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MEMO

DATE: June 1, 2015

TO: Planning and Sustainability Commission

FROM: Michelle Kunec-North, Program Coordinator

CC: Susan Anderson, Director; Joe Zehnder, Chief Planner; Eric Engstrom, Principal Planner

SUBJECT: **Draft Recommended Citywide Systems Plan**

This memo provides a guide to the location of edits to the Draft Recommended Citywide Systems Plan. Edits were made based on PSC guidance in response to public testimony.

The Draft Recommended Citywide Systems Plan includes edits to:

- Chapter 1, page 12
- Chapter 4, pages 52-54
- Chapter 5, page 57

  The final Recommended Citywide Systems Plan (CSP) will include a verbatim copy of the Public Facilities (Chapter 8) and Transportation (Chapter 9) Goals & Policies. Rather than ask Commissioners to review duplicate policies in two different documents, the draft Recommended CSP includes a placeholder for these goals and policies in Chapter 5, page 57.
- Chapter 7, page 138
- Chapter 9, page 209
- Chapter 10, pages 217-218 and various pages between 252-267
- Appendix A, page 276
- Appendix A, page 285 – Transportation Investment Strategy

  The draft Transportation System Plan packet includes a list of transportation projects for the next twenty years. The final Recommended Citywide Systems Plan (Appendix A) and the List of Significant Projects will also include copies of this list. To provide a single place for review and to limit any confusion, we have included the Transportation project list only in the TSP packet.

COMPREHENSIVE PLAN UPDATE

Citywide Systems Plan

Draft Recommended Plan

for Planning & Sustainability Commission review

June 2015

ACKNOWLEDGEMENTS

Primary Authors

The following members of the Citywide Systems Team contributed significantly to the development of the Citywide Systems Plan:

Susan Aldrich, Bureau of Environmental Services

Michele Crim, Bureau of Planning and Sustainability

Sara Culp, Bureau of Environmental Services

Courtney Duke, Bureau of Transportation

Bob Glascock, Bureau of Planning and Sustainability

Susan Hartnett, Office of Management and Finance

Sarah Huggins, Portland Parks & Recreation

Michelle Kunec-North, Bureau of Planning and Sustainability (Project Coordinator)

Patricia Neighbor, Bureau of Transportation (former)

Erik Olson, Office of Management and Finance

Mike Saling, Portland Water Bureau

Bureau of Planning and Sustainability Leadership

Charlie Hales, Mayor

Susan Anderson, Director

Joe Zehnder, Chief Planner

Eric Engstrom, Principal Planner

Additional Contributors and Technical Advisors

Roberta Jortner and Carmen Piekarski, Bureau of Planning and Sustainability; Brett Horner, Emily Roth, and Jenn Cairo, Portland Parks & Recreation; Jeff Leighton, Portland Water Bureau; Denver Igarta, Grant Morehead, Rodney Jennings, Portland Bureau of Transportation; Virgil Adderley, Elisabeth Reese-Cadigan, Alice Brawley-Chesworth, Sam Murray, Dawn Uchiyama, Marie Walkiewicz, Bureau of Environmental Services.

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Reader's Guide

The Comprehensive Plan guides the location of population and job growth as well as public investments in infrastructure, such as streets, sidewalks, parks and stormwater systems, over the next 20 years. It is one of multiple tools that implement the Portland Plan, the City of Portland's strategic roadmap. The Comprehensive Plan sets guidelines for community involvement and influences private development and public facilities — all to ensure Portland is on a path to becoming a more prosperous, healthy, educated, equitable and resilient city.

The Citywide Systems Plan (CSP), a support document to the Comprehensive Plan, guides infrastructure investments to meet the needs of current and future Portlanders.

Purpose of the Citywide Systems Plan

The Citywide Systems Plan is a 20-year (2013-2033), coordinated municipal infrastructure plan for areas within the City of Portland's urban service boundary. Portland's municipal infrastructure assets are physical systems that provide services and are maintained by the City. These include transportation networks; water storage and distribution; sewer and stormwater collection and treatment facilities; parks and recreation facilities; other facilities such as City Hall, office buildings, and fire and police stations; and technology assets.

