinned sewers (450mm) on King/Harvest Moon/Coleraine, 2.91km of sewer twinning on Coleraine (525mm) **Total 5.31km (sewer & forcemain)**	Six (6) minor creek crossings.	Two (2) rail crossings. One (1) Regional Rd crossing. No trenchless crossings.	None.	None.	Construction could cause temporary traffic disruption to Coleraine Drive and King St (to lesser extent than Strategy 2), as well as local residential roads including Harvest Moon Dr.	Sewer alignment across King St rail crossing and Coleraine Drive rail crossing will require permitting and approvals from C.N.R.	**$22.60 M**	Crosses through residential area. Coleraine Trunk Sewer twinning could provide greater flexibility to coordinate with post-period servicing needs.	**Medium**
STRATEGY 5A	**Growth flows from the BRES area would be conveyed via a new trunk sewer south along a potential future easement, west of Coleraine Drive, to Mayfield Rd and west to connect to the future 525 mm sewer at Clarkway Dr and Mayfield Rd.**	None.	6.36km of new sewers (450mm) on easement/Concession limit, 0.83km of new sewer on Mayfield (525mm) **Total 7.19km (sewer & forcemain)**	Four (4) minor creek crossings.	No rail crossings. Two (2) Regional Rd crossings. No trenchless crossings.	Easement ~ 13.50 ha required	None.	Construction could cause temporary traffic disruption on Mayfield Rd.	None.	**$38.48 M**	Extensive easement required. New primary collector along easement could provide greater flexibility to coordinate with post-period servicing needs.	**Low**
STRATEGY 5B	**Growth flows from the BRES area would be conveyed south via Humber Station Rd to connect to the future 525 mm sewer at Clarkway Dr and Mayfield Rd.**	None.	6.12km of new sewers (450mm) on Humber Station Rd **Total 6.12km (sewer & forcemain)**	Two (2) minor creek crossings.	No rail crossings. Two (2) Regional Rd crossings. No trenchless crossings.	None.	None.	Construction could cause temporary traffic disruption on Humber Station Rd.	None.	**$20.13 M**	New primary collector along Humber Station Rd could provide greater flexibility to coordinate with post-period servicing needs.	**Medium**



BluePlan
ENGINEERING
CONSULTANTS
LIMITED

Appendix E - 2014 DC Water & Wastewater Maps



Legend

Existing Infrastructure

- Water Pumping Station
- Water Purification Plant
- Water Reservoir
- Elevated Tank/Stand Pipe
- Water Well

Proposed Infrastructure

- Water Pumping Station
- Elevated Tank
- Water Reservoir
- Water Purification Plant
- Groundwater Wells
- Proposed Transmission Main
- Municipal Boundary

Environmental Features

- Greenbelt Plan Area within Peel
- Niagara Escarpment Plan Area
- Oak Ridges Moraine Conservation Priority Area (CPA)
- Oak Ridges Moraine (within Peel)
- Lakes, Rivers and Creeks

*The Region of Peel is the original source for data presented on this figure.

