Executive Summary

The continuing demand for Capital funding provides the City of Hamilton (City) with the opportunity to maintain their commitment towards the improvement of the infrastructure for the residents of the City. This State of the Infrastructure (SotI) report outlines both the current status of the City’s Corporate Facilities assets as well as a projection of the state of those assets over the next 100 years. Life-cycle assessment was used to determine the sustainable capital requirements for these assets, providing a funding plan at the strategic level. Observations and recommendations are also provided in this report, aimed at continued sustainable asset management practices as well as a SotI Report Card outlining the current condition of the Corporate Facilities asset portfolio. This report, along with the Report Card, provides an approach for the development of more detailed asset management plans in the future and provides the basis for further decision-making at the tactical and operational levels. The SotI report is written in plain English with an easy-to-understand format which is easily updatable.

The Best Practice for Municipal Infrastructure Asset Management, published in November 2003 by the National Guide to Sustainable Municipal Infrastructure, was used to provide the framework for the asset management plan, along with industry experience and expertise. A series of simple questions were asked in order to perform analysis on a life-cycle basis. These are:

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has, over the last few SotI Reports, added two very important questions:

8. How do we maintain sustainability?
9. Do we still need it?

Since service reviews would be done at the tactical and operational levels, question number 9 should follow question number 1.

The SotI report employs this framework, which the City has already adopted in its assessment of sustainable water and wastewater financing needs to systematically evaluate each asset
category. Best Practices from the United States, the United Kingdom, and Australia/New Zealand have also been incorporated into the work.

Developed as a communication tool, this report presents study results in an easy-to-understand format that can be updated regularly to track the City’s path toward sustainability. As a strategic document, the report identifies trends and issues that impact the community’s ability to deal with services (and their supporting assets) on a sustainable basis, and provides recommendations aimed at continuing the deployment of asset management practices within the City of Hamilton.

*Intergenerational Fairness*

Intergenerational fairness is an emotional issue that comes up every time a government wishes to deal with the backlog in infrastructure funding. There is no easy way to deal with a significant backlog since the backlog belongs, in some cases, to a number of past generations. It could be argued that intergenerational fairness is impossible to achieve; and, in fact, that it may even be unfair to try to achieve it for a number of reasons:

- Most assets last longer than one generation or the assets have components that last less than one generation (such as electronic components)
- Difficulties in assigning costs properly to one generation
- Increasing operating and maintenance costs as assets age
- Current shortfall or infrastructure deficit, etc.

Despite these challenges, infrastructure costs need to be dealt with in the most equitable manner possible. There is also a need to recognize that the current situation is not so much an issue of intergenerational fairness as it is a result of past and current public policies and practices. It is, therefore, paramount to change those policies and practices so that we do not repeat mistakes of the past. This, of course, represents somewhat of a double impact for the current generations, but there is little choice in the matter since, as a society, we are at a crossroad where changes and tough decisions need to be made.

The current infrastructure deficit was created by the fact that Life-Cycle costing is a fairly new concept and has not been practiced in the past. Quite the opposite occurred in the past, which has led to municipalities being addicted to growth.
Corporate Facilities Portfolio

The current Corporate Facilities asset portfolio is comprised of 132 facilities and has a replacement value of $354.3 million, as outlined in Table E.1.

Table E.1: Corporate Facilities Asset Portfolio

<table>
<thead>
<tr>
<th>Asset Group</th>
<th>Number of Facilities</th>
<th>Replacement Value</th>
<th>Range of Individual Facility Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and EMS</td>
<td>30</td>
<td>$44.9M</td>
<td>$370,000 - $3,070,000</td>
</tr>
<tr>
<td>Libraries</td>
<td>14</td>
<td>$49.1M</td>
<td>$490,000 - $28,070,000</td>
</tr>
<tr>
<td>C.U.P. Operations</td>
<td>1*</td>
<td>$7.1M**</td>
<td>N/A</td>
</tr>
<tr>
<td>Corporate Administration Buildings</td>
<td>16</td>
<td>$97.3M</td>
<td>$410,000 - $28,100,000</td>
</tr>
<tr>
<td>Work Yards and Maintenance</td>
<td>72</td>
<td>$155.9M</td>
<td>$22,000 - $32,500,000</td>
</tr>
<tr>
<td>**TOTAL:</td>
<td>132</td>
<td>$354.3M</td>
<td></td>
</tr>
</tbody>
</table>

* The City of Hamilton owns the C.U.P. facility and is responsible for the mechanical and electrical components of six other facilities in this category.

** Cost is for C.U.P. facility only

Analysis Results

The Corporate Services asset portfolio has been classified into the following groups and the analysis results are provided based on these groups.

- Fire and Emergency Medical Services (EMS)
- Libraries
- Central Utilities Plant (CUP.) Operations
- Corporate Administration Buildings
- Work Yards and Maintenance

Analysis of the Corporate Facilities assets was performed based on a 100-year timeline to encompass the maximum anticipated lifespan of the various facilities. Future needs were assessed in terms of the following variables:

- Three different life-cycles for the assets: minimum life, expected life and maximum life
- Two funding options: Pay-As-You-Go (PAYG) and Debt-Financing (Debt)

The results discussed in this report concentrate on the expected life of each asset, which is considered to be the number of years that the asset is expected to last with regular usage and proper maintenance.
The analysis assumes that all infrastructure requirements will grow with population in order to meet the needs of the city except for the CUP Operations where there is currently no expectation for these assets to grow significantly with the City. Because demand for CUP facilities is independent of population growth, it was assumed that CUP infrastructure would not grow over the analysis period with the exception of City Hall. Within the analysis, only the replacement value of City Hall is expected to grow with population over the next 100 years.

It is important to note that the actual services provided by both Fire and EMS and Hamilton Libraries are not included in this report since the Corporate Facilities Department is only responsible for maintaining the facilities/buildings themselves.

1. **Fire and Emergency Medical Services (EMS)**

   Over the next 100 years, the average annual capital requirements for Fire and EMS infrastructure are expected to be approximately $2.8 million annually, based on the PAYG model and including expected population growth. If these capital costs are to be debt-financed, annual capital requirements will grow to approximately $3.9 million.

   When Debt-Financing is included, the sustainable capital funding levels increase significantly. Since the sustainable capital costs increase from $2.8 million for PAYG to $3.9 million for Debt-Financing, $1.1 million per year is taken out of the community to pay for interest only under the Debt-Financing model.

2. **Libraries**

   Over the next 100 years, the average annual capital requirements for Library infrastructure are expected to be approximately $2.6 million annually, based on the PAYG model and including expected population growth. If these capital costs are to be debt-financed, annual capital requirements will grow to approximately $3.6 million.

   When Debt-Financing is included, the sustainable capital funding levels increase significantly. Since the sustainable capital costs increase from $2.6 million for PAYG to $3.6 million for Debt-Financing, $1.0 million per year is taken out of the community to pay for interest only under the Debt-Financing model.

3. **Central Utilities Plant Operations (CUP)**

   The Corporate Facilities Department is responsible for the capital costs associated with the Central Utilities Plant and the mechanical and electrical components of the buildings that it serves. The CUP is responsible for the mechanical and electrical components in the following facilities:

   - Art Gallery of Hamilton
   - Copps Coliseum
   - Hamilton Farmer’s Market
Over the next 100 years, the average annual capital requirements for CUP infrastructure are expected to be approximately $1.2 million, based on the PAYG model. If these capital costs are to be debt-financed, annual capital requirements will grow to approximately $1.6 million.

When Debt-Financing is included, the sustainable capital funding levels increase significantly. Since the sustainable capital costs increase from $1.2 million for PAYG to $1.6 million for Debt-Financing, $0.4 million per year is taken out of the community to pay for interest only under the Debt-Financing model.

4. Corporate Administration Buildings

The average annual capital requirements over the next 100 years for the Corporate Administration Buildings infrastructure are expected to be approximately $5.0 million, based on the PAYG model. If these capital costs are to be debt-financed, annual capital requirements will grow to approximately $6.9 million.

When Debt-Financing is included, the sustainable capital funding levels increase significantly. Since the sustainable capital costs increase from $5.0 million for PAYG to $6.9 million for Debt-Financing, $1.9 million per year is taken out of the community to pay for interest only under the Debt-Financing model.

5. Work Yards and Maintenance

If the City were to fund all capital projects on a Pay-As-You-Go plan, then Work Yards and Maintenance Facilities would require $7.8 million in capital funding annually. If, however, capital funding was generated through Debt-Financing, the annual sustainable capital funding levels would increase significantly to $10.6 million. In other words, approximately $2.8 million per year would be taken out of the community to pay only for interest.

Summary

The following streetscape graphically represents the summarized 2009 replacement values and sustainable capital requirements for each of the asset groups based on Pay-As-You-Go (PAYG) and Debt-Financing (Debt) options.
Table E.2 provides a summary of the annual capital requirements for sustainable capital funding for each department. To provide sustainable funding for all Corporate Facilities in this study, a total capital cost of $19.4 million per year will be required. If the City funded all capital expenditures through Debt-Financing, those costs would rise by over 37 percent to $26.6 million annually, thus illustrating the true cost of debt.
Asset Condition Report Card

The following report card is a summary of the condition assessment worksheets that were completed by City staff in order to determine the current funding situation for each group.

<table>
<thead>
<tr>
<th>Asset Group</th>
<th>2009 Rating</th>
<th>Comments</th>
<th>Projected 2029</th>
<th>Projected 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and EMS</td>
<td>B-</td>
<td>Some stations are in the process of being upgraded to current standards and funding is available to upgrade mechanical components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Libraries</td>
<td>B-</td>
<td>Many of the rural facilities require attention, some facilities to be eliminated due to future expansion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUP Operations</td>
<td>B-</td>
<td>Improvement is noted based on funds being provided – new technology may require maintenance costs to rise. Operations budget requirements not being met. Electrical component of CUP building aging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Administration Buildings</td>
<td>B</td>
<td>Funding levels providing improvement in condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Yards and Maintenance</td>
<td>C</td>
<td>Condition of cemeteries deteriorating, inadequate funding. Condition of operations centres good but aging while satellite yards deteriorating. Large operations centres need funding and some reorganization of space allocation in order to improve condition.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure E.2: Summary Report Card

The Corporate Facilities Department has an overall rating of B-, based on the individual asset groups, as illustrated above. Recent improvements by this department have significantly helped to improve the overall condition of the asset portfolio, thus slowing the rate of deterioration. The current absence of sustainable funding is directly related to the expectation that the condition of these assets is not expected to improve by 2050.
Improvements Made

This SotI Report illustrates the effects of the efforts made by the Corporate Facilities Department over approximately the last five years to improve the management and condition of their assets. Placing personnel in key positions in order to manage the assets has resulted in these managers having direct responsibility for their asset portfolio which has led to improved conditions as well as cost savings. This initiative included the addition of two new superintendent positions to better manage the portfolio; formation of the Energy Office to implement and monitor energy efficiency initiatives; and the Archibus system was implemented to support the day-to-day operations and long-range planning requirements.

Conclusions & Recommendations

The recent management improvements and funding allocations have been instrumental in slowing the deterioration that was occurring in this portfolio and have significantly helped to improve the overall condition. Without these efforts, the general condition of the Corporate Facilities assets would be significantly worse.

With those introductory notes in mind, the following recommendations are being made to the Corporate Services Department for priority consideration in 2010:

1. Develop and implement an analytical model that incorporates alternatives, levels of service, risk management, project ranking, etc. to assist in the development of the ten-year Capital budget
2. Develop options with respect to closing the gap in terms of capital budget financing over the next five to ten years, assess impact of further delays and present a report to City Council for their approval
3. Develop performance measures/Level of Service at the strategic, tactical and operational levels, and establish links between a service and the true life-cycle cost of delivering that service through appropriate assets
4. Review existing budgetary documents and budget structure with a view to establishing the True Cost of Service (TCS) which includes asset management, operations, capital and borrowing costs and can measure their progress towards sustainable funding
Acknowledgements


Stantec would like to thank the City’s Corporate Facilities team for its contribution to this State of the Infrastructure Report. We apologize in advance for any inadvertent omissions. In particular, we note the following major contributors:

The following City of Hamilton staff provided information and support in the completion of this document.

- Chuck Alkerton, Superintendent – Operations & Maintenance, Energy, Fleet and Facilities Division
- Rick Andoga, Senior Project Manager, Infrastructure Planning
- Carl Capuano, Project Manager, Facilities, Parks / Infrastructure
- Joe Conti, Infrastructure Technologist, Asset Management Capital Planning & Implementation
- Romolo (Rom) D’Angelo, Manager, Corporate Buildings & Technical Services
- Joe Gerrior, Facilities Supervisor – Chief Engineer/CUP Energy, Fleet and Facilities Division
- Mike Langille, Facilities Supervisor – Corporate Buildings & Technical Services, Fleet & Facilities Division
- Bernice Lilly, Supervisor, Facility Services – Energy, Fleet & Facilities Division
- Geoff Lupton, Acting Director, Energy, Fleet & Facilities
- John Mater, Senior Director of Transportation, Energy & Facilities
- Nick Roundis, Facilities Supervisor – Emergency Services & Technical Trades, Corporate Buildings & Technical Services
- Mike Sands, Facilities Supervisor – Town Halls, Cemeteries & Libraries, Corporate Buildings & Technical Services
- Gerry Shaw, Facilities Supervisor – Transit & Maintenance Yards, Corporate Buildings & Technical Services
- Linda Tattrie, Superintendent, Facility Planning & Customer Services

Project Team

Chuck Alkerton  
(905)546-2424  
Chuck.Alkerton@hamilton.ca

Debbie Burns  
(905)381-3244  
debbie.burns@stantec.com

Thor Neumann  
(519)585-7414  
thor.neumann@stantec.com

Rick Andoga  
(905)546-2424  
rmandoga@hamilton.ca

Andy Dalziel  
(519)585-7484  
andy.dalziel@stantec.com

Linda Tattrie  
(905)546-2424  
Linda.Tattrie@hamilton.ca

Rom D’Angelo  
(905)546-2424  
Rom.D’Angelo@hamilton.ca

John Murray  
(905)546-2424  
jmurray@hamilton.ca

John Vraets  
(905)381-3202  
john.vraets@stantec.com
# Table of Contents

## EXECUTIVE SUMMARY

E.1

Acknowledgments

i

### 1.0 BASIC PRINCIPLES AND APPROACH

1.1 INTRODUCTION ................................. 1.1

1.2 OVERALL APPROACH .............................. 1.1

1.2.1 Implementing Asset Management for Corporate Facilities .......................... 1.1

1.3 BACKGROUND AND CORE DOCUMENTS ............................. 1.2

1.4 SCOPE OF FACILITIES INCLUDED .......................... 1.3

1.5 TASKS AND ACTIVITIES ............................ 1.4

1.6 GLOSSARY OF TERMS ............................. 1.6

1.7 BACKGROUND TO SUSTAINABLE BUDGETS ............................ 1.9

1.8 RATING SYSTEM .................................... 1.10

1.9 DETERIORATION MODELS AND ASSUMPTIONS ..................... 1.10

1.10 TRUE COST OF GROWTH/SYSTEM EXPANSION/NEW DEVELOPMENT .................. 1.10

1.11 LIFE-CYCLE ANALYSIS: GENERAL APPROACH/ASSUMPTIONS ...................... 1.10

1.11.1 Factors Affecting Demand .................................. 1.10

1.12 RELATED ISSUES FOR FUTURE POLICY DEVELOPMENT ...................... 1.10

1.13 INTERGENERATIONAL FAIRNESS .............................. 1.10

1.14 CITY ENERGY USE POLICY .......................... 1.10

1.15 PURPOSE OF SOTI REPORT ............................ 1.10

### 2.0 OVERVIEW OF CORPORATE FACILITIES

2.1 SCOPE OF ANALYSIS ................................ 2.10

2.1.1 Leased Facilities ................................ 2.10

2.2 CORPORATE FACILITIES’ ROLE, VISION AND MISSION STATEMENT ........ 2.10

2.3 ENVIRONMENT PLAN ................................. 2.10

2.4 FUNDING HISTORY .................................. 2.10

2.5 CONSIDERATIONS FOR RECONSTRUCTION/REHABILITATION .................. 2.10

### 3.0 FIRE AND EMERGENCY MEDICAL SERVICES

3.1 ASSET DESCRIPTION .................................. 3.10

3.1.1 Facilities ........................................ 3.10

3.1.2 Components ..................................... 3.10

3.2 SERVICES PROVIDED/PURPOSE OF ASSETS ............................. 3.10

3.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS ............................... 3.10

3.4 LIFE-CYCLE ANALYSIS ................................ 3.10

3.4.1 Introduction and List of 9 Questions .................................. 3.10

3.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy) ........ 3.10

3.4.3 What is it worth? .................................. 3.10
### Table of Contents

December 16, 2009

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4.4</td>
<td>What condition is it in? - Age and condition profiles</td>
</tr>
<tr>
<td>3.4.5</td>
<td>When do we need to do it? - Asset Useful Lives</td>
</tr>
<tr>
<td>3.4.6</td>
<td>What do we need to do to it? - Rehabilitation and Replacement</td>
</tr>
<tr>
<td>3.4.7</td>
<td>How much money do we need? - Capital Costs/Rehabilitation and Renewal</td>
</tr>
<tr>
<td>3.4.8</td>
<td>Summary of the Financial Analysis Results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.0</th>
<th>LIBRARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>ASSET DESCRIPTION</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Facilities</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Components</td>
</tr>
<tr>
<td>4.2</td>
<td>SERVICES PROVIDED/PURPOSE OF ASSETS</td>
</tr>
<tr>
<td>4.3</td>
<td>INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS</td>
</tr>
<tr>
<td>4.4</td>
<td>LIFE-CYCLE ANALYSIS</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Introduction and List of 9 Questions</td>
</tr>
<tr>
<td>4.4.2</td>
<td>What do you have? - Assets (Groups, Types, Components, Hierarchy)</td>
</tr>
<tr>
<td>4.4.3</td>
<td>What is it worth?</td>
</tr>
<tr>
<td>4.4.4</td>
<td>What condition is it in? - Age and condition profiles</td>
</tr>
<tr>
<td>4.4.5</td>
<td>When do we need to do it? - Asset Useful Lives</td>
</tr>
<tr>
<td>4.4.6</td>
<td>What do we need to do to it? - Rehabilitation and Replacement</td>
</tr>
<tr>
<td>4.4.7</td>
<td>How much money do we need? - Capital Costs/Rehabilitation and Renewal</td>
</tr>
<tr>
<td>4.4.8</td>
<td>Summary of the Financial Analysis Results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.0</th>
<th>CENTRAL UTILITIES PLANT OPERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>ASSET DESCRIPTION</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Facilities</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Components</td>
</tr>
<tr>
<td>5.2</td>
<td>SERVICES PROVIDED/PURPOSE OF ASSETS</td>
</tr>
<tr>
<td>5.3</td>
<td>INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS</td>
</tr>
<tr>
<td>5.4</td>
<td>LIFE-CYCLE ANALYSIS</td>
</tr>
<tr>
<td>5.4.1</td>
<td>Introduction and List of 9 Questions</td>
</tr>
<tr>
<td>5.4.2</td>
<td>What do you have? - Assets (Groups, Types, Components, Hierarchy)</td>
</tr>
<tr>
<td>5.4.3</td>
<td>What is it worth?</td>
</tr>
<tr>
<td>5.4.4</td>
<td>What condition is it in? - Age and condition profiles</td>
</tr>
<tr>
<td>5.4.5</td>
<td>When do we need to do it? - Asset Useful Lives</td>
</tr>
<tr>
<td>5.4.6</td>
<td>What do we need to do to it? - Rehabilitation and Replacement</td>
</tr>
<tr>
<td>5.4.7</td>
<td>How much money do we need? - Capital Costs/Rehabilitation and Renewal</td>
</tr>
<tr>
<td>5.4.8</td>
<td>Summary of the Financial Analysis Results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.0</th>
<th>CORPORATE ADMINISTRATION BUILDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>ASSET DESCRIPTION</td>
</tr>
<tr>
<td>6.1.1</td>
<td>Facilities</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Components</td>
</tr>
<tr>
<td>6.2</td>
<td>SERVICES PROVIDED/PURPOSE OF ASSETS</td>
</tr>
</tbody>
</table>
# Table of Contents

6.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS .......................................................... 6.10  
6.4 LIFE-CYCLE ANALYSIS .................................................................................................. 6.10  
6.4.1 Introduction and List of 9 Questions ........................................................................... 6.10  
6.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy) ................. 6.10  
6.4.3 What is it worth? ......................................................................................................... 6.10  
6.4.4 What condition is it in? - Age and condition profiles .............................................. 6.10  
6.4.5 When do we need to do it? - Asset Useable Lives .................................................. 6.10  
6.4.6 What do we need to do to it? - Rehabilitation and Replacement ............................ 6.10  
6.4.7 How much money do we need? - Capital Costs/Rehabilitation and Renewal .......... 6.10  
6.4.8 Summary of the Financial Analysis Results ............................................................... 6.10  

7.0 WORK YARDS AND MAINTENANCE .......................................................................... 7.10  
7.1 ASSET DESCRIPTION ................................................................................................. 7.10  
7.1.1 Facilities .................................................................................................................. 7.10  
7.1.2 Components ........................................................................................................... 7.10  
7.2 SERVICES PROVIDED/PURPOSE OF ASSETS .......................................................... 7.10  
7.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS .................................................... 7.10  
7.4 LIFE-CYCLE ANALYSIS .............................................................................................. 7.10  
7.4.1 Introduction and List of 9 Questions ........................................................................... 7.10  
7.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy) ................. 7.10  
7.4.3 What is it worth? ......................................................................................................... 7.10  
7.4.4 What condition is it in? - Age and condition profiles .............................................. 7.10  
7.4.5 When do we need to do it? - Asset Useable Lives .................................................. 7.10  
7.4.6 What do we need to do to it? - Rehabilitation and Replacement ............................ 7.10  
7.4.7 How much money do we need? - Capital Costs/Rehabilitation and Renewal .......... 7.10  
7.4.8 Summary of the Financial Analysis Results ............................................................... 7.10  

8.0 SUMMARY OF CORPORATE FACILITIES AND RECOMMENDATIONS ............... 8.10  
8.1 SUMMARY OF ANALYSIS RESULTS ......................................................................... 8.10  
8.2 SUMMARY OF THE FINANCIAL ANALYSIS RESULTS ............................................ 8.10  
8.2.2 How do we reach sustainable funding? ................................................................. 8.10  
8.2.3 How do we maintain sustainability? ........................................................................ 8.10  
8.2.4 Do we still need it? ................................................................................................. 8.10  
8.2.5 Key Performance indicators .................................................................................. 8.10  
8.3 IMPROVEMENT PROGRAM ...................................................................................... 8.10  
8.3.1 Asset Management Process Improvements ............................................................. 8.10  
8.3.2 Asset Management Information System Improvements ....................................... 8.10  
8.3.3 Asset Management Data and Knowledge Improvements .................................... 8.10  
8.3.4 Develop and Implement an O&M Strategy for Life-Cycle Analysis and Management ................................................................................................................. 8.10  
8.3.5 Life-Cycle Analysis and Integration with Financial Tools .................................... 8.10  
8.4 CITY ENERGY USE POLICY .................................................................................... 8.10  
8.4.1 Mechanical & Structural ....................................................................................... 8.10  
8.4.2 Electrical ............................................................................................................... 8.10  

mj s:/public works/capital planning & implementation/asset management/state of the infrastructure/corporate facilities soti/final doc/rpt_hamcorpsoti_20091216_fin.doc
8.5 ASSET CONDITION REPORT CARD ................................................................. 8.10
8.5.1 Improvements Made ........................................................................ 8.10
8.6 RECOMMENDATIONS ........................................................................ 8.10
APPENDICES
APPENDIX A: NEW ZEALAND ASSESSMENT TOOL (EXPERPT FROM NAMS PROPERTY MANUAL)
APPENDIX B: VENICE CHARTER FOR CONSERVATION AND RESTORATION OF MONUMENTS AND SITES, AND OTHER HERITAGE CHARTERS AND STANDARDS
APPENDIX C: CITY OF HAMILTON CORPORATE ENERGY POLICY
APPENDIX D: DEBT FINANCING AND TRUE COST OF CAPITAL: IMPACT ON THE TAXPAYER AND ON LONG-TERM SUSTAINABILITY OF INFRASTRUCTURE
APPENDIX E: LISTING OF ASSETS INCLUDED IN ANALYSIS


1.0 Basic Principles and Approach

1.1 INTRODUCTION

Since the late 1990s, the City of Hamilton (City) has been actively engaging in sustainable infrastructure asset management practices. Over this period, the City has built a reputation as a leader in this field. A series of Life-Cycle State of the Infrastructure (SotI) Reports have now been prepared for some of the City’s Public Works assets (Water, Wastewater, Stormwater, Roads, Waste Management, Facilities and Open Spaces, Transit, and Fleet Services in 2005); Corporate Facilities as well as the Community Facilities Department (completed in April 2009). Ongoing efforts towards sustainable asset management have led to this report, a Life-Cycle State of the Infrastructure Report for the City’s Corporate Facilities Division.

1.2 OVERALL APPROACH

1.2.1 Implementing Asset Management for Corporate Facilities

Each of the corporate facilities reviewed as part of this SotI Report have been categorized as one of the following:

- Fire and Emergency Medical Services (EMS)
- Libraries
- C.U.P Operations
- Corporate Administration Buildings
- Work Yards and Maintenance

These services are all offered by the Corporate Facilities Department and have some characteristics that are inherently different from services provided through the Public Works linear assets such as roads and sewers or the Community Services assets which are service-based. The Corporate Facilities are asset-driven and the focus of this report reflects this.

The literature on asset management, from the Canadian InfraGuide to the Australian and New Zealand Manuals, suggests that there are basically three stages of asset management development: strategic, tactical, and operational. Although there is no hard delineation between the stages, Figure 1.1 illustrates conceptually where some of the more common initiatives fit with respect to these three stages.
By complementing the bottom-up approach with a “top-down” approach, the asset manager can significantly accelerate the development of a full service management plan, from technical and financial to communication. This can be achieved through the development of State of the Infrastructure Reports and associated Report Cards as a building block. This approach does not replace the bottom-up approach but is in fact complementary to it and essential in its own right. This approach is therefore a high-level and forward-looking document that clearly spells out the true cost of a service, the future pressure points (service, asset and financial), the associated funding gap, and the steps that need to be taken to close that gap. Soti Reports are easily updatable, need to be updated on a regular basis, and are uniquely based on life-cycles.

1.3 BACKGROUND AND CORE DOCUMENTS

The principles used in completing this study were taken from various Best Practice publications from around the world, including:

- The National Guide for Sustainable Municipal Infrastructure (Canada)
- The International Infrastructure Management Manual (Australia / New Zealand)
- The NAMS Property Manual (New-Zealand) (Excerpt from the manual can be found in Appendix A)
- Various ASCE Manuals of Practice for infrastructure assessment and rehabilitation (USA)
- 2006 RSMeans Square Foot Costs 27th Annual Edition Residential, Commercial, Industrial, Institutional
- Venice Charter for Conservation and Restoration of Monuments and Sites, And Other Heritage Charters and Standards (Appendix B)
- City ReCAPP databases
- City of Hamilton Corporate Energy Policy (Appendix C)
The City of Hamilton’s Corporate Vision, Mission Statement and Values were also included in
the considerations for this study, and are listed below.

**Vision**

To be the best place in Canada to raise a child, promote innovation, engage citizens and
provide diverse economic opportunities.

**Mission Statement**

We provide high quality services in a fiscally and socially responsible, environmentally
sustainable and compassionate manner in order to ensure a healthy, safe and prosperous
community.

We engage our citizens and promote a fair, diverse and accepting community.

We are a skilled, knowledgeable, collaborative and respectful organization that thrives on
innovation and quality customer service.

We are led by a forward thinking Council.

The team (staff) shows leadership in carrying out their responsibilities and is valued and
appreciated for their contributions and accomplishments.

**Values**

Honesty; Accountability; Innovation; Leadership; Respect; Excellence; Teamwork.

1.4 **SCOPE OF FACILITIES INCLUDED**

While the City of Hamilton is comprised of many departments, this SotI report focused on the
assets maintained by the Corporate Facilities Division of the Public Works Department. These
included City Fire and EMS Hamilton (Fire and EMS), Libraries, Central Utilities Plant (CUP)
Operations, Corporate Administration Buildings, and Work Yards and Maintenance, as
illustrated in Figure 1.2 below.
The Corporate Facilities Department is currently responsible for maintaining the Hamilton Public Library building as well as the Fire and EMS buildings, but not the services provided within. Therefore, the Hamilton Public Library is included in Corporate Facilities - Libraries in the organizational chart above as well as under the City of Hamilton, as is Emergency Services.

1.5 TASKS AND ACTIVITIES

The tasks and activities for the SotI Report 2009 on Corporate Facilities were as follows:

Task 1 – Information and Data Gathering

Task 1 included gathering data from the City regarding asset inventory, condition and valuation, as well as the initial interview process between the City and Stantec staff. The interview process identified, at a high-level, the current condition of the asset network based on the City's databases. It was also the means of identifying the source of all asset inventory data and provided the specific information to be used in identifying the current and future funding levels. The following activities were part of Task 1:

- Attend kick off meeting
- Review existing reports
- Interview key staff from each asset class to answer the questions contained within the Asset Management framework
- Review industry standards for asset life projections/deterioration with City Staff, and determine and document any local impact based on staff knowledge
- Identify and collect all data sources for Asset Inventory and Condition, Rehabilitation/Replacement Activities and Unit Costs, as well as any revenue information
- Summarize information and report back to the City
**Task 2 – Condition Analysis**

The condition analysis task involved the systematic review of known and assumed data. The input to this process was all the hard data gathered and confirmed in Task 1. The output from this process was a final needs analysis for assets within the scope of work. The following activities were part of Task 2:

- Load data into analysis tool and review data for irregular records
- Execute analysis using assets' life expectancies to determine rehabilitation/replacement time lines
- Utilize probability distribution to identify early and late rehabilitation/replacement time lines
- Document methods used to populate data and run the analysis
- Document calculations utilized within the analysis
- Present the results from the analysis

**Task 3 – Environmental Considerations**

The City of Hamilton has instituted a Corporate Energy Policy that sets out a strategy for achieving energy reduction targets and defines specific policies for capital investment related to energy, as well as energy procurement. Corporate facilities were evaluated based on the framework set out in the Corporate Energy Policy in order to determine where and how facilities and facility management could be improved to meet energy use targets.

