Belleville Wet Weather and Wastewater Servicing Master Plan
Public Information Centre

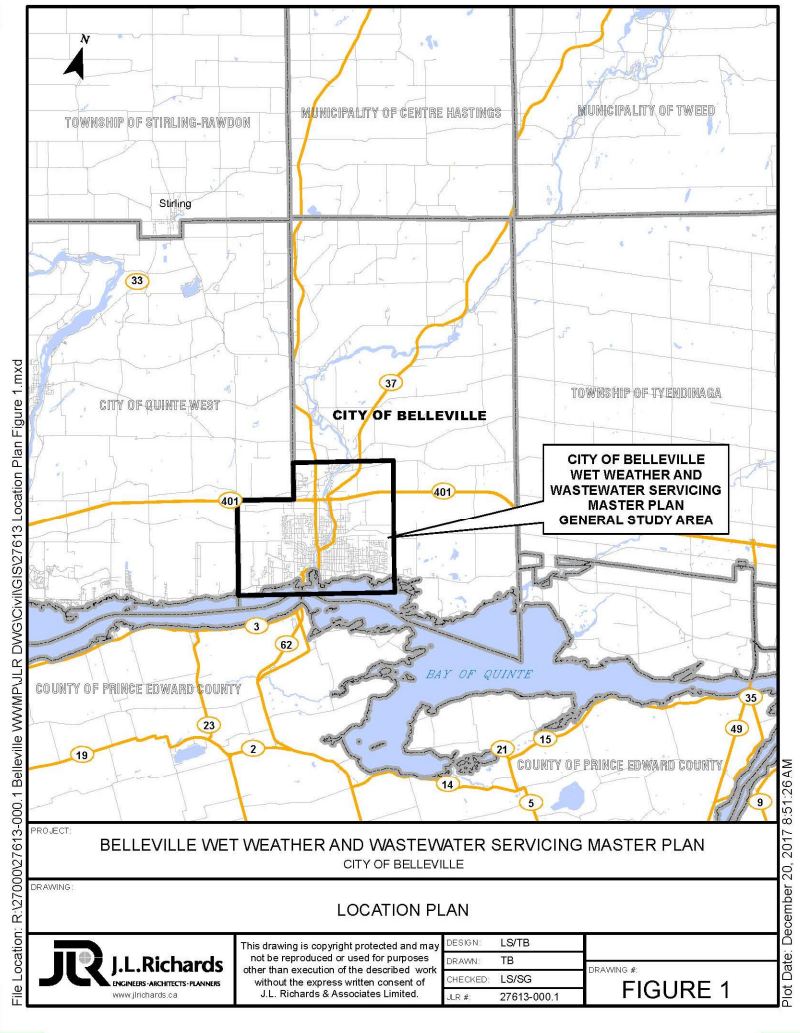
July 25, 2019

Presentation Overview

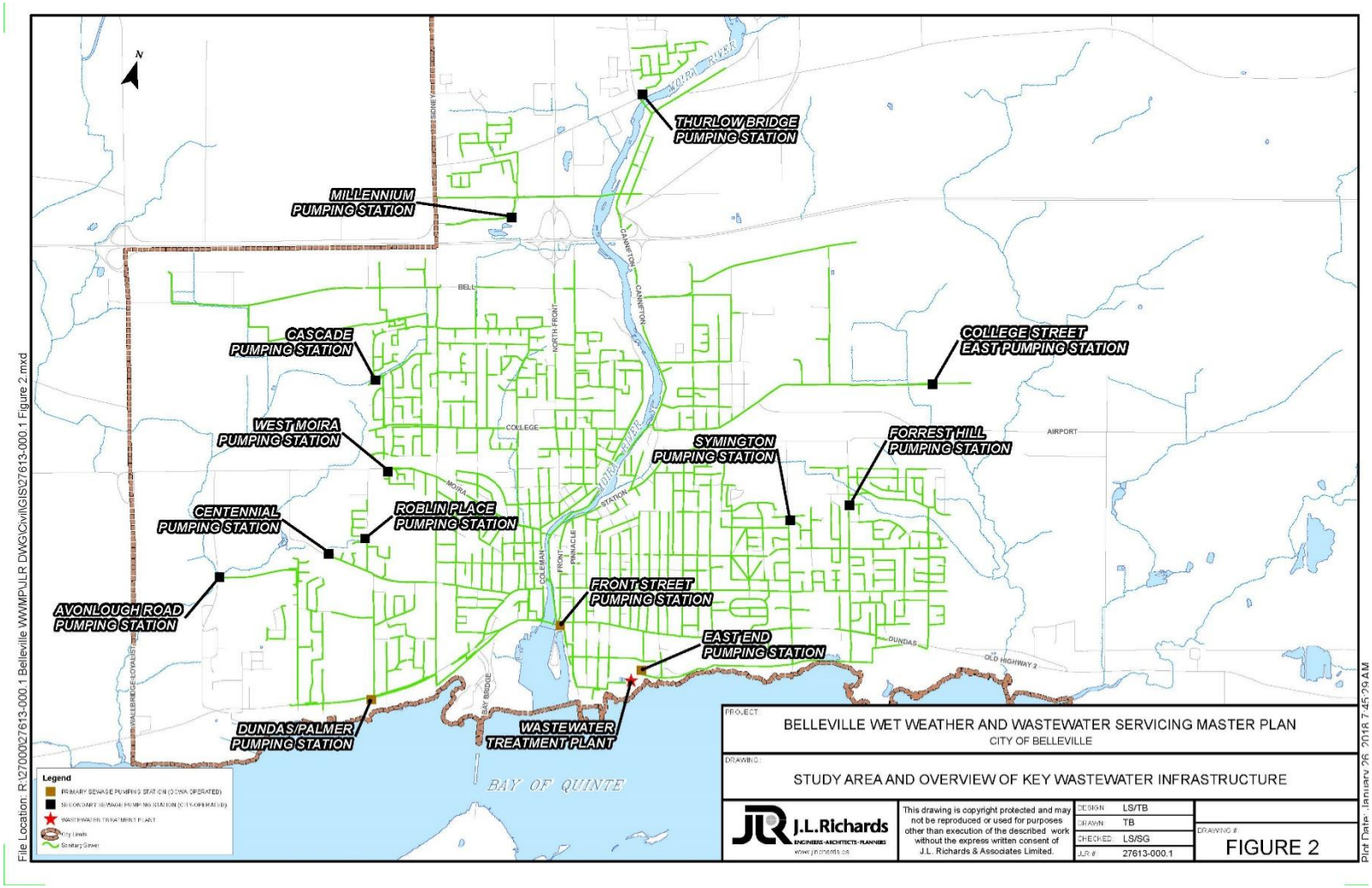
- Background
- Master Planning Process
- Summary of Work Completed To Date
- Class EA Phase 1 (Identify Problem or Opportunity)
- Class EA Phase 2 (Identify and Evaluate Alternative Solutions and Identify a Preferred Solution after Consultation)
- Summary of Recommended Preferred Servicing Options
- Summary of Agency and Public Consultation Activities
- Next Steps

