ES-1 BACKGROUND

The City of Hamilton is one of a number of municipalities in the Greater Golden Horseshoe Area situated around the south western end of Lake Ontario and one of the fastest growing regions in North America. As legislated by the province in the Places to Grow Act, by 2031, the population of this area is forecasted to grow by an additional 3.7 million (from 2001) to 11.5 million people, accounting for over 80 percent of Ontario’s population growth. This new growth will require 1.75 million new homes and 1.7 million additional jobs.

Ready and accessible public infrastructure is essential to the viability of existing and growing communities. Infrastructure planning, land use planning and infrastructure investment require close integration to ensure efficient, safe, and economically achievable solutions to providing the required water and wastewater infrastructure.

The City of Hamilton has developed goals to blend the economic and social activities of a growing City with the preservation and protection of natural areas and resources through a sustainable approach to land management. This approach was initiated by the former Regional Municipality of Hamilton-Wentworth, now the City of Hamilton, through strategic policies generated through VISION 2020, “Building a Strong Foundation” (BASF), and its Growth Related Integrated Development Strategy (GRIDS).

The Water and Wastewater Master Plan (2006) for the Lake-based systems, a critical component in the integrated GRIDS process, provided the framework and vision for the water and wastewater servicing needs for the City into the future. This vision was developed in consideration of the Triple Bottom Line (TBL), balancing criteria for environmental protection, social impacts and benefits, and minimizing costs (financial impacts). For wastewater, the preferred solution included the following primary components:

- Decommissioning of the Waterdown WWTP and diversion of flow to the Woodward Avenue WWTP service area
- Expansion of the Woodward Avenue WWTP capacity to service new growth in the City, and to accommodate flow from Waterdown
- Upgrades to the Woodward Avenue WWTP performance, to strive to achieve contaminant loading goals defined by the Hamilton Harbour Remedial Action Plan (RAP)
- Trunk collection system and Woodward Avenue WWTP improvements, to reduce the discharge of untreated combined sewer overflows resulting from wet weather events, and strive to achieve the goals defined by the Hamilton Harbour RAP, the Ministry of the Environment (MOE) Procedure F-5-5 and wet weather policies developed by the City to protect the Harbour.

To achieve these goals, the City proceeded with Phases 3 and 4 of the Class EA process to plan the expansion of the service area treatment capacity and the collection system improvements necessary for wet weather flow management.
EXECUTIVE SUMMARY

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

This project falls within the scope of projects described in Schedule ‘C’ of the Class EA (MEA, October 2000, as amended in 2007). The Master Plan satisfied Phase 1 (Identification of the Problem) and Phase 2 (Identification and Assessment of Alternative Solutions) of the Class EA process.

Phase 3 involves an evaluation of conceptual design and implementation concepts to achieve the capacity expansion and wet weather flow control improvements, as well as a full evaluation of environmental impacts and mitigation measures. Phase 4 involves the preparation of an Environmental Study Report (ESR) to present the rationale for selection of a preferred design and implementation plan.

The Class EA process entitles members of the public, interest groups and review agencies to review the ESR during a 30-day review period. During this 30-day review period, anyone with outstanding concerns regarding the project, which cannot be resolved in a discussion with the City of Hamilton, may request that that Minister of the Environment make an order for the project to comply with Part II of the Environmental Assessment Act, which addresses the individual environmental assessment, by submitting a written request to the Ministry of the Environment at the following address:

Hon. John Gerretsen
Minister of the Environment
135 St. Clair Avenue West
15th Floor, Toronto, Ontario
M4V 1P5

If no Part II Order (‘bump up’) requests are received within the 30-day review period, the project will proceed through design and construction as outlined in the Environmental Study Report.

Information will be collected in accordance with the Freedom of Information & Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

PURPOSE AND SCOPE OF PROJECT

This ESR documents alternative approaches considered for expanding the Woodward Avenue WWTP treatment capacity and wet weather flow control improvements, the resultant impacts of each and mitigation measures, the rationale for selection of the preferred design concept, and an implementation plan and monitoring program. The report also fully documents the public and agency consultation program undertaken as part of the Class EA study.

The steps undertaken as part of this project are outlined below.

Phase 3: Identify and Assess Alternative Design Concepts for the Preferred Solution

1. A detailed analysis of alternative strategies for providing the required treatment capacity and achieving wet weather flow management goals was carried out, including development of design criteria. This analysis was circulated to regulatory agencies for review and comment.
EXECUTIVE SUMMARY

2. An evaluation methodology, including criteria and value weights, was established with input from City staff and stakeholders for use in determining the preferred design concept for the preferred solution.

3. Alternative design concepts for each component of plant expansion and upgrading, and collection system improvements were developed and evaluated using the decision-making matrix.

4. Preferred design concepts were developed and rationale for selection of the preferred design concepts was documented.

5. An implementation plan was developed for each component of the preferred strategy.

6. A monitoring program was developed for the preferred strategy.

Phase 4: Prepare Environmental Study Report (ESR)
1. An ESR was prepared to document the study process and findings.