The State of Oregon's Growth Management Act requires cities and counties to develop and implement public facilities plans. At a minimum, the public facilities plan (PFP) must describe transportation, water, and sewer facilities needed to support the land uses designated in the acknowledged Comprehensive Plan. Portions of the Citywide Systems Plan will serve as the City's State-mandated public facilities plan.

The Citywide Systems Plan includes inventory, condition, and future project information for City transportation, water, sanitary sewer, and stormwater systems, as required by Oregon Planning Goal 11: Public Facilities and Oregon Revised Statute 197. To provide a more complete picture of the City's infrastructure, the Plan also includes similar information for parks, recreation, and other facilities and systems provided by the City of Portland. Reporting on these facilities and systems is not required by State statutes.

Plan Overview

The Citywide Systems Plan includes the following chapters:

- **Chapter 1. Infrastructure Planning and Coordination** provides an overview of the regional and local planning context for the Citywide Systems Plan and the process for developing the Plan.
- **Chapter 2. Asset Management** describes the City's asset management approach and details key trends and needs.
- **Chapter 3. Guiding Principles** discusses of how the Plan relates to and supports the Comprehensive Plan's integrated Guiding Principles.

- **Chapter 4. Summary of Infrastructure and Service Delivery** provides an overview of the City's infrastructure systems and the investment strategy outlined in the Plan.
- **Chapter 5. Goals and Policies** includes goals and policies form the Public Facilities and Services and Transportation chapters of the Comprehensive Plan Goals and Policies.
- **Chapters 6** through **Chapter 10** include more detailed inventories of existing systems, discussions of infrastructure needs, and investment strategies for the City's major infrastructure systems – sewer and stormwater, water, transportation, parks and recreation, and other essential facilities and services (e.g. public safety and technology).

Process

The Citywide Systems Plan (CSP) was developed by the Citywide Systems Team, a cross-bureau group with representatives from the Bureau of Planning and Sustainability, Bureau of Transportation, Bureau of Environmental Services, Portland Water Bureau, Portland Parks & Recreation, and Office of Management and Finance. The document draws from other plans and projects, including the Portland Plan, other components of the Comprehensive Plan Update, community and agency input, and a wide variety of bureau and agency plans.

The Citywide Systems Plan reflects community conversations that occurred as part of the Comprehensive Plan Update, including Policy Expert Group discussions, public workshops and comments from individuals, associations, businesses, and agencies. A Working Draft of the CSP was available for public review and comment from October through December 2013 – prior to the formal legislative review process.

Chapter 1
Infrastructure Planning and Coordination

Public Facility Provision in Portland

The City of Portland is the primary urban public facility and service provider for water, sewer, stormwater, transportation, civic, parks and recreation within its municipal boundaries. The City of Portland provides these facilities and services to protect the health and safety of Portlanders, safeguard the natural environment, and support economic prosperity. To meet these goals, the City of Portland's infrastructure bureaus steward public investments in these public facilities systems.

A variety of other public agencies work in partnership with the City to provide complementary infrastructure necessary to provide these systems to all Portlanders. The role of these agencies is discussed in greater detail in the relevant system-specific chapters of this plan. For example, drainage districts provide flood management (see Chapter 6); the Rockwood PUD provides water service to portions of east Portland (see Chapter 7); TriMet provides much of the City's public transportation system; the Port of Portland provides air and marine transportation; and Metro provides regional parks (see Chapter 9).

In addition, non-City agencies and companies provide the entirety of public facilities for public education; energy; waste; telecommunications; library; public health; and justice services:

- Public education is provided by Portland Public Schools and the David Douglas, Parkrose, Reynolds, Centennial, and Riverdale School Districts, as well as public colleges and universities. The City partners with school districts on related school facility planning and siting.
- Solid waste, composting, and recycling are provided by Metro, the City and private companies. Metro is the regional solid waste authority, charged with ensuring that the region's solid waste is managed in a manner that protects public health and safety and safeguards the environment. The City partners with Metro and supports Metro's work to ensure sound landfill management. The City regulates collection and hauling; Metro regulates facilities and operates transfer stations; and private companies collect, transfer, process, and dispose of solid waste, compost, and recycling.
- Energy and communications are provided by private utilities and companies. Telephone and communications service is provided by Qwest, Comcast, Verizon, and various wireless providers. Gas and electricity are provided by Northwest Natural, Pacific Power, Portland General Electric, and various small fuel oil companies.
- Libraries are provided by Multnomah County.
- Public health, human services, and justice services are primarily provided by Multnomah County and the State of Oregon.