**Task 4 – Financial Analysis**

The financial analysis determined a range of sustainable revenue requirements for capital expenditures, as well as Reserve Funding. It utilized the results of the Condition Analysis to further identify potential peaks and valleys in terms of expenditures for each class of service/facility. A funding gap report was produced to identify where funding exceeds, or fails to meet, sustainable funding requirements. The following activities were part of Task 4:

- Identify current revenue and reserve funds
- Identify current sources of revenue and assess the stability of that funding
- Identify and analyze current levels of expenditures, both in the capital and operating budgets
- Utilize condition analysis results to determine levels of future investment requirements and associated timing of expenditures
- Determine and report on the financial gap
**Task 5 – Report and Targeted Recommendations**

This final task provided the final deliverable to the City, and included the delivery of the Summary and Detailed reports, and the presentation to staff, as well as to the Departmental Management Team. The following activities were part of Task 5:

- Develop a "Report Card" on all Assets to provide a high-level summary of the current state of the City's Corporate assets, as well as areas of risk and projected trends for the future
- Develop a detailed report that includes compiled information from the interviews, condition analysis, financial analysis, and final assessment of the City's Corporate facilities
- Prepare recommendations on administration processes for managing assets
- Prepare PowerPoint presentation material for review and acceptance by the City's Project Staff
- Deliver presentations to City Staff

**1.6 GLOSSARY OF TERMS**

The following definitions are excerpts from various InfraGuide Best Practices that were developed or adopted as part of the National Guide to Sustainable Municipal Infrastructure, as well as from other sources. These definitions were used in this Life-Cycle State of the Infrastructure Report on the Corporate Facilities Department assets.

**Assessment** — the process used to describe the condition and/or performance of a system component.

**Asset** — A physical component of a facility, which has value, enables services to be provided and has an economic life greater than 12 months. Dynamic assets have some moving parts, while passive assets have none.

**Asset management (source: Transportation Association of Canada, 1999)** — The combination of management, financial, economic, engineering, and operational and other practices applied to physical assets with the objective of providing the required level of service in the most cost-effective manner. This is the systematic process of maintaining, upgrading and operating physical assets effectively, combining engineering principles with sound business practice and economic theory, providing tools to facilitate a more organized, logical approach to decision making.

**Asset management plan** — A plan developed for the management of one or more infrastructure assets that combines multidisciplinary management techniques (including technical and financial) over the Life-cycle of the asset in the most cost effective manner to provide a specified level of service. A significant component of the plan is a long-term cash flow projection for the activities.
Asset management strategy — A strategy for asset management covering the development and implementation of plans and programs for asset creation, operation, maintenance, rehabilitation/replacement, disposal, and performance monitoring to ensure that the desired levels of service and other operational objectives are achieved at optimum cost.

Benchmarking — measuring performance against a standard of quality (industry sector or technical standard).

Best practices — State-of-the-art methodologies and technologies for municipal infrastructure planning, design, construction, management, assessment, maintenance and rehabilitation that consider local economic, environmental and social factors.

Capital — Up-front costs associated with building new infrastructure and investment that extends the life of current infrastructure.

Evaluation — the process used (following completion of the assessment) to determine the remedial measures necessary to improve the condition and/or performance of a system component at the best value for the community.

Infrastructure — the term as used in InfraGuide refers to roads and sidewalks, potable water, wastewater, storm water, and transit. Other infrastructure was considered for purposes of the Life-Cycle State of the Infrastructure Reports for Public Works Assets, City of Hamilton, including but not limited to: Corporate facilities, Community facilities, recreational facilities, Long-Term Care facilities, cultural facilities, as well as stormwater, waste management, facilities, open spaces, transit, fleet, cemeteries, urban forest, etc. for other SotI Reports.

Indicator — at its simplest, an indicator is data that identify the condition or state of something being measured. There is a hierarchy of indicators that roughly mirrors the organizational decision-making structure of municipalities. As indicators are aggregated and massaged, they usually combine with related data to form higher levels of indicators, moving from the specific (operational) to more abstract (strategic).

Levels of Service — Levels of service reflect social, technical and economic goals of the community and may include any of the following parameters: safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost and availability. The defined levels of service comprise any combination of the above parameters deemed important by the municipality.

Life-Cycle Asset Management/Total Asset Management — a tool consisting of an inventory of assets, and the ability to track the performance and projected needs of those assets based on Life-Cycle maintenance and care activities and their associated costs during the expected life of an asset, typically computerized.

Life-Cycle Costing — a method of expressing cost, in which both capital costs and operations and maintenance costs are considered, to compare alternatives. “Present worth” is one way to
express Life-Cycle costs. The present worth represents the current investment that would have to be made at a specific discount (or interest) rate to pay for the initial and future cost of the works.

**Maintenance** — activities of a local nature that occasionally or regularly are needed to ensure the asset performs its intended function. This expenditure is for the ongoing upkeep of assets and includes inspections, mowing, and grading. Building and facility maintenance can be further classified into the following four categories.

- **Backlog** - this includes both statutory and non-statutory expenditure on maintenance works previously uncompleted for reasons such as a lack of suitable funds and changes to legislation.
- **Scheduled** - preventive, programmed or predicted maintenance with a scheduled cycle of less than one year.
- **Breakdown** - unplanned or reactive maintenance on activities related to the immediate upkeep of assets, and includes safety repairs.
- **Cyclic** - periodic maintenance of a cyclic nature with the cycle period being greater than one year but less than the capital renewal cycle. Examples include painting and carpet replacement.

**Municipal Manager** — any public or private sector staff working on behalf of a municipality or public utility at the technical or administrative level, either directly or in a consulting capacity (also called decision maker).

**Operational** — this expenditure is the expected outlay on normal business operations or activities, and includes rates, electricity costs, cleaning, security, and fuel costs. Some operating costs are shared with or paid by other units or sections through their own operating budgets.

**Performance Measure** — a performance measure is an attempt to quantify the success of a best practice in achieving its intended goals or objectives. In the context of municipal infrastructure decision-making support, a performance measure assesses the condition and quality of infrastructure. It can also assess the effectiveness of a particular decision-making process.

**Rehabilitation** — Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset to deliver its original level of service without resorting to significant upgrading or renewal, using available techniques and standards.

**Reinvestment** — Funds allocated to capital projects that are rebuilding the existing municipal infrastructure asset base. New capacities and operations are excluded from infrastructure reinvestment decisions.
Renewal — Restoring or upgrading the condition or capacity of an asset by rehabilitation or replacement/reconstruction to satisfy the objectives for structural and functional integrity, and hydraulic adequacy.

Replacement — the complete replacement of an asset that has reached the end of its service life, to provide an alternative that satisfies a targeted level of service.

Senior Government — Provincial, state or federal levels of government.

Service Life — There are basically three types of “lives” to be considered when analysing and making decisions about assets; physical, useful and economic life.

- The physical life of an asset reflects the actual projected life of an asset based strictly on its estimated physical deterioration.
- The useful life of an asset reflects the projected life of an asset based on the amount of time that the asset is required to provide a service and the provision of that service to an acceptable level of service.
- The economic life of an asset reflects the period when the present worth of the future maintenance costs is equal to the present worth of its replacement, at which time it makes economic sense for the asset to be replaced if the service is still required.

1.7 BACKGROUND TO SUSTAINABLE BUDGETS

While it is obviously impossible to collect data on the future, it is possible to project what some of the potential issues might be. If assumptions are reasonable, then it is safe to assume that resulting projections will also be reasonable. That is the basic premise of the State of the Infrastructure Reports: reasonableness, not accuracy.

What the State of Infrastructure (SotI) Reports are:

- A revenue plan
- Long-term and strategic
- Service based
- Life-Cycle based
- Basis of a communication tool
- Easily updatable

State of Infrastructure Reports (SotI) are NOT:

- A budget
- Short-term/tactical
- Project specific
In other words, SotI Reports:

1. Identify trends and issues, not specific solutions
2. Represent a non-traditional top-down approach or a “skunkworks” approach to identify trends and potential issues in the future, not a traditional detailed financial exercise
3. Represent base principles of sustainability and Life-Cycle, not fixed-term budgeting
4. Establish estimated revenue requirements. They are not expenditure budgets but revenue projections, although they are based on reasonable projections and timeliness of expenditures

The SotI Reports also suggest that there is a need:

1. To differentiate between the initial construction of an asset and its replacement when developing financial reinvestment policies; and
2. To possibly develop a variety of reinvestment policies depending on whether an asset is operationally- or capital-cost intensive, and whether it has a long or short useful life.

The reader is referred to the appendices within this report for a more detailed discussion on infrastructure financing considerations in developing appropriate infrastructure reinvestment policies.

1.8 RATING SYSTEM

Since it is unrealistic to scientifically rate every asset for a high-level SotI Report, a modified American Society of Civil Engineers (ASCE) alphanumeric system was employed for each asset component grouping. Service managers were interviewed and asked to evaluate their assets on a simplified component-by-component basis. Although every rating system is subjective, this process improved accuracy since it incorporated the anecdotal knowledge of the managers with respect to their assets. As a result, uncertainty-based inaccuracies tended to balance one another out.

The assets (by individual components) were rated using a four-step process in order to ensure consistency, focus, and detail:

1. The first step was an overall rating of the assets’ current physical condition. A simple illustrative deterioration curve was used for this process, and the overall physical condition of the asset was noted and displayed on this curve.
2. The second step was a more detailed rating of the current condition in order to start understanding the makeup of the overall rating and identifying what the potential problems the managers were facing.
3. The third step was to combine the detailed rating into a single blended rating that represented the overall score of that component, and then totaled into an overall score for the asset class for purposes of the SotI Report Card.
4. Finally, the fourth step involved generating a projected asset rating for 2020. This consisted of using a simple arrow system in order to indicate trends, i.e. improving, status quo or deteriorating.

The following detailed process was used for each step:

**Step 1: Overall Rating of Current Physical Condition Only**

Service managers were asked to rate the current physical condition of their assets by putting a numerical value to this simplified deterioration curve: 1 being in excellent condition stage where deterioration begins, 2 being average but on the way to rapid deterioration, and 3 having failed.

**Step 2: Detailed Rating of Current Condition**

Assets were evaluated based on the following criteria. Completed tables are included in the individual chapters for those individual assets.

- Condition and Performance
- Capacity versus Need
- Funding versus Need

**Condition and Performance**: This first criterion characterizes the current physical condition of infrastructure. The condition index scale below was provided as a general guideline for grading under this category.

<table>
<thead>
<tr>
<th>Detailed Rating (A, B, C, D or F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition &amp; Performance</td>
</tr>
<tr>
<td>Capacity vs. Need</td>
</tr>
<tr>
<td>Funding vs. Need</td>
</tr>
</tbody>
</table>

- **A** = Excellent: No noticeable defects. Some aging or wear may be visible.
- **B** = Good: Only minor deterioration or defects are evident.
- **C** = Fair: Some deterioration or defects evident, but function not significantly affected.
- **D** = Poor: Serious deterioration in at least some portion of the structure. Function is inadequate.
- **F** = Failed: No longer functional. General failure or complete failure of a major structural component.

**Capacity versus Need**: For most infrastructure categories, this second criterion relates to the demand on a system, such as volume or use, versus its design capacity. This is a critical evaluation criterion for municipalities that are facing ongoing population and community growth. It is also important because a particular asset may be in excellent condition and performing well,
but it is simply too small to meet the needs. A grading scale in 10-percent increments was suggested as a guideline for purposes of intuitive assessment by City staff, as follows:

- **A** = systems that can support ≥ 100% of demand
- **B** = systems that can support 90 - 99% of demand
- **C** = systems that can support 80 - 89% of demand
- **D** = systems that can support 70 - 79% of demand
- **F** = systems that can support less than 70% of demand

**Funding versus Need:** The third evaluation criterion reflects the status of funding dedicated to:

1. Maintaining, replacing and improving the current condition of existing infrastructure, and/or;
2. Building new infrastructure that is needed to keep up with growth (where development charges may not be applicable or may be difficult to define).

Facilities need funding that is dedicated, indexed, long-term, and most importantly sustainable. The primary measure is the amount of funding provided versus the estimated funds needed to meet or maintain the community’s desired quality or performance standard.

Dedicated funds, such as user fees and development charges, need to be applied only to facilities for which they are raised. Indexing means that funds need to increase as the use of the system increases, or as the cost of providing the service increases. Maintenance and construction costs also need to be considered in the evaluation of funding. Steady funding provides for maintenance that extends the life of infrastructure. Long-term, multi-year funding plans should account for growth estimates so that projects can be designed and constructed in anticipation of needs where it is logical and feasible to do so, and not simply in reaction to inadequate capacity or problems caused by poor maintenance. Again, a grading scale in 10-percent increments was suggested as a guideline for purposes of intuitive assessment by City managers, as follows:

- **A** = 90 to 100% of need
- **B** = 80 to 89% of need
- **C** = 70 to 79% of need
- **D** = 41 to 69% of need
- **F** = under 40% of need

Qualitative information collected through the review process was incorporated into the grading process.
Step 3: Blended Rating

An overall 2009 Report Card Rating was assigned to each asset category based on a consolidation of Condition & Performance, Capacity vs. Need and Funding vs. Need criteria.

At this time, each factor equally contributes to the overall weighting. In the future the City may want to weight the contribution of one or more factors to better reflect their relative impact on sustainability or other factors related to the service itself.

We believe that the “Funding vs. Need” criterion appears to be the most critical in terms of sustainability and would likely warrant additional weighting in the analysis in future analyses. For example, quite often new infrastructure or facilities are built through grants, development charges, or other external sources of funding with little or no consideration for its proper maintenance, rehabilitation, and ultimate replacement. In these cases, this newer asset may have received a very favourable rating in the first two criteria since it is in excellent condition and meets current and future needs, but it would receive a low rating in the “Funding vs. Need” category because the lack of financial investment and planning compromise the long-term sustainability of the facility or service to the community.

Step 4: Projected Rating of Future Condition (improving↑, status quo→, deteriorating↓)

The fourth step consisted of a projected asset rating for 2020 using a simple arrow system in order to indicate trends, i.e. improving, status quo or deteriorating.

1.9 DETERIORATION MODELS AND ASSUMPTIONS

As noted in the Glossary of Terms, there are actually three “lives” that should be considered: physical, service, and economic. According to the New Zealand Infrastructure Asset Valuation and Depreciation Guidelines, failure is defined as “the point where assets fail to achieve required levels of service”. Although one can assign a useful life to an asset, for example 50 years for a building, there are many factors that affect the actual life of that asset such as design standards, production of material and quality of construction, operational stresses, lack of maintenance, and lack of capacity as a result of growth. The result is that assets constructed or installed at the same time do not all fail at the same time and the mode of failure is not necessarily the same for each asset. Therefore, for the particular assets under review as part of this SotI Report, the analysis considered a range of cost profiles associated with maximum and minimum life expectancies.
**Broad Economic Assumptions**, exceptions and details are noted, as required, in individual Chapters.

- All estimates in 2009 dollars
- No discount rate or other time value of money adjustments were used
- No inflation was used, and neither was interest gained on reserve funds. These would have a tendency to balance out over time.
- Growth of assets: where noted, assets were assumed to grow at the same rate as the population, which is 1.07%/year per the recent Monteith Brown¹ report which itself was based on provincial projections. In summary, it was assumed that to maintain services at the current level, growth represented an increase in population, which in turn means more infrastructure needs to be built; which requires more funding (for staff and resources) to operate, maintain, and ultimately replace that infrastructure at the end of its useful life.
- Capital costs were calculated on the basis of four (4) ranges:
  1. Useful/expected lives – maximum / minimum / expected
  2. Construction costs – high / low / average
  3. Financing options: pay as you go (PAYG) versus debt-financing (Debt)
  4. Status Quo vs. Growth
- Asset replacement values were obtained from the City’s ReCAPP database.
- Current debt or reserve levels were not incorporated when assessing reserve funds.
- Other sources of revenue such as development charges and grants/subsidies from senior levels of government were not built into the analysis since they are either generally not significant or have not historically been consistent enough to be relied on in a Life-Cycle analysis.
- The cost of capital used included allowances for engineering (15%), overhead (12%) and contingencies (10%) were included, as well as the cost of interest for debt-financing.
- Debentures were calculated on the basis of 15 years at 6%, as recommended by the City’s Finance Department.

Costs were tracked separately by the financial models in order to determine the potential savings to the community if reliance on Debt-Financing for capital expenditures was reduced to a minimum, if not completely abandoned, thus increasing the amount of net capital available for infrastructure investment. This analysis serves to illustrate the following three principles:

1. The real cost of capital to the community

---

2. The permanent debt levels that are experienced with debt-financing of capital and that will only increase as the City moves towards sustainable funding levels, unless changes are made at the policy level.

3. The power of small investments over the long-term, especially in terms of contributions to reserves.

This is a complex issue that merits more discussion and analysis. A detailed discussion of this issue can be found in Appendix D, Debt-Financing and True Cost of Capital: Impact on the Taxpayer and on Long-Term Sustainability of Infrastructure.

1.10 TRUE COST OF GROWTH/SYSTEM EXPANSION/NEW DEVELOPMENT

Every time a new facility is added there is an increase in the overall inventory of infrastructure that the City must operate, maintain, and ultimately replace. This additional infrastructure becomes a significant liability for the City; more on this issue can be found in the Appendix D.

1.11 LIFE-CYCLE ANALYSIS: GENERAL APPROACH/ASSUMPTIONS

Analysis on a life-cycle basis means asking a series of simple questions. The first seven are often referred to as "The Magnificent Seven":

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has, over the last few SotI Reports, added two very important questions:

8. How do we maintain sustainability?
9. Do we still need it?

Since service reviews would be done at the tactical and operational levels, question number 9 should follow question number 1.

The one and only rule of service/asset management:

If a service is not fully funded, it is not sustainable;

And if it is not sustainable, it will eventually fail or fall to an unacceptable level.
1.11.1 Factors Affecting Demand

There are a number of economic, social, environmental, technological, and political factors that can impact demand and the associated infrastructure, as illustrated below. Population growth was included within this analysis.

- Economic
  - Population Growth
  - The use of real estate as an investment tool
  - Growth in floating population due to tourism

- Social
  - Level of awareness
  - Population density
  - Demographic shifts

- Environmental
  - Cost of and Level of access to required resources
  - Climate change
  - Changes in environmentally responsible practices

- Technological
  - Availability, affordability, and popularity of alternative energy sources and new construction materials
  - Changes in communications
  - Lifestyle shifts due to impact of technology

- Political
  - Changes to legislative requirements
  - Changes to policies
  - Privatization or downloading of services

Further study of these factors and predictions regarding their future impact on demand would better prepare the City to provide the appropriate quality and quantity of services at the appropriate time. A key long-term strategy is to manage demand so that future services can be provided at a reasonable cost without a negative impact on delivery.
1.12 RELATED ISSUES FOR FUTURE POLICY DEVELOPMENT

All financial projections were prepared in 2009 dollars at the time of writing. The following list is not meant to be all-inclusive, but only serves to illustrate related issues that were not considered within this analysis and that will need to be dealt with as part of the development of a sound infrastructure reinvestment policy. A detailed discussion is available in the Appendix D.

- Definition of Capital vs. Operating expenditures
- User fees
- Depreciation
- Discount rates
- Inflation
- Existing debt was not included in the analysis, except for Fire and EMS where the debt repayment information was available
- Reinvestment of savings
- Financing policies
- Investment selection policies
- Revenues: pricing and subsidies
- Development charges

1.13 INTERGENERATIONAL FAIRNESS

Intergenerational fairness is an emotional issue that comes up every time a government wishes to deal with the backlog in infrastructure funding. There is no easy way to deal with a significant backlog since the backlog belongs, in some cases, to a number of past generations. It could be argued that intergenerational fairness is impossible to achieve, and in fact, that it may even be unfair to try to achieve it, for a number of reasons:

1. Most assets last longer than one generation (i.e. 50-150+ years), so how can costs be properly assigned to one generation?
2. Many assets have components that last less than one generation such as electronic components.
3. How do you build in advancements in society (i.e. technology, health, and education) that provide benefits today and in the future? How do you apportion the cost of research and development, and ultimately of implementation as well as the cost of the facilities to make this progress possible?
4. Operating and maintenance costs increase as assets get older, so how can costs be fairly distributed over an asset's life? One generation would have enjoyed lower costs when the asset was young, while another generation would be saddled with higher costs
when the asset is older. The difference is even more dramatic when one generation needs to deal with high O&M costs of the old asset as well as the replacement cost of that asset in any given year.

5. There is a current shortfall or infrastructure deficit. It has been created over many generations. Who does it belong to and how can that deficit be fairly apportioned?

6. Intergenerational fairness has never been an issue before, so how can society suddenly bring in a new concept simply because there is a shortfall and looming infrastructure crisis? Is it really just a “Me-generation” issue? Past generations have always built for and invested in the future. Not doing so could be perceived as wasting money and opportunities (i.e. building a sewer or watermain that does not allow for growth).

7. All generations have gained from investments by past generations, and future generations will gain from current initiatives (i.e. health, education, etc.). Society, as a whole, and communities are better for it.

8. Intergenerational fairness is a short-term outlook, when what we need to do is to actually strive for a sustainable and life-cycle outlook (i.e. First Nations: seven generations out).

9. There are many service lives that can be used for an asset: physical life, useful life, and economic life. Which life will be used for the purpose of cost apportionment?

Despite the challenges, infrastructure costs need to be dealt with in the most equitable manner possible. There is also a need to recognize that the current situation is not so much an issue of intergenerational fairness as it is as a result of past and current public policies and practices. It is, therefore, paramount to change those policies and practices so that we do not repeat mistakes of the past. This, of course, represents somewhat of a double impact for the current generations, but there is little choice in the matter since as a society we are at a crossroad where changes and tough decisions need to be made.

The current infrastructure deficit was created by the fact that Life-Cycle costing is a fairly new concept and has not been practiced in the past. Quite the opposite occurred in the past, which has led to municipalities being addicted to growth. There are four main drivers:

1. Traditionally, in new subdivisions, the infrastructure is built at the developer’s cost and is then turned over to the municipality at no cost. These assets can then generate revenues for the City without much additional cost for at least 25 years or more. That funding is then used to offset older infrastructure elsewhere in the City. This “siphoning” of funds may help offset tax increases on the short term, but it leads to unfunded or under funded liabilities in the longer term.

2. Development charges are collected for building new parks, libraries, etc. Again, these assets are essentially “free” in terms of initial capital costs and are relatively inexpensive to operate and maintain in their initial years. As they age, costs increase significantly to the point where replacement is warranted but no funding has been put aside since Life-Cycle financing policies have not been implemented from Day One.

3. Too often, projects required to allow this growth to occur such as widening of roads, expansion of water plants, etc. are not completely funded by development charges.
Municipalities face restrictions as to what they can charge against and collect from development charges.

4. Grants from senior levels of government also skew the fiscal fundamentals, by allowing municipalities to build assets on a cost-shared basis. Assets are then built at a fraction of the cost in terms of municipal contributions, and as noted above no funding has been put aside since Life-Cycle financing policies have not been implemented from Day One.

There is a need for aggressive policy decisions in terms of infrastructure management over the next decade or so if the community is to maintain most of the services that it has grown accustomed to and that have defined it. There is a need not to perpetuate the mistakes of the past, and to move towards Life-Cycle financing policies from the time assets are initially transferred to the municipality and/or put in service.

This SotI Report was prepared on the basis of a fixed contribution (in 2009 dollars) for the assets that were reviewed.

1.14 CITY ENERGY USE POLICY

This State of the Infrastructure Report identifies high-level order-of-magnitude capital and O & M requirements over the Life-Cycle of an asset/asset group to help identify and ensure adequate funding levels are put in place and maintained.

The City of Hamilton’s Corporate Energy Policy (Appendix C) sets out a strategy for achieving energy reduction targets and defines specific policies for capital investment related to energy, as well as energy procurement (see City of Hamilton Corporate Energy Policy For City Facilities and Operations October 2007, Executive Summary p. 3). The Energy Policy calls for targeted energy reductions in energy intensity of City-owned facilities and operations of 20% by 2020 (p6).

It is the City’s Energy Policy that will ensure that the Energy Conservation and Demand Management (CDM) requirements are brought to the forefront of the City’s day-to-day operations and capital planning activities.

The City’s Energy Policy sets out a framework for implementing CDM initiatives, including the formation of a Corporate Energy Steering Committee (CESC) to help key staff work together in developing energy plans and strategies for their Divisions (p. 7). The SotI Report provides a common reference document to help staff put energy reduction plans into the context of asset Life-Cycle planning.
The City’s energy reduction targets and CDM activities will be achieved through a combination of: (p.9)

1. Monitoring and Targeting of Existing/New/Retrofitted Buildings
2. Investment in Energy Efficiency – Existing Buildings

For example, the City’s Energy Policy sets out requirements for monitoring and reporting of energy use under the requirements of Bill 21 – Energy Conservation Responsibility Act (p.5). In order to meet Bill 21 requirements, the City has purchased an Energy Management Software System (Utility Manager) that will store a database of historical energy costs and consumptions (p. 5). From this database, energy intensity factors can be calculated to compare facilities and to accurately identify and monitor energy reductions and savings from CDM activities (p. 6).

The Energy Policy identifies the types of typical equipment that are considered under the process of CDM Retrofits and Capital Renewal/Life-Cycle Replacements such as:

- HVAC equipment
- Lighting and controls
- Building envelope
- Water use (e.g. pools, toilets, water reclaim etc.)
- BAS (building automation system) controls
- Process improvements
- Back-up generators
- Any other energy consuming device (p. 11).

The Energy Policy also sets out strategies for CDM investment for major renovations and new construction, including the evaluation of Leadership in Energy and Environmental Design (LEED) and Green Building Design options. There are also specific policies for investment in the types of equipment listed above, as well as items such as:

- Roof replacement, etc.
- Energy efficient equipment purchasing
- Energy education and awareness
- Electricity generation, cogeneration and district energy
- Specific policies for energy procurement (p. 21)
The City’s Energy Policy provides the framework for achieving the energy reduction targets. The SotI report would be a common reference document and resource in the analysis of various initiatives and provide context relative to an asset’s overall Life-Cycle.

The SotI report is a high-level analysis of the future investment needs of the City to ensure continued provision of services; therefore, it is not possible to comment upon the overall impact of the City’s energy policy. However, we do recognize that while refurbishing facilities, use of energy efficient alternatives may require additional capital investment.

1.15 PURPOSE OF SotI REPORT

The SotI Reports are not meant to suggest that the City is in crisis. They are meant:

- To convey a consciousness and ultimately to project the true cost of services on a Life-cycle basis; and
- To encourage discussion and the development of sound financial reinvestment policies that reduce life-cycle costs to a minimum, while balancing economic and social objectives.

Therefore, SotI reports are meant to assist in managing the crisis before the crisis actually occurs. By focusing solely on asset management, there is a risk of keeping assets long after they have served their useful lives. This in fact leads to the never ending loop of inputs and outputs. Services offered to the community, especially the unique nature of those offered by the Corporate Facilities Department, need to focus on outcomes.
2.0 Overview of Corporate Facilities

2.1 SCOPE OF ANALYSIS

The City’s Corporate Facilities Department has been organized within this report to reflect functional responsibilities rather than by asset type. Therefore, based on these responsibilities, the Corporate Facilities assets were classified into the following groups for the purposes of this report, as illustrated in Figure 2.1 below.

- Fire and EMS
- Libraries
- Central Utilities Plant (CUP) Operations
- Corporate Administration Buildings
- Work Yards and Maintenance

![Figure 2.1: Asset Managing Groups in the City of Hamilton](image)

The Corporate Facilities Department is currently responsible for maintaining the Hamilton Public Library building as well as the Fire and EMS buildings, but not the services provided within. Therefore, the Hamilton Public Library is included in Corporate Facilities - Libraries in the organizational chart above as well as under the City of Hamilton, as is Emergency Services.
2.1.1 Leased Facilities

The Corporate Facilities Department is also responsible for 17 leased facilities including 1447 Upper Ottawa Street, which is partially owned by the City but falls under the responsibility of WCC191 Corporation. These assets were not included in the analysis for this SotI report since the City is not responsible for their maintenance. A listing of the leased facilities administered by the Corporate Facilities Department is included in Appendix E.

2.2 CORPORATE FACILITIES' ROLE, VISION AND MISSION STATEMENT

The specific role, vision and mission statement for the Corporate Facilities department were included in the considerations for this report and have been listed below.

**Role**

The role of Facility Management is to balance People, Places and Processes in order to provide a productive work environment.

Facility Management is defined as "the practice of coordinating the physical workplace with the people and work of the organization: it integrates the principles of business administration, architecture and the behavioral and engineering sciences."

**Vision**

The Facility Management Division is recognized as a leader, and service provider of choice, in the delivery of facility and property maintenance services; exceeding customers expectations through the use of sound business practices.

**Mission**

To achieve a balance between people, places and processes, fostering a productive work environment.

**Values**

<table>
<thead>
<tr>
<th>Customer Focus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td>Commitment</td>
</tr>
<tr>
<td>Integrity</td>
<td>Optimism</td>
</tr>
<tr>
<td>Innovation</td>
<td>Communication</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Diversity</td>
</tr>
<tr>
<td>Competency</td>
<td>Health &amp; Safety</td>
</tr>
</tbody>
</table>
2.3 ENVIRONMENT PLAN

The City is committed to environmental responsibility, as noted in the Public Works’ vision for 2017, listed below. This commitment was included in the considerations and recommendations for this report.

Public Works Vision: Be recognized as the centre of environmental and innovative excellence in Canada.

We, the staff of Hamilton’s Public Works Department, take our environmental responsibility very seriously and we remain committed to implementing programs and measures that will enhance the quality of life and environmental integrity in our community. Through these measures, we aim to further promote Hamilton as a desirable place in which to live, work, and raise a family.

2.4 FUNDING HISTORY

Approximately ten years ago, reports identified a gap of approximately $7.5 million between Block Funding and Sustainability Funding. The City has done much since then to improve the management of assets, such as the set up of an Energy Office and the set up and use of Archibus and ReCAPP databases to manage the City’s portfolio. The subsequent efforts including operational reviews, preventive and routine maintenance, have been successful in improving the state of the current assets within the Corporate Facilities Department.

2.5 CONSIDERATIONS FOR RECONSTRUCTION/REHABILITATION

It should be noted that as facilities and their components are upgraded, new technologies may require additional funds in order to maintain them. New, more modern equipment may cause maintenance costs to rise and these costs need to be accounted for. For example, the installation of new chillers in a facility would result in the requirement for the services of a refrigeration mechanic or a service contract to maintain them.
3.0 Fire and Emergency Medical Services

3.1 ASSET DESCRIPTION

3.1.1 Facilities

The Fire and Emergency Medical Services (EMS) facilities within the City of Hamilton have been grouped into one major category for the purposes of this analysis, called Fire Halls.