2. The public and government review agencies were notified about the completion of the project.

3. A 30-day public review period was initiated on March 28, 2008.

Phase 3 and 4 Public Consultation
A public and government agency consultation program was implemented to facilitate input throughout the project. Input received was incorporated in the decision-making process and the selection of the preferred design approach and proposed mitigation measures. Important consultation activities included:

♦ Three meetings with a Technical Advisory Committee (TAC) established for this project to provide technical information and comments and concerns from the participating agencies

♦ Three meetings with a Community Liaison Committee (CLC) established for this project

♦ Four meetings with a Public Works Sub-Committee (PWSC) established for this project to provide information to City Council as necessary and obtain information regarding any concerns raised

♦ One Public Information Centre to provide all information to the public and solicit feedback on the preferred design concepts

♦ Notices of Commencement and Public Information Centre published in local newspapers, as well as issued to all regulatory agencies and interested members of the public

♦ Notice of Completion and 30-day Public Review Period.
ES-4  EXISTING CONDITIONS

ES-4.1 STUDY AREA

The study area includes the portion of the City serviced by the Woodward Avenue WWTP. Figure ES-1 shows the study area including the entire combined sewer system that feeds the Woodward Avenue WWTP.

The Woodward Avenue WWTP wastewater collection system consists of three main systems, as follows:

- The Western Sanitary Interceptor system
- The Eastern Sanitary Interceptor system
- The Red Hill Creek Sanitary Interceptor system.

The Eastern system consists of exclusively separate sanitary sewers. Most of the Western Sanitary Interceptor System consists of combined sewers, as does a portion of the Red Hill Creek Sanitary Interceptor System. There are 23 combined sewer overflows (CSOs) distributed throughout the combined sewer system, which discharge into Hamilton Harbour. The combined sewer system consists of greater than 600 kilometres of combined sewers.

The overall collection system also includes 70 sewage pumping stations, which vary in size, with some servicing very local areas, to other more major stations, and have firm pumping capacities ranging from 5 L/s to 252 L/s.

The Western system also receives flow from Dundas and Waterdown in excess of the Dundas WWTP capacity.

The Woodward Avenue WWTP is bounded by Woodward Avenue to the west, Brampton Street to the south, the Woodward Avenue Water Treatment Plant (WTP) to the north and an old landfill to the east. Figure ES-2 presents a map showing the Woodward Avenue WWTP and surrounding areas, including significant features.
Figure ES - 2  Woodward Avenue WWTP and Surrounding Areas

The Woodward Avenue WWTP is a secondary wastewater treatment plant with a rated capacity of 409 ML/d and peak flow capacity of 614 ML/d. Wastewater from the three interceptor systems is combined and pumped for treatment through primary clarifiers, aeration, secondary clarifiers and chlorine disinfection. Flow in excess of the peak flow capacity is bypassed directly to disinfection (seasonally). Effluent is discharged through an outfall pipe to Red Hill Creek upstream of Hamilton Harbour.
EXECUTIVE SUMMARY

ES-4.2 RECEIVING WATER

The City of Hamilton wastewater collection system combined sewer overflows discharge to a number of locations, which all feed into the Hamilton Harbour. These receiving waters include:

- Hamilton Harbour
- Cootes Paradise
- Windermere Basin
- Red Hill Creek
- Sherman Inlet.

ES-4.2.1 Hamilton Harbour

Hamilton Harbour is connected to the western end of Lake Ontario by a narrow channel that cuts through the Burlington Beach Strip. Bounded on the north by the City of Burlington, on the south by the City of Hamilton, and on the east by the beach strip, this body of water occupies an area of approximately 21.5 square kilometers. Hamilton Harbour as a whole, is designated an Environmentally Significant Area (ESA) in the Regional Official Plan and subsequent to growing concern in the 1970’s, the International Joint Commission formalized a process to deal with sites on the Great Lakes that showed signs of pollution impacts on both sides of the Canadian and US border. As a result Hamilton Harbour was designated an Area of Concern (AOC) under the Great Lakes Water Quality Agreement. The Hamilton Harbour Remedial Action Plan (RAP) was developed as a multi-stage and multi-stakeholder effort to address the status of the harbour.

Ten combined sewer overflow (CSO) points discharge directly into Hamilton Harbour. A number of controls are in place to mitigate the impact these have on the natural environment, including CSO storage tanks at a number of these CSO points.

ES-4.2.2 Cootes Paradise

Today Cootes Paradise contains the largest remaining coastal marsh in western Lake Ontario. On the western side of Hamilton Harbour, Cootes Paradise represents an important habitat for fish and wildlife. It is owned and managed by the Royal Botanical Gardens and covers an area of 8.4 square kilometers located at the west end of Hamilton Harbour, a natural bay at the west end of Lake Ontario.

The Dundas wastewater treatment plant and 4 combined sewer overflow (CSO) points also discharge into Cootes Paradise. A number of controls are in place to mitigate the impact these have on the natural environment. Effluent from the Dundas WWTP discharges into Desjardins Canal which drains into Cootes Paradise.

ES-4.2.3 Windermere Basin

Windermere Basin is located at the east end of Hamilton Harbour at the mouth of the Red Hill Creek. The area consists of approximately 17.7 ha of water area as terminus for the Red
Hill Creek and 24.4 ha of land surrounding the water. A naturalization project is being planned by the City of Hamilton for this water feature.

Effluent from the Woodward Avenue WWTP discharges into Red Hill Creek, just upstream of where it discharges into Windermere Basin. In addition, CSO discharges from the Parkdale and Red Hill outfalls flow directly into the basin.

**ES-4.2.4 Red Hill Creek**

The Red Hill Creek is the second largest of several streams that drain into Hamilton Harbour. Extending over an area of 68 square kilometres, the Red Hill Creek watershed exists entirely within the boundaries of the City of Hamilton in Southern Ontario. Flow discharges into the western end of Lake Ontario via Hamilton Harbour. Four CSO outfalls and effluent from the Woodward Avenue WWTP discharge into the Red Hill Creek upstream of Windermere Basin and Hamilton Harbour.

