What if municipalities knew exactly the right amount to spend on exactly the right infrastructure at exactly the right time? What if they knew when infrastructure needed to be repaired and replaced because they knew the details of its lifecycle? What if they always had the money to spend on infrastructure because they knew when they needed it and could plan accordingly? What if they knew that they were spending no more than they had to because their infrastructure was already optimized? What if they could tell you instantly the state of the town's, the city's, the county's, the region's, or the province's infrastructure, all at the push of a button? What if communities had all their needs met in a perfectly sustainable way?

Sounds like dream, doesn't it? Once it may have seemed so, but it's a dream not that far off. This idea is not magic, but rather a simple, practical process. Municipalities across Canada are coming to terms with the fact that the infrastructure they own—from transportation systems, to water and wastewater systems, to facilities supporting administrative and social programs—are all assets that have a value. These assets need to be managed to protect this value on behalf of their citizens, so that services relying on this infrastructure remain sustainable—key for healthy and prosperous communities.

Some municipalities are ahead of others in developing infrastructure management systems focused on sustainability. The City of Hamilton has proven to be a leader in this development, not only for their own community, but in demonstrating the value and the "how to" for other municipalities to advance their own sustainable management processes. Visionary staff at the City recognized more than 15 years ago that there is a need to address infrastructure management practices and unsustainable levels of funding. And the City recognized that dramatic changes to institutionalized practices would require a partnership with others to develop the new approaches and information needed to support the types of decisions that can effect such changes.

This submission offers a body of work for change management in the context of the Hamilton and RVA partnership. The projects in this process have been leading-edge, innovative and effective—not only in developing changes for infrastructure management practices within Hamilton to support its vision of sustainability, but also in providing leadership amongst Canadian communities through demonstrating change practices, tools and processes that have since been modelled by others.

The RVA and Hamilton partnership has resulted in strategic projects that have been the genesis of many new processes, changing the very nature of infrastructure engineering and management practices in Canada by introducing "strategic lifecycle planning" principles in practical and effective implementation steps.

It began in 1998 when RVA was managing a 5-year Infrastructure Asset Management Strategy program for Hamilton's water and wastewater systems following a traditional "bottom-up" engineering approach. Hamilton's Director of Operations Engineering challenged the program to provide some strategic guidance with respect to infrastructure investment strategies. This led to RVA creating a "top-down" approach—the watershed moment that has changed the traditional municipal approach and introduced a strategic and high-level perspective of infrastructure management issues and practice. This gave rise to the first "Cost of Sustainable Infrastructure Report" for the municipality.

This approach has now become standard across the engineering industry since it supplies "snapshot" investment plans to municipalities, helping them plan for their current and future needs.

Since publishing the first Hamilton asset management reports, RVA has been committed to improving asset management practices through the refinement of that initial top-down approach and an overall asset management framework. This framework turns the complex into simple by working with municipalities to answer smaller, less complex questions. These questions give municipalities the information needed to make key decisions about their infrastructure. Significant advancements have been made by many municipalities across Canada, and new approaches and tools continue to evolve.

A number of strategic projects completed by RVA in recent years for Hamilton have contributed significantly to the evolution of asset management framework and practices.

One marquee project was the Hamilton Water and Wastewater Facilities Asset Management Master Plan (2007). This plan looked at water and wastewater facilities as a whole, while recognizing that these facilities are the sum of their parts. A key feature of this plan is the emphasis on determining optimized asset management plans with sustainable funding levels that incorporate risk-based evaluation and objective assessment of competing priorities.

The 2009 Financial Plan for Water, Wastewater and Storm Systems developed a 100-year lifecycle profile of investment and funding requirements, integrating in one picture, for the first time, growth, upgrades to meet regulatory requirements and renewal needs.

These and other projects were related to individual components of Hamilton's overall infrastructure network. But those projects helped provide the basis for a more high-level strategic project—the 2009 State of the Infrastructure (SOTI) Report. This report presents the state of Hamilton's infrastructure, shows what has to be done to maintain the status quo, and predicts future trends based on current levels of investment. It allows key decision-makers to recognize the impact of their decisions and to rationalize those decisions within the City's overall strategic vision.

