

# Multisector Asset Management Case Studies

*Presented by*

U.S. Environmental Protection Agency



U.S. Department of Transportation,  
Federal Highway Administration



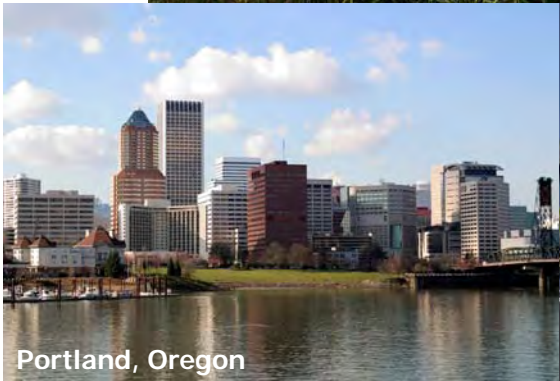
Calgary, Alberta, Canada



Henderson, Nevada



Hamilton, Ontario, Canada



Portland, Oregon



Saco, Maine

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## CHAPTER 1 INTRODUCTION

### Section 1 Background

North America's infrastructure is integral to our economic, environmental, and cultural vitality. Federal, state, and local entities have been successfully building and operating assets for generations. Across several sectors, our built assets are aging! Some roadway, water, and wastewater systems are more than 100 years old.

To meet the renewal challenges and at the same time address the essential expansion and upgrade of our infrastructure, calls for exploring new processes, practices and skills crucial for the long-term sustainable management of assets.

New, internationally tested asset management (AM)<sup>1</sup> principles and practices appropriate across multiple sectors are surfacing in the United States (U.S.) and Canada. These innovative AM methods offer established approaches for communities; in systems monitoring capabilities, information handling, and advanced decision support systems that can function across service sectors (e.g., water, wastewater, highways, airports, mass transit). These new tools and techniques are timely in that they enable us to think about choices in more sophisticated ways and enhance our understanding of condition. They facilitate the capacity to better predict failures and in so doing help decision makers to draw more informed conclusions about optimal investment and reinvestment strategies. At the more sophisticated levels, these approaches take into account the service requirements across several sectors.

AM processes and practices have emerged as a strategic approach to infrastructure focused on the managerial, business, and engineering processes that enable better decision making. The modern processes are adept at guiding decisions considering the effective mix of maintaining, repairing, renewing, or replacing components within and across systems.

AM strategies recognize that the key issues and drivers relating to infrastructure management are the same across infrastructure sectors and across all communities with mature infrastructure systems. The best practice management of infrastructure and the whole of life cycle processes are common for infrastructure assets, yet respect that the specific application practices related to individual asset types will be different, e.g., condition assessment practices.

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*Portland commissioners are supportive of the AM tool, because "it helps convey to citizens how their money is spent." The mayor stated that the "longer we put this off, the faster the deterioration of the infrastructure."*

—Portland Case Study

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*The Henderson mayor and council stated that the reason for developing an AM strategy was because it demonstrates good business and good stewardship. Leaving a legacy is important to the City's culture.*

—Henderson Case Study

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<sup>1</sup> National Asset Management Steering (NAMS) Group. 2006. *The International Infrastructure Management Manual*. The NAMS Group, Thames, New Zealand.

## Section 2 The Approach to Case Study Development

The U.S. Environmental Protection Agency (EPA) and the Department of Transportation, Federal Highway Administration (FHWA) have worked together to develop case studies to support communities that are considering multisector or “*whole of government*” AM strategies. These case studies are designed to gather lessons learned and summarize the knowledge and experiences of entities that have adopted AM approaches across multiple infrastructure systems.

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*The Calgary AM program has enabled staff to more easily obtain requested funding for infrastructure needs, based on better data.*

—Calgary Case Study

For each case study, FHWA/EPA representatives interviewed city transportation, water, wastewater, and planning staff and compiled the information. City representatives reviewed the resulting material. Each case study presents background information on the city’s infrastructure, history of, and reasons for applying AM tools; lessons learned to date; and benefits of AM. These case studies also assess how far along each city is with applying *best practices* within each sector (transportation, water, and wastewater).

The activities generally regarded as the steppingstones to effective AM programs include the following:

- Develop an asset inventory (a list of assets and their principal components).
- Assess asset condition and failure modes (quantifying the deterioration rate and remaining useful life of an asset).
- Determine residual lives (what is the remaining useful life of the asset?).
- Evaluate life cycle and replacement costs/economic evaluation (the sum of all costs throughout the life of an asset, including planning, design, acquisition, construction, operation, maintenance, rehabilitation/renewal, and disposal costs).
- Set a target level of service (a defined standard against which the quality and quantity of service can be measured). A level of service can include reliability, responsiveness, environmental acceptability, customer values and cost.
- Determine business risk exposure/criticality (the chance of something happening that will have an effect on objectives). Risk is measured in terms of likelihood and consequences.
- Optimize operations and maintenance investment (keeping an asset operating as designed or preventing it from deteriorating prematurely).
- Optimize capital investment strategies.
- Determine funding strategies.
- Build an AM Plan (AMP) (an enterprise-wide plan that includes AM for multisectors).

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*In Hamilton, “AM helps us show the total picture to our constituents, and helps us build the business case. I highly recommend this process to other cities.”*

—Hamilton Case Study

### Section 3 Participating Communities

EPA/FHWA selected North American Communities that are diverse in geographic location and size—from small to large—that are developing AM programs involving at least water and wastewater and transportation sectors. The participating communities include the following:

- Calgary, Alberta, Canada
- Hamilton, Ontario, Canada
- Henderson, Nevada
- Portland, Oregon
- Saco, Maine

We encourage you to review the case studies and to note the wide range of approaches that have worked in these communities. Note also the benefits listed by each participant and the lessons learned from their unique experiences.

### Section 4 General Findings

The case studies provide examples of good stewardship and proactive leadership, while demonstrating and documenting the benefits that may accrue by effective collaboration across sectors. The drivers, leadership strategies and approaches for instituting AM programs vary for each community—some programs were initiated by upper management, and some began at the staff level. The communities shared a common interest in applying AM principles, saw the benefit of cross training on key elements and envisioned the value of shared program knowledge across multiple asset sectors. In each case, knowledge and awareness of the benefits of AM were strengthened over time. Each of these communities is at a different stage in their journey and the particulars of their voyage vary, yet their common goal is to produce an enterprise, or corporate-wide, AMP.

From an evolutionary standpoint, a precursor found in the staff and management of these communities was their steadfastness in acquiring asset practice knowledge. The AM staffs shared a passion for their work and were significantly engaged in exchanging information with their counterparts and colleagues throughout the national and international AM practitioner community. In addition, there were common underpinnings that provided the foundation for the strategic and tactical undertaking at each location:

- An advocate(s) (a champion) was a major factor in growing the practices.
- Upper management valued information and process improvements and linked progress in these areas with sustaining high quality services and improving asset life cycle decisions, and

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*New England Water Environment Association has sponsored a couple of EPA AM conferences that were instrumental to Saco's AM program startup and development.*

—Saco Case Study

- City leaders invested in the strategies and embraced the stewardship aspects of long term practice improvements as part of their leadership responsibilities in furthering the sustained delivery of quality services.

Throughout the interview process, the people interviewed revealed deeply held legacy values. There was a mutual respect in regard to the intergenerational aspects of building and sustaining community assets. Also, throughout the interview process, the depth of community pride was apparent; as was the noticeable job satisfaction associated with having a leadership or expert role in the application of advanced practices

## *Section 5 Acknowledgements*

EPA and FHWA wish to thank the city participants for their active engagement in this assessment. The interviewees' insights into their particular experiences and knowledge of program details and challenges were indispensable to the preparation of these case studies.

The case studies also include information and examples developed by city staff for AM status reports, budget reports, and tools and techniques including in some cases information in regards to particular software applications. As a disclaimer, please note that the exact practice information, tools, models and software applications deployed by these organizations may not directly transfer to other communities and nothing in this report is intended to imply endorsement, product assessment or draw any conclusions as to particular application, effectiveness or transferability of products referred to in the presentations.



## Multisector Asset Management Case Studies

### CHAPTER 2 THE CALGARY, ALBERTA, CANADA EXPERIENCE

The City of Calgary (City) is the largest city in the province of Alberta, Canada. It is in the south of the province in an area of foothills and high plains, approximately 50 miles east of the front ranges of the Canadian Rocky Mountains. Calgary's economy is dominated by the oil and gas industry. Geospatially, Calgary is the second largest municipality in Canada, at 328 square miles. As of the 2007 civic census, Calgary's population was 1,019,942. Between 2001 and 2006, Calgary's population grew by 12.4 percent. In the past few years, growth is actually down from 55,000 persons per year to 35,000.



## Section 1 Executive Summary

In 1999, the City recognized the need to focus on addressing its infrastructure. Calgary is applying asset management (AM) principles across its transportation, water and wastewater sectors, among others. Calgary's Corporate Asset Management Program (CAMP) is a corporate function that coordinates AM among 13 infrastructure-related business units. The City's program is quickly evolving and flourishing at both the strategic and operational levels. The City's CAMP was formalized in 2004 and consists of the Corporate AM (CAM) team of six staff. The CAM team is within the Infrastructure Services business unit. AM-trained personnel are also embedded into other business units. The CAM team is responsible for:

- Developing the City's CAM strategy.
- The annual Infrastructure Status Reports (ISRs).
- Promoting and assisting business units with implementing AM principles.
- Helping to develop business unit asset management plans (AMPs).
- Ultimately developing and implementing a corporate (City)-wide AMP.

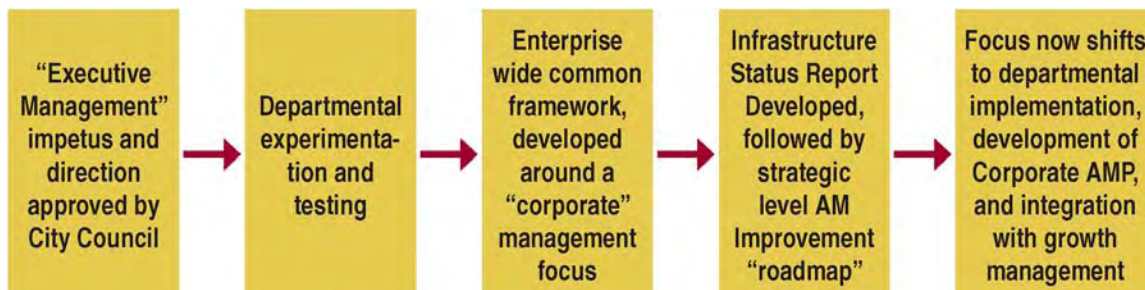
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*A corporate-wide infrastructure AM strategy is one of the City's key corporate initiatives to address Calgary's growing infrastructure needs and crucial for effective service management by the corporation.*

—Infrastructure Status Report, 2004

A key component of the vision for the City's CAMP was to separate the AM function from the Finance Department while maintaining a strong partnership. The City's rationale for this was to focus the management of the AM program on the business side of decision making at the corporate level rather than from purely the accountancy perspective.

From its inception, Calgary's formal AM approach has been strategic in its vision and organizational level. First championed by an executive-level manager, the effort has been fully embraced by the City Manager. Much effort has been focused on building an enterprise-wide perspective and framework, then moving in a structured manner into the mid- and lower-levels of management.



Preceding the formal structuring at the executive level, experimentation and application of strategic AM practices was emerging in the Utilities Department. The Utilities Department endeavour included whole scale business process redesign and business continuity, implementing work and maintenance management systems to enhance asset workflow and decision making and a formal restructuring of their organizational structure to better enable AM and service delivery.

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*Ultimately, AM best practices will provide asset stewards the right information to make the right infrastructure decisions at the right time.*

—*Calgary's Asset Management Strategy*, 2005

Unlike older communities, Calgary's impetus for embracing the multisector AM concept was dealing with its rapid growth, driven to a large extent by the exploding international energy industry. The City needed to balance growth and renewal needs. The City is overseeing the development of 35 new communities in Calgary. At the same time, the City's infrastructure is also aging—the majority was constructed during the economic growth period from the 1960s to the mid-1980s. More stringent environmental requirements and rapidly increasing construction costs are putting increasing pressures on the already limited funds for infrastructure investment.

A corporate-wide infrastructure AM strategy is one of the City's key corporate initiatives to address Calgary's growing infrastructure needs and is crucial for effective service management by the corporation. Calgary's CAMP supports the City's growth and development by applying a triple bottom line concept—assessing economic, social and environmental issues. The City is planning its growth around the *Unicity* concept, which consists of one major core city and adjacent communities. The City has developed initiatives against sprawl intensification in favor of densification.

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*As a business practice, AM is based on the underlying philosophies of the Triple Bottom Line, Risk Management and Lifecycle Costing, amongst others.*

—*The State of AM Report*, April 2008

Calgary has recognized a number of benefits in applying AM, which include the following:

- The application of AM principles has begun to positively affect the quality of decision making—there is more validated information available for assets on which to base project prioritization and budget allocation decisions.
- AM program data is useful to better justify capital and maintenance expenses to the public—the City can better make the case for what taxpayers are paying more for and what new assets will cost them.
- The council is gaining confidence in the data provided under the CAMP.

The City is ahead of most cities in North America in implementing generally recognized AM principles and practices and is working toward its goal of developing a CAMP.

## Section 2 Calgary's AM Vision and Triggers for Initiating AM

### A. Initial Vision

In 1999, the City recognized the need to focus on addressing its infrastructure needs. The City established CAMP, oversaw the development of the CAM Strategy and developed annual ISRs to provide council and senior management with information that supports decision making. The City's efforts pulled together into a corporate focus several separate and rather independent forays into AM that had been for some time informally initiated in several departments, most notably, Roads and Water. These early efforts were internally focused within the departments and targeted the application of practices; specific and relevant to the nature of each department's unique service requirements. In 2004 Calgary's city council formally approved the corporate AM program.

Calgary's AM vision for a successful corporate AM program includes:

- Separating management of the CAM function from the Financial Services Department, while maintaining a partnership;
- Developing business unit AM strategies;
- Developing business unit AMPs and, ultimately, an integrated Corporate AMP;
- Restructuring the capital budget process to connect 3-year business plans with 3-year budgets;
- Using an Expert Choice business model to rank and schedule projects;
- Integrating the information technology (IT) process at the strategic level; and
- Involving land use planners in developing and implementing the Corporate AMP.

As indicated above, before instituting the vision of the CAMP, the Water Resources and Roads departments were applying AM concepts. In 1973, the Water Resources Department started its main break program



Calgary's CAM vision focuses on four key elements that must be in balance to consistently meet service levels and minimize the overall cost of asset ownership—Strategy, Asset Information, People, Processes and Systems.

and built a database to track main breaks and house data for making main replacement investment decisions. In a parallel endeavour, the Roads Department had developed a pavement management system which it used to create its pavement investment plans, several years before CAMP. As CAMP evolved, the Roads Department expanded the sophistication of its decision-making systems by including more advanced AM concepts.

Calgary's AM governance model is not based upon a traditional centralized command and control approach. Innovation is not dictated from the corporate office down to the various departments.

- Changes to current AM practices can be developed at the corporate level (for example, in the consistent approach on AM planning, budgeting or governance).
- Or, at the departmental level (including implementing business continuity and benchmarking practices specific for the Utilities Department or the use of GIS in asset decision making in the Roads Department).

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*Formalizing AM as a corporate function is a fabulous opportunity for breaking down silos. The CAM team can link into and coordinate projects and provide AM services to all business units.*

—Steve Wyton, CAM Manager, 2008

In either case, Calgary leverages a cross-departmental group of AM practitioners (known as the AM Network) to disseminate and share AM practice innovations.

- All AM practices are first tried in limited pilot applications, baseline results are established, cost-benefit analyses are conducted, programs are established or changed, and results are checked.
- If the results warrant, the practice is documented in the departmental AMPs and is spread throughout the corporation via the AM Network.

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*Calgary staff suggests the following keys to success:*

- *Separate CAM from the financial department*
- *Integrate the information technology process at the strategic level*
- *Integrate people involved with land use early*

This process assures that the City is confident in its plans because they have been substantially tested, tweaked, and consensus arrived at with the practitioners. It also provides an organic and efficient way of innovating AM both in the departments and at the corporate level.

## **B. AM as a Strategic Level Corporate Function**

In 2004 Calgary's CAMP was formalized as a strategic-level, corporate function. The objective was to provide a coordinated business link among the many operational, engineering-focused, asset-managing business units and strategic, mid- to long- range planning, land use, IT, and financial functions.

The CAM Office was established as a line of business in the fall of 2004. The AM core team consists of six staff, but AM support staffs are also embedded in other business units. Through this approach, the AM function and AM strategy is *strapped on* (linked) to core City functions at the strategic level. The CAM Manager emphasized that this embedded approach is a key element central for success. The CAM team is considered to be an internal consulting group that provides direction to business units regarding five key AM business functions: (1) Infrastructure Strategy and AM Planning, (2) Infrastructure Investment and Capital Budgeting, (3) Infrastructure Performance Measurement and Program Reporting, (4) Infrastructure Asset Management Advocacy, and (5) Strategic Program Support Services. Calgary recognized early that it was important to bring land use planners on board early in the process.

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*Keeping CAM separate from the finance department has been critical. It has forced financial staff to think outside the box when looking at infrastructure funding needs.*

—Steve Wyton, CAM Manager, 2008

### **C. AM Program is Separate from Financial Operations**

A key aspect of Calgary's vision for a successful AM program is that most of the CAM Office is separate from the Financial Operations Office. Although the offices work together on projects there is an intentional separation that protects the grassroots/technical engineering functions and decisions from being counteracted purely from the financial/comptroller perspective.

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*Calgary has risen to the challenge by developing a proactive strategy to effectively manage its asset inventory. This AM Strategy is the foundation for infrastructure best practices that will allow us to provide effective municipal services while balancing smart growth with a sustainable quality of life.*

—Calgary's Asset Management Strategy, 2005

The separation focuses Calgary's AM program on the managerial side of decision making at the corporate level rather than from solely the accountancy perspective. The result is that it enables the CAM team to better play its role as integrator of AM practices into all business unit areas. The impetus is from a strategic level (City Manager's Office). The organizational separation enables the CAM team to focus on the technical aspects of infrastructure assets such as residual lives and risk management.

In addition, to proceed with Calgary's AM vision, it was important to reform the Financial Operations Office's role and to encourage financial staff to think less like accountants and more like financiers. (Traditionally, governmental financial accounting is restricted to using historic costs rather than replacement costs, thereby severely limiting the utility of the financial reports for infrastructure investment purposes; managerial accounting, on the other hand, may incorporate replacement costs, which are much more relevant to investment decision making.) Calgary's approach respects that both perspectives are necessary for prudent decision making.

### **D. Strategic Planning—CAM Strategy**

City council approved CAMP and *Calgary's Asset Management Strategy* in 2005. The Strategic Infrastructure Asset Management framework is a suite of corporate-wide business planning

processes, systems and tools that integrates the capital intense operational business units into a common AM approach.

The objective of Calgary's AM program is to ensure the corporate-wide sustainability of service through the strategic management of infrastructure assets. The program is enabled by instituting (1) risk-based capital investment decision making, (2) mid- and long-term infrastructure planning, (3) life cycle forecasting and (4) infrastructure performance measurement that links infrastructure decisions to corporate financial, economic and growth policy.

## E. Strategic Planning—Business Unit AM Strategy

Calgary's AM approach also involves applying AM strategies at the business unit/operational level. The capital-intensive service providers in the City are quickly adopting AM concepts at the operational level. The business units are beginning to use operational AM techniques to; (1) provide work and maintenance management, (2) manage and plan for infrastructure condition and functionality, and (3) develop capital and operating budgets for their specific service areas. The CAM team respects the importance of allowing the business units to develop their own best practices, recognizing that staff members at that operational level are the best positioned to define the detailed business processes. The development and adoption of operational AM best practices and processes are at various levels and degrees of implementation and operation, depending on the business unit.

## F. Business Unit AMPs

To promote development of business unit AMPs, the CAM team has developed a document entitled *The Asset Management Planning Guidelines*. The guidelines are designed to enable business units to understand the basis and need for AM plans and to provide a framework for developing the AMPs. The business unit AMPs documents the framework for achieving the business unit's goals and, ultimately, the corporate strategic goals by focusing on levels of service, life cycle AM planning and the resulting long-term cash flow requirements.

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*Life cycle costing is the brains of AM, and the process gives you hard data to determine funding gaps.*

—Steve Wyton, CAM Manager, 2008

The CAM team has also developed the *Asset Management Plan Framework*, which is an annotated Table of Contents for the business unit AMPs. It provides a succinct overview of an AMP and describes each of the plan's required elements. The CAM team creates buy-in to the concept of the business unit AMPs by reminding staff that the plans basically pull together what the business unit is already doing and provides the information needed for budget requests. The business unit AMPs also help managers assess needs requests and prepare project funding decisions.

