

Appendix A Tech Memo #1: Background Information Review



City of London Pollution Prevention Control Plan (PPCP) Master Plan Update

Existing Document Review and Summary Tech Memo

Prepared by GEI Consultants Canada (Formerly GM BluePlan Engineering)



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Version Updates

The following is a record of the changes/updates that have occurred on this document:

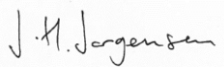
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1 Introduction

The 'Background Document Review and Summary' Technical Memorandum has been prepared in support of the Pollution Prevention Control Plan (PPCP) update study. The PPCP update study was initiated by the City of London (City) in 2023 as part of its ongoing efforts to improve the performance and resiliency of the City's sanitary and combined sewer infrastructure.

The 'unwanted' water that contributes to possible increased overflows and bypasses comes from the inflow of stormwater via direct connections, such as downspouts and weeping tiles or the infiltration of groundwater into sewer pipes through joints and cracks. Overflow structures that exist in the system were originally built to protect homes from flooding caused by an excess of extraneous water. The overflows and bypasses are a mixture of stormwater and untreated sewage that is then released to the receiving streams, including the Thames River and other tributaries. The primary objective of the PPCP update study is to develop an implementation plan for a long-term solution that will limit the volume and frequency of untreated sewage discharges to the receiving streams from various SSO and PS bypasses throughout the City, while still maintaining an acceptable level of service and protection against basement flooding.

The PPCP update study follows the Municipal Engineers Association (MEA) Class Environmental Assessment (EA) process and will satisfy Phases 1 and 2 of the Class EA process. The study will be completed in alignment with the requirements as set out by the Ministry of Environment, Conservation, and Parks (MECP) F-5-5 Procedure.

The aim of this Technical Memorandum is to compile all relevant background information available as part of a comprehensive baseline analysis and to determine any opportunities and constraints in the sewer system. It also acts as a bridging document, providing key updates on the short and medium-term projects and studies as recommended in the previous 2018 PPCP Implementation Plan.

2 Study Area

The City of London is one of Ontario's fastest growing municipalities and is the largest urban centre within the Middlesex County area. It is located at the forks of the Thames River in central Western Ontario on the southwestern peninsula and within the Treaty territories of the Anishinaabeg and Haudenosaunee Confederacy. The Oneida Nation of the Thames, Chippewas of the Thames First Nation, and Munsee Delaware Nation are located south-west of the City.

The Study Area for the PPCP update project includes the entire municipal jurisdiction of the City of London.

2.1 System Inventory

The City is a single-tier municipality that owns and operates all of its sewer system infrastructure. The current sewer infrastructure includes approximately 3000 km of sewers (including sanitary, storm, and forcemains), 13.1 km of which are still combined. There are also 35 active pumping stations that help to store and lift sewage to higher elevations, 29 of which have bypasses and overflows directly into receiving streams or indirectly by way of storm sewers during extreme wet weather events. There is a total of five WWTPs that are in commission: four conventional activated sludge secondary treatment plants with seasonal ultraviolet disinfection (Greenway WWTP, Adelaide WWTP, Pottersburg WWTP, and Vauxhall WWTP) and one conventional activated sludge with membrane filtration (Oxford WWTP). The City's 2020 total average sewage flow directed to the WWTPs was 194 Million Litres per day.¹

The Study Area is shown in **Figure 2-1** and also indicates the location of all active PSs, WWTPs, sewer outfalls and sanitary sewers within each of the five sewersheds.

¹ City of London Wastewater Treatment Operations Master Plan, February 2022.

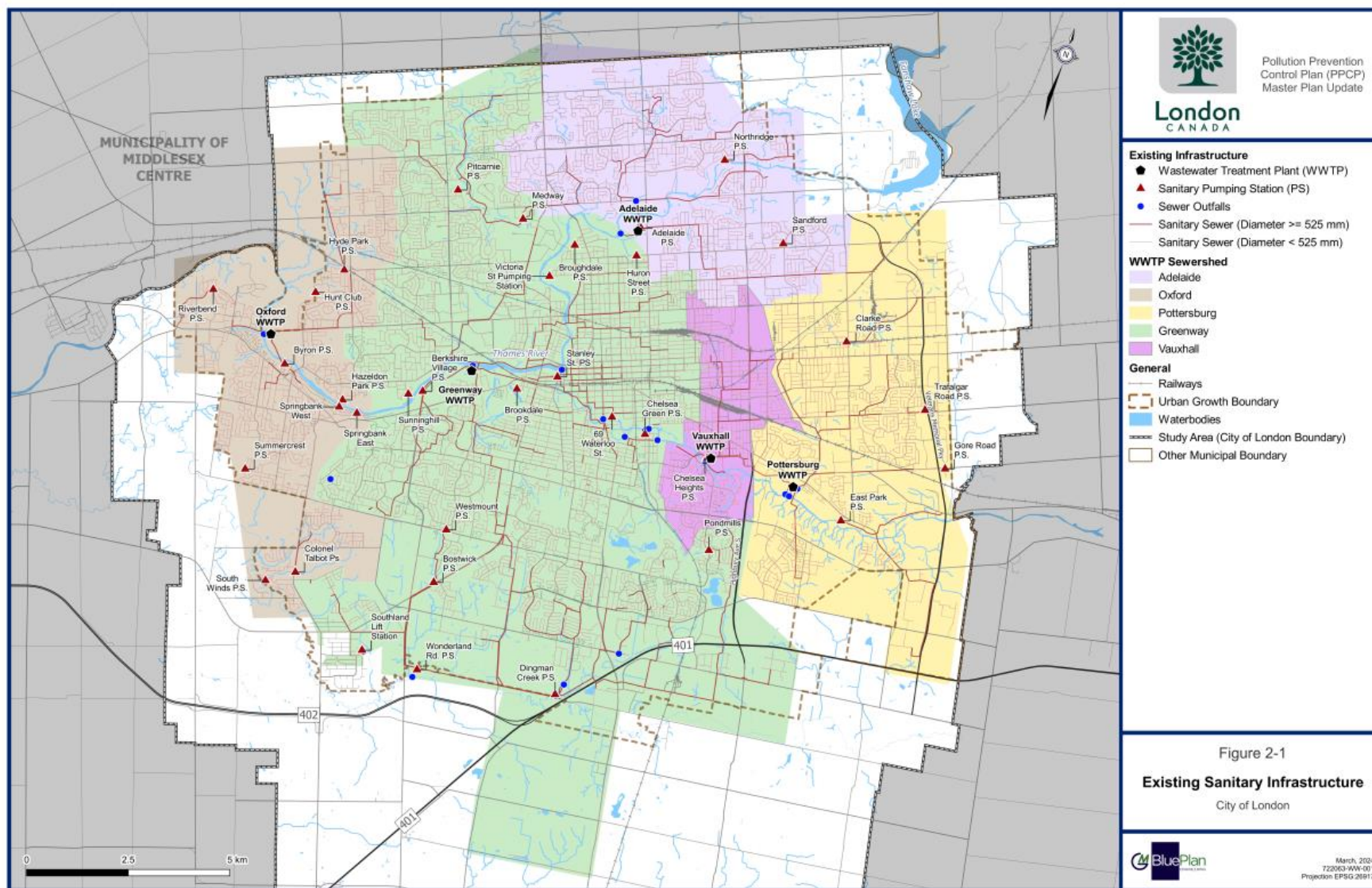


Figure 2-1: Study Area and Existing Sanitary Infrastructure Map

2.2 Natural Environment

There are two main watersheds located within the study area: the Thames River watershed and the Kettle Creek watershed. However, the City's urban area is located exclusively within the Thames watershed, which is further subdivided into 17 individual Subwatersheds.

The City is the largest urban area on the Thames River and is the primary contributor of phosphorous from stormwater runoff, localized discharges from WWTP and PS, overflows and bypasses. Other related receiving streams include the Dingman Creek, Medway Creek, Pottersburg Creek, and the Coves. The Thames River watershed is one of the largest watersheds in the Lake Erie basin and contributes 30%² of the phosphorus that is coming from Ontario. Provincial and federal initiatives have identified the Thames River as a priority watershed and requires immediate action to reduce phosphorus loads.