- **Fire Halls** – All Fire and EMS facilities share similar properties and characteristics, and have been analyzed as a single group. This group includes all 30 fire stations as well as the Fire Department Administration Building, which is associated with Fire Station #1.

The Corporate Facilities Department is responsible for maintaining the Fire and EMS buildings, but not the services provided within. Therefore, only the buildings/facilities have been included in this analysis.

3.1.2 Components

The Fire and EMS facilities have been divided into five component classifications:

- **Surface and Site Systems** – components that are located on the same site as the facility, but are not typically attached to that facility, e.g. walkways
- **Architectural and Structural** – physical parts that make up the building, e.g. foundations, walls, doors, windows, roofs
- **Electrical** – all parts of a facility that use or conduct electricity, e.g. wiring, lighting, electric heaters, and fire alarm systems
- **Mechanical** – parts of the facility that convey and utilize all non-electrical utilities within a facility, e.g. gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
- **Vertical Movement** – components used for moving people between floors of buildings, e.g. elevators, wheelchair and stair lifts.

Of the five component categories, Surface and Site Systems components are unique in that their replacement and refurbishment is not directly dependent on the facility with which they are associated. For example, walkways on a property likely would not need to be replaced as part of the replacement of the facility. Rather, site components are scheduled for replacement based on their own useful lives and their replacement schedule remains independent of the facility.

Unlike site components, architectural and structural, mechanical, electrical, and vertical movement components are directly incorporated into the facility itself, and would need to be replaced as part of the replacement of the facility.
3.2 SERVICES PROVIDED/PURPOSE OF ASSETS

The Fire and EMS facilities provide fire protection, emergency and medical services to the City of Hamilton residents.

Purpose

The emergency management program is designed to address the five phases of the emergency management cycle. Those phases are defined as mitigation, prevention, preparedness, response and recovery.

Vision

The emergency management program is designed to ensure that the City of Hamilton is constantly evaluating its program and completing the necessary requirements to obtain the Essential, Enhanced and Comprehensive Levels set forth by Emergency Management Ontario (EMO) by the end of year 2006.

Mission Statement

The mission statement of the Emergency Management Program is ‘To establish and maintain a program that identifies, analyzes, evaluates and treats the risks that pose a threat to the community and environment in the City of Hamilton.’

3.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS

The following assumptions were included in the analysis of Fire and EMS facilities.

- The property value of the land was not included in the analysis, since property is considered to be a completely separate asset category and the land itself is not replaced when the facility or asset is replaced.

- Site components on the land, such as walkways, are included as separate entities in the analysis since these components are replaced based on their expected service lives and not necessarily based on the expected service life of the facility or asset being replaced.

- Minimum, maximum and expected facility replacement costs are based on data from the City of Hamilton’s ReCAPP Database system, along with input from NAMS, RS Means data and Stantec industry experience.

- Component costs (HVAC, electrical, roof, plumbing, etc.) and ranges are derived from an analysis of NAMS and RS Means data as well as Stantec industry experience.

- Status quo analysis assumes no increase in the asset portfolio, thereby resulting in decreased level of service as demand/population increases.
Demand-based (PAYG) analysis assumes maintaining level of service relative to projected demand/population growth.

**Heritage-Designated Assets**

- Structural framing life expectancy was used for building life expectancies – 500 years
- Historic sites would not be replaced, they would only be preserved and conserved

### 3.4 LIFE-CYCLE ANALYSIS

#### 3.4.1 Introduction and List of 9 Questions

Analysis on a Life-Cycle basis means answering a series of simple questions. The first seven are generally accepted within the industry:

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has added two very important questions, which are:

8. *How do we maintain sustainability?*
9. *Do we still need it?*
3.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy)

All of the Fire and EMS facilities were grouped into one category for the purposes of this analysis. A total of 30 facilities were included as summarized in Figure 3.1 and a complete listing of the individual facilities can be found in Appendix E.

![Fire and EMS Asset Diagram](image)

**Figure 3.1: Fire and EMS Assets (Capital Costs Only)**

3.4.3 What is it worth?

The 30 Fire and EMS facilities included in this analysis have a combined replacement value of approximately $44.9 Million.

3.4.4 What condition is it in? - Age and condition profiles

Interviews with key City staff along with the 2009 Condition Assessment Reports provided by Jacques Whitford were used to update the expected lives, replacement costs and possible upgrades required to meet modern standards for the components within these facilities.

During interviews with key City staff, worksheets were completed in order to obtain estimates of the present condition and expected future condition of the Fire and EMS facilities. Table 3.1 lists the results of these interviews and includes ratings for the different types of components.
contained within each facility. These worksheets were also used to develop the department report card. The Fire and EMS worksheet illustrates the opinion that this asset group is in reasonably good shape (B-) and is expected to remain the same by 2029, based on current funding levels.

The current condition of the Fire and EMS portfolio is based on the fact that approximately $1.3 million is available this year to upgrade the mechanical, electrical, architectural and structural components. This has contributed to the generally good current condition of these assets.

It was noted during discussions with staff that it is believed that Station 22 needs to be reconstructed or replaced within the next five years. It was also suggested that consideration should be given to combining facilities such as the training complex and Station 5.

Currently, the Energy Group is assessing the lighting upgrades via the Energy Lighting Audit Spring 2009 program. Some of the fire stations are currently in the process of being upgraded to current standards and funding is available to upgrade mechanical components.
### Table 3.1: Condition Assessment Worksheet: Fire and EMS

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Asset Component</th>
<th>Condition (Select point on deterioration curve)</th>
<th>Useful Life (Years)</th>
<th>Rating (A, B, C, D or F)</th>
<th>Overall Rating (A, B, C, D or F)</th>
<th>2029 Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Stations</td>
<td>Surface and Site Systems</td>
<td><img src="#" alt="Graph" /></td>
<td>10 – 30</td>
<td>Condition &amp; Performance  B</td>
<td>C+</td>
<td><img src="#" alt="Up" /></td>
<td>Station 23 is currently being renovated. Station 22 – Training Complex – needs to be replaced within the next 5 years or sooner. Combine training complex and station 5?</td>
</tr>
<tr>
<td></td>
<td>Architectural and Structural</td>
<td><img src="#" alt="Graph" /></td>
<td>10 – 30 (architectural) 50 – 75 (structural)</td>
<td>Condition &amp; Performance  B+</td>
<td>B-</td>
<td><img src="#" alt="Up" /></td>
<td>Some stations are being upgraded in 2009, for example, the addition of female change rooms</td>
</tr>
<tr>
<td></td>
<td>Vertical Movement</td>
<td><img src="#" alt="Graph" /></td>
<td>60</td>
<td>Condition &amp; Performance  A</td>
<td>B</td>
<td><img src="#" alt="Up" /></td>
<td>Some funding this year to address mechanical components</td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td><img src="#" alt="Graph" /></td>
<td>20 – 40</td>
<td>Condition &amp; Performance  B</td>
<td>B</td>
<td><img src="#" alt="Up" /></td>
<td>Some funding this year to address mechanical components</td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td><img src="#" alt="Graph" /></td>
<td>10 – 40</td>
<td>Condition &amp; Performance  B</td>
<td>B</td>
<td><img src="#" alt="Up" /></td>
<td>Energy Lighting Audit Spring 2009</td>
</tr>
</tbody>
</table>
3.4.5 When do we need to do it? - Asset Useful Lives

Each asset has an associated useful life value assigned to it. This useful life is the number of years that the asset is expected to last with regular usage and proper maintenance. The useful lives for Fire and EMS facilities are listed in Table 3.2. Fire Station #1 is a designated historical building, and as such, is expected to be maintained well beyond the typical useful life for a municipal building. A lifespan of 500 years was applied to Fire Station #1 in this analysis in order to represent the maintenance of the facility well beyond the 100-year period being analyzed. A 75-year expected life was applied to all other Fire and EMS buildings.

Various factors can affect the useful lives of facilities. Factors such as weathering, heavy use, or misuse can shorten the life of a facility. Conversely, factors such as under-utilization or better-than-expected construction practices and materials could extend the life of a facility. For this reason, a range of useful lives for each facility was considered in the analysis as listed in Table 3.2. These ranges were determined through analysis of NAMS, ReCAPP data, RSMeans, and Stantec industry experience.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Expected Life</th>
<th>Expected Life</th>
<th>Maximum Expected Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and EMS Stations</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>Fire and EMS Stations – Historically Significant</td>
<td>500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These useful lives provide an indication of when significant capital expenditures will be required in order to maintain the Fire and EMS facilities. For example, if a fire station was originally constructed in 1977 and it has an expected life of 75 years, then it is assumed that in 2052 (75 years after 1977) a new fire station will be constructed in order to replace the aging facility.

It is expected that the new facility would be constructed in a similar fashion, and would therefore have the same expected life. In the example of the fire station that would be reconstructed in 2052, that facility would then be replaced again 75 years later in 2127, and so on.

3.4.6 What do we need to do to it? - Rehabilitation and Replacement

Within this report this question deals only with the capital investments associated with maintaining the facilities and, for the purposes of this report, it has been assumed that operating and maintenance (O & M) costs are currently at the appropriate level, which is not necessarily the case. Each facility consists of various components. These components have unique properties and typically have to be replaced or refurbished in order to ensure that the facility remains functional for the entirety of its expected life as illustrated in Figure 3.2.
Figure 3.2: Life-Cycle of a Fire Hall and its Roof Component

For example, a fire hall that has an expected useful life of 75 years has a roof that is installed as part of the building’s construction. At the time of construction, the cost of that roof would be included in the total construction cost of the facility. Likewise when that facility would be reconstructed in 75 years, the cost of the roof would be included in the cost of reconstruction. However, the roof has an expected useful life of only 25 years, much less than the 75 years that the building is expected to last. Therefore, in year 25 of that facility’s life, the cost of a roof replacement would have to be accounted for as a unique capital cost. Likewise, the cost would have to be accounted for again in year 50 of the building’s life, as illustrated in Figure 3.2.

The same method is used to account for all capital costs associated with maintaining and replacing components of a facility as part of maintaining the facility as a whole. Table 3.3 provides an example of the components and life expectancies used for this analysis.

Table 3.3: Examples of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Example Component</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>25 Years</td>
</tr>
<tr>
<td>Furnace</td>
<td>25 Years</td>
</tr>
<tr>
<td>Windows</td>
<td>32 Years</td>
</tr>
<tr>
<td>Parking lot</td>
<td>20 Years</td>
</tr>
</tbody>
</table>

Actual life expectancies were provided within the City’s ReCAPP databases. However, in order to determine a range of expected lives for this analysis, these values were adjusted to create minimum and maximum expected life estimates. Using NAMS, RSMeans and Stantec industry experience, a range of expected lives for different types of assets was determined as a percentage of the actual expected lives and applied to create minimum and maximum life scenarios, as summarized in Table 3.4 below.
Table 3.4: Percentage Ranges of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Asset</th>
<th>Component</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Stations (ALL)</td>
<td>Surface and Site Systems</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Architectural and Structural</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Vertical Movement</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>

3.4.7 How much money do we need? - Capital Costs/Rehabilitation and Renewal

The expected useful lives, as outlined in Sections 3.4.5 and 3.4.6, are used to define the rehabilitation and reconstruction cycles used within the analysis. The cost of this reconstruction or rehabilitation is expected to be comparable to the initial cost of the facility; and the new facility is assumed to have the same expected life.

Similar to a facility’s expected useful life, its expected replacement value can vary depending on a number of factors, including furnishings and market pricing. In consideration of these factors, a range of expected replacement costs was developed using NAMS, ReCAPP data, RSMeans and Stantec industry experience. The expected replacement costs per square foot are summarized in Table 3.5.

Table 3.5: Facility Replacement Unit Costs

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Replacement Cost</th>
<th>Expected Replacement Cost (per ft²)</th>
<th>Maximum Replacement Cost (per ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Stations</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Fire Stations – Historically Significant</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>

3.4.7.1 Level of Service

Two level-of-service (LOS) options for the Fire and EMS facilities were considered within this analysis. These are status quo and growth-based demand, and are further explained below.

3.4.7.2 Factors Affecting Levels of Service

The factors affecting levels of service can be broken into three broad categories according to their key performance criteria.
• Legislative Requirements - mandatory provisions or standards set by local, provincial, federal or international bodies that govern asset utilization, particularly in terms of various issues affecting the general public.

• Strategic and Corporate Goals - broad framework-based management directives. These are expected to be consistent with goals and values stated in policies and strategies.

• User Requirements - user expectations of the services provided by the utilization of the asset which are, in turn, dependent upon the user’s ability and willingness to pay through taxes.

3.4.7.3 Status Quo

The first LOS option assumes that the:

• Fire and EMS would maintain the status quo for service, i.e., the number of facilities and resources presently available would remain unchanged indefinitely; and

• Facilities would be maintained and replaced as necessary, but facilities themselves would never be expanded and no new facilities would be added to the existing inventory.

This scenario would be adequate to maintain the existing level of service as long as the population of the City was also static. However, if the City’s population were to grow as is expected, the result of the status quo maintenance of Fire and EMS services would result in a reduced level of service per capita. This is because the gross supply of service would remain the same, approximately 30 facilities, while the population continued to increase. As can be seen in the following table, the number of facilities per 100,000 residents will reduce from the current level of 5.8 to 2.0 over the course of this analysis (100 years).

<table>
<thead>
<tr>
<th>Year</th>
<th>Facilities/100,000 Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>5.8</td>
</tr>
<tr>
<td>2034</td>
<td>4.4</td>
</tr>
<tr>
<td>2059</td>
<td>3.4</td>
</tr>
<tr>
<td>2084</td>
<td>2.6</td>
</tr>
<tr>
<td>2108</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Table 3.6: Number of Fire and EMS Facilities per 100,000 Residents – Status Quo

Figure 3.3 illustrates the annual capital requirements and sustainable funding level for maintaining the status quo in Fire and EMS. The annual sustainable funding requirement is $1.6 million for the Status Quo model.
Figure 3.3: Sustainable Capital Funding Model (Status Quo)

In the status quo model, it is important to note that the sustainable funding level is constant from year to year, while population is growing.

### 3.4.7.4 Growth-Based Demand

The second LOS option assumes that:

- Demand is a constant as a percentage of the population;
- Fire and EMS facilities will grow at the same rate as population increases; and
- The average rate of population growth is approximately 1.07% per year based on the results of the Monteith Brown Report.
As shown in Figure 3.4, a higher sustainable funding level of $2.8 million annually reflects the increased cost of maintaining the existing level of service as the city’s population grows.

3.4.8 Summary of the Financial Analysis Results

The SotI analysis attempts to predict capital costs up to 100 years into the future. Rather than consider the results to be definitive, they are considered to be guideline figures and can vary for any number of reasons.

Within the following section expected results have been listed as well as high and low estimates of sustainable funding requirements. There are three key factors that can have a significant impact on the sustainable funding requirements:

- Anticipated useful lives of assets
- Replacement costs of assets
- Whether those costs are paid in cash or debt-financed by the City
Figure 3.5 demonstrates how these three factors can be graphically depicted as three physical dimensions, with replacement cost as the vertical y-axis, expected useful life as the horizontal x-axis, and amount of debt incurred as the z-axis.

When all capital costs are paid in cash by the City, otherwise referred to as Pay-As-You-Go (PAYG) spending, a two-dimensional range of sustainable funding requirements is determined as illustrated in Figure 3.6.

Figure 3.6 illustrates the expected sustainable capital funding requirements for the range of expected life and replacement costs. The number in the centre of the square represents the midpoint of both dimensions and is considered to be the most likely (expected) outcome. In other words, if the City funds all capital projects on a PAYG plan, then Fire and EMS would require $2.8 million in capital funding per year.
3.4.8.1 PAYG versus Debt-Financing

Figure 3.7 illustrates the analysis results for Fire and EMS facilities including the third dimension, Debt-Financing.

When Debt-Financing is included, the sustainable capital funding levels increase significantly. For example, annual sustainable capital costs increase from $2.8 million for PAYG to $3.9 million for Debt-Financing. In other words, $1.1 million per year is taken from the community to pay only for interest.
3.4.8.2 Sustainable Funding Model

Figure 3.8 illustrates the results of the analysis for Fire and EMS using the PAYG model.

- The blue (vertical bar) columns represent the actual capital requirements for each of the subsequent 100 years
- The orange line represents the average capital requirements
- The green line provides the amount of cumulative reserves that would be generated if the sustainable capital funding requirements (orange line) were adhered to

![Figure 3.8: Fire and EMS Sustainable Capital Funding Model (PAYG)](image)

In years when the actual capital requirements are less than the sustainable capital funding level, the surplus would be added to the capital reserves. In years where the capital requirements are greater than the sustainable capital funding level, money would be taken from reserves to cover the shortfall. This ensures that investments are the most timely and cost-effective, i.e. doing the right thing to the right asset at the right time, instead of trying to maintain capital spending at a fairly consistent level from year to year.
Figure 3.9 illustrates the analysis results assuming that all capital expenditures would be funded through Debt-Financing, using a 15-year borrowing period at 6%. The sustainable funding requirements would increase from $2.8 million (PAYG) to $3.9 million (Debt-Financing).

It should be noted that 15 years were added to analysis period for the Debt scenario in order to include the payment of all debt incurred.

Figure 3.9: Fire and EMS Sustainable Capital Funding Model (Debt-Financed)
4.0 Libraries

4.1 ASSET DESCRIPTION

4.1.1 Facilities

There is one major category of Library facilities within the City of Hamilton:

- **Libraries** – All Library facilities share similar properties and characteristics, and have therefore been analyzed as a single group. This group includes 14 Libraries, including two designated historical facilities: Waterdown Public Library and Kenilworth Public Library.

The Corporate Facilities Department is responsible for maintaining the Hamilton public library buildings, but not the services provided within. Therefore, only the buildings/facilities have been included in this analysis.

4.1.2 Components

There are five component classifications for Library facilities:

- **Surface and Site Systems** – components that are located on the same site as the facility, but are not typically attached to that facility, e.g. walkways
- **Architectural and Structural** – physical parts that make up the building, e.g. foundations, walls, doors, windows, roofs
- **Electrical** – all parts of a facility that use or conduct electricity, e.g. wiring, lighting, electric heaters, and fire alarm systems
- **Mechanical** – parts of the facility that convey and utilize all non-electrical utilities within a facility, e.g. gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
- **Vertical Movement** – components used for moving people between floors of buildings, e.g. elevators, wheelchair and stair lifts.

Of the five component categories, site components are unique in that their replacement and refurbishment is not directly dependent on the facility with which they are associated. For example, walkways on a property likely would not need to be replaced as part of the replacement of the facility. Rather, site components are scheduled for replacement based on their own useful lives and their replacement schedule remains independent of the facility.

Unlike site components, structural, mechanical, electrical, and vertical movement components are directly incorporated into the facility itself, and would need to be replaced as part of the replacement of the facility.
4.2 SERVICES PROVIDED/PURPOSE OF ASSETS

The Hamilton Public Library facilities provide access to materials for general entertainment and leisure purposes as well as for general research to the City of Hamilton residents. Materials available include but are not limited to fiction and movies, as well as educational and nonfiction materials of interest to the general public; computer and internet access is also often offered. A public library (also called circulating library) is a library which is accessible by the public and is generally funded from public sources such as tax money.

Purpose

Public libraries exist in most nations of the world and are often considered an essential part of having an educated and literate population since they provide access to materials for all residents.

Values

- **Intellectual Freedom** – Providing access to all expressions of knowledge and creativity.
- **Inclusiveness** – Connecting with diverse communities.
- **Innovation** – Anticipating and responding to changing needs.
- **Respect** – Embracing a diversity of opinions and protecting the dignity of individuals.
- **Accountability** – Ensuring that library services are vital and relevant.

Mission

Freedom to Discover.

4.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS

The following assumptions were included in the analysis of Library facilities.

- The property value of the land was not included in the analysis, since property is considered to be a completely separate asset category and the land itself is not replaced when the facility or asset is replaced.
- Site components on the land, such as walkways, are included as separate entities in the analysis since these components are replaced based on their expected service lives and not necessarily based on the expected service life of the facility or asset being replaced.
- Minimum, maximum and expected facility replacement costs are based on data from the City of Hamilton’s ReCAPP Database system, along with input from NAMS, RS Means data and Stantec industry experience.
Component costs (HVAC, electrical, roof, plumbing, etc.) and ranges are derived from an analysis of NAMS and RS Means data as well as Stantec industry experience.

Status quo analysis assumes no increase in gross service provision, thereby resulting in decreased level of service as demand/population increases.

Demand-based analysis assumes maintaining level of service relative to projected demand/population growth.

Heritage-Designated Assets

- Structural framing life expectancy was used for building life expectancies – 500 years
- Historic sites would not be replaced, they would only be preserved and conserved

4.4 LIFE-CYCLE ANALYSIS

4.4.1 Introduction and List of 9 Questions

Analysis on a Life-Cycle basis means answering a series of simple questions. The first seven are generally accepted within the industry:

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has added two very important questions, which are:

8. How do we maintain sustainability?
9. Do we still need it?

4.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy)

Library facilities were all placed within one category, Libraries. A total of 14 facilities were included in the analysis as illustrated in Figure 4.1.
4.4.3 What is it worth?

The Library facilities in this analysis have a combined replacement value of approximately $49.1M, as illustrated in Figure 3.1.

4.4.4 What condition is it in? - Age and condition profiles

Interviews with key City staff along with the 2009 Condition Assessment Reports provided by Jacques Whitford were used to update the expected lives, replacement costs and possible upgrades required to meet modern standards for the components for these facilities.

During interviews with key City staff, worksheets were completed in order to obtain estimates of the present condition and expected future condition of the Library facilities. Table 4.1 lists the results of these interviews and includes ratings for the different types of components contained within each facility. These worksheets were also used to develop the department report card. The Libraries worksheet illustrates the opinion that this asset group is in reasonably good shape (B-) and is expected to deteriorate by 2029. This is due to the fact that the rural library facilities are in need of intervention and the fact that sustainable funding levels are not in place. It was also noted during these discussions that future considerations for expansion in Flamborough may eliminate some facilities. Future reorganization of the facilities may impact the funding levels required to sustain the Libraries assets.
### Table 4.1: Condition Assessment Worksheet: Libraries

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Asset Component</th>
<th>Condition (Select point on deterioration curve)</th>
<th>Useful Life (Years)</th>
<th>Rating (A, B, C, D or F)</th>
<th>Overall Rating (A, B, C, D or F)</th>
<th>2029 Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libraries</td>
<td>Surface and Site Systems</td>
<td><img src="image1" alt="Graph" /></td>
<td>20 - 30</td>
<td>B- Condition &amp; Performance</td>
<td>B</td>
<td>B</td>
<td>Rural facilities require attention</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Future expansion in Flamborough will eliminate some facilities</td>
</tr>
<tr>
<td>Architectural and Structural</td>
<td></td>
<td><img src="image2" alt="Graph" /></td>
<td>10 – 30 (architectural) 50 – 75 (structural)</td>
<td>C Condition &amp; Performance</td>
<td>C Condition &amp; Performance</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Vertical Movement</td>
<td></td>
<td><img src="image3" alt="Graph" /></td>
<td>30</td>
<td>B- Condition &amp; Performance</td>
<td>B</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td><img src="image4" alt="Graph" /></td>
<td>20 - 30</td>
<td>B- Condition &amp; Performance</td>
<td>B Condition &amp; Performance</td>
<td>B-</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
<td><img src="image5" alt="Graph" /></td>
<td>20 - 30</td>
<td>B- Condition &amp; Performance</td>
<td>B Condition &amp; Performance</td>
<td>B-</td>
<td></td>
</tr>
</tbody>
</table>
4.4.5 When do we need to do it? - Asset Useful Lives

Each asset has an associated useful life value assigned to it. This useful life is the number of years that the asset is expected to last with regular usage and proper maintenance. The useful lives for Library facilities are listed in Table 4.2.

Various factors can affect the useful lives of facilities. Factors such as weathering, heavy use, or misuse can shorten the life of a facility. Conversely, factors such as under-utilization or better-than-expected construction practices and materials could extend the life of a facility. For this reason, a range of useful lives for each facility was considered in the analysis as listed in Table 4.2. These ranges were determined through analysis of NAMS, ReCAPP data, RSMeans, and Stantec industry experience.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Expected Life</th>
<th>Expected Life</th>
<th>Maximum Expected Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libraries</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>Libraries – Historically Designated</td>
<td>500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These useful lives provide an indication of when significant capital expenditures will be required in order to maintain the Library facilities. For example, if a library was originally constructed in 1982 and it has an expected life of 75 years, then it is assumed that in 2057 (75 years after 1982) a new library would be constructed in order to replace the aging facility.

It is expected that the new facility would be constructed in a similar fashion, and would therefore have the same expected life. In the example of the library that would be reconstructed in 2057, that facility would then be replaced again 75 years later in 2132, and again in 2207, and so on.

Two of the libraries in the portfolio are designated as historical buildings. These are the Kenilworth Library and the Waterdown Library. As such, these libraries are expected to be maintained in perpetuity. An expected useful life of 500 years was applied to these historical assets since they are not expected to be replaced during the analysis period.

4.4.6 What do we need to do to it? - Rehabilitation and Replacement

Within this report this question deals only with the capital investments associated with maintaining the facilities and, for the purposes of this report, it has been assumed that operating and maintenance (O & M) costs are currently at the appropriate level, which is not the case. Each facility consists of various components. These components have unique properties and typically have to be replaced or refurbished in order to ensure that the facility remains functional for the entirety of its expected life as illustrated in Figure 4.2.
For example, a library building that has an expected useful life of 75 years has a roof that is installed as part of the building’s construction. At the time of construction, the cost of that roof would be included in the total construction cost of the facility. Likewise when that facility would be reconstructed in 75 years, the cost of the roof would be included in the cost of reconstruction. However, the roof has an expected useful life of only 25 years, much less than the 75 years that the building is expected to last. Therefore, in year 25 of that facility’s life, the cost of a roof replacement would have to be accounted for as a unique capital cost. Likewise, the cost would have to be accounted for again in year 50 of the building’s life, as illustrated in Figure 4.2.

The same method is used to account for all capital costs associated with maintaining and replacing components of a facility as part of maintaining the facility as a whole. Table 4.3 provides an example of the components and life expectancies used for this analysis.

### Table 4.3: Examples of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Example Component</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>25 Years</td>
</tr>
<tr>
<td>Furnace</td>
<td>25 Years</td>
</tr>
<tr>
<td>Windows</td>
<td>32 Years</td>
</tr>
<tr>
<td>Parking lot</td>
<td>20 Years</td>
</tr>
</tbody>
</table>

Actual life expectancies were provided within the City’s ReCAPP databases. However, in order to determine a range of expected lives for this analysis, these values were adjusted to create minimum and maximum expected life estimates. Using NAMS, RSMeans and Stantec industry experience, a range of expected lives for different types of asset components was determined.
as a percentage of the actual expected lives and applied to create minimum and maximum life scenarios, as summarized in Table 4.4 below.

<table>
<thead>
<tr>
<th>Asset</th>
<th>Component</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libraries</td>
<td>Surface and Site Systems</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Architectural and Structural</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Vertical Movement</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>

4.4.7 How much money do we need? - Capital Costs/Rehabilitation and Renewal

The expected useful lives, as outlined in Sections 4.4.5 and 4.4.6, are used to define the rehabilitation and reconstruction cycles used within the analysis. The cost of this reconstruction or rehabilitation is expected to be comparable to the initial cost of the facility; and the new facility is assumed to have the same expected life.

Similar to a facility’s expected useful life, its expected replacement value can vary depending on a number of factors, including furnishings and market pricing. In consideration of these factors, a range of expected replacement costs was developed using NAMS, ReCAPP data, RSMeans and Stantec industry experience. The expected replacement costs per square foot are summarized in Table 4.5.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Replacement Cost</th>
<th>Expected Replacement Cost (per ft²)</th>
<th>Maximum Replacement Cost (per ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libraries</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Libraries – Historically Designated</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>
4.4.7.1 Level of Service

Two level-of-service (LOS) options for the Library facilities were considered within this analysis. These are *status quo* and *growth-based demand*, and are further explained below.

4.4.7.2 Status Quo

The first LOS option assumes that the:

- Libraries would maintain the status quo for service, i.e., the number of facilities and resources presently available would remain unchanged indefinitely; and
- Facilities would be maintained and replaced as necessary, but facilities themselves would never be expanded and no new facilities would be added to the existing inventory.

This scenario would be adequate to maintain the existing level of service as long as the population of the City was also static. However, if the City’s population were to grow as is expected, the result of the status quo maintenance of Library services would result in a reduced level of service per capita. This is because the gross supply of service would remain the same, approximately 14 facilities, while the population continued to increase. As can be seen in the following table, the number of facilities per 100,000 residents will reduce from the current level of 2.7 to 0.9 over the course of this analysis.

<table>
<thead>
<tr>
<th>Table 4.6: Number of Library Facilities per 100,000 Residents – Status Quo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>Facilities/100,000 Capita</td>
</tr>
</tbody>
</table>

Figure 4.3 illustrates the annual capital requirements and sustainable funding level for maintaining the status quo in Libraries.

In the status quo model, it is important to note that the sustainable funding level is constant from year to year, while population is growing. The annual sustainable funding requirement is $1.5 million for the Status Quo model.
4.4.7.3 Growth-Based Demand

The second LOS option assumes that:

- Demand is a constant as a percentage of the population;
- Library facilities will grow at the same rate as population increases; and
- The average rate of population growth is approximately 1.07% per year based on the results of the Monteith Brown Report.

As shown in Figure 4.4, a higher sustainable funding level of $2.6 million annually reflects the increased cost of maintaining the existing level of service as the city’s population grows.
4.4.7.4 Factors Affecting Levels of Service

The factors affecting levels of service can be broken into three broad categories according to their key performance criteria.

- Legislative Requirements - mandatory provisions or standards set by local, state, federal or international bodies that govern asset utilization, particularly in terms of various issues affecting the general public.
- Strategic and Corporate Goals - broad framework-based management directives. These are expected to be consistent with goals and values stated in policies and strategies.
- User Requirements - user expectations of the services provided by the utilization of the asset which are, in turn, dependent upon the user’s ability and willingness to pay through taxes.
4.4.8 Summary of the Financial Analysis Results

The SotI analysis attempts to predict capital costs up to 100 years into the future. Rather than consider the results to be definitive, they are considered to be guideline figures and can vary for any number of reasons.

Within the following section expected results have been listed as well as high and low estimates of sustainable funding requirements. There are three key factors that can have a significant impact on the sustainable funding requirements:

- Anticipated useful lives of assets
- Replacement costs of assets
- Whether those costs are paid in cash or debt-financed by the City

Figure 4.5 demonstrates how these three factors can be graphically depicted as three physical dimensions, with replacement cost as the vertical y-axis, expected useful life as the horizontal x-axis, and amount of debt incurred as the z-axis.