The City has an interest in coordinating with these agencies and companies to ensure adequate service provision to current and future Portlanders. Additionally, the City plays a role in regulating the siting of, licensing, and/or franchising of some of these facilities.

The Citywide Systems Plan

The Citywide Systems Plan (CSP) is a coordinated 20-year plan for the City of Portland's municipal infrastructure systems, including transportation, water, stormwater, sewer, parks and natural areas, and other publicly owned facilities and systems. Many of these systems are supplemented by public facilities that are owned and managed by other public agencies, nonprofit organizations, and private entities. The CSP acknowledges these critical relationships but only describes and plans for City systems.

The Citywide Systems Plan represents a significant update to the 1989 Public Facilities Plan to reflect updated regional and local planning and practices. It serves as a long-range, coordinated plan to guide future public infrastructure investments. Portions of the plan – including Citywide, Bureau of Environmental Services, Portland Water Bureau, and Portland Bureau of Transportation chapters - serve as the City's state-mandated public facilities plan, as required by Oregon Planning Goal 11: Public Facilities and Oregon Revised Statute 197.

However, the CSP goes beyond the State planning requirements and includes a more coordinated and comprehensive look at the City's infrastructure based on community values and best practices. To this end, the CSP includes chapters related to parks and recreation and other essential facilities, such as technology and civic assets. The CSP recognizes the critical roles these systems play in meeting the needs of Portlanders and supporting the overall mission of the City of Portland.

The 1989 Public Facilities Plan and the list of significant projects intended to implement the plan are outdated. City infrastructure bureaus have completed a number of facilities plans that have not been included in a citywide public facilities plan. The CSP incorporates these updated plans, improves coordination between infrastructure planning efforts, and considers the community's infrastructure priorities in a consistently manner.

The CSP reflects a number of significant changes since the 1989 Public Facilities Plan in the internal and external conditions surrounding local capital planning, including:

- The City of Portland has grown significantly, adding over 155,000 residents between 1990 and 2011. By 2035, the city is expected to grow by approximately 260,000 people (123,000 households) and 142,000 new jobs.
- The Portland metropolitan region – of which the City of Portland is the employment, housing, and transportation center – has grown by over 1 million people.
- The planning area for the City of Portland changed significantly with the annexation of the Pleasant Valley area. A public facilities plan for Pleasant Valley was completed, but was not integrated into a citywide public facilities plan.
- Metro completed the Region 2040 Growth Concept and the Urban Growth Management Functional Plan, which provide long-term guidance for future growth and development.
- City priorities have shifted and now include the need to:
    - Address aging infrastructure;
    - Improve equity and address service deficiencies;

  - Focus growth in centers and corridors;
  - Support economic development and household prosperity;
  - Incorporate sustainable development; green infrastructure; and the protection, restoration, and management of natural systems;
  - Build resilience to natural hazards, manmade disasters, and a changing climate through carbon emission reductions, natural hazard mitigation, and preparation;
  - Meet new and expanded State and federal regulations; and
  - Foster inter-bureau collaboration.

- The Portland Plan, adopted in 2012, provides a strategic framework for both the City's short-term actions and long-range goals and policies, focused around priorities of equity, prosperity, health and education.
- The City has advanced its asset management practices, providing more comprehensive and detailed information about the investments needed to provide and maintain infrastructure services.
- The City recognizes the value of green infrastructure and natural system approaches that can improve infrastructure performance and reduce costs while also improving neighborhood livability and watershed health.
- Analytical tools and technology are vastly different: Metro now provides a centralized data resource; the City has a demographer on staff; and GIS, computer modeling, and other technologies allow for fundamentally new analysis and exploration of data.