Some important environmental policy designations are also noted within the Study Area, including Areas of Natural and Scientific Interest and local and provincially significant features such as wetlands, valleylands and Environmentally Significant Areas. Other natural heritage features shown on **Figure 2-2** are the City's woodlands, and waterbodies and watercourses.

² Upper Thames River Conservation Authority Website: [Great Lakes Connections - Upper Thames River Conservation Authority](#). Visited February 2024.

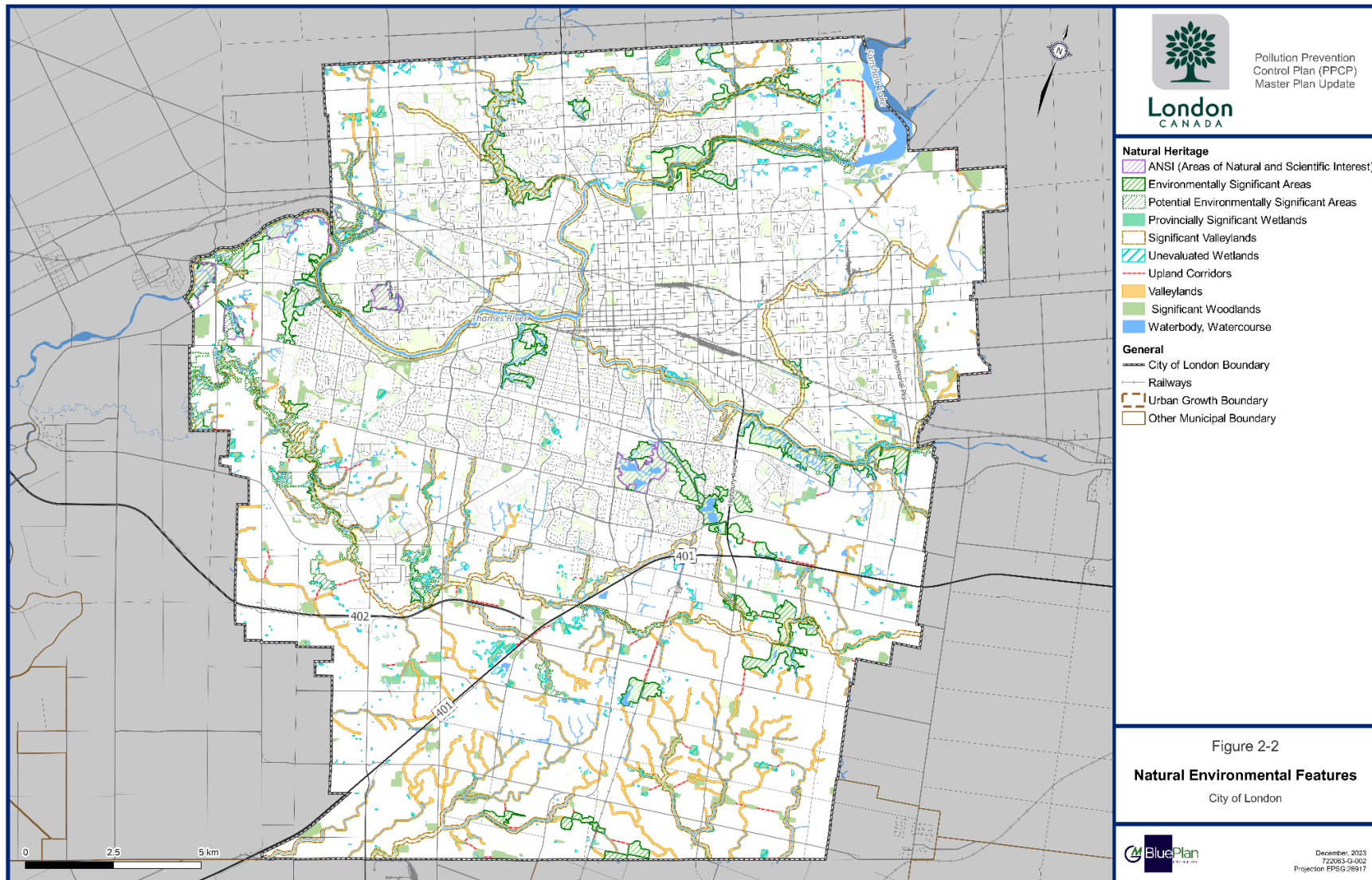


Figure 2-2: Natural Environment Features Map

3 Legislation and Regulation

The PPCP update study must comply with and meet both provincial and municipal legislation and regulatory requirements which govern the sewer infrastructure system and the natural environment within the study area. Several of the key requirements are summarized in the following sections.

3.1 Provincial Legislations and Regulations

3.1.1 Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) sets the policy foundation for land use planning and development in Ontario, providing guidance and support with the intention to protect resources, public health and safety, and the quality of the natural and built environment³. The PPS contains policies relevant to sanitary infrastructure planning under policy Section 1.6 including, but not limited to:

- Requirement that infrastructure be provided in an efficient manner that prepares for the impacts of a changing climate while accommodating projected needs.
- Coordinate and integrate land use planning and growth management so that they are financially viable over their lifecycle and are available to meet current and projected needs.
- Optimization of the use of existing infrastructure and public service facilities before developing new infrastructure.

Relevance to this study: The PPS supports the need for the PPCP update study. Its policies will be considered and incorporated into the evaluation process of the implementation plan where the final recommendations shall be provided in an efficient manner that prepares for the impacts of a changing climate.

3.1.2 MECP F-5-5 Procedure

The MECP F-5-5 Procedure defines the goals and criteria for treating municipal and private combined and partially separated sewers⁴. To address the impact of SSOs to the environment, the F-5-5 Procedure requires wastewater systems to:

³ Ontario Ministry Website: [Provincial Policy Statement, 2020 - Ontario Ministry](#). Visited February 2024.

⁴ Ontario Ministry Website: [F-5-5 Determination of treatment requirements for municipal and private combined - Ontario Ministry](#). Visited February 2024.

- Treat 100% of dry weather flows
- Treat 90% of wet weather flows from April to October in an average year
- Maintain or improve the existing level of treated sewage
- Develop a Pollution Prevention Control Plan (PPCP) to identify pollution sources and causes, propose alternative solutions, and recommend an implementation plan