**ES-4.2.5 Sherman Inlet**

The Sherman Inlet is located along the south shore of Hamilton Harbour adjacent to working port lands and heavy industry. Historically the inlet was linked to watercourses in Hamilton and conveyed flows from the Niagara Escarpment to Hamilton Harbour. As a result of significant development and associated infilling along the harbour, this location has been reduced to a ponded inlet.

Recently there has been interest in developing the Sherman inlet to provide a recreational opportunity along the network of trail systems being implemented in Hamilton. Control of the Birch Street CSO outfall will contribute significantly to this initiative. Future goals for the inlet have been expressed which include improved fish and wildlife habitat, improved water quality, and greater public access at this location.

**ES-5 DEVELOPMENT OF PREFERRED STUDY AREA STRATEGY**

Figure ES-3 presents a schematic of the planning process for all phases of the development of the preferred study area strategy. This will be explained in further detail in the following sections.
EXECUTIVE SUMMARY

Figure ES - 3  Planning Process Schematic

ES-5.1 POLICY FRAMEWORK

The preferred servicing strategy was developed to meet the goals and objectives set out by the following:

- Provision of adequate capacity to service growth, as defined in the Problem/Opportunities statement
- Wet weather flow management policy developed in the Master Plan
- Ontario Ministry of the Environment (MOE) Procedure F-5-5 for combined sewer overflow (CSO) control
- Hamilton Harbour Remedial Action Plan (RAP) loading targets for select pollutants from CSOs and wastewater treatment plant effluents
- Canadian Environmental Protection Act (CEPA) regulation to ban inorganic chloramines and chlorinated wastewater effluent
- City goals to protect local sensitive receiving waters.

The following criteria were developed in the context of these goals and objectives:

- Woodward Avenue WWTP service area average day flow of 500 ML/d
- Woodward Avenue WWTP future performance objectives as presented in Table ES-1
Table ES-1 Woodward Avenue WWTP Future Effluent Design Objectives

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design Objectives</th>
<th>RAP Final Loading Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design Objective</td>
<td>Corresponding Loadings at 500 ML/d</td>
</tr>
<tr>
<td>Total suspended solids (TSS)</td>
<td>3 mg/L</td>
<td>1,488 kg/d</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>0.15 mg/L</td>
<td>74 kg/d</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>2 mg/L (May to November)</td>
<td>1,000 kg/d</td>
</tr>
<tr>
<td></td>
<td>5 mg/L (December to April)</td>
<td></td>
</tr>
<tr>
<td>Biochemical oxygen demand (BOD₅)</td>
<td>5 mg/L</td>
<td>2,500 kg/d</td>
</tr>
</tbody>
</table>

Note:
1. Monthly geometric mean density during disinfection period, May 15 to October 15.

It is very important to note that while design is based on the concentrations presented in Error! Reference source not found., it is understood that compliance concentrations and loadings to be defined in the Certificate of Approval will be less stringent. This allows for routine process upsets due to maintenance, seasonal variability and industrial loadings common to municipal wastewater treatment facilities.

♦ Wet weather flow capture and CSO loading objectives:
  - Maximize the use of the available treatment capacity, i.e., there will be no overflows from the collection system if the Woodward Avenue WWTP is not operating at its capacity
  - Strive to achieve the RAP Final loading targets for CSOs, as presented in Table ES-2
  - Eliminate CSOs during dry-weather periods, except under emergency conditions
  - During a seven-month period commencing within 15 days of April 1, capture and treat, for an average year¹, all the dry-weather flow plus 90% of the volume resulting from wet weather flow that is above the dry weather flow. The volumetric control criterion is applied on a system-wide basis.
  - Additional controls above the minimum CSO controls are required for swimming and bathing beaches affected by CSOs
  - Controlling to not more than 2 overflow events per season (June 1 to September 30) for an average year¹ in a combined sewer system with the

¹ An average year refers to: the long term average of flow based on using simulation of at least twenty years of rainfall data; and/or a year in which the rainfall pattern (e.g. intensity, volume and frequency) is consistent with the long-term mean of the area; and/or a year in which the runoff pattern resulting from the rainfall (e.g. rate, volume and frequency) is consistent with the long-term mean of the area.
combined total duration of the CSOs at any single CSO location being less than 48 hours and ensuring that the controlled combined sewage which does not overflow receives a level of treatment (primary equivalent) plus disinfection.

<table>
<thead>
<tr>
<th>RAP Loading Targets</th>
<th>TSS</th>
<th>TP</th>
<th>Ammonia-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial (kg/d)</td>
<td>1,400</td>
<td>70</td>
<td>160</td>
</tr>
<tr>
<td>Final (kg/d)</td>
<td>200</td>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

In addition to the minimum requirements of Procedure F-5-5, the City has also committed to controlling all CSOs in an average year at the following environmentally significant locations:

- The Birch Street CSO, which discharges into the Sherman Inlet aquatic habitat restoration initiative.
- The Parkdale Avenue CSO, which discharges into Windermere Basin.

The City has also committed to no more than one CSO event per year for the combined sewer outfalls discharging to Cootes Paradise (Royal, Ewen and Sterling CSOs).

It should be noted that the Hamilton Harbour RAP prepared a report entitled “Hamilton Harbour RAP Water Quality Goals and Targets Review” (Hamilton Harbour RAP, 2007) responding favourably to the City’s proposed wastewater system upgrades, which can be found at [http://www.hamiltonharbour.ca/rap/reports.htm](http://www.hamiltonharbour.ca/rap/reports.htm).

