

Draft Terms of Reference – City of London Municipal Class Environmental Assessment – Pollution Prevention and Control Study to Work Towards Conformance with Procedure F-5-5

Background

The discharge of combined sewer overflow (CSO) volumes to receiving streams has been an issue in Ontario for a number of municipalities for decades. Through the development of Pollution Prevention and Control Plans (PPCPs), municipalities have been identifying CSOs and developing strategies to remove them or mitigate their impacts to acceptable levels.

Infrastructure

The City of London's first collection systems were built in the 1850's. Some of these original sewers are still in service today. Over the years, the City has grown through annexations of former municipalities and has assumed responsibility for their sewers, pumping stations and pollution control plants. Today, the City is responsible for approximately 2,750 km of sanitary, storm, and combined sewers. The City's sanitary sewer system is comprised of six main sewersheds (Pottersburg, Vauxhall, Greenway, Adelaide, Oxford, and Southland).

The City recently completed a program to identify and document CSOs and identify their discharge points within the City sewer system. In some cases, multiple CSOs enter the same relief sewer and discharge to a common discharge point. In all, the City confirmed 129 CSO locations within the conveyance system and 45 corresponding discharge points to receiving streams.

There are also six wastewater treatment plants (WWTPs) and 37 wastewater pumping stations in the City of London. Each WWTP has a plant bypass and 28 of the 37 pumping stations have bypasses that discharge directly to receiving streams during extreme wet weather events. The primary receiving stream for the City of London is the Thames River and the largest contributor of bypass volumes to the Thames is the Greenway sewershed and the Greenway Pollution Control Centre.

Receiving Stream Environment

Like most rivers in southern Ontario, the Thames River is a Policy 2 receiving stream for phosphorus as defined by the MOE in their "Water Management - Policies, Guidelines, Provincial water Quality Objectives of the Ministry of the Environment and Energy, July 1994." This designation indicates that the water quality in the Thames River does not meet the provincial water quality objective for phosphorus and cannot be further degraded, and that all practical measures shall be taken to upgrade the water quality to the Provincial standards. In 2006, the City completed a Discharge Strategy Master Plan with a preferred

solution to systematically reduce phosphorus discharge concentrations with future plant expansions.

Ongoing Pollution Prevention and Control Efforts

The City has an ongoing program aimed at investigating CSO and bypass issues and developing and implementing remediation plans. This program is developed and implemented by the City's Wastewater and Drainage Engineering Division (WADE). This program has led to the identification and mitigation of a number of CSO sources. In 2008, the City of London completed a CSO inventory program to map and document suspected overflow locations through drawing review and field inspections. WADE has also compiled a list of available CSO and bypass data. The related reports and inventory data will be made available to the successful consultant for this study.

Numerous capital improvement projects have recently been completed or are planned that may impact the frequency and volume of CSO and bypass discharges. These include upgrades at WWTPs and improvements to sanitary pumping stations and sewer capacities. Drawings and information related to these projects will be made available to the successful consultant for this study.

Water Quality and benthic studies have been ongoing in the Thames River. The Upper Thames Conservation Authority cooperates with the City in efforts to assess the water quality in the river within the boundaries of the City. Water Quality information and existing benthic data from the City of London are available on the City's website.

Purpose and Goals of the Project

The purpose of the proposed project is to develop a long-term solution to the wet weather CSOs and bypasses in the City of London. The project goal is to address CSOs and bypasses to meet system wide conformance with Procedure F-5-5 and understand and mitigate the impacts of CSO and bypass volumes on the Thames River water quality. To achieve this goal, the PPCP will be required to establish recommendations that will allow the City to meet the F-5-5 requirements as set forth by the MOE in "Procedure F-5-5, Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface waters".

The implementation of successful CSO and bypass control measures and the development of a long term solution requires a thorough understanding of the collection system, pumping stations, and WWTP characteristics. This understanding will be developed through this PPCP, through a number of other related studies that will be initiated by the City of London to run concurrently with this PPCP and through the ongoing efforts of WADE and Sewer Operations to improve and maintain the City's sanitary infrastructure.

Project Description

The proposed PPCP project relates to the provision of engineering services for the development of a PPCP under the Municipal Class Environmental Assessment process as a Schedule "B" Master Plan. The consultant services include the development of the Master

Plan documentation and the public consultation as required in the Municipal Engineers Association Class EA Planning Process for Master Plan level studies.