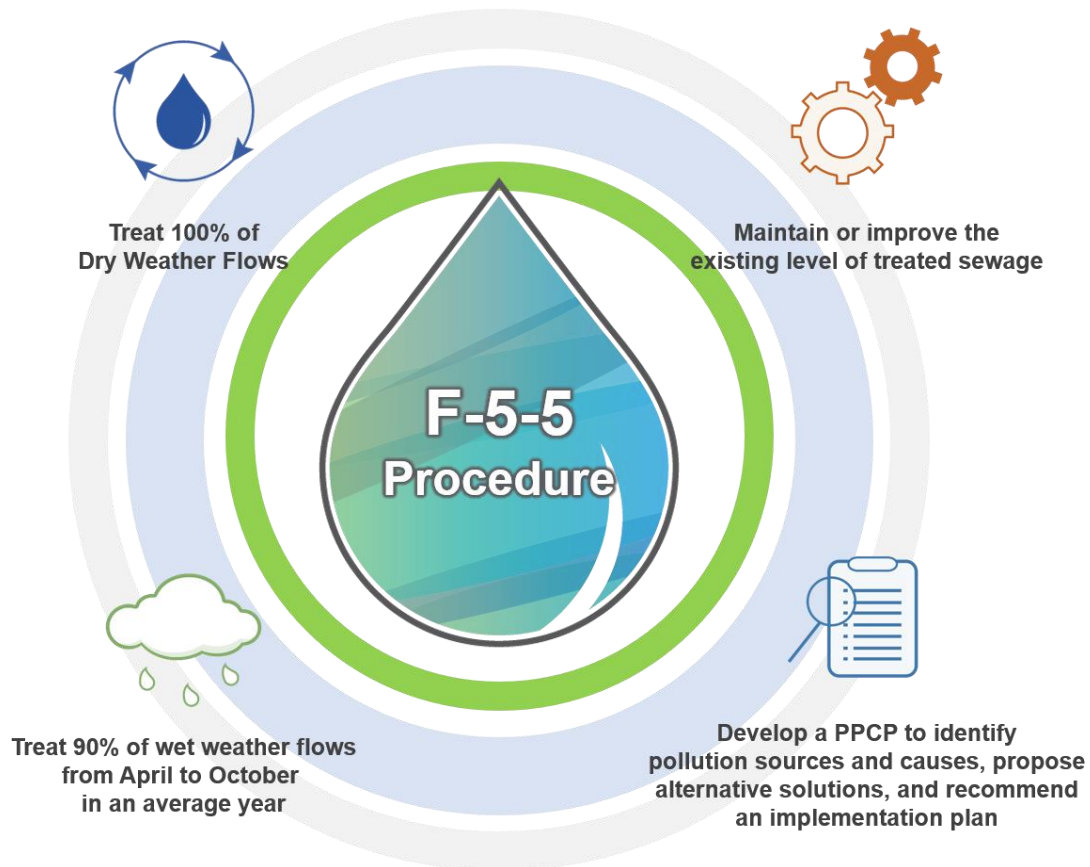


Figure 3-1: MECP F-5-5 Procedure Criteria

Relevance to this study: The recommendations from the PPCP update study, including the final implementation plan, must satisfy the goals and criteria of the MECP F-5-5 Procedure to mitigate the impacts of SSO and bypass volumes on the Thames River and its tributaries.

3.1.3 Canada-Ontario Lake Erie Action Plan (2016)

Under the amended Great Lakes Water Quality Agreement between Canada and the United States, specific phosphorous loading target set for local and lake-wide areas to address algal blooms. For Lake Erie's western and central basins and nearshore priority areas, the target is a 40% reduction in spring loads of total phosphorus and soluble phosphorus (from 2008 levels) by

2025⁵. To support this agreement, the Canada-Ontario Lake Erie Action Plan was developed with multiple agencies and partners including Conservation Authorities and municipalities and serves as Ontario's plan to achieve the phosphorous reduction target.

Relevance to this study: The City, as a leader in active planning, has developed a series of municipal actions to achieve the Lake Erie Action Plan phosphorous loading targets, as set by the Domestic Action Plan. A key action focuses on sewer system overflow reductions which will be met through the PPCP update study by reducing and mitigating the priority overflows and bypasses within the City that contribute untreated wastewater to the Thames River.

3.1.4 Conservation Authorities Act (1946)

The legislative mandate of the Conservation Authority, as set out in Section 20 of the Conservation Authorities Act, is to establish and undertake programs designed to further the conservation, restoration, development, and management of natural resources.

Conservation Authorities are local agencies that protect and manage water and other natural resources at the watershed level. Conservation Authorities act as commenting agencies in the land use planning and development process and may also have agreements with partnering municipalities to provide technical services regarding matters associated with natural heritage protection, hazardous land management, and water resources.

Relevance to this study: There are three local conservation authorities within the municipal boundary of the study area, as shown in **Figure 3-2**: Upper Thames River Conservation Authority (UTRCA), Lower Thames Valley Conservation Authority (LTVCA), and Kettle Creek Conservation Area (KCCA). The implementation plan as part of the PPCP update study shall be consulted with the UTRCA or the LTVCA should any of the recommendations fall within their respective regulation limits.

⁵ Government of Canada Website: [Canada-Ontario Lake Erie Action Plan - Government of Canada](#). Visited February 2024.

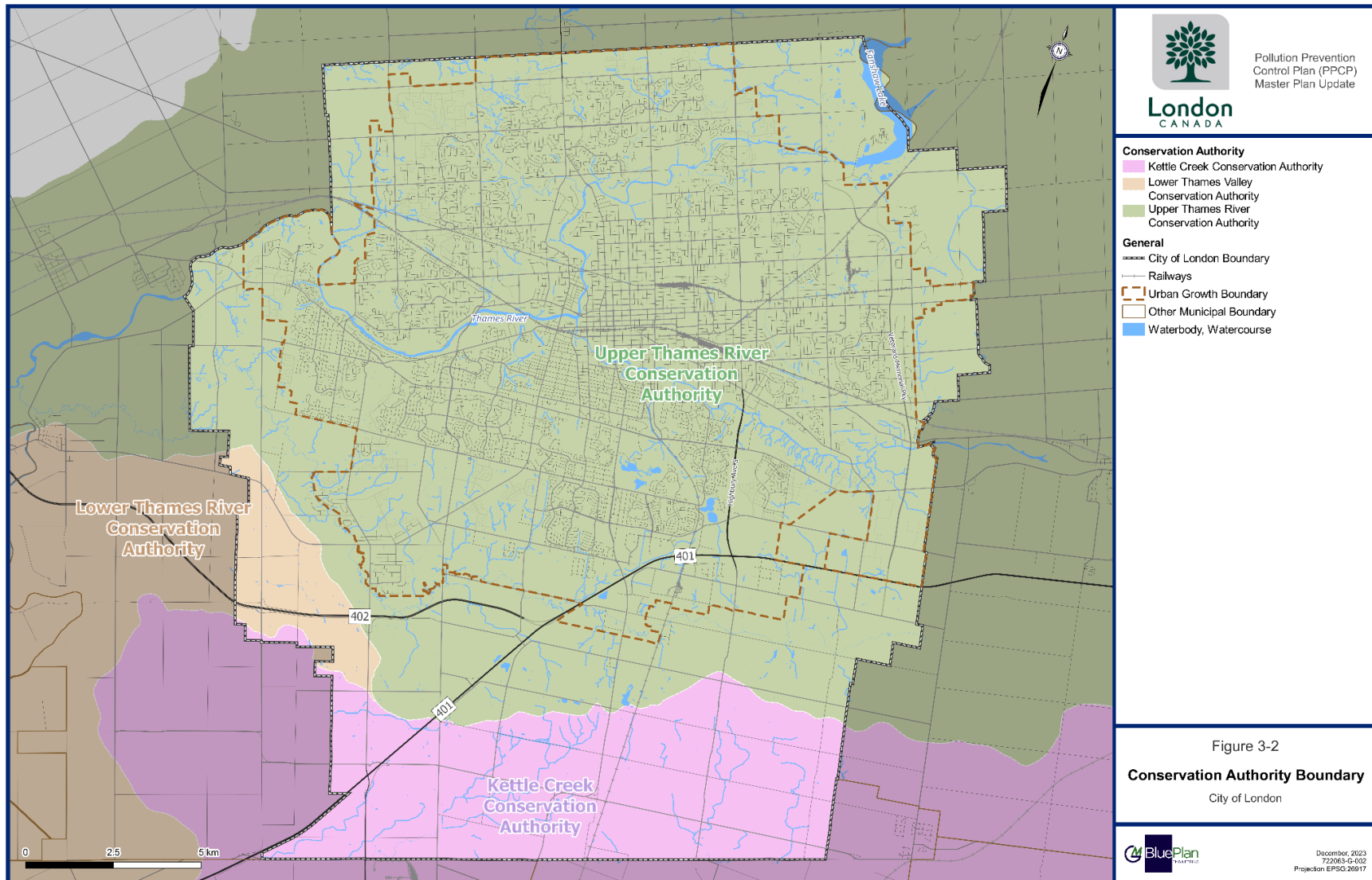


Figure 3-2: Conservation Authority Boundary Map

3.2 Local Legislations and Regulations

3.2.1 Strategic Plan for 2023-2027

The 2023-2027 Strategic Plan outlines the specific outcomes, expected results, and strategies that the Council and Civic Administration will deliver on. In alignment with the Council-declared climate emergency, one of the Strategic Areas of Focus was identified to be Climate Action and Sustainable Growth. This focus area aims to address the challenges of environmental sustainability and long-term climate resilience by building reliable municipal infrastructure in a sustainable way – both financially and environmentally⁶.