When all capital costs are paid in cash by the City, otherwise referred to as Pay-As-You-Go (PAYG) spending, a two-dimensional range of sustainable funding requirements is determined as illustrated in Figure 4.6.

The figure above illustrates the expected sustainable capital funding requirements for 2009 for the range of expected life and replacement costs. The number in the centre of the square represents the midpoint of both dimensions and is considered to be the most likely (expected)
outcome. In other words, if the City funds all capital projects on a PAYG plan, then Libraries would require $2.6 million in capital funding in 2009.

4.4.8.1 PAYG versus Debt-Financing

Figure 4.7 illustrates the analysis results for Library facilities including the third dimension, Debt-Financing.

When Debt-Financing is included, the sustainable capital funding levels increase significantly. For example, sustainable capital costs increase from $2.6 million for PAYG to $3.6 million for Debt-Financing. In other words, approximately $1.0 million/year is taken from the community to pay for interest only, thus illustrating the true cost of debt.
### 4.4.8.2 Sustainable Funding Model

Figure 4.8 illustrates the results of the analysis for Library facilities using the PAYG model.

- The blue (vertical bar) columns represent the actual capital requirements for each of the subsequent 100 years.
- The orange line represents the average capital requirements weighted by population growth of 1.07%.
- The green line provides the amount of cumulative reserves that would be generated if the sustainable capital funding requirements (orange line) were adhered to.

In years when the actual capital requirements are less than the sustainable capital funding level, the surplus would be added to the capital reserves. In years where the capital requirements are greater than the sustainable capital funding level, money would be taken from reserves to cover the shortfall. This ensures that investments are the most timely and cost-effective, i.e. doing the right thing to the right asset at the right time, instead of trying to maintain capital spending at a fairly consistent level from year to year.
These results illustrate a deficit around 2055 due to non-sustainable funding practices used in the past. This peak is due to the expected replacement of the Central Library facility in 2055. Since the analysis begins building reserves in 2009 and the library has an expected useful life of 75 years, Figure 4.8 illustrates that the cumulative reserves have not had enough time to build up the entire replacement cost of the Central Library by 2055.

Figure 4.9 illustrates the analysis results assuming that all capital expenditures would be funded through Debt-Financing, using a 15-year borrowing period at 6%. The sustainable funding requirements would increase from $2.6 million (PAYG) to $3.6 million (Debt-Financing). The peak in cumulative debt starting in 2055 is due to the replacement of the Central Library where the costs are spread out over the following 15 years.

It should be noted that 15 years were added to analysis period for the Debt scenario in order to include the payment of all debt incurred.
5.0 Central Utilities Plant Operations

The City of Hamilton is currently responsible for maintaining the mechanical and electrical components of the assets within the Central Utilities Plant (CUP) Operations facilities group as well as all components of the Central Utilities Plant.

5.1 ASSET DESCRIPTION

5.1.1 Facilities

The Central Utilities Plant Operations asset group is comprised of the following assets:

- Art Gallery of Hamilton
- Central Utilities Plant
- Copps Coliseum
- Farmers Market
- Hamilton Art Gallery Parking Garage
- Hamilton Convention Centre
- Hamilton Place

This group of assets is unique in that the City is only responsible for the mechanical and electrical components of these assets. Therefore, this analysis includes all components of the Central Utilities Plant facility and only the mechanical and electrical components of the other six facilities listed above.

5.1.2 Components

There are five component classifications for Library facilities:

- **Surface and Site Systems** – components that are located on the same site as the facility, but are not typically attached to that facility, e.g. walkways
- **Architectural and Structural** – physical parts that make up the building, e.g. foundations, walls, doors, windows, roofs
- **Electrical** – all parts of a facility that use or conduct electricity, e.g. wiring, lighting, electric heaters, and fire alarm systems
- **Mechanical** – parts of the facility that convey and utilize all non-electrical utilities within a facility, e.g. gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
5.2 SERVICES PROVIDED/PURPOSE OF ASSETS

The Central Utilities Plant is a cogeneration facility that provides heating, cooling and electricity to City-owned buildings in the downtown core. Therefore, the Central Utilities Plant maintains and operates the mechanical equipment for the following downtown facilities, Copps Coliseum, Central Library, Farmers Market, Convention Centre, Hamilton Place, Central Utilities Plant, City Hall, Hamilton Art Gallery Parking Garage (Convention Centre).

In addition to City-owned facilities, the City also currently provides chilled water from the CUP to the Ellen Fairclough Building (also known as the Ontario Government Building), Hamilton Art Gallery and the Hamilton Wentworth District School Board office.

This SotI analysis included the CUP plant itself as well as the six facilities listed under section 5.1.1.

5.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS

The following assumptions were included in the analysis of CUP facilities.

- The property value of the land was not included in the analysis, since property is considered to be a completely separate asset category and the land itself is not replaced when the facility or asset is replaced.
- Site components on the land, such as walkways, are included as separate entities in the analysis since these components are replaced based on their expected service lives and not necessarily based on the expected service life of the facility or asset being replaced.
- Minimum, maximum and expected facility replacement costs are based on data from the City of Hamilton’s ReCAPP Database system, along with input from NAMS, RS Means data and Stantec industry experience.
Component costs (HVAC, electrical, roof, plumbing, etc.) and ranges are derived from an analysis of NAMS and RS Means data as well as Stantec industry experience.

Facility construction dates were used for any components where construction/implementation dates were missing.

Only maintenance and electrical components were included in the analysis for facilities other than the Central Utilities Plant itself.

The Ontario Government Building was not included in the analysis due to ownership and lack of available data.

### 5.4 LIFE-CYCLE ANALYSIS

#### 5.4.1 Introduction and List of 9 Questions

Analysis on a Life-Cycle basis means answering a series of simple questions. The first seven are generally accepted within the industry:

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has added two very important questions, which are:

8. How do we maintain sustainability?
9. Do we still need it?

#### 5.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy)

CUP facilities all fall within one category. A total of six facilities were included in the analysis as illustrated in Figure 5.1.
5.4.3 What is it worth?

The CUP facilities in this analysis have a combined replacement value of approximately $7.1M, as illustrated in Figure 5.1. However, this does not take into account the replacement values of the six other facilities which are services by the Central Utilities Plant.

5.4.4 What condition is it in? - Age and condition profiles

Interviews with key City staff along with the 2009 Condition Assessment Reports provided by Jacques Whitford were used to update the expected lives, replacement costs and possible upgrades required to meet modern standards for the components for these facilities.

During interviews with key City staff, worksheets were completed in order to obtain estimates of the present condition and expected future condition of the CUP facilities. Table 5.1 lists the results of these interviews and includes ratings for the different types of components contained within each facility. These worksheets were also used to develop the department report card. The CUP Operations worksheet illustrates the opinion that this asset group is in reasonably good shape (B-) and is expected to stay the same by 2029, based on current funding levels.
Table 5.1: Condition Assessment Worksheet: CUP Operations

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Asset Component</th>
<th>Condition (Select point on deterioration curve)</th>
<th>Useful Life (Years)</th>
<th>Rating (A, B, C, D or F)</th>
<th>Overall Rating (A, B, C, D or F)</th>
<th>2029 Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUP Operations</td>
<td>Architectural and Structural (CUP only)</td>
<td><img src="image" alt="Graph" /></td>
<td>10 - 70</td>
<td>C</td>
<td>B-</td>
<td></td>
<td>Funds are being provided 32 years old</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Based on new strategies being utilized 4 new chillers and new piping for approx. 80% of plant Some new handlers $3.5 million invested</td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td><img src="image" alt="Graph" /></td>
<td>25 - 30</td>
<td>B-</td>
<td>B-</td>
<td></td>
<td>Electrical substation is 32 years old $2.5 million Electrical is at the end of its life (within 5 to 7 years)</td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td><img src="image" alt="Graph" /></td>
<td>30</td>
<td>B</td>
<td>C-</td>
<td></td>
<td>Pertains to Commonwealth Square – recently upgraded sealed membrane, has flower beds, water outlets, lighting, concrete slabs (above grade)</td>
</tr>
<tr>
<td></td>
<td>Parks, Trails &amp; Grounds</td>
<td><img src="image" alt="Graph" /></td>
<td>80 - 100</td>
<td>B+</td>
<td>B+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Central Utilities Plant was built in 1976 and is aging. A capital allotment of $8.5 million was provided to the Central Utilities Plant in order to upgrade the 14 chillers and related air conditioning systems with a more reliable, cost-and-energy-efficient district cooling system. This project was completed in 2009 and will provide redundancies and improve the downtown infrastructure as well as provide savings in energy and maintenance costs.

It was also noted during these discussions that the electrical substation is nearing the end of its useful life and requires approximately $2.5 million in improvements.

### 5.4.5 When do we need to do it? - Asset Useful Lives

Each asset has an associated useful life value assigned to it. This useful life is the number of years that the asset is expected to last with regular usage and proper maintenance. The useful lives for CUP facilities are listed in Table 5.2.

Various factors can affect the useful lives of facilities. Factors such as weathering, heavy use, or misuse can shorten the life of a facility. Conversely, factors such as under-utilization or better-than-expected construction practices and materials could extend the life of a facility. For this reason, a range of useful lives for each facility was considered in the analysis as listed in Table 5.2. These ranges were determined through analysis of NAMS, ReCAPP data, RSMeans, and Stantec industry experience.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Expected Life</th>
<th>Expected Life</th>
<th>Maximum Expected Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.U.P.</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>C.U.P.-Serviced Facilities</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
</tbody>
</table>

These useful lives provide an indication of when significant capital expenditures will be required in order to maintain the CUP facilities. For example, the CUP was originally constructed in 1976 and has an expected life of 75 years. Therefore it is assumed that in 2051 (75 years after 1976) a new CUP would be constructed in order to replace the aging facility. It is expected that the new facility would be constructed in a similar fashion, and would therefore have the same expected life. In the example of the CUP that would be reconstructed in 2051, that facility would then be replaced again 75 years later in 2126, and again in 2201, and so on.

### 5.4.6 What do we need to do to it? - Rehabilitation and Replacement

Within this report this question deals only with the capital investments associated with maintaining the facilities and, for the purposes of this report, it has been assumed that operating and maintenance (O & M) costs are currently at the appropriate level, which is not the case.
Each facility consists of various components. These components have unique properties and typically have to be replaced or refurbished in order to ensure that the facility remains functional for the entirety of its expected life as illustrated in Figure 5.2.

For example, a facility that has an expected useful life of 75 years has a roof that is installed as part of the building’s construction. At the time of construction, the cost of that roof would be included in the total construction cost of the facility. Likewise when that facility would be reconstructed in 75 years, the cost of the roof would be included in the cost of reconstruction. However, the roof has an expected useful life of only 25 years, much less than the 75 years that the building is expected to last. Therefore, in year 25 of that facility’s life, the cost of a roof replacement would have to be accounted for as a unique capital cost. Likewise, the cost would have to be accounted for again in year 50 of the building’s life, as illustrated in Figure 5.2.

The same method is used to account for all capital costs associated with maintaining and replacing components of a facility as part of maintaining the facility as a whole. Table 5.3 provides an example of the components and life expectancies used for this analysis.

<table>
<thead>
<tr>
<th>Example Component</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>25 Years</td>
</tr>
<tr>
<td>Furnace</td>
<td>25 Years</td>
</tr>
<tr>
<td>Windows</td>
<td>32 Years</td>
</tr>
<tr>
<td>Parking lot</td>
<td>20 Years</td>
</tr>
</tbody>
</table>

Actual life expectancies were provided within the City’s ReCAPP databases. However, in order to determine a range of expected lives for this analysis, these values were adjusted to create...
minimum and maximum expected life estimates. Using NAMS, RSMeans and Stantec industry experience, a range of expected lives for different types of assets was determined as a percentage of the actual expected lives and applied to create minimum and maximum life scenarios, as summarized in Table 5.4 below for components, where applicable.

Table 5.4: Percentage Ranges of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Component</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface and Site Systems</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Architectural and Structural</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Vertical Movement</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Electrical</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Mechanical</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>

5.4.7 How much money do we need? - Capital Costs/Rehabilitation and Renewal

The expected useful lives, as outlined in Sections 5.4.5 and 5.4.6, are used to define the rehabilitation and reconstruction cycles used within the analysis. The cost of this reconstruction or rehabilitation is expected to be comparable to the initial cost of the facility; and the new facility is assumed to have the same expected life.

Similar to a facility’s expected useful life, its expected replacement value can vary depending on a number of factors, including furnishings and market pricing. In consideration of these factors, a range of expected replacement costs was developed using NAMS, ReCAPP data, RSMeans and Stantec industry experience.

Table 5.5: Facility Replacement Unit Costs

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Replacement Cost</th>
<th>Expected Replacement Cost (per ft²)</th>
<th>Maximum Replacement Cost (per ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUP</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>CUP-Serviced Facilities</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>

5.4.7.1 Level of Service

The CUP is a stand-alone facility that supplies energy to a fixed network of buildings. Currently, there is no expectation for CUP Operations to grow significantly with the city; therefore, only one level of service, Status Quo, has been considered in this analysis for CUP Operations.
5.4.7.2 Status Quo

This LOS option assumes that the:

- CUP Operations would maintain the status quo for service, i.e., the number of facilities and resources presently available would remain unchanged indefinitely; and
- Facilities and assets would be maintained and replaced as necessary, but facilities themselves would never be expanded and no new facilities or assets would be added to the existing inventory.

5.4.7.3 Factors Affecting Levels of Service

The factors affecting levels of service can be broken into three broad categories according to their key performance criteria.

- Legislative Requirements - mandatory provisions or standards set by local, state, federal or international bodies that govern asset utilization, particularly in terms of various issues affecting the general public.
- Strategic and Corporate Goals - broad framework-based management directives. These are expected to be consistent with goals and values stated in policies and strategies.
- User Requirements - user expectations of the services, where applicable, provided by the utilization of the asset which are, in turn, dependent upon the user's ability and willingness to pay through taxes.

Based on discussions with City staff, growth was not considered in the analysis for CUP Operations since the client-base in the downtown core is not expected to increase over time; therefore, the following analysis results only address the status quo.

5.4.8 Summary of the Financial Analysis Results

The SotI analysis attempts to predict capital costs up to 100 years into the future. Rather than consider the results to be definitive, they are considered to be guideline figures and can vary for any number of reasons.

Within the following section expected results have been listed as well as high and low estimates of sustainable funding requirements. There are three key factors that can have a significant impact on the sustainable funding requirements:

- Anticipated useful lives of assets
- Replacement costs of assets
- Whether those costs are paid in cash or debt-financed by the City
Figure 5.3 demonstrates how these three factors can be graphically depicted as three physical dimensions, with replacement cost as the vertical y-axis, expected useful life as the horizontal x-axis, and amount of debt incurred as the z-axis.

When all capital costs are paid in cash by the City, otherwise referred to as Pay-As-You-Go (PAYG) spending, a two-dimensional range of sustainable funding requirements is determined as illustrated in Figure 5.4.

Figure 5.3: The Three Dimensions of Impact on Capital Requirements

Figure 5.4: Sustainable Capital Funding Requirements (PAYG)

The figure above illustrates the expected annual sustainable capital funding requirements for the range of expected life and replacement costs. The number in the centre of the square represents the midpoint of both dimensions and is considered to be the most likely (expected) outcome. In other words, if the City funds all capital projects on a PAYG plan, then CUP Operations would require $1.2 million annually.
5.4.8.1 PAYG versus Debt-Financing

Figure 5.5 illustrates the analysis results for CUP facilities including the third dimension, Debt-Financing.

![Figure 5.5: Sustainable Capital Funding Requirements (Debt-Financing)](image)

When Debt-Financing is included, the sustainable capital funding levels increase significantly. For example, sustainable capital costs increase from $1.2 million for PAYG to $1.6 million for Debt-Financing. In other words, approximately $0.4 million/year is taken from the community to pay only for interest.

5.4.8.2 Sustainable Funding Model

Figure 5.6 illustrates the results of the analysis for CUP facilities using the PAYG model.

- The blue (vertical bar) columns represent the actual capital requirements for each of the subsequent 100 years
- The orange line represents the average capital requirements weighted by population growth of 1.07%.
- The green line provides the amount of cumulative reserves that would be generated if the sustainable capital funding requirements (orange line) were adhered to.
In years when the actual capital requirements are less than the sustainable capital funding level, the surplus would be added to the capital reserves. In years where the capital requirements are greater than the sustainable capital funding level, money would be taken from reserves to cover the shortfall. This ensures that investments are the most timely and cost-effective, i.e. doing the right thing to the right asset at the right time, instead of trying to maintain capital spending at a fairly consistent level from year to year.

These results illustrate a deficit in capital funding until around 2069 due to the current backlog, as well as the non-sustainable funding practices used in the past.

Figure 5.7 illustrates the analysis results assuming that all capital expenditures would be funded through Debt-Financing, using a 15-year borrowing period at 6%. The sustainable funding requirements would increase from $1.2 million (PAYG) to $1.6 million (Debt-Financing).
It should be noted that 15 years were added to analysis period for the Debt scenario in order to include the payment of all debt incurred.

5.4.8.3 Energy Savings

The City’s current cooling system in the downtown core has been updated this year. This project included the consideration of the City’s new Corporate Energy Policy, which calls for targeted reductions in energy intensity in City-owned facilities and operations of 20 per cent by 2020. This project included replacing the current cooling system at the Central Utilities Plant facility and the results included reducing the required number of chillers for the district cooling system from 14 to 11. The benefits of the upgrade resulted in a 41% reduction in annual energy with an annual utility savings of $181,000 and a reduction of 556-tonnes per year in harmful CO₂ emissions.

The downtown buildings impacted by this project include: the CUP, Copps Coliseum, Hamilton Convention Centre, Hamilton Place, Hamilton Public Library and Market, and Hamilton City Hall.
6.0 Corporate Administration Buildings

6.1 ASSET DESCRIPTION

6.1.1 Facilities
There are five major categories of Corporate Administration facilities within the City of Hamilton:

- **City Hall** – Consists of Hamilton City Hall
- **Old Halls** – general purpose halls, consisting of Ancaster Square and Library, Charlton Hall and Old Stoney Creek Fire Hall (no longer used as a fire facility)
- **Historical** – designated heritage buildings, consisting of Old Stoney Creek Town Hall and Library and Dundas Town Hall
- **Town Halls** – Town halls including Flamborough Town Hall and Glanbrook Municipal Offices
- **Other Corporate Administration Buildings** – miscellaneous administration facilities including storage facilities, a pedestrian overpass, a theatre, etc.

In approximately 2011, the City will become responsible for the Lister Block. This facility was not included in the analysis due to lack of data and has therefore, not been included in expected costs. Also, the SPCA facility was not included in this analysis due to the fact that the City is not responsible for the maintenance of this facility. A complete listing of all Corporate Administration Buildings facilities is included in Appendix E.

6.1.2 Components
There are five component classifications for Corporate Administration facilities:

- **Surface and Site Systems** – components that are located on the same site as the facility, but are not typically attached to that facility, e.g. walkways
- **Architectural and Structural** – physical parts that make up the building, e.g. foundations, walls, doors, windows, roofs
- **Electrical** – all parts of a facility that use or conduct electricity, e.g. wiring, lighting, electric heaters, and fire alarm systems
- **Mechanical** – parts of the facility that convey and utilize all non-electrical utilities within a facility, e.g. gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
- **Vertical movement** – components used for moving people between floors of buildings, e.g. elevators, wheelchair and stair lifts.
Of the five component categories, site components are unique in that their replacement and refurbishment is not directly dependent on the facility with which they are associated. For example, walkways on a property likely would not need to be replaced as part of the replacement of the facility. Rather, site components are scheduled for replacement based on their own useful lives and their replacement schedule remains independent of the facility.

Unlike site components, structural, mechanical, electrical, and vertical movement components are directly incorporated into the facility itself, and would need to be replaced as part of the replacement of the facility.

6.2 SERVICES PROVIDED/PURPOSE OF ASSETS

The purposes of the assets in the Corporate Administration Buildings category are diverse, depending on the facility. Some facilities are dedicated to supporting corporate activities; others provide contact points between the City and residents.

6.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS

The following assumptions were included in the analysis of Corporate Administration facilities.

- The property value of the land was not included in the analysis, since property is considered to be a completely separate asset category and the land itself is not replaced when the facility or asset is replaced.
- Site components on the land, such as walkways, are included as separate entities in the analysis since these components are replaced based on their expected service lives and not necessarily based on the expected service life of the facility or asset being replaced.
- Minimum, maximum and expected facility replacement costs are based on data from the City of Hamilton’s ReCAPP Database system, along with input from NAMS, RS Means data and Stantec industry experience.
- Component costs (HVAC, electrical, roof, plumbing, etc.) and ranges are derived from an analysis of NAMS and RS Means data as well as Stantec industry experience.
- Status quo analysis assumes no increase in gross service provision, thereby resulting in decreased level of service as demand/population increases.
- Demand-based analysis assumes that the City Hall will maintain level of service relative to projected demand/population growth. Other Corporate Administration assets were analyzed with a growth rate of 0%.
- Facilities of similar size were considered to have components of similar values, where data not available.
- Facility construction dates were used for any components where construction/implementation dates were missing.
Heritage-Designated Assets

- Structural framing life expectancy was used for building life expectancies – 500 years
- Historic sites would not be replaced, they would only be preserved and conserved

6.4 LIFE-CYCLE ANALYSIS

6.4.1 Introduction and List of 9 Questions

Analysis on a Life-Cycle basis means answering a series of simple questions. The first seven are generally accepted within the industry:

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has added two very important questions, which are:

8. How do we maintain sustainability?
9. Do we still need it?

6.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy)

Corporate Administration facilities all fall within one category. A total of 15 facilities were included in the analysis as illustrated in Figure 6.1.
6.4.3 What is it worth?

The Corporate Administration facilities in this analysis have a combined replacement value of approximately $97.3M, as illustrated in Figure 6.1.

6.4.4 What condition is it in? - Age and condition profiles

Interviews with key City staff along with the 2009 Condition Assessment Reports provided by Jacques Whitford were used to update the expected lives, replacement costs and possible upgrades required to meet modern standards for the components for these facilities.

During interviews with key City staff, worksheets were completed in order to obtain estimates of the present condition and expected future condition of the Corporate Administration facilities. Table 6.1 lists the results of these interviews and includes ratings for the different types of components contained within each facility. These worksheets were also used to develop the department report card. The Corporate Administration Buildings worksheet illustrates the opinion that this asset group is in reasonably good shape (B) and is expected to stay the same by 2029, based on current funding levels.
Table 6.1: Condition Assessment Worksheet: Corporate Administration Buildings

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Asset Component</th>
<th>Condition (Select point on deterioration curve)</th>
<th>Useful Life (Years)</th>
<th>Rating (A, B, C, D or F)</th>
<th>Overall Rating (A, B, C, D or F)</th>
<th>2029 Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Administration Buildings</td>
<td>Surface and Site Systems</td>
<td><img src="#" alt="Condition Bar Chart" /></td>
<td></td>
<td>Condition &amp; Performance B</td>
<td>B+</td>
<td><img src="#" alt="Green Arrow" /></td>
<td>- Less funding available for Charlton Hall and 13 Lake</td>
</tr>
<tr>
<td></td>
<td>Architectural and Structural</td>
<td><img src="#" alt="Condition Bar Chart" /></td>
<td></td>
<td>Condition &amp; Performance B</td>
<td>B</td>
<td><img src="#" alt="Green Arrow" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical Movement</td>
<td><img src="#" alt="Condition Bar Chart" /></td>
<td></td>
<td>Condition &amp; Performance B-</td>
<td>B</td>
<td><img src="#" alt="Yellow Arrow" /></td>
<td>- $1.3 million upgrade to Courthouse</td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td><img src="#" alt="Condition Bar Chart" /></td>
<td></td>
<td>Condition &amp; Performance B</td>
<td>B</td>
<td><img src="#" alt="Green Arrow" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td><img src="#" alt="Condition Bar Chart" /></td>
<td></td>
<td>Condition &amp; Performance B</td>
<td>B</td>
<td><img src="#" alt="Green Arrow" /></td>
<td></td>
</tr>
</tbody>
</table>
6.4.4.1 City Hall Renovations

In May 2007 renovations began on the City Hall facility that was constructed in 1960, at a cost of approximately $75 million. This comprehensive renovation project was required to meet current building codes as well as modern energy efficiency requirements. The renovation plan ensures the newly renovated building will maintain the style and architectural features of the original building designed by Stanley Roscoe and includes consideration for the City’s Energy Policy.

The City Hall Renovation project is expected to be completed in 2010 and has been included in the analysis for this report.

6.4.5 When do we need to do it? - Asset Useful Lives

Each asset has an associated useful life value assigned to it. This useful life is the number of years that the asset is expected to last with regular usage and proper maintenance. The useful lives for Corporate Administration facilities are listed in Table 6.2.

Various factors can affect the useful lives of facilities. Factors such as weathering, heavy use, or misuse can shorten the life of a facility. Conversely, factors such as under-utilization or better-than-expected construction practices and materials could extend the life of a facility. For this reason, a range of useful lives for each facility was considered in the analysis as listed in Table 6.2. These ranges were determined through analysis of NAMS, ReCAPP data, RSMeans, and Stantec industry experience.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Expected Life</th>
<th>Expected Life</th>
<th>Maximum Expected Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Administration Buildings</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>Corporate Administration Buildings – Historically Designated</td>
<td></td>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>

These useful lives provide an indication of when significant capital expenditures will be required in order to maintain the Corporate Administration facilities. For example, if a building was originally constructed in 1982 and it has an expected life of 75 years, then it is assumed that in 2057 (75 years after 1982) a new facility would be constructed in order to replace the aging facility.

It is expected that the new facility would be constructed in a similar fashion, and would therefore have the same expected life. In the example of the facility that would be reconstructed in 2057, that facility would then be replaced again 75 years later in 2132, and again in 2207, and so on.
6.4.6  What do we need to do to it? - Rehabilitation and Replacement

Within this report, this question deals only with the capital investments associated with maintaining the facilities and, for the purposes of this report, it has been assumed that operating and maintenance (O & M) costs are currently at the appropriate level, which is not the case. Each facility consists of various components. These components have unique properties and typically have to be replaced or refurbished in order to ensure that the facility remains functional for the entirety of its expected life as illustrated in Figure 6.2.

For example, a building that has an expected useful life of 75 years has a roof that is installed as part of the building’s construction. At the time of construction, the cost of that roof would be included in the total construction cost of the facility. Likewise, when that facility would be reconstructed in 75 years, the cost of the roof would be included in the cost of reconstruction. However, the roof has an expected useful life of only 25 years, much less than the 75 years that the building is expected to last. Therefore, in year 25 of that facility’s life, the cost of a roof replacement would have to be accounted for as a unique capital cost. Likewise, the cost would have to be accounted for again in year 50 of the building’s life, as illustrated in Figure 6.2.

The same method is used to account for all capital costs associated with maintaining and replacing components of a facility as part of maintaining the facility as a whole. Table 6.3 provides an example of the components and life expectancies used for this analysis.

<table>
<thead>
<tr>
<th>Example Component</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>25 Years</td>
</tr>
<tr>
<td>Furnace</td>
<td>25 Years</td>
</tr>
<tr>
<td>Windows</td>
<td>32 Years</td>
</tr>
<tr>
<td>Parking lot</td>
<td>20 Years</td>
</tr>
</tbody>
</table>

Figure 6.2: Life-Cycle of an Administration Building and its Roof Component
Actual life expectancies were provided within the City’s ReCAPP databases. However, in order to determine a range of expected lives for this analysis, these values were adjusted to create minimum and maximum expected life estimates. Using NAMS, RSMeans and Stantec industry experience, a range of expected lives for different types of assets was determined as a percentage of the actual expected lives and applied to create minimum and maximum life scenarios, as summarized in Table 6.4 below.

### Table 6.4: Percentage Ranges of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Component</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface and Site Systems</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Architectural and Structural</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Vertical Movement</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Electrical</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Mechanical</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
</tbody>
</table>

#### 6.4.7 How much money do we need? - Capital Costs/Rehabilitation and Renewal

The expected useful lives, as outlined in Sections 6.4.5 and 6.4.6, are used to define the rehabilitation and reconstruction cycles used within the analysis. The cost of this reconstruction or rehabilitation is expected to be comparable to the initial cost of the facility; and the new facility is assumed to have the same expected life.

Similar to a facility’s expected useful life, its expected replacement value can vary depending on a number of factors, including furnishings and market pricing. In consideration of these factors, a range of expected replacement costs was developed using NAMS, ReCAPP data, RSMeans and Stantec industry experience. The expected replacement costs per square foot are summarized in Table 6.5.

### Table 6.5: Facility Replacement Unit Costs

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Replacement Cost</th>
<th>Expected Replacement Cost (per ft²)</th>
<th>Maximum Replacement Cost (per ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Administration Buildings</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
<tr>
<td>Corporate Administration Buildings – Historically Designated</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>
6.4.7.1 Level of Service

Two level-of-service (LOS) options for the Corporate Administration facilities were considered within this analysis. These are status quo and growth-based demand, and are further explained below.

6.4.7.2 Status Quo

The first LOS option assumes that the:

- Corporate Administration Buildings would maintain the status quo for service, i.e., the number of facilities and resources presently available would remain unchanged indefinitely; and
- Facilities would be maintained and replaced as necessary, but facilities themselves would never be expanded and no new facilities would be added to the existing inventory.

This scenario would be adequate to maintain the existing level of service as long as the population of the City was also static. However, if the City’s population were to grow as is expected, the result of the status quo maintenance of Corporate Administration services would result in a reduced level of service per capita. This is because the gross supply of service would remain the same, approximately 15 facilities, while the population continued to increase. As can be seen in the following table, the number of facilities per 100,000 residents will reduce from the current level of 2.9 to 1.0 over the course of this analysis.

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2034</th>
<th>2059</th>
<th>2084</th>
<th>2108</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities/100,000 Capita</td>
<td>2.9</td>
<td>2.2</td>
<td>1.7</td>
<td>1.3</td>
<td>1.0</td>
</tr>
</tbody>
</table>

In the status quo model, it is important to note that the sustainable funding level is constant from year to year, while population is growing. The annual sustainable funding requirement is $3.9 million for the Status Quo model, as shown in Figure 6.3 below.
6.4.7.3 Growth-Based Demand

The second LOS option assumes that:

- Demand for Corporate Administration services, and in turn for Corporate Administration facilities are constant as a percentage relative to the City’s population;
- Corporate Administration facilities will grow at the same rate as population increases;
- All other Corporate Administration facilities perform functions that do not require expansion to maintain the present level of service as the population grows; and
- The average rate of population growth is approximately 1.07% per year based on the results of the Monteith Brown Report.