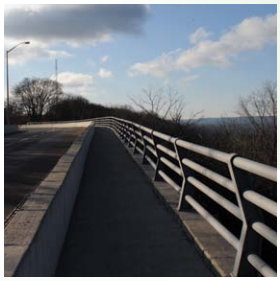
This report was followed up in 2010 with a "Phase 2" SOTI Report to assist the City with identifying the next steps needed for achieving higher ratings. This report also led the City Hamilton to identify another strategic aspect of the question associated with the state of municipal infrastructure and infrastructure spending—what is an "acceptable" level of service? As a result of this discussion, the City of Hamilton has initiated yet another strategic undertaking—a public engagement process to address the questions around acceptable levels of service. This project is currently underway. It demonstrates the ongoing nature of infrastructure management as a continuous improvement process.

Our partnership with Hamilton has produced the groundbreaking work that has filtered to other municipalities across Canada. Similar work has been undertaken across Ontario, the Maritimes, Alberta, and Yukon. Overall, this is proving that asset management is getting more inclusive—it is no longer the domain of engineers and government officials. It is a core part of how we, as part of a local and global society, need to start thinking of our sustainable future. Asset management's evolution is not over yet, but we can see how far it has come and where it can go, and RVA and Hamilton plan to be at the forefront of that movement towards our sustainable future.

Canadian Consulting Engineer Award Submission 2011

City of Hamilton:

Evolution of Asset Management


Hamilton

R.V. Anderson Associates Limited
engineering · environment · infrastructure

CANADA'S 50 BEST MANAGED COMPANIES

What if municipalities knew exactly the right amount to spend on exactly the right infrastructure at exactly the right time? What if they knew when infrastructure needed to be repaired and replaced because they knew the details of its lifecycle? What if they always had the money to spend on infrastructure because they knew when they needed it and could plan accordingly? What if they knew that they were spending no more than they had to because their infrastructure was already optimized? What if they could tell you instantly the state of the town's, the city's, the county's, the region's, or the province's infrastructure, all at the push of a button? What if communities had all their needs met in a perfectly sustainable way?

Sounds like a dream, doesn't it? Once it may have seemed so, but it's a dream not that far off. This idea is not magic, but rather a simple, practical process. Municipalities across Canada are coming to terms with the fact that the infrastructure they own—from transportation systems, to water and wastewater systems, to facilities supporting administrative and social programs—are all assets that have a value. These assets need to be managed to protect this value on behalf of their citizens, so that services relying on this infrastructure remain sustainable—key for healthy and prosperous communities.

Some municipalities are ahead of others in developing infrastructure management systems focused on sustainability. The City of Hamilton has proven to be a leader in this development, not only for their own community, but in demonstrating the value and the "how to" for other municipalities to advance their own sustainable management processes. Visionary staff at the City recognized more than 15 years ago that there is a need to address infrastructure management practices and unsustainable levels of funding. And the City recognized that dramatic changes to institutionalized practices would require a partnership with others to develop the new approaches and information needed to support the types of decisions that can effect such changes.

R.V. Anderson Associates Limited (RVA) became a key partner with the City of Hamilton to lead the development of its strategies for change. This has been a natural partnership for RVA, since it has spent over 60 years providing municipal and environmental consulting engineering services and evolving its own vision and leadership for a sustainable future for Canadian municipalities.

This submission offers a body of work for change management in the context of the Hamilton and RVA partnership. The projects in this process have been leading edge, innovative and effective—not only in developing changes for infrastructure management practices within Hamilton to support its vision of sustainability, but also in providing leadership amongst Canadian communities through demonstrating change practices, tools and processes that have since been modeled by others.

The RVA and Hamilton partnership has resulted in strategic projects that have been the genesis of many new processes, changing the very nature of infrastructure engineering and management practices in Canada by introducing "strategic lifecycle planning" principles in practical and effective implementation steps.

The RIGHT amount of money on the right things at the right time

= SUSTAINABILITY

Making the complex simple

Municipal asset management by its nature is complex and continually evolving. It's about planning to meet the ever-changing needs of its citizens, taking into account what is needed now, what is needed soon, and what is needed well into the future.