Relevance to this study: The 2023-2027 Strategic Plan includes strategies relevant to the PPCP update study such as ensuring that the City's sewer infrastructure is built, maintained, and secured to support future growth and protect the environment.

3.2.2 The London Plan (2023)

The City's Official Plan, hereby referred to as the London Plan, was consolidated on May 25, 2023, adopted by City Council on June 23, 2016 and was approved by the Minister on December 28, 2016. The London Plan is a statement of principles, goals, objectives, and policies intended to guide future land use, physical development, and change. As well, the plan sets out ways to protect and enhance the Natural Heritage System, such as by continually to improve the quality of water that is discharged into the Thames River and its tributaries.

Growth management in the City is in conformity with the Province's Growth Plan, while also staying true to the City's vision and direction for growth. The London Plan anticipates the City's population will grow by more than 77,000 people and 41,000 housing units between 2015 to 2035⁷. Such a significant increase in population requires the provision of reliable, coordinated, and cost-effective civic infrastructure which also avoid adverse impacts on the natural environment.

Relevance to this study: Specifically for the sanitary system, the London Plan identifies that a PPCP will need to be prepared by the City to upgrade, maintain, and replace older sanitary sewage infrastructure to reduce combined sewers and minimize bypasses. The PPCP update

⁶ City of London Website: [City of London - 2023-2027 Strategic Plan](#). Visited February 2024.

⁷ City of London Website: [City of London - The London Plan \(Official Plan\)](#). Visited February 2024.

study will conform to the London Plan for any planning involving municipal infrastructure such as sewers, PSS and WWTPs.

3.2.3 Secondary Plans

A secondary plan is a land use plan for a particular area of a municipality that is prepared as an official plan amendment. Typically, a secondary plan will provide detailed policies for the area it covers in a coordinated planning approach. In the event of conflict between provisions of a secondary plan and provisions of the London Plan, the secondary plan policy shall prevail. The current active secondary plans are listed below, along with the corresponding sewershed:

- Victoria Park Secondary Plan, potentially contributing to the overflows in the Greenway sewershed;
- Byron Gravel Pit Secondary Plan, potentially contributing to the overflows in the Oxford sewershed; and
- White Oaks Dingman Secondary Plan, potentially contributing to the overflows in the Greenway sewershed.

Relevance to this study: In developing the evaluation of pollution source reduction alternatives for the PPCP update study, the impacts to and from active secondary plan areas will be taken into consideration with respect to potential impacts, positive and negative. Specifically, these secondary plan areas may potentially impact the SSO and PS bypass discharge volumes at downstream overflow locations within the corresponding sewershed.

4 Previous PPCP and Related Assessments

The City completed the previous PPCP in three phases in alignment with the requirements of the MECP F-5-5 analysis and the London Plan. Phase 3 of the PPCP developed a road map for implementing infrastructure and operational improvements to reduce and mitigate the impacts of SSOs on the environment. Additional model updates were since completed to expand the hydraulic model to include all serviced areas within these five sewersheds.

4.1 Phase 1 PPCP (2014)

The intent of Phase 1 was to compile and analyze the background information regarding the City sewers and treatment facilities, to develop an understanding of the Thames River water quality, and to create a preliminary ranking of SSO and bypass locations within each sewershed. A total of 149 SSOs and bypasses were confirmed in the City, which corresponded to 45 discharge points.

4.2 Phase 2 PPCP (2018)

The intent of Phase 2 was to conduct water chemistry studies and benthic macro invertebrate studies to provide a more detailed understanding of the Thames River water quality. Further, the SSO and bypass locations were characterized based on the theoretical results from hydraulic modelling for SSOs and the observed overflow volumes for bypasses. Since WWTPs within the City undergo regular plant upgrades and expansions, any bypass concerns to meet the intent of the MECP F-5-5 Procedure is addressed through site specific ECAs. As such, WWTPs were not further considered within Phase 2 and Phase 3 of the PPCP.

As part of Phase 2, 12 modelling assignments were conducted in two rounds between 2015 and 2016 using InfoWorks CS and InfoWorks ICM. The hydraulic modelling results facilitated the estimation of overflow volumes, frequencies, and percent capture of wet weather flows during the 2010 typical year which was representative of current annual precipitation conditions at the time. The modeling assignments were determined by logical groupings of SSO locations within close proximity to each other, within each sewershed, and of similar overflow type. Of the 149 SSOs identified at the beginning of the PPCP, a resulting 136 SSOs were grouped into 12 modelling assignments. All hydraulic modeling assignments were accompanied by a flow monitoring program to calibrate the model and validate the modeling results.

SSOs were evaluated based on the results of the hydraulic modelling assignments, while PS bypasses were evaluated based on the recorded annual overflow volumes during the typical year from April 1 to October 31, 2010. **Appendix A** includes a table of all priority SSOs which were

modelled to have overflowed within the typical year of 2010, ranked by theoretical overflow volume. For both SSOs and bypasses, a high priority ranking meant an overflow volume greater than 1000 m³/yr and if the overflow receiving stream was identified as “impaired” in terms of water quality. A total of 11 SSOs and 6 PS bypasses were considered as high priority and were further evaluated in Phase 3 to identify the preferred alternatives and develop an Implementation Plan to mitigate and reduce these identified overflow volumes.

4.3 Phase 3 PPCP (2018)

The intent of Phase 3 was to evaluate the refined short list of priority SSO and bypass locations determined from Phase 2 and to recommend preferred mitigation measures. The priority SSO locations were grouped by subcatchment (‘Groups A-F’), and the priority PS bypasses were considered as standalone (‘Groups G-L’).

The alternatives for the mitigation and elimination of inflow and infiltration (I&I) wet weather flows focused on source and conveyance control methods rather than end-of-pipe controls. Source controls, such as weeping tile disconnection programs, were considered as a best management practice to reduce the volume of I&I that is directed to the combined or sanitary sewers, which increases the overall system performance. Conveyance controls, such as adjusting SSO structures, increasing pipe sizes and combined sewer separation, also provides system resiliency potential and additional water quality benefits.

A summary of the short-term and medium-term recommended control measures for each applicable priority group is provided below, and the full Implementation Plan can be found in **Appendix B**.

- **Group A:** Seven phases of sewer separation in the City Centre are planned such that stormwater flows do not directly enter the sanitary system. Additionally, storm sewer disconnection at MC-02 and DS-01 is recommended, which will reduce the overflow volumes for both the ‘Group A’ and ‘Group C’ subcatchment areas.
- **Group B:** A weeping tile disconnection program at a 60 percent participation rate is recommended to eliminate the overflow volumes for the subcatchment area.
- **Group C:** Feasibility studies are recommended to determine whether to implement Option 1 to reduce I&I by 50% or Option 2 to remove storm flows from the Pall Mall Storm and Relief sewer.

- **Group D:** The new Cavendish Trunk is planned that will directly impact the overflow volumes for the subcatchment area.
- **Group E:** A feasibility study is recommended to identify the sources of I&I and determine how to reduce I&I by 50%, prior to implementing any infrastructure upgrades.
- **Group F:** The Horton/Wharncliffe Sewer Realignment is planned that will directly impact the overflow volumes for the subcatchment area.
- **Group H:** A weeping tile disconnection program is recommended for the subcatchment area associated with Medway PS.
- **Group I:** A weeping tile disconnection program is recommended for the subcatchment area associated with Sunninghill PS.

For 'Groups G (Westmount PS), J (Hunt Club PS), K (Dingman PS), and L (Southland PS)', no further actions were recommended as part of the 2018 PPCP Implementation Plan.

4.4 Modelling Report (2022)

The City hydraulic model covers the five WWTP sewersheds. Separate model files for Adelaide, Greenway, Oxford, and Vauxhall were initially developed as 13 individual assignments for the Phase 2 PPCP, calibrated using monitoring data from 2014-2016. These were later merged into four sewershed models in 2020. The model network for Pottersburg was created in a separate 2011 assignment. The 2022 modeling assignment expanded the model to include all serviced areas within these five sewersheds. It should be noted that the Greenway sewershed encompasses all of Greenway North, Greenway, Lambeth and Dingman, as shown in Figure 2-1.