Figure 6.4 illustrates a higher sustainable funding level of $5.0 million annually reflects the increased cost of maintaining the existing level of service as the city’s population grows.
6.4.7.4 Factors Affecting Levels of Service

The factors affecting levels of service can be broken into three broad categories according to their key performance criteria.

- Legislative Requirements - mandatory provisions or standards set by local, state, federal or international bodies that govern asset utilization, particularly in terms of various issues affecting the general public.
- Strategic and Corporate Goals - broad framework-based management directives. These are expected to be consistent with goals and values stated in policies and strategies.
- User Requirements - user expectations of the services provided by the utilization of the asset which are, in turn, dependent upon the user’s ability and willingness to pay through taxes.
6.4.8 Summary of the Financial Analysis Results

The SotI analysis attempts to predict capital costs up to 100 years into the future. Rather than consider the results to be definitive, they are considered to be guideline figures and can vary for any number of reasons.

Within the following section expected results have been listed as well as high and low estimates of sustainable funding requirements. There are three key factors that can have a significant impact on the sustainable funding requirements:

- Anticipated useful lives of assets
- Replacement costs of assets
- Whether those costs are paid in cash or debt-financed by the City

Figure 6.5 demonstrates how these three factors can be graphically depicted as three physical dimensions, with replacement cost as the vertical y-axis, expected useful life as the horizontal x-axis, and amount of debt incurred as the z-axis.

When all capital costs are paid in cash by the City, otherwise referred to as Pay-As-You-Go (PAYG) spending, a two-dimensional range of sustainable funding requirements is determined as illustrated in Figure 6.6.

Figure 6.6 illustrates the expected annual sustainable capital funding requirements for the range of expected life and replacement costs. The number in the centre of the square represents the midpoint of both dimensions and is considered to be the most likely (expected) outcome.
other words, if the City funds all capital projects on a PAYG plan, then Corporate Administration facilities would require $5.0 million in capital funding annually.

### 6.4.8.1 PAYG versus Debt-Financing

Figure 6.7 illustrates the analysis results for Corporate Administration facilities including the third dimension, Debt-Financing.

![Figure 6.7: Sustainable Capital Funding Requirements (Debt-Financing)](image)

When Debt-Financing is included, the sustainable capital funding levels increase significantly. For example, sustainable capital costs increase from $5.0 million for PAYG to $6.9 million for Debt-Financing. In other words, approximately $1.9 million/year is taken from the community to pay only for interest, thus illustrating the true cost of debt.
6.4.8.2 Sustainable Funding Model

Figure 6.8 illustrates the results of the analysis for Corporate Administration facilities using the PAYG model.

- The blue (vertical bar) columns represent the actual capital requirements for each of the subsequent 100 years.
- The orange line represents the average capital requirements weighted by population growth of 1.07%.
- The green line provides the amount of cumulative reserves that would be generated if the sustainable capital funding requirements (orange line) were adhered to.

In years when the actual capital requirements are less than the sustainable capital funding level, the surplus would be added to the capital reserves. In years where the capital requirements are greater than the sustainable capital funding level, money would be taken from reserves to cover the shortfall. This ensures that investments are the most timely and cost-effective, i.e. doing the
right thing to the right asset at the right time, instead of trying to maintain capital spending at a fairly consistent level from year to year.

Figure 6.9 illustrates the analysis results assuming that all capital expenditures would be funded through Debt-Financing, using a 15-year borrowing period at 6%. The sustainable funding requirements would increase from $5.0 million (PAYG) to $6.9 million (Debt-Financing) annually.

![Figure 6.9: Corporate Administration Facilities Sustainable Capital Funding Model (Debt-Financed)](image)

It should be noted that 15 years were added to analysis period for the Debt scenario in order to include the payment of all debt incurred.
7.0 Work Yards and Maintenance

The Work Yards and Maintenance division is a diverse group that includes such assets as cemetery buildings, operations centres and yards, transit centres as well as recycling facilities, as outlined below.

7.1 ASSET DESCRIPTION

7.1.1 Facilities

The Work Yards and Maintenance facilities were grouped into the following categories:

- **Cemetery Facilities** – includes all cemetery buildings within the city of Hamilton. At the time of amalgamation, the Hamilton Municipal Cemeteries portfolio increased in size from 15 to 67 cemeteries across the entire City of Hamilton. Only the buildings located on these properties are included in this report.
- **Historical** – all designated-historical buildings, Hamilton Cemetery Office (also known as the Gate House)
- **Large Operations Centres** – the Traffic Operations Centre building
- **Materials Recycling Facility (M.R.F.)** – the Materials Recycling Facility building
- **Operations Centres** – Localized operations centres such as Ancaster Animal Control, Darts Building, Forestry Operation, etc.
- **Satellite Yards** – Service-related work yards buildings including Bernie Court Yard, Dundas Yard and Gage Park Greenhouse
- **Transit Centres** – Transit-related facilities including Wentworth Street Operation Centre, Limeridge Transit Terminal and Mountain Transit Centre.

A complete listing of all assets included in the Work Yards and Maintenance group can be found in Appendix E of this report.

7.1.2 Components

There are five component classifications for Works Yards and Maintenance facilities:

- **Surface and Site Systems** – components that are located on the same site as the facility, but are not typically attached to that facility, e.g. walkways
- **Architectural and Structural** – physical parts that make up the building, e.g. foundations, walls, doors, windows, roofs
- **Electrical** – all parts of a facility that use or conduct electricity, e.g. wiring, lighting, electric heaters, and fire alarm systems
7.2 SERVICES PROVIDED/PURPOSE OF ASSETS

The services provided by the assets in the Work Yards and Maintenance portfolio vary from storage, work yards facilities, administration centres, and manufacturing facilities. The cemeteries buildings provide mainly storage and office space. The large operations centres provide administrative facilities to transit and City employees.

7.3 INCLUSIONS, EXCLUSIONS AND ASSUMPTIONS

The following assumptions were included in the analysis of Work Yards and Maintenance facilities.

- The property value of the land was not included in the analysis, since property is considered to be a completely separate asset category and the land itself is not replaced when the facility or asset is replaced.
- Site components on the land, such as walkways, are included as separate entities in the analysis since these components are replaced based on their expected service lives and not necessarily based on the expected service life of the facility or asset being replaced.
- Minimum, maximum and expected facility replacement costs are based on data from the City of Hamilton’s ReCAPP Database system, along with input from NAMS, RS Means data and Stantec industry experience.
- Component costs (HVAC, electrical, roof, plumbing, etc.) and ranges are derived from an analysis of NAMS and RS Means data as well as Stantec industry experience.
- Status quo analysis assumes no increase in gross service provision, thereby resulting in decreased level of service as demand/population increases.
Demand-based analysis assumes maintaining level of service relative to projected demand/population growth.

**Heritage-Designated Assets**
- Structural framing life expectancy was used for building life expectancies – 500 years
- Historic sites would not be replaced, they would only be preserved and conserved

### 7.4 LIFE-CYCLE ANALYSIS

#### 7.4.1 Introduction and List of 9 Questions
Analysis on a Life-Cycle basis means answering a series of simple questions. The first seven are generally accepted within the industry:

1. What do we have?
2. What is it worth?
3. What condition is it in?
4. What do we need to do to it?
5. When do we need to do it?
6. How much money do we need?
7. How do we reach sustainable funding?

The City of Hamilton has added two very important questions, which are:

8. *How do we maintain sustainability?*
9. *Do we still need it?*

#### 7.4.2 What do you have? - Assets (Groups, Types, Components, Hierarchy)
Work Yards and Maintenance facilities all fall within one category. A total of 72 structures were included in the analysis as illustrated in Figure 7.1. A complete listing of all structures is provided in Appendix E.
7.4.3 What is it worth?

The Work Yards and Maintenance facilities in this analysis have a combined replacement value of approximately $155.9M, as illustrated in Figure 7.1.

7.4.4 What condition is it in? - Age and condition profiles

Interviews with key City staff along with the 2009 Condition Assessment Reports provided by Jacques Whitford were used to update the expected lives, replacement costs and possible upgrades required to meet modern standards for the components for these facilities.

During interviews with key City staff, worksheets were completed in order to obtain estimates of the present condition and expected future condition of the Work Yards and Maintenance structures. Table 7.1 lists the results of these interviews and includes ratings for the different types of components contained within each structure. These worksheets were also used to develop the department report card. The Work Yards and Maintenance worksheets illustrate the opinion that this asset group is in poor shape (C) and the condition is expected to deteriorate by 2029, based on current funding levels.
### Table 7.1: Condition Assessment Worksheet – Work Yards and Maintenance

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Asset Component</th>
<th>Condition (Select point on deterioration curve)</th>
<th>Useful Life (Years)</th>
<th>Rating (A, B, C, D or F)</th>
<th>Overall Rating (A, B, C, D or F)</th>
<th>2029 Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cemeteries</td>
<td>Surface and Site Systems</td>
<td><img src="image1" alt="Graph" /></td>
<td></td>
<td>B</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Architectural and Structural</td>
<td><img src="image2" alt="Graph" /></td>
<td></td>
<td>C-</td>
<td>C-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td><img src="image3" alt="Graph" /></td>
<td></td>
<td>B</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td><img src="image4" alt="Graph" /></td>
<td></td>
<td>B-</td>
<td>B-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table above includes the condition assessment for various asset components, their useful life, and overall ratings, along with comments on condition & performance, capacity vs. need, and funding vs. need.
<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Asset Component</th>
<th>Condition (Select point on deterioration curve)</th>
<th>Useful Life (Years)</th>
<th>Rating (A, B, C, D or F)</th>
<th>Overall Rating (A, B, C, D or F)</th>
<th>2029 Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Centres</td>
<td>Surface and Site Systems</td>
<td><img src="image1" alt="Condition Graph" /></td>
<td>20 – 30</td>
<td>Condition &amp; Performance</td>
<td>B</td>
<td>2029 Rating</td>
<td>• Assets aging, getting tired</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>B+</td>
<td></td>
<td>• Yard Rationalization Study</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>B</td>
<td></td>
<td>• Addressing consolidation, etc.</td>
</tr>
<tr>
<td>Architectural and Structural</td>
<td></td>
<td><img src="image2" alt="Condition Graph" /></td>
<td>10 – 30 (Arch)</td>
<td>Condition &amp; Performance</td>
<td>C</td>
<td>2029 Rating</td>
<td>• One facility with vertical movement: Shaver Road</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 – 75 (Struct)</td>
<td>Capacity vs. Need</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Movement</td>
<td></td>
<td><img src="image3" alt="Condition Graph" /></td>
<td>60</td>
<td>Condition &amp; Performance</td>
<td>A+</td>
<td>2029 Rating</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td><img src="image4" alt="Condition Graph" /></td>
<td></td>
<td>Condition &amp; Performance</td>
<td>C</td>
<td>2029 Rating</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
<td><img src="image5" alt="Condition Graph" /></td>
<td></td>
<td>Condition &amp; Performance</td>
<td>B</td>
<td>2029 Rating</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset Type</td>
<td>Asset Component</td>
<td>Condition (Select point on deterioration curve)</td>
<td>Useful Life (Years)</td>
<td>Rating</td>
<td>Overall Rating (A, B, C, D or F)</td>
<td>2029 Rating</td>
<td>Comments</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>-----------------------------------------------</td>
<td>---------------------</td>
<td>--------</td>
<td>---------------------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Satellite Yards</td>
<td>Surface and Site Systems</td>
<td></td>
<td>5</td>
<td>Condition &amp; Performance</td>
<td>D</td>
<td>C-</td>
<td>Gravel, no paving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>C-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Architectural and Structural</td>
<td></td>
<td></td>
<td>10 – 30 (Arch) 50 – 75 (Struct)</td>
<td>Condition &amp; Performance</td>
<td>D</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>C-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
<td>Condition &amp; Performance</td>
<td>B-</td>
<td>C+</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>C-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
<td></td>
<td></td>
<td>Condition &amp; Performance</td>
<td>B-</td>
<td>C+</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capacity vs. Need</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Funding vs. Need</td>
<td>C-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset Type</td>
<td>Asset Component</td>
<td>Condition (Select point on deterioration curve)</td>
<td>Useful Life (Years)</td>
<td>Rating (A, B, C, D or F)</td>
<td>Overall Rating (A, B, C, D or F)</td>
<td>2029 Rating</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------</td>
<td>--------------------------</td>
<td>--------------------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Large Operations Centres       | Surface and Site Systems         | ![Condition Graph](image)                     | 20 – 30             | B+                       | D                             | 2029        | • Deteriorating  
  • Half back parking lot updated – some recent paving                                             |
|                                | Architectural and Structural     | ![Condition Graph](image)                     | 10 – 30 (Arch) 50 – 75 (Struct) | B                        | C                             | 2029        | • Transit Centre – structural crack/shifting – engineering report – nothing done to date  
  • Transit roofs all done within last two years  
  • Person doors are sagging, not closing properly  
  • Transit – not enough space  
  • Wentworth – overhead doors need to be replaced                                                |
|                                | Vertical Movement                | ![Condition Graph](image)                     | 60                  | A+                       | A                             | 2029        | • Transit has newer mechanical components  
  • Wentworth is older and in need                                                                  |
|                                | Mechanical                       | ![Condition Graph](image)                     | 20 – 30             | B-                       | C                             | 2029        | • Transit – energy pilot study, 50% of lighting replaced last year  
  • Honeywell exhaust fans installed                                                              |
|                                | Electrical                       | ![Condition Graph](image)                     | 20 – 30             | B-                       | C+                            | 2029        | • Transit – energy pilot study, 50% of lighting replaced last year  
  • Honeywell exhaust fans installed                                                              |
It should be noted that the transit facilities were all in poor condition when they were taken over during the amalgamation of the City. The condition of the cemeteries is deteriorating due to inadequate funding while the condition of the operations centres is reasonably good but these facilities are aging. The large operations centres require funding and reorganization of space allocation and the satellite yards are also deteriorating.

7.4.5 When do we need to do it? - Asset Useful Lives

Each asset has an associated useful life value assigned to it. This useful life is the number of years that the asset is expected to last with regular usage and proper maintenance. The useful lives for Work Yards and Maintenance facilities are listed in.

Various factors can affect the useful lives of facilities. Factors such as weathering, heavy use, or misuse can shorten the life of a facility. Conversely, factors such as under-utilization or better-than-expected construction practices and materials could extend the life of a facility. For this reason, a range of useful lives for each facility was considered in the analysis as listed in Table 7.2. These ranges were determined through analysis of NAMS, ReCAPP data, RSMeans, and Stantec industry experience.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Expected Life</th>
<th>Expected Life</th>
<th>Maximum Expected Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Yard Buildings</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>Hamilton Cemetery Gate House</td>
<td></td>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>

These useful lives provide an indication of when significant capital expenditures will be required in order to maintain the Work Yards and Maintenance buildings. For example, if a facility was originally constructed in 1982 and it has an expected life of 75 years, then it is assumed that in 2057 (75 years after 1982) a new facility would be constructed in order to replace the aging facility.

It is expected that the new facility would be constructed in a similar fashion, and would therefore have the same expected life. In the example of the facility that would be reconstructed in 2057, that facility would then be replaced again 75 years later in 2132, and again in 2207, and so on.

One of the buildings in the portfolio is designated as historical buildings, the Hamilton Cemetery Gate House. As such, this building is expected to be maintained in perpetuity and an expected useful life of 500 years was used since it is not expected to be replaced during the analysis period.
7.4.6 What do we need to do to it? - Rehabilitation and Replacement

Within this report this question deals only with the capital investments associated with maintaining the facilities and, for the purposes of this report, it has been assumed that operating and maintenance (O & M) costs are currently at the appropriate level, which is not the case. Each facility consists of various components. These components have unique properties and typically have to be replaced or refurbished in order to ensure that the facility remains functional for the entirety of its expected life as illustrated in Figure 7.2.

For example, a building that has an expected useful life of 75 years has a roof that is installed as part of the building’s construction. At the time of construction, the cost of that roof would be included in the total construction cost of the facility. Likewise when that facility would be reconstructed in 75 years, the cost of the roof would be included in the cost of reconstruction. However, the roof has an expected useful life of only 25 years, much less than the 75 years that the building is expected to last. Therefore, in year 25 of that facility’s life, the cost of a roof replacement would have to be accounted for as a unique capital cost. Likewise, the cost would have to be accounted for again in year 50 of the building’s life, as illustrated in Figure 7.2.

The same method is used to account for all capital costs associated with maintaining and replacing components of a facility as part of maintaining the facility as a whole. Table 7.3 provides an example of the components and life expectancies used for this analysis. Expected lives used for this analysis were provided by the City of Hamilton in the ReCAPP database. The minimum and maximum expected life spans were determined based on these expected life spans and adjusted with consideration of NAMS, RSMeans and Stantec industry experience.

Table 7.3: Examples of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Example Component</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>25 Years</td>
</tr>
<tr>
<td>Furnace</td>
<td>25 Years</td>
</tr>
<tr>
<td>Windows</td>
<td>32 Years</td>
</tr>
<tr>
<td>Parking lot</td>
<td>20 Years</td>
</tr>
</tbody>
</table>
Actual life expectancies were provided within the City’s ReCAPP databases. However, in order to determine a range of expected lives for this analysis, these values were adjusted to create minimum and maximum expected life estimates. Using NAMS, RSMeans and Stantec industry experience, a range of expected lives for different types of assets was determined as a percentage of the actual expected lives and applied to create minimum and maximum life scenarios, as summarized in Table 7.4 below.

### Table 7.4: Percentage Ranges of Facility Component Life Expectancy

<table>
<thead>
<tr>
<th>Component</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface and Site Systems</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Architectural and Structural</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Vertical Movement</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Electrical</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
<tr>
<td>Mechanical</td>
<td>80%</td>
<td>100.0%</td>
<td>120%</td>
</tr>
</tbody>
</table>

7.4.7 **How much money do we need? - Capital Costs/Rehabilitation and Renewal**

The expected useful lives, as outlined in Sections 7.4.5 and 7.4.6, are used to define the rehabilitation and reconstruction cycles used within the analysis. The cost of this reconstruction or rehabilitation is expected to be comparable to the initial cost of the facility; and the new facility is assumed to have the same expected life.

Similar to a facility’s expected useful life, its expected replacement value can vary depending on a number of factors, including furnishings and market pricing. In consideration of these factors, a range of expected replacement costs was developed using NAMS, ReCAPP data, RSMeans and Stantec industry experience. The expected replacement costs per square foot are summarized in Table 7.5.

### Table 7.5: Facility Replacement Unit Costs

<table>
<thead>
<tr>
<th>Facility</th>
<th>Minimum Replacement Cost</th>
<th>Expected Replacement Cost (per ft²)</th>
<th>Maximum Replacement Cost (per ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Yards and Maintenance Buildings</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
</tr>
</tbody>
</table>
7.4.7.1 Level of Service

Two level-of-service (LOS) options for the Work Yards and Maintenance facilities were considered within this analysis. These are status quo and growth-based demand, and are further explained below.

7.4.7.2 Status Quo

The first LOS option assumes that the:

- Work Yards and Maintenance would maintain the status quo for service, i.e., the number of facilities and resources presently available would remain unchanged indefinitely; and
- Facilities would be maintained and replaced as necessary, but facilities themselves would never be expanded and no new facilities would be added to the existing inventory.

This scenario would be adequate to maintain the existing level of service as long as the population of the City was also static. However, if the City’s population were to grow as is expected, the result of the status quo maintenance of Work Yards and Maintenance services would result in a reduced level of service per capita. This is because the gross supply of service would remain the same, approximately 72 structures, while the population continued to increase. As can be seen in the following table, the number of facilities per 100,000 residents will reduce from the current level of 13.8 to 4.8 over the course of this analysis.

<table>
<thead>
<tr>
<th>Year</th>
<th>Facilities/100,000 Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>13.8</td>
</tr>
<tr>
<td>2034</td>
<td>10.6</td>
</tr>
<tr>
<td>2059</td>
<td>8.1</td>
</tr>
<tr>
<td>2084</td>
<td>6.2</td>
</tr>
<tr>
<td>2108</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Figure 7.3 illustrates the annual capital requirements and sustainable funding level of $4.4 million for maintaining the status quo in Works Yards and Maintenance.
In the status quo model, it is important to note that the sustainable funding level is constant from year to year, while population is growing.

### 7.4.7.3 Growth-Based Demand

The second LOS option assumes that:

- Demand is a constant as a percentage of the population;
- Work Yards and Maintenance facilities will grow at the same rate as population increases; and
- The average rate of population growth is approximately 1.07% per year based on the results of the Monteith Brown Report.
As shown in the figure above, a higher sustainable funding level of $7.8 million annually reflects the increased cost of maintaining the existing level of service as the city’s population grows.

### 7.4.7.4 Factors Affecting Levels of Service

The factors affecting levels of service can be broken into three broad categories according to their key performance criteria.

- **Legislative Requirements** - mandatory provisions or standards set by local, state, federal or international bodies that govern asset utilization, particularly in terms of various issues affecting the general public.

- **Strategic and Corporate Goals** - broad framework-based management directives. These are expected to be consistent with goals and values stated in policies and strategies.

- **User Requirements** - user expectations of the services provided by the utilization of the asset which are, in turn, dependent upon the user’s ability and willingness to pay through taxes.
7.4.8 Summary of the Financial Analysis Results

The SotI analysis attempts to predict capital costs up to 100 years into the future. Rather than consider the results to be definitive, they are considered to be guideline figures and can vary for any number of reasons.

Within the following section expected results have been listed as well as high and low estimates of sustainable funding requirements. There are three key factors that can have a significant impact on the sustainable funding requirements:

- Anticipated useful lives of assets
- Replacement costs of assets
- Whether those costs are paid in cash or debt-financed by the City

Figure 7.5 demonstrates how these three factors can be graphically depicted as three physical dimensions, with replacement cost as the vertical y-axis, expected useful life as the horizontal x-axis, and amount of debt incurred as the z-axis.

When all capital costs are paid in cash by the City, otherwise referred to as Pay-As-You-Go (PAYG) spending, a two-dimensional range of sustainable funding requirements is determined as illustrated in Figure 7.6.

The figure above illustrates the expected sustainable capital funding requirements for 2009 for the range of expected life and replacement costs. The number in the centre of the square represents the midpoint of both dimensions and is considered to be the most likely (expected)
outcome. In other words, if the City funds all capital projects on a PAYG plan, then Work Yards and Maintenance would require $7.8 million in capital funding annually.

7.4.8.1 PAYG versus Debt-Financing

Figure 7.7 illustrates the analysis results for Work Yards and Maintenance facilities including the third dimension, Debt-Financing.

![Figure 7.7: Sustainable Capital Funding Requirements (Debt-Financing)](image)

When Debt-Financing is included, the sustainable capital funding levels increase significantly. For example, sustainable capital costs increase from $7.8 million for PAYG to $10.6 million for Debt-Financing. In other words, approximately $2.8 million/year is taken out of the community to pay only for interest, thus illustrating the true cost of debt.

7.4.8.2 Sustainable Funding Model

Figure 7.8 illustrates the results of the analysis for Work Yards and Maintenance facilities using the PAYG model.

- The blue (vertical bar) columns represent the actual capital requirements for each of the subsequent 100 years.
- The orange line represents the average capital requirements weighted by population growth of 1.07%.
- The green line provides the amount of cumulative reserves that would be generated if the sustainable capital funding requirements (orange line) were adhered to.
In years when the actual capital requirements are less than the sustainable capital funding level, the surplus would be added to the capital reserves. In years where the capital requirements are greater than the sustainable capital funding level, money would be taken from reserves to cover the shortfall. This ensures that investments are the most timely and cost-effective, i.e. doing the right thing to the right asset at the right time, instead of trying to maintain capital spending at a fairly consistent level from year to year.

Figure 7.9 illustrates the analysis results assuming that all capital expenditures would be funded through Debt-Financing, using a 15-year borrowing period at 6%. The sustainable funding requirements would increase from $7.8 million (PAYG) to $10.6 million (Debt-Financing).
It should be noted that 15 years were added to analysis period for the Debt scenario in order to include the payment of all debt incurred.
8.0 Summary of Corporate Facilities and Recommendations

8.1 SUMMARY OF ANALYSIS RESULTS

The following streetscape graphically represents the summarized 2009 replacement values and sustainable capital requirements for each of the asset groups based on Pay-As-You-Go (PAYG) and Debt-Financing (Debt) options.

Table 8.1 provides a summary of the annual capital requirements for sustainable capital funding for each department. To provide sustainable funding for all Corporate Facilities in this study, a total capital cost of $19.4 million per year would be required. If the City funded all capital expenditures through Debt-Financing, those costs would rise by over 37 percent to $26.6 million annually.
### Table 8.1: Summary of Annual Capital Requirements

<table>
<thead>
<tr>
<th>Group</th>
<th>PAYG</th>
<th>DEBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire &amp; EMS</td>
<td>$2.8M</td>
<td>$3.9M</td>
</tr>
<tr>
<td>Libraries</td>
<td>$2.6M</td>
<td>$3.6M</td>
</tr>
<tr>
<td>C.U.P. Operations</td>
<td>$1.2M</td>
<td>$1.6M</td>
</tr>
<tr>
<td>Corporate Administration Buildings</td>
<td>$5.0M</td>
<td>$6.9M</td>
</tr>
<tr>
<td>Work Yards &amp; Maintenance</td>
<td>$7.8M</td>
<td>$10.6M</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>$19.4M</strong></td>
<td><strong>$26.6M</strong></td>
</tr>
</tbody>
</table>

### 8.2 SUMMARY OF THE FINANCIAL ANALYSIS RESULTS

Within the following section expected results have been listed as well as high and low estimates of sustainable funding requirements. There are three key factors that can have a significant impact on the sustainable funding requirements:

- Anticipated useful lives of assets
- Replacement costs of assets
- Whether those costs are paid in cash or debt-financed by the City

When all capital costs are paid in cash by the City, otherwise referred to as Pay-As-You-Go (PAYG) spending, a two-dimensional range of sustainable funding requirements is determined as illustrated in Figure 8.2.

![Figure 8.2: Sustainable Capital Funding Requirements (PAYG)](image-url)
The figure above illustrates the expected sustainable capital funding requirements for 2009 for the range of expected life and replacement costs. The number in the centre of the square represents the midpoint of both dimensions and is considered to be the most likely (expected) outcome. In other words, if the City funds all capital projects on a PAYG plan, then $19.4 million in capital funding annually in order to support all Corporate Facility infrastructure.

8.2.1.1 PAYG versus Debt-Financing

Figure 8.3 illustrates the analysis results for Corporate Facilities including the third dimension, Debt-Financing.

![Figure 8.3: Sustainable Capital Funding Requirements (Debt-Financing)](image)

When Debt-Financing is included, the sustainable capital funding levels increase significantly. For example, sustainable capital costs increase from $19.4 million for PAYG to $26.6 million for Debt-Financing. In other words, approximately $7.2 million/year is taken from the community to pay only for interest, thus illustrating the true cost of debt.
8.2.1.2 Sustainable Funding Model

Figure 8.4 illustrates the results of the analysis for all Corporate Facilities using the PAYG model.

- The blue (vertical bar) columns represent the actual capital requirements for each of the subsequent 100 years.
- The orange line represents the average capital requirements weighted by population growth of 1.07%.
- The green line provides the amount of cumulative reserves that would be generated if the sustainable capital funding requirements (orange line) were adhered to.

In years when the actual capital requirements are less than the sustainable capital funding level, the surplus would be added to the capital reserves. In years where the capital requirements are greater than the sustainable capital funding level, money would be taken from reserves to cover the shortfall. This ensures that investments are the most timely and cost-effective, i.e. doing the right thing to the right asset at the right time, instead of trying to maintain capital spending at a fairly consistent level from year to year.
Figure 8.5 illustrates the analysis results assuming that all capital expenditures would be funded through Debt-Financing, using a 15-year borrowing period at 6%. The sustainable funding requirements would increase from $19.4 million (PAYG) to $26.6 million (Debt-Financing).

![Figure 8.5: Corporate Facilities Sustainable Capital Funding Model (Debt-Financed)](image)

It should be noted that 15 years were added to analysis period for the Debt scenario in order to include the payment of all debt incurred.

### 8.2.2 How do we reach sustainable funding?

Since the current budget is well under $10 million, there is a significant shortfall in capital funding and it is recommended that the gap be closed within the next five to ten years. The City will need to increase funding each year by more than the rate of inflation in order to reach its sustainable capital funding requirements. These increases may be in the form of increased levies, diversion of funds through cost-cutting measures or a combination of the two.
8.2.3 How do we maintain sustainability?

The City should continue lobbying the provincial and federal governments for funding to maintain and improve the Corporate Facilities. Progress could be measured by revisiting the State of the Infrastructure Report every five years to review funding levels, debt levels and levels of service.

8.2.4 Do we still need it?

This was not included within this analysis; however, it is recommended that an asset review committee be formed and that appropriate asset disposal policies be developed based on need and/or economic life of the asset. Consideration should be made for the merging of some facilities in order to improve efficiency and limit redundancy. For example, the Yard Rationalization Study will provide input into possible consolidation of facilities and improvements to services.

8.2.5 Key Performance indicators

As the Corporate Facilities Department continues to improve their Asset Management Plan, they need to identify key performance indicators (KPI) in order to measure and thus improve performance as well as to provide accountability. These KPI should be set up on a strategic, tactical and operational level.

- **Strategic:**
  - Develop and maintain an acceptable level of service (sustainable)
  - Maintain level of acceptable business risk
- **Tactical (Functional):**
  - Over-all report card rating (e.g. target of B-)
  - Maintenance/rehabilitation relative to capital replacement value (e.g. around 60%)
  - Cost per capita for supplying staff
  - Ability of facilities to meet demand
- **Operational KPI:**
  - Actual demand for facility
  - Response times to service requests
  - Number/type of service requests
  - Repair and maintenance costs per square metre
  - Energy and utility costs per square metre
  - Water costs per square metre
  - CO₂ emissions in tonnes of carbon dioxide per square metre for operational property
8.3 IMPROVEMENT PROGRAM

8.3.1 Asset Management Process Improvements

Asset management processes are defined as the processes, analyses and evaluation techniques needed to support Life-Cycle asset management. These include the following asset management functions:

- Knowledge of assets
- Levels of service
- Condition assessments
- Asset accounting - valuation, revaluation, depreciation
- Life-Cycle planning
- Asset operations and maintenance
- Asset creation and disposal
- Performance monitoring
- Quality assurance and continuous improvement
- Risk management
- Design and project management
- Reviews and audit processes

8.3.2 Asset Management Information System Improvements

Asset management information systems are defined as the systems that support asset management processes and manipulate the relevant data. These include the following asset management functions:

- Asset registers
- Financial system
- Maintenance management system
- Condition monitoring
- Capital works programming
- As constructed plans
- Geographical information systems
- Advanced applications such as deterioration modeling
- Future demand analysis
Such systems may replicate or even automate asset management processes. The Corporate Facilities Department has implemented improvements in their Asset Management Information System that include, but are not limited to, the ReCAPP and Archibus systems as well as numerous recently performed facility condition assessments.