The concept of recognizing what is needed "now" and "soon" has always been a core concept of municipal planning. However, it's always been a reactive process—fixing things as they broke or wore down. Today, though, municipalities are realizing that it is far more important to be **proactive**.

Forward-thinking municipalities like the City of Hamilton, with the assistance of engineering firms like RVA, are now looking at their infrastructure and asking themselves: **are we making the right decisions?**

This is the key question that is turning engineering and municipalities on its head. Historically, the major question was "Are we doing things right?" Meaning, were those water treatment plant upgrades or those new sewers constructed correctly? Today, though, engineers and key municipal decision makers are stepping back and realizing that the real question to be answered for sustainability is "Are we doing the right things?"

Strategic planning processes focus on infrastructure systems at a broader level that consider the lifecycle impacts of investment decisions. Should an asset be upgraded and/or rehabilitated, or is it strategically beneficial to replace it, achieving benefits of improved operating and maintenance costs? What strategy will provide for the most cost-effective implementation and sustainability of the assets? Are some assets redundant and should be eliminated? What is the value of a particular asset or family of assets and what is its investment profile and average annual investment need? In some cases, these require 50 to 100-year lifecycle considerations.

So how do you plan that far into the future without losing sight of what is needed now? What exactly are "right" decisions? What information is needed to make these decisions?

RVA's strategy to provide a context for answering these questions was to adopt an asset management framework premised on answering six simple questions…

1. What have you got (inventory)?
2. What is it worth (valuation)?
3. What condition is it in?
4. What do you need to do to it?
5. When do you need to do it?
6. How much will it cost?

Where it all began

It was 1998 and RVA was managing a 5-year Infrastructure Asset Management Strategy (IAMS) program for Hamilton's water and wastewater systems following a traditional "bottom-up" engineering approach. The program included the development of extensive data collection processes and analysis that would support some strategic direction for the long-term management of its assets. Halfway through this program Hamilton's Director of Operations Engineering challenged the program to provide some strategic guidance with respect to infrastructure investment strategies. This challenge was years ahead of the data available through the collection program that would support this information.

Following a series of strategy sessions on how to meet this challenge, the six simple asset management questions were identified and a "top-down" approach to answer them was created. The adoption of this top-down approach was the watershed moment that has changed the traditional municipal approach and introduced a very real "strategic" and high-level perspective of infrastructure management issues and practice. It included using best available information and, in some cases, creating surrogate information with some strategic assumptions.

These simple questions and a practical and simple approach to answer them changed Hamilton's IAMS program and RVA's program deliverables. The "top-down" approach to asset management was first documented in a 2000 report prepared by RVA for Hamilton, offering a strategic perspective of lifecycle-based sustainable investment requirements for its water and wastewater systems, as well as one of the first Canadian "cost of sustainable service" reports.

The result of this analysis was a strategic, high-level understanding of Hamilton's long-term water and wastewater systems investment requirements. It identified the assets most vulnerable to short-falls in current investment levels. It demonstrated those assets that were most significant in terms of future investment needs and when these investments would be needed. All of this information formed the basis of a business case submission that influenced a strategic political decision for a long-term investment strategy.

The City of Hamilton's "how to" case study was a key feature in a subsequent 2002 document prepared by RVA and published by the Federation of Canadian Municipalities titled "Ahead of the Wave – A Guide to Sustainable Asset Management for Canadian Municipalities." This top-down approach is a core concept currently used by infrastructure managers across Canada.

The six simple questions evolved into an asset management framework adopted by RVA. This framework continues to provide context for ongoing advancements in AM processes and tools. This helps to keep a perspective of the simple, straight-forward approach inherent in the initial creation of the framework, i.e the six simple questions.