As outlined in the Modelling Report, the hydraulic model was updated to include new pumping stations and additional sanitary servicing to cover the new development areas within the City. SSOs listed in the previous PPCP were also tracked in the hydraulic model against existing GIS shapefiles and were removed where implementation projects were indicated to be complete. Of the 136 previously listed SSOs, only 129 remained in the hydraulic model following these updates.

Relevance to this study: The PPCP update study will use the updated hydraulic model as a baseline to verify the updated SSO inventory and determine the F-5-5 percent capture rate for future capacity assessments.

5 2018 PPCP Recommended Project Status Update

Since the completion of the Phase 3 PPCP Report, several recommended projects have been completed or commenced. The City has spent \$57 million for capital projects in relation to the sewer separation since 2018. Most notably, the combined sewer separation within the City Centre as part of 'Group A' has been largely completed. Additionally, the installation of a new Cavendish Trunk sewer as part of 'Group D' has also been completed. **Table 1** includes a status update on the specific short-term and medium-term projects that have been completed or are currently in progress for each applicable priority group as part of the 2018 PPCP Implementation Plan.

The combined sewer separation for 'Group A' is anticipated to have a positive impact in the reduction of stormwater contributions to the downstream overflow locations within the subcatchment area. As well, the new Cavendish trunk sewer is anticipated to reduce the overflow volume within the 'Group D' subcatchment area due to the additional capacity provided. **Figure 5-1** shows the sewer separation completed to date within the City Centre, while **Figure 5-2** shows the location of the upsized Cavendish Trunk sewer. Further discussion and analysis, including the change in overflow volume ($\text{m}^3/\text{Typical Year}$) for the priority group subcatchment areas, will be provided in the updated F-5-5 assessment of the existing system using the new 2018 Typical Year rainfall.

It should also be noted that the City was challenged with the implementation of City initiated weeping tile disconnections within the targeted priority subcatchments as part of 'Groups B, H and I'. Further discussion and analysis will be provided in later technical memorandum to review how to increase disconnection participation rates, as well as a comparison of other I&I reduction and control measures.

Table 1: 2018 PPCP Implementation Plan Status Update

Priority Group	Summary of Recommended Projects/Studies from the 2018 PPCP Implementation Plan	Status of Work Completed	Downstream Overflow Locations Impacted	Future Planned Works
Group A	S2: Five phases of sewer separation in the City Centre along York Street, Talbot Street, Richmond Street, King Street, and Clarence Street.	- Phase 1 completed in 2018 – 450 metres separated. - Phase 2 completed in 2019 - 500 metres separated. - Phase 3 completed in 2020 - 255 metres separated. - Phase 4 completed in 2021 - 380 metres separated.	- SW-01 - CW-04	Phase 5 will be completed in 2027- 410 metres to be separated.
	M2: Two phases of sewer separation in the City Centre along Wellington and York Street.	Phase 6 completed 2023 - 410 metres separated.	- SW-01 - CW-04	Phase 7 will be completed in 2024 - 500 metres to be separated.
Group A and Group C	S3: Storm sewer disconnection at MC-02 and DS-01.	Completed in 2022.	- SW-01 - CW-04 - PM-02 - PM-09 - SD-05 - PM-03	
	S4: Determine the feasibility of reducing the I&I by 50% in the PM-02, PM-03 and PM-09 catchment areas (Option 1). S4: Determine the feasibility of removing storm flows from the Pall Mall Storm and Relief sewer to utilize the sewer as in-line storage for the Pall Mall Trunk SSOs (Option 2).	Initiated and on-going.	- SW-01 - CW-04 - PM-02 - PM-09 - SD-05 - PM-03	Option 1 / Option 2.

Priority Group	Summary of Recommended Projects/Studies from the 2018 PPCP Implementation Plan	Status of Work Completed	Downstream Overflow Locations Impacted	Future Planned Works
Group B	S7: Implement a targeted weeping tile disconnection program at a 60 percent participation rate.	Initiated and on-going.	- SP-45 - SW-03	To review how to increase disconnection participation rates.
Group D	S5: Construct the Cavendish Trunk sewer.	- Phase 1 completed in 2018 - 220 metres replaced. - Phase 2 completed in 2019 - 445 metres replaced. - Phase 3 completed in 2020 - 510 metres replaced.	SD-01	
Group E	S6: Determine the feasibility of removing I&I from the identified sources.	Initiated and on-going.	CP-09	
Group F	M3: Realignment of the Horton/Wharnccliffe Sewer.	Initiated and on-going.	SN-05	Construction to begin in 2025.
Group H	M4: Implement a weeping tile disconnection program.	Initiated and on-going.	Medway PS	To review how to increase disconnection participation rates.
Group I	M5: Implement a weeping tile disconnection program.	Initiated and on-going.	Sunninghill PS	To review how to increase disconnection participation rates.

