1. Executive Summary

The Region of York (the Region) Southeast Collector (SEC) project involves the construction of a 15 km tunnelled sanitary trunk sewer. This capital project is vital to service the approved growth within the Region. On March 31, 2010, the Minister of the Environment (MOE) approved the Individual Environmental Assessment (IEA) for the project; however approval was subject to the imposition of a series of stringent conditions.

The Minister's Conditions related to the reduction of inflow and infiltration (I/I) are defined in Section 8, Water Efficiency and Inflow and Infiltration Reduction Monitoring of the "Notice to Proceed with the Undertaking". Specifically, Subsection 8.2 states that the Region is required to develop an Inflow and Infiltration Reduction Strategy (the Strategy), which "*shall include a program for the reduction of inflow and infiltration by the Regional Municipality of York to the Southeast Collector Trunk Sewer from its and its lower tier municipalities' sewage systems. This program shall include reduction priorities, targets, timelines, tactics and initiatives, and the associated costs to implement these.*"

This Strategy has been developed by the Region in response to Condition 8 and describes the process that the Region intends to undertake in order to successfully meet the Minister's Conditions.

The Strategy will build upon programs already underway within the Region. Region of York and the municipalities that discharge wastewater to the SEC each have existing programs in place, including but not limited to operations and maintenance programs, asset management programs, inspection and monitoring programs, and I/I reduction programs. It is the purpose and intent of this Strategy to build upon these existing programs to meet or exceed the requirements and intent of the Minister's Conditions.

Through the development and implementation of this Regionally adopted I/I reduction Strategy, York Region and the member municipalities have an opportunity to demonstrate leadership in I/I reduction within the water and wastewater industry. The Region and Municipalities' current commitment to I/I reduction will serve to form the foundation upon which a world class I/I reduction program can be developed.

This Strategy document is divided into four sections:

Section 1: Executive Summary: provides a brief overview of significant elements of the Strategy

Section 2: Background and Rationale: describes the purpose and goals of the Strategy, asset principals, provides a brief description of the York and Municipal sewerage system, its major hydraulic components and the impact that anticipated growth could have on the system. Previous projects and existing I/I control efforts that are being conducted within the system are discussed in detail.

Section 3: Strategy Development: describes the governance and organization of the Steering Committee and various Working Groups and includes a discussion on the findings of a Best in Class review that was conducted.

Section 4: 2031 I/I Reduction Strategy: This section contains the substance of the Region's I/I Reduction Strategy. The Strategy is defined in a series of Program Areas, each of which will require that a number of Program Activities be accomplished. This approach includes defining or addressing issues in each of the following Program Areas:

1. Overall Program Goals and I/I Targets
2. Monitor and Analyze Flows
3. Investigate and Mitigate
4. New Construction and Capital Projects

Attachment C

5. Financial Management
6. Communication & Education
7. Report I/I Reduction
8. Continuous Improvement

Section 4 defines each of these Program Areas and provides descriptions of the specific Program Activities and deliverables that will be required within each Program Area. These and deliverables are necessary to successfully reduce inflow and infiltration in the area tributary to the SEC and to meet the Minister's Conditions.

Principal elements of the Strategy include:

Governance and Formation of Strategy Leadership
It will be necessary to define the leadership for implementing the Strategy. The Region intends that the Strategy will be championed and led jointly by the I/I Steering Committee with overall leadership, direction and assistance provided by an I/I Reduction Program Manager employed by the Region. The Steering Committee was formed in April 2010 and is comprised of representatives from each of the nine municipalities and the Region. The committee was initially responsible to review I/I issues and formulate an overall direction for the development of this Strategy was responsible for reporting back to their respective organizations and Councils.

As the Regional Strategy is implemented over the next 20 years, the Steering Committee and Program Manager will continue to provide primary leadership for the Strategy, representing the interests of both the Region and each of the municipalities and having responsibility for reporting to the Ministry as required to meet the Conditions that have been set forth.

To support the Steering Committee, five (5) Working Groups have been established to address the following topics:

- Strategy Development,
- Funding,
- Communication and Advocacy,
- Audit, Monitor and Measure, and
- Standards, Implementation and Continuous Improvement.

Section 4.3 Program Area 1 - Establish I/I Program Goals and Targets

At the highest levels, the goals of the Region and the Municipalities in regard to this Strategy include:

- Reduce inflow and infiltration rates over a 20 year period into the Southeast Collector (SEC),
- Minimize total conveyance, treatment and disposal system costs, and
- Implement a long term program that meets the Conditions as set forth by the MOE for the SEC IEA.