Purpose of Master Plan

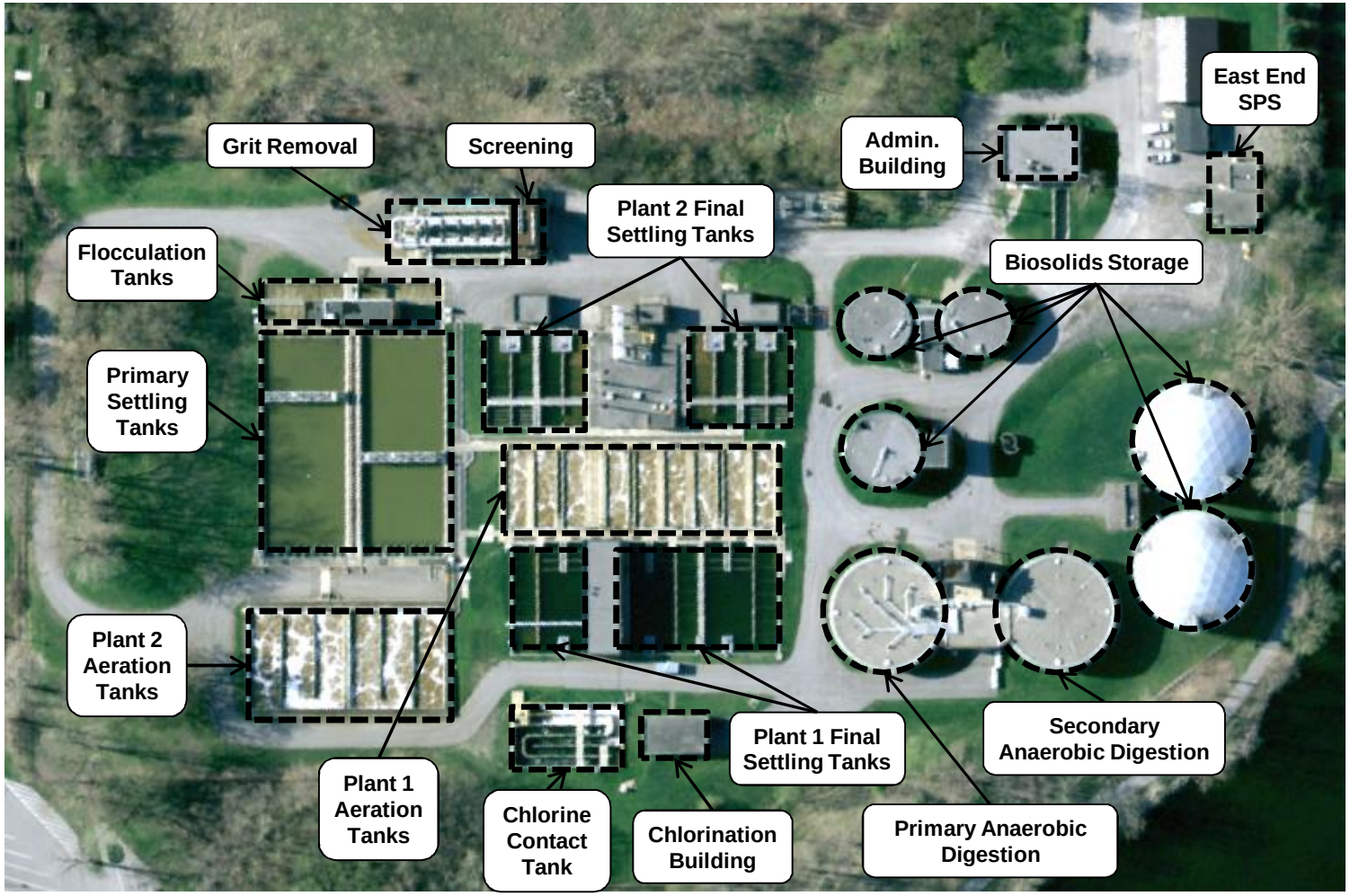
- In July 2017, the City of Belleville initiated a formal Master Planning process of the City's wastewater conveyance and treatment system in accordance with the Municipal Engineers Association (MEA).
- The City and Ontario Clean Water Agency (OCWA) have made efforts in recent years to ensure effective operation, maintenance and compliance of the system, however, a number of challenges have been identified, including, but not limited to relatively high wet weather flows, capacity limitations within the existing treatment plant, periodic odour generation, challenging operational conditions, insufficient emergency power and aging equipment. The communal system must also be able to accommodate future developments.
- The ultimate objective of this Master Plan is to identify what infrastructure and other measures are required and timing for the implementation of those measures that will be needed to ensure the continued performance and reliability of the City's communal wastewater system in accommodating current and future predicted flows.



Overview of Key Wastewater Infrastructure



Existing Belleville Wastewater Treatment Plant

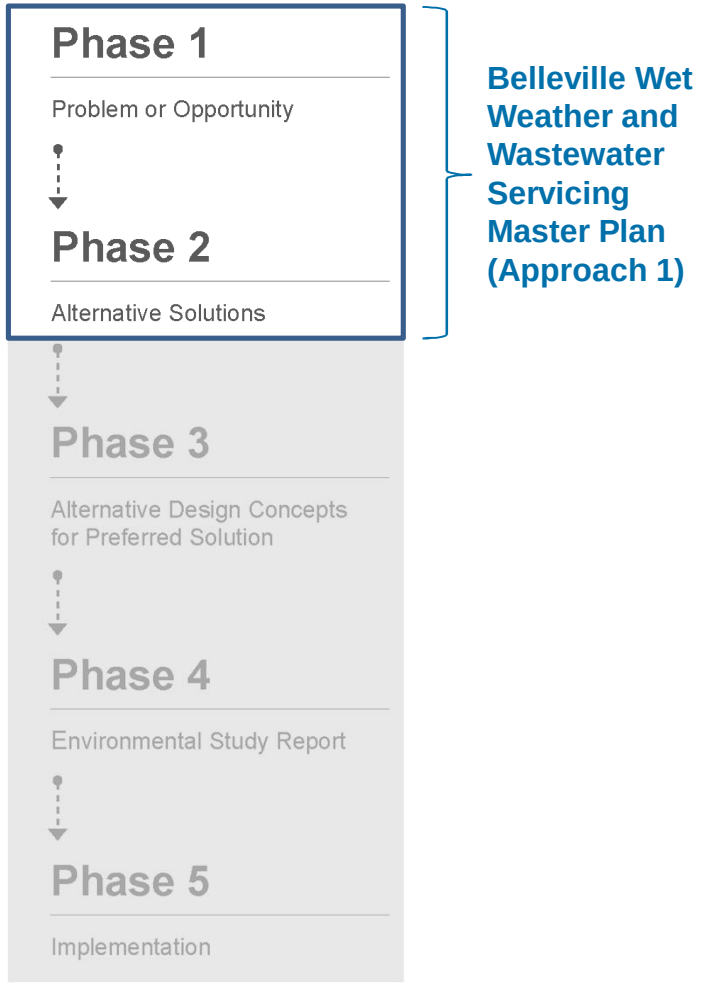


Overview of the Master Planning Process

Class EA Process
The *Ontario Environmental Assessment (EA) Act*, R.S.O., 1990 requires that projects corresponding to municipal infrastructure projects, including roads, water, and wastewater projects follow an approved planning process set out in the Municipal Class EA document prepared by the Municipal Engineers Association (MEA).

Master Plan Process
Master Plans are conducted under the framework of the MEA Class EA Process. They are a planning tool that identifies infrastructure and other requirements for the existing and future land use, through the application of environmental assessment principles. The current Master Plan is intended to satisfy Phases 1 and 2 of the Municipal Class EA process (i.e., ***Approach 1***).

Master Plan Approach 1
This approach concludes at the end of Phases 1 and 2. With this approach, the Master Plan is being completed at a broad level of assessment and may require further detailed assessment at the project-specific level.



Master Plan Methodology

As part of the Master Plan process, a number of key technical issues were reviewed and documented in the following Technical Memoranda (TMs).

- TM1 Population and Development Projections
- TM2A Wastewater Treatment Plant (WWTP) Condition Assessment
- TM2B WWTP Needs Assessment
- TM3 Wastewater Conveyance Needs Assessment
- TM4 WWTP Liquid Train Approaches
- TM5 WWTP Solids Train Approaches
- TM6 WWTP Odour Control
- TM7 WWTP Backup Power
- TM8 Conveyance System Assessment and Alternatives

Summary of Work Completed To-Date

WE ARE HERE

Notice of Study Commencement	Ongoing Public and Agency Consultation throughout Study	Public Information Centre	Notice of Completion
Issued August, 2017		July 2019	August 2019

Phase 1 – Identify Problem or Opportunity

- TM1: Population Projections
- TM 2A: WWTP Condition Assessment
- Ministry of the Environment, Conservation and Parks (MECP) Pre-Consultation Meeting
- TM 2B: WWTP Needs Assessment
- TM 3: Conveyance Condition and Needs Assessment
- Phase 1 Report

Phase 2 – Identify and Evaluate Alternative Solutions

- Flow monitoring to calibrate modeling
- TM 4: WWTP Liquid Train
- TM 5: WWTP Solids Train
- TM 6: Odour Control
- TM 7: Back-Up Power
- TM 8: Conveyance System
- Draft Master Plan Report with Recommended Solution

