

# Multisector Asset Management Case Studies

*Presented by*

U.S. Environmental Protection Agency



U.S. Department of Transportation,  
Federal Highway Administration



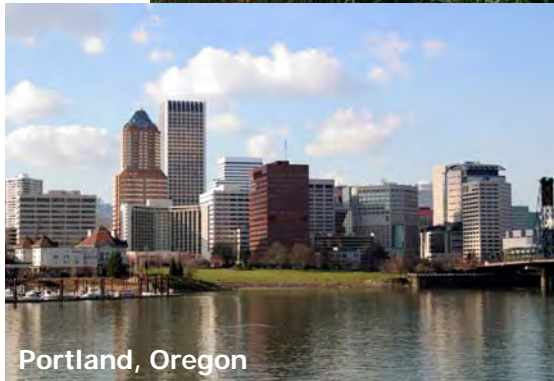
Calgary, Alberta, Canada



Henderson, Nevada



Hamilton, Ontario, Canada



Portland, Oregon



Saco, Maine



## 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



## 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*.

*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:

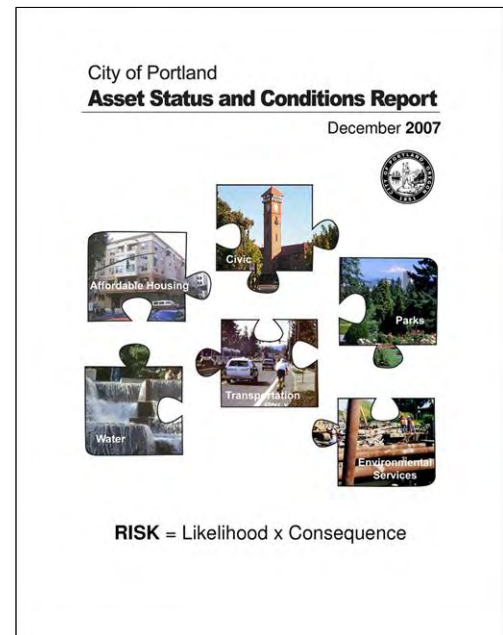
- AM creates a common language across sectors and clarifies bureau missions
- AM helps to deliver more efficient, cost-effective services

## 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.

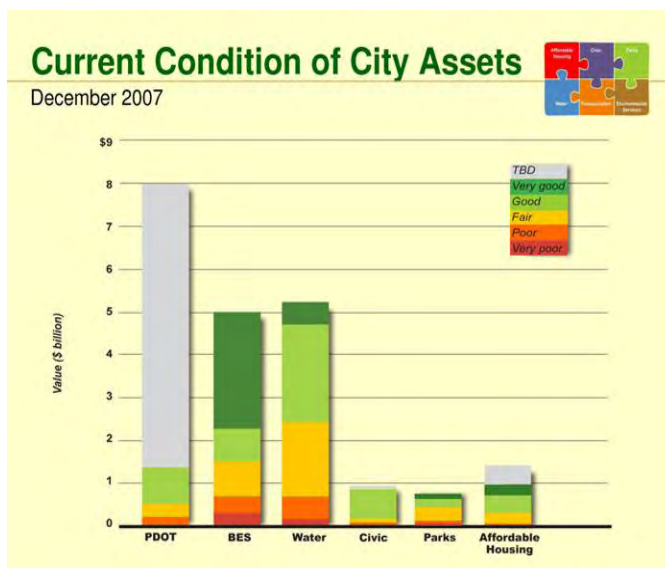


The City's level of AM practice, with respect to the core AM best practices, is summarized below for PDOT, BES and the PWB.

## 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.



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

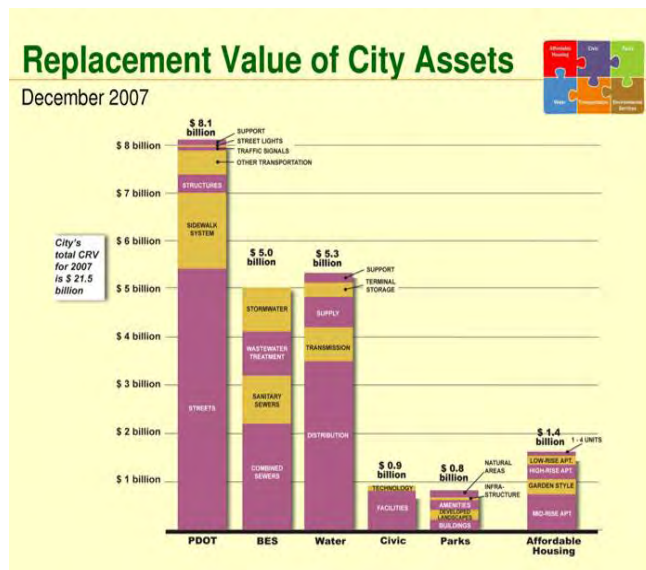
PDOT does not apply the concept of **remaining life** and is moving more toward implementing an aggressive preventative maintenance program based on condition such as visual distresses, traffic loadings and rating factors, which will assist with budgeting and decision making. PDOT presents **level of 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.