**ES-5.2 IDENTIFICATION OF A PREFERRED COLLECTION SYSTEM AND TREATMENT STRATEGY**

**ES-5.2.1 Overview**

A two-step approach was undertaken within the scope of Phases 3 and 4 of the Class EA study to identify preferred design concepts to implement this solution, as follows:

- Step 1: Identification of a preferred collection system and treatment strategy to implement the preferred solution defined in the Master Plan
- Step 2: Evaluation of alternative design concepts and selection of preferred, for each component of the preferred strategy.

**ES-5.2.2 Current Conditions**

Table ES-3 presents the current loadings and average wet weather flow captured compared to the goals described in Section ES-5.1. As shown, loadings from the Woodward Avenue WWTP and CSOs are between 3 and 10 times higher than the RAP targets, corresponding to only about 53% capture and treatment of wet weather flows on average.
Table ES - 3  Current Woodward Avenue WWTP and CSO Loadings and Targets

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Woodward Avenue WWTP</th>
<th>Combined Sewer Overflows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>Target</td>
</tr>
<tr>
<td>TSS (kg/d)</td>
<td>6,918</td>
<td>900 (RAP Final)</td>
</tr>
<tr>
<td>TP (kg/d)</td>
<td>207</td>
<td>60 (RAP Final)</td>
</tr>
<tr>
<td>Ammonia-N (kg/d)</td>
<td>2,971</td>
<td>530 (RAP Final)</td>
</tr>
<tr>
<td>% Wet Weather Flow Receiving Treatment</td>
<td>53%</td>
<td>&gt;90% (F-5-5)</td>
</tr>
</tbody>
</table>

ES-5.2.3  Preferred Servicing Strategy

Through a thorough evaluation of options during the Class EA process, a preferred strategy for CSO control and wastewater treatment was developed. To provide treatment capacity for growth in the City, the following strategy was recommended for the Woodward Avenue WWTP:

- Expand the average day flow capacity of Woodward Avenue WWTP from 409 ML/d to 500 ML/d, with a peak capacity of 1,000 ML/d
- Upgrade the treatment processes to provide year round ammonia removal and tertiary suspended solids and phosphorus removal, and provide a non-toxic disinfection method (in line with design objectives outlined in Table ES-1).

The preferred strategy for management of wet weather flows:

- Expand primary treatment capacity at Woodward Avenue WWTP to provide a total peak capacity of 1,300 ML/d
- Upgrade the raw wastewater pumping station at the Woodward Avenue WWTP to provide reliable pumping capacity at a flow rate of 1,700 ML/d, a flow rate equivalent to the capacity of the trunk sewers that feed the plant
- Upgrade the collection system to convey flows to the Woodward Avenue WWTP so that the full treatment capacity may be utilized (i.e., there will be no collection system bypassing when the plant is not operating at capacity).

Table ES-4 compares the existing scenario to the design objectives for the preferred servicing strategy.
Table ES - 4 Existing Scenario and Improvements for Preferred Servicing Strategy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current¹</th>
<th>Future Design Objective (2031)</th>
<th>% Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodward Avenue WWTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total suspended solids (TSS)</td>
<td>6,918 kg/d</td>
<td>1,488 kg/d</td>
<td>78%</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>207 kg/</td>
<td>74 kg/d</td>
<td>64%</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>2,971 kg/d</td>
<td>1,000 kg/d</td>
<td>66%</td>
</tr>
<tr>
<td>Wet Weather Flow Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total suspended solids (TSS)</td>
<td>2,396 kg/d</td>
<td>315 kg/d¹</td>
<td>86%</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>46 kg/d</td>
<td>8 kg/d²</td>
<td>82%</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>117 kg/d</td>
<td>48 kg/d²</td>
<td>59%</td>
</tr>
<tr>
<td>% Wet Weather Flow Receiving Treatment</td>
<td>53%</td>
<td>&gt;90%²</td>
<td>70%</td>
</tr>
</tbody>
</table>

Notes:
2. In an average rainfall year, which refers to: the long term average of flow based on using simulation of at least twenty years of rainfall data; and/or a year in which the rainfall pattern (e.g. intensity, volume and frequency) is consistent with the long-term mean of the area; and/or a year in which the runoff pattern resulting from the rainfall (e.g. rate, volume and frequency) is consistent with the long-term mean of the area.

With implementation of the above recommendations, the City will achieve goals on a system-wide basis for wet weather flow capture and treatment, with more than 90% of the wet weather flow receiving treatment in an average rainfall year¹. However, while overall system goals would be achieved, upgrades to reduce CSO events at specific sensitive locations are required, specifically:

- Cootes Paradise
- Sherman Inlet
- Windermere Basin.

Improvements to the system are required to optimize operation, and maximize the use of the existing system so that there are no CSO bypasses when the Woodward Avenue WWTP has capacity remaining. Furthermore, local area upgrades are required in areas with local capacity limitations where basement flooding events have been experienced. These system upgrades will require a separate program of investigations and remediation, considered to be outside the scope of this Class EA study.