Top-Down Approach

Strategic Planning

The "Big Picture" in the context of lifecycle considerations

Tactical Planning

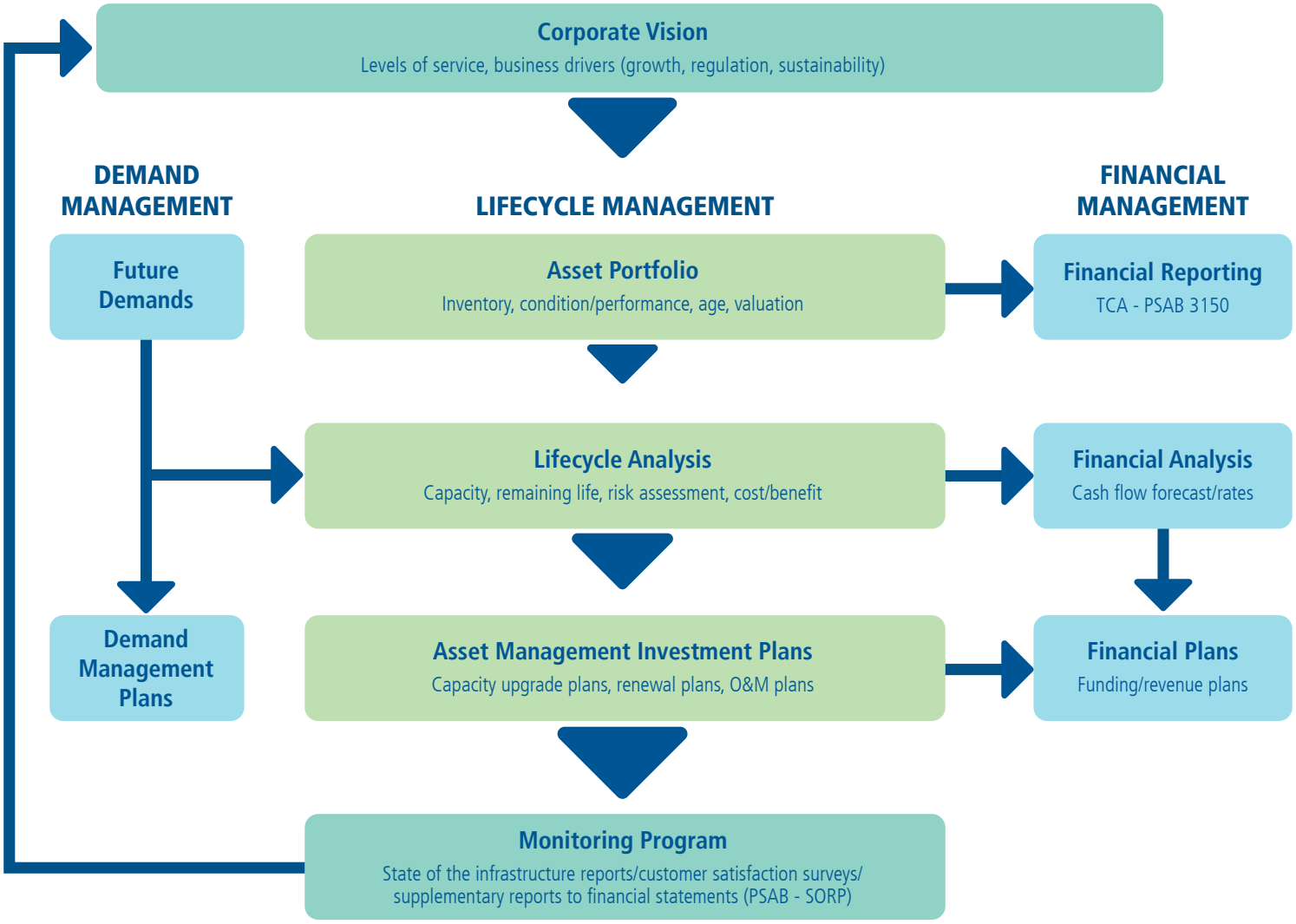
10-20 year component of the big picture

Operational Planning

Short-term (annual) activities linked to the big picture

Asset Management Framework

This framework turns the complex into simple by working with municipalities to answer much smaller, less complex questions. These questions give municipalities the information needed to make key decisions about their infrastructure—decisions that affect every person living within that city.



Corporate Vision

Levels of service, business drivers (growth, regulation, sustainability)

What is our vision for the future? What is our mandate?