The following specific actions would improve Corporate Facilities’ asset management information system and hence further improve the availability of data required to make decisions related to the ongoing management of the asset portfolio:

- Continued use of ReCAPP, Archibus or similar infrastructure management system and extend implementation to other asset groups
- Perform regular facility condition assessments and adjust maintenance requirements and timelines based on the most recent information

### 8.3.3 Asset Management Data and Knowledge Improvements

Asset management data and knowledge is defined as appropriate, accessible and reliable data that can be used with information systems to enable enhanced asset management. This includes the following data on the following asset characteristics and topics.

- Classification and identification
- Physical attributes
- Condition
- Cost and maintenance histories
- Benchmark data
- Valuation
- Life-Cycle cost evaluation
- Data quality
- Risk information
- Recording of new assets

### 8.3.4 Develop and Implement an O&M Strategy for Life-Cycle Analysis and Management

It is recommended that the Division begin the process of developing and implementing an O & M strategy for the various assets within the portfolio. The purpose of the strategy document is to:

- Identify the strategies and actions used in the proactive maintenance of the assets.
- Document the projected expenditures over a prescribed planning horizon which will typically be shorter than that used for the SotI report.
An important initial step in this process would be a review of the current O & M activities complete with costs; these activities should be categorized as either reactive or proactive. By completing this review it will be possible to begin defining changes that will be needed to adjust the balance of reactive vs. proactive activities.

8.3.5  Life-Cycle Analysis and Integration with Financial Tools
As the knowledge of the assets both in terms of the various attributes and condition increases it will be possible for the Corporate Facilities Department to begin the process of managing the assets using life-cycle concepts. It will be important to develop an understanding of the true costs associated with the management of the assets to assist in making better informed decisions in the future. Therefore, in order to ensure that the various costs associated with maintaining the assets are captured it will be essential to explore options for extending either the ReCAPP or Hansen systems to track work orders related to the facilities and their components.

8.4  CITY ENERGY USE POLICY
The following sections outline some improvements that may be appropriate for implementation within the City’s Corporate Facilities assets to assist in achieving the goals for energy conservation set out in the City’s Energy Use Policy (Appendix C). This list is not intended to be exhaustive and is provided for illustrative purposes:

8.4.1  Mechanical & Structural
Depending on the actual configuration and age of this asset group some of the following may be applicable:

- Investigate the tightness and insulation of the building envelope in all properties and develop programs for improvement
- Reduce solar gain through windows with awnings or other architectural features/landscaping etc
- Improve mechanical systems by replacing old inefficient systems with new high efficiency systems; investigate if incentives for these improvements are available through the City’s natural gas utility

8.4.2  Electrical
- Install occupancy sensors
- Implement energy efficiency lighting using compact fluorescent light bulbs and install timers where appropriate to control outside lights
- Consider a power monitoring session which will show the peak demand which could lead to lower utility bills, reduced operating costs and more efficient use of utility power.
8.5 ASSET CONDITION REPORT CARD

The following report card is a summary of the condition assessment worksheets that were completed by City staff in order to determine the current funding situation for each group.

<table>
<thead>
<tr>
<th>Asset Group</th>
<th>2009 Rating</th>
<th>Comments</th>
<th>Projected 2029</th>
<th>Projected 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and EMS</td>
<td>B-</td>
<td>Some stations are in the process of being upgraded to current standards and funding is available to upgrade mechanical components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Libraries</td>
<td>B-</td>
<td>Many of the rural facilities require attention, some facilities to be eliminated due to future expansion.</td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>CUP Operations</td>
<td>B-</td>
<td>Improvement is noted based on funds being provided – new technology may require maintenance costs to rise. Operations budget requirements not being met. Electrical component of CUP building aging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Administration Buildings</td>
<td>B</td>
<td>Funding levels providing improvement in condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Yards and Maintenance</td>
<td>C</td>
<td>Condition of cemeteries deteriorating, inadequate funding. Condition of operations centres good but aging while satellite yards deteriorating. Large operations centres need funding and some reorganization of space allocation in order to improve condition.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 8.6: Summary Report Card

The Corporate Facilities Department has an overall rating of B-, based on the individual asset groups, as illustrated above. Recent improvements by this department have significantly helped to improve the overall condition of the asset portfolio, thus slowing the rate of deterioration. The absence of sustainable funding is directly related to the expectation that the condition of these assets is not expected to improve by 2050.

8.5.1 Improvements Made

This SotI Report illustrates the effects of the efforts made by the Corporate Facilities Department over approximately the last five years to improve the management and condition of their assets. Placing personnel in key positions in order to manage the assets has resulted in these managers having direct responsibility for their asset portfolio which has led to improved conditions as well as cost savings. This initiative included the addition of two new superintendent positions to better manage the portfolio; formation of the Energy Office to
implement and monitor energy efficiency initiatives; and the Archibus system was implemented to support the day-to-day operations and long-range planning requirements.

8.6 RECOMMENDATIONS

As with previous SotI Report for the Corporate Facilities Department, there are enough issues on the table that this is an opportune time to start developing long-term policies and implementation plans in a rational and strategic way. This will require some tough decisions to be made, both at the service level and the asset level. However, the current situation is clearly unsustainable over the long term and if the funding is unsustainable, then the service is unsustainable.

The recent management improvements and funding allocations have been instrumental in slowing the deterioration that was occurring in this portfolio and have significantly helped to improve the overall condition. Without these efforts, the general condition of the Corporate Facilities assets would be significantly worse.

There is a need to develop budget management models that take into account the City’s physical and population growth and its associated impact on services and assets on an annual basis. These new funds would go to increase operating and capital funding to reserves for future upgrading, rehabilitation and replacement of the asset. This policy also should apply to assets that have just been replaced to ensure that sustainable funding is in place for the future.

It is recommended that the following asset Life-Cycle management goals be achieved within the next five to ten years.

1. Develop and implement an analytical model that incorporates alternatives, levels of service, risk management, project ranking, etc. to assist in the development of the ten-year Capital budget
2. Develop options with respect to closing the gap in terms of capital budget financing over the next five to ten years, assess impact of further delays and present a report to City Council for their approval
3. Develop performance measures/Level of Service at the strategic, tactical and operational levels, and establish links between a service and the true life-cycle cost of delivering that service through appropriate assets
4. Develop a relationship between levels of service and cost
5. Review existing budgetary documents and budget structure with a view to establishing the True Cost of Service (TCS) which includes asset management, operations, capital and borrowing costs and can measure their progress towards sustainable funding
6. Develop methods to determine the true cost of assets and services. Match service levels with expectations
7. Review operating and maintenance practices on a business-case basis, use Best Practices (where available) and other technical documents, and develop an associated tactical plan
8. Review associated funding levels in order to ensure that systems are maintained at the optimal Life-Cycle cost

9. When additional funding is identified, ensure that a portion of this funding is for additional staff to successfully develop and implement the required program delivery and asset management plans

10. Review the traditional practice of using capital (debt) financing in the context of sustainable levels of funding. Use of traditional capital funding (and associated interest/debt payments) results in the community, paying considerably more every year than it receives in actual value (i.e. the difference between the gross and the net expenditures) as a result of a permanent debt level. See Appendix D for a more detailed review of this practice

11. Develop public policy relating to levels of service and Total Cost of Service (TCS)

12. Continue with efforts to establish and maintain a more comprehensive database with respect to condition of assets in order to develop better deterioration models

13. Provide regular updates to the SotI Report Card

14. Develop budget management models that take into account the City’s growth (physical and population base and its associated impact on services and assets) on an annual basis, in order to conduct sustainable service delivery and asset management in the future

15. Develop appropriate reporting measures to monitor actual costs and compare them to minimum Life-Cycle costs on a business-case basis

16. Implement a comprehensive budget structure along service delivery lines, so that service managers can adequately know what the true total cost of their service is (including asset management, operations, capital and borrowing costs) and measure their progress towards sustainable funding

17. Develop better ways to determine actual O&M costs and incorporate them in future analyses

18. Implement environmental sustainability and energy-saving improvements to support City goals and initiatives

19. Provide funding options and recommendations for the eventual replacement of buildings and major building components when they reach the end of their expected service life

20. Question the need for a particular facility before proceeding with rehabilitation or replacement, and formulate a suitable disposal program if required
Appendix A: New Zealand Assessment Tool  
(Excerpt from NAMS Property Manual)

The National Asset Management Steering Group (NAMS) from New Zealand is a non-profit industry organization established to promote best practice asset management through advocacy and the development of guidelines and training. In that light, they published the NAMS Property Manual for the strategic to tactical long-term planning for property assets. As stated in the Manual,

“Property asset management is all about having the right property, in the right place, maintained in the right state, performing in the right way, at the right time and delivering the right benefits.”  

NAMS Property Manual, 2006

Good property asset planning requires analysis and activities such as risk management, information management, financial planning, customer consultation, maintenance management, project planning, facility management as well as lease/occupancy management. The NAMS Manual and toolkits are designed to assist property owners with the long-term planning of their portfolio of property assets. The focus is on delivery of the best outcomes for all stakeholders.

The RECAPP system used by the City of Hamilton is a good inventory system that can assist in analysis of a property portfolio by providing raw data and some analytical results. The State of the Infrastructure Report – Facilities 2008 is limited to a very high-level analysis in order to scope out issues, but does not contain the details required to make property management decisions at a detailed level or on a property-by-property basis. This next logical step would allow the City to identify strategic land holdings, functionality of buildings, condition as well as

Following are examples of screenshots from some of the tools available to licensed users:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Questions to determine the Property Quality Standard</td>
</tr>
<tr>
<td></td>
<td>Description of categories</td>
</tr>
<tr>
<td></td>
<td>Significance</td>
</tr>
<tr>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td></td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td>Health</td>
</tr>
<tr>
<td></td>
<td>Accessibility</td>
</tr>
<tr>
<td></td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>Sustainability</td>
</tr>
<tr>
<td></td>
<td>Intervention required</td>
</tr>
<tr>
<td></td>
<td>Typical regulations / requirements to meet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Individual Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Does the unit have asbestos internal lining / finish?</td>
</tr>
<tr>
<td></td>
<td>1 100 x</td>
</tr>
<tr>
<td></td>
<td>Special removal of asbestos and replace</td>
</tr>
<tr>
<td></td>
<td>Architectural regulations and CSR guidelines</td>
</tr>
<tr>
<td>4</td>
<td>Does the unit have T.R.S. wiring?</td>
</tr>
<tr>
<td></td>
<td>1 2500 x</td>
</tr>
<tr>
<td></td>
<td>Remove existing and fit new. Repair gb</td>
</tr>
<tr>
<td></td>
<td>Electrical regulations</td>
</tr>
</tbody>
</table>
As stated previously, it is highly recommended that the City take the next logical step of using the NAMS property tools (or similar) to identify strategic land holdings, functionality of buildings, condition of buildings as well as utilization and finally identification of critical assets. This recommendation mostly applies to Hamilton Housing, which has a significant and varied portfolio of properties that is in various states of deterioration while facing ever-changing demands. The City would be well-served by performing a detailed analysis on a property-by-property basis and using some of the tools suggested by NAMS:

- To understand what could happen and how it could be managed, i.e. to assess current and potential future shortfalls in Levels of Service
- To determine where it is going and what it needs, i.e. to develop lifecycle policies and strategies for long-term creation, acquisition, improvement, replacement, maintenance and disposal programs
- To assess its options on a risk-management and lifecycle cost basis
- To prioritize capital projects
- To establish an auditable process

Stantec Consulting is a registered owner and user of the NAMS Property Manual and its proprietary toolkits which include MS Excel spreadsheets, data collection forms and report templates.
Appendix B: Venice Charter for Conservation and Restoration of Monuments and Sites, and Other Heritage Charters and Standards

There is agreement around the world that historical artefacts, structures and landmarks contribute significantly to the general well-being of a civilization, in understanding its past and thus shaping its future. The conservation of historic and cultural sites requires qualified specialists as well as specialized techniques and materials that may need to differ greatly from modern approaches to construction. Ironically, it is also recognized that this, in and of itself, represents a threat to historic buildings in general since they are being altered in order to be preserved. That is why countries all over the world have developed a number of formal Charters and overall guidelines to be used in dealing with cultural and historical issues.

B.1 BRIEF HISTORY OF CHARTERS

The first attempt to establish a coherent and logically defensible philosophy for building conservation was in the Society for the Protection of Ancient Building's Manifesto of 1877. The Manifesto consists principally of a plea to "put protection in place of restoration", and only the last two paragraphs commend a philosophy of care. However, it is this relatively brief Manifesto statement that marks the starting point for the many later policy statements.

In 1931, the International Museum Office organized, at the Athens Conference, a meeting of conservationists of historical buildings. They established basic principles for an international code of practice for conservation. It was not until 1957 that the architectural specialists themselves organized their own congress in Paris. This Congress made 7 strong recommendations with respect to restoration of historic sites, specialized training requirements and integration of historic buildings into town planning. The Second International Congress of Architects and Technicians of Historic Monuments, which met in Venice from May 25th to 31st 1964, approved the text of an International Charter for the Conservation of Monuments and Sites (the Venice Charter), which superseded the Athens Charter. The Venice Charter, which was adopted by the newly formed International Council on Monuments and Sites (ICOMOS), itself the result of a resolution put forward by UNESCO, is an important modern milestone for the conservation movement. ICOMOS is an international non-governmental organisation that promotes the study of the theory, methodology and technology of conservation applied to monuments, historic areas and sites. The Venice Charter was critical in establishing principles with respect to conservation, restoration, rehabilitation, renovation and reconstruction of historic sites (which include buildings as well as landscapes and gardens) as well as archaeology, documentation and use of modern materials.

As stated previously, the IIInd International Congress of Architects and Technicians of Historic Monuments, which met in Venice from May 25th to 31st 1964, approved the following text and referred to as the Venice Charter – 1964 and adopted by the International Council on
Monuments and Sites (ICOMOS) in 1965. This Charter is the International reference of choice in terms of guiding principles for keeping and restoring sites and facilities of historic and cultural significance.

**B.2 THE VENICE CHARTER 1964**

**THE INTERNATIONAL CHARTER FOR THE CONSERVATION AND RESTORATION OF MONUMENTS AND SITES**

**IIND INTERNATIONAL CONGRESS OF ARCHITECTS AND TECHNICIANS OF HISTORIC MONUMENTS, VENICE 1964**

**Preamble**

Imbued with a message from the past, the historic monuments of generations of people remain to the present day as living witnesses of their age-old traditions. People are becoming more and more conscious of the unity of human values and regard ancient monuments as a common heritage. The common responsibility to safeguard them for future generations is recognized. It is our duty to hand them on in the full richness of their authenticity.

It is essential that the principles guiding the preservation and restoration of ancient buildings should be agreed and be laid down on an international basis, with each country being responsible for applying the plan within the framework of its own culture and traditions.

By defining these basic principles for the first time, the Athens Charter of 1931 contributed towards the development of an extensive international movement which has assumed concrete form in national documents, in the work of ICOM and UNESCO and in the establishment by the latter of the International Centre for the Study of the Preservation and the Restoration of Cultural Property. Increasing awareness and critical study have been brought to bear on problems which have continually become more complex and varied; now the time has come to examine the Charter afresh in order to make a thorough study of the principles involved and to enlarge its scope in a new document.

Accordingly, the IInd International Congress of Architects and Technicians of Historic Monuments, which met in Venice from May 25th to 31st 1964, approved the following text:

**Definitions**

ARTICLE 1. The concept of an historic monument embraces not only the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or an historic event. This applies not only to great works of art but also to more modest works of the past which have acquired cultural significance with the passing of time.
ARTICLE 2. The conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the study and safeguarding of the architectural heritage.

Aim

ARTICLE 3. The intention in conserving and restoring monuments is to safeguard them no less as works of art than as historical evidence.

Conservation

ARTICLE 4. It is essential to the conservation of monuments that they be maintained on a permanent basis.

ARTICLE 5. The conservation of monuments is always facilitated by making use of them for some socially useful purpose. Such use is therefore desirable but it must not change the lay-out or decoration of the building. It is within these limits only that modifications demanded by a change of function should be envisaged and may be permitted.

ARTICLE 6. The conservation of a monument implies preserving a setting which is not out of scale. Wherever the traditional setting exists, it must be kept. No new construction, demolition or modification which would alter the relations of mass and color must be allowed.

ARTICLE 7. A monument is inseparable from the history to which it bears witness and from the setting in which it occurs. The moving of all or part of a monument cannot be allowed except where the safeguarding of that monument demands it or where it is justified by national or international interest of paramount importance.

ARTICLE 8. Items of sculpture, painting or decoration which form an integral part of a monument may only be removed from it if this is the sole means of ensuring their preservation.

Restoration

ARTICLE 9. The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins, and in this case moreover any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp. The restoration in any case must be preceded and followed by an archaeological and historical study of the monument.

ARTICLE 10. Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modern technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience.
ARTICLE 11. The valid contributions of all periods to the building of a monument must be respected, since unity of style is not the aim of a restoration. When a building includes the superimposed work of different periods, the revealing of the underlying state can only be justified in exceptional circumstances and when what is removed is of little interest and the material which is brought to light is of great historical, archaeological or aesthetic value, and its state of preservation good enough to justify the action. Evaluation of the importance of the elements involved and the decision as to what may be destroyed cannot rest solely on the individual in charge of the work.

ARTICLE 12. Replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historic evidence.

ARTICLE 13. Additions cannot be allowed except in so far as they do not detract from the interesting parts of the building, its traditional setting, the balance of its composition and its relation with its surroundings.

ARTICLE 14. The sites of monuments must be the object of special care in order to safeguard their integrity and ensure that they are cleared and presented in a seemly manner. The work of conservation and restoration carried out in such places should be inspired by the principles set forth in the foregoing articles.

Excavations

ARTICLE 15. Excavations should be carried out in accordance with scientific standards and the recommendation defining international principles to be applied in the case of archaeological excavation adopted by UNESCO in 1956.

Ruins must be maintained and measures necessary for the permanent conservation and protection of architectural features and of objects discovered must be taken. Furthermore, every means must be taken to facilitate the understanding of the monument and to reveal it without ever distorting its meaning.

All reconstruction work should however be ruled out a priori. Only anastylosis, that is to say, the reassembling of existing but dismembered parts can be permitted. The material used for integration should always be recognizable and its use should be the least that will ensure the conservation of a monument and the reinstatement of its form.

Publication

ARTICLE 16. In all works of preservation, restoration or excavation, there should always be precise documentation in the form of analytical and critical reports, illustrated with drawings and photographs. Every stage of the work of clearing, consolidation, rearrangement and integration, as well as technical and formal features identified during the course of the work, should be
included. This record should be placed in the archives of a public institution and made available to research workers. It is recommended that the report should be published.

The following persons took part in the work of the Committee for drafting the International Charter for the Conservation and Restoration of Monuments:

- Piero Gazzola (Italy), Chairman
- Raymond Lemaire (Belgium), Reporter
- José Bassegoda-Nonell (Spain)
- Luis Benavente (Portugal)
- Djurdje Boskovic (Yugoslavia)
- Hiroshi Daifuku (UNESCO)
- P.L. de Vrieze (Netherlands)
- Harald Langberg (Denmark)
- Mario Matteucci (Italy)
- Jean Merlet (France)
- Carlos Flores Marini (Mexico)
- Roberto Pane (Italy)
- S.C.J. Pavel (Czechoslovakia)
- Paul Philippot (ICROM)
- Victor Pimentel (Peru)
- Harold Plenderleith (ICROM)
- Deoclecio Redig de Campos (Vatican)
- Jean Sonnier (France)
- Francois Sorlin (France)
- Eustathios Stikas (Greece)
- Gertrud Tripp (Austria)
- Jan Zachwatovicz (Poland)
- Mustafa S. Zbiss (Tunisia)

**Other cultural heritage charters and standards**

J. K. Gillon provides the following summary of other heritage charters and standards that were developed and used by other countries around the world.

The **Venice Charter** was followed by a plethora of other standards, charters, formal recommendations and conventions relating to building conservation. These provide invaluable guidance for practitioners working in the field of building conservation and are an essential framework for good practice in the protection and enhancement of the historic environment. The most significant of these that have the approval of ICOMOS are:
- The Florence Charter on Historic Gardens (1982). Provides a definition of the term historic garden and the architectural compositions that constitute the historic landscape. It emphasizes the need to identify and list historic gardens, and provides philosophical guidance on maintenance, conservation, restoration and reconstruction. It refers back to the Venice Charter for many of its principles.


- Charter for the Protection and Management of the Archaeological Heritage (1990). Considers the subject of archaeology under the following headings: definitions, integrated protection policies, legislation, survey, maintenance and conservation, presentation, reconstruction, and international co-operation.


- Resolution on the Conservation of Smaller Towns (1975). Considers the potential threats to such places, which are detailed as: lack of economic activity, outward movement of population, disruption of structures due to insertion of new elements, and measures to adapt to modern activities. Methods of counteracting these threats are then considered.

- Declaration of Amsterdam (Congress on the European Architectural Heritage, 1975). Notes that the significance of the architectural heritage and the justification for conserving it are now more clearly perceived, and considers processes that would place the conservation of the architectural heritage on firm and lasting foundations. The importance of integrating conservation of the architectural heritage into the urban and City planning process is identified as one of the most important factors.

- The Charter on Cultural Tourism (1976). Considers the positive and negative effects of cultural tourism on historic monuments and sites.


- The Burra Charter. The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance (1981). This Charter develops the principles detailed in the Venice Charter to suit local Australian requirements. It includes a comprehensive list of definitions of items such as place, fabric, conservation, maintenance, preservation, restoration, reconstruction, adaptation and compatible use. It also introduces the concept of cultural significance, the 'aesthetic, historic, scientific or social value for past, present and future generations', and requires this to be defined for each place, and conservation plans to be established and justified prior to any intervention. It continues with a description of conservation principles and processes that are intended as a definition of good practice. The Burra Charter is well established in Australia and is frequently used by the Australian Government in its formal capacity.
The Appleton Charter for the Protection and Enhancement of the Built Environment (ICOMOS Canada, 1983). Considers levels of intervention in the historic environment, notes that respect for original fabric is a fundamental basis for the activities of protection and enhancement, and considers good practice in terms of documentation, avoidance of conjecture, distinguishability of new work, use of traditional materials and techniques, maintenance of patina, reversibility and respect for the integrity of the structure.

Charter for the Conservation of Places of Cultural Heritage Value (ICOMOS New Zealand, 1992). Provides comprehensive definitions of the processes involved in conservation, and sets out principles to guide the conservation of places of cultural heritage value in New Zealand. It aims to provide a frame of reference as guidelines for appropriate professional practice. Although written for use in New Zealand, the basic principles are generally applicable and follow the spirit of the Venice Charter.

Preservation Charter for the Historic Towns and Areas of the United States of America (US ICOMOS, 1992). Sets down a comprehensive statement concerning the importance of historic town, neighbourhoods and places, and states what should be done to tackle preservation issues in a coherent and thorough manner.

Guidelines for Education and Training in the Conservation of Monuments, Ensembles and Sites (1993). The aim of this document is to promote the establishment of standards and guidelines for education and training in the conservation of historic buildings, historic areas and towns, archaeological sites, and cultural landscapes. It emphasises the need to develop a holistic approach to heritage issues and sets out the relevant skills that are required.

Barcelona Charter: It should be noted that these Charters and standards mostly focus on monuments and sites ashore. Maritime heritage is not covered despite its close affinity. Therefore, the fourth EMH Congress, at its meeting in Barcelona in 2001, resolved to adapt the Venice Charter for maritime heritage in Europe, to be known as the Barcelona Charter.
Appendix C: City of Hamilton Corporate Energy Policy

CITY OF HAMILTON
CORPORATE
ENERGY POLICY

For
City Facilities and Operations
October 2007

Prepared By:
The Office of Energy Initiatives
Fleet and Facilities
PUBLIC WORKS
TABLE OF CONTENTS

EXECUTIVE SUMMARY ........................................................................................................... 3

1.0 INTRODUCTION ............................................................................................................... 4
  1.1 Background .................................................................................................................... 4
  1.2 Bill 21 – Energy Conservation Responsibility Act ......................................................... 5
  1.3 Energy Reduction Targets ............................................................................................. 6
  1.4 Corporate Energy Steering Committee ......................................................................... 7

2.0 STRATEGY FOR ACHIEVING ENERGY REDUCTION TARGETS ................................ 9
  2.1 Monitoring and Targeting Program ............................................................................. 9
  2.2 CDM Investment: Existing Buildings ......................................................................... 11
  2.3 CDM Investment: Major Renovations / New Construction ........................................... 14
  2.4 Implementation of Eco-Responsive Energy Management Policies ............................. 16

3.0 SPECIFIC POLICIES RE CAPITAL INVESTMENT ....................................................... 18
  3.1 Energy Management Standard – Central BAS Control ............................................... 18
  3.2 Incandescent Lighting .................................................................................................. 18
  3.3 Roof Capital Replacement Evaluation .......................................................................... 18
  3.4 Energy Efficient Equipment Purchasing ...................................................................... 18
  3.5 Electricity Generation, Cogeneration, and District Energy ....................................... 18
  3.6 Back-up / Emergency Power Systems ....................................................................... 18

4.0 SPECIFIC POLICIES RE ENERGY PROCUREMENT ................................................... 21
  4.1 'Traditional' Energy Procurement .............................................................................. 21
  4.2 Renewable Energy ........................................................................................................ 21
  4.3 Green Power ................................................................................................................ 22
  4.4 Emissions Trading ........................................................................................................ 22

APPENDIX A - DEFINITIONS ........................................................................................... 23
EXECUTIVE SUMMARY

The City of Hamilton’s Energy Policy is designed to:

- Facilitate the achievement of City-wide energy reduction targets
- Address legislated reporting requirements
- Provide for ongoing Energy Monitoring and Targeting of utility usage
- Define policies re capital investment related to energy
- Define policies related to energy procurement.

The Energy Policy incorporates the following key components:

1) **Strategy for Achieving Energy Reduction Targets**
   - a) Monitoring and Targeting of Existing/New/Retrofitted Buildings
   - b) Conservation and Demand Management Investment: Existing Buildings
   - c) Conservation and Demand Management Investment: Major Renovations / New Construction
   - d) Implementation of Eco-Responsive Energy Management Policies

2) **Specific Policies re: Capital Investment Related to Energy**
   - a) Energy Management Standard - Central Building Automation System control
   - b) Incandescent lighting
   - c) Roof Capital Replacement Evaluation
   - d) Energy Efficient Equipment Purchasing
   - e) Electricity Generation, Cogeneration, District Energy
   - f) Back-up / Emergency Power Systems

3) **Specific Policies re: Energy Procurement**
   - a) Energy Procurement
   - b) Green power
   - c) Emissions trading
   - d) Renewable Energy
1.0 INTRODUCTION

1.1 Background

The City of Hamilton, like most Ontario municipalities, is challenged with significant budgetary pressures due to reduced levels of funding and increasing costs. Hamilton also has the added pressure of an aging infrastructure which will require significant investment over the next several years.

In terms of energy supply and pricing, reports like the "Peak Oil" report raise awareness that energy costs will continue to increase and the impact of these rising prices can be severe to the City and our local economy. What is unknown is how quickly energy prices will rise over the next several years and to what degree. Given the way energy markets tend to perform, the bigger challenge now is managing for viability of pricing. The reality is that energy prices are now globally driven rather than locally driven. Ontario alone will need to invest billions of dollars, over the next decade, in utility infrastructure and new electricity generation to replace the aging supply base that exists today. In total, about 80% of Ontario's existing electricity generation capacity must be replaced over the next 20 years.

With the increasing focus on global warming and the environment, we have a situation which demands a new technological leap for producing clean and green energy at a reasonable cost. If this situation is not addressed, the news on maintaining energy costs at today's rates over the longer term is not good.

The City of Hamilton currently spends about $40 million annually on its energy and water utilities. Small increases in energy costs can quickly impact the bottom line. A 2.5% increase in energy costs adds another million dollars to the City's budget. The graph below demonstrates what an annual increase in energy costs between 5% and 12% could do to the City's current budget.
The issues described above clearly show that the City needs to take action and a long term view of energy costs, in conjunction with our related policies, such as Vision 2020, which is targeting a 20% reduction in greenhouse gas emissions by the year 2020.

Addressing both these challenges require the establishment of a Corporate Energy Policy (Energy Policy). The City has already undertaken action for managing its energy commodity costs, but the best way to mitigate its exposure to rising energy prices is to use less energy. By setting targets and strategies for energy reduction the City can better control energy costs while decreasing environmental emissions over the long term. With Council and staff support of the Energy Policy and its recommendations, Energy Conservation and Demand Management (CDM) is brought to the forefront of the City’s decision making process with all City facilities and operations. The added benefit of the Energy Policy is that as the City reduces its energy consumption, it also reduces environmental emissions.

Within this Energy Policy it is recommended that the City adopt energy reduction targets identified below, along with the following recommendations/guidelines within the Energy Policy to achieve these results. This Energy Policy has been drafted for implementation within all City Departments. The Energy Policy also recommends that all City Boards and Agencies be encouraged to acknowledge and adapt the City’s Energy Policy as part of their board resolutions.

This policy document is written with the next 3 to 5 years in mind. It is expected that additions or changes will be made to the energy policy as legislation, codes and market conditions change and evolve over time.

Typically, larger energy CDM initiatives take from 3 to 5 years to identify, evaluate, plan, budget, implement, monitor and verify results. The strategies identified can create a road map to initiate energy CDM plans and processes within individual departments and divisions.

City Council and Senior City Staff’s commitment to the Energy Policy and the foregoing energy plans is critical to encouraging staff involvement and buy-in to the program. The City’s success will come from change to the way we think about energy CDM in our daily working activities. It brings CDM to the forefront of all facilities and operational retrofits, for greater budget control, reduced costs, reduced emissions and an overall better quality of life for staff and the community. The Energy Policy also provides a methodology for capturing and recording our results and reporting on our successes.

1.2 Bill 21 – Energy Conservation Responsibility Act

The introduction of Bill 21 - the Energy Conservation Responsibility Act will put mandatory requirements for monitoring and reporting of energy use for all Ontario municipalities, including the City of Hamilton. This puts stringent requirements on the City to have a thorough understanding and organization of all of our energy and utility costs, along with our consumption profiles.