To obtain a snapshot of each business unit's current capabilities and competencies with respect to applying AM principles, the CAM team hired a consultant to conduct an AM assessment and develop AM improvement strategies. The assessment was built on the

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*Calgary's Corporate Asset Management team linked operational AM, land use planning, finance and economics to create its Infrastructure Strategy.*

British version of the Australian AM framework and consisted of a questionnaire (29-questions). The findings were summarized in the *Asset Management and Assessment and Improvement Plan* in July 2008. This report provided the CAM team with valuable information about how to better coordinate between business units and how best to break down the silo mentality among groups. It's intended to facilitate development of business unit AMPs. Business unit assessments have been completed for Recreation, Fire, Emergency Medical Services, Water, Waste and Recycling, Roads, Transit, Fleet, IT, Corporate Properties and Parks. Outstanding assessments include Animal and Bylaw Services, Police, and Development & Building Approvals.

## **G. Corporate AMP**

The ultimate, long-term goal for the business unit AMPs is to roll them up into a Corporate AMP that will organize and document the process and provide a comprehensive, sustainable approach to citywide AM. The City expects to start generating its Corporate AMP this year (2008). The Corporate AMP will link land use data to the capital budget and provide an integrated plan for how services will be delivered. The eventual result of the Corporate AMP is an integrated citywide infrastructure investment strategy.

## **H. Restructured Business Planning Approach**

Before the CAMP could be fully implemented, the City needed to reform the capital budget prioritization process. Since 2005, the City has been implementing a new approach for business planning and is developing 3-year business plans coupled with 3-year budgets. Calgary refers to this process as the Business Planning and Budget Creation (BPBC) process, which is coordinated by the City Manager's Office and staffed from the Finance Department. The CAMP has developed a parallel process, the *3-Year Strategic Infrastructure Asset Management Business Process* (SIAM), which links AM planning, capital budgeting and infrastructure performance measurement, and which specifically links capital prioritization of the Pay-As-You-Go and Life Cycle Reserve to the larger BPBC process.

Prioritization of the capital budget is a CAM function (based on risk); and the Finance and Supply group develops the operation and maintenance budgets. The business plan/budgets require that a business case is developed for each project, and each business unit must include 100-year infrastructure life cycle sustainability forecasts and 10-year capital investment plans.

After a detailed design process in 2009, the intent of the 3-year, SIAM business process is to link the various operational infrastructure AM programs to other corporate-level business planning and financial decision-making/reporting processes (1) the Multiyear BPBC process, (2) the Long Range Financial Plan and (3) the Public Sector Accounting Board (PSAB) Tangible Capital Asset process. 2009–2011 will be the first budget cycle using business case and business unit information which integrates 3-year capital and operating budgets together. At its fully mature stage, the SIAM will facilitate the provision of timely, accurate, and relevant business unit information to the council and senior management.

## **I. Decision Tools**

For 3 years, the City has used a decision-making process (Expert Choice Business Model Software) to assist with the prioritization of capital expenditures. The process applies a triple



bottom line concept and uses 21 criteria to prioritize every project. The model facilitates a cost-benefit assessment to identify the best investments related to how much money is available. This information is presented to an Infrastructure Coordinating Committee (ICC) for final decisions on project prioritization.

The City is also piloting the use of the RIVA (Real-Time Inventory Valuation and Analysis) in its major Business Units. This tool is designed to support infrastructure life cycle modelling and analysis. The system has the capacity to integrate information from the various operational AM systems (including Hansen, DataStream 7i, Oracle World (SPL), Calgary's financial system (PeopleSoft) and geographic information system (GIS) (ESRI). The concept is that better integration across operational support systems improves strategic infrastructure business intelligence and improves asset decisions.

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*The ISR is aligned with National Research Council of Canada's recommendations for municipalities to be able to answer these six key questions:*

- *What do we own?*
- *What is it worth?*
- *What is its remaining service life?*
- *What condition is it in?*
- *What do we spend and what should we spend?*
- *What is the gap?*

## **J. Infrastructure Status Reports**

The ISR is an integral component of Calgary's integrated CAM strategy. In 2003 the Mayor wanted to know, "What are we missing—what are we *not* funding that we should be funding?" The first ISR was developed in 2004 and is considered by staff as the platform and impetus for AM. The ISR provided the response to the Mayor's request and put a value on what infrastructure projects should be funded. The ISR was designed to *onboard* (bring aboard) the council and line departments. The line department managers had resisted the ISR until they saw how council was using it and, thus, its value.

Upon implementation of the SIAM business process in the 2009/11 business cycle, the ISR will compare infrastructure performance against business environment indicators and financial trends and present the expected future effects on service targets and financing levels. While the ISR currently provides a 10-year outlook for infrastructure performance, in the near future, it will align the 10-year infrastructure capital plans within business unit AMPs. Thus, the ISR will be used to make minor annual adjustments to service targets previously set in the 3-year AMPs and to provide guidance for setting service levels for each subsequent 3-year infrastructure AMP.

## **K. Urban Alliance**

Another component of Calgary's AM vision is the Urban Alliance program. Under this program, the City and the University of Calgary conduct research on how to measure the effect of infrastructure investment from the triple bottom line standpoint. The City's CAM team recently conducted a pilot project with the University's Centre for Social Work Research and Professional Development. The purpose of the small pilot project was to explore the social bottom line for infrastructure, identify key social factors relevant to infrastructure, and develop a draft model to be applied to infrastructure decision making.

<b>CAM's Vision:</b>
To support the Corporate Vision of Calgary, the best place to live, through the strategic enablement of safe and reliable infrastructure. — <i>Program Charter, 2004</i>
<b>CAM's Mission:</b>
To implement and continuously improve asset management and stewardship. — <i>Program Charter, 2004</i>
<b>CAM's Mandate:</b>
To manage Calgary's Asset Management Program by providing leadership and advice regarding the implementation of <i>Strategic Infrastructure Asset Management</i> best practices throughout the City of Calgary. — <i>Calgary's Asset Management Strategy, 2004</i>

### Section 3 Lessons Learned

The City has learned many lessons developing and implementing its CAMP:

- 1) Developing a strategic infrastructure AM business process was an imperative to facilitate the provision of timely, accurate and relevant information to council and senior management from AM business units that operated the infrastructure.
  - In building an AM program, start with a long-term view and recognize that its development will take some time. (Do not set in concrete a firm time frame; it is a setup for failure).
  - A successful AM program requires a commitment of front-end training of staff and demands using a common AM language. It was important to speak in plain English and use common terms.
- 2) Start with things that are most practical and meaningful.
  - In the beginning, stick with basic questions such as, “What do we own? What is it worth?” [This can be considered the Phase 1 deliverable]. If this information is refined within 2–3 years, that is a good start].
  - From there the program can move to conducting risk analysis and budgeting.
- 3) It is essential to coordinate the delivery of infrastructure at a community level across business areas. The City has learned to take a more *hands on* approach to the delivery of infrastructure to build *whole communities*, which is imperative to development in a new area.

✚ *The AM program has enabled staff to more easily justify required funding for infrastructure needs, based on better data.*

✚ *The general competency in applying AM concepts has dramatically risen, and senior staff takes the program seriously.*

✚ *The council is becoming more familiar with AM concepts and terminology.*

✚ *As a whole, the City has come a long way but still has work to do. He further stated that*

✚ *This is a double-edged sword, we get the money, but then we need to deliver in infrastructure renewal and construction.*

—L. Brad Stevens, General Manager Asset Management & Capital Works

- 4) Do not hesitate or give in to *analysis paralysis*; just *take the leap* into AM.
  - It is important to encourage a hands-on approach from staff. Allowing staff to *get their hands dirty* and actively participate in infrastructure needs assessments and solutions might be the best way to obtain tangible, short-term gains/savings in AM and set the stage for rolling ideas from lower staff levels to corporate strategic levels.
  - City staffs realize that it is easier to make this suggestion because Calgary's executive management supports implementing AM principles.
  - A strictly top-down approach can exhaust the budget before gains are realized.
- 5) Development of the Roads business unit pilot AMP showed staff how to integrate advanced AM concepts into long term planning horizons.
  - Do not make the corporate strategy too prescriptive. Staff should be allowed to collaborate, which leads to more innovation, rather than be stifled by a strict, prescriptive strategy.
  - Develop a program framework and processes that allow for continual evolution, improvement and innovation. Often, municipalities will establish new programs but inadvertently solidify processes that were intended to evolve over time.
  - The field of AM is continually evolving and, as such, the program's processes must be prepared to adapt accordingly.
- 6) It is not important for a CAM team to have total control.
  - In fact, CAM staff has learned that they actually get more control by giving up control—by demonstrating good ideas, the ideas sell themselves to business unit staff.
  - The CAM team sets guidelines on minimum expectations, so there is consistency, and an AM program framework for the business units to follow.
- 7) Embedding AM staff in the business units is a recipe for success.
  - Encourage business units to move forward with AM on their own and not wait for directives from the CAM team. Calgary has seen very good ideas come from the business units that were eventually incorporated into the Corporate Strategic Plan.
  - Bringing all business units to the table has taught some of the smaller business units how to interact with the larger, older business units, voice their needs and compete for funds.

While it is not yet the mandate of the CAMP to coordinate capital infrastructure delivery and investment in community developments, the CAM team is working with land use planning staff to establish growth management strategies and capital coordination processes as part of a proposed Integrated Infrastructure Strategy. This strategy was under development at the time this case study was being developed.

## Section 4 Benefits of AM

The beneficial outcomes that City staff members have attributed to the CAMP include the following:

- 1) Applying AM principles has begun to positively affect decision making—there is more and better-validated information available for assets on which to base project prioritization and budget decisions.
  - AM program data is useful to better justify capital and maintenance expenses to the public—the City can better make the case for what taxpayers are paying more for and what new assets will cost them.
  - The council is gaining confidence in the data provided under the CAMP.
  - AM provides a great opportunity for breaking down silos between business areas and getting them to coordinate on AM projects.
- 2) Institution of the CAM function has encouraged individual business units to implement AM principles and supports the development of a corporate-wide AM strategy.
  - The process of assessing available data has had the added benefit of forcing business units to clean up their data (*clean house*).
  - The CAM process of bring the separate business units together for discussion about projects has acquainted and educated groups to the necessary trade-offs between assets.
- 3) The Water Resources business unit projects that the AM approach to replacement and rehabilitation decisions has already saved \$30 million in capital replacement and averted \$16 million in main break repair costs over the past 10 years. It will have saved a total of \$50 million on capital replacement over the original 30-year time horizon by 2027. Better, more substantiated AMPs and business cases more readily yield requested funding.
  - Improved data about assets helps the City target certain projects that generate the most significant payback.
  - Improved asset information also helps validate when an asset or project is already optimized, and money can be saved when council knows that additional budget is not needed for optimized assets/projects.
  - The ISR has been proven to be useful to the council and business units. The report was originally designed to onboard council members to the AM process, and now business unit managers and staff turn to the report as the first source for asset/infrastructure information.

## Section 5 Calgary's AM Program — Where is it Today?

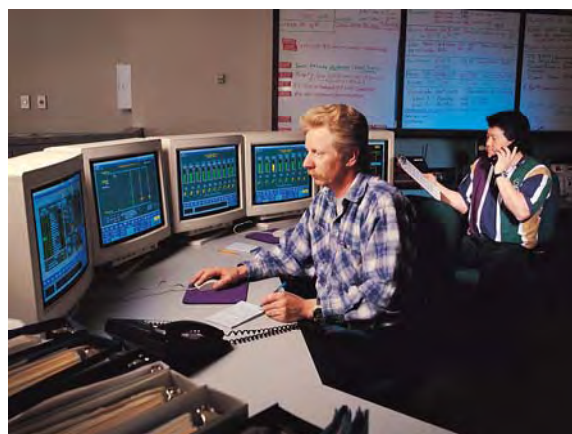
The Corporate Asset Management Teams recent accomplishments include the following:

- Expanded the governance scope of ICC to include growth management.
- Leveraged the AM Network to develop AM Plan framework.
- Linked capital cost escalation to capital budgeting in supported 2008 capital budget adjustments.

- Started to institutionalize AM as a corporate strategy—conducting corporate-wide AM assessments.
- Delivered an AM program integration strategy, including developing communications and change management plans, linking AM to other corporate projects.
- Developed the ISRs.
- Completed CAM business process design for budgeting and began the process automation with Real-time Asset Valuation Analysis (RIVA).

## A. Status of Water and Wastewater AM Practices

Much of the City's infrastructure is still relatively young. The City has essentially completed an **asset inventory** for all water, wastewater and stormwater assets. The assessment of **asset condition and failure modes** will be ongoing and is being addressed on a priority basis. These assessments have been conducted for the entire water network infrastructure and are nearly complete for the wastewater infrastructure.



The City has developed rough estimates for water and wastewater treatment plant infrastructure, but these estimates use industry averages and experience (*gut feel*) of operations staff. Refinements of the estimates will come from experimenting and testing. The City has (1) a high confidence level in its estimates for the **residual lives** of water network assets, (2) is about a year away from an equal level of confidence with the wastewater and stormwater networks, and (3) has estimates from the operations supervisors for the major treatment plant assets.

**Evaluation of life cycle and replacement costs** will likely be done on a priority basis as each asset class ages into consuming significant resources (money, repair costs, replacement levels) that provide payback for the effort of estimating the amount of resources the asset class will require in the coming decade.

- The City has not established a formalized **target level of service** for water and wastewater assets. The working assumption is that generally water and wastewater treatment plants will be upgraded because of changed regulations and City growth, rather than because of asset wear and deterioration. A comprehensive study on these assets is considered premature because the assets are relatively new.
- The City is well along in determining **business risk exposure/criticality** for its largest network infrastructure elements (force and feeder mains, syphons, reservoirs) and has started doing so with pump and lift stations. It plans to have this information by 2009.
- For water and wastewater small mains replacement or rehabilitation decisions, staff are using City asset databases extensively and scientifically to **optimize operations and**

**maintenance investment.** Staff members are not, however, using these data for maintenance decisions. Asset information and criticality estimates are used to prioritize inspections of large-main assets. The inspections, in turn, with criticality concerns can then result in proactive capital replacement. Under current operating procedures, maintenance of large mains is still uniform for all those assets.



- The City has begun a project to set the size and priority of pump and lift station maintenance and replacement work on the basis of asset history, condition and criticality. This project is expected to affect decisions by 2009. Water Resources has a long-term **funding strategy to optimize investment strategies** that are reported annually to management and city council. The dynamic growth of Calgary presents issues, yet staffs feel that they are doing very well in large part because they know the City's needs and the ability of the current infrastructure to address the needs.

Water resources staff members plan to develop the first business unit **AMP** by the end of 2008, refining it to meet senior management's need for comprehensive, long-term planning by 2010. In addition to applying best practices the Water Resources business unit has done the following:

- Diverted \$500,000 per year from water main replacement starting in 1997 to build an infrastructure database and research the status of the infrastructure. \$2.5 million was diverted to new electromagnetic field inspection technologies that determined the condition of 110,000 meters of the worst water mains, and \$2 million per year has been diverted from main replacement to mains rehabilitation via corrosion protection, (anode retrofit), all using what are now standard AM approaches to capital management. This has resulted in the savings of tens of millions of dollars.
- Used the database of 30,000 sewer video inspections combined with cost-benefit analyses of the alternative strategy of sewer lining (rather than sewer replacement), to cancel a planned expansion in the sewers replacement budget from \$4 million to \$10 million. The new strategy involves investing in more inspections, spot repairs and lining.
- Used AM cost-benefit and triple bottom line risk-management analysis to justify, cost-size and initiate a \$1 million per year water feeder main inspection program. It will also use new sensing technologies to avert the largest risks of feeder main failure applying a least cost approach. This new undertaking was in response to the massive feeder main failure in 2004 that cost over \$1 million in repairs and significantly compromised service to an area for months.

## B. Status of Roads AM Practices

The Roads business unit has an **asset inventory** of all assets in a GIS. The assets are broken into following major categories (with many subcomponents): Pavement; Concrete (which includes sidewalks, curb and gutter, medians); Bridges; Streetlight System; Traffic Signals; Traffic Signs and Road Markings.

- The Roads business unit is consolidating individual systems and developing a single asset register for all its assets.
- The Streetlight System, Traffic Signals and Traffic Signs have been completed, and the unit is working on the Pavement, Concrete, Bridges and Road Markings.
- By mid-2009, the asset register is expected to be centralized for all the assets listed above. The Roads business unit has a bridge management system that houses data on extensive condition assessments of the bridges. The City also has a bridge preservation program, which is separate from the bridge management system.

The business unit's status with **assessing asset condition and failure modes** is as follows:

- A visual condition inspection of 100 percent of the road network is performed annually.
- International Roughness Index information is collected using a laser-equipped van for a sample of the pavement network.
- Condition assessments are performed regularly for all other asset classes as determined by the asset manager;
- Useful lives have been estimated for all asset classes; an annual ISR is produced that reports on the condition of all assets, replacement value and remaining life.
- Planned activities include developing rigorous deterioration models for assets; determining the dominant failure mode for each asset. Also, historically the Roads business unit has focused on physical failure but is looking at other failure modes as well (capacity, demand, financial efficiency, and so on).

Status of **determination of residual lives** is as follows:

- An annual ISR is produced to report the condition of all assets, replacement value and remaining life; and useful lives have been estimated for all asset classes.
- The business unit bases residual life on a time scale for certain assets that do not have well-defined deterioration curves, such as signs, but would like to develop models that will account for physical condition and levels of service for these assets. Pavement, structures and steel poles have better deterioration curves associated to them.
- To **evaluate life cycle and replacement costs/economic evaluation**, the business unit has performed some life cycle costing on its assets by analysing annual budgets and estimated lives of its assets. In addition, life cycle costing and economic evaluation was part of the business unit AMP.

**Levels of service** are defined for many of the Roads assets.

- These levels of service include such things as response times to customer complaints, time taken to complete one pass of the major roads for snow and ice control, response time to replace priority signs, response times for responding to traffic signals trouble calls, and so on.
- The Roads business unit conducts an annual citizen satisfaction survey that is specific to roads. This business unit uses this data to understand customer values and expectations. This year Roads will work with the CAM team to refine its definition of asset levels of service.



The business unit has completed a **high-level risk assessment** for all its assets. The risk assessment was done for each asset class, not the individual assets. This risk assessment allowed the business unit to understand the asset areas that have the greatest business risk exposure ratings. The next step will be to look at business risk exposure for individual (high-risk) assets and to state the business risk exposure using a common measure (dollars).

With respect to **optimizing operations and maintenance investment** the City's Roads department has several initiatives.

- **Pavement & Concrete:** The Materials & Research section is actively involved in testing the performance of a variety of materials. Asphalt mix designs are chosen on the basis of the test results.
- The City also has a laser-equipped van that it uses to perform inspections that measure the International Roughness Index of the pavement. It uses this information along with visual condition inspections to define the surface overlay program.
- **Streetlights:** The City has a pole and cabinet painting program to extend the life of these assets, and the City is using junction boxes to splice underground cables rather than replacing entire spans. The resulting cost savings allow more repairs to be completed in the same budget. The City completed a streetlight retrofit project to replace the luminaries on residential streetlights with lower wattage streetlights that minimized the amount of light pollution. The result environmental benefits and financial efficiencies.
- **Traffic Signs:** The City has installed test signs facing different directions (to vary the sunlight exposure) to evaluate the performance of different reflective materials. It uses test results when specifying materials for use on the signs.
- **Road markings:** The City monitors a number of test sections to evaluate the performance of different types of paint and durable markings.



The City's **capital investment strategies are optimized** using the Transportation Infrastructure Investment Plan (TIIP). The TIIP defines the priority and timing of major infrastructure construction projects and life cycle maintenance programs for the Roads department.

- The City reviews this plan is reviewed every 2 to 4 years to update priorities and funding. According to the annual citizen satisfaction survey, transportation issues continue to be a main concern for Calgary's citizens.
- This TIIP update addresses these concerns by recommending infrastructure and programs that improve mobility; align to council's approved sustainability principles; and reflect themes in council goals and priorities for the 2009–2011 business planning cycle.
- The City developed a robust and inclusive methodology that considered input from multiple stakeholders and measured alignment to smart-growth principles. TIIP 2009–2018 forms the basis for the Roads department's 3-year business plan, and capital budget and is one of the main mechanisms to implement strategic planning objectives and promote smart growth.

The Roads business unit is planning to refine its **AMP** in conjunction with **determining a funding strategy**. In 2008 the Roads business unit hired a consulting team to help develop its first business unit AMP. As part of the process, current business practices were reviewed and evaluated against world's best practices. The AMP also included a 100-year funding forecast on the basis of a preferred management strategy for each asset type.

## C. Information Technology

Calgary found that it was important to establish early the approach to integrating the IT process at the corporate, strategic level. Collaboration with the IT group has been a key to sustained AM process improvement. The City purchased the RIVA business intelligence tool to assist with life cycle costing analyses. The Roads, Buildings, and Fire business units are getting underway with life cycle costing using these tools. Calgary's approach to integrating all business unit data systems is to wait for the IT market to produce more attractive and viable solutions.