Purpose and Objectives

The Citywide Systems Plan has been developed to meet a number of objectives. It is intended to:

- Guide and coordinate future public infrastructure investments to maintain existing systems, resolve existing deficiencies, serve new residential and employment growth, and meet long-term infrastructure needs.
- Reflect current practices and policies, as expressed in the Comprehensive Plan and system-specific plans.
- Meet State planning requirements under the growth management act.
- Incorporate and respond to the community vision and goals highlighted in visionPDX and the Portland Plan.
- Provide policy recommendations and a list of significant projects for the Comprehensive Plan.

Meeting Growth Management Planning Requirements

The Citywide Systems Plan responds to State, regional, and local growth management and infrastructure planning requirements as well as community objectives. An update of the 1989 Public Facilities Plan is necessary to meet these planning requirements and accurately reflect community values and goals.

State Planning Requirements

Comprehensive Planning

In 1973, Oregon adopted Senate Bill 100 establishing a statewide land use planning program to "provide for the protection of farm and forest lands, conservation of natural resources, orderly and efficient development, coordination among local governments, and citizen involvement". "The program affords all Oregonians predictability and sustainability to the development process by allocating land for industrial, commercial, and housing development, as well as transportation and agriculture." Oregon's land use program is administered at the State level by the Department of Land Conservation and Development (DLCD) and is guided by the Land Conservation and Development Commission (LCDC), a volunteer citizen board.

Under the program, all cities and counties in Oregon are required to create, adopt, and implement local comprehensive plans to guide growth and development, and to protect resources within their jurisdictions. These plans must meet mandatory State standards included in the 19 Statewide Planning Goals, which address land use, development, housing, transportation, and conservation of natural resources.

History of Portland's Comprehensive Plan

The City of Portland adopted its first Comprehensive Plan in October 1980, after significant public input and planning. The Plan has been amended many times since. Portland's Comprehensive Plan includes three primary elements: a set of goals and policies that apply to the entire city; a list of significant public facility projects; and a set of mapped features. These features include land use designations, street classifications, the city limits, and the urban service boundary.

Since the Comprehensive Plan's adoption in October 1980, all of City Goal 6 (Transportation) and parts of City Goal 11 (Public Facilities) have been amended. The Transportation Goal received major revisions in 1992, 1996 and 2002. In October 2004, the Transportation System Plan received a technical update. The Public Facilities Goal was amended with an urban services study (1983) and transportation policy updates (1996 and 2002).

The City's List of Significant Projects was adopted with the completion of the City's first Citywide Systems Plan in 1989. It has been amended by subsequent updates of the Transportation System Plan and by updates to the sanitary sewer element in 2011.

In 2009, the City began the first major update to the Comprehensive Plan since it was adopted in 1980. The Working Draft Part 1 of the update, released for public review in January 2013, included draft goals and policies for public facilities and transportation. The Working Draft Part 2, released for public review in October 2013, included an initial draft of the Citywide Systems Plan as well as the Map App, an interactive online mapping tool that illustrated existing conditions and potential planning and investment options. A Proposed Draft of the full Comprehensive Plan update was published for legislative review in July 2014.

Public Facilities Planning

The State of Oregon's Growth Management Act requires cities and counties to develop and implement public facilities plans. At a minimum, the public facilities plan (PFP) must describe transportation, water, sewer, and stormwater facilities needed to support the land uses designated in the acknowledged Comprehensive Plan. Public facilities plans typically have a 20-year time horizon and help to identify capital improvement projects (5-year horizon) and capital budgets (1-year horizon).

State requirements for public facilities plans are found in Statewide Goal 11: Public Facilities, Oregon Statute 197 and Oregon Administrative Rule 660. To meet these State requirements, the Citywide Systems Plan, which will serve as the City of Portland's public facilities plan, includes:

- An inventory and general assessment of the conditions of all of the significant public facility systems which support the land uses in the acknowledged comprehensive plan;
- A list of significant public facilities to support the land uses designated in the acknowledged comprehensive plan;
- Rough cost estimates of each public facility project;
- A map or written description of each public facility project's general location or service area;
- Policy statements or urban growth management agreements identifying the provider of each public facility system;
- An estimate of when each facility will be needed; and
- An assessment of the financial capacity of the City to complete needed infrastructure improvements and a discussion of existing and potential funding mechanisms. '

DLCD evaluates public facilities plans for inclusion of required elements; whether the plan contains all agreements (urban growth management, any special districts, or State agency coordination); and whether the public facilities plan is consistent with the acknowledged Comprehensive Plan, the Metro Functional Plan, and statewide planning goals.