An Energy Management Software System (Utility Manager) has been purchased that will store a database of all historical energy costs and consumptions, and meets all the reporting, monitoring and verification standards that are required under Bill 21.
Utility Manager has the capabilities to standardize energy use reporting and analysis by correcting consumption for weather, using energy intensity factors to compare facilities, and to accurately identify and monitor energy reductions and savings from CDM activities.

Utility Manager will also be used for utility bill verification to identify any billing errors from the Utilities, create load profiles of our energy consumption, and monitor and verify rate structures.

The OEI will play an instrumental role in providing data to help with forecasting and creating energy budgets as required, by delivering the most up to date consumption and cost patterns for all facilities from the Utility Manager database. The OEI will work with Finance groups to supply any information required.

It is important that all City departments comply with utility information requests from the OEI so that all project and energy information is recording for future verification and reporting to Council and as part of Bill 21 requirements.

1.3 Energy Reduction Targets

The key to a successful long term energy conservation and demand management (CDM) vision is a strong Energy Policy, with measurable and achievable targets.

The Energy Policy calls for targeted energy reductions in energy intensity of City owned facilities and operations of:

- 3.0% by 2009
- 7.5% by 2012
- 20% by 2020

These targets equate to about a 1.5% reduction in energy per year. The report recommends that 2005 be used as the base year for measuring results.

2005 has been established as the City’s base year that energy reduction results will be measured against, as accurate energy data is available for 2005 while pre-amalgamation energy information prior to 2005 is less reliable.

The Energy Reduction Target will be applied to each City Department or Division’s overall energy usage on a proportional basis. This means larger energy users in the City must achieve the same reduction on a percentage basis in relation to their 2005 base year consumption, but their overall contribution to energy, cost and emission reductions will be much larger overall.

1.3.1 Comparison with Other Municipalities

The following table compares the energy reduction targets of different municipalities:
1.4 Corporate Energy Steering Committee

The formation of a Corporate Energy Steering Committee (CESC) is necessary to success of the Energy Policy. The CESC will provide a vehicle for key staff to work together in developing energy plans and strategies for their divisions. The CESC will have lead responsibility and accountability for achieving energy reduction targets. The intent is that the CESC will have a similar committee structure to the Central Fleet Advisory Committee.

The recommendations for the CESC committee are as follows.

1. A Corporate Energy Steering Committee (CESC) shall consist of key representatives from within the City’s major energy user groups (e.g. Facilities, Housing, Culture & Rec., Water & Waste Water or project managers/ advisors e.g. Office of Energy Initiatives (OEI), Capital Planning and Implementation (CPI)). The Corporate Energy Steering Committee will oversee the development of respective divisional Energy Conservation and Demand Management Plans and budgets for achieving targeted results. The following chart provides an example of how the CESC could be structured. The CESC would meet on a minimum quarterly basis (monthly initially).
2. The Public Works, Office of Energy Initiatives be responsible for reporting on all City of Hamilton corporate energy consumption reductions, cost savings initiatives and associated environmental emission reductions associated with energy conservation and demand management on an annual basis at a minimum and as required by legislation under Bill 21 - Energy Conservation Responsibility Act, 2006.

3. All City Departments and participating Boards and Agencies will be responsible for reporting on all energy incentive funding, project cost, energy consumption reductions, cost savings initiatives etc., and all other activities associated with energy conservation and demand management as requested by the OEI.

4. All City Boards and Agencies are encouraged to acknowledge and adapt the City’s Energy Policy and its changes from time to time as part of their board resolutions including the City’s recent Statement of Policies and Goals Relating to the Use of Commodity Price Hedging Agreements.
2.0 STRATEGY FOR ACHIEVING ENERGY REDUCTION TARGETS

To ensure that the City moves energy CDM activities to the forefront of normal business practices the City will need to achieve its energy reduction results through a combination of:

1) Monitoring and Targeting of Existing/New/Retrofitted Buildings
2) Investment in Energy Efficiency - Existing Buildings
3) Implementation of Energy Efficient Design - MajorRenovations / New Construction
4) Implementation of Eco-Responsive Energy Management Policies

These are outlined in the following sections.

2.1 Monitoring and Targeting Program

Energy accounting is a cornerstone of an effective energy management program. Monthly utility usage and costs should be monitored to identify trends, highlight anomalies, and benchmark facility usage against that of similar buildings in the portfolio.

Monitoring and Targeting is the next level in utility cost management, as it allows for more timely identification of energy usage anomalies. This is to be implemented at all existing / new buildings.

The vision is for energy to be managed through a management-by-exception process at the building level. Here daily target utility load profiles would be generated for each building based on day type and hourly weather data for comparison against real-time metering data. Using these tools it will be possible to identify variances or exceptions that can be investigated to resolve any problems.

To get to this point, the following key components of this strategy must be in place:

1) Ongoing Real-Time Monitoring of All Utilities
2) Standards of Performance

These are explored in the following sections.

2.1.1 Verification and Validation of Utility Bills

The OEI will monitor utility bills (verify and validate) for the correct application of energy rates, demand and energy consumption charges.

2.1.2 Ongoing Real-Time Monitoring of All Utilities

Each utility (e.g. electricity, gas, water, district cooling, district heating) should be tracked for each building on an hourly basis. The addition of real-time metering enables real-time feedback
confirmation to operational changes, and allows targeted measures to be monitored and their positive financial effects confirmed.

City of Hamilton buildings greater than 5,000 square metres should move towards having interval meters on their electrical services and pulse outputs on their gas and water meters as a basic first step.

2.1.3 Standards of Performance

Efficient building operation must be defined in order to be managed. Once standards for efficient operation are quantified, operation and maintenance effectiveness can be measured. Early identification of operational problems also mitigates the risk of having significant operation failures.

The following temperature settings apply to all City Facilities unless a deviation from the standard is required as determined by Corporate Buildings & Technical Services due to mechanical or system limitations:

- Indoor temperature settings in all spaces during occupied periods will be 22 degrees Celsius (72°F) during the winter and 24 degrees Celsius (75°F) during the summer. Where available, occupants will be given the temporary capability of varying temperature +/- 1 degree Celsius (2°F), resulting in 21-23°C (70-73°F) for heating and 23-25°C (74-77°F) for cooling.

- Indoor temperature settings in all spaces during unoccupied periods will be 18°C (64°F) during the winter and 27°C (81°F) during the summer. The exception is for pre-heating or pre-cooling periods necessary to maintain building system performance during occupied periods, especially during adverse weather conditions.

Spaces, such as research facilities, requiring critical temperature settings will be more tightly controlled and will be addressed as exceptions to the Energy Policy where necessary.

Occupants who control their own thermostats are required to adhere to these temperature standards also.

A performance standard must be measurable and quantifiable. The following are examples of potential standards of performance for City of Hamilton buildings:

- Desirable domestic hot water tank temperature (e.g. 50°C).
- Minimum light levels in offices, hallways, storage areas, etc (e.g. 400 LUX).
- Maximum CO₂ level in offices, resident spaces, etc (e.g. 700 ppm above ambient)
- Fan operation: when outdoor air temperature > 12°C.

When it comes time to consider / evaluate energy efficiency measures (e.g. lighting retrofits, control of fresh air volume using CO₂, etc.), these provide useful guidelines/checks.

Definitions of the standards are not arbitrary. The standards must reflect building code requirements, good O&M practices, and occupant needs.
2.2 CDM Investment: Existing Buildings

CDM Activities can benefit the City through:

✓ Reduced Energy Demand & Consumption
✓ Reduced Energy Costs
✓ Reduced Environmental Emissions
✓ Reduced Maintenance Costs
✓ Reduced Exposure to Energy Market Volatility (Risk Mitigation)
✓ Improved Working Environments
✓ Improved Productivity

2.2.1 Strategy: CDM Retrofits and Capital Renewal/Life Cycle Replacements

CDM Retrofits tend to be initiatives or project specific, where a new energy efficient technology or group of technologies are added or retrofit within a facility or group of facilities (e.g. Energy Retrofit Pilot Program for 20 City buildings).

Capital Renewal/Life Cycle Replacements are generally managed by the division who carries responsibility for operating and maintaining the existing or original equipment e.g. Public Works, Corporate Buildings & Technical Services. Typical projects include major capital replacements of chillers, boilers, fans, pumps, piping etc.

Typically equipment to be considered for this process includes:

• HVAC equipment (e.g. boilers, chillers, pumps, motors etc.),
• Lighting and controls
• Building envelope (e.g. roofs, insulation, windows and doors etc.),
• Water use (e.g. pools, toilets, water reclaim etc.)
• BAS (building automation system) controls,
• Process improvements
• Back-up generators
• Any other energy consuming device

These types of projects generally follow 4 steps:

✓ Project Identification & Feasibility - Energy Audits, Feasibility Analysis or through detailed Condition Assessments.
✓ Planning & Budgeting - Project Financing, Incentives, Business Case & Approvals
✓ Implementation - Tender, Project Execution, Project Management, Commissioning
✓ Monitoring & Verification - Measure and Verify Results, Reporting Achievements

The intent is to make CDM part of the City's normal course of business for all facility and operational retrofits, including capital renewal and life cycle replacements projects. Success means incorporating CDM options at the initial stages of a project design. This ensures that options for improving energy efficiency are considered, evaluated and quantified in terms of life cycle costing analysis, including cost, maintenance and emission reductions.
Projects will continue to be managed by the division who carries responsibility for operating and maintaining existing or original equipment. The OEL will be a resource section for implementation and the follow-up to the recommend (5) step process (below). In the following recommendations all facility and operational CDM retrofits and capital renewal/ life cycle replacement projects, would be required to adapt the following procedures:

1) **Identify government and utility funding programs (incentives):**

Incentives funding opportunities for CDM projects and feasibility studies are on the rise. Funding opportunities exist today that were not available in previous years. It is anticipated that, unless there is a major shift politically at the Provincial and Federal levels of government, incentive funding for CDM activities is expected to be available to encourage greater efficiency levels for at least the next 3 to 5 years.

Most government and utility funding programs are designed to encourage greater levels of energy efficiency or CDM activities which would not have been normally achieved without these funds. As new energy efficient product costs decline or become more cost effective due to increases in utility rates, and as design techniques become mainstream, through code changes or reduction targets achieved, funding for these activities will likely be reduced or eliminated altogether. It should be noted that all funding programs are established with a defined or limited budget. Typically it is the early adopters that reap the largest subsidies.

To be an early adopter, the City needs to change the way we approach our day to day business in terms of facility retrofits, capital renewal, new construction and major renovations of the City’s building stock. Energy conservation and demand management must be viewed as the cornerstone to these activities moving forward if we are to achieve targeted results with the greatest return on investment for the City and its taxpayers.

In many cases these funds can be used to cover a portion of both the feasibility/ engineering study costs and part of the incremental costs of the energy efficient upgrade.

For each project, the following must be identified:

- Potential utility or government funding (incentives) for CDM feasibility studies
- Potential utility or government funding (incentives) for CDM retrofit/ renewal projects
- Application process
- Eligibility criteria
- Steps to securing funding.

Some funding programs are prescriptive (product specific) while others consider custom measures, often requiring detailed engineering analysis. In some cases a feasibility study may be necessary.

It should be noted that most government and utility incentive / funding programs will NOT provide incentives for project feasibility studies or CDM retrofit / renewal projects that have been initiated prior to application approval.

2) **Determine the project base case(s) vs. the alternative CDM option(s).**
For CDM retrofit projects the "base case" is usually the existing equipment. For Capital Renewal / Life Cycle Replacement Projects the "base case" is typically the standard efficiency replacement option.

Note: Check incentive / funding criteria before proceeding. In some cases the funding can be for prescriptive measures. Nevertheless, the existing, base case and energy efficiency options must all be considered for tracking and reporting purposes.

3) Identify the following for each option on an annual and life cycle cost basis:
   - Associated project / equipment costs
   - Energy consumption and energy demand (e.g. kWh, kW, GJ, M3, L etc.)
   - Energy/ utility costs and savings
   - Maintenance and operational savings
   - Impact with and without financial incentives or funding.

Energy rate escalators should be factored in savings (3% annually).

Determining the equipment cost, energy consumption, and cost savings associated with all options is necessary for qualifying for incentive funding and for internal tracking purposes.

4) Provide Project information to the OEI.

Project information will be used by the OEI for tracking, monitoring and verification for reporting to City Council and Senior City Management.

The OEI will also ensure that legislative requirements for reporting under Bill 21 – the Energy Conservation Act are met.

The OEI will identify related environmental emission reductions for each option vs. existing or the base case.

5) Identify project recommendations for proceeding with the base case or the more energy efficient option and reasons / rationale why.

These steps are important to ensure that energy efficiency is considered in all projects and for incentives application which will in most cases compare an energy efficient option to a base case. It also provides the City with the ability to track all energy saving initiatives and their environmental and cost savings.
2.3 CDM Investment: Major Renovations / New Construction

Major Renovations are similar to new construction in that they involve major capital and planning involvement e.g. Public Works, Capital Planning & Implementation. City Housing Hamilton also has a similar capital project group for managing these types of projects. The renovation of Hamilton’s City Hall is an example of a major renovation project that falls under this category.

New Construction projects involve the complete design, development and construction of a new facility. These projects are also managed by Public Works, Capital Planning & Implementation, or by similar groups e.g. Housing.

The following strategy recommendations outline steps to ensure that CDM options are properly evaluated in the early stages of a project development.

2.3.1 Strategy: Evaluation of LEED and Green Building Design Options – Major Renovations and New Construction of City Owned Buildings

LEED (Leadership in Energy and Environmental Design) is a green building certification tool administered by CaGBC (Canada Green Building Council), which provides a framework for constructing green/energy efficient buildings. LEED® Canada NC 1.0 for New Construction and Major Renovations (launched in 2004) rating system addresses the performance of commercial and institutional buildings.

Many municipalities are starting to explore LEED certification for their own buildings. Some municipalities have even adapted standards such as minimum LEED Silver rating for all new municipally owned new construction projects. Considering LEED for new construction and major renovations makes good business sense, in that a high performance green building vs. conventional inefficient buildings can reduce energy consumption by 25% to 75%, water use reduction by 20% to 50% and reduced environmental greenhouse gas (GHG) emissions by as much as 60%.

The Prerequisites and Credits are organized in the five principal LEED® categories:
CITY OF HAMILTON CORPORATE FACILITIES
STATE OF THE INFRASTRUCTURE REPORT
City of Hamilton Corporate Energy Policy
December 18, 2009

Corporate Energy Policy

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality

An additional category, Innovation & Design Process, addresses sustainable building expertise as well as design measures not covered under these five environmental categories. Project ratings are certified by the CaGBC based on the total point score, following an independent review and audits of selected Credits of documentation submitted by a design and construction team. With four possible levels of certification (certified, silver, gold and platinum), LEED® can accommodate a wide range of green building strategies that best fit the constraints and goals of particular projects.

The following information outlines what other municipalities are doing with LEED standards for their municipal buildings.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>LEED® Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamilton</td>
<td>3-year LEED Pilot Program</td>
</tr>
<tr>
<td>Toronto</td>
<td>None – Toronto has their own standard</td>
</tr>
<tr>
<td>Waterloo</td>
<td>Silver LEED standards for new facilities over 500 m²</td>
</tr>
<tr>
<td>York</td>
<td>Silver LEED standards for new facilities over 500 m²</td>
</tr>
<tr>
<td>London</td>
<td>None</td>
</tr>
<tr>
<td>East Gwillimbury</td>
<td>Silver LEED standards for new facilities</td>
</tr>
<tr>
<td>Ottawa</td>
<td>Silver LEED standards for new facilities over 500 m²</td>
</tr>
<tr>
<td>Richmond</td>
<td>Gold LEED standards for new facilities over 2,000 m²</td>
</tr>
<tr>
<td>Silver LEED standards for new facilities under 2,000 m²</td>
<td></td>
</tr>
<tr>
<td>Oakville</td>
<td>Promote LEED only</td>
</tr>
<tr>
<td>Vancouver</td>
<td>Gold LEED standards for new facilities over 1,000 m²</td>
</tr>
<tr>
<td>Calgary</td>
<td>Silver LEED standards for new facilities</td>
</tr>
<tr>
<td>Edmonton</td>
<td>Considering LEED Silver as mandatory</td>
</tr>
</tbody>
</table>

(Source: CaGBC Municipal Green Building Toolkit)

The Energy Policy recommends that the City conduct a 3-year pilot program to evaluate the financial, energy and environmental impacts of various levels of LEED certification.

The LEED Pilot Program would allow the City to gather valuable information on several key projects such as the upcoming major renovations project at City Hall and the Library and Market. Based on the 3-year LEED Pilot Program, the City will have the opportunity to further develop their expertise, and demonstrate leadership in design evaluations for maximizing the environmental and energy components on a life cycle basis of new buildings and major renovations.

The LEED Pilot Program is outlined as follows:

1) Major Renovations - For a 3-year period all major renovations of City owned facilities will require a life cycle cost assessment of the energy, financial and environmental benefits associated with:
   a. Base case design
2) **New Construction** - For a 3-year period all new City facilities to be constructed will require a life cycle cost assessment of the energy, financial and environmental benefits associated with having the building constructed according to:

- Base case design
- LEED Certified design
- LEED Silver design
- LEED Gold design
- LEED Platinum design

3) **Evaluation of Energy Performance Upgrades** - As part of the LEED Pilot Program, all major renovations and new construction projects will require evaluation of energy efficiency upgrades compared to the base case design standard. The base case design standard is the minimum level of energy efficiency that must be achieved as defined under LEED<sup>®</sup> Canada NC 1.0 for New Construction and Major Renovations and its subsequent addendums.

4) **Evaluation of Renewable Energy Options** - As part of the LEED Pilot Program, options for renewable energy are to be evaluated. This will provide the City detailed information on the viability of renewable energy projects in the context of the overall project. The project evaluation shall investigate supplying using at least 5%, 10% and 20% renewable energy vs. the buildings total energy use, as per LEED<sup>®</sup> Canada NC 1.0 for New Construction and Major Renovations.

5) **Evaluation of Green & White Roofs** - As part of the LEED Pilot Program, options with respect to green and white roofs (or cool roofs which reflect heat) are to be evaluated as a potential LEED credit and provide information in terms of energy, water/sewage infrastructure or system benefits, financial, environmental benefits and overall viability in relation to the overall project.

These standards will apply to City owned buildings in excess of 500 square metres (5,400 ft<sup>2</sup>). Buildings below 500 square metres are to follow the recommendation outlined in Section 2.2 of this report for CDM Retrofits/Initiatives & Capital Renewal/Life Cycle Replacement Projects.

Following the 3-year LEED Pilot Program, OEI staff will report to Council on the energy, environmental and financial life cycle benefits and results of various LEED and energy efficiency evaluations and provide recommendations for implementing future standards.

### 2.4 Implementation of Eco-Responsive Energy Management Policies

The following supplemental policies will apply for all buildings.
City of Hamilton

Corporate Energy Policy

2.4.1 Temperature Setback: Smog / Constrained Electricity Supply Days

During smog days or electricity supply constrained periods, cooling season temperatures will be increased an additional 2 degrees Celsius in an effort to reduce energy consumption.

2.4.2 After Hours ‘Lights Out’ Program

Environment Hamilton recommended that the City pursue an After Hours Lights Out program in their recent Short Term City Response to Climate Change Report. City staff agrees that this would be a positive initiative in terms of reducing energy use and sending a message to the public that the City is not wasteful in its energy use by keeping the lights on after hours. There are two challenges to overcome with a lights out program. The first is technological, the second is cleaning schedules. Given this:

1) Public Works, Fleet and Facilities, OEI and Corporate Buildings & Technical Services work together to phase in automated lighting control upgrades on City facilities as budgets allow, so that the City can lead by example by automatically turning off unnecessary lighting in City owned facilities after hours when the buildings are unoccupied.

2) Where manual lighting controls exist in facilities, Corporate Buildings & Technical Services will continue to educate security guards, cleaning staff and maintenance staff on the importance of lighting only areas that are necessary during unoccupied periods.

2.4.2.1 Leased Office Spaces – Terms for Leases

In City leased office spaces, temperature conditions for occupied and unoccupied periods within the Energy Policy should be established as part of building lease agreements.
3.0 SPECIFIC POLICIES RE CAPITAL INVESTMENT

3.1 Energy Management Standard – Central BAS Control

As BAS controls (building automated system) are modernized they will be centrally controlled by Corporate Buildings & Technical Services at the CUP so that they can be monitored and adjusted from a single location to maintain building temperatures or flag problem areas quickly. This will ensure temperature control is maintained reliably and monitored from a single location. This will also build on the existing system the City already has in place for several facilities.

3.2 Incandescent Lighting

The City is committed to replacing or eliminating incandescent lighting by 2012 (as per recent provincial legislation).

3.3 Roof Capital Replacement Evaluation

As part of ongoing roof capital replacement evaluations that in addition to standard roof replacement that the feasibility of a “Green” or “White” roof be explored for City owned facilities.

3.4 Energy Efficient Equipment Purchasing

ENERGY STAR® is a trusted and a simple source that the City can use to identify products that are among the most energy-efficient on the market. Only manufacturers and retailers whose products meet the ENERGY STAR criteria can label their products with this symbol. ENERGY STAR is a voluntary program between Natural Resources Canada’s (NRCan’s) Office of Energy Efficiency and organizations that manufacture sell or promote products that meet the ENERGY STAR levels of energy performance. ENERGY STAR is administered by Natural Resources Canada’s (NRCan’s) Office of Energy Efficiency (OEE). Visit online at eee.nrcan.gc.ca/energystar for more information.

Why we are recommending ENERGY STAR?

- to reduce energy costs
- to reduce electricity demand
- to reduce impact on the environment
- Energy-efficient products on the market today can reduce energy costs by 25 to 50 percent, or even more, without compromising quality or performance.
- Investments in energy-efficient products can quickly pay for themselves and provide a significant return, making funds available for investment in your community.
- Energy-efficient products have an extended life and offer decreased maintenance.
- Incentives may be available for some equipment.

ENERGY STAR is easy to use and provides comprehensive tools and information with an online purchasing guide for specifying products that meet energy efficiency criteria.
City of Hamilton Corporate Energy Policy

1) City Purchasing Policies adapt as a minimum standard ENERGY STAR® rated equipment or equivalent for energy consuming devices such as: appliances, photo copiers, computers, computer monitors etc.

2) All new and retrofit motor replacements (e.g. fans, pumps, etc..) specify high efficiency motors as minimum standards. Where required the OEI will provide recommendations on minimum efficiency standards.

The OEI will develop an energy roster for purchasing energy CDM related consulting, engineering and contracting services.

3.5 Energy Education and Awareness

Education and awareness programs on energy conservation play an integral role in achieving and sustaining reductions in energy use. By employing a range of educational tools to teach staff and the community about energy efficiency and the benefits of conservation, awareness programs will reinforce the link between individual behaviour, energy use and the potential for savings.

3.6 Electricity Generation, Cogeneration, and District Energy

Generation or cogeneration of electricity or developing district energy projects can be an attractive way of improving efficiency, providing security of supply and reducing environmental emissions. These projects can also be very costly and carry a significant amount of risk and as such need to be thoroughly evaluated both technically and financially vs. a variety of potential market conditions. As such the Energy Policy recommends that:

1) All electricity generation, cogeneration and district energy projects are evaluated on a case by case basis, with the aid of independent third party technical, legal and financial expertise, through the OEI.

2) The City will only construct clean or green generation or cogeneration projects.

3) These projects consider the economic impact to the City, including overall efficiency gains, security of supply, environmental impact, life cycle analysis and the local economic benefits for City.

4) The OEI be included in all generation, cogeneration and district energy project reviews prior to commitment to ensure all legal, technical and energy related issues have been considered. This is to make certain that the impacts of the new project can be clearly understood beyond the context of the specific project to measure any impact it has with other City energy strategies e.g., commodity supply and hedge strategies.

3.7 Back-up / Emergency Power Systems

1) All new and retrofit back-up/ emergency generation units and equipment will be reviewed for the economic (life cycle analysis), energy efficiency and environmental benefits of converting to newer cleaner fuel options such as natural gas or dual fuel generation units vs. existing diesel powered units.
2) All new and retrofit back-up/ emergency generation units are to also evaluate the costs and feasibility of “synchronization” of this equipment with the facility so that these units can used for “Peak Shaving” or “Peak Clipping” when favourable market conditions exist. This would also enable the City to participate in potentially lucrative Demand Response (DR) programs sponsored by the OPA. Synchronization allows the back-up/ emergency generators to run in parallel (at the same time) as the power is supplied to the facility from the grid and prevents power interruptions for critical and sensitive equipment such as elevators and computer systems.

3) That the OEI be included in the review of all new or retrofit back-up/ emergency generation power system projects prior to commitment to ensure all legal, technical and energy related issues have been considered.
4.0 SPECIFIC POLICIES RE: ENERGY PROCUREMENT

4.1 'Traditional' Energy Procurement

The OEI will evaluate energy procurement options for the City on an ongoing basis, taking into account evolving energy requirements, energy market regulations and conditions, and the City's risk profile. The Manager of Energy Initiatives may enter into hedging strategies where it is deemed appropriate and subject to the previously Council approved Commodity Price Hedging Policy (FCS07024).

4.1.1 Utility Supply and Rate Management

The OEI will evaluate utility rates (electricity, natural gas, water and waste water) for the City on an ongoing basis taking into account evolving energy requirements, energy market regulations and supply conditions/contacts and the City's commodity supply arrangements. The OEI may initiate all utility rate changes as required to manage utility supply and utility rates. This is to ensure continued supply and allow for optimization of utility metering and rates favourable to the City.

4.1.2 Energy Contract Management

The OEI will manage all energy commodity, energy supply, utility rates etc., as required to maintain energy supply to the City and the City's end-use customers where the City directly supplies district heating, cooling or electricity from the CUP. All contracts will be managed within established City guidelines.

4.1.3 Utility Billing, Metering and Sub-Metering

The OEI will manage all customer billing, metering/ sub-metering, monitoring, verification, validation and energy use data for the City's district heating, cooling and electricity end-use customers.

4.2 Renewable Energy

The City of Hamilton is one of the Provinces leading municipal producers of Clean and Green Power. Currently a portion of the Central Utility Plant's electricity which is supplied by Hamilton Community Energy is EcoLogo Certified as Clean Energy. The power produced by burning methane at the City's Woodward Co-Generation Plant is considered green. Glenbrook's Landfill Gas generation project when it comes online in 2008 will also produce green power.

4.2.1 Renewable Energy Metering

All renewable energy projects include appropriate metering to accurately determine actual net energy production and the subsequent life cycle costs analysis and corresponding environmental benefits.
4.2.2 Inclusion of OEI in Renewable Energy Project Evaluations

That the OEI be included in all corporate renewable energy project evaluations prior to commitment to ensure all legal, technical and energy related issues have been considered.

Note: If a renewable energy project receives funding from the OPA (Ontario Power Authority), their contracts stipulate that all green tags or credits produced, become the property of the OPA. The OPA in turn would have the right to sell these credits to a third party.

4.3 Green Power

With the current production of clean and green power and the premium cost of buying green power the OEI recommends that the City delay purchasing any new Green Power at this time. The cost premium for Green Power is approximately 3 cents per kilowatt-hour greater. This is a 50% increase in the current commodity rate the City is paying for electricity. It is recommended that Green Power be considered as part of the LEED evaluation for major retrofits or new construction (50% Green Power for a facilities provides one LEED credit). Green Power can be considered at a later date if necessary to supplement target shortfalls in CDM initiatives.

4.4 Emissions Trading

Emission trading, carbon trading, green tags etc., are still emerging options. The primary issues that the City will need to consider is whether the City sells or retires future credits for the benefits of the environment. It is recommended that the OEI, Corporate Finance and Planning & Economic Development, Long Range Planning & Design (Air Quality & Climate Change) continue to work together to establish a framework for selling or retiring future emission credits, carbon trading, green tags etc. along with the required certification and cost of ongoing monitoring and verification of measures. The results of this analysis is to be reported back to Council in June 2009.
APPENDIX A - DEFINITIONS

"CUP" (Central Utility Plant) which is owned by the City and is located within the downtown core of Hamilton, was constructed and became operational in 1977, in order to generate and distribute district energy (heating, cooling and electricity) to facilities in the downtown area. Hamilton Community Energy (HCE) provides electricity and thermal heating (hot water) to the CUP which in turn redistributes these services to its end use customers such as Copps Coliseum, the Central Library, and Farmer's Market, Hamilton Place, Convention Centre, Parking Garage, Ellen Fairclough Building, Art Gallery and Hamilton City Hall.

"CDM or Energy CDM" means Energy Conservation and Demand Management

"Energy Intensity" for purposes of the Energy Policy, is the process of reducing overall energy usage or consumption of a facility or facility operations using a common measure over a specific timeframe. By measuring energy intensity vs. straight energy consumption reductions we are able to account for additions or deletions in the City's building stock. We can also account for building expansions, changes in the City's portfolio and correct for seasonal weather variations. Example: Comparing kilowatt-hours (kWh) per square foot of a building between 2005 vs. 2007.

"Facility" shall include all City owned buildings and grounds e.g. parks and recreation facilities.

"HECFI" means The Hamilton Entertainment and Convention Facilities, Inc.

"HVAC" means heating, ventilation, and air-conditioning

"IESO" means Independent Electricity System Operator.

"Life Cycle Cost Analysis" is a method of economic analysis that sums all relevant project costs over a given study period in present-value terms. It is most relevant when selecting among mutually exclusive project alternatives that provide the same functional performance but have different initial costs, O&M costs, and/or expected lives:

- Investment-related:
- Acquisition costs
- Replacement costs
- Residual value (resale or disposal cost)
- Operating-related:
- Operation, maintenance, and repair costs
- Energy and water costs
- Contract-related costs (for financed projects)


"OPA" means Ontario Power Authority

"Operations" Operations is what the City "does" and how it delivers its "product" to customers or constituents. It is the core of a company's business. Example: Public Works, Water & Waste Water.
Appendix D: Debt-Financing and True Cost of Capital: Impact on the Taxpayer and on Long-Term Sustainability of Infrastructure

D.1 EXECUTIVE SUMMARY

Provision of public services and ownership of public infrastructure creates significant responsibilities for municipalities to make best use of investment dollars to preserve and improve assets within the locale. At present, most Canadian municipalities are struggling to maintain their existing infrastructure under current tax and tax levels. They continue to deal with downloaded responsibilities and face growing needs to maintain and renew aged and decaying infrastructure. Some reasons for this current situation include:

- Much infrastructure was built 35-60 years ago and is now approaching end of life (physical, useful or economic)
- Financial reserves typically do not hold sufficient funds to meet rehabilitation and replacement costs
- Location/capacity of facilities does not meet current demand
- Cuts in maintenance budgets in 1990s led to rapid asset deterioration
- Implementation of traditional short-term practices by municipalities that have not been cost-effective over the long term

Like most if not all cities, the City of Hamilton's current inventory of infrastructure has deteriorated and is continuing to deteriorate rapidly. It must be kept in mind that deterioration is not linear and that the rate of deterioration will only accelerate over time and the deterioration itself will become increasingly noticeable. Eventual consequences could include reduction in level of service and quality of life, and potential environmental damage. However, the introduction of sustainable reinvestment policies has the potential to significantly reduce long-term and overall lifecycle costs.