### *Section 6 What's Next?*

In the near term, the CAM team will support the business units in developing their AMPs. The long-term goal of the CAMP is to develop a sustainable process to deliver a sustainable City built on a hierarchy of plans. The CAMP's ultimate focus will be on cost, level of service, risk relationships, and corporate and business unit strategies.

The highlights of the CAM team's objectives for 2008 and into 2009/11 (from the Strategic AM Update, 2008) include the following:

- Manage the 2009/11 capital budget prioritization process, including management of the ICC prioritization process and the delivery of capital expenditure.
- Manage the initiation of AM planning for the corporation including completing AM assessment for 13 business units, delivering 13 preliminary AM Implementation Plans and a draft corporate implementation plan; developing an AMP Guideline and a

- preliminary Corporate AMP Strategy; and developing an overarching Infrastructure Strategy for the corporation.
- Provide ongoing infrastructure reporting to Council and the Administrative Leadership Team.
  - Enable various business process and IT improvements in the corporation as related to AM, including implementing a corporate-wide AM business process that links to other corporate business functions.
  - Develop and support an external infrastructure advocacy framework for presentation to the ICC, including developing an external Infrastructure Advisory Committee.
  - Further support the research of Canadian AM standards and best practices by working with Edmonton/Vancouver establishing the Trilateral Learning Forum and continued support national AM through active participation in the National Roundtable for Sustainable Infrastructure, InfraGuide, Municipal Infrastructure Investment Plan, the Urban Alliance and other university-based research projects.
  - Provide professional advice and governance support to the Mayor's office, the Administrative Leadership Team and the ICC regarding sustainable infrastructure strategy and financing.
  - Assist the ICC to identify key systemic financing issues within the existing capital budgeting methodology, including prioritization of the corporate infrastructure bucket capital requirements.

## *Section 7 Background Facts*

Calgary is governed in accordance with Alberta's Municipal Government Act (1995). The citizens vote for members of the Calgary city council every 3 years, with the most recent vote in October 2007. City council consists of the Mayor and 14 full-time council members. The City has an operating budget of \$2.1 billion for 2007. Forty one (41) percent is from property taxes. \$757 million in property taxes are collected annually, with \$386 million from residential and \$371 million from non-residential properties. Fifty-four percent of the budget is for wages of the 13,043 city employees and expenditures.

Thirteen (13) business units manage the City's infrastructure and are involved in the AM program

- Calgary Police Service
- Civic Partners
- Corporate Properties & Buildings
- Emergency Medical Services
- Fire
- Fleet Services
- Information Technology
- Parks
- Recreation
- Roads
- Transit
- Waste & Recycling Services
- Water Resources/Water Services

## A. Water and Wastewater Resources

The Water Resources business unit is responsible for the operation and maintenance of all water, wastewater and drainage infrastructure in the City. Water Resources is also responsible for the collection, transmission, treatment, and disposal of all wastewater and stormwater generated in Calgary.

- Calgary's storm system runs 3,600 kilometers (km) of mains, 29 pump stations and 148 retention ponds.
- The water system includes two water treatment plants (Glenmore and Bearspaw, undergoing upgrades) a concrete gravity dam, 70,000 valves, 4,600 km of transmission/distribution pipe, reservoirs, pump stations and 290,000 service connections.
- The City operates three wastewater treatment plants (Bonnybrook, Fish Creek and Pine Creek) 4,000 km of wastewater mains, 295,000 lateral connections, 55,000 manholes and 27 sewage lift stations. The business unit also operates the Glenmore Reservoir and Glenmore Dam.

## B. Roads Resources

The Roads business unit is responsible for assessing, designing and optimizing permanent and temporary traffic controls; maintenance and operation of street lighting and traffic controls; infrastructure repair and life cycle maintenance of structures, roadways, sidewalks and other roadway assets; street cleaning and snow and ice control; reviewing new road infrastructure designs, monitoring quality, and managing delivery processes (e.g., local improvements and new subdivisions).

Roads assets include:

- 7,042 lane-km local roads; 2,711 lane-km collector roads; 2,879 lane-km arterial roads.
- 6,057,447 square meter (m<sup>2</sup>) sidewalks; 2,129,000 meter (m) pavement markings; 6,537,000 m streetlight wires.
- 161 vehicular bridges; 117 pedestrian bridges; 93 other (light-rail, rail subways and parks).
- 122,000 traffic signs; 3,070 traffic signal poles.
- 280 pedestrian corridors.
- 69,297 streetlight poles; 78,921 lamps; 793 traffic cabinets; 534 streetlight cabinets.

## Multisector Asset Management Case Studies

### CHAPTER 3 THE HAMILTON, ONTARIO, CANADA EXPERIENCE

The City of Hamilton (City) is a port city in the Canadian province of Ontario with a population of approximately 500,000. Hamilton is on Lake Ontario midway between Toronto and Buffalo, New York, on the western end of the Niagara Peninsula. Its major physical features are Hamilton Harbour, marking the northern limit of the City, and the Niagara Escarpment running through the middle of the City across its entire breadth, bisecting the City into upper and lower parts. Hamilton is known as Canada's Steeltown because of the presence of major steel manufacturers. Hamilton's population is expected to increase to 622,420 by 2031 at the current growth rate.



## Section 1 Executive Summary

Hamilton is applying asset management (AM) principles across its transportation, water and wastewater assets. Hamilton has a dedicated AM group of 22 staff that is responsible for buried infrastructure (water and wastewater distribution and collection) and above ground assets (pavement, bridges, parks, public works facilities). The AM group resides within the Capital Planning and Implementation Division, within Public Works. The AM group sets and facilitates all AM policy and oversees and coordinates all infrastructure projects. The General Manager of Public Works ensures that the AM policy is carried out across other divisions and promotes the policies and practices across the corporation.

Two senior staff co-manage the group.

- One manager is in charge of surface assets and finance.
- The other is responsible for buried infrastructure and information technology.

The AM group is responsible for the citywide condition assessment of surface and subsurface assets. The condition assessment is used to forecast and schedule appropriate rehabilitation and reconstruction activities to produce an annual capital budget program. The AM group monitors current levels of service, life cycle trends and deterioration models to plan and develop (1) an integrated 3- to 5-year detailed budget, (2) a 20-year long-range capital budget and (3) a 100-year financial forecast to predict the City's infrastructure investments.

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*The need to develop a strong technical AM program that optimizes asset life cycle is critical in the quest for sustainability.*

Gerry Davis—Senior Director, Capital Planning & Implementation, 2008

The City's vision for an AM program began in 1998 when senior managers began focusing on questions about asset sustainability and funding issues. They became acquainted with the international model for managing assets (as characterized in the International Infrastructure Management Manual). The managers began to apply AM principles and developed a financial sustainability plan.

In 2000, the Province of Ontario required the amalgamation of the Regional Municipality of Hamilton-Wentworth and six other municipalities into one city. The reorganization brought about by the amalgamation provided the impetus for creating and funding an AM group.

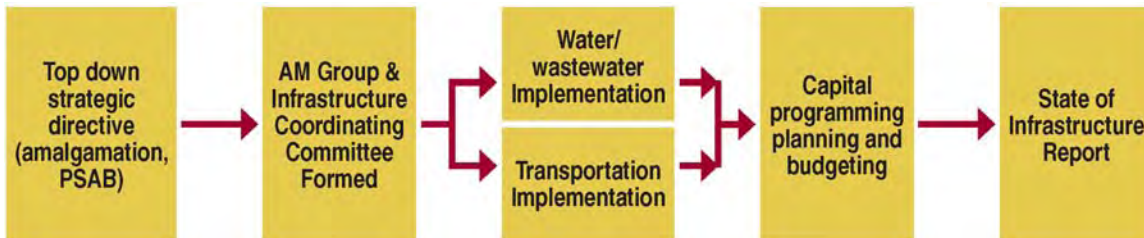
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*City managers planted the seed for AM in 1998, and the reorganization caused by amalgamation of the municipalities gave managers the impetus for creating and funding an AM group in 2001.*

- There was general consensus around the need to move away from the *silo mentality* of keeping asset groups separate, and
- Promoted a more integrated approach to dealing with the economic and geographic diversity of the seven municipalities that were being joined through the amalgamation.

Hamilton’s AM approach is an integrated, bottom-up approach that gained momentum in conjunction with the amalgamation.

Top executive managers seize upon the opportunity presented in the amalgamation. Today, a decade later, the city council highly values the City’s AM approach. Information provided by the AM group helps council members deliver quality services at the lowest possible tax structure while also addressing their constituents’ needs with respect to infrastructure projects and necessary funding, and it helps the council make the business case for projects.



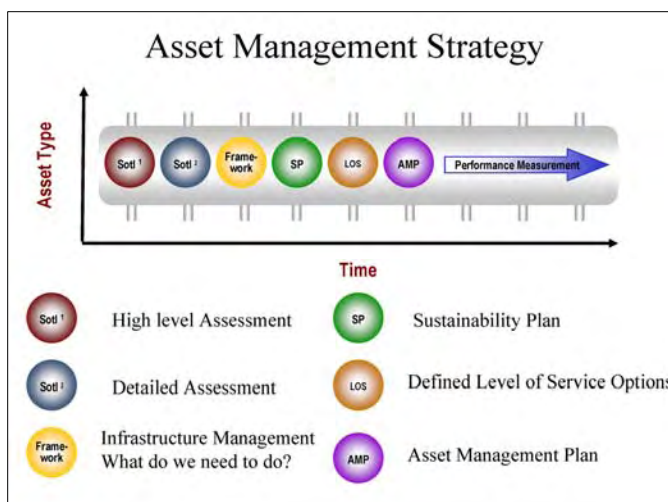
Constant communication and education of council members has been instrumental to Hamilton’s successful AM program. The communication and education strategies between AM staff and council members include: (1) annual one-on-one meetings and (2) City tours and (3) developing informational materials for specific issues. These approaches have built relationships and trust between City staff and the council and have built credibility for the AM program.

*AM helps us show the total picture to our constituents, and helps us build the business case. We take our alternative solutions to the people to get buy-in to the best solution. I highly recommend this process to other cities.*

—Russ Powers, City Councillor

The City is ahead of most cities in North America in implementing generally recognized AM principles and practices and is working toward its goal of development of an Enterprise Asset Management Plan.

The City has experienced the benefits of applying the AM principles. Staff members feel that their program is validated because of the many representatives from U.S. and Canadian cities that have sought Hamilton AM staff expertise and the many inquiries about the City’s AM program.



The dialogue with other cities has provided significant value in developing theories and approaches to AM. It was in light of these consultations Hamilton initiated a national AM group known as CNAM (Canadian Network of Asset Managers). This group’s board of directors consists of 14 people representing 7 major cities across Canada. To date, the group has successfully run two national working sessions drawing

participation from more than 120 people representing more than 30 cities and municipalities from across the country.

Other benefits of AM include the following:

- Via the AM program, staff can demonstrate to City management and the public that the City is using its resources cost-effectively.
- The AM processes and information produced has sped up the capital budget development process.
- The process has taught all players to see the community as a whole and how the assets function together to deliver a higher quality of life.

*The State of the Infrastructure annual report is an invaluable communication and long-term planning tool. It serves as the AM program's guiding document and is key in providing a communication bridge between the AM group and the city council.*

—Russ Powers, City Councillor

The City has produced *State of the Infrastructure Reports on Public Works Assets* for 2005 and 2006. The reports have served to promote support for the AM program from staff, politicians and the public. The focus of the reports is to evaluate the current state of various public works assets within the City to; (1) predict their status in 2020, (2) identify major funding gaps and (3) recommend policy. The reports present over the life cycle of the asset, operating and capital costs improving the understanding of revenue requirements.

The City also develops annual State of the Infrastructure Report Cards to provide an easy-to-understand reference (updated regularly) to track the City's path toward sustainability.

The City's Public Works Department developed a strategic plan in 2007 titled *Innovate Now! A Compass to Public Works to 2017*. The strategic plan; (1) defines the City's fundamental purpose, (2) explains its vision for 2017, (3) identifies top priorities critical for achieving the vision and plans.

City of Hamilton 2006 Infrastructure Report Card			
Asset Group	Rating 2006	Comments	Trend 2020
Public Transit Services	B	The transit system appears to be sufficiently funded at this time, on a full pay-as-you-go basis. Ratio of fares to subsidy is currently about 1:1, and is projected to increase to 1.2:1 as ridership increases. Future growth of the City, as well as plans to improve and expand service will require annual increases in the Transit budget of 3% plus inflation.	
Central Fleet Services	C	Fleet Services ins now on a full-cost recovery basis with full replacement charges to the user departments. Slight increases in reserve fund contributions can result in significantly lower cost over all and should be implemented as soon as possible.	
Waste Management Services	C	Waste Management Services are rapidly growing. This will create a "bubble" of assets that will require rehabilitation and replacement in a similar short time frame in the future. Future growth of the City will also put tremendous pressure on this service. The Waste Management Master Plan is currently being developed. However, failure to develop and implement the necessary infrastructure reinvestment policies in the short-term will cause the future trend to deteriorate rapidly.	
Forestry Services	F	Forestry Services face the largest revenue gap of all Public Works assets, or approximately 5x the current levels. Forestry assets offer significant environmental benefits, and realistic expectations and plans must be developed. Reliance on capital will only exacerbate the problem, ultimately increasing cost 40%. Doubling the tree canopy coverage from 14% to 30% needs to be revisited. Even if developers were forced to plan one tree per new property, ongoing liability for these increased forestry assets need to be considered.	
Traffic Services	C	Traffic Services are under-funded by at least \$10 million / year. Growth of the City will increase assets. Some current assets are approaching the end of their useful life and pavement markings and signage are not up to standard.	
Cemetery Services	B	Cemetery Services are slightly under-funded. However, analysis includes contributions to reserves for rehabilitation of facilities and ultimately replacement of those facilities. Two risks that should be addressed through future analysis and policy: insufficient funding in the trust funds require annual contribution of \$2M from the levy and private cemeteries being transferred to the City should be abandoned.	
Facilities – Communal & Corporate	F	Facilities face a significant shortfall in revenue. Lack of operating and maintenance funding results in accelerated deterioration. Facilities are more capital intensive than most assets: unlike other assets, a good proportion of operating budgets is spent on program delivery and not necessarily on asset preservation. Service levels and expectations are closely linked, with partial funding coming from user fees with the associated sensitivity to social impact and quality of life. There is still a great deal of work to be done in this area in terms of more-well founded State of the Infrastructure Report in the future.	

## Section 2 *Hamilton's AM Vision and Triggers for Initiating AM*

### A. Initial Vision

The foundation was set for Hamilton's AM program in 1998 in the Water and Wastewater program. The leading edge (champions) for Hamilton's AM vision included the Directors of Water and Wastewater and the Capital Finance Department and several council members. At this point, the staff looking at the sustainability of assets were not yet calling the endeavour AM — they just “knew they had a problem” and recognized that “getting a handle on how to sustain the City's infrastructure” was critical to the future well-being of the community.

As a starting point, Hamilton focused on thinking about asset sustainability and funding issues. They began by reviewing a study by the Canadian National Research Council called the *Municipal Infrastructure Investment Program* and learned about the *International Infrastructure Management Manual* for managing assets. The initial challenges were obvious:

- The City's infrastructure was aging (with some assets dating back to the mid-1800s),
- There was little available data on assets,
- Water prices were insufficient to cover actual construction and maintenance costs.

Realizing that they were facing a potential crisis, the staff developed models on sustainability. They concluded that Hamilton needed to start increasing water rates by 8 to 10 percent annually to over the long run sustain their services. The city council recognized the value of the AM based approach and approved the increase in rates for water and wastewater services to address the funding gap identified in the initial financial sustainability plan.

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*There were several triggers for Hamilton's AM program:*

- *Forward thinking by managers*
- *The amalgamation*
- *Public Sector Accounting Board requirements*
- *Drinking water and wastewater regulations*

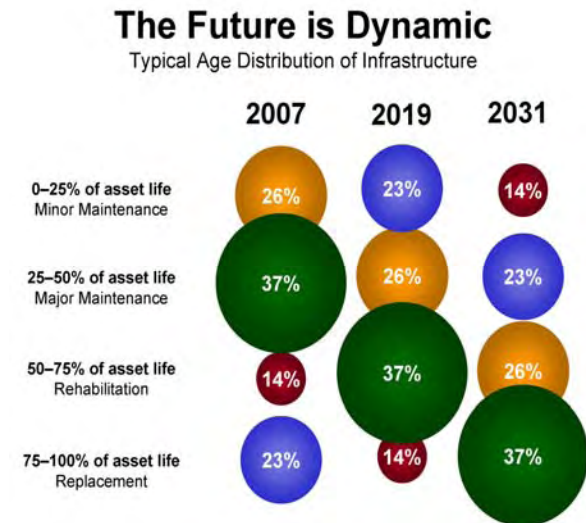
### B. Amalgamation

In 2000, the Province of Ontario required that the Regional Municipality of Hamilton-Wentworth and six other municipalities be combined into one city. On January 1, 2001, the new City of Hamilton was formed from the amalgamation of the regional municipality of Hamilton-Wentworth and its six municipalities (Hamilton, Ancaster, Dundas, Flamborough, Glanbrook and Stoney Creek). After the amalgamation, Ontario hired a new City Manager and executive team for Hamilton.

Obviously, at the crux of the challenges associated with the amalgamation was the complexity of integrating a multitude of assets that were previously managed under seven different jurisdictions. The managers that were promoting the concept of AM saw the amalgamation as a strategic opportunity to establish a whole new service program called Asset Management. In 2001 the managers created an AM group. The initial AM group began developing forecasts for the City's



overall asset life through 2031. The basic concept was to present with greater confidence the dynamic life cycle requirements of Hamilton's aging infrastructure.




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*The 2001 amalgamation was a catalyst for our AM program, now arguably one of the most mature programs established in Canada.*

Gerry Davis—Senior Director of Capital Planning and Implementation, 2008

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*If you do not attend the coordination meetings, you do not get funding for your projects.*

—Infrastructure Project Coordinating Committee

To establish its importance and authority, the executive team gave the new AM group control of funding and approval of infrastructure improvement projects. Under the process:

- All projects were required to go through the AM group for review to ensure that AM processes were applied and that the projected costs were correct.
- If not, the AM group would send back the project plan for further refinement. The AM group's authority is not based upon a legal construct, rather the group's role is to encourage other groups to adopt AM best practices, and it defines and approves projects and moves them along to the Director, then to Council.

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*These figures were the catalyst needed to energize the asset management movement in Hamilton.*

—Gerry Davis, Senior Director of Capital Planning & Implementation, 2008

Over time, the confidence in the AM group's capacity grew to a point where Hamilton's Council looks for other groups to follow the same policies and processes as the AM group. Staff members believe that the authority given to the AM group to control the budget has been one of the major keys to making improvements to the AM processes and practices.

In a further process refinement, the General Manager created the Infrastructure Project Coordinating Committee to provide a forum for all business units to become jointly involved through the review of the infrastructure projects planned by the AM group. This coordination allows feedback and issue identification before the plan is finalized. To ensure participation, senior managers instituted a participation rule: *If you do not attend the coordination meetings, you do not get funding for your projects.*

The City also found that it was essential to include the operations and maintenance (O&M) representatives at the coordination meetings. Their asset specific knowledge and close contact with the assets, made it essential that the O&M staff members play an important role in identifying and prioritizing projects.

### **C. Public Sector Accounting Board**

There is no provincial or federal mandate for AM in Canada; however, the Public Sector Accounting Board (PSAB) requires municipalities to account for their worth including value of assets (based on historic costs). This PSAB requirement is similar to the Governmental Accounting Standards Board Statement 34 in the United States. Hamilton has three full-time staff members responsible for addressing PSAB requirements. They report conjointly to the AM managers and Finance Department managers. City staff reports that the PSAB requirements provided further impetus for applying AM principles.

### **D. Drinking Water and Wastewater Regulations**

New drinking water and wastewater regulations also provided momentum for applying AM principles. An outbreak of *Escherichia coli* in Ontario in 2000 caused seven deaths and the expenditure of \$250 million, Ontario enacted new regulations related to drinking water and wastewater quality and protection. The 2002 Safe Drinking Water Act (SDWA) was enacted to protect human health through the control and regulation of drinking water systems and drinking water testing.

The SDWA requires certificates of approval for water and mandates AM concepts such as risk assessments, sustainability plans and growth projections. The act also requires municipalities to conduct a risk analysis that presents probability of failure, criticality and contaminant detect ability. Municipalities also must prepare financial plans that present data on costs, rates and forecasting revenue requirements, including replacement. The legislation sets a minimal acceptable level of service for drinking water treatment plants. These regulations are seen as major legislative drivers for AM.

The Sustainable Water and Sewage Systems Act also passed in 2002, makes it mandatory for municipalities to assess the costs of providing water and sewage services and to recover the amount of money needed to operate, maintain and replace them. Although, the Act is not yet in force pending associated regulation. The requirements set under the SDWA are seen as precursors to the regulations in the Sustainable Waters and Sewers Act. Under the Sustainable Waters and Sewers Act, municipalities will be required to provide a full cost report for both their water and wastewater operations—including information on the infrastructure and investment needed to provide water and wastewater services, the full cost of providing those services and the revenue obtained to provide those services—and a cost-recovery plan describing how the



municipality intends to pay for the full cost of providing the services. In addition, the act will require municipalities to establish and maintain a dedicated reserve account for their water and wastewater operations so that cost recovery plan revenues are segregated from the municipality's general revenues.