Next

Selection of Preferred Solutions Following Consultation Activities

Phase 1 – Identify Problem or Opportunity

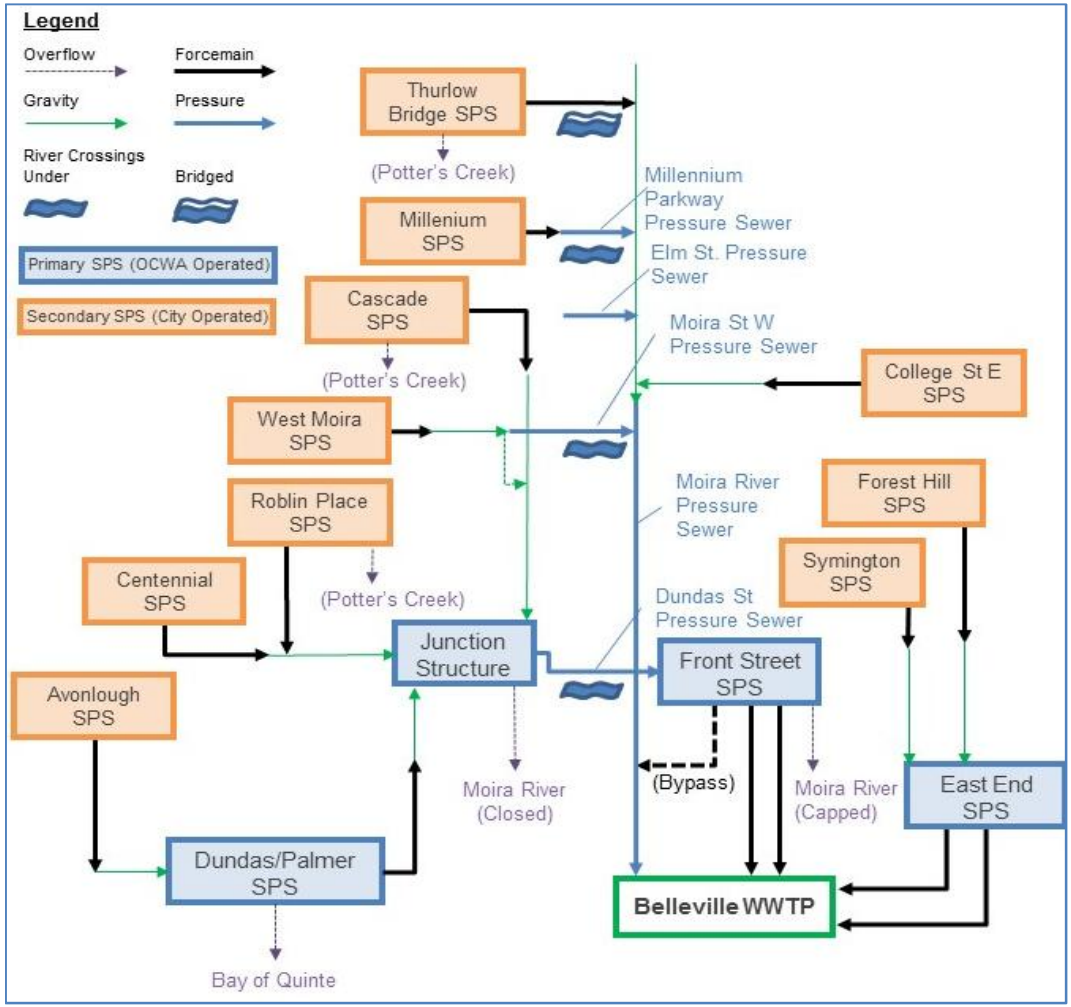
The objectives of Phase 1 are to:

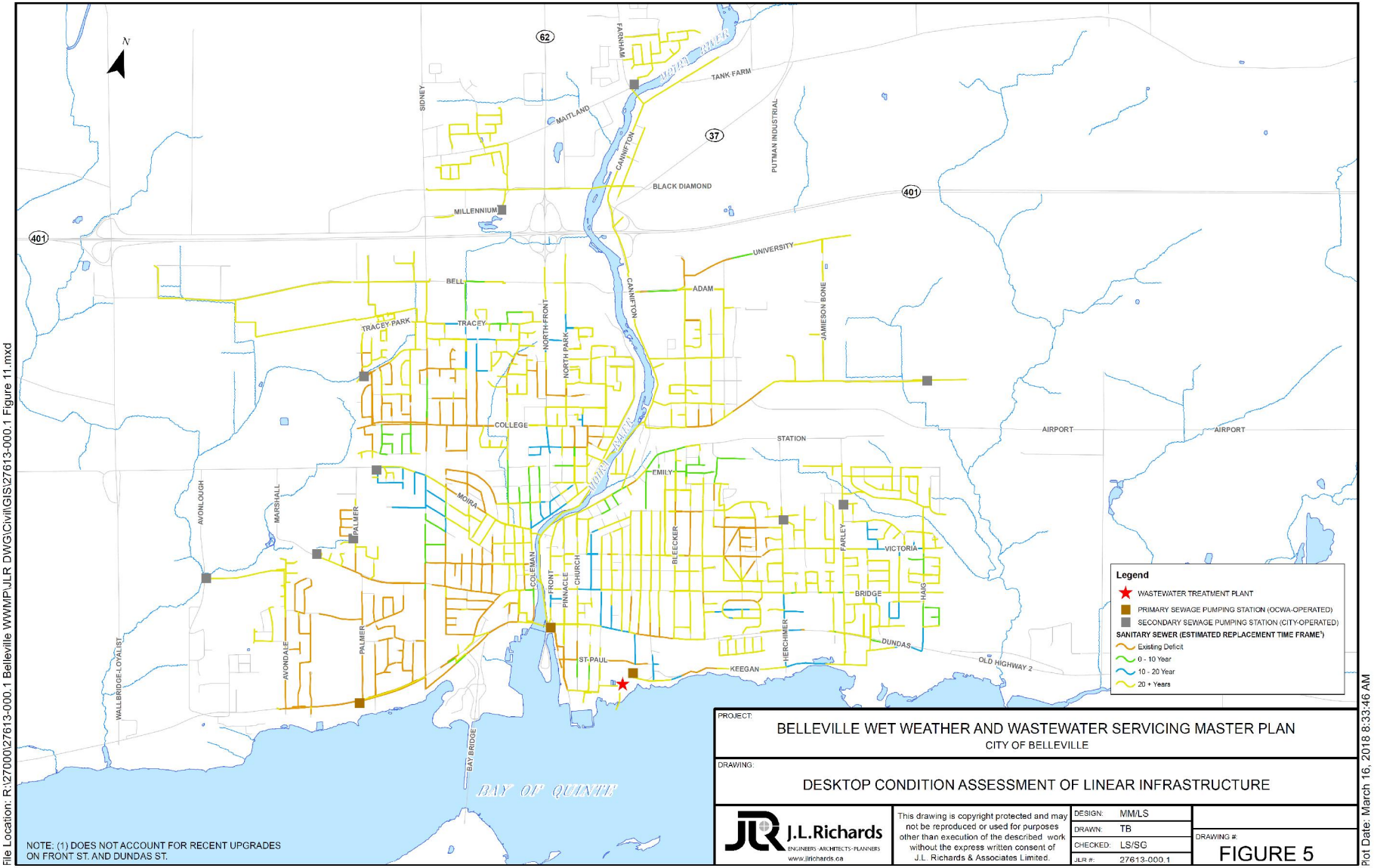
- Identify existing conditions and constraints associated with the WWTP and conveyance system
- Establish the design basis for WWTP and conveyance system
- Provide information related to land use, planning and natural environment in the study area
- Establish a Problem/Opportunity Statement; and
- To confirm Phase 2 methodology and next steps