The Public Facilities Plan (PFP) is a support document to a comprehensive plan. Some elements of a PFP must be adopted as part of the City's Comprehensive Plan. These elements are:

- A list of significant projects;
- A map or written description of the project locations or service areas; and
- Policies or urban growth management agreement(s) designating the provider of each public facility system.

The Citywide Systems Plan as Portland's Public Facilities Plan

For this update, the City of Portland has chosen to develop this Citywide Systems Plan, which serves the same long-range purpose as a public facilities plan. The term "public facilities plan" is found in State administrative rules, Portland's previous plans, and planning literature generally. This Citywide Systems Plan represents a more comprehensive and holistic view of the City's infrastructure service delivery.

While it has been developed to meet the State requirements for public facility plans as described in the previous section, it also includes system planning that extends beyond that mandate.

For example, the Citywide Systems Plan includes facility plans for parks, recreation, and other essential facilities; addresses maintenance needs; and includes programmatic investments that are key to meeting service demands. Where applicable, the Citywide Systems Plan identifies these non-required components. The City has included these additional components in the interest of comprehensive infrastructure planning and in support of City and applicable State goals. The City does not intend for these components to be reviewed for compliance with Oregon Statute 197 or Oregon Administrative Rule 660.

Regional Plans and Requirements

In addition to complying with State planning requirements, many infrastructure systems also look to Metro, the area's regional government, for planning guidance. The following plans have major impacts on planning for the City's infrastructure:

2040 Growth Concept and the Urban Growth Management Functional Plan

The 2040 Growth Concept, adopted by the Metro Council, provides a long-range plan for the future growth and development of the Portland metropolitan region. It is based on a set of shared regional values, including thriving neighborhoods and communities; abundant economic opportunity; clean air and water; protecting streams and rivers; preserving farms and forestland; access to nature; and a sense of place. The Growth Management Functional Plan provides tools that help meet goals in the 2040 Growth Concept.

Regional Transportation Plan

Metro's adopted Regional Transportation Plan (RTP) shapes future planning to protect the livability of the region's communities and sustain the region's well-being and economic prosperity. The Plan is intended to advance regional policies, public priorities, and local efforts to implement the 2040 Growth Concept to keep the region a great place to live and work for everyone.[1] The City of Portland's Transportation System Plan, which serves as the transportation component of this plan, will be updated as part of the Comprehensive Plan Update process to be consistent with the RTP.

Community Investment Strategy

Metro's Community Investment Strategy (2010) recommends both public and private investments necessary to maintain prosperity, sustainability and equity in the Portland metropolitan region. It is based on an assessment of the region's urban growth boundary. The Community Investment Strategy supports investments within existing communities to promote economic development, protect natural areas, and

[1] Metro. "2035 Regional Transportation System Plan Update". http://www.metro-region.org/index.cfm/go/by.web/id=25038

improve livability. More specifically, it recommends continued investments in the region's centers and corridors and regional collaboration to identify and address critical infrastructure gaps.

The Intertwine

The City of Portland is one of over 100 regional public, private, and non-profit partners in the Intertwine Alliance. The Intertwine provides a vision, objectives, and a plan for an "exceptional, multi-jurisdictional, interconnected system of neighborhood, community and regional parks, natural areas, trails, open spaces, and recreation opportunities" in the Portland metropolitan region. Chapter 9: Parks and Recreation includes information and investments related to the City of Portland's park, natural area, and trail components of this regional network.

Local Plans

The Portland Plan

The Portland Plan, adopted in 2012, set four shared priorities – prosperity, education, health, and equity – to guide the actions of the City and other government agencies in Portland over the next 25 years. The Comprehensive Plan is one of a set of important tools for implementing the Portland Plan priorities and guiding policies.

According to The Portland Plan, "For Portland to be prosperous, educated, healthy and equitable, quality, reliable basic services must be provided for all." The Citywide System Plan supports this goal and continues the integration of the Portland Plan's strategic priorities and guiding policies. The four shared priorities, and their implications for infrastructure planning and future investment, are discussed in Chapter 3: Guiding Principles. The legacy of these priorities and policies can also be seen in the goals and policies included in Chapter 5.