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*The City's strategic plan for public works calls for the City to run its AM program from a triple bottom line perspective—taking into account environmental and social performance in addition to financial performance.*

## E. Strategic Plan

In the 2007 strategic plan called *Innovate Now! A Compass to Public Works to 2017*, the City identified three core capabilities it wants to maintain and strengthen: environmental knowledge and advocacy, adaptability and integrated community sustainability planning. The City added five new strategies to support and enhance its services (students of the community; employee-centered; cross-enterprise efficiencies; risk tolerance; and culture of innovation). The City's strategic plan for public works calls for the City to run its AM program from a triple bottom line perspective—taking into account environmental and social performance in addition to financial performance.

<b>Vision 2017:</b>	To be recognized as the center of environmental and innovative excellence in Canada.
<b>Fundamental Purpose:</b>	Provide safe, strategic and environmentally conscious services that bring our communities to life. <i>Innovate Now! A Compass to Public Works to 2017, 2007</i>

## Section 3 Lessons Learned

The City has learned several lessons developing and implementing its AM program. The Senior Director of Capital Planning and Implementation offered that getting the process started can be overwhelming and that it is difficult to even determine where to begin. Another lesson learned is that it is important to form a strong relationship with decision makers (i.e., city council) to build a successful and credible AM program. The State of the Infrastructure report has been important in setting the program's framework and as a go-to-guide for staff and council.

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*Understanding basic AM issues and policies, is a key component of the discussion with the community on what services it wants in the future, how much it is willing to pay, and in what manner it is willing to pay for them.*

—2006 State of the Infrastructure Report

*“Just jump in! We made mistakes and asked for forgiveness (instead of permission).”  
“Do not be afraid to step forward—even if you fall on your face, you are still moving forward.”*

Senior Director of Capital Planning and Implementation

Additional insights offered by staff and managers to others initiating AM programs include the following:

- 1) Do not reinvent the wheel. Build on what has been done by other communities. Follow the *International Infrastructure Management Manual*—it is cradle-to-grave in its approach.

- The City realized that *assets were becoming liabilities* and that coordinating and approving every capital project through the AM group was critical. The authority given to the AM group to control the budget was essential to making the process work.
- Strive to achieve *quick wins* or early demonstrations of clear improvements in the AM process. Also demonstrate early how better information to improve decision making.



- 2) Educate the public and council on the value of the infrastructure. Clearly demonstrate the critical need to change from the current practice. Hamilton did the latter by developing forecasts for the City’s overall asset life through 2031.
  - Use participatory strategies (council tours and presentations to the public) to involve users in changing the current practice.
  - The biggest challenge may be on the people side: (1) getting staff, politicians and public to buy in and participate (2) convincing people to change their mindset (even getting them to listen).
- 3) Upper management support is essential to the success of an AM program.
- 4) People who are willing to play in an unrestrained format (i.e., they have open minds and an innovative spirit) are valuable to the process.
  - Staff had to break through the mindset that AM was not a data system and teach people that it goes beyond that—AM is a business model, a way of thinking and making investment decisions about physical assets.
  - Staff and managers must exercise patience with all parties.
  - Be tolerant of mistakes because it is the only way to move forward and improve.

- Be willing to share knowledge and experience with peers.
- 5) Departure of key people has a huge effect on the AM process, and lack of adequately trained staff can be a major challenge.
  - 6) Improvements can be made as an industry much quicker than as individual cities.

## Section 4 Benefits of AM

- 1) A key benefit the City has realized from its AM program is the strong working relationship it has built between the AM group and city council.
  - The council has fully accepted the AM principles and practices and recognizes that the AM program helps them do their job and that they are *doing the right thing* for their community.
  - The council has confidence in the funding requests made by the AM group on behalf of the Public Works Department, and funding requests are more easily approved.
  - The council has embraced the AM policies and can better relate return on investment data to funding decisions. The AM program has benefitted greatly from working to obtain buy-in from council members.
- 2) Constant communication and education of council members has been crucial to Hamilton's successful, sustainable AM program.
  - Every year, the asset managers meet with every council member to review the latest 3-year capital plan.
  - The managers spend a day with each council member and update them on the status of the AM program.
  - Staff members refer to these meetings as Council Boot Camp.
- 3) Also once a year, the AM group takes the mayor and council members on a bus tour to every ward. The City tours with council members are very well received and are considered a *reality check* for members to present their specific issues and compare issues with other wards.
  - This approach has helped the AM group reduce hesitation from council members to promote projects in other wards.
  - The AM group also provides ward maps to each council member denoting current and future public works projects and meets with council members throughout the year about specific projects.

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*The communication strategies between AM staff and council members include annual one-on-one meetings (Council Boot Camp), citywide tours with all council members, and development of ward-specific informational materials.*

- The AM group also provides information to council members when they are responding to constituents about the status of specific projects.
- 4) Additional beneficial outcomes that City staff members have attributed to the AM program include the following:
- The process has taught all players to see the community as a whole and how the assets function together to deliver a better quality of life.
  - Via the AM program, staff can demonstrate to city management and the public that the City is using its resources cost effectively.
  - The AM process, and information produced, has sped up the capital budget development process.
  - The AM process sets expectations and the demands are greater for how and what to deliver. AM raises the understanding of community needs.
  - The council asks more informed questions now and has asked that the AM program incorporate other areas, such as parks.
  - The AM process enabled the City to provide a better and more efficient level of service—the AM group is a *one-stop shop*.
  - The City now is better able to quantify what assets it has and what they require to sustain performance.
  - AM staff members are recognized by their peers as experts on the AM process. Having staff asked to speak at conferences across North America reinforces that the City is doing the right thing.
  - The finance department now reports on asset deficits and uses AM concepts in its budget projections.

## Section 5 Hamilton's AM Program—Where Is it Today?

The City is finalizing its **asset inventory**. The City's **assessment of asset condition and failure modes** has been done for some time for roads and wastewater, and the assessment for water system is just being finished. The AM group has determined **residual lives** (the remaining useful life) of its asset inventory and has evaluated **life cycle and replacement costs**.

The City sets a target **level of service** at a high level for annual presentation to the city council. The staff plans to include willingness to pay techniques in water and pavement condition techniques in transportation to develop future levels of service. Staff members have just completed **business risk exposure/criticality** scores for linear water assets (pipes) and are in the process of establishing scores for plants and facilities. Nothing has been done for wastewater yet. Business risk exposure scores were developed for roads through the Red Hill Valley sustainability plan.

With respect to **optimization of operations and maintenance investment**, staff members say that although they are not 100 percent there yet, the framework for this step exists. The City is just starting this on the transportation side and is setting key performance indicators for linear assets and water and wastewater treatment plants.

In the water program, the City is changing operating practices on the basis of capital strategies. The City is in the process of issuing a request for proposal (RFP) to provide the City with a Right of Way Asset Management Business Optimization (RAMBO) system. The City is planning to build the RAMBO system, which will draw on captured data and greatly assist in optimizing decisions across various asset types. **Optimize capital investment strategies**—staff members say they are doing this step, yet it is not optimized.

The State of the Infrastructure reports and working relationship with the corporate finance group is assisting the City in **determining its funding strategy**. The City aspires to developing its **Enterprise Asset Management Plan** within a couple years. Again, the RAMBO system will assist with this task.

### A. Red Hill Valley Project

A project following the AM framework developed for roads is the Red Hill Valley Project. This is a very large infrastructure project that consists of construction of the north-south leg of the 403 QEW parkway; an 8-



km, four-lane, 90 km/hour, controlled-access parkway; a truck-climbing lane; multiple stormwater management ponds; stabilization and realignment of Red Hill Creek; construction of combined sewer overflow pipe; and landscape management. For this project, the AM group identified trends and issues that the community will face over the life cycle of these new assets.

## **B. Information Technology**

After the amalgamation, the City inherited seven different road and bridge management systems. Hamilton decided to replace all systems with the Hansen pavement management system, which provides the City with the ability to do activity-based costing. Hamilton now has 5 years of pavement management data. Field crews have the ability to input data directly into the Hansen data system. Hansen has also been the information management platform for water and wastewater data since 1995, including failure codes and customer service codes and this is directly tied to payroll. A similar capability is not yet available on the roads side.

## **C. Ongoing AM Projects**

The AM activities in progress include the following:

- Ongoing asset inventory data capture and initial assessment. Hamilton is using a Global Position System to determine the exact location of sewer lines as staff moves through maintenance inspections. Ongoing data is capture from as-built drawings
- A Road inspection program to monitor the condition and commission repairs or rehabilitation of all paved surfaces.
- A Bridge Management System that includes the inspection of bridges every 2 years
- A maintenance pothole inspection program that includes full system inspection of a 3-year cycle, including development of a condition assessment rating system to support this program
- Multiyear, program-based contracts for relining the sewer system.
- Linking construction to the AM program so that an asset condition assessment can be updated in an efficient and reliable manner when construction is completed.
- Ongoing capture of water pipe condition assessment along with asset attributes such as soil conditions, pipe material and installation date
- Ongoing data analysis of assets such as tracking breaks per km, flow problems, odor complaints, back-ups, flows, pressures, and such.
- Hydrant inspection program performed by operations staff.
- The ongoing geospatial data capture in Intergraph and Hansen.
- Conducting pavement condition survey every 5 years with Hansen (using use laser trucks and video capture including sign inventory).
- Implementing business processes for the Water main Management Framework.



## Section 6 What's Next?

After the initial impetus, Hamilton's approach to implementing AM practices has been largely *bottom-up*—that is, driven by concerted but rather separate efforts within each sector (Water and Transportation) loosely integrated by the co-managers. This strategy (as opposed to a *top-down* approach driven by a highly integrated roadmap) allowed the City to adopt best practices at the asset level faster.

- Hamilton will continue to work toward developing an Enterprise Asset Management Plan.
- Staff members say a challenge they have is that their strategies are not adequately documented because they simply have not had the time to devote to it.
- The next step will be to take the two frameworks that exist— (water and wastewater and transportation) —and pull out the commonalities to set a common AM framework.

The AM group will continue to research and integrate innovative AM tools.

- Staffs are looking to update deterioration models, using a significantly larger data set to more accurately reflect the deterioration of linear water and wastewater assets.
- Another tool the AM group is studying is the Pipe Assessment Technique Rationalization Tool, which measures actual pipeline distress (direct assessment) or surrounding factors that will likely influence pipeline deterioration (indirect assessment).
- The City is also applying trenchless rehabilitation techniques in the maintenance of its linear water and wastewater assets. Trenchless rehabilitation techniques for maintaining and rehabilitating wastewater and stormwater pipelines and manholes include cured-in-place pipe, sliplining, pipe bursting and spray lining.

The City expects to achieve sustainability with water and wastewater assets at current levels of service in 2009—a remarkable goal for the AM program.



## Section 7 Background Facts

Citizens of Hamilton are represented by three tiers of government. The federal representation consists of five members of parliament serving in the Parliament of Canada. At the provincial tier, there are five elected members who serve in the Legislature of Ontario. The municipal tier consists of one mayor, elected citywide and 15 city council members, elected individually by each of the 15 ward divisions to serve on the Hamilton city council.

The Hamilton city council is granted authority to govern by the province through the Municipal Act of Ontario. Ontario has supervisory privilege over the municipality and the power to redefine, restrict or expand the powers of all municipalities in Ontario. Further, the province provides oversight of Hamilton city council through the Ontario Municipal Board. The Municipal Act gives authority to the city council to dictate tax on property and water and wastewater rates. The City can enter into debt without going to the province. The City uses the gas tax fund and the property levy to fund the O&M and capital programs. The City receives \$80 million for O&M and capital.

The AM group resides in the Capital Planning and Implementation Division, within the Public Works Department. The AM program encompasses the following asset groups:

- Water: pipes, pumping stations, storage facilities and treatment facilities (centralized and communal systems)
- Wastewater: pipes pumping stations, storage facilities
- Stormwater: pipes, pumping stations, storage facilities and treatment facilities (ponds)
- Waste Management: landfill, transfer stations and any other diversion or processing facilities
- Roads: streets, sidewalks, bridges, culverts, signs, signals, markings, street lights,
- Facilities: arenas, pools, recreation centers, heritage and other buildings (estimated at 300)
- Open Spaces: parks, trails, fields
- Transit: rolling inventory, facilities
- Fleet: balance of fleet inventory that is not included in specific programs

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*The City of Hamilton was named the 2005 recipient of the first annual InfraGuide National Award of Excellence for leadership and innovation in municipal infrastructure management.*

*The Hamilton model demonstrates that the burden of proof rests squarely on the shoulders of the City department managers. Council members are better able to make the right funding decisions when they are armed with the data they need and fully understand the principles of AM.*

Gerry Davis—Senior Director of Capital Planning and Implementation, 2008



After the amalgamation combined the assets of seven municipalities, the City is responsible for a significant infrastructure asset portfolio, including the following:

- 6,200 lane-kilometers (km) of roads in 14,000 segments 350+ bridges and culverts
- 2,100 km of water mains in 32,000 segments
- 2,500 km of sewer mains in 40,000 segments
- 700 facilities
- 5,520 acres of park land and 430 outdoor facilities
- Multiple fleet and transit systems

## Multisector Asset Management Case Studies

### CHAPTER 4 THE HENDERSON, NEVADA EXPERIENCE

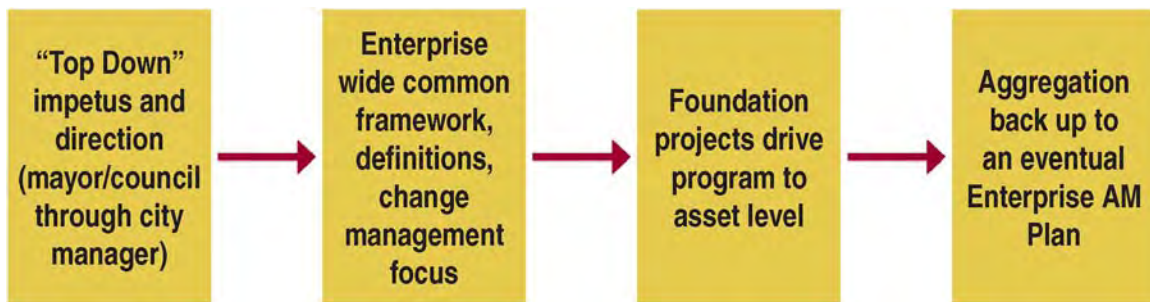
The City of Henderson (City) is the second largest city in Nevada and is 7 miles southeast of Las Vegas. The City is primarily a residential community and is in the middle of the Mojave Desert, near Lake Mead. Henderson's population is approximately 270,000, and the City comprises 103 square miles. Henderson has experienced tremendous growth over the past 20 years—growing from 60,000 in 1989 to its current population of 270,000. An average of 1,000 new people a month have been attracted to Henderson over the past decade. City planners project its population to be approximately 468,000 by the year 2035.



## Section 1 Executive Summary

Henderson is applying asset management (AM) principles across its transportation, water and wastewater sectors. Henderson’s integrated AM approach involves the Department of Utility Services (DUS) and the Public Works Department (PWD). DUS is responsible for water, wastewater, and reclaimed water services. PWD is responsible for construction and maintenance of streets, curbs and gutters, sidewalks, flood control and stormwater management structures, traffic control signage and markings, City facilities and buildings, and the City’s fleet and fleet repair shop.

The City’s vision for an AM program stemmed from the city council’s 1999 *City of Henderson Strategic Plan*. The Mayor and council designated the development and implementation of a citywide AM and maintenance program as council Priority No. 7. The City’s AM approach is *top down*—conceived by upper management and carried through by middle managers who are adamant about involving technical and field staff in the AM program-building process.



The Mayor and council gave the City’s AM program momentum from the top. At the same time, the technical and field staff members were already looking for better tools to do their jobs (e.g., data systems, asset inventory). According to the AM Program Manager, “the bottom line is that the City wants to demonstrate good business and good stewardship.” This top-down approach ensures that staff members are talking the same AM language, understand its usefulness and therefore buy in to the process, early. AM staff members anticipate that the top-down approach will enable them to reach their endpoint more quickly — developing an enterprise asset management plan (AMP). Via the AMP, City staff will respond directly to the Mayor and the council’s Priority No. 7—development and implementation of a citywide AM and maintenance program.

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*The Mayor and council gave the City’s AM program momentum from the top. At the same time, the technical and field staff members were already looking for better tools to do their jobs. “The bottom line is that the City wants to demonstrate good business and good stewardship.”*

—AM Program Manager, 2008

The City evaluates its organizational culture and uses the information to engage staff in its *journey to excellence*, as promoted by the City Manager. The City incorporated organizational psychology concepts, such as culture assessments and change management, while developing the AM strategy. This approach appears to have put the City well on its way to a successful AM program. The process assures that all players (from

the Mayor and council, to managers, to technical and field staff) are engaged and on the same page regarding the usefulness of applying AM principles.

City managers feel that momentum supporting the AM concept is maintained at all levels because of several factors.

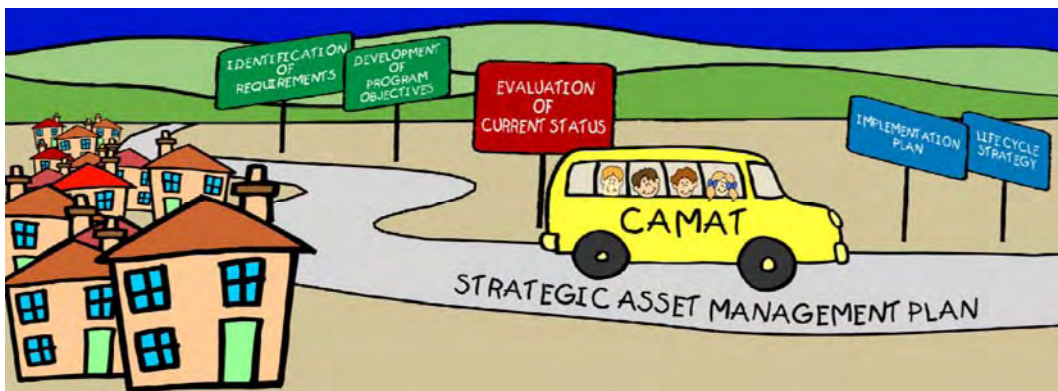
- The Mayor and council have a high level of confidence in staff, and this relationship has supported the cause.
- The City’s management is committed strategically to AM, and AM planning is included in the City’s performance measures, goals and objectives.
- The City promotes small-town values, and staffs are proud to support the City and community.



The City has recognized a number of benefits in applying AM, which include the following:

- Managers see visible energy and excitement from the people AM affects the most. Some feel that the biggest achievement is that all levels of staff are engaged. This, combined with the commitment from the top, is likely a recipe for success. AM provides more tangible information about return on investment and makes it easier to ask the council for money when the budget needs estimates is less *fuzzy*.
- There is now a roadmap, a path forward, to demonstrate good stewardship of the public’s assets.

The Citywide AM Action Team (CAMAT) developed this self portrait of the AM approach. It depicts a group of people heading down the road together on a school bus on the road toward a Strategic Asset Management Plan. It depicts that they have completed *Identification of Requirements and Development of Program Objectives* and that they still need to develop an *Implementation Plan and Life Cycle Strategy* on their quest to develop an AMP.



## Section 2 Henderson’s AM Vision and Triggers for Initiating AM

The initial vision of the City’s AM initiative was based on a citywide strategic planning approach and ran from 1999 to 2007. In 2008 the City restructured its AM approach to a department-wide program, which involves DUS, PWD, Parks & Recreation, Information & Technology (IT), and Finance. Under this context, the City began developing its AM program from a high-level perspective of the entire City, and then moved its focus to its infrastructure support departments. All the departments and others continue to be linked to the overall strategy through liaisons to the departmental AM initiatives.

The City’s initial AM approach was triggered in 1999 when the Mayor and council conducted their first strategic planning session. Developing an AM strategy was one of the objectives that evolved from that session. The vision for an AM program arose when the Mayor and council polled the City’s department heads with the question: “What issues keep you up at night?” The management of the City’s infrastructure and assets was found to be a key issue. The Mayor and council stated that the reason for developing an AM strategy was because it demonstrates good business and good stewardship. Launching a legacy is important in the City’s culture.

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*The Mayor and council stated that the reason for developing an AM strategy was because it demonstrates good business and good stewardship. Leaving a legacy is important in the City’s culture.*

In December 2000, the Executive Management Team created an Asset & Infrastructure: Inventory & Management (AIIM) Focus Group. The role of the group was to develop a citywide framework for identifying the needs, elements and benefits of a suitable AM and inventory program. The focus group conducted general research on identification of assets, maintenance regimes, best practices, regulatory criteria and identified areas needing improvements. They published a report in September 2001 titled *Asset and Infrastructure: Inventory and Management (AIIM) White Paper*. The purpose of the white paper was to help the Mayor and council determine what the City’s AM needs were and how to proceed. Underlying the implementation challenges was keeping in mind the City’s unique internal culture and being sensitive to the departmental interests.