Phase 1 – Identify Problem and/or Opportunity

Conveyance System

Conveyance System Existing Conditions

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62
37
401
SIDNEY
FARNHAM
MAITLAND
TANK FARM
CANNIFTON
PUTMAN INDUSTRIAL
BLACK DIAMOND
MILLENNIUM
UNIVERSITY
BELL
ADAM
JAMIESON BONE
TRACEY PARK
TRACEY
NORTH FRONT
NORTH PARK
COLLEGE
STATION
AIRPORT
EMILY
MOIRA
AVONLOUGH
MARSHALL
PALMER
COLEMAN
FRONT
PINNACLE
CHURCH
BLEECKER
PARLEY
VICTORIA
BRIDGE
HAIG
DUNDAS
OLD HIGHWAY 2
KEEGAN
HERCHIMER
ST-PAUL
AVONDALE
WALLBRIDGE-LOYALIST
BAY BRIDGE
BAY OF QUINTE
Legend
WASTEWATER TREATMENT PLANT
PRIMARY SEWAGE PUMPING STATION (OCWA-OPERATED)
SECONDARY SEWAGE PUMPING STATION (CITY-OPERATED)
SANITARY SEWER (ESTIMATED REPLACEMENT TIME FRAME[1])
Existing Deficit
0 - 10 Year
10 - 20 Year
20 + Years
NOTE: (1) DOES NOT ACCOUNT FOR RECENT UPGRADES ON FRONT ST. AND DUNDAS ST.
PROJECT:
BELLEVILLE WET WEATHER AND WASTEWATER SERVICING MASTER PLAN
CITY OF BELLEVILLE
DRAWING:
DESKTOP CONDITION ASSESSMENT OF LINEAR INFRASTRUCTURE
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Sewage Pump Station Condition Assessment

Pump Station	Future Considerations	OPC
Thurlow Bridge	• Pump replacement; minor upgrades related to safety, code, best practice, etc.	$500,000
Symington	• Station replacement	$352,000
Roblin Place	• Minor concrete work; recommended to be decommissioned with flow diverted to Potter Creek Drain Area	$2,000
West Moira	• Wet well and pump replacement; recommended to be decommissioned with flow diverted to Potter Creek Drain Area	$504,000
Millennium	• Minor improvements	-
Forest Hill	• Station Replacement	$329,000
Centennial	• Minor improvement; recommended to be decommissioned with flow diverted to Potter Creek Drain Area	$3,000
Cascade	• Minor improvement	$3,000
Avonlough	• Station upgrades to receive flow from Cascade, West Moira, Roblin Place and Centennial Pump Stations	$34,080,000
College St. E.	• Nothing to Note	-
Dundas/Palmer	• Nothing to note	-
Front Street	• Screen replacement; screening room ventilation review	N/A
East End	• Screen grinder replacement; periodic pump replacement; control system upgrades.	$650,000

Conveyance System Model Simulation and Level of Service

- PCSWMM hydraulic model has been developed to simulate sanitary system, including major trunk sewers, pressure sewers, maintenance holes, primary pumping station and forcemains.

- Both “static” and “dynamic” model simulations were undertaken. The static simulation utilizes the City’s sanitary sewer standard design and has been used to evaluate the hydraulic capacity of the trunk sewer. The dynamic simulation utilizes field collected flow monitoring data (Mar. – Jun. 2018) and used for assessment of pump station and major pressure sewers.

- For purpose of assessment, the proposed level of service (LOS) is as follows:

Component	Dry Weather Criteria	Wet Weather Criteria
Gravity Sewers	Flow to be less than sewer capacity	HGL to be within 300 mm above pipe obvert or greater than 2 m below finished ground during the specific rainfall dependent inflow and infiltration (RDII) event where basements are present.
Pumping Stations	Flow to be less than pump station firm capacity	1:10 year storm flow to be less than firm capacity and 1:100 year storm flow to be less than peak capacity
Pressurized Sewers	Velocity to be greater than 0.9 m/s	

Future Servicing Requirements

Growth Projections:

Timeframe	Residential Growth		ICI Growth (1) (ha)		
	Population	New Land Area (ha)	Industrial	Commercial	Institutional
Near to Medium Term (2017-2027)	6,878	187	7.7 (25.7)	4.8 (15.9)	4.1 (11.7)
Near to Long Term (2017-2037)	11,308	209	13.5 (44.9)	9.3 (31.0)	5.9 (16.9)

(1) Presented as gross floor area with estimated plan area in parenthesis.

ICI Growth Projections by Plan Area:

ICI	Ratios (GFA: Total Plan Area)	Growth (by Plan Area in m²)(1)	
		Near to Medium Term (2017-2027)	Near to Long Term (2017-2037)
Industrial	30%	257,330 (25.7)	449,047 (44.9)
Commercial	30%	158,567 (15.9)	309,537 (31.0)
Institutional	35%	117,460 (11.7)	169,331 (16.9)

(1) Presented as gross floor area with estimated plan area in parenthesis.

Phase 1 – Identify Problem or Opportunity

Wastewater Treatment Plant

WWTP Historical Upgrades

Year	Description
1962	Original construction of the Belleville WWTP (primary treatment only)
1969	Upgrade to secondary treatment (new primary settling tanks, aeration tanks and secondary settling tanks), and addition of a secondary digester (Tank No. 3)
1982	Expansion to include additional primary clarifiers, chlorine contact tank, and a new primary and secondary digestion process (Tanks No. 4 and 5)
1992	Addition of two new sludge storage tanks (Tanks No. 6 and 7)
1996	Addition of a second treatment train (“Plant 2”)
2005-2006	Various modifications to improve hydraulics
2009	Screen replacement
2012-2014	Various modifications to solids and liquid treatment trains to improve performance

Existing ECA Compliance Requirements

- WWTP Rated Capacity, per ECA Number 2178-B2ZLM8, dated May 30, 2019:

Parameter	Flow Rate
Average Daily Flow	54,500 m^3/d
Primary Treatment	163,440 m^3/d
Secondary Treatment	92,000 m^3/d

- Effluent compliance objectives and limits:

Parameter	Objectives	Limits	
		Concentration	Loading
5-day Carbonaceous Biochemical Oxygen Demand (1)	10.0mg/L	15.0mg/L	817.5kg/d
Total Suspended Solids(1)	10.0mg/L	15.0mg/L	817.5kg/d
Total Phosphorus (2)	0.2mg/L	0.3mg/L	16.35kg/d
Total Residual Chlorine (4)	Non-detectable	0.02 mg/L	-
E. Coli(3)	100CFU/100mL	200CFU/100mL	-
pH (4)	6.5 – 8.5	6.0 – 9.5	

(1) Annual average concentration and loading.
(2) Monthly Average
(3) Monthly geometric mean.
(4) Single sample

WWTP Condition Assessment Recommended Upgrades (2017-2027)

	Description	OPC
Headworks	Misc. architectural and structural repairs; blowers and sluice gate replacement; MCC upgrades, etc.	$500,000
Primary Treatment	Misc. architectural and structural repairs; process equipment replacement; electrical and instrumentation system upgrades, etc.	$2,460,000
Secondary Treatment	Misc. architectural and structural repairs; building mechanical system upgrades; process equipment replacement; electrical and instrumentation system upgrades, etc.	$2,450,000
Disinfection	Misc. architectural and structural repairs; building mechanical system upgrades; process equipment replacement.	$510,000
Digestion	Misc. architectural and structural repairs; process equipment replacement; electrical and instrumentation system upgrades, etc.	$1,440,000
Biosolids Storage	Misc. architectural and structural repairs; process equipment upgrades; electrical and instrumentation system upgrades, etc.	$2,030,000
Other Buildings	Generator replacement and misc. architectural and structural repairs.	$460,000
Site-Wide	Electrical substation replacement; instrumentation and controls upgrades	$1,350,000
	Sub-Total	$11,200,000
	Engineering and Contingency (30%)	$3,360,000
	Total	**$14,600,000**

WWTP Condition Assessment Recommended Upgrades (2027-2037)

	Description	OPC
Headworks	Process equipment replacement; misc. tank upgrades	$1,050,000
Primary Treatment	Process equipment and piping replacement	$120,000
Secondary Treatment	Process equipment upgrades; electrical MCC replacement; building mechanical system upgrades, etc.	$1,630,000
Disinfection	Process equipment replacement; lighting and power system upgrades.	$220,000
Digestion	Building mechanical system upgrades; process equipment replacement, etc.	$210,000
Biosolids Storage	Building mechanical system upgrades; various piping and process equipment upgrades.	$200,000
Other Buildings	Generator building mechanical system replacement; misc. lighting and power replacement	$60,000
Site-Wide	N/A	-
	Sub-Total	3,500,000
	Engineering and Contingency (30%)	$1,050,000
	Total	**$4,550,000**