¹ An average year refers to: the long term average of flow based on using simulation of at least twenty years of rainfall data; and/or a year in which the rainfall pattern (e.g. intensity, volume and frequency) is consistent with the long-term mean of the area; and/or a year in which the runoff pattern resulting from the rainfall (e.g. rate, volume and frequency) is consistent with the long-term mean of the area.
ES-6  STEP 3: DEVELOPMENT OF PREFERRED DESIGN CONCEPTS

ES-6.1  EVALUATION METHODOLOGY

An evaluation methodology is a weighting and ranking system that enables a systematic, rational and reproducible comparison of alternatives, and identification of those that are preferred. This approach allows a comparison of the value of alternatives. The following steps describe the development and use of the matrix:

1. A full range of evaluation criteria was established that reflects a broad scope of performance targets and potential impacts of the alternative, as related to the City's Triple Bottom Line (TBL) goal to balance environmental protection, social impacts and benefits and minimizing costs (financial impacts).

2. Each evaluation criterion was assigned a value weight that reflects the importance of that particular criterion relative to others. For criteria categories with higher value weights, evaluation results will have more significance to the total score for any alternative.

3. The criteria and weighting were used to develop a total score for each alternative design concept. The score enabled a quantitative comparison of one alternative to another. The total score is the sum, across criteria categories, of the average score for each criteria category, multiplied by the value weight for that criteria category. Scores were assigned to each alternative based on the technical, performance and cost information developed for each.

Final value weights used for the evaluation were developed with input from City of Hamilton staff as well as stakeholders, and are shown in Table ES-5.

ES-6.2  UPGRADE AND EXPANSION COMPONENTS

A detailed review of the existing plant capacity, condition and limitations was completed to identify those plant components that require upgrade, replacement, retrofit or expansion to provide capacity for growth, wet weather treatment and meet the performance objectives for the 2031 planning period. The following major process upgrades were identified:

- **Raw wastewater pumping station**: Upgrade to address operational limitations and provide firm capacity equivalent to the capacity of the incoming trunk sewers

- **Primary treatment**: Upgrade and/or expand to provide a firm capacity of 1,300 ML/d

- **Secondary treatment**: Expand the capacity from 409 ML/d average day and 614 ML/d peak, to 500 ML/d average day and 1,000 ML/d peak, and upgrade to provide year round nitrification

- **Tertiary treatment**: New processes to provide tertiary suspended solids and phosphorus removal for the full plant capacity

- **Disinfection**: Expand the disinfection capacity for the full plant capacity, and provide processes to eliminate chlorine residual
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description/Considerations</th>
<th>Relative Value Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance (emerging contaminants)</td>
<td>Maximizes the removal of emerging contaminants, such as endocrine disruptors.</td>
<td>2%</td>
</tr>
<tr>
<td>Energy efficiency (greenhouse gases)</td>
<td>Minimizes the use of energy, and generation of green house gases.</td>
<td>5%</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Best achieves performance objectives under full range of conditions, i.e., flows, loadings, rainfall events.</td>
<td>10%</td>
</tr>
<tr>
<td>Operational simplicity</td>
<td>Represents technology concept that is simplest to operate and maintain, and therefore, has most performance reliability.</td>
<td>8%</td>
</tr>
<tr>
<td>Demonstrated technology – performance</td>
<td>Minimizes risk of poor performance and environmental impacts because there is confidence through experience in technology performance.</td>
<td>8%</td>
</tr>
<tr>
<td>Constructability</td>
<td>Can be constructed with minimum potential risk of poor treatment performance and non-compliance, due to processes off-line or tie-ins.</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Total Environment</strong></td>
<td></td>
<td>41%</td>
</tr>
<tr>
<td><strong>Social Impacts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential odours</td>
<td>Minimize potential for odours to nearby community from process technology and with long buffer distance.</td>
<td>9%</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Construct facilities that are invisible or attractive to the community and other adjacent land users, e.g., consider view from new walking trail, or visual impacts of new CSO storage facilities.</td>
<td>3%</td>
</tr>
<tr>
<td>Land use/land acquisition</td>
<td>Enhance current land, surface water uses and minimize loss of land uses, e.g., ball diamond, land acquisition and potential affects on nearby land uses (e.g., loss of property values). Considers potential archaeological and cultural heritage resource impacts and mitigation requirements.</td>
<td>5%</td>
</tr>
<tr>
<td>Community impacts during construction</td>
<td>Minimize potential impacts during construction to local community from noise, dust and traffic during construction, and minimize period of construction and related impacts.</td>
<td>3%</td>
</tr>
<tr>
<td>Ability to facilitate growth in the community</td>
<td>Meets or exceeds schedule to provide capacity and allow development, and corresponding employment growth.</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total Social</strong></td>
<td></td>
<td>25%</td>
</tr>
<tr>
<td><strong>Economic Impacts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital cost</td>
<td>Net present value (NPV) cost of construction and 20 years of operations and maintenance. (O&amp;M). Lowest cost receives full score)</td>
<td>27%</td>
</tr>
<tr>
<td>Financial Risk</td>
<td>Minimizes risk of unplanned capital or O&amp;M investment because there is confidence through experience in technology performance and O&amp;M needs.</td>
<td>5%</td>
</tr>
<tr>
<td>Future Costs</td>
<td>Minimizes future costs beyond 2031 for plant expansion, because expansion can occur on existing site, and/or, further land acquisition and cost of facilities in new location are not required.</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Total Economic</strong></td>
<td></td>
<td>34%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

- **Outfall:** Expand the outfall capacity to be equivalent to the capacity of the raw wastewater pumping station.

- **Biosolids:** Upgrades, including decommissioning of the South digesters, relocation of the WAS thickening facilities, and expansion of the dewatering and cake pumping processes.

- **Power:** Upgrades to provide the power supply for all existing and new processes at the Woodward Avenue WWTP.