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*Strategic AM is critical. Implementing a comprehensive, strategic AM program will enhance use and preservation of City assets.*

—AIIM Focus Group, 2001

In 2002, DUS was asked to take the lead for carrying the City’s AM program forward and deciding on the next steps. An Asset Management Steering Committee (AMSC) was formed that consisted of seven

Mission
<p>The AMP will develop and implement a consistent, integrated, comprehensive framework in order to:</p> <ul style="list-style-type: none"> <li>• Support the stewardship of public assets</li> <li>• Enhance departmental asset management practices</li> <li>• Meet established standards</li> <li>• Support regulatory compliance</li> <li>• Accurately forecast future financial requirements</li> </ul>
Vision
<p>In the coming years, the City of Henderson will be faced with continued growth and aging of its asset base. The AMP will help meet these challenges by implementing a decision-making framework to guide departments in managing the City’s assets with increased efficiency and cost-effectiveness.</p>

department directors. The committee met quarterly to provide direction and support for the AM program and ensure coordination of individual departmental initiatives.

The City also created the CAMAT (the AM working group) which created the City's charter, mission and vision in 2004, as presented in the *City of Henderson Asset Management Program Charter*. The CAMAT group was then suspended after having met the objectives for which it was formed.

In 2004 the City hired a consultant to support further development and implementation of the AM program and to prepare a preliminary gap analysis to identify where the City stood regarding management of its existing and future assets. The *Asset Management Program Gap Analysis and Review* report was published in June 2006.

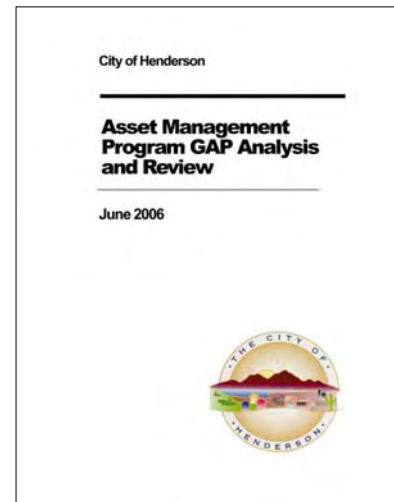
After the gap analysis was completed, DUS managers were anxious to move the AM program forward and show some tangible results. The original citywide approach laid out in the white paper was converted to a department-wide approach to develop an AM framework, and PWD joined with DUS. The citywide approach laid a solid foundation on which the more specific, department-wide construct was formed. The citywide approach was championed (lead) by the Assistant City Manager.

During the period where the City was initiating its AM program, it was also experiencing tremendous population growth. Responding to growth issues was monopolizing staff time and resources. Managers and staff came to believe that AM could be the key to meeting the challenges of growth.

The city began to realize that deferring the issue of maintenance, because of lack of resources and planning, could eventually lead to big problems. The City needed a systematic AM program to address and track operations and maintenance of assets. Additionally, the Governmental Accounting Standards Board Statement 34 requirement (which requires the City to disclose the book value of its entire infrastructure) and aging infrastructure were motivators for pushing forward with an AM program.

The Program Manager stated that staff and management expectations were varied—managing expectations has been a continuing challenge both citywide and departmentally. There is a broad understanding throughout every level that AM is a transformational project that will change the way the City does business. Bringing consultants on to develop detailed project activities helped to focus and structure staff expectations.

The City is very committed to implementing organizational psychology concepts, such as change management, in its AM initiative. The change management portion of the AM initiative is



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*While the City was initiating its AM program, it was also experiencing tremendous population growth. Managers and staff came to believe that AM could be the key to meeting the challenges of growth.*



strongly supported by senior management. To determine whether the organization was ready for AM, the City administered the Dennison™ organizational culture assessment.

- The idea behind these assessment tools is that once the perceptions of staff are understood, the perceptions can be addressed.
- A key finding of the cultural assessment was that the issues and perceptions in one department were very similar to other departments.

The City management's culture highly promotes soliciting good ideas from the field level up to the strategic planning and management level. Understanding the organizational culture is of great importance to the new City Manager, and she continues to encourage staff to use assessment information to assist the City on its journey to excellence. Change management is written into every AM task order scope of work.

The City is also diligent about ensuring that all staff members are buying into and understanding their role and knows the importance of their input in building the AM strategy. Early in the process, AM staff received feedback on workshop evaluation forms from field staff that included responses such as, "How do I fit into this program?" and "I don't know why I'm here." Now the AM staffs provide a brief presentation at the beginning of every workgroup meeting to present the big picture of the AM program and to reinforce for all staff of their role in the process.

The City's staffs appreciate the focus on addressing cultural issues in the AM strategy. They feel that it encourages everyone to understand how their particular job contributes to the program's overall success. In addition, it helps address communication challenges up and down the management chain and across departments.

### Section 3 Lessons Learned

AM staff members feel strong support from City leadership has removed many barriers and obstacles. This also presents a challenge because staffs feel they are *under a microscope* to produce results in a project that is inherently slow to capture tangible results.

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*The City's staff appreciate the focus on addressing cultural issues in its AM*

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*What information is most important for decision makers? Funding, optimal renewal, asset condition, resource priorities.*

—AM Program Manager, 2008

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*One of the key issues identified was the need to improve communication about what AM means to the organization—and that the style and method of communication must be tailored to individual groups.*

—Finding of organization culture assessment, 2007

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*Understanding basic AM issues and policies, is a key component of the discussion with the community on what services it wants in the future, how much it is willing to pay, and in what manner it is willing to pay for them.*

—2006 State of the Infrastructure Report

- Internal resourcing needs (mainly time commitment on an already lean staff) continues to emerge as an issue.
  - Diverse funding sources and the budget process in general is a continuing challenge, now highlighted because of a downturn in the economic climate.
  - Furthermore, the Mayor and council will likely be changing in the coming year—and staffs are unsure of the effect the change will have on the AM initiative.
- 1) The City learned many lessons developing and implementing an AM program:
    - The citywide approach was the right way to start, although it took more time than expected. Later adjustment to a department-wide approach was a successful tactic.
    - The magnitude of time and effort needed should not be underestimated.
    - Stability in the executive management (Mayor/City Manager/council) gave the City consistency in support from the top and established AM as a strategic issue.
    - Developing clear AM program definitions of terms was important to ensure clear communication and consistent understandings.
  - 2) The change management process and emphasis on cultural organization was instrumental and led to involvement in the AM initiative from all levels of the organization.
    - The importance of change management should not be underestimated. Understand that people are not averse to change if they understand the purpose and they have a voice in its management and can participate in planning the changes.
    - Consistent and explicit communication of the process and benefits of AM to field, technical and administrative staff is a key to a successful AM program.
    - Constant communication to all levels is imperative. Tools for keeping all staff involved included; the project Web site, staff meeting updates, focus groups, interviews and feedback forms were useful.
  - 3) Educating staff about the process and components of AM is extremely important. For example, many people erroneously think that developing a Computerized Maintenance Management System (CMMS) is the end point.
    - It is important that decision makers understand the concepts and value of AM so that they will continue to fund and sustain the AM program.
    - Expertise from consultants who transfer that knowledge and environment of ownership to City staff is beneficial.
    - Developing a roadmap for the future was helpful.

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*Understanding basic AM issues and policies, is a key component of the discussion with the community on what services it wants in the future, how much it is willing to pay, and in what manner it is willing to pay for them.*

—2006 State of the Infrastructure Report

- It is important to plan for ensuring that institutional staff and consultant knowledge is passed on, e.g., document processes, conduct training sessions.
  - It is important to know how to reach everyone that's involved.
- 4) Incorporating a feedback form at the end of every meeting, coupled with the immediate and aggressive implementation of suggested changes has substantially increased the perceived quality of communication by attendees.
- 5) Funding consistency over the life of a project—much less the life cycle of the asset—is a substantial challenge for the General Fund Departments.



## Section 4 Benefits of AM

- 1) The beneficial outcomes that City staffs have attributed to the AM program include the following:
- Managers see visible energy and excitement from the people AM affects the most. Some feel that the biggest achievement is that all levels of staff are engaged. This, combined with the commitment from the top, is likely a recipe for success.
  - AM provides more tangible information about return on investment and makes it easier to ask the council for money when the budget needs estimates are less *fuzzy*.
  - There is now a roadmap, a path forward, to demonstrate good stewardship of the public's assets.
  - An AM *umbrella* has opened over many ongoing projects, which has allowed communication and connectivity across the projects.
  - Staff at all levels are using common AM terminology and embracing AM concepts.
  - Staff are learning to communicate all the way through the organization, about specific assets.
  - Because of the cultural assessment initiative, there is now an awareness of the City's organizational culture that benefits the City as a whole.
- 2) In the long run, the City as a whole will benefit from a staff educated in AM principles.
- The support of top management has led to a great deal of visibility for the AM program. This helps educate staff and the community about the program's goals.
  - Planning for the AM strategy includes a policy of training and knowledge transfer from consultants, as well as senior staff with critical institutional knowledge. Planning for knowledge transfer benefits the City as a whole.

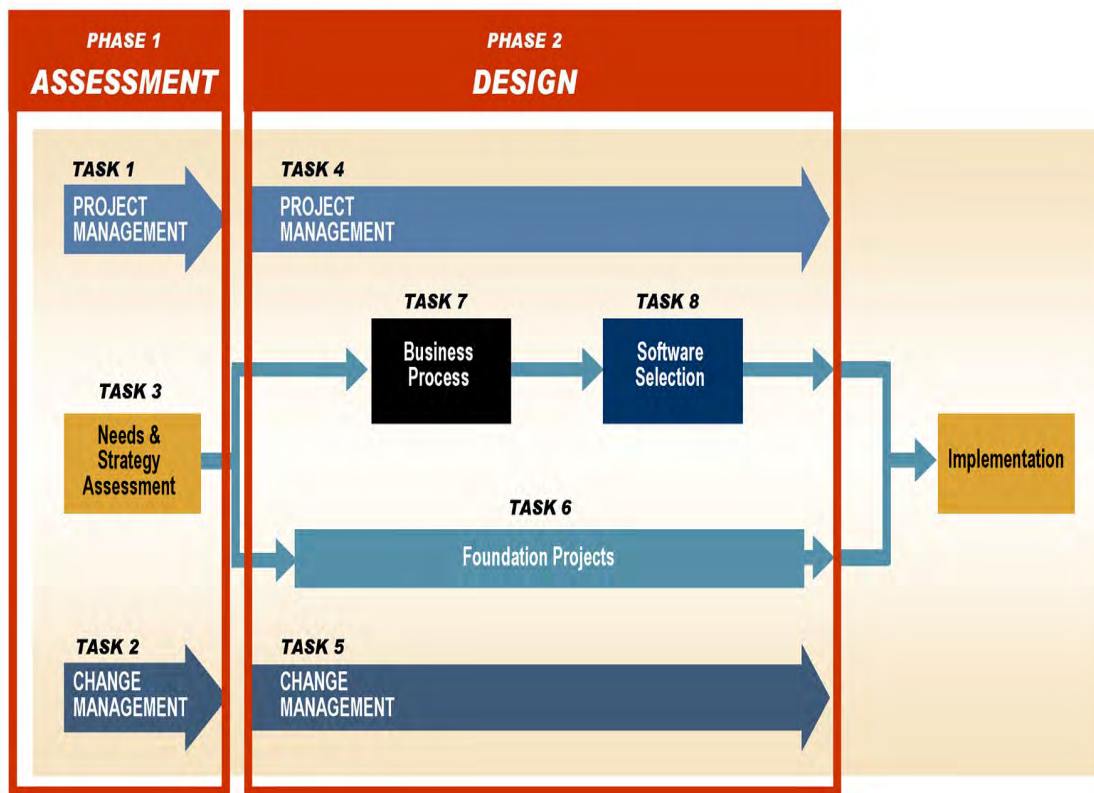
The citywide review of Capital Improvement Projects (CIP) is a major step forward. The City is now looking at capital projects holistically with other groups and moving it forward in a coordinated fashion.

### Section 5 Henderson’s AM Program—Where is It Today?

DUS and PWD each have a roadmap of projects that were identified through the gap analysis. These projects are referred to as *Foundation Projects*. They are designed to strengthen specific AM practices throughout the participating organizational units. The time frame for completing the first set of Foundation Projects is within the next 2 years.

As the departments move through the projects, they will coordinate activities through the Joint Program Management Team. This steering team comprises representatives from DUS and PWD and meets every other week to coordinate the projects.

## Program Approach



## Section 6 Foundation Projects

- 1) The current status of the City's AM program.
  - DUS completed the Inventory Management Strategy Foundation Project.
  - DUS and PWD are working on the Enterprise Asset Management System Master Plan.
  - The DUS Risk Assessment Foundation Project meeting to present the initial results of the asset risk scoring task was held on May 29, 2008.
  - DUS and PWD are beginning a joint scope negotiation on the Data Standards and CMMS Foundation Projects.
  - Organizational Culture projects are being reviewed with departmental and citywide efforts.
  - DUS has hired consultants to assist with evaluating and organizing pertinent DUS asset data for the purposes of risk scoring; developing initial risk scores for DUS assets and identify high-, medium- and low-risk assets that can be used for prioritizing maintenance and renewal activities (this includes development of probability of failure scores and consequence of failure scores); documenting the asset risk assessment process to ensure repeatability in the future; and building the capacity of DUS staff using the methodologies for calculating asset risks.
- 2) Current AM tasks specific to the departments are as follows:

### *DUS*

- Pump station condition assessment and performance evaluation
- Inventory management implementation
- Information Technology (IT) integration strategy
- Supervisory Control and Data Acquisition (SCADA) Wonderware implementation

### *PWD*

- Capital program management software—project modules
- Work order system using Rover Pen technology for facilities maintenance
- Traffic signage inventory, condition assessment and replacement
- Street light pole inventory, condition assessment and replacement
- Safe routes to school—inventory and condition assessment of sidewalks, curb/gutter, signs and crosswalks around all Henderson schools

## Section 7 Information Technology Plans

- The City is negotiating project scope with a consultant for a CMMS Implementation Plan and Software Procurement. The City's goal was to have a CMMS vendor selected by December 31, 2008. CMMS-like systems that are now in use, such as CarteGraph and PMC, will be integrated or decommissioned.
- The City is working with a consultant on an Enterprise Application Integration project reviewing major applications such as Geographic Information System (GIS), SCADA, Financials, Laboratory Information Management Services, and the like.

CIP management is facilitated by a commercial software package.

- The software is a common repository for capital project information across all departments in the City and includes general project information, cost estimates (including the associated operations and maintenance costs), fund modelling and a record of project prioritization within specific programs.
- The City is configuring the project management modules of the software, including detailed project schedules, risk and issue management, and budget and expense tracking for implementation in August 2008.

The City does not have IT systems in place for renewal decision support or materials management. Staff stated that DUS's historical data does not rate a high confidence level. The data being captured through current AM initiatives is mainly stored in GIS; this data is readily available and reliable.

The City has an overarching IT integration strategy for AM for DUS and PWD. The AMSC worked with the IT department to develop the strategy. The City funded two IT positions for the AM initiative. The City is considering middleware and data warehouse solutions. Data standards projects are not yet underway.

## Section 8 Status of Core AM Practices

The City's level of AM practice is summarized below.

The City is building an **asset inventory** for all assets within DUS and PWD. A list of assets and an asset hierarchy was developed for water and wastewater assets specifically for the DUS Risk Assessment Foundation Project. Bits and pieces of asset inventory exist in various databases and spreadsheets. The Data Standards project will address this for both departments.



The DUS Risk Assessment project is the first cut to assess **asset condition, failure modes and residual lives** across DUS. In PWD, roadway condition assessment occurs at regular intervals, with rehabilitation and replacement schedules, taking into account deterioration rates and useful life calculations, managed through the City's MicroPaver software package. Fleet assets are also routinely condition assessed, and a standardized, optimum-renewal, decision-making process is applied. Traffic, flood and facility asset processes are less defined.



The City has not formally started to conduct an economic evaluation of **life cycle and replacement costs**. This is an important goal of the City's AM initiative. Draft **levels of service** were developed for both departments during the Needs & Strategy Assessment. These levels of service will be further refined during the Business Process portion of Phase 2.

Risk scoring or determination of **business risk exposure/criticality** has been conducted at a high level for DUS via the Risk Assessment Foundation Project. The City will continue to fine tune the risk scoring to asset level (most of the work done so far is at the system/process level). This has not been initiated yet for PWD. In DUS, the City is just beginning to talk about how the risk scoring data will be used to drive maintenance policy and **optimize operations and maintenance investment**. The City will use this data for long-term financial strategies, and optimization will be addressed as the process is refined.

The City is negotiating scope on a CIP validation project to **optimize capital investment strategies**. With respect to the step to determine a funding strategy, the City has long-term funding strategies in place, but the connectivity with AM is still in the beginning phases. The City has a citywide AM charter, mission and vision but does not have formal AM plans or an **enterprise-wide AMP**. PWD staff members estimate that they will have PWD's first strategic AMP by the middle to end of calendar year 2009 and will pilot test one asset type such as flood control assets. DUS will also produce their first strategic AMP during this time frame.

## A. Addressing the Deferred Maintenance Issue

An issue raised by several managers is the need to continue to change the mindset about maintenance of assets. In the past 3 years, the new deputy directors have pushed for a more proactive perspective on maintenance. Because of rapid population growth, the City added a significant amount of new infrastructure and experienced very few failures. The City was not focused on



maintenance until there was an equipment failure at the wastewater treatment plant. This incident was a wake-up call and invigorated a new discussion about how the City manages its assets. Newly hired staff with experience in older cities that experienced frequent infrastructure failures promoted a mindset of being more proactive rather than reactive to system failure and maintenance issues.



City staff members are now challenging themselves to better manage maintenance and plan to assemble a workgroup to revise operation and maintenance manuals to address recurring maintenance. The City has also funded a maintenance manager position. Managers said that the City is working to move from concentrating solely on capital needs and balancing those needs with maintenance needs. They realize that getting data management systems in place is crucial to managing assets. The City plans to develop a data support system that will help managers make decisions to manage assets and balance capital needs with maintenance needs.

One manager stated that preventing deferred maintenance also requires awareness of staffing needs at the highest levels. The City prides itself in running an efficient local government and states on its Web site, “Lowest employee to resident ratio in the Vegas Valley demonstrating government efficiency.” This manager feels that the City must acknowledge that additional staff members are needed for developing and implementing AM, including better maintenance and renewal management.

Another asset maintenance issue the City is confronted with is the timing of the developer-donated infrastructure and the challenges faced planning for the operation and maintenance costs associated with that infrastructure. Also, the Southern Nevada Land Sales Act provides funds to the City for creating bicycle and walking trails and open spaces, but the funds do not provide for maintenance of these facilities. The City is left trying to come up with additional maintenance funds.





## B. Completed Projects

AM projects already completed by DUS and PWD include the following:

### *DUS*

- Reservoir Rehab Program
- Large Meter Inventory
- CarteGraph Program
- Water Treatment Plant Condition Assessment
- Inventory Management Strategy
- GIS Enhancements
- Needs & Strategy Assessment (including Organizational Culture Survey)
- Citywide Sewer Vulnerability Study

### *PWD*

- Capital Program Management Software—Planning Modules
- Pavement Inventory of Major Arterial Roadways
- Storm Drain Inventory and Condition Assessment
- Needs & Strategy Assessment (including Organizational Culture Survey)
- Information Technology Integration Strategy

## C. What's Next?

Execution of the Foundation Projects is ongoing. AM program funding and resourcing issues will continue to be a challenge and that the City will likely hit a point at which AM could impede day-to-day operations as staff try to implement AM strategy and perform their other full-time jobs.

AM staff members feel that the momentum for moving forward with the City's AM program is firmly established. They see that the challenge is in determining how to accomplish all the pieces as soon as possible. The staff and managers are eager to document successes. AM leaders will also continue to manage the change in culture toward full buy-in and implementation of the AM program at all staff levels.

- 1) DUS and PWD will work jointly on developing data standards and a CMMS.
- 2) Upcoming specific projects for DUS include Pittman Wash Improvements and Pipeline Condition Assessment; CIP Validation; Geodatabase Conversion; and Workforce Development.
- 3) Near-term projects planned for PWD include:

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*The AM Program will develop and implement a consistent, integrated, comprehensive framework in order to:*

- *Support the stewardship of public assets*
- *Enhance department asset management practices*
- *Meet established standards*
- *Support regulatory compliance*
- *Accurately forecast future financial requirements*

—City of Henderson AM Mission Statement, 2004

- Conversion of easement, vacation, right-of-way and benchmark data into GIS; customer complaint database conversion into new customer relationship management system;
  - Strategic asset plans for streets and flood assets (risk and condition assessments, demand planning, replacement strategies);
  - Asset handover processes for developer-donated and City-built assets;
  - Leadership coaching for all supervisory levels.
- 4) AM leaders have their eye toward eventual development of an enterprise AMP. Staff see the endpoint as an AM program and data system that promotes coordination of asset construction and maintenance so that they can do a better job of balancing asset renewal needs with growth.
- 5) Via the AMP, the AM staff will have responded directly to the Mayor and council's Priority No. 7—development and implementation of a citywide AM and maintenance program.