WWTP Needs Assessment Recommendations

Overall, the needs of the Belleville WWTP were generally grouped into the following categories based on the initial scoping of the project:

- Treatment Capacity, Operation and Solids Management
- Wet Weather Flow Management and Treatment
- Odour
- Backup Power

WWTP Future Servicing Requirements

- Future WWTP Design Capacity:

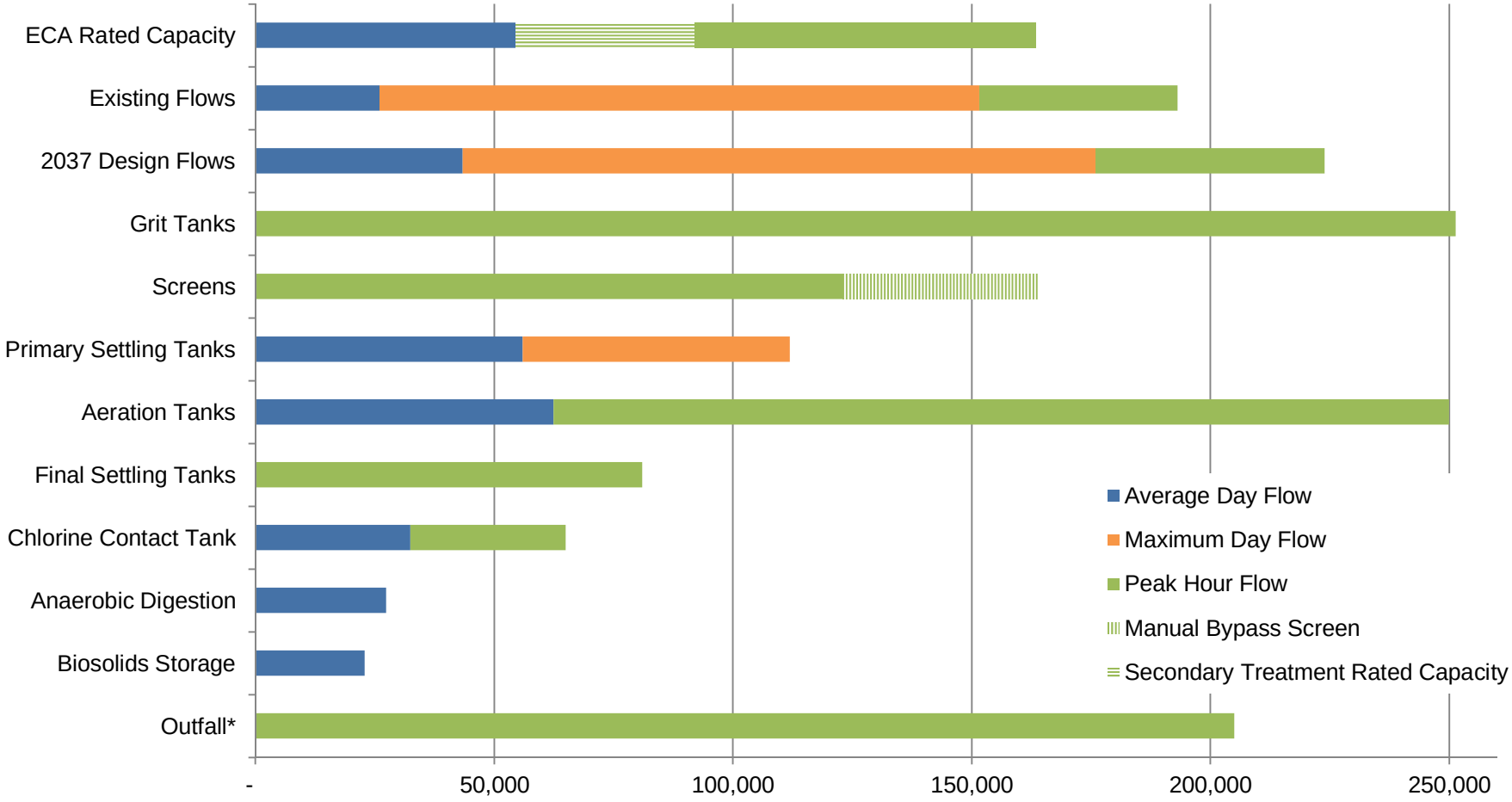
Parameter	Existing	2027	2037	Existing Rated Capacity
Population	50,716	57,594	62,024	-
Average Day Flow (m^3/d)	26,077	37,900	43,500	54,500
Maximum Day Flow (m^3/d)	151,610	168,000	176,000	-
Peak Hour Flow (m^3/d)	193,159	213,000	224,000	163,440 (Primary) 92,000 (Secondary)

- Possible Effluent compliance objectives and limits:

Parameter	Objectives	Limits	
		Concentration	Loading
5-Day Carbonaceous Biochemical Oxygen Demand(1)	10.0mg/L	15.0mg/L	817.5kg/d
Total Suspended Solids(1)	10.0mg/L	15.0mg/L	817.5kg/d
Total Phosphorus(1) (3)	0.08 – 0.16mg/L	0.1 – 0.2mg/L	5.45-10.9kg/d
Total Ammonia Nitrogen(1)	TBD. Likely seasonal limits between 9 and 23mg/L.		
Total Residual Chlorine	Non-detect	0.02mg/L	2.7kg/d
E. Coli(2)	100cts/100mL	200 cts/100mL	-
pH	6.5 – 8.5	6.0 – 9.5	

(1) Monthly average concentration and loading.
(2) Monthly geometric mean.
(3) Possible long-term requirements.

WWTP Capacity Assessment Results



ECA Rated Capacity, Existing Flows, 2037 Design Flows and Theoretical Capacity of WWTP (m^3/d)

Phase 1 – Problem and Opportunity Statement

The City of Belleville is serviced by a communal wastewater system that consists of approximately 200km of gravity sewer, one major pressure sewer, three main larger capacity pumping stations, several smaller capacity sub-area pumping stations, and a single wastewater treatment plant (WWTP) that provides secondary treatment and disinfection to wastewater prior to the discharging of treated effluent to the Bay of Quinte. Although the WWTP has been able to historically meet its Environmental Compliance Approval treated effluent requirements, there have been a number of significant challenges and associated risks in achieving these requirements with the current treatment facility and more challenges are predicted moving into the future including, accommodation of increased average day flows, continued high peak flows leading to bypassing of the secondary treatment process, treatment process and equipment capacity constraints, aging plant equipment and components and changing legislative requirements. The conveyance portion of the communal wastewater system (i.e. the gravity collection sewers, pressure sewers, pump stations and forcemains) will also need to be appropriately expanded and renewed as needed to accommodate current and future flows generated within the community. There is an opportunity through the Master Planning process to review the wastewater system holistically and develop a strategic plan of actions that can be implemented over a logical time period and in a prioritized fashion with the intended goal of addressing the identified problems (including management of wet weather events) and ensuring appropriate performance and reliability of the wastewater system in both the short and long term.