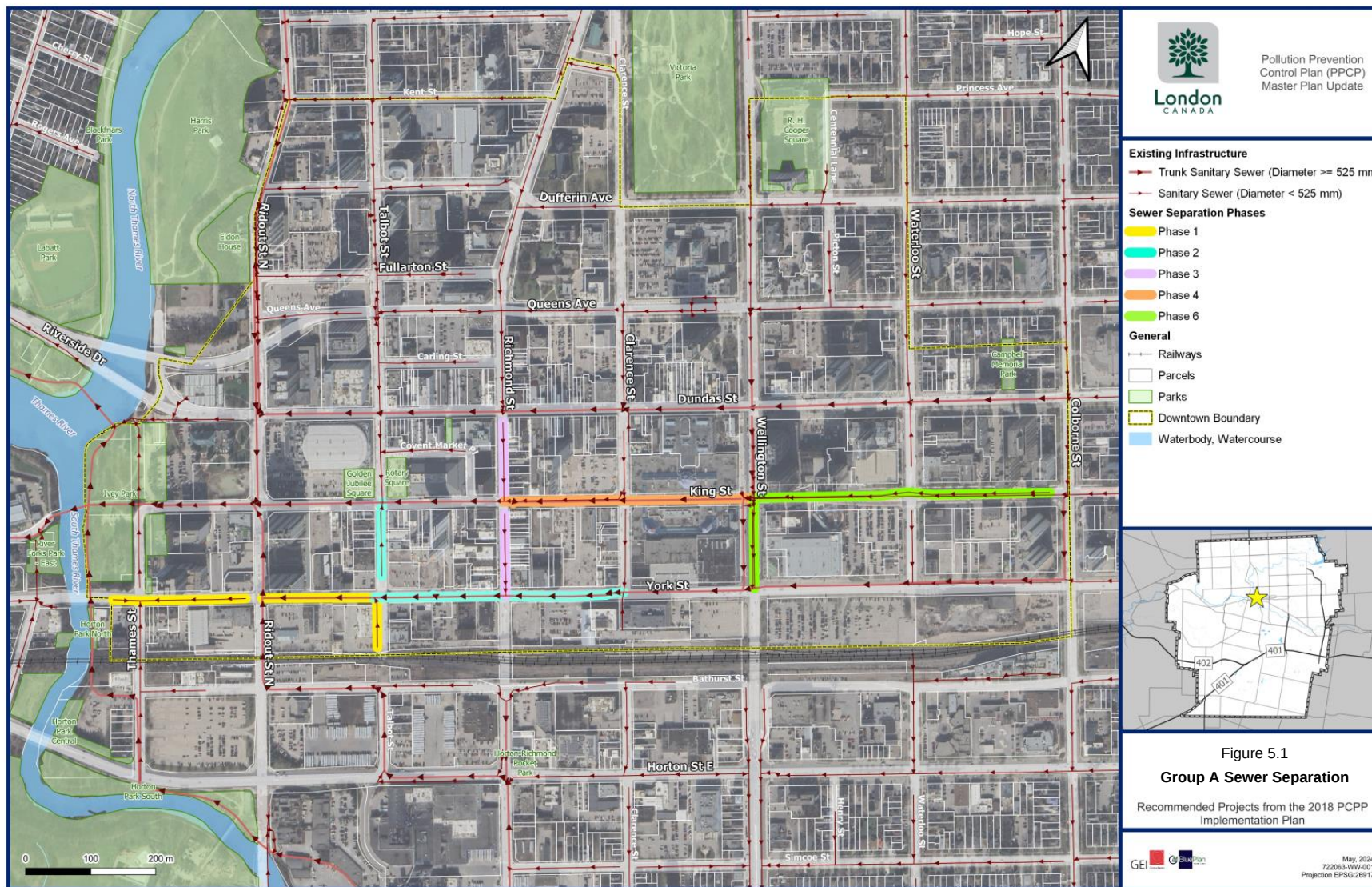


Figure 5-1: 'Group A' Sewer Separation Completed

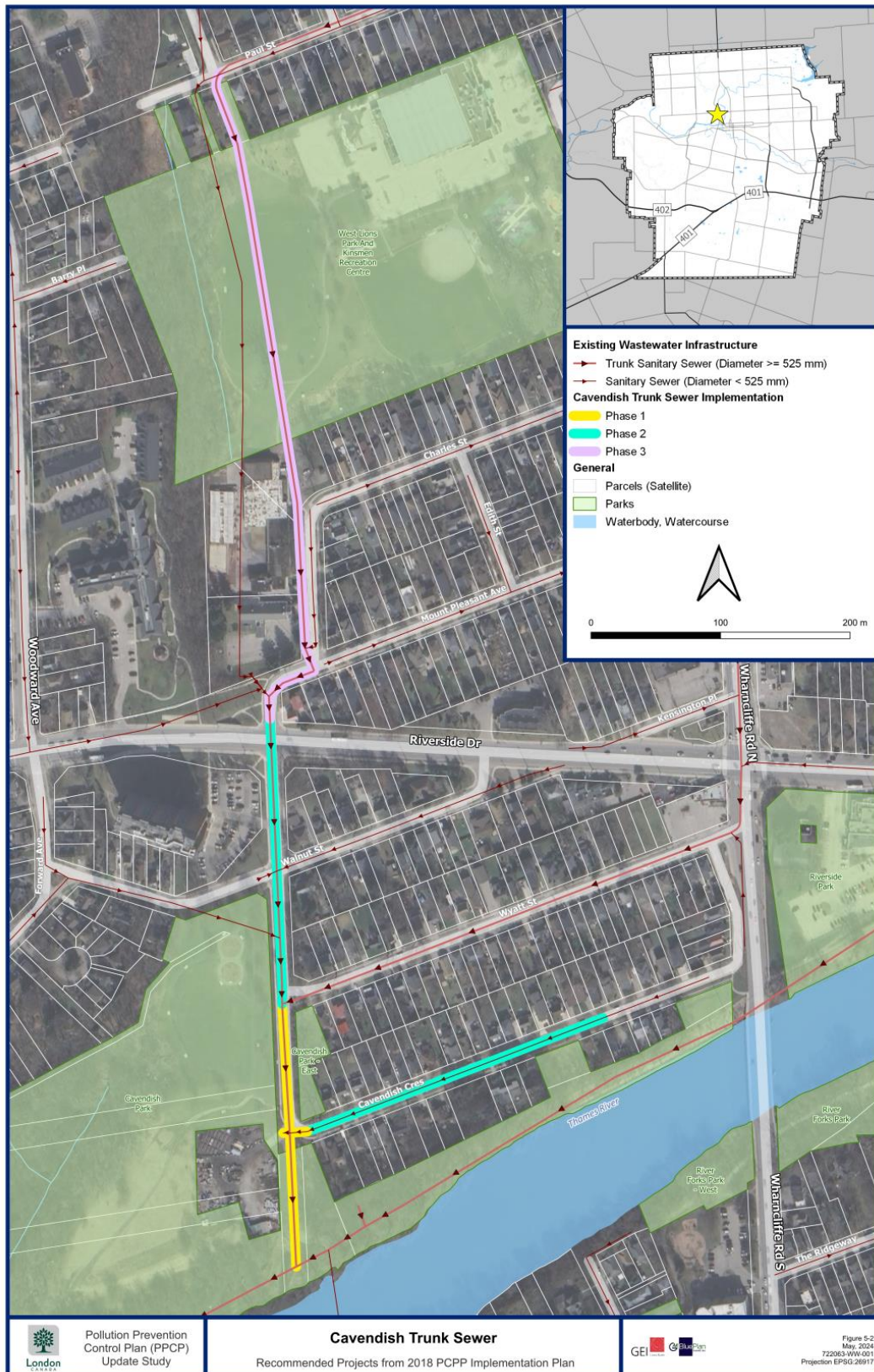


Figure 5-2: 'Group D' Cavendish Trunk Sewer Implementation

6 Conclusion and Next Steps

The 'Background Document Review and Summary' technical memorandum reviewed and compiled all relevant information available regarding the Study Area, relevant Legislations and Regulations at both the provincial and local levels, a summary of the previous PPCP and Related Assessments, and a Status Update on the short and medium-term recommended projects and studies as per the 2018 PPCP Implementation Plan.

Additional technical memorandums will be completed in support of the PPCP update study which will utilize the information in this bridging document as a basis. Next steps are to complete the F-5-5 assessment of overflows in the existing system and evaluate I&I reduction and control measures. This technical memorandum will be included as an appendix to the final PPCP Update Study Report.

Appendix A – 2010 Typical Year Priority SSO Rankings

Table 2: SSOs Ranked by 2010 Typical Year Overflow Volume

SSO ID	SSO Location	Typical Year Overflow Volume (m ³)	F-5-5 Percent Capture Rate	Priority
SW-01	King St. and Thames St.	40,251	87%	High
PM-02	Pall Mall St. and Richmond St.	10,332	83%	High
SD-01	Cavendish Cres. south towards Thames River	10,070	95%	High
PM-09	Lorne Ave. and Elizabeth St.	7,752	78%	High
SN-05	Evergreen Ave. and Riverview Ave.	3,390	85%	High
CW-04	York St. and Ridout St.	2,709	97%	High
SD-05	Ridout St. at Blackfriars Bridge	2,531	96%	High
PM-03	Pall Mall St. and Maitland St.	1,397	97%	High
DS-01A	Dundas St. and Ridout St. N (top)	0 ^a	N/A ^d	N/A ^f
DS-01B	Dundas St. and Ridout St. N (bottom)	Unknown ^b	N/A ^d	N/A ^f
MC-02	King St. between Thames St. & Ridout St.	Unknown ^c	N/A ^d	N/A ^f
SD-08	Trevithen St. (north limit)	607	98%	Medium
PM-30	Oxford St. E and Barker St.	358	92%	Medium
PM-25	Quebec St. and Salisbury St.	358	98%	Medium
SP-19	Windsor Ave. and Belgrave Ave.	322	97%	Medium
CP-09	Edward St. and Tecumseh Ave. E	322	99%	Medium ^e
SN-03	Ivey Park	319	100%	Medium
SP-12	Simcoe St. and Richmond St.	307	99%	Medium
SP-16B	Waterloo St. at Thames River	280	75%	Medium
PM-28	Quebec St. north of Mornington Ave.	274	98%	Medium
SP-46	Emery St. E and Belgrave Ave.	261	99%	Medium
PM-15	Quebec St. and Dundas St.	259	97%	Medium
SP-53	Windsor Ave. at Belgrave Ave.	208	N/A ^d	Medium
PM-29	Quebec St. south of Oxford St. E	191	99%	Medium
SP-03	Western Rd. and Windermere Rd.	186	98%	Medium
SP-54	422 McKenzie Ave.	178	N/A ^d	Medium
SD-03	Wellington St. north of Thames River	162	86%	Medium
SW-02	Grey St. and Richmond St.	161	99%	Medium
SP-45	Devonshire Ave and Cathcart St.	146	98%	Medium ^e

PM-06	Princess Ave. and William St.	126	100%	Medium
SP-14	Adelaide St. N and South St.	78	99%	Medium
PM-11	Ontario St. and Dufferin Ave.	66	100%	Medium
PM-19	McMahen St. and Adelaide St. N	58	98%	Medium
SP-07	Dundas St. and Ontario St.	51	16%	Medium
CW-05	Grand Ave. and Wellington Rd.	25	100%	Medium
PM-34	Oxford St. E and Linwood St.	24	100%	Medium
PM-01	Mill St. and Talbot St.	22	100%	Medium
PM-20	Adelaide Street north of McMahan St.	11	99%	Medium
PM-31	Oxford St. E and Stuart St.	8	100%	Medium
PM-16A	Pall Mall St. and William St.	5	100%	Medium
SW-03	Devonshire Ave west of Cathcart St.	5	100%	Medium ^e
PM-12	903 Queens Ave.	4	100%	Medium
MC-01	Horton St. E and Richmond St.	2	100%	Medium
PM-05	William St. and Central Ave.	2	100%	Medium

Note: SSOs which do not overflow during a typical year are considered a low priority not included on this list.