What do we see as being the acceptable level of service to provide (the benchmark)?

Where do we see growth happening and how does that affect our levels of service?

What could happen in the future? For example, will new regulations affect how we provide certain services?

How do we, as a municipality, define sustainability? Does that mean cost-effectiveness within the next 5 to 30 years or within the next 60 to 100 years? Or does it mean something else entirely? If it's something else, what do we need to do to be "sustainable"?

DEMAND MANAGEMENT

Future Demands

What do we need to meet future needs in 5 years, 10 years, 25 years, 50+ years?

LIFECYCLE MANAGEMENT

Asset Portfolio

Inventory, condition/performance, age, valuation

What do we have in terms of assets? Do we look at things in terms of its whole or as a sum of its components? For example, do we count it as one water treatment plant, or a water treatment plant that is made up of a certain number of pumps, treatment trains, electrical components, etc.?

What condition are those assets in? How well are they performing?

How old are they? What are they made of?

How much are they currently worth, since asset values depreciate like car values do as they get older?

FINANCIAL MANAGEMENT

Financial Reporting
TCA - PSAB 3150

What's the best way to calculate the combined total worth of our assets and how do we report to the government as required by law (PSAB 3050)?

Lifecycle Analysis
Capacity, remaining life, risk assessment, cost/benefit

What does it take in terms of maintenance requirements and costs to keep that asset performing optimally? How much does it cost to keep it operating at all?

Based on the asset's condition, how much "life" does it have? How likely is it for that asset to "fail" or to stop performing at its best? When would that happen and how would that affect the community and/or other assets? Should we prevent that from happening? If so, how and when would do we do it, and how much would that cost?

As it exists right now, will the asset meet future needs (5, 10, 25, 50+ years)? If not, what would it take to make it meet future needs? How much would that cost?

What is the best way to spend that money? Are there other ways that may be more cost-effective, maybe not right now, but in the future? For example, would it be better to completely replace the asset instead of upgrading it, consolidate similar assets into one bigger asset, or perhaps eliminate the asset altogether?

Financial Analysis
Cash flow forecast/rates

How do we afford what we need? What type of cash flow is required, and how do we generate the revenue? How much and when do we need to adjust our tax rates? Is this feasible? If not, what other options are open to us?

Demand Management Plans

When do we need to increase capacity of certain assets to meet future needs? What is the best way to phase that out so that we don't get nasty surprises that we can't afford?

Asset Management Investment Plans

Capacity upgrade plans, renewal plans, O&M plans

How much will it cost to keep a group of assets operating? How much is required to perform necessary maintenance? When should we undertake that maintenance?

How much will it cost to renew various assets and when should we renew them? How will this affect our operations and maintenance budgets and plans?

How much will it cost to meet future needs and what is the timing? How does this affect our renewal and operations and maintenance budgets and plans?

Financial Plans

Funding/revenue plans

How do we meet our funding needs? What type of investment plan is required? Are there other opportunities for specific funding needs, such as federal funding? When would that be required, and if that opportunity doesn't occur, what is our back-up plan?

Monitoring Program

State of the infrastructure reports/customer satisfaction surveys/ supplementary reports to financial statements (PSAB - SORP)

Recognizing that asset management is a continually changing process, what are we doing right and what could be done better?

What's our next step? Are there information gaps that we need to fill?

What changes have occurred that we need to account for? How can we better anticipate these types of changes in the future?

Are our citizens pleased with what we're doing? How can we better meet their needs?

In short, are we making the right decisions?

Taking the guesswork out of asset management

Since publishing the first Hamilton asset management reports, RVA has been committed to improving asset management practices. Significant advancements have been made by many municipalities across Canada, and new approaches and tools continue to evolve. A general understanding of the benefits of these processes increases as more and more municipalities engage in asset management practices.

Hamilton continues to be an asset management leader in Canada, initiating and engaging in strategic projects that keep advancing asset management concepts and maintaining the City as a national leader.

A number of strategic projects completed by RVA in recent years for Hamilton have contributed significantly to the broader body of knowledge in efforts to take the guesswork out of asset management, where at times, some of these processes may seem complex.