**Wet Weather Flow Management**

To achieve the goals of the City’s wet weather control policy and MOE Procedure F-5-5 for combined sewer systems, in addition to overall system optimization and treatment of wet weather flows at the Woodward Avenue WWTP, the following sensitive locations require upgrades:

- Cootes Paradise: Sterling CSO and Main-King CSO
- Sherman Inlet: Birch CSO
- Windermere Basin: Parkdale CSO.

A number of alternative technologies and design concepts for each sensitive location CSO outfall were evaluated using the decision-making model, to identify the preferred approach.

**ES-6.3 PREFERRED DESIGN CONCEPTS**

**ES-6.3.1 Woodward Avenue WWTP**

The preferred design concept for the expansion and upgrade of the Woodward Avenue WWTP to provide reliable capacity and performance for the 2031 planning period includes the following major components:

- Construction of a new raw wastewater pumping station to replace the existing station, with a firm capacity of 1,700 ML/d

- Expansion of the primary treatment system with two new primary clarifiers to provide a firm primary capacity of 1,300 ML/d

- Upgrading of the existing North and South secondary treatment plants, to optimize performance, and down-rate the plant capacity to 270 ML/d (average day flow) and 540 ML/d (peak flow) to provide nitrification

- Construction of a new membrane filtration (MF) facility with capacity of 270 ML/d (average) and 540 ML/d (peak) to provide tertiary treatment to secondary effluent from the existing conventional activated sludge plant

- Construction of a new membrane bioreactor (MBR) facility, that will run parallel with the existing CAS and new MF plant, to be located in the same facility as the new MF process, to provide secondary and tertiary treatment with a capacity of 230 ML/d
(average) and 460 ML/d peak. Alternatively, the membrane facility could be operated as a tertiary MBR facility, in series with the existing secondary treatment plant, using essentially the same process equipment and tanks.

- Construction of a new outfall to deliver tertiary treated, disinfected effluent to the Red Hill Creek
- Modifications to approximately 900 m of Red Hill Creek, including stream widening, construction of aquatic and terrestrial habitat improvements
- Construction of two new chlorine contact tanks, one for primary effluent bypasses, and a second for tertiary treated effluent, and new facilities for dechlorination of all chlorinated effluent to meet MOE and CEPA requirements
- Biosolids upgrades, including decommissioning of the South digesters, relocation of the WAS thickening facilities, and expansion of the dewatering and cake pumping processes.
- Power upgrades to provide the necessary power supply for all existing and new processes at the Woodward Avenue WWTP, and relocation of the maintenance building.

New thermal reduction and ash handling facilities recommended through the Biosolids Master Plan are being planned through a separate Phase 3 and 4 Class EA process.

Figure ES-4 presents an aerial view of the preliminary site layout for the expanded plant.

**ES-6.3.2 Wet Weather Flow Management**

To achieve the goals of the City’s wet weather control policy, RAP, and MOE Procedure F-5-5 for combined sewer systems, the following project components have been selected as preferred:

- **Overall system optimization:**
  - Complete field investigations to validate the City’s combined trunk sewer MOUSE model in terms of current control structure configurations and settings to ensure 1,300 ML/d is delivered to Woodward Avenue WWTP prior to bypassing
  - Identify and evaluate strategies for optimizing the combined trunk system operation, with a goal of fully utilizing available CSO tank storage and planned Woodward Avenue WWTP capacity before any system bypassing, and achieving local control goals, based on modification of flow control structures and real time control (RTC) (local manual and/or automated)
  - Design and implement the preferred optimization and real time control (RTC) strategy
  - Initiate a data monitoring and reporting strategy, and use on-going results for further refinement and enhancement.

- **Cootes Paradise:** Construction of a pumping station at the Main-King CSO storage tank site to increase the conveyance capacity for dry-weather flow under Highway
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403 so that capacity in the Main-King CSO storage tank can be reserved for wet weather flows from both Main-King and Sterling catchment areas.

- Sherman Inlet: Construction of a combined sewage pumping station to capture flows from the Birch CSO catchment area and pump flows to the Wentworth CSO outfall.
- Windermere Basin: Adjustment of the weir at the Parkdale CSO and implementation of real-time control to avoid overflow discharges at this location.

ES-6.3.3 Capital Cost

The total estimated capital cost for the Woodward Avenue WWTP upgrade expansion and CSO control at individual sensitive locations is broken down as follows:

- Woodward Avenue WWTP: $491 million
- Collection system improvements: $22 million

These budget numbers include the engineering costs and are considered to be accurate within ± 20%. Value Engineering review is recommended to be completed during pre-design and detailed design of the project, to confirm that the City will proceed with the most cost-effective design and construction plan for this project.

ES-6.4 IMPLEMENTATION SCHEDULE

At the conclusion of the public review process for this Environmental Study Report, the design activities will proceed. The following sets out the proposed project schedule.

- Late March 2008: File Environmental Study Report and Start 30-day public review period
- March 2008 to February 2011: Detailed design for various plant expansion components and collection system upgrades phased as required to accommodate construction on site.
- Mid-2008 to 2014: Construction activities on site at the Woodward Avenue WWTP, phased according to site development capacity and process requirements.
Figure ES - 4  Preliminary Site Layout for Expanded Woodward Avenue WWTP

- New Power Building
- New thermal reduction and ash handling facilities recommended through the Biosolids Master Plan are being planned through a separate Phase 3 and 4 Class EA process.
- New raw wastewater pumping station with firm capacity of 1,700 ML/d
- New primary clarifiers for treatment of firm capacity of 1,300 ML/d and upgrades to clarifier channels to alleviate hydraulic bottlenecks
- New Maintenance Building

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- New Membrane Facility (Membrane Bioreactor and Membrane Filtration or Tertiary Membrane Bioreactor)
- New Outfall for treated effluent to Red Hill Creek (subject to approval and additional studies)
- New Chlorine Contact Tanks (with dechlorination) for secondary/tertiary effluent and relocate existing chlorine contact tank for primary effluent bypass flows
- Upgrade existing secondary treatment processes to alleviate any constraints
ES-7 IMpACts AND MITIGATION MEASURES

Impacts and mitigation measures are outlined as factors related to the “Triple Bottom Line” (TBL) evaluation criteria: environmental, social and economic.