The objectives of the PPCP are to:

- Complete the study following the Phase 1 and Phase 2 components of the Class EA Master Planning process
- Create a detailed CSO and bypass inventory
- Create a ranked list of discharge points for CSOs and bypasses, based on theoretical maximum capacity
- Characterize the receiving stream environment (Thames River) in regard to water quality and CSO and bypass impacts
- Estimate CSO and bypass volumes and frequencies through theoretical hydrologic and hydraulic modelling
- Compile and screen a comprehensive list of CSO and bypass control alternatives
- Determine the preferred control measures for the reduction of CSO and bypasses
- Develop a prioritized implementation plan for the preferred control measures that will allow the City to meet MOE Procedure F-5-5 on a system wide basis and mitigate the impact on water quality in the Thames River

Project Implementation Overview

The project will be delivered in three phases. These phases do not necessarily coincide with the Class EA Phase 1 and Phase 2 descriptions and may overlap where required to complete the overall PPCP. General scheduling requirements are provided in the Terms of Reference but the consultant is required to assess the schedule requirements and determine the most optimal schedule for completion of each of the individual tasks within the three phases of work. The scope of work for the PPCP has been developed to be supported by the other studies initiated by WADE to improve and maintain the City's sanitary infrastructure.

The PPCP will be directed by a Technical Steering Committee comprised of the City of London, the Ministry of the Environment (MOE) and the Upper Thames River Conservation Authority (UTRCA).

Phase One

The intent of Phase One is to initiate the PPCP, develop an understanding of the current information available in regard to Thames River benthic and water quality data, and to create a ranked list of CSO and bypass discharge points within each sewershed. The CSO and bypass status of each respective sewershed within the City's sanitary infrastructure is, at this time, understood to varying levels of detail. The intent is that at the conclusion of Phase One, the existing information and identified gaps of each of the sewersheds be understood and, at a minimum, a ranked list of CSO and bypass discharge points is developed. **Where sufficient information is not available to adequately characterize each sewershed in this manner, the additional effort required will be recommended by the consultant to be completed as part of WADE efforts concurrent with Phase One.**

Phase Two

The intent of Phase Two is to continue with the Class EA requirements, to develop a benthic and water quality characterization of the Thames River in relation to the impacts of water quality impairment that may result from CSO and bypasses, and to further develop the characterization of the CSO and bypass information using hydrologic and hydraulic modelling to allow the theoretical frequency and volume of each individual CSO and bypass to be determined. Using CSO and bypass information, a list of priority CSO and bypass locations will be developed based on the requirement to conform with F-5-5. The long list of available CSO and bypass control measures will also be screened in Phase Two. **Where sufficient information is not available to adequately characterize each CSO and bypass, the additional effort required will be recommended by the consultant to be completed as part of WADE efforts concurrent with Phase Two.**

Phase Three

The intent of Phase Three is to complete the Class EA requirements for the PPCP and to recommend preferred CSO and bypass control measures. These recommended control measures will address the priority CSO and WWTP bypasses and allow the City to meet system wide conformance with Procedure F-5-5 and mitigate the impacts of CSO and bypass volumes on the Thames River water quality. An implementation plan is required that describes the costs and schedule of the recommended control measures.

Detailed Task Descriptions

The detailed scope of engineering services requested for each of the three phases is outlined below.

Phase One

Task 1: The Initiation of the Project as a Master Plan Schedule “B” Class EA

The proposed PPCP will be completed as a Class EA Schedule “B” Master Plan. The Master Plan, at a minimum, must address Phases 1 and 2 of the Class EA process. The successful consultant shall complete the following tasks in order to meet all the requirements of the Master Plan including but not limited to:

- Development of a mailing list including agencies, interest groups, and NGOs
- Development of a Notice of project commencement (The City will be responsible for publishing the Notice)
- Define the project need and purpose
- Create and maintain the required project files for the Master plan
- Prepare a Notice of a Public Information Centre (PIC) (The City will be responsible for publishing the Notice)
- Prepare for and attend the PIC to inform the public of the intent and objectives and tasks related to the project
- Prepare a consultation report to the City on the outcome of the PIC

Anticipated Deliverables: Mailing list, notices, PIC panels, and PIC report

Task 2: Collection and Review of Background Data and Relevant Documentation

The consultant will collect and review all relevant infrastructure and receiving stream data and documentation from available sources and provide to the Technical Steering Committee a summary of the relevant information including an initial gap analysis. The gap analysis will identify where data and documentation is not available and what effort is required to fill the gaps that would assist in the development of the PPCP. The review and gap analysis will be provided to the Technical Steering Committee in a technical memorandum style report.