## Section 9 Background Facts

Henderson, incorporated in 1953, was chartered in 1965 as a council and manager form of government. The Mayor and council address legislative needs. Four council members (four wards) are elected at large. The City Manager is appointed by council. As of January 2008, the City has 3,197 employees (1,899 full-time, 1,298 part-time). The annual City budget is \$221.4 million.

- 1) DUS assets include the following water, wastewater and reclaimed water assets:

- Water: 15 million gallons per day (mgd) water treatment plant, 1,200 miles of water lines, 40 reservoirs, 24 pump stations, 90 pressure reducing stations, 10,000 fire hydrants, 28,000 valves
- Wastewater: 32 mgd water reclamation facility, 945 miles of sewer lines, 12 lift stations, 19,500 manholes, 69 kV substation
- Reclaimed Water: 50 miles of reclaimed water lines, seven



reservoirs, three pump stations

2) PWD assets include the following public works assets:

- Streets: 806 centerline miles of roadway, including appurtenances such as sidewalk, curb and gutter, traffic markings and street lighting
- Traffic: 178 signalized intersections and school crossing signal systems
- Flood: 12 detention basins; 304 miles of storm drainage including channels, culverts and pipe; 3,600 drop inlets; and 4,100 manholes
- Fleet: More than 1,400 vehicles including police cars and motorcycles, fire equipment, heavy equipment and utility vehicles
- Facilities: More than 1,440,000 square feet of building space including police substations, fire stations, recreation centers and City operations and maintenance buildings

The organizational structure of the City's AM team includes the AMSC, which consists of the Director of Utility Services (chair), Director of Finance, Director of Public Works, Assistant Director of Public Works, Director of Parks & Recreation, Chief Information Officer, and Manager of Budget and Strategic Planning.

The AM Program Manager oversees and coordinates all AM activities. The Joint Program Management Team consists of the AM Program Manager, the PWD Senior Technical Analyst, the Assistant Public Works Director, both Deputy Directors of Utility Services, and the Manager of Utility Management Services. This group meets every week to coordinate the AM activities of DUS and PWD. The team also negotiates scopes for task orders. Project-based departmental AM teams are staffed from all levels of the organization at the start of a Foundation Project.

The initial budget and schedule for the citywide phase of the AM program (2004–2006) was \$250,000. The departmental-focused AM program is funded at \$3,500,000 for (2007–2009).

## Multisector Asset Management Case Studies

### CHAPTER 5 THE PORTLAND, OREGON, EXPERIENCE

The City of Portland (City) with a population of 568,000 comprises an area of approximately 145 square miles in north-western Oregon. Located on the Willamette River at its confluence with the Columbia River, Portland is the center of commerce, industry, transportation, finance and services for a metropolitan area of more than 2 million people. Portland is the largest city in Oregon and the second largest city in the Pacific Northwest. City planners project that the Portland region will grow by a million new residents in the next 20 to 30 years.



## Section 1 Executive Summary

Portland is beginning to apply asset management (AM) principles in its transportation, water and wastewater sectors. Although not highlighted in this case study report, Portland’s AM program also involves managing parks, affordable housing and civic facilities (city-owned facilities such as government offices, parking garages, and sports and entertainment venues).

Portland has applied traditional AM tools

- In the transportation sector for more than 20 years.
- In the past 5 years, in the water and wastewater sectors, and
- Has begun to apply the principles characterized in the *International Infrastructure Management Manual*.

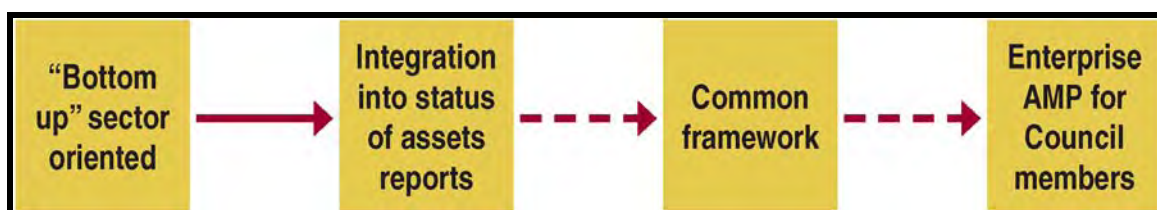
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*Commissioners stated that they were supportive of the AM tool because “it helps convey to citizens how their money is spent.” Mayor Tom Potter stated that the “longer we put this off, the faster the deterioration of the infrastructure,” and that the annual reports prepared by the planning staff provide a “good heads up for everybody.”*

—City Council Meeting  
February 27, 2008

Although the City’s transportation, water, stormwater and wastewater sectors started with, and continue to use, different AM frameworks, the City supports collaboration and the alignment of these frameworks with the long-term goal of developing a citywide AM plan. At this stage, the sectors use common definitions and terminology but do not apply, as of yet, consistent technique. The City has set up a City Asset Managers Group and assigned Bureau of Planning staff to promote partnering between bureaus to improve AM practice and coordination for all City assets.

Portland’s approach to AM consists of the following general process:



The Bureau of Planning has developed five annual reports on the status and condition of the City’s physical infrastructure. Via these reports, the City takes a holistic approach to ensure that its assets are adequate to provide desired levels of service. The reports provide an accounting of the number of assets, condition, replacement value, current service levels and cost of unmet needs. Information in the reports is intended to assist the City’s efforts to ensure that the infrastructure is in good condition and that operation, maintenance, rehabilitation and development programs are as efficient, effective and coordinated as possible.

Beginning, two years ago, the annual reports introduced data confidence level scores (a rough assessment of the quality of the data included in the report). Last year, the report introduced the concept of business risk exposure (a weighting of the probability of failure by the consequence of failure). The city council says these additions improve the quality and usefulness of the asset report in the decision-making process.

The City Asset Managers Group receives policy and resource direction from the Planning and Development Directors. The directors group coordinates long-range planning and manages certain cross-bureau planning and development initiatives. Each AM report is presented to the city council at the start of annual budget work sessions.

While AM best practices will take a number of years to implement, Portland has made strides to integrate principles from the *International Infrastructure Management Manual*.

At this early point in Portland's AM experience, the City has recognized a number of benefits in applying AM principles including the following:

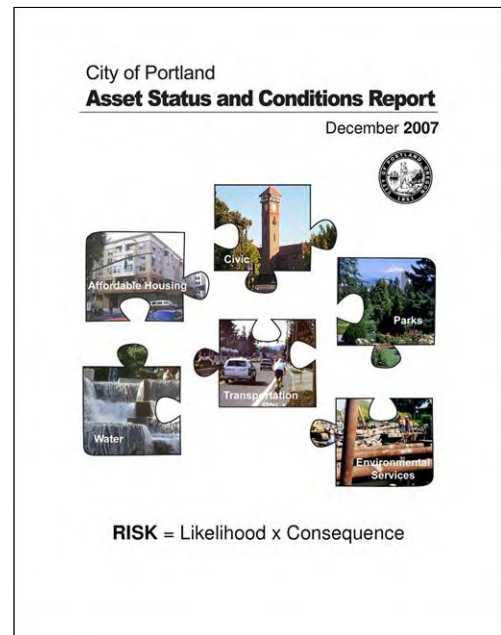
- AM creates a common language across sectors and clarifies bureau missions
- AM helps to deliver more efficient, cost-effective services

## Section 2 Portland's AM Vision

Portland seeks to develop a sustainable asset base that responds to social, economic and environmental needs. The goal for physical assets is to cost-effectively provide a desired level of service.

A variety of federal, state and city policies guide the upkeep of the City's infrastructure including the following:

- State and federal regulations, policies and standards, such as the Clean Water Act, National Bridge Inspection Standards and Governmental Accounting Standards Board (GASB) Statement 34
- State planning requirements mandating that the City develop a public facilities plan as a component of the City's Comprehensive Plan
- Municipal-bonded debt covenants
- City capital improvement plan (CIP) budget manual, which requires bureaus to analyze operations and maintenance costs and savings in new projects



*Via this report, the City takes a holistic approach to ensure that the City's assets are adequate to provide desired levels of service.*

### Section 3 Lessons Learned

Applying AM practices and attempts to integrate infrastructure sectors has taught Portland several lessons:

- 1) Engage the support of top management (bureau directors and city council) to enable policy and budget decisions needed to strengthen business practices.
  - Find small, early successes to show the value of AM.
  - Learn best practices from other communities, in the United States and abroad.
- 2) Recognize the varied business needs of each sector.
  - Involve staff at all levels of an organization to implement AM.
  - Build institutional knowledge and expertise on AM to sustain best practice.
- 3) Allocate resources to collect and maintain reliable asset data.



### Section 4 Benefits of AM

At this early point in Portland's AM experience, the staff group recognizes that AM can do the following:

- Create a common language across sectors and clarify bureau missions
- Help to deliver more efficient, cost-effective services
- Improve business and planning decisions at all levels
- Increase knowledge of assets
- Improve bureau coordination and accountability—for use in making choices in the types and levels of service

### Section 5 Agency Facts and Key Institutional Players

Portland is a home rule charter city and is the last remaining commission form of government among large cities in the United States. The Mayor, four Commissioners and the Auditor are elected at-large. The Mayor and the Commissioners make up the city council. The Auditor is not part of city council and has no formal voting authority. The Mayor and Commissioners also serve as administrators of City departments, individually overseeing bureaus/offices and carrying out policies approved by city council.

The **Portland Office of Transportation (PDOT)** is responsible for 31 transportation asset classes. These assets include some 4,000 lane-miles of roads, 157 bridges, 992 traffic signals and more than 53,000 street lights. The City also owns 10 streetcars; an aerial tram; various support facilities; traffic calming devices; signs; parking meters; pavement markings; bikeways; guardrails; retaining walls; and traffic signal computer controllers. The city's transportation system is valued at approximately \$8.1 billion.



The **Bureau of Environmental Services (BES)** provides sewage and stormwater collection and treatment services to 555,000 people, numerous commercial and industrial facilities, and six wholesale customers. The existing system consists of a 1,445-mile network of separated storm and sanitary sewers, 878 miles of combined sewer lines that carry stormwater runoff and sanitary waste, 96 pumping stations and 2 wastewater treatment plants. The city's sewer and stormwater systems are valued at more than \$5 billion.

The **Portland Water Bureau (PWB)** delivers potable drinking water for consumption and fire protection. The City is the largest supplier of domestic water in Oregon, serving more than 800,000 people and providing about 100 million gallons of water per day, or about 36 billion gallons per year. About 60 percent of the water is delivered to customers within City limits. The remaining 40 percent is sold to customers in 19 surrounding cities and special water districts. Water is supplied from the Bull Run watershed and the Columbia South Shore wellfield through more than 2,000 miles of pipes. The water system is valued at \$5.3 billion.

The **Bureau of Planning** conducts long-range, comprehensive planning for the City and helps coordinate cross-bureau infrastructure issues, including AM. This assistance occurs through bimonthly meetings with the department directors to facilitate collaboration on policies, programs and projects that affect multiple bureaus; coordinating the City Asset Managers Group; and producing the annual *City Asset Status and Conditions Report*. The AM staff group briefs and seeks direction from the directors group.



The **Auditor's Office** receives and maintains all documents relating to the accounts and contracts of the City, including its debts, revenues and financial affairs. The Auditor conducts financial and performance audits of City bureaus and their functions. The Auditor ensures that the City is getting the most value for money spent and is efficiently managing its funds. In the past 5 years, the Auditor has evaluated maintenance practices of transportation and water systems.



## Section 6 Triggers for Initiating AM in Each Bureau

The Portland story is one of individual sector needs and multisector aspirations.

### A. Citywide

In Fiscal Year (FY) 2001–2002, the city council set strategic priorities as part of a *Managing for Results* exercise. City council identified the City’s deteriorating physical infrastructure as an immediate strategic priority. To address this issue, an interbureau team was formed in 2003, composed of infrastructure asset managers, the Bureau of Planning, and Financial Planning. This team initiated collaboration on AM issues and prepared annual reports on the City’s physical assets. Their reports to city council in 2003 and 2004 focused on the current and projected condition of infrastructure, not on the strategies needed to manage assets over the whole life. Efforts to describe assets and needs varied from bureau to bureau as did confidence in the information, making it difficult for city council to make decisions using information in the report.

In 2005 the interbureau committee became the City Asset Managers Group, adopting a more holistic approach to AM and looking for ways to collaborate on common AM issues. While transportation had an existing AM program, other bureaus were just beginning to adopt AM principles and techniques. By joining forces, the group identified common, long-term AM needs and is now working to align AM approaches and reporting. The staff group produced an annual *City of Portland Assets and Conditions Reports* in 2005, 2006 and 2007.

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*Portland has taken a bottom-up approach to AM, with activities originating in the various infrastructure sectors. However, the City supports collaboration among these sectors and the alignment of diverse AM frameworks with the long-term goal of developing a citywide asset management plan.*

In FY 2005–2006 budget process, City Commissioners asked for better data on the funding gap in capital maintenance. They had questions about the quality and completeness of the data and doubts about the bureaus’ stated funding needs. To address city council’s concerns and to reflect the current state of City AM, the 2005 report added three features: common definitions for basic AM terms, data confidence levels and bureau observations on their AM activities.

More recently, the City has made progress in emphasizing risk analysis and using that information to prioritize projects. The additional level of detail provided on confidence and risk was well received by the council. Commissioners voiced support for that the AM tool, because, “it helps convey to citizens how their money is spent.” The Mayor was clear, “the longer we put this off, the faster the deterioration of the infrastructure,” and that the annual reports prepared by the planning staff provide a “good heads up for everybody.” It is apparent that city council promotes the AM process, is increasingly knowledgeable about it and that their confidence in the process has grown with familiarity.



The Bureau of Planning seeks opportunities to advance AM practices in the Portland Plan, an inclusive, citywide effort to guide how Portland develops over the next 30 years. The Portland Plan will update a number of planning documents, including the 1980 Comprehensive Plan, the 1988 Central City Plan and the 1989 Public Facilities Plan.

A major product of the Portland Plan is a coordinated 20-year infrastructure plan, the Citywide Systems Plan (CSP), which will address transportation, water, stormwater, sewer, parks and publicly owned buildings. The CSP is designed to update the City's 1989 Public Facilities Plan and will include an inventory and general assessment of the condition of the significant public facility systems. It will provide a list of significant public facility projects, estimates of when and where each project will be needed with rough cost estimates. The CSP will also discuss existing and potential funding mechanisms and their ability to fund the development of

each public facility project. The CSP will go beyond the state planning requirements to incorporate a more coordinated and comprehensive look at the City's infrastructure on the basis of community goals and best practices.

## B. Office of Transportation

In the early 1970s, PDOT started to track bridge conditions in response to a federal mandate for biennial bridge inspections of bridge surfaces and supporting structures. PDOT had been tracking condition information before this mandate, but with the mandate, it redesigned the AM tracking system to fit the federal government's standards. A second impetus came with GASB Statement 34, adopted in 1999. GASB 34 requires the government to report the value of infrastructure assets.

In the early 1980s, PDOT developed a Pavement Management System (PMS) to enable it to inventory and track the condition of its pavement assets, including street lights. The City recognized that the PMS assisted with making recommendations for project prioritization and helped PDOT identify optimal solutions that fit within budget constraints. In 1995 gas tax dollars declined. This focused attention on the transportation asset backlog and appropriate levels of service. The PMS provided helpful data to assess and prioritize paving backlogs. The current AM program for PDOT grew out of this inventory, which now tracks data on 31 asset groups.

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*In 1995 the City experienced its first impact of reduction in available gas tax dollars, which focused the attention on the transportation asset backlog and assessing the level of service of transportation assets.*

In 1986 PDOT issued its first asset status and conditions report. Starting with the 2000 report, PDOT wrote several condition reports focused on aging infrastructure and introduced the concept

of *managing for results*. This shift involved looking more comprehensively at existing assets, defining institutional priorities, and examining levels of service and related costs. Improvements to asset tracking and reporting also supported the citywide asset status and condition reporting, which began at approximately the same time.

In recent years, PDOT has moved PMS responsibilities to the construction engineer; instituted a pavement moratorium policy regulating street cuts; and conducted a business practice study, which will provide greater ability to target future investments for paving assets. PDOT is now updating pavement management practices, partially in response to audit reports. These updates include new pavement condition rating methods, replacing 25-year-old PMS software and changing street preservation activities.

### C. Bureau of Environmental Services

In BES, several factors converged as the impetus for instituting AM. In 2002 the Chief Engineer asked his staff to create a group to better coordinate capital construction to reduce conflicts with other City construction projects. Thus, a citywide coordination effort was initiated, which has evolved into the current citywide coordination workgroups. Concurrently, the BES staff was learning about the practice and benefits of AM via a West Coast benchmarking effort and decided to implement AM practices (including life cycle costs, triple bottom line, risk, failure modes, residual lives and the concept of how to score/prioritize projects) in their System Plan update. This initiative has evolved into part of the CSP, coordinated by the Bureau of Planning.

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*BES determined that by 2010–2015, 70 to 80 percent of the City's wastewater pipe would be 100 years old and that an AMP could help focus reconstruction and rehabilitation needs.*

Through the analytical work related to the System Plan update, the bureau determined that by 2010–2015, 70 to 80 percent of their wastewater pipe was going to be 100 years old and that an Asset Management Plan (AMP) could help focus its reconstruction and rehabilitation needs. As part of the System Plan update, the bureau is developing a sewer rehabilitation plan that incorporates many AM concepts that aid in asset repair or replacement decisions.

In BES's case, AM planning started with middle management and moved up, with the goal of undertaking benchmarking with a focus on best practices. Addressing aging infrastructure continues to be an increasingly prominent need, and the bureau recognizes the value of AM in facilitating better decisions regarding asset renewal and replacement.

### D. Water Bureau

In 2004 the PWB formed a Water Asset Management Group as part of a reorganization and expansion of its Engineering Department. Initiating the AM group was also in response to an auditor's report that discussed the PWB's water system maintenance efforts and difficulties completing capital projects. The Chief Engineer, the Operations Group Director, and the Construction Group Director formed the original Asset Management Steering Committee and worked to ensure organizational and budget support. The Senior Engineer in the Asset Management Group defined the role and the nature of the PWB's AM program. The PWB also

developed an AM charter, signed by the management team. The charter defines the objectives of pursuing AM.

Early AM efforts in the PWB responded to short-term needs or questions.

- Useful life of assets, maintenance practices and replacement values.
- International utility benchmarking project.
- Identifying key processes and best practices and trying to make progress in those areas (e.g., risk methodology). PWB staff members stated that they are making slow, steady progress to adopt AM concepts.



The Water Bureau developed an AM charter, signed by the management team. The charter defines the objectives of pursuing AM.

## Section 7 Portland’s AM Program – Where is it today?



The 2007 *Asset Status and Conditions Report* found the following:

- A current replacement value of \$21.5 billion.
- An annual funding gap of at least \$112 million (between available funding and need).
- At current funding levels, some of Portland’s infrastructure will continue to deteriorate.
- Risk of asset failure is a key measure and should be identified and reported.
- Green infrastructure plays a key role in the City’s infrastructure services and should be accounted for similarly to traditional infrastructure.

Each year, individual bureaus and the citywide staff make incremental improvements to the annual *City Asset Status and Conditions Report* with the long-term goal of developing a citywide AMP.

The City's level of AM practice, with respect to the core AM best practices, is summarized below for PDOT, BES and the PWB.

## A. Transportation

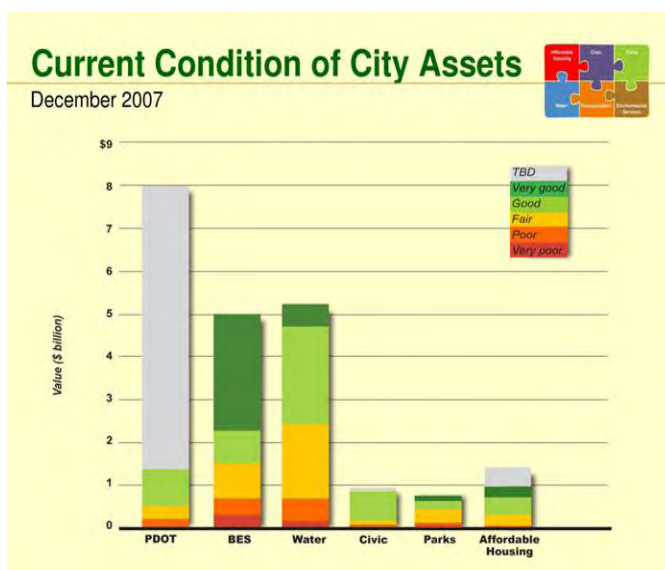
PDOT is in its 21st year of annually reporting on the **inventory, condition, replacement value and deferred maintenance** of its assets. PDOT's confidence in the current status of inventory, condition and replacement value information varies from low (street lights) to optimal (bridges).