Through the development of this Strategy, the Region of York and the Municipalities commit:

- To develop and maintain this Strategy including the programs, goals and inter-agency and regulatory reporting requirements for a staged reduction of inflow and infiltration over the next 20-years.
- To recommend to future Councils that they commit funds for I/I reduction that are economically justified by the avoidance of future costs to treat and convey inflow and infiltration
- To measure wastewater flows before and after carrying out construction/rehabilitation work on sewers and to document I/I expenditures and flow reduction measures.
- To use the information gathered in future I/I reduction processes.

- To continue to work together in a collaborative manner over the life of the Strategy and to commit the appropriate staffing and financial resources towards the implementation of the Strategy.

The SEC IEA contained a detailed evaluation of the effectiveness of water conservation and I/I reduction measures across several municipalities. In general, a targeted 10% reduction of flows is thought to be achievable in the Region of York. This reduction was expressed both in terms of the current I/I design allowance in York (0.29 L/s/ha reducing to 0.26 L/s/ha) and in terms of the corresponding reduction in flows in the SEC (1.43 m3/s or 10% of the design capacity of the SEC).

The service area was divided into a series of increasingly smaller, nested drainage basins to allow analysis, rehabilitation and auditing within reasonably sized geographic areas.

Geographic Delineation of the YDSS

Geographic Delineation	Number	Avg. Area (ha)	Avg. Length (Km)	Description
Service Area	1	34,295	2,740	Entire area draining to SEC
Sewer Shed	5	6,859	548	Municipality
Major Basin	54	4,287	343	Model calibration basins
Audit Basin	159	216	17	Level at which I/I reduction is audited
Mini Basin	450	100	7	SSES basins
Catchment	2900	15	1	Model sub catchments

Existing I/I volumes, I/I reduction targets and successful I/I reduction will be reported at the Audit Basin level.

Due to the complexity of the audit and measure process, the detailed procedures for the analysis and audit processes will be included in a separate Appendix of this Strategy.

Section 4.4 Program Area 2 - Monitor and Analyze Flows

Wet weather flows can be highly variable depending on seasonal groundwater table fluctuation, snow pack, and antecedent moisture condition. Continuous flow monitoring over a sufficient time period is necessary to reveal these variations in flow. The Region of York and the Municipalities will need to utilize a network of temporary and continuous flow monitors in order to measure and record the changes in I/I rates over time and determine flow rates under a variety of seasonal conditions.

It is recognized that a variety of flow metering technologies will be required to meet the requirements of the Strategy. The flow monitoring implementation must balance the cost / benefit of various technologies and also consider site specific and hydraulic conditions. The Flow Monitoring program requirements will need to include details such as flow meter type, meter accuracy, data quality and management procedures, meter relocation planning, etc.

Flow monitoring will include:

- Permanent Trunk / Municipal Monitoring
- Audit Basin
- Mini Basin
- Post Construction

- New Development Areas
- Rainfall Monitoring

A flow monitoring strategy will be developed in the early stages of the Strategy implementation. It is anticipated that ongoing flow monitoring activities will be required throughout the course of implementing the Strategy.

Section 4.5 Program Area 3 - Investigate and Mitigate

The Strategy describes the processes that will be applied to investigate the severity, extent and location of I/I sources. The sewerage system that drains to the SEC has been delineated into a series of drainage basins. Additional flow monitoring will be conducted at the outlet of Mini Basins in order to identify locations that display evidence of elevated inflow or infiltration flows.

Inspections

Specific basins will be identified where additional physical and electronic inspections will be required. These inspections will be implemented as a series of Sanitary Sewer Evaluation Studies (SSES) and conducted as part of the Condition Assessment Program.

Two major objectives of the SSES analysis are:

1. Identifying specific I/I sources and system conditions
2. Applying standardized defect distress coding and inspection practices in order to reflect the severity and extent of issues.

SSES investigation techniques typically include:

- Smoke testing
- CCTV mainline inspection
- CCTV lateral inspections (in many cases both private and public laterals)
- Manhole inspections
- Flood/dye testing
- Household drainage inspections

Project Delivery

Following the results of detailed flow analysis and structural and hydraulic assessments, cost-effective solutions can be identified and specific rehabilitation techniques selected. Potential rehabilitation projects will be identified and then prioritized based on several factors including: criticality, risk of failure, costs and expected benefits, expected lifecycle and performance improvements, environmental impacts, social implications, plant performance, and operation and maintenance cost savings.