Anticipated Deliverables: Task Technical Memorandum on review summary and gap analysis

Task 3: Thames River Historical Benthic Studies and Water Quality Review

The consultant will be required to collect and review relevant benthic and water quality information from the Thames River and tributary receiving streams from historical reports. The benthic inventory and water quality studies provide the background for establishing current trends in river water quality. Previous trends and potential data gaps or methodology gaps are to be assessed and reported as part of this Phase One Task. Also, as part of this review, the CSO and bypass discharge point locations inventoried in Task 4 will be compared to the historical benthic and water quality sample locations to determine if more suitable sites are required to adequately characterize the impacts of CSO discharges and bypasses on Thames River water quality. The requirements for the Thames River Characterization in Phase Two may be adjusted based on the results of this Task 3 review.

Anticipated Deliverables: Task Technical Memorandum on summary of historical water quality trends and recommendations for Phase Two benthic and water quality study

Task 4: Inventory of Collection System CSOs and Bypasses and Discharge Points

Having regard for the current available information, the consultant will develop an inventory of all known CSOs and bypasses on a sewershed basis for the City's six main sewersheds (Pottersburg, Vauxhall, Greenway, Adelaide, Oxford, and Southland). The inventory must include hydraulic calculations of the CSO or bypass regulator as well as the corresponding discharge point. The theoretical maximum capacity (full-pipe gravity flow) of each CSO and bypass will be determined by the consultant using previously gathered information. The number of locations to be evaluated is estimated to be:

- 129 collection system CSOs and 45 corresponding discharge points
- 28 pumping station bypasses and corresponding discharge points
- 6 WWTP bypasses and corresponding discharge points

Where comprehensive data is not available from existing information, a scope of work will be defined that will allow for sufficient effort to complete the inventory and characterization. A cost for this effort will be developed by the consultant and a recommendation of scheduling to complete this work within the requirements of the PPCP Phase One will be made.

The final inventory will be provided to the Technical Steering Committee in a technical memorandum style report, including GIS location mapping and tabular descriptions for each CSO, bypass and discharge location.

Anticipated Deliverables: Task Technical Memorandum and additional scope of work description

Task 5: Determination of Flow Monitoring Requirements

From the Task 1 background review of available sewershed studies and recently completed flow monitoring data, the consultant will recommend the number and location of flow monitors required to assist with the hydrologic and hydraulic modelling exercise to be completed in Phase Two.

Anticipated Deliverables: Task Technical Memorandum on monitoring recommendations

Task 6: Ranking of CSO and Bypass Discharge Points

The consultant will produce a ranked list of CSO and bypass discharge points based on several factors. These factors are anticipated to include, but are not limited to, the following:

- The theoretical maximum capacity of all CSOs and bypasses contributing to a given discharge point
- The overflow freeboard clearance of CSOs based on comparison of the controlling overflow elevation (weir, overflow pipe, etc.) to the sanitary sewer invert
- Historically measured CSO and bypass volumes
- Theoretical contaminant loadings
- Receiving stream conditions downstream of the discharge point

The Technical Memorandum for Task 6 will include details of the rationale for the ranking and comprehensive GIS mapping of the CSOs and bypasses and discharge points and historical receiving stream monitoring locations. The consultant will also prepare a summary report of the Phase One results, including conclusions and recommendations for further study.

Anticipated Deliverables: Task Technical Memorandum on rankings, Phase One Summary Report

Phase Two

Note – it is anticipated that the detailed task descriptions for Phase 2 will be re-visited at the end of Phase 1 by the Technical Steering Committee and modified as necessary.

Task 7: Continuation of the Master Planning Requirements

In Phase Two, the consultant will continue the efforts of the Master Planning process in accordance with the Class EA requirements for the Master Planning process and will carry out the following:

- Update the mailing list including agencies, interest groups and NGOs
- Continue to maintain the required project file for the Master plan

- Prepare a Notice of public information centre (PIC) (The City will be responsible for publishing the Notice)
- Prepare for and attend one public information centre (PIC) to inform the public of the progress and outcomes related to the project
- Prepare a consultation report to the Technical Steering Committee on the outcome of the PIC

Anticipated Deliverables: Updated mailing list, notices, PIC panels and PIC report

Task 8: Thames River Characterization

The consultant will be required to conduct a benthic and water quality inventory of the Thames River. A report will be generated in Task 8 that provides a comprehensive review of the findings and conclusions in regard to the condition of the river and in relation to the potential impacts of CSO and bypass volumes.