PDOT has developed an **inventory** of 100 percent of its 31 asset classes, including all pavement and bridges. The bureau intends to improve the inventory of signs and markings to enhance information about pavement markings by type (e.g., paint vs. thermal plastic markings). The City has legacy condition data for bridges and retaining walls and is re-rating the condition of 3,949 miles of pavement.

PDOT does not apply the concept of **remaining life** and is moving more toward implementing an aggressive preventative maintenance program based on condition such as visual distresses, traffic loadings and rating factors, which will assist with budgeting and decision making. PDOT presents **level of service** options and targets in its financial plans. In 2004 the bureau adopted a life cycle perspective on level of service options.

**Risk analysis** is done informally now, and the new PMS will help PDOT with better risk analysis information for pavement assets. The bridge AM program has a well-developed risk analysis component. With respect to **maintenance and capital investment strategies**, for PDOT, a paving project is considered a capital improvement if it requires more than 2 inches of road cut or costs more than \$250,000. On a project basis, PDOT conducts a cost study to determine whether it is more cost-effective to perform maintenance work or contract the project out as a CIP, in which case, other funding must be identified.

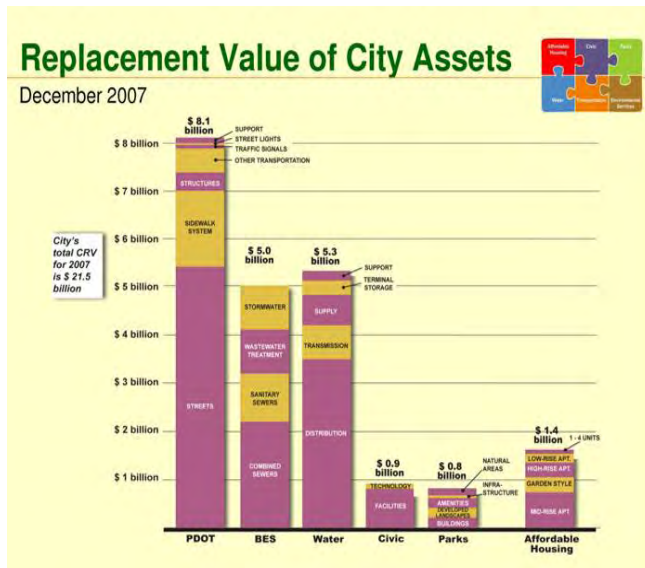
The primary **funding** source of PDOT's discretionary operating revenue, the State Highway Trust Fund, is not indexed to inflation and has not been increased by the Oregon Legislature since 1993. The transportation maintenance liability has continued to increase faster than revenues. PDOT plans to explore alternative revenue sources to address maintenance needs. The new PMS will help PDOT to identify the most appropriate fixes for pavement problems that fit within budget constraints. Since 2001 PDOT's asset teams have completed eight **AMPs** in the following areas: streetlights, structures, traffic signals, sidewalks, signs, pavement, pavement markings and parking. These plans provide ongoing guidance for asset preservation and renewal strategies.



Portland's annual asset report summarizes the physical condition of six asset groups.

## B. Bureau of Environmental Services

BES applies AM practices of **asset inventory**, **condition assessment** and computerized maintenance management systems for its treatment and pump stations and collection system. BES has developed an inventory of 99 percent of its combined, stormwater and sanitary systems and has assessed the condition of about 75 percent of that system. Ninety-nine percent of the separate storm system has been **inventoried**, and 20 percent of that system has been assessed for **state of condition**.



Portland's annual asset report estimates the replacement value of six asset groups.

BES has an active project to improve the projection of the remaining useful life of pipe assets and is developing deterioration curves for various types of pipes; BES will evaluate the use of these curves to strengthen its optimized renewal decision making processes and practices.

The **levels of service** applied by BES are generally permit-based (e.g., driven by the standards and requirements listed in the City's National Pollutant Discharge Elimination System permits), and stormwater and sanitary sewer system design standards are developed around such standards.

The bureau is now **using risk as a priority-ranking criterion** for

evaluating and recommending capital and operating activities. The BES system plan will incorporate system inventory, condition, geographical information system (GIS) data and failure records in an AM context to develop a risk register consisting of Likelihood of Failure × Consequence of Failure.

To **define maintenance and capital investment strategies**, the recommended solutions (projects) will be based on life cycle cost analysis that looks at the triple-bottom-line ranking of projects that considers financial, social and environmental benefits of a project. The intended result is that project expenditures will result in optimal asset value and customer service for possibly lower costs than in the past. Mortality is based on decay curves under development.

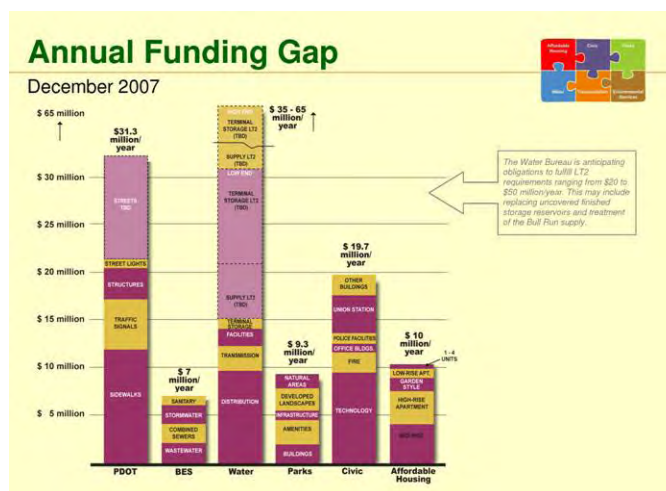
BES is moving toward daily dynamic optimization in its combined sewer overflow (CSO) and sanitary sewer programs. CIP projects are rated and ranked on the basis of pre-established criteria by bureau managers.

BES has no systematic projections yet for **funding strategies** beyond 5 years. BES is in the process of developing its first **AMP**. BES has established a new System Planning Program to provide continuous and coordinated infrastructure planning that integrates the bureau's various watershed, stormwater and wastewater plans. BES intends to update the System Plan to include a sewer rehabilitation plan, updated treatment plan, stormwater plan and updated combined and sanitary sewer system plans. The System Plan update is driven by the need to address the

bureau's aging infrastructure and a desire to provide a prioritized list of potential projects for inclusion in the bureau's capital improvement program after year 2011 (after completing the CSO construction project). The new sewer rehabilitation plan element will identify the appropriate sewer maintenance routines (and repairs) to enable the individual infrastructure components to reach an optimal useful service life at an overall minimum cost. The AM-driven sewer rehabilitation program will blend both operational and capital expenditures to optimize the system's performance.

## C. Water Bureau

The citywide AM initiative pushed forward the bureau's efforts to obtain **inventory, condition and replacement value/remaining life** estimates for the entire water system (which was the basis for developing the *Status and Condition* report of 2006). As part of the individual AMPs for asset groups, understanding failure modes and developing deterioration curves are two tasks underway (although progress varies with the asset group).



Portland's annual asset report shows the annual funding gap of six asset groups.

With respect to **life cycle processes**, staff members stated that the bureau has been slow to embrace total life cycle cost comparisons when evaluating alternatives and that there is a bias toward capital solutions to problems. The organization now looks at operating costs of alternatives (in engineering planning), and some of the business case developments by AM look at triple-bottom-line costs.

During the budget process in 2005, the bureau established effectiveness measures for budget programs. There were then, and are still, about 200 of these measures. Many of the measures are very detailed and focus on individual asset group activities, as opposed to representing key **service levels**. A key effectiveness measure for the PWB is the number of customers without water (the goal is less than 5 percent without water for more than 4 hours in a year). Until last July, there was no software system to record this information. Now, a GIS tool can calculate the number of services out of water when a valve is closed. However, while the tool is now available, there is still limited information being communicated (from the field mechanics, through their supervisors, to dispatch and to the data entry clerks) on valve closure start and, especially, end times. The need to complete this step has been highlighted as a priority in the construction crew work order.

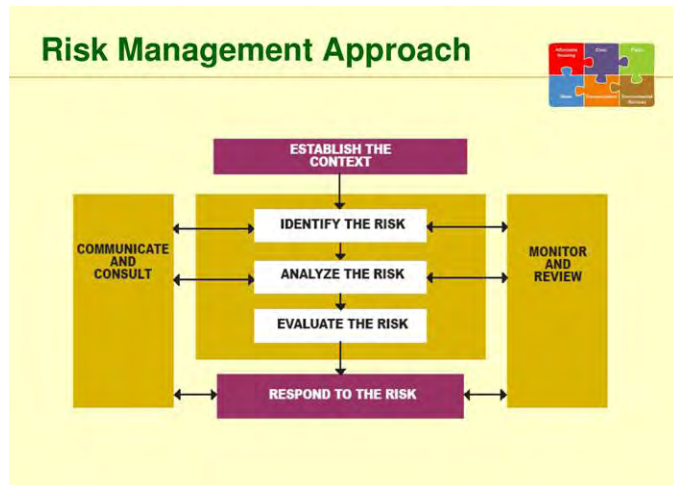
Led by the Asset Management Group but accomplished using an organization-wide committee, a risk **methodology** was developed (following models from Australia and New Zealand using a 1 to 5 scale for consequence and likelihood) and has now been applied to more than 100 assets or asset groups. The methodology identified high-risk assets that previously were given little attention. This year's budget process included using the risk ranking for project selection (it was not the only method used). The risk methodology is now being used as part of the citywide AM effort to select projects for funding. The PWB conducted a system-wide evaluation of risks and

the likelihood and consequence of failure of many of their key assets. As of November 2007, the bureau had assessed 200 asset/failure mode combinations.

With respect to **maintenance and capital investment** strategies, the PWB's AM team has recommended strategies in its individual AMP. There is no rigorous CIP or project management software system.

The bureau's **long-range funding plan** includes applying a planning model to forecast future funding needs for maintaining, repairing and replacing the assets.

The bureau developed **AMPs** for mains, valves, meters, pump stations and tanks. Many of the distribution system assets have been analysed as part of asset plans.



*The 2007 City Asset Status and Conditions Report introduced the risk management process.*

## Section 8 What's Next?

### A. Whole-of-City

Portland is at a crossroads in AM practice. Each bureau is making incremental AM improvements according to internal business needs. Each fall, the City Asset Managers Group prepares the whole-of-city *Asset Status and Conditions Report*. Bureau directors need to decide whether to pursue a whole-of-city AMP. Such an AMP would require a common vision and a concerted, multiyear commitment of policies and resources. Other upcoming decision points include recommendations for near- and long-term improvements to AM practice (through the annual whole-of-city reports), how the Mayor-elect defines infrastructure roles and gives budget instructions and determining long-term infrastructure policies and priorities, as recommended through the CSP.

The City Asset Managers Group will soon conduct an AM gap analysis of participating City bureaus. Survey results will shape a survey of other communities for transferable AM best practices. The Bureau of Planning will manage this activity, with assistance from several consulting firms.

### B. Bureau-level Improvements

The **BES** plans to complete its System Plan in the spring of 2009, which will recommend operating activities and capital projects to address system deficiencies that were determined through an AM framework. The bureau also continues to participate in the Water Services Association of Australia (WSAA) AM benchmarking project to identify bureau strengths and



weaknesses. Findings from the benchmarking process will help the bureau determine strategic next steps and identify a long-term direction for its AM program.

The **PWB** plans to implement AM for all program areas and asset classes. The primary driver behind the current initiative is observing efforts in other utilities and proposing actions, mimicking applicable best practices. The focus for improvement includes doing risk ranking and establishing cost-effective risk



treatment; setting key service levels; developing business cases (using total life cycle cost, triple bottom line, risk cost) and establishing guidance; forecasting asset budget needs (for maintenance, repair and replacement); completing bureau AMP. The PWB is very active in promoting and developing a single, system-wide AMP. The PWB is also participating in the WSAA benchmarking project.

**PDOT** staff expressed concern that there is no funding available to move AM forward systematically. Despite the lack of funding, PDOT continues to track assets and their conditions to inform decision making. PDOT also plans to implement risk assessment and life cycle costs across assets to better allocate the limited resources for transportation operations and maintenance. PDOT will continue to update the AMPs, which are used by each asset class to guide the work it does to effectively and efficiently manage the assets.

At the strategic level, the **Bureau of Planning** will continue in its role of providing coordination among the bureaus, helping to develop a common AM framework and working toward a citywide AM plan. The bureau will continue to improve the annual *City Asset Status and Conditions Report* to reflect improvements in data collection and management. Finally, the Bureau of Planning is also coordinating the update of the City's public facilities plan as it updates the City's comprehensive plan. The CSP will guide long-term infrastructure investments in light of the ongoing AM work of the bureaus.

## Multisector Asset Management Case Studies

### CHAPTER 6 THE SACO, MAINE, EXPERIENCE

The City of Saco (City) is on Maine's southern coast at the mouth of the Saco River on the southerly side of Saco Bay in the Gulf of Maine. Saco is the tenth largest city in Maine. It is part of the Portland–South Portland–Biddeford, Maine Metropolitan Statistical Area. Saco continues to be a key area in the state for residential growth and a key area in which industrial and commercial companies are investing. Saco was ranked among the top five cities in Maine for this growth. Saco has a land area of 38.5 square miles and a population of 18,230.



## Section 1 Executive Summary

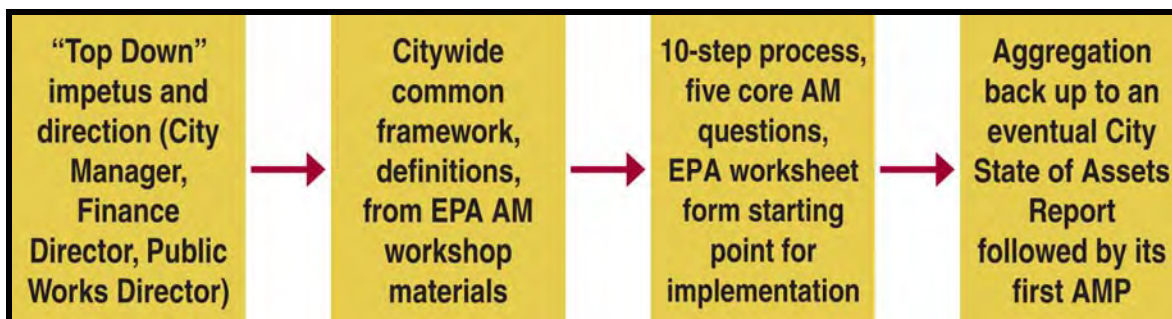
Saco is applying asset management (AM) principles across its wastewater and transportation sectors. The City purchases water from a private company, Biddeford-Saco Water Company. The City's AM plan (AMP) will also include other departments within the City. The Public Works Department is responsible for wastewater and transportation services and has taken the lead on the City's AM program development. An AM committee representing all the City departments was created in January of 2007. That committee was active during the discussions establishing the goals and direction of the committee and the asset inventory phase.

The City's vision for an AM program initiated from its required response to Governmental Accounting Standards Board (GASB) Statement 34. When addressing GASB, the Financial Director at the time pushed for implementing AM concepts and applying best practices in City management. Thus, the stage for AM was already set in the City because of an orientation for best management practices. The major impetus for formalization of an AM program came in 2007 after management staff attended the Advanced Asset Management Workshop held by the U.S. Environmental Protection Agency (EPA) and sponsored by New England Water Environment Association (NEWEA). The NEWEA-sponsored EPA workshop provided the breakthrough framework around which the Saco approach has been successfully mobilized, and the EPA materials provided visuals to demonstrate the AM principles to management.

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*The NEWEA-sponsored EPA workshops provided the breakthrough framework around which the Saco approach has been successfully mobilized, and the EPA materials provided visuals to demonstrate the AM principles to management.*

The City's AM approach is very much a collaborative, *top down* approach—that is, considerable effort has gone into establishing a common framework (including definitions and a 10-step *roadmap* for implementation) before implementing department-specific initiatives to strengthen AM practices. The framework adopted was that promulgated by EPA. Saco's modest size means that the same staff that created the framework is also executing its implementation.



The City has come a long way in a short time. The shortened time frame is likely because of using the existing framework provided by the EPA workshop and materials. Saco demonstrates

that small communities can successfully apply AM principles and develop AM programs. Small city programs might be on a smaller scale and might be less formalized than larger cities' programs, but as Saco has demonstrated, the programs are effective in supporting infrastructure sustainability needs.

The City has recognized a number of benefits in applying AM principles including the following:

- City departments are looking at assets on the basis of sustainability, life cycle costs and financial effects into the future.
- Knowledge of what assets the City has is incredibly useful in making resource decisions for budgeting. The AM tools help prepare for the future.
- The community does not want to see spikes in tax bills, so everyone is better served by applying AM principles to plan to avoid spikes in taxes from projects that were not planned and budgeted.

Saco prides itself in striving to be a green and sustainable city. *Going Green Magazine* voted Saco as Greenest City in Maine. Managers agree that AM principles work nicely toward the sustainability goal—providing information on how to manage assets, how to prioritize construction and operation and maintenance (O&M) on the basis of life cycle costs. The City is creating a position that was originally referred to as the Energy Coordinator, but it has renamed the position to Sustainability Coordinator. The Sustainability Coordinator will be responsible for incorporating AM into energy and sustainability projects.

The Public Works Director stated that the elected officials and City Administrator have been extremely supportive of the efforts under the AM program. “They provide support and trust our judgment to move forward—without that support, we could not have moved forward like we have.”

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*As budgets become more accurate, the information provided through AM will allow a rational decision process to capital investment and maintenance.*

—Michael Bolduc, Public Works Director

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*The elected officials and City Administrator provide support and trust our judgment to move forward—without that support, we could not have moved forward like we have.*

—Michael Bolduc, Public Works Director

## Section 2 Saco's AM Vision and Triggers for Initiating AM

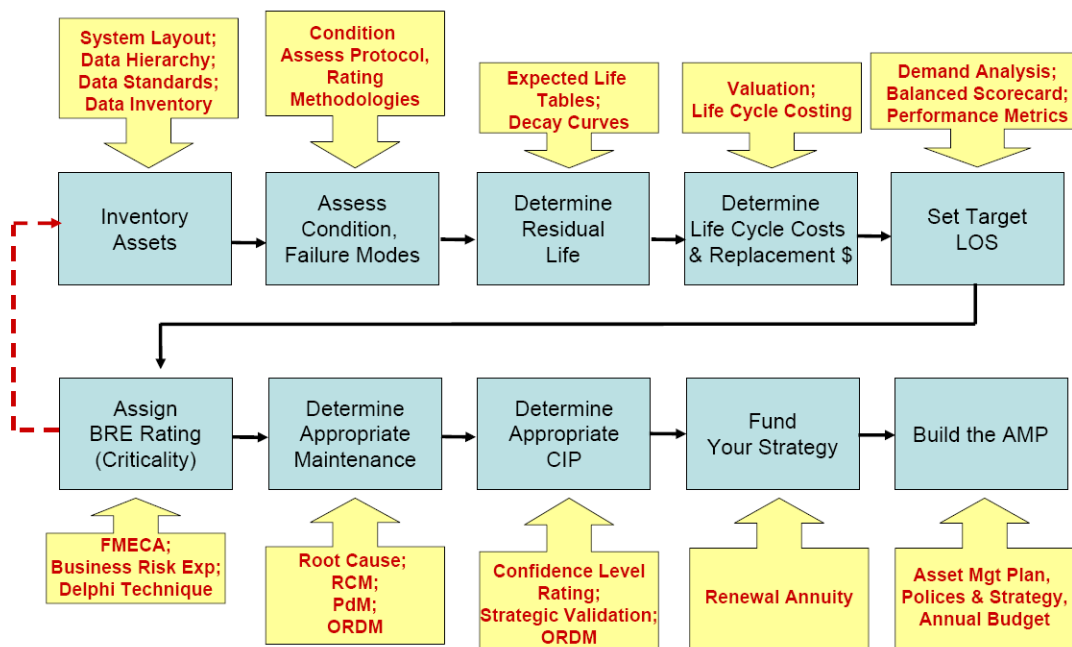
The City's multisector AM program was initiated in January 2007 after the Public Works Director and Deputy Director attended the Advanced Asset Management workshop held by EPA and sponsored by NEWEA. The workshop espoused the AM principles promoted in the *International Infrastructure Management Manual*. The managers were excited by the ideas presented, felt that the AM principles made sense and were a natural progression for the City's vision of AM.

They presented the concepts to the City Administrator who supported the idea. The City Administrator asked that the program vision be expanded beyond wastewater and transportation to other departments such as fire, police and facilities and that level of service standards be developed for every service the City provides.

*New England Water Environment Association has sponsored a couple of EPA AM conferences that were instrumental to our AM program startup and development.*

—Michael Bolduc, Public Works Director

### International Infrastructure Management Manual



Saco based its AM process on the AM Plan Process presented at the EPA Advanced AM Workshop.