One marquee project has been the completion of the ***Hamilton Water and Wastewater Facilities Asset Management Master Plan (2007)***. Developing a strategic understanding of water and wastewater treatment and pumping facilities has challenged municipalities since they are inherently more complex than linear or "pipe system" assets. The challenge? Recognizing that with the thousands of individual components that make up water and wastewater facilities, the assignment of a singular life expectancy is not practical from an asset management perspective.

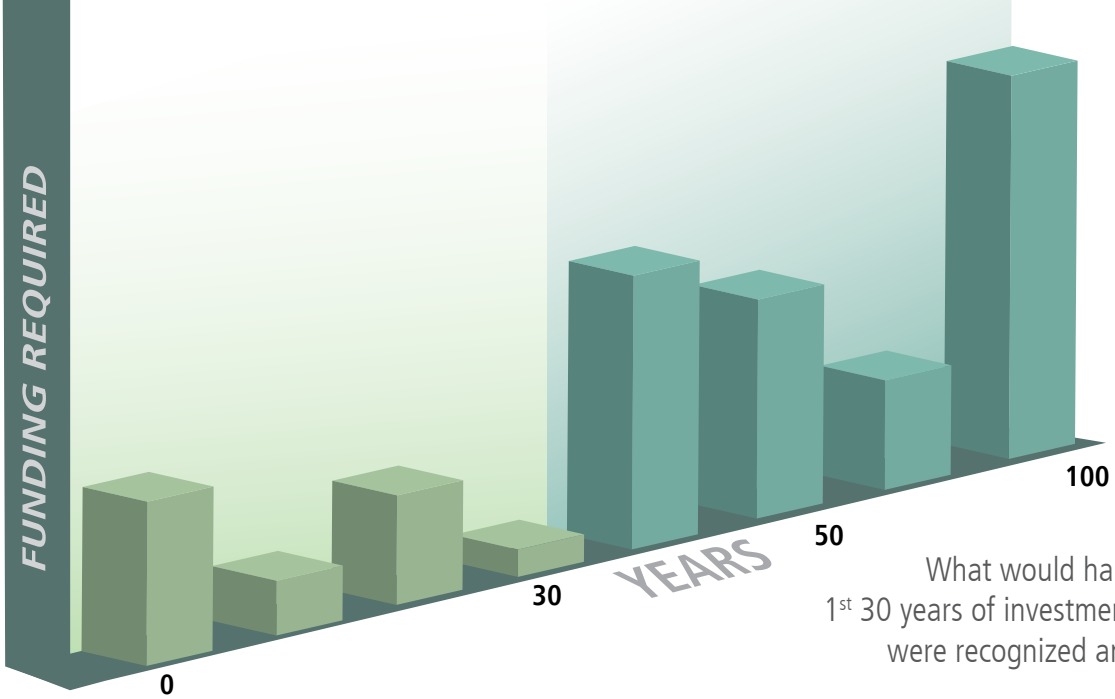
To address this issue, RVA undertook an assessment of these types of facilities and created a concept for a data hierarchy that set the stage for an assessment methodology that considered different levels of complexity.

A data hierarchy was developed with a concept of category systems (e.g mechanical, electrical, structural, etc.) that could be rolled up to a facility level. At the same time, being able to assess a facility in its different processes and components was also an important feature.

RVA devised a breakdown structure that allowed for a roll-up to a facility level from components, to assemblies of components, to process areas, and finally, to the facility as a whole. The concept of assessing a facility by these linked levels of hierarchy set the stage for considering different levels of assessment for different purposes.

This was an important step in considering the process of condition assessments to support different asset management processes. More specifically, this also became strategic in defining a simple valuation method for the new financial reporting requirements for tangible capital assets as defined by the new Public Sector Accounting Board – PSAB 3150. The concept was used by municipalities across Canada.