Phase 2 – Alternative Solutions

The objectives of Phase 2 are to:

- Identify alternative solutions for conveyance system and WWTP, to address the "problem/opportunity statement" developed in Phase 1
- Evaluate the alternative solutions against the existing environments (social/cultural, economic, natural, technical)
- Identify impacts and mitigation measures of the recommended preferred solution
- Identify future projects, timing of implementation, Class EA project schedule, etc.
- Conduct a public information centre (PIC) to consider and incorporate public and stakeholder agency input
- Select a preferred alternative solution based on all input
- Publish the Master Plan for a 30 day public review period

Phase 2 – Alternative Solutions

Conveyance System

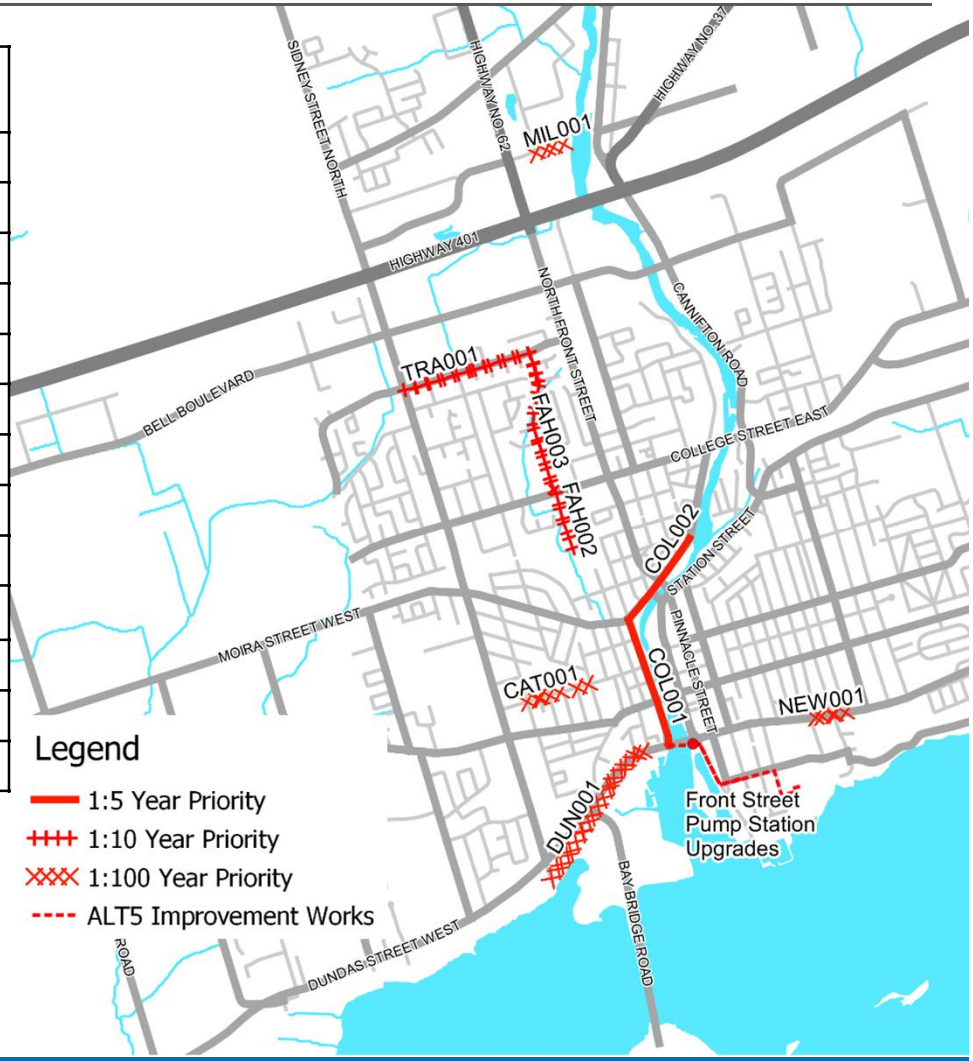
Conveyance System - Pressure Sewer

- The hydraulic modelling results have shown that some sections of the pressure sewer system are not achieving the level of service criteria. The slow moving sections of the pressure sewer system could be more susceptible to sedimentation in the sewers and blockages.

- It is recommended that the City implement a periodic cleaning program (e.g., every 10 years) for the pressure sewer system to ensure efficient operation in the long term. The current routine using the WWTP pumps to clean the Moira pressure sewer should also continue.

Conveyance System - Gravity Sewer Localized Improvements

Project	Trunk Sewer	Opinion of Probable Costs
COL001	Coleman Street Trunk Sewer	$ 1,900,000
COL002	Coleman Street Trunk Sewer	$ 1,400,000
	Subtotal	$ 3,300,000
FAH002	Fahey Street Trunk Sewer	$ 1,000,000
FAH003	Fahey Street Trunk Sewer	$ 2,300,000
TRA001	Tracey Street Trunk Sewer	$ 2,000,000
	Subtotal	$ 5,300,000
CAT001	Catherine Street Trunk Sewer	$ 700,000
DUN001	Dundas Street (Main) Trunk Sewer	$ 2,300,000
MIL001	Millennium Parkway Trunk Sewer	$ 600,000
NEW001	Newberry Street Trunk Sewer	$ 500,000
	Subtotal	$ 4,100,000
TOTAL		**$ 12,700,000**



Conveyance System – Downstream Pump Station Capacity

- The primary pump stations level of service and required capacity to meet future servicing requirements are shown below.

- In order to achieve the desired level of service, Front Street Pump Station would require a capacity increase to accommodate predicted peak flows. Another sewer crossing under the Moira River will also be required to provide additional capacity and redundancy.

Pump Station	Firm Capacity (l/s)	Peak Capacity (l/s)	Dry Weather Flow (l/s)	Future Firm Capacity 1:10 year Storm (l/s)	Future Peak Capacity 1:100 year Storm (l/s)	Expansion?
East End	550	800	110	380	700	Not required
Front Street	975	1,290	340	1,880	2,130	Required
Dundas	289	519	50	160	200	Not required

Conveyance System – Downstream Pump Station Servicing Options

- The following alternatives were identified to alleviate capacity constraints in the immediate area upstream of the Moira River crossing and the Front Street Pump Station. The alternatives were evaluated against natural environment, social and cultural environment, technical feasibility and capital cost.

Alternative Servicing Options	Description
Option 1 – Reduce network inflow and infiltration	Inspection and targeted upgrading of linear infrastructure system to reduce inflow and infiltration thus reducing flow in the system during rainfall events.
Option 2 – Utilize existing overflow at Front Street Pump Station to act as a relief for higher wet weather flows	Open the blocked overflow at the Front Street Pump Station to provide relief and alleviate hydraulic grade line(HGL) pressures in the system.
Option 3 – Provide equalization storage at Front Street Pump Station	Store and release the equivalent of the overflow volume to reduce the HGL.
Option 4 – Provide equalization storage at the Dundas Junction Chamber	Store and release on the west side of the Moira River as this would avoid having to upgrade the connection under the Moira River.
Option 5 – Expand capacity of the Front Street Pump Station	An upgrade of the Front Street Pump Station to improve capacity. Includes upgrades of one forcemain and an increase in capacity under the Moira River.

Conveyance System - Evaluation of Servicing Options

- The evaluation process consisted of a review of servicing options in consideration of the criteria below.

Criteria	Description
Natural Environment Considerations	Natural features, natural heritage areas, Areas of Natural and Significant Interest, designated natural areas, watercourses and aquatic habitat
Social and Cultural Environment Considerations	Proximity of facilities to residential, commercial and institutions, archeological and cultural features, designated heritage features, source water protection areas, land-use and planning designations
Technical Feasibility	Constructability, maintaining or enhancing drinking water source quality, maintaining or enhancing wastewater treatment, reliability and security of systems, ease of connection to existing infrastructure and operating and maintenance requirements
Financial Considerations	Capital costs, Operation and Maintenance costs

- The relative impact for each criterion to each potential servicing strategy was assessed based on whether the alternative is ‘Preferred’, ‘Less Preferred’, ‘Least Preferred’ or ‘Not Feasible’ with respect to that criterion. The four evaluation criteria were assigned equal weights as they were considered to have equal importance in this evaluation at the Master Plan stage.

Conveyance System – Downstream Capacity Evaluation

Servicing Options	Natural Environment	Social and Cultural Environment	Technical Feasibility	Financial Environment
Option 1 – Reduce network inflow and infiltration	Less Preferred	Less Preferred	Less Preferred (when implemented alone)	Least Preferred
Option 2 – Utilize existing overflow at Front Street Pump Station to act as a relief for higher wet weather flows	Least Preferred	Least Preferred	Not Feasible	Preferred
Option 3 – Provide equalization storage at Front Street Pump Station	Less Preferred	Least Preferred	Not Feasible	Least Preferred
Option 4 – Provide equalization storage at the Dundas Junction Chamber	Less Preferred	Less Preferred	Not Feasible	Least Preferred
Option 5 – Expand capacity of the Front Street Pump Station **** PREFERRED SERVICING OPTION*** *(WITH CONCURRENT IMPLEMENTATION OF OPTION 1)*	Preferred	Less Preferred	Less Preferred	Less Preferred

Phase 2 – Alternative Solutions

Wastewater Treatment Plant

WWTP – Methodology and Approach

- The following TMs were prepared as part of Phase 2 for the WWTP portion of the Master Plan:
  - TM 4 WWTP Liquid Train
  - TM 5 WWTP Solids Train
  - TM 6 WWTP Odour Control
  - TM 7 WWTP Back-up Power
- Each TM is specific to a treatment train or process in the WWTP. A number of alternative approaches were developed in each TM. The evaluation of options and identification of overall master plan servicing alternatives were completed holistically after the completion of the TMs, and at the master plan preparation stage.