ES-7.1 ENVIRONMENTAL PROTECTION

ES-7.1.1 Receiving Water Loadings

Through increasing the capacity of the Woodward Avenue WWTP, collection system improvements to allow more wet weather flow to be treated, and implementing treatment improvements, the proposed strategy will reduce contaminant loadings to the Harbour, and realize improvements to Harbour water quality compatible with RAP objectives.

Figures ES-5, ES-6 and ES-7 present the overall loading reductions for target parameters total suspended solids (TSS), total phosphorus, and ammonia, respectively. It should be noted that loadings for the 2031 scenario were developed using 2031 flows based on population projections for the City, together with data for average rainfall years 1988 and 1989 with the level of treatment that is proposed for this expansion. Current loadings were from AWS (2004).

It should be noted that the Hamilton Harbour RAP prepared a report entitled “Hamilton Harbour RAP Water Quality Goals and Targets Review” (Hamilton Harbour RAP, 2007) responding favourably to the City’s proposed wastewater system upgrades, which can be found at http://www.hamiltonharbour.ca/rap/reports.htm.

Figure ES - 5  TSS Loading Reductions to Hamilton Harbour
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Figure ES - 6  Total Phosphorus Loading Reductions to Hamilton Harbour

Figure ES - 7  Ammonia Loading Reductions to Hamilton Harbour
ES-7.1.2 Ecosystem Protection

The proposed expansion of the Woodward Avenue WWTP incorporates the following mitigating measures for the protection of the ecosystem:

- Stormwater running off newly developed impermeable areas of the site, and existing impermeable areas where practicable, will be subject to both quality and quantity controls.
- Spill prevention, control and containment measures will be implemented wherever required throughout the facility.
- Permanent erosion and sediment controls will be implemented wherever required.

An Environmental Contingency Plan for the Woodward Avenue WWTP will be created to incorporate relevant information regarding the expanded facility, and will be used to guide operations and other staff in responding to environmental contingencies.

ES-7.1.3 Air Quality

The Biosolids Master Plan recommended thermal reduction as the preferred biosolids management concept, however the project will now undergo a Phase 3 and 4 Class EA process to determine the preferred design concept. For any new emissions, the City will undertake Human Health Risk Assessment and Air Dispersion Modelling studies to assess the impacts. As such, air quality impacts will be detailed in the Environmental Study Report for Biosolids Management to be completed.

ES-7.2 SOCIAL IMPACTS

ES-7.2.1 General

The expansion, as proposed here, offers the following improvements of significance to the business, institutional and recreational communities:

- Lower potential for odour generation from the expanded facilities
- Improved aesthetics for the surrounding community
- Decreased total traffic volume to and from the site
- No extension of the existing plant boundaries.

The expansion of the Woodward Avenue WWTP is not expected to have any significant impacts on the surrounding business, institutional, residential and recreational communities, with the possible exception of the loss of the baseball diamonds immediately adjacent to the Woodward Avenue WWTP site. This space will be required for staging of construction on the site.

ES-7.2.2 Odour

Potential odours are a concern to stakeholders in the expansion of the Woodward Avenue WWTP as the site borders residential areas to the west and south sides.
All processes have been designed with adequate treatment capacity and contingency to minimize the potential for odour generation. In addition, for select processes with odour potential, additional odour control measures will be investigated during detailed design.

Additionally, odours are most typically associated with solids handling processes and these issues will be addressed as part of the Phase 3 and 4 Class EA that is being conducted for the biosolids management options for the City.

**ES-7.2.3 Traffic**

The Woodward Avenue WWTP is located adjacent to some residential areas that could cause concern if traffic to the site increases substantially. While car and truck traffic will increase during construction, this traffic will occur within normal working hours, 5 days per week. Measures will be put in place during construction to minimize impacts from mud and dust on Woodward Avenue. Additional impacts could be experienced along Brampton Street during construction as the use of Globe Road may be necessary for site access during construction. All feasible measures to reduce the noise and dust due to this traffic will be taken.

During normal operation, there will not be a significant increase in the number of vehicles that access the site. These will be primarily City of Hamilton staff vehicles. Trucks will also access the site for chemical and other deliveries.

**ES-7.2.4 Construction**

All construction and commissioning activities associated with this project will be governed by the requirements of a project-specific Environmental Management Plan (EMP), to be developed during subsequent design activities.

**ES-7.2.5 Waste Management**

All waste materials from operation of the expanded plant, such as screenings and grit, will be disposed off-site in accordance with applicable legislation and guidelines, including the *Ontario Waste Management Act*, as is the current practice.

**ES-7.2.6 Noise**

In both the existing and expanded plant, large equipment and machines are located indoors in buildings appropriately designed for noise attenuation to the outdoors. In addition, noise from truck traffic will be reduced over current levels. Noise in the area surrounding the expanded plant is not expected to be a significant concern. A Certificate of Approval (C of A) for air and noise for the expanded plant will be required and standards outlined in the C of A will be met.