The basis for the characterization will be the comprehensive sampling program that has historically been carried out at 16 locations in the Thames River as indicated in the historical background documents (Water Quality Monitoring Program for the Thames River, 2006, 2008, 2009) provided on the City's website. The previously identified 16 benthic sample locations from the earlier studies will be reviewed by the consultant and locations that are appropriate for determining the impacts of CSO and bypass discharge points will be selected for inclusion in the Thames River characterization component of the PPCP study. If the selected benthic sample points do not provide sufficient opportunity to characterize the impacts of CSO and bypass, an additional 3-5 locations will be selected by the consultant to provide focused sampling at prioritized CSO and bypass outfall locations. The sampling program is to be approved by the project Technical Steering Committee prior to setting the final scope for this task.

On-site measurements will be recorded at the time of sample collection for parameters including but not limited to substrate characteristics, water depth, velocity, presence of macrophytes, temperature, dissolved oxygen, pH, and conductivity.

Sampling, taxonomic identification and QA/QC procedures used in the benthic study will also be carried out in the same manner as the previous studies. Water quality assessments will be carried out using the Simpson's Diversity Indices and the Hilsenhoff's Modified Family Level Biotic Index (Hilsenhoff, 1988). The results of the benthic analysis will be reported based on current water quality conditions and historical trends in relation to the locations of CSO and bypass discharge points.

Water chemistry is to be sampled at the same locations selected for benthic sampling between April 1st and October 31st for parameters including but not limited to nitrate, nitrite, ammonia as N, TKN, phosphorus (total and dissolved), total suspended solids, dissolved metals, E. coli, total coliforms.

Sampling is to be carried out during 4 wet weather events of sufficient intensity and duration to produce significant overflows from CSOs and bypasses upstream of the sampling locations. The event size required for sampling will be determined through a correlation of WWTP wet weather bypasses to historical rainfall intensity and duration data.

Sampling is also to be carried out during periods of dry weather. Dry weather water chemistry is to be sampled on 4 occasions at the 16 locations after a minimum period of 48 hours without rainfall and a minimum of 7 days after any CSO discharges and/or bypass overflows have occurred.

Results of the water chemistry analysis will be reported based on current water quality conditions and historical trends in relation to the locations of CSO and bypass discharge points.

Anticipated Deliverables: Thames River benthic and water quality report

Task 9: Hydrologic and Hydraulic Modelling

The consultant will use hydrologic and hydraulic system models for each sewershed to determine theoretical CSO and bypass frequencies and volumes. This determination will be carried out in accordance with F-5-5 requirements for the “typical year”.

All CSOs and bypasses and discharge points must be incorporated into the models. The models are not required to be “all-pipe” models but must be calibrated and verified using WADE flow monitoring data. The model must incorporate the use of dynamic wave solution modelling to analyze surcharged conditions. Pump stations and hydraulic control structures that will impact the theoretical CSO volumes such as siphons, weirs, and existing CSO storage tanks must be included. This refinement will be carried out for each of the city’s six sewersheds using existing data and information, and the completed efforts from those additional scoped projects completed in Phase One.

Sewersheds within the City where a refinement is not possible from the existing information will be identified and a scope of work defined that will allow for sufficient effort to complete the refinement. A cost for this effort will be developed by the consultant and a recommendation of scheduling to complete this work within the Phase two requirements of the PPCP will be made. It is anticipated that ongoing efforts by WADE will be incorporated as appropriate into the development of Task 8. The final outcome of Task 8 will be provided to the Technical Steering Committee in a technical memorandum style report.

Anticipated Deliverables: Task Technical Memorandum on modelling and additional scope of work description

Task 10: Long List of CSO and Bypass Control Alternatives

The consultant is required to develop a comprehensive list of potential CSO and bypass control alternatives. The list should be developed from a wide range of North American experience and include aspects of both receiving stream water quality improvement and reduction of CSO and bypass discharge volumes. The list should include:

- BMPs such as street sweeping and litter control and maintenance
- Source controls such as sump pump disconnections, roof leader disconnections
- Conveyance controls such as in-line storage, sewer separation
- End-of pipe controls such as high rate treatment, storage

The list will be developed in consultation with the Technical Steering Committee. It is expected that the consultant will review and assess the application of the control technologies relative to the needs of the City of London.