^a This SSO overflows to sanitary sewer connected to DS-01B

^b Results suggest negligible sanitary overflow volume enters the storm sewer. It is recommended that this SSO is further investigated.

^c Overflow structure requires further investigation.

^d Percent capture cannot be accurately calculated.

^e Medium priority based on typical year overflow volume; high priority based on BioMAP Water Quality

^f SSO to be further investigated and influences flow at SW-01. SSO is linked to SW-012022 Infoworks – Vauxhall, Greenway, Pottersburg, Adelaide, Oxford



Appendix B – 2018 PPCP Implementation Plan

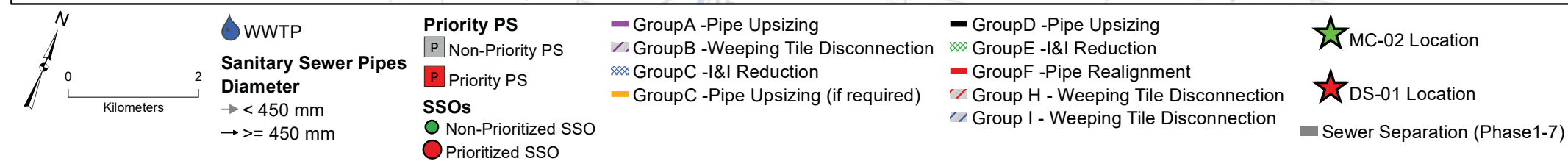
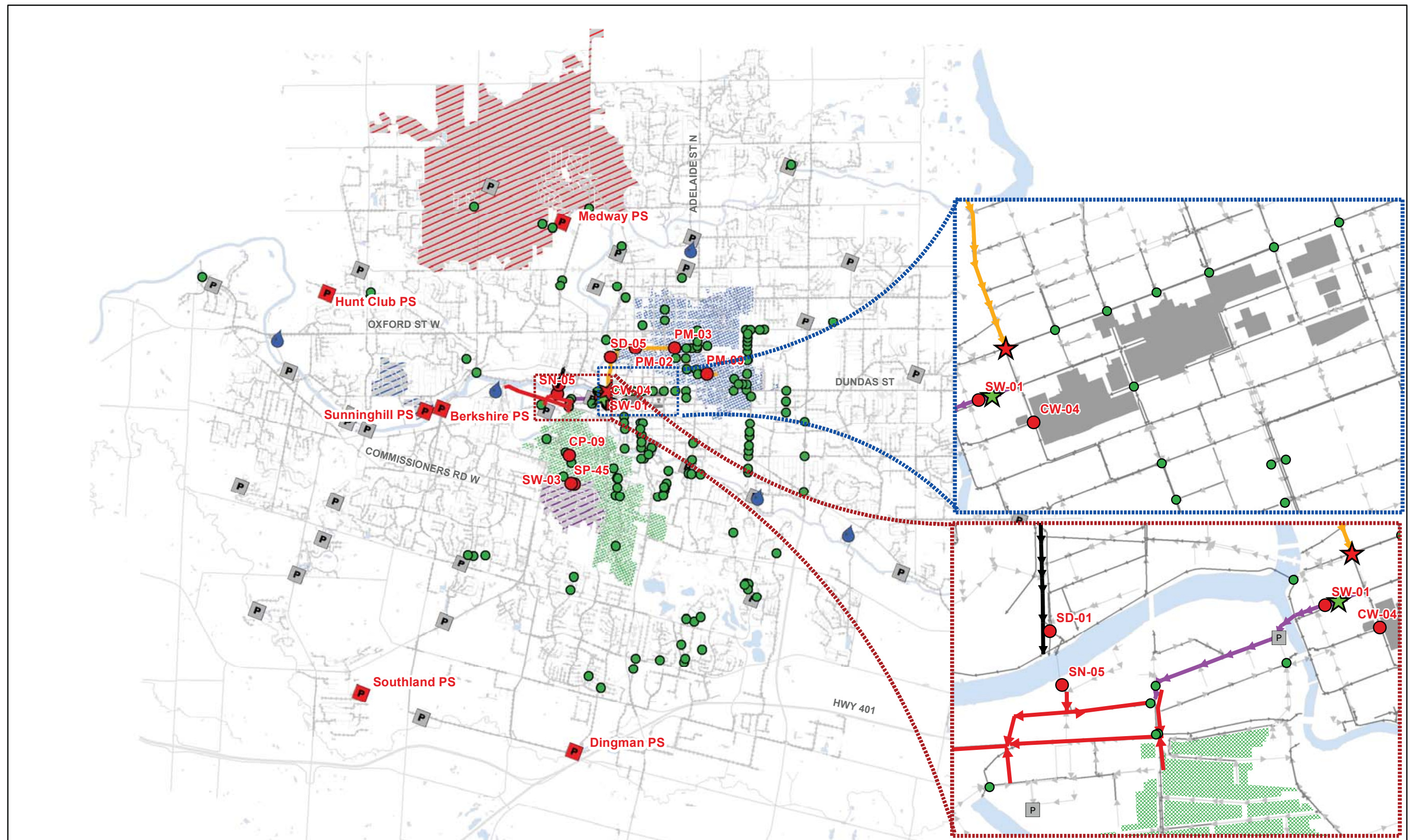


Figure ES-6
 Preferred Alternatives for Priority SSO Groupings
 London Pollution Prevention and Control Plan
 City of London

Table ES-2. Recommended Implementation Plan

Project Implementation Number	Group ID.	Group Description	Recommendation	SSO(s) Impacts	Infrastructure/Construction Cost Estimate	Engineering Cost Estimate	Considerations	Implementation Timeframe
S1	N/A	N/A	Egerton Street sewer separation (from Dundas Street to 75 m north of Brydges Street, King Street from Egerton St to Kellogg Lane) and King Street (from Egerton Street to Kellogg Lane)	N/A	\$5,799,999 ^a	-	This planned project will help reduce the wet weather flows in the sanitary system in the Vauxhall sewershed.	Short-Term Phase 1 - 2018
S2	Group A	King/Thames, York/Ridout and Richmond	Storm Sewer Separation Phase 1 (River to Talbot Street, and Talbot Street south to CN rail tracks) to Phase 2 (Talbot Street to Clarence Street, and Talbot Street from York Street to King Street)	SW-01, CW-04	\$15,050,500 ^{a,d}	\$ 1,441,000 ^d	This project will help reduce the wet weather flows in the Group A catchment area. Remaining phases of downtown sewer separation are recommended in subsequent years, depending on budget availability etc.	Short-Term Phase 1 - 2018 Phase 2 - 2019
S3	Group A and C	King/Thames, York/Ridout and Richmond and Pall Mall Relief System	Storm sewer disconnection at MC-02 and DS-01	SW-01, CW-04, PM-02, PM-09, SD-05, PM-03	\$4,000	-	Verify no PDCs remain upstream of storm sewers.	Short-Term
S4	Group A and C	King/Thames, York/Ridout and Richmond and Pall Mall Relief System	Conduct an I&I reduction analysis to determine feasibility of reducing the I&I by 50 percent in the PM-02, PM-03, and PM-09 catchment areas	SW-01, CW-04, PM-02, PM-09, SD-05, PM-03	-	\$150,000	This should be carried out to determine feasibility and effectiveness on I& reduction, to determine if there is need to increase the Pall Mall trunk sanitary sewer size.	Short-Term