In addition to the evaluation hierarchy, a key feature of the Master Plan was an emphasis on determining an "optimized" investment management plan including the identification of sustainable funding levels and incorporating risk-based



evaluation and objective assessment of competing priorities. This is a shift from the traditional approach of "worst-first" prioritized lists of projects that match available funding. It is a proactive approach premised on the original concept of spending the right amount of money on the right assets at the right time. The plan is designed to begin to remove some of the guesswork out of investment planning decisions. These processes were presented in the context of the asset management framework.

Another strategic Hamilton project that advanced the creation of some decision-making tools was the ***Decision Process Mapping and Water Main Lifecycle Analysis Model (2009)***. In essence, this project was all about making priority investment decisions and creating a process map to simply the process. It established and documented the decision-making process by identifying priorities for investigative projects and capital works associated with the City's water distribution system.

RVA developed an analytical tool to determine the optimal investment scenarios (either rehabilitation or replacement) and the corresponding timeframe for that investment in critical water main infrastructure. This tool is used by City staff to guide their decisions for spending money by rationalizing the decision process. This makes decisions more precise, cuts down on unnecessary spending, and thus reduces costly and intrusive pipe failures in the future.

Another strategic project was the ***2009 Financial Plan for Water, Wastewater and Storm Systems***, which developed a 100-year lifecycle profile of investment and funding requirements, integrating in one picture, for the first time, growth, upgrades to meet regulatory requirements and renewal needs.

This financial plan allowed the City and RVA to reach a key milestone in asset management. For the first time, we were able to directly integrate mandates from two different departments (Public Works and Finance):

1. Investment planning—what do we need to spend to maintain our current levels of service and what is required to meet future levels of service?
2. Revenue planning—how do we finance the investment needed to meet those levels of service?

To do this, RVA developed a framework that incorporated information from both worlds—engineering and municipal accounting—to lead us through the plan development. The result? Inter-departmental staff strategized on the City's investment needs and the ability to pay for them. Financial statements reflected a clear picture of the City's immediate and longer term needs on a holistic view identifying future management issues to be addressed. Strategic planning discussions addressed debt, sustainability and viability of revenue streams with respect to current investment levels. The Financial Plan fulfilled a regulated requirement for the City, but more importantly, initiated financial reporting processes and strategic discussions to better understand and manage infrastructure backlog issues.

All three of these projects were related to individual components of Hamilton's overall infrastructure network. But those projects helped provide the basis for a more high-level strategic project—the ***2009 State of the Infrastructure (SOTI) Report***.

Hamilton Public Works Report Card 2009

ASSET GROUP	2009 RATING	TREND
Water	B+	→
Wastewater	B-	→
Storm Water	C-	↓
Roads and Traffic	D-	↓
Central Fleet	C	↓
Corporate Facilities	C-	↓
Parks & Open Spaces	C-	↑
Public Transit	B+	↑
Waste Management	B-	↓
Forestry	C-	↓
Cemetery	C	→

A = Excellent B = Good C = Fair D = Poor F = Fail

This report establishes the investment requirements for all public works infrastructure, not just municipal infrastructure, within the City and provides an easily understood rating that indicates the level of sustainable funding being provided compared to previous years. It is a report that encompasses an assessment of current practices, and recommendations and opportunities for advancing the City's asset management processes.

In short, this report presents the state of its infrastructure, what has to be done to maintain the status quo and, more important, predicts future trends based on current levels of investment. It allows key decision makers to recognize the impact of their decisions and to rationalize those decisions within the City's overall strategic vision.

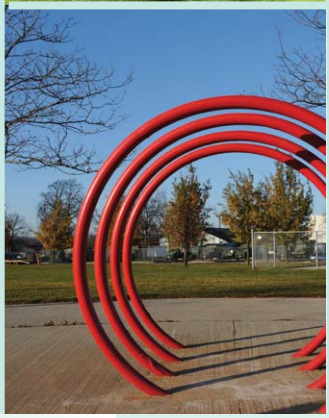
This report was followed up in 2010 with a "Phase 2" SOTI Report. Hamilton City Council had requested information on how to improve rating scores, so RVA assisted the City with identifying the next steps needed for achieving higher ratings in such asset groups as roads and traffic, stormwater, corporate facilities, and forestry, which were declining from previous years.