Anticipated Deliverables: Task Technical Memorandum on alternatives

Task 11: Short List of CSO and Bypass Control Alternatives

As a first step toward refining the list of CSO and bypass control measures, the consultant will assess the application and viability of the various potential control alternatives using a set of defensible criteria. These criteria need to conform to the requirements of the master planning process and include areas of technological feasibility, social feasibility, environmental feasibility and economic feasibility. The criteria will be developed in consultation with the PPCP Technical Steering Committee. The purpose of this task is to develop the short list of potential control alternatives that will be assessed in Phase Three of the PPCP for CSO and bypass locations. The consultant will also prepare a summary report of the Phase Two results, including conclusions and recommendations for further study.

Anticipated Deliverables: Task Technical Memorandum on short list, Phase Two Summary Report.

Phase Three

Note – it is anticipated the detailed task descriptions for Phase 3 will be re-visited at the end of Phase 2 by the Technical Steering Committee and modified as necessary.

Task 12: Continuation of the Master Planning Requirements

The consultant will continue the efforts of the Master Planning process including the following:

- Update the mailing list including agencies, interest groups and NGOs
- Continue to maintain the required project file for the Master plan
- Prepare a Notice of public information centre (PIC) (The City will be responsible for publishing the Notice)
- Prepare for and attend one public information centre (PIC) to inform the public of the progress and outcomes related to the project
- Prepare a consultation report to the Technical Steering Committee on the outcome of the PIC
- Prepare Notice of Completion (The City will be responsible for publishing the Notice)

Anticipated Deliverables: Updated mailing list, notices, PIC panels and PIC report

Task 13: Updated Ranking and Prioritization of CSO and Bypass Discharge Points

The consultant is required to update and prioritize the ranked list of discharge points based on information gathered during the Phase Two. The revised ranking and prioritization will be based on, at a minimum but not limited to, volume and frequency of overflow, contaminant loadings to receiving environments, potential to contribute to system wide conformance with Procedure F-5-5, and potential for mitigation of impacts on receiving

stream environments in the Thames River. The consultant must prioritize the ranked list to establish the number of projects required to meet the volumetric requirement of procedure F-5-5. The Technical Memorandum for Task 13 will include details of the revised ranking and prioritization and comprehensive GIS mapping of the CSO and bypass locations and discharge points and updated receiving stream monitoring locations.

Anticipated Deliverables: Task Technical Memorandum on ranking and prioritization

Task 14: Preferred Alternative Selection Criteria

The consultant will develop a set of defensible criteria to select the preferred alternative for each prioritized discharge point. These criteria need to conform to the requirements of the master planning process and include areas of technological feasibility, social feasibility, environmental feasibility and economic feasibility. Conformance with F-5-5 and mitigation of water quality impairment of the Thames River also need to be considered in the criteria development. The criteria will be developed in consultation with the PPCP Technical Steering Committee.

Anticipated Deliverables: Task Technical Memorandum on criteria

Task 15: Selection of the Preferred Alternatives

The criteria established in Task 14 will be applied to the prioritized list to establish a preferred alternative for each discharge point. Since certain discharge points have multiple connected CSOs, the preferred solution proposed may be a combination of alternatives. It is anticipated that individual EA's will be completed for each project outside of the PPCP, and that the final preferred solution may be refined during this stage.

Anticipated Deliverables: Task Technical Memorandum on preferred alternatives

Task 16: Implementation Plan

For Task 16, an implementation plan is required that provides a schedule and estimate of costs associated with the implementation of the preferred alternatives.

Anticipated Deliverables: Implementation Plan will be incorporated into the Draft and Final EA Master Plan report

Task 17: Class EA Master Plan PPCP Report Completion

The Class EA Master Plan report will be developed by the consultant to conform to the requirements of the Class EA Master Planning process. The draft report will be filed for 30 days for review by the public and agencies and then finalized by the consultant to include any comments.

Anticipated Deliverables: Draft and Final EA Master Plan PPCP reports

Project Schedule

The schedule for the PPCP needs to consider the integration of ongoing WADE efforts to support the PPCP. As such the schedule will evolve over the length of the project as information becomes available. The following is a preliminary schedule for the project:

Phase One – Years 1-2 of the PPCP efforts.

Phase Two - Years 3-5 of the PPCP efforts.

Phase Three – Year 6 of the PPCP efforts.

Meetings

Technical Steering Meetings will be held between the consultant team and the Technical Steering Committee at milestone dates as defined by the schedule of deliverables.

Project Management

Project management will include monthly progress updates and invoicing as well as milestone meetings with the Technical Steering Committee.

Reporting

Reports will include technical memoranda, Thames River benthic and water quality report, Phase One and Two Summary Reports and the draft and final Class EA Master Plan PPCP report.