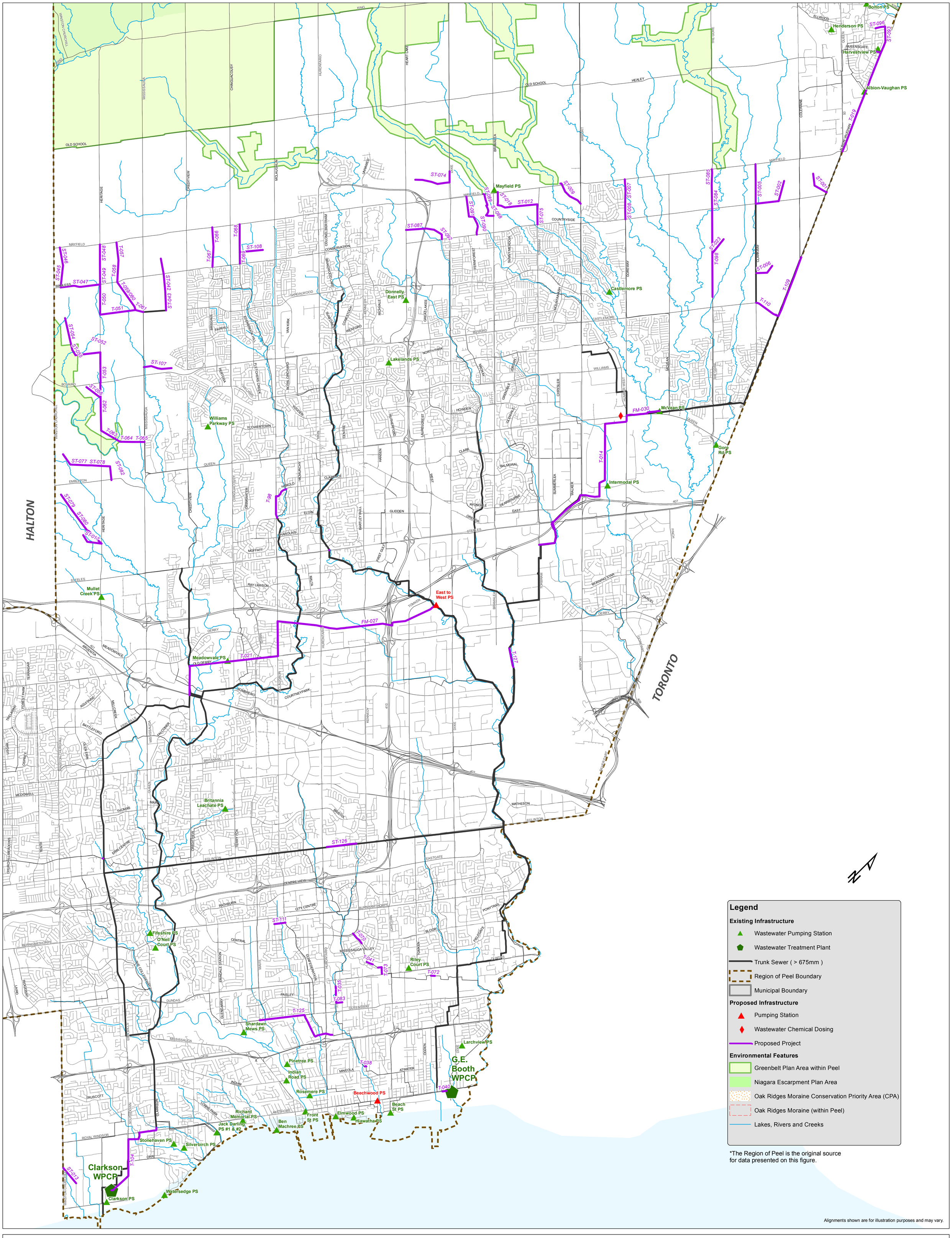
Region of Peel
Working for you

2013 Water and Wastewater Master Plan
for the Lake-Based systems

Appendix 3G
Water Capital Plan Projects

BluePlan AECOM

Mar 27, 2014
1:37,387
60216517-46-W



Region of Peel
Working for you

2013 Water and Wasewater Master Plan for the Lake-Based systems

Appendix 4I
Wastewater Capital Plan Projects

BluePlan AECOM

Mar 27, 2014
1:35,696
60216517-45-WW

BluePlan
ENGINEERING
CONSULTANTS
LIMITED

Appendix F - Preferred Option 1 Costing & Implementation

BRES SERVICING COSTS - OPTION 1

Option 1 - North of Columbia Way

														1.48%		*13.29%*	*85.23%*
Water																	
OPT 1 - STRAT 1 **PREF (Tunnel on B.A.R. w/ E.T.)**																	
Project #	**Project Description**	**Type**	**Size**	**Unit**	**Total Estimated Cost (2013$)**	**Funding Year**	**In Service Year**	**Class EA Schedule**	**Study Duration (yrs)**	**Design Duration (yrs)**	**Construction Duration (yrs)**	**Study Cost ($)**		**Design Cost ($)**		**Construction Cost ($)**	
1	Z6 Feedermain, from ex. 1050 mm at Coleraine-King to Z6A BPS	WM	400	mm	$ 4,150,000	2020	2022	A+/B		1	1	$ 61,420		$ 551,535		$ 3,537,045	
2	Z6A BPS, at King & Coleraine (greenfield)	PS	79.0	L/s	$ 6,080,000	2019	2022	B	1	1	1	$ 89,984		$ 808,032		$ 5,181,984	
3	Z6A Feedermain on BAR, from Z6A BPS to E.T. in Option 1	WM	400	mm	$ 26,630,000	2018	2022	C	1	1	2	$ 394,124		$ 3,539,127		$ 22,696,749	
4	E.T. for Option 1 (TWL = 315m)	ET	5.1	ML	$ 8,570,000	2019	2022	C	1	1	1	$ 126,836		$ 1,138,953		$ 7,304,211	
5	Z6A Feedermain, from E.T. to distribution (south & west)	WM	400	mm	$ 2,790,000	2021	2022	A+		0.5	0.5	$ 41,292		$ 370,791		$ 2,377,917	
	Total				**$ 48,220,000**							**$ 713,656**		**$ 6,408,438**		**$ 41,097,906**	