The City currently borrows for capital expenditures and generally does not appear to fully recover the true cost of development and growth-related projects. This double-edged practice will lead to a permanent and ongoing debt level that will be a major issue for the City as it moves towards sustainability. The interest paid for financing this debt will lead to a permanent increase in the delivery cost of services, or in other words the citizens will get less than what they pay for, or put another way will pay more than they receive, permanently. There is therefore a need to review current financing strategies and consider new strategies of infrastructure reinvestment within the context of sustainable funding. A potential consideration in this regard is differentiation between initial construction of an asset and its replacement, and development of different policies based on whether an asset is operational or capital replacement cost intensive.
Asset management and lifecycle analysis are fairly new practices that are becoming increasingly accepted and implemented to more effectively allocate funding to maintain asset infrastructure. The following comments clearly illustrate the issue of debt-financing of capital projects and its impact on the taxpayer and the level of service provided by the municipality, as well as providing background on a number of related asset funding issues.

D.2 TRUE COST OF CAPITAL

Whenever a capital project is approved, the perception by the general public and elected officials is that the project amount shown in the budget is the actual cost. The figure shown in the budget may in fact be the amount paid to consultants and contractors, but it grossly understates the actual amount of money that will ultimately be taken out of the community and paid by the taxpayers. In fact, the difference between the budgeted cost and the financial burden on the municipality is a factor of two or more. This differential clearly illustrates why it is imperative to focus future discussions and public policies on revenue requirements and not expenditure/budget requirements as is traditionally the case.

The SOTI reports done for the city have generally been based on adding a % for administration and overhead and for internal staff requirements and ancillary costs, as well calculation of debt-financing among others. When these costs are included, the cost of a project actually doubles. In other words, a $1 million dollar project will actually cost the taxpayers $2 million when all is said and done. The impact of that project on the tax rate is therefore twice what the general public (and possibly elected officials) probably understand it to be.

In fact, calculations in previous SOTI reports have shown that cost of borrowing could be as high as 25% or more of total annual costs, depending on how capital intensive the asset was.

D.3 DEBT FINANCING: IMPACT ON THE TAXPAYER AND LEVELS OF SERVICE

The SOTI reports to date, including the latest 2008 SOTI Report on facilities, identified and reported on the cost of borrowing as a separate item, using a full debt policy for financing capital works. It should be further noted that current debt levels were not incorporated in the analysis. Based on a debenture period of 15 years, with an interest rate of 6%, costs of borrowing add approximately 60% to the actual capital cost of the project. When other costs are added in, such as project management, overhead, administration, etc., project costs double. This cost could easily increase with higher interest rates, or by using a debenture period of twenty years or more. It should be noted that the SOTI Reports were intended as a method of identifying trends and potential future concerns, and not as a detailed financial exercise where more appropriate models could be developed and used.

Debt-financing is very appealing on the short-term and can be quite misleading. If, for example, the City borrowed $1 million to renew a building with a debenture period of 15 years and a 6% interest rate, the impact on the tax rate for the following year would only be approximately
$103,000, i.e. taxes would not have to be raised significantly to meet this initial cost. However, after 15 years, the total cost to taxpayers for the project would have been over $1.6 million. In other words, taxpayers, although not experiencing much in the way of an initial tax increase, would over time pay a 60% premium just for interest costs alone because the project was debt-financed. The total cost of the project virtually doubles when adding other internal costs, as noted previously. The “value of money” argument can somewhat temper this argument on a project basis, but it loses its argumentative capacity when one looks at things on a program level and on a permanent debt basis.

Debt-financing actually becomes even more destructive when one looks at things on a program basis rather than a single project basis. Continuing from the example given above, if the City funded ten such projects a year under a building renewal and reconstruction program with an annual budget of $10 million, in the first year taxpayers would only be liable for a tax increase to cover the annual repayment amount for that debt or just over $1 million dollars. However, as the program continued at the same rate of borrowing over the next fifteen years, additional repayments would be added to eventually reach $15.5 million at fifteen years and would plateau at this point. Upon closer scrutiny, this means that taxpayers would pay $15.5 million in taxes each and every year, but actually would only receive $10 million of value, forever! This is illustrated by Figure 4.1.

![True Cost of Debt Financing](image)

This example illustrates what potentially serious negative impact interest payments can have. In fact, interest costs are the single largest expenditure (other than actual capital cost) once a project or program has been approved. The premium paid for interest charges actually reduces the net funding available over the long term, which makes things even worse. This either
results in investments that are non-sustainable if gross spending is capped since net spending then becomes inadequate or in increased overall costs to the community in perpetuity as a result of interest payments if net capital spending is to be at sustainable levels.

A quick assessment determined the potential savings to the community if capital debt-financing was completely abandoned, thereby increasing the amount of net capital available for infrastructure re-investment. The overall cost of perpetual debt can be as high as 25% or more of overall expenditure on a given asset class for a given service. This means that taxes could over time be significantly reduced (or at least not increase as much) if there was no reliance on capital debt-financing, or service levels could increase to reflect available levels of funding. However, taxes would need to rise more quickly in the first few years of this limited- or non-debt policy as the City transitioned towards a PAYG policy. A complimentary alternative would be to delay expenses, where feasible and logical without jeopardizing minimum lifecycle cost principles, and transfer the money to reserves. These reserves could then be built up or directed to more rapidly retiring the current debt as the City moves towards PAYG. Either approach could lead to significant benefits in terms of lower lifecycle costs, and probably a balanced use of approaches might yield greater benefits overall.

It is recommended that the City’s current practice of using debt financing for capital expenditures be reviewed in the move towards sustainable asset management. Sustainable funding of ongoing re-investment in infrastructure is significantly different from the more traditional one-time investments that have been used in the past on an individual project basis rather than on a program basis. An important component in smoothing the transition to new funding policies is to communicate to the public the issues and trends that led to, as well as the future benefits of, the transition.

The above discussion notwithstanding, because the assets being constructed provide long-term benefits for the community, some debt is necessary in order to share the costs of capital among all generations that stand to benefit. As such, a balance is required between PAYG and debt financing. Consequently, there may be a need to differentiate in investment strategies between original construction of infrastructure and its subsequent replacement, i.e. debt-financing of original and PAYG for replacements. This is obviously a complex issue that requires more discussion and analysis as part of the development of an infrastructure re-investment policy for the City.
D.4 RELATED ISSUES FOR POLICY DEVELOPMENT

In the development of an infrastructure re-investment policy for the City, additional factors should be considered. Such issues would include, but are not limited to:

- User fees
- Depreciation
- Discount rates
- Inflation
- Debt financing
- Re-investment of savings
- Financing policies
- Investment selection policies
- Revenues: pricing and subsidies
- Development charges

D.5 MISCONCEPTIONS AND OTHER ISSUES IN POLICY DEVELOPMENT

There are many common misconceptions and other issues regarding asset management and sustainable funding which may arise during the development of an infrastructure re-investment policy. Financing of public infrastructure and current infrastructure challenges are complex and multi-faceted issues that cannot be explained by a single rationale or excuse as has often been the case in the past. These issues require in-depth consideration and ultimately a combination of forces to explain them fully. Examples of some of the misconceptions and potential issues surrounding asset management are outlined below:

D.5.1 Absence of tax increases in 1990s had a detrimental effect on infrastructure

This may be true in the long run, but it’s not that clear or simple. While it’s true that there was considerable shrinkage in revenues in the 90’s as a result of a number of years of zero tax increases or increases below the rate of inflation, there is a need to clearly differentiate between available funding levels and how well that money is being used. Tax increases in the 90s would have increased funding levels but would not necessarily have solved today’s infrastructure challenge. The additional funds may have simply perpetuated and expanded the practices in place at the time. In addition, fewer options in terms of rehabilitation technologies were available in the past, meaning that money may have been spent on less cost-effective options than are currently available.

D.5.2 Maintenance requires an increase in funding

This may not necessarily be the case. As stated previously, without a shift in investment strategy, extra funds may simply perpetuate and expand current practices. O&M practices need to evolve and more realistically incorporate level of service, reliability and risk management, as well as lifecycle costing. Additionally, alternatives to preventative maintenance that are based on the weighted importance of the maintenance work, such as reliability-centred maintenance (RCM) or other forms of optimized predictive maintenance, need to be considered. Studies
have shown that up to 90% of preventive maintenance activities should be reviewed or abandoned since they do not achieve the desired results and/or are not cost-effective.

**D.5.3 Reserve funds should only be used “for a rainy day” or for unplanned expenditures**

Under a lifecycle re-investment plan, reserve funds are in fact earmarked for planned interventions and should be monitored as such. Although the exact timing of these expenditures may be unknown, it can be projected with a certain degree of accuracy so there is no such thing as a “rainy-day”.

**D.5.4 Expenditures should be leveled out**

In contrast to the traditional objective of leveling expenditures (capital or operating), cost-effective sustainable asset management requires **doing the right thing to the right asset at the right time**. Leveling expenditures can result in keeping assets for too long, or replacing them too quickly – increasing lifecycle costs in both cases. Therefore, contrary to past and current practice, the focus should be on stabilizing revenues by avoiding wild swings in tax increases (which is really what the taxpayer and elected officials want) and to spend the money at the most opportune time by using the reserves judiciously. In other words, make sure that the funds are available to ensure optimum expenditure in terms of timing, technology and money. This alternative approach is based on using reserve funds during the right window of opportunity to make up for any shortfall.

**D.5.5 Infrastructure from new development is “free”**

When a new subdivision or new development is added to the system the infrastructure is generally built at the developer’s cost and transferred to the City at no cost. These new and additional assets increase the overall inventory of infrastructure that the City must operate, maintain, and ultimately replace. In other words, this new infrastructure really becomes a liability for which funding should be immediately included in that year’s budget. For water as example, an amount equivalent roughly to four percent of the overall replacement value of this additional inventory should be added to the water rates annually, in order to ensure sustainable funding thereby avoiding under-funding that is so prevalent today. These new assets/new infrastructure may be virtually cost-free in terms of operation and maintenance in the short-term, but it is in fact a future liability and those revenues should be targeted rather than being used to compensate for current infrastructure shortfalls. This new policy would effectively “stop the slide” that we are currently experiencing, stop repeating mistakes of the past and allow the City to move towards sustainable funding for its existing inventory of assets.
D.5.6 Infrastructure in new surveys, when not actually installed by the developer, is paid for through development charges as are all other growth-related costs

In fact, it is our understanding (per City Finance staff) that development charges were only introduced in Hamilton in 1990 and still do not cover all growth-related costs. Since that time, the City has failed to maximize development charge revenue growth potential. Prior to that, funding from growth came from lot levies and only covered about 5% of the cost of new infrastructure. As stated previously, new development may appear to be an asset on the short term but more importantly it is a huge liability on the long term and must be treated as such.

D.5.7 Borrowing is essential due to an infrastructure crisis

A significant gap between available and required funding currently exists due to aging infrastructure and past funding practices. SOTI Report projections anticipate that this gap will continue to increase before reaching a peak in approximately 15-25 years. It can easily be argued that there is in fact no crisis at this time, compared to the challenges that we will face within the next generation. Therefore, any strategies generated to cope with the gap must consider long-term infrastructure challenges. Just as importantly, there is a need to change current funding practices to avoid mistakes of the past that have created this crisis, and to consider the long-term consequences of any other strategies that we may implement in the short term. In other words, what will the City do in terms of debt management if it caps out its debt capacity before the real infrastructure challenges hit? Considering short-term solutions may only serve to limit funding options in the future.

D.5.8 Replacing infrastructure saves maintenance costs

Technically, this statement is correct in that maintenance costs will be reduced with new infrastructure. However, this statement is overly simplistic and misleading. The real question is “will those reduced maintenance costs outweigh the capital costs?” The short answer is that, in many cases, there is only a limited business case (if any) that can be made that any reduction in maintenance costs outweighs the capital costs of replacing or building new especially when debt costs are included. Either way, as with new development described above, when infrastructure is replaced, money should immediately be put aside for its eventual maintenance, rehabilitation and replacement. These “pennies” will then grow into the necessary dollars required for sustainability.

D.5.9 Replacing everything when the road is replaced saves money

This statement is often correct when only the specific project costs are considered. However, this statement is also overly simplistic and misleading. Project costs and lifecycle costs are two very different and distinct things and cannot be inter-changed although they often are. A cheaper single and integrated project does not necessarily mean lower lifecycle costs. In fact, some analyses have shown that the timely (as opposed to the integrated) approach can result in 10-30% savings on a lifecycle basis, whereas premature or delayed replacement of an asset, or
wrong intervention, will most likely increase overall lifecycle costs. As previously mentioned, cost-effective sustainable asset management involves doing the right thing, to the right asset, at the right time.

D.5.10 We will rely on funding from senior levels of government

Consistent funding from senior levels of government cannot be guaranteed. More importantly, this funding generally represents only a small fraction of what municipalities need for infrastructure. To depend on permanent budget handouts is not conducive to developing pro-active strategies with regard to financing policies based on ownership of the infrastructure.

D.5.11 We can’t afford to raise taxes

The real question is can the City afford not to. The SOTI Reports clearly highlight that there is a considerable gap in re-financing of infrastructure, and that reliance on debt-financing simply results in even much higher costs in the future. To avoid paying more for the same service, or receiving less service for the same price, the least cost option is PAYG. Put another way, if revenues are not at a sustainable level, then the service is not sustainable and it will eventually either be lost or fall to an unacceptable level. Of course, the City needs to seek the appropriate, acceptable and realistic balance between level of service and cost. But at the end of the day, it’s not an issue of affordability; it’s an issue of sustainability.

D.5.12 We will use alternative/innovative financing

In the end, the cost has to borne by the user through user fees, the public-at-large, or a combination of both. The ultimate objective should not be to level out expenditures and avoid a huge tax increase; it should be to adopt the most cost-effective and least lifecycle cost solution to the problems at hand.

D.5.13 We are building a new (additional) facility (not a replacement) and want to debt-finance it

Debt-financing for a new facility (not a replacement) would allow the City to invest today without suspending its ongoing obligations to re-invest in its infrastructure, since the impact on the budget would be minimized. However, funding should be immediately increased to operations, capital and reserves for future lifecycle asset management of this new and additional facility. Furthermore, repayment costs should in principle not come from reductions to existing budgets unless an LCC analysis determines that the cuts do not negatively impact the lifecycle costs of existing infrastructure. The following figure shows that for debt financing a new Facility, currently valued at $35 M, an annual investment to reserves of $1.4 M would provide adequate replacement funding at the end of its 25 year life cycle. This results in a Total Cost of Ownership (TCO) plus replacement of $195 M over the 25 years. If the project was debt financed to not only construct it but to also reconstruct it the TCO decreases to $160 M but an
additional $73 M plus $21 M in interest will be required to replace it. This results in a TCO plus replacement of $254 M or a 30% increase.

D.6 CONCLUSION

The first rule of asset management is: if it’s not affordable (i.e. properly funded), then it’s not sustainable. The corollary to that rule is: if it’s not sustainable, then the service that asset provides will eventually be lost or will fall to an unacceptable level. Some the ideas expressed in this paper can be seen as creating a crisis. In fact, they are meant to avoid an even bigger crisis and to encourage discussion and development of sound financial re-investment policies that reduce lifecycle costs to a minimum, while balancing economic and social objectives. Such a management plan would in fact be a solution to the infrastructure challenges that the City currently faces and the exponentially larger ones that it will face in the future. In other words, such a plan is meant to manage the crisis before it occurs, as a result of rapidly deteriorating infrastructure in ever-increasing amounts.

The City offers the majority of the hard services that the community uses. These services require a great deal of assets and it is incumbent upon the City to preserve those assets in a
cost-effective manner. The funding deficit is not only due to asset condition generally declining since time of original construction and lack of maintenance, it is also due to current funding policies and practices. Assets will naturally continue to decline even more rapidly in the future if the status quo is maintained. As described, short-term financial and/or technical solutions are extremely expensive in the long run. As shown in the SOTI Report, the best possible use of funding is through a PAYG re-investment policy. It may take a number of years for the City to transition to and fully implement such a policy, but the sooner the City starts the sooner it will reap considerable benefits. The SOTI Reports clearly illustrate the benefits of starting early, and the significant cost of not doing so. This is obviously a complex issue that needs more comprehensive analysis as part of the development of Hamilton’s infrastructure re-investment policy.

D.6.1 Recommendations

1. Immediately implement a sustainable interim infrastructure re-investment policy with respect to assets transferred from developers as well as rebuilt and replacement assets.
2. Develop an infrastructure re-investment policy based on Lifecycle Costing and other principles described in this Appendix.
3. Develop the re-investment policy on the basis of programs and not projects.
4. Develop financial policies that strike the right balance between debt and PAYG (example only: continue debt-financing for new and additional infrastructure, PAYG for renewal or replacement of existing infrastructure).
5. Develop an implementation plan for the infrastructure re-investment policy (example only: increase taxes by 2%/year over and above other costs for ten years while making judicious reductions in assets and possibly services, to achieve full implementation and benefits in ten years).
6. Review current O&M practices and realign on the basis of a more cost-effective level which more realistically incorporates level of service, reliability, risk management and lifecycle costing.
7. Develop financial models for future SOTI Reports based on the City’s new infrastructure re-investment policy. Consider depreciation, discount rates, inflation, and other financial variables where appropriate. Consider managing reserves as a whole, in order to balance the peaks and valleys on a corporate basis thereby minimizing the financial impact on the community, while tracking levels of reserves required on a service by service basis.
8. Consider the development of a local Infrastructure Advisory Committee
<table>
<thead>
<tr>
<th>Account Name</th>
<th>Group</th>
<th>Subgroup</th>
<th>Total Replacement Value</th>
<th>Structure Replacement Value</th>
<th>Structure Replacement Value per sq ft</th>
<th>Structure Size (sq ft)</th>
<th>Construction Year (YYYY)</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRE DEPARTMENT ADMIN BLDG</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$17,070,260.00</td>
<td>$17,070,260.00</td>
<td>$67.00</td>
<td>254780 1978 1 Summers Lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #6 (30 John St N)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$5,549,776.00</td>
<td>$5,549,776.00</td>
<td>$119.00</td>
<td>1060 1991 30 John St N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #11 (15 Upper Sherman Ave)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,639,196.00</td>
<td>$1,639,196.00</td>
<td>$135.00</td>
<td>1208 1991 15 Upper Sherman Ave</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #12 (222 Queen Rd N)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,830,870.00</td>
<td>$1,830,870.00</td>
<td>$37.00</td>
<td>2974 1978 222 Queen Rd N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #14 (261 West King St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,568,150.00</td>
<td>$1,568,150.00</td>
<td>$23.00</td>
<td>786 1979 261 West King St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #16 (315 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,186,900.00</td>
<td>$1,186,900.00</td>
<td>$105.00</td>
<td>773 1978 315 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #17 (431 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,592,370.00</td>
<td>$1,592,370.00</td>
<td>$45.00</td>
<td>837 1978 431 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #20 (260 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,667,500.00</td>
<td>$1,667,500.00</td>
<td>$80.00</td>
<td>605 1978 260 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #23 (215 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,285,000.00</td>
<td>$1,285,000.00</td>
<td>$85.00</td>
<td>538 1978 215 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #27 (206 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,318,500.00</td>
<td>$1,318,500.00</td>
<td>$85.00</td>
<td>538 1978 206 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #31 (208 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,667,500.00</td>
<td>$1,667,500.00</td>
<td>$119.00</td>
<td>1060 1991 208 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #34 (155 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,405,000.00</td>
<td>$1,405,000.00</td>
<td>$105.00</td>
<td>773 1978 155 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #35 (225 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,667,500.00</td>
<td>$1,667,500.00</td>
<td>$80.00</td>
<td>605 1978 225 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #37 (205 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,318,500.00</td>
<td>$1,318,500.00</td>
<td>$85.00</td>
<td>538 1978 205 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #38 (215 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,285,000.00</td>
<td>$1,285,000.00</td>
<td>$85.00</td>
<td>538 1978 213 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #40 (207 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,667,500.00</td>
<td>$1,667,500.00</td>
<td>$80.00</td>
<td>605 1978 207 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #41 (209 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,667,500.00</td>
<td>$1,667,500.00</td>
<td>$80.00</td>
<td>605 1978 209 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE STN #42 (213 King William St)</td>
<td>Fire &amp; EMS</td>
<td>Fire Hall</td>
<td>$1,556,730.00</td>
<td>$1,556,730.00</td>
<td>$61.00</td>
<td>2786 1978 213 King William St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATERDOWN PUBLIC LIBRARY</td>
<td>Libraries</td>
<td>Satellite Library</td>
<td>$1,989,428.00</td>
<td>$1,989,428.00</td>
<td>$569.00</td>
<td>3412 1997 25 Mill St N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONCESSION STREET LIBRARY</td>
<td>Libraries</td>
<td>Satellite Library</td>
<td>$2,216,420.00</td>
<td>$2,216,420.00</td>
<td>$259.00</td>
<td>8380 1991 565 Concession St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREELTON LIBRARY</td>
<td>Libraries</td>
<td>Satellite Library</td>
<td>$837,655.00</td>
<td>$837,655.00</td>
<td>$355.00</td>
<td>2061 1995 1803 Brock Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOCKE PUBLIC LIBRARY</td>
<td>Libraries</td>
<td>Satellite Library</td>
<td>$504,700.00</td>
<td>$504,700.00</td>
<td>$300.00</td>
<td>1649 1995 285 Locke St S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOUNT HOPE HALL &amp; LIBRARY</td>
<td>Libraries</td>
<td>Satellite Library</td>
<td>$2,238,032.00</td>
<td>$2,238,032.00</td>
<td>$191.00</td>
<td>9152 1904 3027 Homestead Dr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TERRYBERRY LIBRARY</td>
<td>Libraries</td>
<td>Satellite Library</td>
<td>$5,202,080.00</td>
<td>$5,202,080.00</td>
<td>$174.00</td>
<td>28920 1991 100 Mohawk Rd W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CENTRAL UTILITIES PLANT</td>
<td>C.U.P.</td>
<td>Operations</td>
<td>$7,090,650.00</td>
<td>$7,090,650.00</td>
<td>$450.00</td>
<td>15757 1976 121 King St W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FARMERS' MARKET</td>
<td>C.U.P.</td>
<td>Operations</td>
<td>$7,200,000.00</td>
<td>$7,200,000.00</td>
<td>$120.00</td>
<td>60000 1980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAMILTON INCUBATOR OF TECHNOLOGY</td>
<td>Corporate Administration</td>
<td>Other Corporate Administration</td>
<td>$6,800,000.00</td>
<td>$6,800,000.00</td>
<td>$160.00</td>
<td>40000 1993 7 Innovation Dr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEDESTRIAN - ARCADE OVERPASS</td>
<td>Corporate Administration</td>
<td>Other Corporate Administration</td>
<td>$409,080.00</td>
<td>$409,080.00</td>
<td>$210.00</td>
<td>1948 1984 1 Summers Lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLANBROOK MUNICIPAL OFFICES</td>
<td>Corporate Administration</td>
<td>Town Halls</td>
<td>$2,608,250.00</td>
<td>$2,608,250.00</td>
<td>$205.00</td>
<td>9650 1995 4280 Binbrook Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DUNDAS TOWN HALL</td>
<td>Corporate Administration</td>
<td>Historical</td>
<td>$2,615,498.00</td>
<td>$2,615,498.00</td>
<td>$202.00</td>
<td>12849 1848 60 Main St</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHARLTON HALL</td>
<td>Corporate Administration</td>
<td>Old Halls</td>
<td>$1,984,800.00</td>
<td>$1,984,800.00</td>
<td>$200.00</td>
<td>9924 1905 52-56 Charlton Ave</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEDESTRIAN - ARCADE OVERPASS</td>
<td>Corporate Administration</td>
<td>Other Corporate Administration</td>
<td>$409,080.00</td>
<td>$409,080.00</td>
<td>$210.00</td>
<td>1948 1984 1 Summers Lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Work Yards and Maintenance

<table>
<thead>
<tr>
<th>Asset Name</th>
<th>Group</th>
<th>Subgroup</th>
<th>Total Replacement Value</th>
<th>Structure Replacement Value</th>
<th>Structure Replacement Value sq ft</th>
<th>Structure Size (sq ft)</th>
<th>Construction Year (YYYY)</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROVE CEMETERY</td>
<td>Work Yards &amp; Maintenance</td>
<td>Cemetery Facilities</td>
<td>80,000.00</td>
<td>80,000.00</td>
<td>100.00</td>
<td>800</td>
<td>129 1/2 YORK ROAD, Dundas</td>
<td></td>
</tr>
<tr>
<td>MOUNT ZION CEMETERY</td>
<td>Work Yards &amp; Maintenance</td>
<td>Cemetery Facilities</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MT HAMILTON CEMETERY - Storage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Cemetery Facilities</td>
<td>737,600.00</td>
<td>461.00</td>
<td>160.00</td>
<td>4612</td>
<td>1978</td>
<td>244 Rymal Rd E</td>
</tr>
<tr>
<td>WENTWORTH STREET OPERATION CENTRE</td>
<td>Work Yards &amp; Maintenance</td>
<td>Large Operations Centre</td>
<td>32,619,070.00</td>
<td>130.00</td>
<td>42,220</td>
<td>130065</td>
<td>1988</td>
<td>330 Wentworth St N</td>
</tr>
<tr>
<td>FORESTRY OPERATION CENTRE - Garage/ Storage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Operations Centres</td>
<td>930,048.00</td>
<td>192.00</td>
<td>60.00</td>
<td>4844</td>
<td>1980</td>
<td>1301 Upper Ottawa St</td>
</tr>
<tr>
<td>FORESTRY OPERATION CENTRE - Quonset</td>
<td>Work Yards &amp; Maintenance</td>
<td>Operations Centres</td>
<td>209,580.00</td>
<td>60.00</td>
<td>-</td>
<td>3493</td>
<td>1980</td>
<td>1301 Upper Ottawa St</td>
</tr>
<tr>
<td>STONEY CREEK OPERATIONS CENTRE - Shop / Garage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Operations Centres</td>
<td>5,905,350.00</td>
<td>110.00</td>
<td>-</td>
<td>46185</td>
<td>1995</td>
<td>349 Jones Rd</td>
</tr>
<tr>
<td>BERNIE COURT YARD - Office / Garage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>3,670,052.00</td>
<td>121.00</td>
<td>-</td>
<td>22112</td>
<td>1989</td>
<td>308 Rymal Rd</td>
</tr>
<tr>
<td>BERNIE COURT YARD - Salt Dome</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>426,240.00</td>
<td>80.00</td>
<td>-</td>
<td>5328</td>
<td>1990</td>
<td>308 Rymal Rd</td>
</tr>
<tr>
<td>CENTRE ROAD YARD - Quonset Hut</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>743,280.00</td>
<td>489.00</td>
<td>-</td>
<td>1520</td>
<td>1970</td>
<td>1255 Centre Rd</td>
</tr>
<tr>
<td>FIDDLER'S GREEN YARD - Salt Dome</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>464,480.00</td>
<td>80.00</td>
<td>-</td>
<td>5806</td>
<td>1959</td>
<td>1104 Fiddler's Green Rd</td>
</tr>
<tr>
<td>GAGE PARK - Greenhouse #3</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>151,520.00</td>
<td>80.00</td>
<td>-</td>
<td>1894</td>
<td>1958</td>
<td>42 Lawrence</td>
</tr>
<tr>
<td>GLANBROOK YARD #1 - Shop / Garage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>1,119,140.00</td>
<td>184.00</td>
<td>-</td>
<td>5210</td>
<td>1965</td>
<td>2111 Binbrook Rd</td>
</tr>
<tr>
<td>GLANBROOK YARD #2 - Shop / Garage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>1,319,292.00</td>
<td>174.00</td>
<td>-</td>
<td>5858</td>
<td>1965</td>
<td>7098 Airport Rd</td>
</tr>
<tr>
<td>MILLGROVE REGIONAL YARD #1 - Salt Dome</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>508,880.00</td>
<td>80.00</td>
<td>-</td>
<td>6361</td>
<td>1971</td>
<td>594 5th Con Rd W</td>
</tr>
<tr>
<td>ROCKTON REGIONAL YARD #2 - Salt Dome</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>505,920.00</td>
<td>80.00</td>
<td>-</td>
<td>6324</td>
<td>1967</td>
<td>810 Woodhill Rd</td>
</tr>
<tr>
<td>TAPLEYTOWN MAINTENANCE YARD - Sand dome</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>92,430.00</td>
<td>90.00</td>
<td>-</td>
<td>1027</td>
<td>1978</td>
<td>119 Tapleytown Rd</td>
</tr>
<tr>
<td>TAPLEYTOWN MAINTENANCE YARD - Shop / Garage</td>
<td>Work Yards &amp; Maintenance</td>
<td>Satellite Yard</td>
<td>2,006,012.00</td>
<td>148.00</td>
<td>-</td>
<td>10919</td>
<td>1969</td>
<td>119 Tapleytown Rd</td>
</tr>
<tr>
<td>4 HUGHSON STREET</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>34 JAMES STREET SOUTH</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2 KING STREET WEST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1550 UPPER JAMES STREET</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>120 KING STREET WEST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100 MAIN STREET EAST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

## Leased

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Group</th>
<th>Subgroup</th>
<th>Total Replacement Value</th>
<th>Structure Replacement Value</th>
<th>Structure Replacement Value sq ft</th>
<th>Structure Size (sq ft)</th>
<th>Construction Year (YYYY)</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 JAMES STREET NORTH</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>35 WURTZ STREET</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>65 WURTZ STREET EAST (KEegan STREET EAST)</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18 KING STREET SOUTH</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>107 JAMES STREET EAST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2905 SANTUCCI ROAD</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1550 UPPER JAMES STREET</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2905 NORTH STREET WEST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2255 HAMILTON STREET</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2111 BINBROOK RD</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>80 CORNISH STREET WEST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>60 W BISHOP STREET</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2255 WATTERS STREET UNIT 3 NO 2 E</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2311 HUNTER STREET EAST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2311 HUNTER STREET WEST</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2111 Binbrook Rd</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2111 Binbrook Rd</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>119 Tapleytown Rd</td>
<td>Leased</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

E2