**ES-7.2.7 Dust and Mud**

Dust and mud are not anticipated to be significant concerns during the operation of the expanded facilities. Measures will be put in place during construction to minimize impacts from mud and dust on Woodward Avenue.
ES-7.3 ECONOMIC IMPACTS

As noted in Section 3, the expansion of the Woodward Avenue WWTP is being undertaken in order for the City of Hamilton to:

- Meet the growth objectives of the Province through its Places to Grow document, which identified the need to accommodate growth within the City of Hamilton
- Provide water and wastewater service to areas already approved for development as well as future residential and commercial/industrial lands
- Implement wastewater infrastructure upgrades required to address water quality concerns in Hamilton Harbour
- Integrate planning, water/wastewater, transportation and stormwater processes to ensure implementation of a sustainable growth strategy and fulfill the City’s goals identified in Vision 2020.

The benefits of these objectives being met are self-evident and substantial. Any potential negative impacts of the plant expansion are not significant compared to the consequences of failing to plan for the expected growth.

To minimize economic impacts, costs and risks for future costs were considered in the TBL evaluation of all alternatives.

ES-8 MONITORING AND REPORTING

To verify that the effluent criteria established for the Woodward Avenue WWTP and the combined sewer overflows within the City are being met, a monitoring program will be updated to evaluate the performance of the treatment plant and collection system and quality of discharges to Hamilton Harbour.

ES-8.1 WOODWARD AVENUE WWTP

Table ES-6 presents the proposed monitoring program for raw wastewater and final effluent from the Woodward Avenue WWTP. Final effluent refers to flow that has received full secondary/tertiary treatment. As noted, flow in excess of full treatment capacity is considered CSO, and will be discharged through a dedicated outfall.

The monitoring program presented in Table ES-6 is similar to the existing monitoring requirements, as presented in the existing Certificate of Approval No. 7380-6URKDA (October 23, 2006).

No changes to the existing reporting requirements defined in the Certificate of Approval are proposed.
### Table ES - 6 Proposed Woodward Avenue WWTP Monitoring Program

<table>
<thead>
<tr>
<th>Location</th>
<th>Parameters</th>
<th>Minimum Frequency</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>Raw wastewater</td>
<td>Flow, CBOD₅, COD, TSS, TKN, TP, Alkalinity, pH</td>
<td>Continuous</td>
<td>Flow meter</td>
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<td></td>
<td></td>
<td>1/week</td>
<td>24-hour composite</td>
</tr>
<tr>
<td>Final Effluent</td>
<td>CBOD₅, TSS, TP, dissolved P, Total Ammonia, Nitrates, Alkalinity</td>
<td>1/week</td>
<td>24-hour composite</td>
</tr>
<tr>
<td></td>
<td>Total chlorine residual</td>
<td>1/week</td>
<td>Grab</td>
</tr>
<tr>
<td></td>
<td>Dissolved oxygen, pH¹, temperature¹</td>
<td>1/week</td>
<td>Grab/Probe</td>
</tr>
<tr>
<td></td>
<td>E. Coli</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

Note:
1. Temperature and pH of effluent will be measured at the time of sampling for Total Ammonia and used to calculate the Unionized Ammonia concentration.

### ES-8.2 COMBINED SEWER OVERFLOWS

Currently, there is no system-wide monitoring and reporting requirement for CSOs, although there are specific requirements identified in the Certificates of Approval for individual CSO storage tanks. A system-wide program is proposed, to provide information on the capture efficiency of the CSO control strategy, and loadings from CSOs to the Harbour. The proposed strategy is presented in Table ES-7.

Preparation of an annual report on the CSO discharges is proposed, with the following information:

- A summary and interpretation of all monitoring data, including an overview of the effectiveness and adequacy of the CSO management facilities
- For each CSO tank, a tabulation of the volume into the tank and pumped out of the tank
- For each CSO outfall, a tabulation of the number of events, hours of bypass, bypass volume and estimated loadings
- For the entire Harbour, a tabulation of total CSO volume to the Harbour, and estimated loadings.

The City is proposing that a CSO characterization study be completed every 5 years, to produce data that will be used to quantify the loadings from CSOs to the receiving water. Those numbers will be used to confirm theoretical loading calculations based on raw wastewater data collected at the Woodward Avenue WWTP.
<table>
<thead>
<tr>
<th>Location</th>
<th>Parameters</th>
<th>Frequency</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CSO Locations in Collection System</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSO Outfalls – All</td>
<td>Flow</td>
<td>Every event</td>
<td>Flow meter</td>
</tr>
<tr>
<td>CSO Tanks – All</td>
<td>Flow into tank</td>
<td>Every event</td>
<td>Flow meter</td>
</tr>
<tr>
<td>CSO Tanks – All</td>
<td>Tank overflow volume</td>
<td>Every event</td>
<td>Flow meter</td>
</tr>
<tr>
<td><strong>Bypassing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodward Avenue WWTP Raw Wastewater Bypass</td>
<td>Flow</td>
<td>Every event</td>
<td>Flow meter</td>
</tr>
<tr>
<td>Woodward Avenue WWTP Primary Effluent Bypass</td>
<td>Flow, BOD, TSS, TP and Ammonia</td>
<td>Every event</td>
<td>Composite</td>
</tr>
<tr>
<td></td>
<td>Chlorine Residual</td>
<td>Every event</td>
<td>Grab</td>
</tr>
</tbody>
</table>