WWTP - Development of Approaches

Liquid Treatment Train (TM4)	Solids Treatment Train (TM5)	Odour Control (TM6)	Back-up Power (TM7)
• Approach 1 – Maintain Treatment Status Quo and Optimize Existing Infrastructure • Approach 2 – Provide Expanded Treatment Capacity • Approach 3 – Provide Wet Weather Specific Treatment Capacity • Approach 4 – Reduce Peak Hourly Flow through WWTP	• Approach 1 - Maintain Sludge Handling, Digestion and Biosolids Handling Status Quo and Optimize Existing Infrastructure • Approach 2 – Provide Expanded Sludge Handling, Digestion and Biosolids Handling Capacity • Approach 3 – Modify Sludge Handling, Digestion and Biosolids Handling Practices	• Approach 1 – Status Quo with Improved Housekeeping and Operational Adjustments • Approach 2 – Implement Odour Treatment Systems • Approach 3 – Implement Odour Modification, Counteraction and Masking • Approach 4 – Change Treatment Process Technology	• Approach 1: Status Quo • Approach 2: Enhanced Level of Service

WWTP Servicing Options – Preliminary Screening

- A preliminary screening of the liquid and solids treatment train approaches has been completed for the purpose of shortlisting practical options. The preliminary screening is focused on the overall practicality, economic viability and the spatial requirements of each approach and its ability to fully solve the problems identified.

	Description	Screening Result
Liquid Train Approach 1	Maintain Treatment Status Quo and Optimize Existing Infrastructure	☒Does not meet future servicing requirements. Not carried forward.
Liquid Train Approach 2	Provide Expanded Treatment Capacity	☑ Feasible option. Carried forward.
Liquid Train Approach 3	Provide Wet Weather Specific Treatment Capacity	☑ Feasible option. Carried forward.
Liquid Train Approach 4	Reduce Peak Hour Flow through WWTP	☒ Not technically and financially feasible. Not carried forward.
Solids Train Approach 1	Maintain Status Quo and Optimize Existing Infrastructure	☒ Does not meet future servicing requirements. Not carried forward.
Solids Train Approach 2	Provide Expanded Treatment Capacity	☑ Feasible option. Carried forward.
Solids Train Approach 3	Fundamentally Modify Treatment Practices	☑ Feasible option. Carried forward.

- The proposed approaches for odour control and backup power were not pre-screened at this stage, as the approaches identified for these two aspects can be accommodated once the preferred liquid and solids treatment train servicing strategies are selected and the design concepts further developed. For the purpose of developing conceptual solutions and costs at the Master Plan level, ***odour control approach 2 – implement odor control treatment*** and ***backup power approach 2 – enhanced level of service*** have been carried.
- In the immediate term prior to project implementation, it is recommended that the City continue with ***odour control approach 1 - improved housekeeping and operational adjustment*** to minimize odour.

WWTP - Servicing Options

The feasible liquid and solids train approaches were then carried forward and consolidated into the following WWTP servicing options.

	Description	Preliminary Screening
Option 1	Status Quo – No Capacity Expansion, Allow for Optimization of Existing Systems, with No Fundamental Changes to Both Treatment Trains	☒Does not meet future servicing requirements. Not carried forward.
Option 2	Expand the Liquid and Solids Train Capacity to Accommodate Future Flows, Allow for Optimization of Existing Systems, with No Fundamental Changes to Both Treatment Trains	☑ Feasible option. Carried forward.
Option 3	Add a Dedicated Wet Weather Specific Treatment System and Expand Solids Treatment Capacity to Accommodate Future Flow, Allow for Optimization of Existing Systems, with No Fundamental Changes to Both Treatment Trains	☑ Feasible option. Carried forward.
Option 4	Fundamentally Modify Liquid Train and Expand Existing Solids Train Capacity to Accommodate Future Flows, Allow for Optimization of Existing Systems	☑ Feasible option. Carried forward.
Option 5	Expand the Liquid Train and Fundamentally Modify Solids Train	☑ Feasible option. Carried forward.
Option 6	Fundamentally Modify the Liquid and Solids Train with New Technology to Accommodate Future Flows	☑ Feasible option. Carried forward.
Option 7	New WWTP Elsewhere or Expanded WWTP Beyond Existing Site Boundary	☒ Financially prohibitive (>$200 million in capital cost), and technically challenging for influent flow re-direction

WWTP - Servicing Options Evaluation

- The evaluation process consisted of a review of the short-listed combination in consideration of the criteria below.

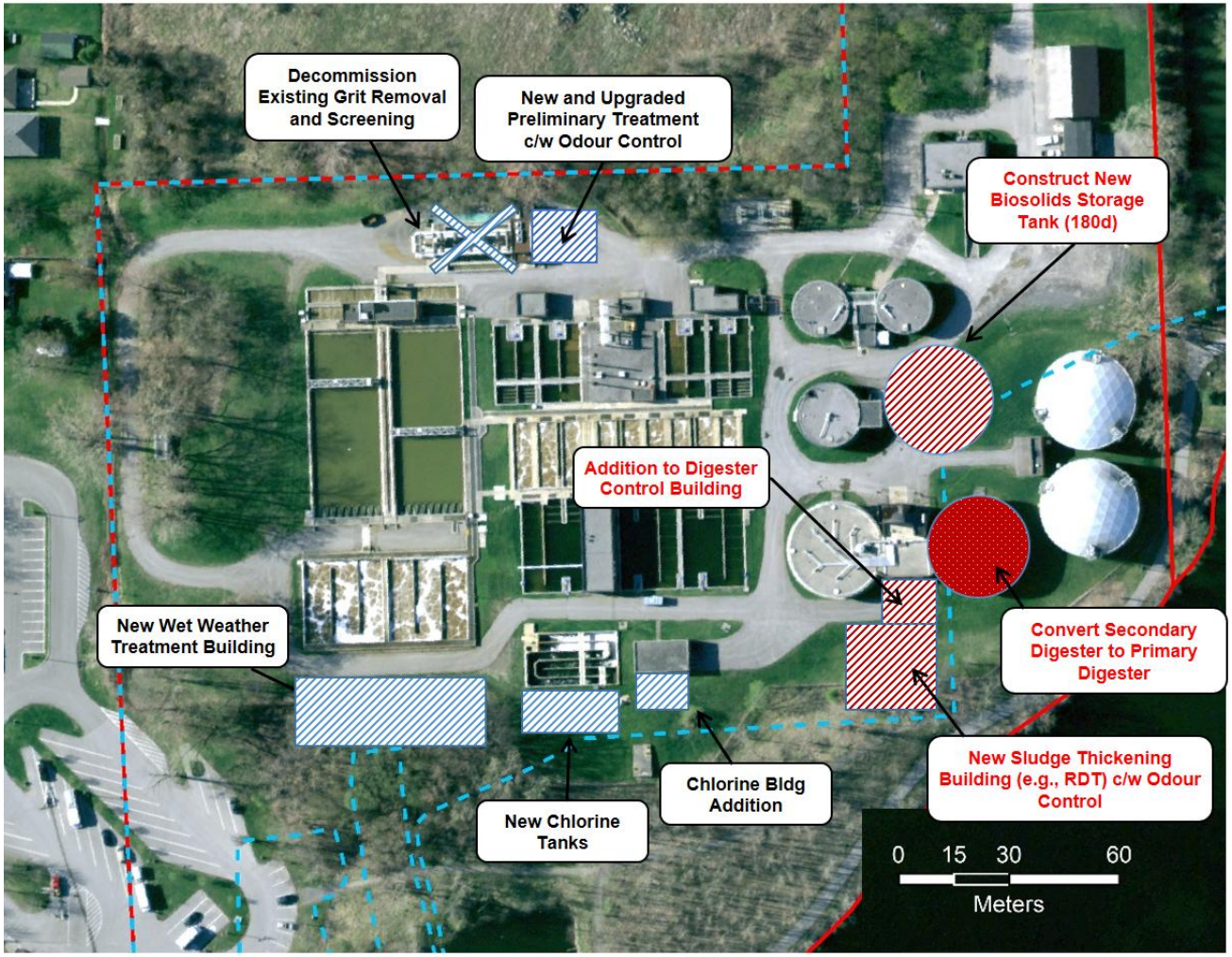
Criteria	Description
Natural Environment Considerations	Natural features, natural heritage areas, Areas of Natural and Significant Interest, designated natural areas, watercourses and aquatic habitat
Social and Cultural Environment Considerations	Proximity of facilities to residential, commercial and institutions, archeological and cultural features, designated heritage features, source water protection areas, land-use and planning designations
Technical Feasibility	Constructability, maintaining or enhancing wastewater treatment, reliability and security of conveyance system, ease of connection to existing infrastructure and operating and maintenance requirements, ability to mitigate odour, addresses aging infrastructure, expandability
Financial Considerations	Capital costs, Operation and Maintenance costs