## 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.

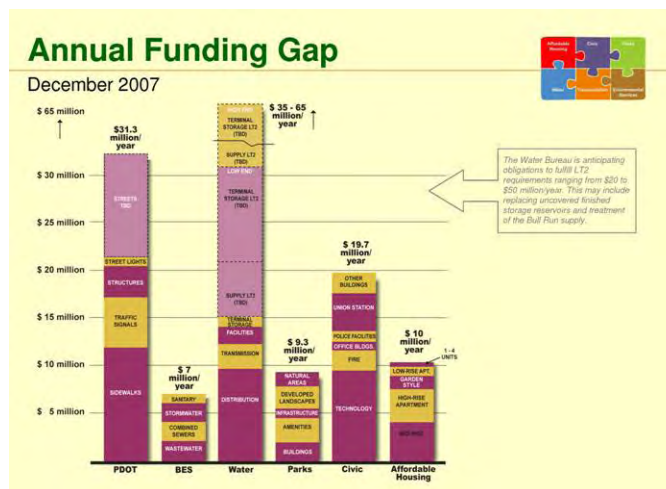
BES is moving toward daily dynamic optimization in its combined sewer overflow (CSO) and sanitary sewer programs. CIP projects are rated and ranked on the basis of pre-established criteria by bureau managers.

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.

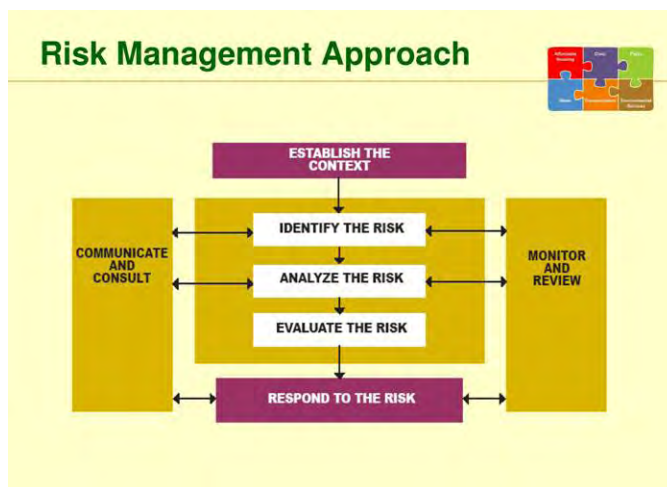
During the budget process in 2005, the bureau established effectiveness measures for budget programs. There were then, and are still, about 200 of these measures. Many of the measures are very detailed and focus on individual asset group activities, as opposed to representing key **service levels**. 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 2007 City Asset Status and Conditions Report introduced the risk management process.*

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.

## 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.

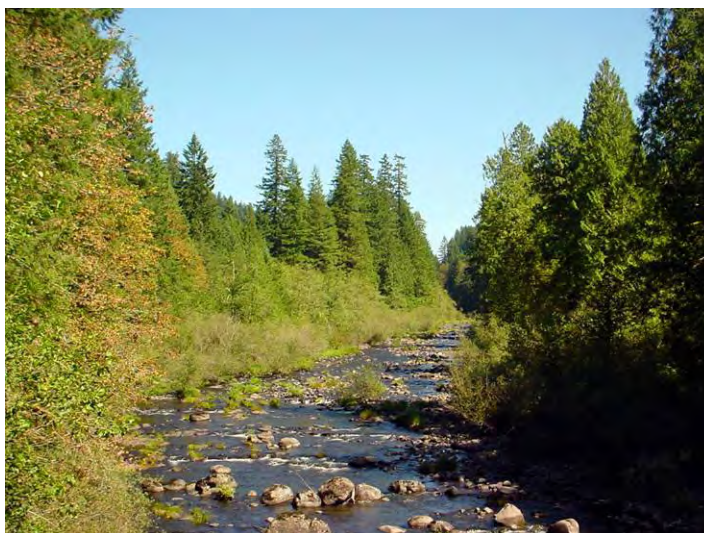
### B. Bureau-level Improvements

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.