The project delivery and assessment phase of the Strategy will involve the design and construction of rehabilitation and replacement projects. Projects will be selected based on defined criteria and approved by the Steering Committee. Selected projects will have been evaluated on a cost/benefit or other risk based process.

The initial phase of project delivery is already underway with the implementation of the initial ten (10) pilot projects that were identified in the Region and Municipal I/I Phase 1 Pilot Program. Construction of these projects is anticipated to occur prior to 2013. Upon completion of these projects, post construction flow monitors will be installed to validate that I/I reduction has been successfully achieved.

Determine I/I Reduction Achieved
In a manner similar to the pilot projects planned for the Region and Municipal I/I Phase 1 Pilot Program, after future projects are constructed, I/I reduction will be measured and the structural condition of the rehabilitated sewer system will be evaluated to ensure that the predictions for flow reduction and the effectiveness of the selected solutions were met.

As system rehabilitation and repair work is completed and post construction flow monitoring is conducted and the data is analyzed, a hydraulic model will be updated with revised hydrologic input parameters which simulate I/I entering the system. Upon recalibration, the hydraulic model will then be used to characterize the newly repaired Audit Basin and the 25-yr. design storm I/I projections can be simulated. Revised I/I volumes and reduction targets will be input into an audit process spreadsheet model to reflect actual I/I reduction and to quantify any remaining difference between actual and targeted I/I reduction.

External Asset Management Condition Assessment Programs
Recognizing that the Region and Municipalities currently are conducting ongoing condition assessment as part of their asset management programs, ongoing programs, procedures and condition assessments as they relate to asset management or I/I reduction should complement this Strategy. The Steering Committee or its designated working group will collaborate to coordinate these municipal programs with the Regional Strategy.

Inspection Standards
In order to support the efficient collection and use of inspection records, it will be important that inspection data is collected using standardized procedures and terminology. York has developed a series of Technical Specifications and Standards for CCTV mainline/lateral inspections, manhole inspections, and smoke testing that should be used for future inspections. A comprehensive "routine" inspection program including the frequency and type of the inspection recommended should be developed that is based on the age and criticality of the discrete components.

Design and Construction Standards
Efforts to prevent I/I from occurring in new construction should be ongoing, even as the I/I reduction program addresses existing I/I sources. Precluding the entry of potential future I/I into the system from new construction is an important element of the Strategy. Application of sound engineering design practices, development of specifications cognizant of I/I, and enforcement of the specifications through adequate construction inspection during construction are key elements for achieving a tight sewer system. A review of existing Design Standards is recommended.

Section 4.7 Program Area 5 - Financial Management

The objective of the funding component is to develop a sustainable source of funding to support the long term implementation of this Strategy that is equitable to the partners and community while addressing the I/I reduction targets required through the Ministry of Environment Conditions.

In the absence of a full program scope, and based on Regional estimates, an initial funding target of $100M over a 20 year period was used to assess the potential funding requirements. This equates to a future annual investment of $5M per year across the Region.

The Strategy will be supported by a collaborative long term funding model based on a cost shared approach between the two tiers of government. The key funding principles are:

- A set rate will be collected at both the local and regional level as identified through the needs of the Strategy and as agreed to by the municipal partners.

- The amount collected at the local level will be used to address priorities identified both through the Strategy and as determined by each local municipality. The funding is to be used to meet the objectives of the Strategy in support of I/I reduction. Any additional investments required to maintain local sanitary infrastructure will be in addition to the amounts required by the Strategy.
- The amount collected at the regional level will be used to address regional I/I priorities both at the regional and local level. Investments in the local systems will be made to accelerate resolution of regional priorities through augmenting local funding sources.
- The allocation of regional funds intended for use in the local systems will be managed and allocated by a joint board made up of representatives from each municipality and the Region, and will be granted based on the most effective application to achieve the desired I/I improvements as quickly as possible.

The Strategy will require that each municipality contributes and maintains a specific and sustainable funding allocation towards the I/I program. However, this funding shall be allocated to the local system from which it is collected for future allocation through reserves or other appropriate means.

The funding requirement does not preclude the local municipality from collecting additional funding from the rate for other infrastructure and asset management needs of the local sewer system.

The net impact of the new Strategy could be an increase in local rates or a reallocation of existing local rates. This would be dependent on current and future needs as determined by each municipality and provided that the local system meets a regional performance standard determined through the Strategy.