City of Portland and Multnomah County Climate Action Plan and Climate Change Preparation Strategy

Portland's Climate Action Plan is a strategy to put Portland and Multnomah County on a path to achieve a 40 percent reduction in carbon emissions by 2030 and an 80 percent reduction by 2050 (compared to 1990 levels). The plan builds upon a legacy of forward-thinking climate protection initiatives that have resulted in significant total and per person reductions in local carbon emissions. The Climate Action Plan identifies several 2030 objectives and near-term carbon reducing actions in a variety of areas that are relevant to the Citywide Systems Plan, including energy, land use, transportation, and natural systems. The Climate Change Preparation Strategy focuses on understanding how climate affects the community today and how those impacts are expected to change in the coming century. In addition to identifying vulnerabilities and risks, the strategy outlines key objectives and actions to build resiliency to heat, drought, wildfire, floods, and landslides into the City's everyday operations, services, and built and natural infrastructure.

Transportation System Plan

The Transportation System Plan (TSP) is Portland's long-range plan to guide transportation investments. The TSP meets State and regional planning requirements and addresses local transportation needs for cost-effective street, transit, freight, bicycle, and pedestrian improvements. The Plan provides transportation choices for residents, employees, visitors, and firms doing business in Portland, making it more convenient to walk, bicycle, take transit, and drive less to meet their daily needs. The TSP provides a balanced transportation system to support neighborhood livability and economic development.

The Transportation System Plan is being updated to reflect the Comprehensive Plan Update and the update of the Regional Transportation Plan. The TSP serves as the transportation component of the Citywide Systems Plan, as authorized in State public facility planning statutes (OAR 660-011 and ORS Chapter 197).

Portland Watershed Management Plan

In 2006, Portland City Council adopted the Portland Watershed Management Plan (PWMP) in order to focus efforts to protect and restore Portland's natural systems while also addressing relevant environmental regulations. The PWMP is a citywide plan that lays out an integrated, system-wide approach to improving watershed health. Although the Bureau of Environmental Services is the lead implementation bureau, the PWMP relies on and informs projects and programs of other bureaus and relates to many infrastructure investments.

Other City and Agency Plans

The Citywide Systems Plan (CSP) draws from other plans and policies created and adopted by the City's planning and infrastructure bureaus and by agency partners. Individual bureau or asset plans form the foundation of the CSP. In many cases, these plans provide more detailed information regarding infrastructure needs and investment strategies. Area and neighborhood plans, developed through partnerships between the City and local neighborhood associations, organizations, and community members, identify community needs and desired improvements for consideration in long-term infrastructure plans.

With the exception of the Transportation System Plan, discussed above, referenced bureau and agency plans are not adopted as part of the CSP or the Comprehensive Plan. A list of supporting plans and reports can be found in Appendix C.

Process and Public Involvement

Periodic Review Work Program

Portland is updating its Comprehensive Plan, as required by the State of Oregon, through a process called "periodic review." According to the state, the fundamental purpose of periodic review is to ensure local comprehensive plans are:

- Updated to respond to changes in local, regional, and State conditions;

- Coordinated with other comprehensive plans and investments; and
- In compliance with the statewide planning goals, statutes, and rules.

The Bureau of Planning and Sustainability developed a work plan for this update that has been approved by City Council and the Oregon Department of Land Conservation and Development (DLCD). The work plan includes the following tasks:

- Task 1: Community Engagement: Providing open and meaningful opportunities for individuals and organizations to effectively influence the Comprehensive Plan update.
- Task 2: Inventory and Analysis: Conducting research and analysis necessary to provide a solid factual base for the Comprehensive Plan update.
- Task 3: Consideration of Alternatives: Exploring the social, economic, environmental, and energy implications of alternative patterns of development.
- Task 4: Policy Choices: Considering and making a variety of policy choices.
- Task 5: Implementation: Identifying and developing implementation measures necessary to carry out the policy choices.

The Citywide Systems Plan is a component of Task 4 and builds on the work completed in Tasks 1 through 3.