Wastewater																	
OPT 1 - STRAT 2A **PREF (via Taylorwood)**																	
Project #	**Project Description**	**Type**	**Size**	**Unit**	**Total Estimated Cost (2013$)**	**Funding Year**	**In Service Year**	**Class EA Schedule**	**Study Duration (yrs)**	**Design Duration (yrs)**	**Construction Duration (yrs)**	**Study Cost ($)**		**Design Cost ($)**		**Construction Cost ($)**	
1	Twinning of local collection sewers through North Hill (Alt A)	WWM-UPG	450	mm	$ 15,460,000	2019	2023	B	1	1	2	$ 228,808		$ 2,054,634		$ 13,176,558	
2	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 300,000	2019	2022	A+/B	1	1	1	$ 4,440		$ 39,870		$ 255,690	
3	Bolton SPS upgrade	SPS-UPG	166.1	L/s	$ 12,280,000	2021	2024	B	1	1	1	$ 181,744		$ 1,632,012		$ 10,466,244	
4	New forcemain from Bolton SPS east to Albion-Vaughan Trunk Sewer	FM-NEW	400	mm	$ 4,100,000	2020	2024	B	1	1	1	$ 60,680		$ 544,890		$ 3,494,430	
5	Sewer extension, on Coleraine Dr from ROA3 to Harvest Moon Dr	WWM-NEW	250	mm	$ 880,000	2021	2022	A+		0.5	0.5	$ 13,024		$ 116,952		$ 750,024	
	Total				**$ 33,020,000**							**$ 488,696**		**$ 4,388,358**		**$ 28,142,946**	

1. All costs expressed in 2013$ dollars.
2. Costs do not include manhole costs for trenchless and/or valve costs for forcemains.
3. Costs do not include internal servicing (all sewers up to Columbia Way).
4. Costs do not include DC level trunk infrastructure.

BluePlan
ENGINEERING
CONSULTANTS
LIMITED

Appendix G - Preferred Option 3 Costing & Implementation

BRES SERVICING COSTS - OPTION 3

Option 3 - North Hill West

Water

OPT 3 - STRAT 1 **PREF (King-Gore WM, w/ E.T.)**

Project #	Project Description	Type	Size	Unit	Total Estimated Cost (2013$)	Funding Year	In Service Year	Class EA Schedule	Duration Study (yrs)	Duration Design (yrs)	Duration Construction (yrs)	Study Cost ($)	Design Cost ($)	Construction Cost ($)
1	Z6 Feedermain, from ex. 1050 mm at Coleraine-King, east to Future Z7 BPS	WM	400	mm	$ 4,150,000	2020	2022	A+		1	1	$ 61,420	$ 551,535	$ 3,537,045
2	Z7 BPS, at King & Coleraine (greenfield)	PS	79.0	L/s	$ 6,080,000	2019	2022	B/C	1	1	1	$ 89,984	$ 808,032	$ 5,181,984
3	Z7 Feedermain on King/Gore, from Z7 BPS to E.T. outside Option 3	WM	400	mm	$ 13,520,000	2018	2022	C	1	1	2	$ 200,096	$ 1,796,808	$ 11,523,096
4	E.T. for Option 3 (TWL = 327.7m)	ET	5.1	ML	$ 9,120,000	2019	2022	C	1	1	1	$ 134,976	$ 1,212,048	$ 7,772,976
5	Z7 Feedermain, from E.T. to distribution	WM	400	mm	$ 3,690,000	2021	2022	A+/B		0.5	0.5	$ 54,612	$ 490,401	$ 3,144,987
	Total				**$ 36,560,000**							**$ 541,088**	**$ 4,858,824**	**$ 31,160,088**

Wastewater

OPT 3 - STRAT 2 (King-Coleraine, twin @450, ex. prof.)

Project #	Project Description	Type	Size	Unit	Total Estimated Cost (2013$)	Funding Year	In Service Year	Class EA Schedule	Duration Study (yrs)	Duration Design (yrs)	Duration Construction (yrs)	Study Cost ($)	Design Cost ($)	Construction Cost ($)
1	New gravity sewer on King & Coleraine, from Option 3 to ex. Coleraine Trunk Sewer	WWM-NEW	450	mm	$ 9,410,000	2018	2022	A+/B	1	1	1.5	$ 139,268	$ 1,250,589	$ 8,020,143
2	Twinning of Coleraine Trunk Sewer, from south of rail to 700 m north of George Bolton Pkwy	WWM-UPG	525	mm	$ 8,990,000	2025	2028	A+		1	2	$ 133,052	$ 1,194,771	$ 7,662,177
3	Sewer extension, on Columbia Way from ROA2 to Kingsview Dr.	WWM-NEW	250	mm	$ 300,000	2021	2022	A+		0.5	0.5	$ 4,440	$ 39,870	$ 255,690
	Total				**$ 18,700,000**							**$ 276,760**	**$ 2,485,230**	**$ 15,938,010**

1. All costs expressed in 2013$ dollars.
2. Costs do not include manhole costs for trenchless and/or valve costs for forcemains.
3. Costs do not include internal servicing (all sewers up to Humber Station Rd/King St).
4. Costs do not include DC level trunk infrastructure.