Funding is a region wide controlled pool that is directed by the I/I Steering Committee, and is allocated based on the priorities developed through the I/I Strategy to achieve the greatest system benefits Region wide.

A preliminary list of program activities that will require funding includes:

- Flow monitoring
- Inspection programs
- Data analysis
- Development of common guidelines and standards
- Continuous improvement
- Communications programs
- Rehabilitation/replacement programs
- Pilot tests

To accomplish this, short term (1-5 years), Medium Term (5-10 years) and Long Term (10 years and beyond) planning horizons have been developed to establish and sustain funding for the Strategy.

Section 4.8 Program Area 6 - Communication and Education

Communications, Education and Advocacy has been identified as one of the components required to successfully achieve inflow and infiltration reduction in York Region. A coordinated team of Regional and local municipal staff will oversee the creation of clear and consistent messaging with a consistent brand identity for use both internally and externally with the various stakeholder groups. The communications and advocacy staff team will work closely with other members of the program team to create a communications plan that will meet the needs of the evolving program.

Communications and Advocacy will play a strong support role in working with technical staff in delivering the key messages to the various stakeholders. The key areas of focus will be:

- Internal communication for Steering Committee and staff
- External communication for council, public, other agencies
- Identify who needs to know what and when
- Development of consistent and appropriate messaging (for council, staff, public, other agencies)
- Coordination with leadership and advocacy to identify stakeholders
- Development of a communication plan (timing, media, based on communication template, etc.)

The communications and advocacy staff team will liaise with regulatory compliance and policy staff to ensure that current and future works comply with all applicable regulations.

Section 4.9 Program Area 7 - Report I/I Reduction

The Region has developed this Strategy for long term I/I reduction and it is anticipated that the Strategy will evolve over time and as such it will be a living document to be used by the Region and Municipalities to guide the management of the I/I reduction programs.

In alignment and support of the annual and 5-year update reporting requirements that the Region has with the Ministry of the Environment, each municipality will need to plan for and develop annual Summary Progress Status and Achievement reports. These reports, which have not yet been defined, could contain the following kinds of information that describes the municipality's I/I related activities that have occurred during the previous year and activities planned for the upcoming period:

- Sewer system mapping
- Update on the amount of infrastructure inspected for I/I source detection purposes
- The extent of new sewer construction and sewer repair and replacement work
- A summary of the results of all flow monitoring work undertaken
- The location and frequency of all sanitary sewer overflows
- A summary of expenditures for sewer system evaluation, repair and replacement activities, and
- Planned activities, milestones and budget allocations for the upcoming period

Section 4.10 Program Area 8 - Continuous Improvement

Continuous improvement is an ongoing effort to improve the way services or programs are implemented. While this Strategy serves as a starting point and seeks to provide the technical requirements of implementing the various programs, there will be a number of key areas and future initiatives required over the short and long term.

The following areas have been identified as areas to focus on which may require enhancement as the Strategy is implemented.

- Review and refine data analysis and exchange procedures
- Review and refine flow monitoring standards
- Review and refine/Implement Rehabilitation Standards
- Develop/update Sewer Use Bylaws and Building Codes
- Review and refine Inspection (SSES) Standards
- Review new technologies (Inspection and Rehabilitation)
- Review and refine Design and Construction Standards
- Review and implement private property mitigation programs, and
- Review and update overall I/I Strategy document

Review and Update Overall Strategy

The Steering Committee, led by, and in collaboration with an assigned I/I Reduction Program Manager employed by the Region will assume joint responsibility to implement this Strategy. They will also be required to further define and implement the requisite activities necessary to ensure that this Strategy is continually maintained, enhanced and carried out. This process will commence in 2011 and is anticipated to continue until the Strategy is finalized.

The Strategy will be updated as necessary as data is collected, as new information is learned, and as new technology becomes available. Review and update of the overall Strategy will require the continual commitment of Regional and Municipal resources over the life of the Strategy. Updates and revisions to this Strategy will be presented to the MOE annually and in 5-year Update reports. The Region of York will submit to the Regional Director and the SeCAC an annual report detailing its progress on implementing the Strategy including I/I reduction.

In addition to the providing annual reports to the Ministry, the Region is required to update the Strategy, to the satisfaction of the Regional Director, at a minimum of once every five years until the Strategy is finalized or until otherwise directed by the MOE.

Additional information about each of the above noted activities can be found in Section 4 - 2011 – 2031 I/I Reduction Strategy