The future

The ***Phase 2 State of the Infrastructure Report (2010)*** for the City Hamilton identified another strategic aspect of the question associated with the state of municipal infrastructure and infrastructure spending – what is an "acceptable" level of service? This idea ultimately leads to the questions of: what are acceptable costs for different levels of service? And, what level of service is the public willing and able to pay for? Until now this question has tended to be addressed by staff and Council, but it's clear that the paying public is the key stakeholder in this type of decision.

As a result of this discussion, the City of Hamilton has initiated yet another strategic undertaking—a public engagement process to address the questions around acceptable levels of service. This process is new and is resulting in challenges that need to be addressed. For example, what does the public view as an "acceptable" level of service? What is important to the public in terms of the services provided by the City and what value does the public put on these services? How do we effectively communicate with the public to gain useful insights into their vision of infrastructure based services? How do we best convey the information that links infrastructure investment with level of service? How do we create public policy for infrastructure that addresses these public views and visions?

This project is currently underway. It demonstrates the ongoing nature of infrastructure management as a continuous improvement process.

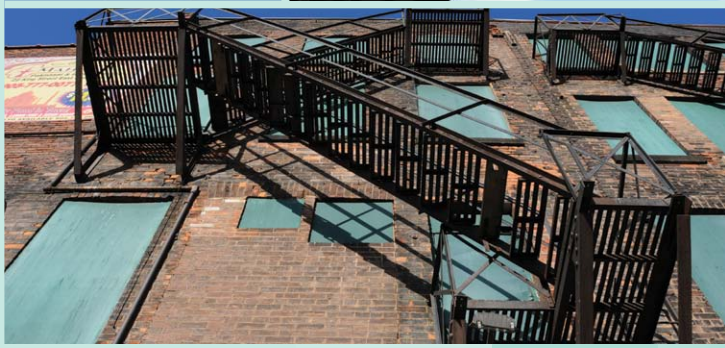



Hamilton and beyond

The City of Hamilton is recognized as a national leader in asset management. The projects undertaken within the City have given RVA the opportunity to push boundaries by stepping away from "tradition" and referring back to the key question: are we making the right decisions?

Our partnership with Hamilton has produced the groundbreaking work that has filtered to other municipalities across Canada. For example, in Fredericton, we helped develop an overall asset management plan (2010), creating simple, high-level risk and condition analysis tools to help the City analyze risk and priorities across all infrastructure types and develop optimized investment schemes based on objective priorities. For the first time, Fredericton's public works department was able to both rationalize and justify funding expenditures to key decision makers in a way that was easily understood.

Similar work has been undertaken across Ontario, the Maritimes, Alberta, and Yukon. Overall, this is proving that asset management is getting more inclusive—it is no longer the domain of engineers and government officials. It is a core part of how we, as part of a local and global society, need to start thinking of our sustainable future. Our hope is that asset management practices get taken to a new level, through integrating and optimizing spending and investment goals, societal advancement and health, and environmental sustainability. It is not an impossible goal—we at RVA and our partners across Canada, particularly the City of Hamilton, have proven that asset management practices really do work.



The City of Hamilton and R.V. Anderson Associates Limited partnership has defined the vision of a municipality with the boldness to travel where others have not yet traveled, with innovative, creative and pragmatic thinking. The partnership of these organizations has been a critical factor in bringing about the types of changes in the management of municipal infrastructure that has proven to be leading edge in many ways. The importance of these projects in the change process is evidenced by the understanding that one project has typically led the way to take the next step and move another step closer to the ultimate goal of sustainable communities.

From the introduction of the "top-down" approach, the door was opened for many more to follow and evolve asset management in ways not previously envisioned. The asset management framework has been the guiding map, a foundational process that has proven its worth based on the contributions and progress that has been made by many in improving individual components of the framework, and in particular, understanding the context for all new advancements. Master plans, decision-making tools, financial plans, state of infrastructure reports…these are all strategic milestones RVA has created in partnership with the City for Hamilton.

Asset management's evolution is not over yet, but we can see how far it has come and where it can go, and RVA and Hamilton plan to be at the forefront of that movement towards our sustainable future.