Interbureau Coordination

The Citywide Systems Plan was developed by the Citywide Systems Team. The Citywide Systems Team is an interbureau working group comprised of representatives from the Bureau of Environmental Services, Bureau of Transportation, Portland Water Bureau, Portland Parks & Recreation, Office of Management and Finance, and Bureau of Planning and Sustainability. The group is overseen by these bureaus' directors and convened by the Bureau of Planning and Sustainability.

Community Involvement

Development of the Citywide Systems Plan draws on multiple other planning processes that were completed in coordination with the community including:

- The work of Comprehensive Plan Update **Policy Expert Groups**, composed of community and government representatives, who developed, reviewed and provided comments to City staff on policy directions for the Comprehensive Plan Update.
- The **Working Draft Part 1** of the Comprehensive Plan Update, which focused extensively on the draft goals and policies that shape this Plan. These draft goals and policies are included in Chapter 5.
- The **Working Draft Part 2** of the Comprehensive Plan Update, which provided an opportunity for public review of the Citywide Systems Plan and the infrastructure investment strategy.
- The **Portland Plan**, which set strategic priorities and guiding policies that provide a framework for the investments included in this Plan. The Portland Plan was developed in partnership with Portland agencies and institutions, community members, and businesses.

- Various **bureau and agency plans** including Parks 2020, the Portland Watershed Management Plan, and the Transportation System Plan. Many of these plans were developed in consultation with the community.
- The City's **annual budget process** and Budget Advisory Committees, which involve community members in shaping the City's Capital Improvement Plan, which is reflected in the CSP's investment strategy.

In addition, development of the Citywide Systems Plan has offered various opportunities for direct public review and input. These opportunities included:

- **Online and mail comment options**: Both email and mail comment options were available so residents, businesses, agency partners and organizations could submit comments on the draft Comprehensive Plan Update.
- **An online Map App**: The investment strategies outlined in this plan were included as map layers in the Comprehensive Plan Update's online Map App. The Map App was an interactive online tool that allowed community members, business owners, agency representatives, and other interested people to compare infrastructure needs and investments with potential areas of growth, demographic information, and other policy choices to identify and prioritize investment needs. Visitors to the Map App were able to view the maps, combine map layers, see areas of concern or change, make comments, and view comments from others.
- **Community events**: Staff attended 98 workshops, meetings, and other community events during the three-month comment period, with approximately 1,950 people attending the sessions. These events included:
    - Fifty-one community meetings, where organizations invited staff to introduce and engage members with tools and products like the Citywide Systems Plan, Map App, and the Companion Guide. Many of these meetings were tailored to specific group interests or geographies.
    - Thirty-three training events, where staff primarily focused going through the Map App and the Companion Guide.
    - Three information sessions hosted by the Bureau of Planning and Sustainability, held in downtown and in East Portland.
    - Three District Mapping Conversations, held in West, East, and North Portland, involving interactive discussions focused on specific issues and questions facing those districts.
    - Three community events where staff set up tables and talked to the public in North Portland, East Portland, and Downtown.

During review of the Working Draft (fall 2013), the Bureau of Planning and Sustainability received over 1100 comments through the outreach methods described above. Over 725 of these comments related specifically to infrastructure or to the Citywide Systems Plan. The City received over 4,000 public comments during review of the Proposed Draft – of which 1068 related to transportation and 125 related to other public facilities, The Citywide Systems Plan has been updated to reflect community conversations that occurred as part of the Comprehensive Plan Update, including Policy Expert Group discussions, public workshops and comments from individuals, associations, businesses, and agencies.

Chapter 2
Asset Management

Effectively Managing the City's Infrastructure Systems

In 2013, the replacement value of the City of Portland's built infrastructure was estimated at $31.3 billion.[2] Providing, operating, and maintaining the City's infrastructure has become increasingly important as current systems age and Portland's population grows.

Asset management is a tool to identify the most cost-effective way to protect assets, provide community services, and safeguard public health, environmental quality, and economic security. Asset management is commonly defined as meeting agreed upon customer service levels, while minimizing life cycle costs at an acceptable level of risk. It focuses on delivering value to the customer – both in terms of the services provided and the rates charged – in an efficient and transparent manner.