The Public Works Department took the lead in developing the City's AM program. An AM committee was formed in January 2007 representing all the City departments (except schools, which could become involved at a later date). The committee was active during the discussions

establishing the goals and direction of the committee and the asset inventory phase. The Public Works Director heads up the committee, which met once or twice a month until February 2008.

In February, the asset inventory project hit a roadblock due to server capacity issues. The City had to purchase and install a new server to accommodate its database needs. This caused a delay in implementation and access to the databases. To date, a significant amount of staff resources has been involved in data collection and start up of the geographic information system (GIS) assets.

Before the workshop, the City had been working on a number of independent projects such as computerized O&M programs, a GIS mapping system (Environmental Systems Research Institute), strategic planning, and sustainability issues. The Public Works Director realized that the strategic plan did not pull everything together in terms of resource allocation (there was still too much competition for funding) and did not provide an adequate framework for decision making. Then he received a flyer from NEWEA for the EPA AM workshop. He stated, "Asset management seemed to be the right mechanism to pull all the plans together into one plan that incorporates the City's entire infrastructure."

Before this, the City's former Financial Director actively pushed the City to use the GASB Statement 34 modified method for infrastructure reporting. Under GASB Statement No. 34, eligible infrastructure capital assets are not required to be depreciated under specific requirements. Saco is one of the few communities using the modified valuation method. The former Financial Director's work was instrumental in moving the City toward AM. The City Administrator, who supports AM concepts and applying best practices in City management, supported the efforts of the former Financial Director. The Public Works Director stated, "Without her dynamic support, we would not have moved forward as quickly."

In addition to following the processes outlined in the EPA workshops and the process described in the *International Infrastructure Management Manual*, the City is modeling its AM program on the programs implemented by Orange County Sanitation District and Hamilton, Canada. The Public Works Director plans to issue the first Status of Assets Report by January 2009 with a report card like the one Hamilton has produced to communicate the status of the City's infrastructure to elected officials. He also hopes to develop the citywide AMP before the end of 2009.

The City has been working on its first AMP for 18 months. The City's draft AMP states that the basic functional process for developing the information in an AMP is the following:

- Know the physical and functional characteristics of the assets.

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*The modified approach gave the City not only the numbers needed to fulfill the accounting reporting requirements on the financial statements, but an asset management tool that can be used in managing the City's most valuable assets. It goes back to the old notion that you cannot manage what you do not measure.*

—Lisa Parker, former Financial Director

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*AM, using the techniques taught in EPA's AM training workshops, is the way to go. These techniques are needed to manage the City's infrastructure.*

—Michael Bolduc, Public Works Director

- Determine an acceptable standard or level of service on the basis of business objectives and customer needs.
- Determine the current condition and performance of the assets and the systems and facilities of which each asset forms a part.
- Determine the assets' likely failure modes and the probable time and failure. The failure modes will include condition or structural failure, end of useful life, under capacity, not meeting established level of service, and no longer economic to own and operate.
- Determine the optimal solution to overcome the failure mode on the basis of a justified business case including costs and risk.
- Document these decisions in the AMP.
- Review the draft AMP against the organizations capacity and capability of completing the plan, including the amount of risk that the plan represents to the organization.
- Rationalize and document the trade-offs necessary to undertake implementation of the plan.
- Review the plan and update periodically.

The City is converting its water and wastewater O&M data from MP2 to Azteca's Cityworks software, which will tie into the City's GIS. The City is in the early stages of implementing Cityworks. The first AMP will be tied to Cityworks, include the value of current assets and project future renewal, maintenance and regulatory costs.

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*In this community, I am very proud of what we have done in AM. We have started a good structure on which to build toward the future.*

—Rick Michaud, City Administrator

The Public Works Department is using Cityworks to track all calls for service. Work orders are attached to assets that have been developed in the GIS database. This allows staff to track work history and cost of maintenance on each asset. Cityworks will also be used to track inspections and condition assessments of City assets. The wastewater treatment plant (WWTP) staff members are in the process of converting to Cityworks to track maintenance on all assets at the treatment plant and all pump stations. Once the database is complete and the reporting is established, the City expects to be able to pull together the budgetary reports and capital plan for the city council.

The City developed its own GIS mapping system to store the asset inventory information tied to asset location. The GIS inventory is fairly complete—the inventory of gas company assets is still incomplete. The City intends to introduce Toughbooks for use in the field soon. To assess the conditions of pipelines, the City also shares a closed-circuit television unit with two other communities.

The City Administrator required the establishment of levels of service for all City assets, including human resources. To date, the City has developed *Level of Service Statements* for many of its assets including WWTP operations to prevent sanitary sewer overflows and combined sewer overflows (CSOs), gravity sewers, household waste transfer facility, information technology (IT) Help Desk services and other operations such as maintaining athletic fields and personnel response time to customer request. Each level of service statement includes a discussion of the level of service goal, level of service element, reliability, standards, service

response, future demands, improvements, maintenance of service levels, compliance with minimum standards and asset allocations.



### Section 3 Lessons Learned

The City learned many lessons developing and implementing its AM program:

- 1) Initiating the AM process forced the departments to work together to prepare an inventory of the City's assets. The most critical information for decision makers is an understanding of the condition of the assets today and how well they are performing in relationship to residents' expectations.
- 2) Bringing department heads and mid-level managers on early in the process and inviting them to be on the AM committee was the right approach to take.
  - Although there was initial resistance to change, the acceptance of the AM program and its principles has been more forthcoming.
  - Taking the initial step of just getting started was the most important. AM is a new way of thinking and conducting business in the City.

*The most critical information for decision makers is an understanding of the condition of the assets today and how well they are performing in relationship to our residents' expectations. It is critical to know the condition of the asset, whether it is functioning as needed, whether it is functioning efficiently, and what the cost is to maintain the asset.*

—Michael Bolduc, Public Works Director



- Using the principle of determining useful life of assets proved to be a very powerful tool for management buy-in to the program, as well as budget preparation.
- 3) Data is only as good as data input. Correct data is needed to make good decisions. Ensure that data is correct and is input correctly into data systems.
    - It might be difficult to get buy-in from all groups, but if all parties are educated about the process, usefulness and benefits of multisector AM, necessary players can be brought on board.
    - Go ahead and consider human assets from the beginning of the process, it is an important piece of the program. Some departments, e.g., police and fire departments, are heavily focused on human assets.
    - Understand in advance the technical limitations to coordinating and consolidating a Computerized Maintenance Management System (CMMS).
  - 4) The original AM committee was too large and unmanageable. Paring it down to include a good cross-section of representatives from asset groups was a good idea.
  - 5) Educate elected officials about the AM concepts and plan early in the process and continue to keep them abreast of progress.
  - 6) Hiring a consultant could have prevented some of the unforeseen missteps or exposed the problems encountered (especially with IT) earlier in the process.



## Section 4 Benefits

City departments are looking at assets on the basis of sustainability, life cycle costs and financial effects into the future.

1) The City now has a good idea on what assets it has, the condition the assets are in and the cost of the assets.

- Knowledge of what assets the City has is incredibly useful in making resource decisions for budgeting. The AM tools help prepare for the future, and applying AM principles is a “healthy thing to do.”
- AM provides hard data as to what real performance of assets is, and why the City needs to invest in infrastructure.

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*Knowledge of what assets the City has is incredibly useful in making resource decisions for budgeting. The AM tools help prepare for the future, and application of AM principles is a “healthy thing to do.”*

—Ron Michaud, Mayor

2) Having an AM program helps the City plan for its financial future.

- The AM program has led infrastructure data to be cleaned up, compiled, organized and is more accessible now—“data is now at our fingertips.” O&M manuals were even overhauled to incorporate AM principles.
- The community does not want to see spikes in tax bills, so everyone is better served by applying AM principles to plan to avoid spikes in taxes from projects that were not planned and budgeted.
- The asset information helps with succession planning for asset maintenance, and the documentation is available for someone else to come in and follow the succession plan. This makes succession planning easier because it is explicit knowledge.

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*The community does not want to see spikes in tax bills, so everyone is better served by applying AM principles to plan to avoid spikes in taxes from projects that were not planned and budgeted.*

—Rick Michaud, City Administrator

3) The AMP will be a long-term plan that discusses replacement values. This will be a tool to inform the council about what the assets are worth, and the council members will have the information they need to make good decisions.

4) Initially, the fire chief was reluctant to step out on the AM program. He used level of service information made available because of the AM program for his budget request and became an advocate. He promotes the AM program and said, “As long as we are moving ahead, we can be patient since we know there are long-term benefits.”

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*Every year we are accountable to voters for what we have done in terms of budget line items. AM arms us with hard data as to what real performance of assets is—why we need to invest. If we don’t do this, here is the impact. Having AM helps the City plan for its financial future.*

—Ron Michaud, Mayor

## Section 5 Agency Facts

The City is empowered to levy a property tax on both real and personal property in its boundaries. The City operates under the mayor-council-city administrator form of government. Policy-

making and legislative authority is vested in the seven-member city council. The council is elected on a nonpartisan basis. The part-time Mayor and council members are elected to 2-year terms from seven districts (or wards). The city council is responsible for passing ordinances, adopting the budget and confirming mayoral nominations of committees and the City Administrator.

The City Administrator is responsible for carrying out the policies and ordinances of the city council, for overseeing the day-to-day operations of the City and for appointing the heads of the City's departments, some with city council confirmation. The City provides a full range of services, including police and fire protection; sanitation services; constructing and maintaining highways, streets, and infrastructure; WWTP; solid waste collection; public education; health and social welfare; recreation; general administration; and economic development.

The City has prepared a 5-year Capital Improvement Plan Policy. This policy outlines all the capital assets owned by the City, their historical costs, their estimated useful lives and their estimated replacement years and costs. With this information, the City will be better able to plan for replacements, which will aid in its budget preparation in future years because it will have a better idea of fiscal impacts from replacement being projected. In the current fiscal year, approximately \$6,743,694 was budgeted to fund various capital improvement projects, including numerous capital asset additions and infrastructure maintenance projects. The City continues to remain significantly below state-mandated thresholds for allowable debt liability.

The Public Works Department operates and maintains the City-owned infrastructure including the following:

- Commercial Pier
- Landfill and Transfer Station
- Public Works Facility
- Sanitary Collection Systems
- Wastewater Treatment Facility
- Stormwater Collection System
- Street Lights
- Traffic Signals
- Transportation

**Sanitary Collection System.** The City maintains and operates a sanitary collection system consisting of both combined (storm and sanitary) and sanitary-only waste. The system is composed of 4- to 72-inch lines of various materials including clay, concrete and polyvinyl chloride pipe. The system has 1,516 manholes, 338,902 feet of gravity lines and 78,970 feet of pressure force main. The system has six CSOs that the Department of Environmental Protection regulates. Additionally, the City recently accepted maintenance of approximately 125,000 feet of house services.



**Stormwater Collection System.** The City maintains an extensive system of open and closed stormwater collection systems. The closed system consists of 216,600 feet of piping from 8-inch-diameter pipe to 10 x 10 box culverts, 1,796 catch basins, 381 drain manholes, and 29 water quality detention units. The open system consists of 312,561 feet of drainage ditches, 6,178 of cross culvert and 16,852 feet of driveway culverts.

**Wastewater Treatment Facility.**

The Wastewater Treatment Department operates a biological activated sludge secondary treatment facility that is permitted to treat an average of 4.2 million gallons per day (mgd) and a peak of 8.4 mgd. The treatment process also allows for an additional 5.6 mgd of primary treated stormwater. The Wastewater Treatment Department maintains and operates 29 pumping stations throughout the City.



**Transportation.** The City operates and maintains a transportation system consisting of single, two-lane and four-lane roads; bicycle paths; sidewalks; parking lots; traffic signals; and street lighting. The City also operates and maintains an Amtrak train station and loading platform. The transportation system is composed of the following elements (the units are approximated): 256 lane-miles of roadway comprised of 21 lane-miles of state arterials; 54 lane-miles of state collectors; 179 lane-miles of town ways; 45 miles of sidewalks; parking lots; 15 signalized intersections; 1,610 street lights; three City-owned bridges. The roads and sidewalks are inspected and rated annually for condition assessment.

## *Section 6 Saco's AM Program—Where is it Today?*

The City's 3-year plan for its AM program is presented on the next page. The City's program is close to completion of all Year One projects and has begun several projects under Year Two, including developing the AMP.

The AM program hit a snag with IT issues and development of its database in the first half of 2008. The issues are being resolved and the program soon will be back on track. The City's level of AM practice, with respect to the core AM best practices, is summarized below.

The City's **asset inventory** is essentially complete for assets exceeding \$8,000 in value. Some assets have been aggregated to meet the threshold, such as radio equipment and personal computers. The City has completed its asset **condition assessments**. Staff members have made educated guesses on the life and remaining life of an asset. They have not conducted a detailed study on the useful life or **failure modes** of some longer-term assets like sewers. The City has completed a determination of **residual lives** on the basis of the assets' estimated life expectancy and current age. The City has not begun to **evaluate life cycle and replacement costs**. This exercise will not start until the third year of the program.

**Setting a target level of service** has been a hard concept for many of the departments. The City has made some headway in this area, but it still needs a great deal of work. The levels of service evaluated to date have been tied to assets.

Departments that are less dependent on assets, such as the Police Department are still being educated about the need for this evaluation. This will be a major focus in the upcoming year. The City has not started to **determine business risk exposure/criticality**. This will be initiated in Year Three of the program.

The City has used the CMMS in the Wastewater Treatment Department for 20+ years, and Public Works has used it in the fleet operations for 15 years to **optimize O&M investment**. The Cityworks application should be available soon for use at an interdepartmental level. The WWTP has recently made the switch to Cityworks, replacing the MP2 program. The City is developing a report to the council on road maintenance. The City has not yet developed a plan to **optimize capital investment strategies** or a **long-range funding plan** for its AM program for full-cost pricing. The City plans to ultimately develop an **AMP**—an enterprise-wide plan that includes AM for multiple infrastructure sectors.

Year One
<ul style="list-style-type: none"> <li>• A comprehensive inventory and listing of the City assets</li> <li>• An evaluation of the asset condition</li> <li>• An idea of the expected life of the asset</li> <li>• Developing a database accessible to all departments</li> <li>• Two AM level of service statements from each department</li> </ul>
Year Two
<ul style="list-style-type: none"> <li>• Completing the AM database</li> <li>• Refining the life expectancies</li> <li>• Risk Assessment</li> <li>• Level of Service statements (continuing)</li> <li>• Budgetary reporting</li> <li>• GASB-34 reporting</li> <li>• Develop AMP</li> <li>• Additions and deletions</li> </ul>
Year Three
<ul style="list-style-type: none"> <li>• Plan revision</li> <li>• Additions and deletions</li> <li>• Integration with Strategic Plan</li> </ul>

### Section 7 What's Next

Saco will continue to address AM program funding and resources issues. Saco is a small town and does not have the staff and resources to dedicate to the AM program. Even with its small staff, Saco is seeing progress with its AM program.



The City has made great strides in its AM program, with more that still needs to be done.

The Public Works Director plans to submit the first State of the Assets Report to council in December 2008 and the AMP by the end of 2009. With delivery of the first State of the Assets Report, the AM committee plans to present the status of the asset register and results of asset condition assessments. In the near future, the City will begin to assess formal business risk scores and criticality for its infrastructure assets.

## Multisector Asset Management Case Studies

### CHAPTER 7 SUMMARY AND CONCLUSIONS

These five case studies provide insight into the issues surrounding public sector management in communities that range from (1) a very large metropolitan city to (2) a suburban residential city to (3) a small city. Although the scale of the challenges facing each of the jurisdictions varies, the primary issue remains the same – how to keep the level of service equal to or better than what exists today in the face of dramatically rising costs. Public assets, regardless of their current condition, will eventually become public liabilities that every agency must manage. There are a number of lessons represented in the case studies that apply to virtually all public sector organizations.

#### *Section 1 For Elected Officials and Decision Makers:*

In every case, agencies cited the importance of infrastructure as a quality of life consideration for the community. Clean water, sanitary sewers, transportation, good public facilities are essential to the “triple bottom line” of economic, social, and environmental quality of the community. Sustaining these services is not an easy job, particularly where there is rapid population growth, expanding commerce, and aging infrastructure.

- In Calgary, officials asked “What are we missing”?
- In Hamilton, officials were committed to keeping service levels at the 2009 levels.
- In Henderson, officials asked managers “What issues keep you up at night?”
- In Portland, Commissioners voiced support for that the AM tool, because, “it helped convey to citizens how their money is spent.”
- In Saco, officials want to avoid unplanned spikes in tax bills from unplanned projects or failures.

The context suggests the need for a more proactive approach to managing public infrastructure and led to the development of asset management programs in each of these communities.

In every community, support from the high-level officials was cited as a critical component to making the management programs work. Communications between those who allocate funds and those who run the programs were identified as prime areas for improvement. The studies suggest that officials should expect that inventory and condition reports will show enormous needs associated with long-term sustainability. It is critical to make known the

challenges associated with maintaining levels of service. Becoming knowledgeable as to the depth of the challenges appears to be an essential step along the pathway for developing strategic programs to respond to the needs. The case studies clearly demonstrate that it is possible to plan for future service levels and take steps to make sure that forward thinking plans become the basis for action.

Perhaps the single most important lesson is that communities are much better positioned to face the challenges when they move from “gut feelings” to knowledge management structures and to better inform investment decisions. Improved processes and techniques that provide the basis for informed decision are tested and available. More developed approaches are not necessarily way more expensive. It is very much about a way of thinking. The approaches can be tailored to provide benefits in the context of real world resource constraints and approach applicable to the relative size of communities. Frequently, getting a handle on the situation is the least expensive approach over the long term.

## *Section 2 For Managers and Department Heads:*

In the communities studied, programs to proactively manage assets relied heavily on the commitment and work of managers and department heads in the respective agencies. In most cases, these individuals were already practicing at least some of the asset management techniques in their current programs. Often, knowing the complete inventory, condition, and performance history of community assets was cited as the primary benefit to proactive management. Every community said that asset management helped establish a more solid basis for strategic planning, for setting performance level expectations, for budgeting, and for allocating resources – both physical resources and human resources.

Documentation of agency processes is an important function for managers. By defining expected performance levels, analysis techniques, decision matrices, long-term development, operations and maintenance programs, agencies remove the mystery and provide the necessary linkage between investment and real measureable performance. Managers reported better communications with elected officials and citizens because of the availability of information from their asset management programs. Most of the agencies cited improvements in auditing as an additional benefit.

In the case studies where high population growth was a factor, managers saw asset management as an important part of assuring that city services allocated to protecting and maintaining existing investments were on par with the attention paid to new investments. In these same communities, information from asset management systems also provided a strong basis for evaluating future liability of “developer provided – city maintained” facilities.

## *Section 3 For Practitioners of Public Works:*

Proactive management of infrastructure requires a new level of communication within the agency. The case studies showed that if investment decisions were to be made on the basis of need and long-term performance, it is essential that accurate, organized and up-to-date data be available to decision makers. Agencies reported that sometimes existing data collection programs did not provide the right information, were incomplete, or were not accurate enough for

investment decisions. In Portland, the agency not only collects data but also reports as to the quality of its data in the annual report. The city recognizes that data collection can be expensive and balances that expense against what is needed for good investment decisions.

For some practitioners, asset management represents a major change from day-by-day management to long-term focus. The implication is that all efforts, however small, represent infrastructure investments by the community and have long-term effects on the performance quality and life of the assets. Every case study indicated that solid two-way communication throughout the agency was critical to making asset management work. The bottom line is that everyone plays an important role in managing and sustaining the communities' assets.

#### *Section 4 For Citizens:*

The case studies are all about stewardship and the sustainability of the assets owned and operated by the community. These assets are essential to the deliver of services. The case studies cite the value of infrastructure to the quality of life in the community and the importance of sustaining these systems, indefinitely. The studies speak to the business risk nature of public investments and the desire to assure the continuity of service. The case studies communities were driven "to avoid spikes in the tax rates due to unplanned projects" such as responding to water main breaks, emergency bridge repairs, pump station failures and similar events. They recognized the essential aspects of investing in the data and information necessary to fully comprehend what needed to be done and identify opportunities to improve.

Each of these communities were at different stages in development of their asset management programs. Some communities were very mature and they had full inventories, annual reporting, and well documented processes. Others were still in the process of inventory and developing the framework for investment decisions. All the agencies felt it was important to "get started" and they anticipated the need to grow their knowledge as to approaches and practices along the way.

Every community cited substantial benefits as a result of moving to proactive asset management. The common major benefits cited were:

- ✚ Improved communication between departments.
- ✚ Better knowledge of the assets and ability to better justify budgetary requests for maintenance and improvements.
- ✚ Staff with increased energy and excitement.
- ✚ Elected officials' that became advocates and champions as they gained exposure to the benefit of the approaches and techniques.

Each of the communities recognizes that they still have a lot of work, yet to be done. All agreed that their work to date represented improved management and they are able to cite benefits that that already resulted from their efforts. It was clear, time and again, that the elected officials were most excited by their improved ability to carry out their stewardship responsibilities and to sustain the deliver of their "triple bottom line" - communities that are socially desirable, environmentally safe, and economically sound.