- The relative impact for each criterion to each potential servicing strategy was assessed based on whether the alternative is ‘Preferred’, ‘Less Preferred’, ‘Least Preferred’ or ‘Not Feasible’ with respect to that criterion. The four evaluation criteria were assigned equal weights as they were considered to have equal importance in this evaluation at the Master Plan stage.

WWTP – Servicing Option Evaluation

Alternative Servicing Options	Natural Environment	Social and Cultural Environment	Technical Feasibility	Financial Feasibility
Option 2: Expand Liquid and Solids Train with No Fundamental Changes to Both	Less Preferred	Least Preferred	Not Feasible	Less Preferred
Option 3: Add a Dedicated Wet Weather Treatment System and Expand Solids Train ***PREFERRED SERVICING OPTION***	Preferred	Preferred	Preferred	Preferred
Option 4: Fundamentally Modify Liquid Train and Expand Solids Train	Preferred	Preferred	Less Preferred	Less Preferred
Option 5: Expand Liquid Train and Fundamentally Modify Solids Train	Preferred	Preferred	Less Preferred	Less Preferred
Option 6: Fundamentally Modify Both Liquid and Solids Train	Preferred	Preferred	Least Preferred	Least Preferred

WWTP – Recommended Servicing Option



- Various condition upgrades
- New preliminary treatment facility
- New wet weather treatment system and building
- Expand disinfection
- New sludge handling facility
- Expand digester building
- Retrofit existing secondary into primary digester
- New biosolids storage
- Site-wide electrical, instrumentation and control upgrades
- New odour control systems
- Opinion of Probable Costs: $73,200,000

Recommended Overall Implementation Plan

- There are a number of projects (in the conveyance system and at WWTP) that have been identified in the Master Plan. Based on the various evaluations, including overall problem identification, the following list has been developed to allow the City to appropriately plan and phase the identified projects.

Potential Timeframe	Project Description	OPC (Rounded)
2020-2022	Schedule 'C' Class EA for WWTP and Front Street Pump Station/Forcemain and River Crossing	$350,000
2020-2023	Infiltration and Inflo (I&I) Study and Sanitary Sewer Asset Condition Assessment	$600,000
2021-2027	Various Small Pump Stations Condition Upgrades	$2,373,000
2022-2026	WWTP Upgrades Phase 1a – Wet Weather Treatment, New Headworks, Site-wide Upgrades	$29,925,000
2022-2025	WWTP Upgrades Phase 1b – Condition Upgrades	$15,248,000
2025-2027	Coleman Street Trunk Sewer Expansion	$3,300,000
2026-2030	WWTP Upgrades Phase 2 – Disinfection Expansion, Digester Conversion, New Sludge Thickening Facility, Site-wide Upgrades	$18,828,000
2026-2030	Front Street Pump Station/Focemain/River Crossing (Capacity Upgrades)	$32,000,000
2027-2029	Fahey Street and Tracey Street Trunk Sewer Expansion	$5,300,000
2029-2031	Catherine, Dundas, Millennium, Newberry Trunk Sewer Expansion	$4,100,000
2030-2037	WWTP Upgrades Phase 3a – Condition Upgrades	$3,491,000
2030-2037	WWTP Upgrades Phase 3b – Biosolids Storage Expansion	$5,709,000
Ongoing	Avonlough Sewage Pump Station	$34,080,000
Ongoing	Combined Sewer Separation Program	Ongoing

Permits and Approvals

- A number of pre-construction approvals are potentially required prior to implementing the proposed works:
  - Obtaining an Environmental Compliance Approval (Sewage) Amendment from the MECP on the WWTP and Sewage Pump Stations
  - Obtaining an Environmental Compliance Approval (Air and Noise) from the MECP on the WWTP and Sewage Pump Stations
  - Approval/Permit from Quinte Conservation Authority
  - Site Plan Approval from the City
  - Building Permit from the City
  - Permit to Take Water (PTTW) During Construction from MECP for dewatering activities
  - Electrical Safety Authority (ESA) Permit
  - Screening of the project in accordance with the requirements of the Canadian Environmental Assessment Act, should any federal approvals be required or should funding be provided by the Federal Government for the project
  - Department of Fisheries and Oceans Permit for River Crossing

Source Water Protection

- The recent amendments to the Class EA process requires the proponent to identify, during the Class EA and Master Planning process, if the proposed undertaking occurs within a source water protection vulnerable area. This Master Plan identifies whether or not the proposed projects are located within a vulnerable area, and their impact on the source water protection. Further assessment and consultation is recommended with the MECP and Quinte Conservation Authority in the subsequent Class EA studies and detailed design.

Identified Project	Preliminary Analysis	Impact
Belleville WWTP Upgrades	• Located outside of Intake Protection Zone (IPZ) for the Gerry O'Connor Water Treatment Plant	No/minimal impact
Centennial Pump Station and Dundas Street Pump Station	• Located within the IPZ-2 with a vulnerability score of 8.1; • Sewage Pump Station is not a significant risk in IPZ-2; • No risk for both chemical and pathogen per "2017/2018 Tables of Drinking Water Threats for Pathogens and Chemicals" due to capacity.	No/minimal impact
Dundas Street West (DUN001) Gravity Sewer Improvement	• Sewer follows the boundary between IPZ-1 and IPZ-2 with a vulnerability score of 8.1 for both IPZs; • Wastewater collection system is not a significant risk in IPZ-1 and IPZ-2; • Sewer capacity in exceedance of 100,000 m^3/d; low impact for chemicals based on "2017/2018 Tables of Drinking Water Threats for Pathogens and Chemicals"	Low impact

Key Public Consultation Activities Summary

	Date	Description
Stakeholder Consultation Plan	July 2017	Defined mandatory consultation requirements and objectives of effective consultation with the public and other potential stakeholders
Notice of Project Initiation	August 2017	Published on City of Belleville's Website, and distributed directly to the potential stakeholders.
Ministry of the Environment, Conservation and Parks Pre-Consultation Meeting	October 2017	Pre-consultation meeting with MECP to discuss specific concerns the ministry has on the conveyance and WWTP systems, and related legislations, and to share information related to key issues and anticipated master plan approach to WWTP effluent requirements.
Ministry of the Environment, Conservation and Parks, City Council Consultation Meeting	July 2019	Consultation Meeting with MECP and City Council to provide an update on the recommended master plan servicing option
Public Information Centre	July 2019	Provide public and stakeholder agencies an update on the recommended master plan servicing option
Notice of Study Completion (To be completed)	August 2019	To notify the public and stakeholder agencies of the completion of master plan study and 30d review period begins.

Next Steps

- Collect and address public comments from PIC
- Finalize Master Plan recommendations
- Issue Notice of Completion (August 2019)
- Publish Master Plan on public record for 30 days (August – September 2019)
- City may choose to proceed with the recommended projects after the 30-day review period if no Part II order request.

Contacts for Questions and Comments

Brian Hein, P. Eng.
Project Manager
J.L. Richards & Associates Limited
613-728-3571
bhein@jlrichards.ca

Stan Czyczyro
Senior Project Manager
City of Belleville
613-968-6481
sczyczyro@belleville.ca