Project Implementation Number	Group ID.	Group Description	Recommendation	SSO(s) Impacts	Infrastructure/Construction Cost Estimate	Engineering Cost Estimate	Considerations	Implementation Timeframe
S5	Group D	Cavendish	Construct the new proposed Cavendish Trunk. Monitor the overflow volume at SD-01 after completion of the construction of the new Cavendish Trunk to reassess this SSO	SD-01	\$2,695,350 ^a	\$10,000 (flow monitoring)	Phase 1 of the Cavendish trunk is planned for construction in 2018. SD-01 has a relatively large overflow volume during the typical year.	Short-Term
S6	Group E	Edward/Tecumseh	That an I&I study to identify the sources of I&I and determine the feasibility of removing the I&I be conducted before any infrastructure upgrades are implemented for CP-09	CP-09	-	\$150,000	This study should be initiated in 2018 of 2019 to determine the potential for I&I reduction in this catchment area.	Short-Term
S7	Group B	Cathcart/ Devonshire	Implement a targeted weeping tile disconnection program to achieve a 60 percent participation rate, which corresponds to 250 homes in the Group B catchment area	SP-45, SW-03	\$1,275,000	-	Requires home owner participation	Short-Term
M1	N/A	N/A	Storm Sewer Separation for the City's combined sewer areas (that are not included in S1, S2 M2, and L1). This includes approximately 17 km of combined sewer replacement (through complete infrastructure renewal and road reconstruction). ^b	N/A	\$108,800,000 ^c	\$16,300,000 ^e	The planned sewer separation projects will help reduce wet weather flow within the City's sanitary system. Please refer to the Canada-Ontario Lake Erie Action Plan for phosphorus reduction for further details.	Medium- Term
M2	Group A	King/Thames, York/ Ridout and Richmond	Storm Sewer Separation Phase 3 (Richmond Street – York Street to	SW-01, CW-04	\$42,000,000 ^d	\$5,300,000 ^e	This project will help reduce the wet weather flows in the	Medium-Term

Project Implementation Number	Group ID.	Group Description	Recommendation	SSO(s) Impacts	Infrastructure/Construction Cost Estimate	Engineering Cost Estimate	Considerations	Implementation Timeframe
			Dundas Street), Phase 4 (King Street Phase 1 – Richmond Street to Wellington Street), Phase 5 (Clarence Street – York Street to Dundas Street; York Street – Clarence Street to Wellington Street), and Phase 6 (Wellington Street – Dundas Street to King Street; King Street – Wellington Street to Colborne Street)				Group A catchment area. Remaining phases of downtown sewer separation are recommended in subsequent years, depending budget availability etc.	
M3	Group F	Evergreen/ Riverview	Implement the proposed Horton/Wharncliffe Sewer Realignment infrastructure upgrades. Monitor the overflow volume at SN-05 after completion of the construction of the new proposed Horton/Wharncliffe Sewer Realignment to reassess this SSO	SN-05	\$5,100,000 ^f	\$10,000 (flow monitoring) \$765,000 ^e	Needs to be implemented before Group A and Group C pipe capacity upgrades, but implemented after some wet weather flow reduction is achieved upstream so that flows to the Greenway WWTP are not substantially increased.	Medium-Term
M4	Group H	Medway PS	Implement a targeted weeping tile disconnection program in the Group H catchment area.	N/A	\$17,243,100 ^g		Requires home owner participation.	Medium-Term
M5	Group I	Sunninghill PS	Implement a targeted weeping tile disconnection program in the Group I catchment area.	N/A	\$1,907,400 ^g		Requires home owner participation.	Medium-Term

Project Implementation Number	Group ID.	Group Description	Recommendation	SSO(s) Impacts	Infrastructure/Construction Cost Estimate	Engineering Cost Estimate	Considerations	Implementation Timeframe
L1	Group A	King/Thames, York/ Ridout and Richmond	Storm Sewer Separation Phase 7 (York Street – Wellington Street to Colborne Street)	SW-01, CW-04	\$10,440,000 ^d	\$1,310,000 ^e	This project will help reduce the wet weather flows in the Group A catchment area.	Long-Term
L2	Group A and C	King/Thames, York/ Ridout and Richmond and Pall Mall Relief System	Upsizing the 900-mm-diameter pipe from the intersection of King St. and Ridout St. to Wharncliffe Rd. and Becher St. to a 1,200-mm-diameter pipe. Increase SW-01 invert elevation to pipe obvert.	SW-01, CW-04, PM-02, PM-09, SD-05, PM-03	\$6,204,000 ^h	\$930,600 ^e	This is a requirement to reduce discharges and has a major impact on SSO volumes and frequency. The pipe capacity increases at Wharncliffe/ Horton need to be implemented first. To avoid excessive construction in the downtown core, this should not be implemented until the sewer separation projects are complete.	Long-Term
L3	Group A and C	King/Thames, York/ Ridout and Richmond and Pall Mall Relief System	Complete I&I removal projects and then increase the SSO control elevations along the Pall Mall trunk sewer to reduce the potential for overflow	SW-01, CW-04, PM-02, PM-09, SD-05, PM-03	N/A ⁱ		This is a preferred approach to improve capacity and reduce SSOs than increasing the Pall Mall sewer pipe size. SSO elevations should not be increased until after upsizing the 900-mm-diameter pipe from the intersection of King St. and Ridout St. to Wharncliffe Rd. and Becher St. to a 1,200-mm-diameter pipe.	Long-Term (if required)

Project Implementation Number	Group ID.	Group Description	Recommendation	SSO(s) Impacts	Infrastructure/Construction Cost Estimate	Engineering Cost Estimate	Considerations	Implementation Timeframe
L4	Group A and C	King/Thames, York/Ridout and Richmond and Pall Mall Relief System	Replace the Pall Mall trunk sewer with a 900-mm-diameter pipe from Elizabeth St. and Queens Ave. to Dundas St. and then increase the SSO control elevations along Pall Mall trunk to reduce the potential for overflow	SW-01, CW-04, PM-02, PM-09, SD-05, PM-03	\$24,066,000	\$3,609,900 ^e	This option should only be implemented if sufficient I&I reduction cannot be achieved (based on the I&I study). This work should not be completed until after upsizing the 900-mm-diameter pipe, from the intersection of King St. and Ridout St. to Wharncliffe Rd. and Becher St. to a 1,200-mm-diameter pipe.	Long-Term (if required)
L5	Group E	Edward/Tecumseh	Complete I&I removal projects.	CP-09	N/A ⁱ		Relatively low overflow volume. This is a preferred approach to improve capacity and reduce SSOs than increasing pipe sizes.	Long-Term (if required)
L6	Group E	Edward/Tecumseh	Upsize the sewers downstream of CP-09 to Wharncliffe and Horton.	CP-09	\$11,741,300	\$1,761,195 ^e	Relatively low overflow volume. This option should only be implemented if sufficient I&I reduction cannot be achieved (based on the I&I study).	Long-Term (if required)

^a Cost based on tendered value

^b Source: City of London (2017)

^c Cost based on a unit cost, with the assumption that the average cost of this full road reconstruction (watermain, sewer and selected utility upgrade/replacement) is equivalent to installing 900 mm diameter sewers at 5 m depth.

^d Source: AECOM (2017)

^e Cost assumed from 15% of construction cost

^f Source: R.V. Anderson Associates Limited (2016)

^g Cost based on the assumption that 100% of the homes with weeping tile connections in the catchment area will participate in disconnecting weeping tiles from the sanitary system.

^h Assuming bridge work on the King Street Pedestrian Bridge is not required

ⁱ Cost of reducing I&I to be determined during I&I reduction feasibility study