The goal of asset management is to make better decisions about infrastructure acquisition, planning, design, construction, operation and maintenance, and renewal or replacement. Five core questions of asset management help achieve this goal:

- What is the current state of the assets?
- What is the required sustained level of service?
- Given the system, which assets are critical (based on risk) to sustained performance?
- What are the best "minimum life-cycle cost," Capital Improvement Program (CIP), and Operation and Maintenance (O&M) strategies?
- Given the above, what is the best financing strategy?

Asset management involves continuous improvement. City bureaus are committed to improving asset management practices to accurately inform strategic decision making and effective infrastructure management. For example, the City continues to develop more sophisticated methods for assessing and tracking the condition of its infrastructure.

Maintaining Existing Assets

Because Portland's city limits cannot expand significantly, the majority of new growth will be accommodated within the City of Portland's current boundaries. This means existing transportation, water, sewer, stormwater, and parks and recreation systems will serve the majority of current and new residents' and businesses' needs over the coming decades, resulting in additional demands on existing infrastructure. These systems also will be used more heavily as new residents of Portland's suburbs come into the city to work, shop, or play.

[2] City of Portland, "Citywide Assets Report", 2013, Available at: http://www.portlandoregon.gov/bps/article/49854 .

The City has a large infrastructure maintenance deficit, due largely to the age of many systems, chronic underinvestment in preventative maintenance and capital repair, increasing maintenance costs, and the lack of revenue to allow more sustainable investment. At current funding levels, some of Portland's infrastructure will continue to deteriorate. This will increase the risk of asset failures, reduce levels of service, and perpetuate long-standing inequities.

Managing risk

Asset management involves comprehensively examining the risks of infrastructure failure. Infrastructure can fail due to poor condition or impacts from a natural or man-made event. They can also fail to provide the intended service, fail to meet regulatory goals, or fail to be cost effective. The City's infrastructure bureaus are undertaking risk management analyses to help identify strategic investments that will cost-effectively reduce the likelihood of asset failure. For example, the Bureau of Environmental Services and Portland Water Bureau both evaluate the age and condition of pipes. They combine this data with information about what could cause a pipe to fail, how likely these events are to occur, and the potential consequences of a failure. This analysis enables the Bureaus to identify the most critical and cost-effective repair or replacement projects. Actions to manage risk should increase the City's ability to meet community needs while protecting human and environmental health. However, new funding strategies or sources will also be needed to fully address deficiencies.

Complying with regulatory mandates

In addition to meeting maintenance and repair needs, the City also must maintain compliance with a variety of federal and State regulations, primarily related to protecting public health and environmental quality. At the federal level, many of these mandates are related to the Clean Water Act, Clean Air Act, Safe Drinking Water Act, Endangered Species Act, and Americans with Disabilities Act. Complying with these mandates is a City priority and represents a large component of infrastructure spending. Because of this priority, meeting regulatory mandates can mean that other maintenance, repair, and improvement projects must be put on hold, or additional funding must be allocated. As regulations are created or revised in the future, the City will need to continue to examine investment approaches and priorities to ensure infrastructure systems adequately serve the community. More detailed information on regulatory mandates can be found in the system-specific chapters of this plan.

Accommodating growth

The majority of the City's residential and employment growth over the next 20 years will occur on vacant sites or as redevelopment within the city's existing boundaries. As such, the ability of the City's infrastructure to accommodate growth depends primarily on the City's ability to resolve current deficiencies — to serve under-served areas and to improve or maintain the condition of existing infrastructure.

Major redevelopment efforts can have significant implications on existing assets and the type and extent of new infrastructure needed to serve an area. Without careful planning, such projects can overstretch the ability of existing built and natural infrastructure to meet community needs, particularly in under-served areas. As redevelopment is planned, it will be important to consider the full implications of such efforts on

infrastructure needs and financial resources, and to coordinate planning with bureaus whose infrastructure might be impacted.

To better accommodate growth and reduce system loads, bureaus are actively researching and using a variety of demand management strategies. The ability of bureaus to innovate, reduce demand, or increase efficiency through new technologies and practices will be instrumental in their ability to serve the city in the future.

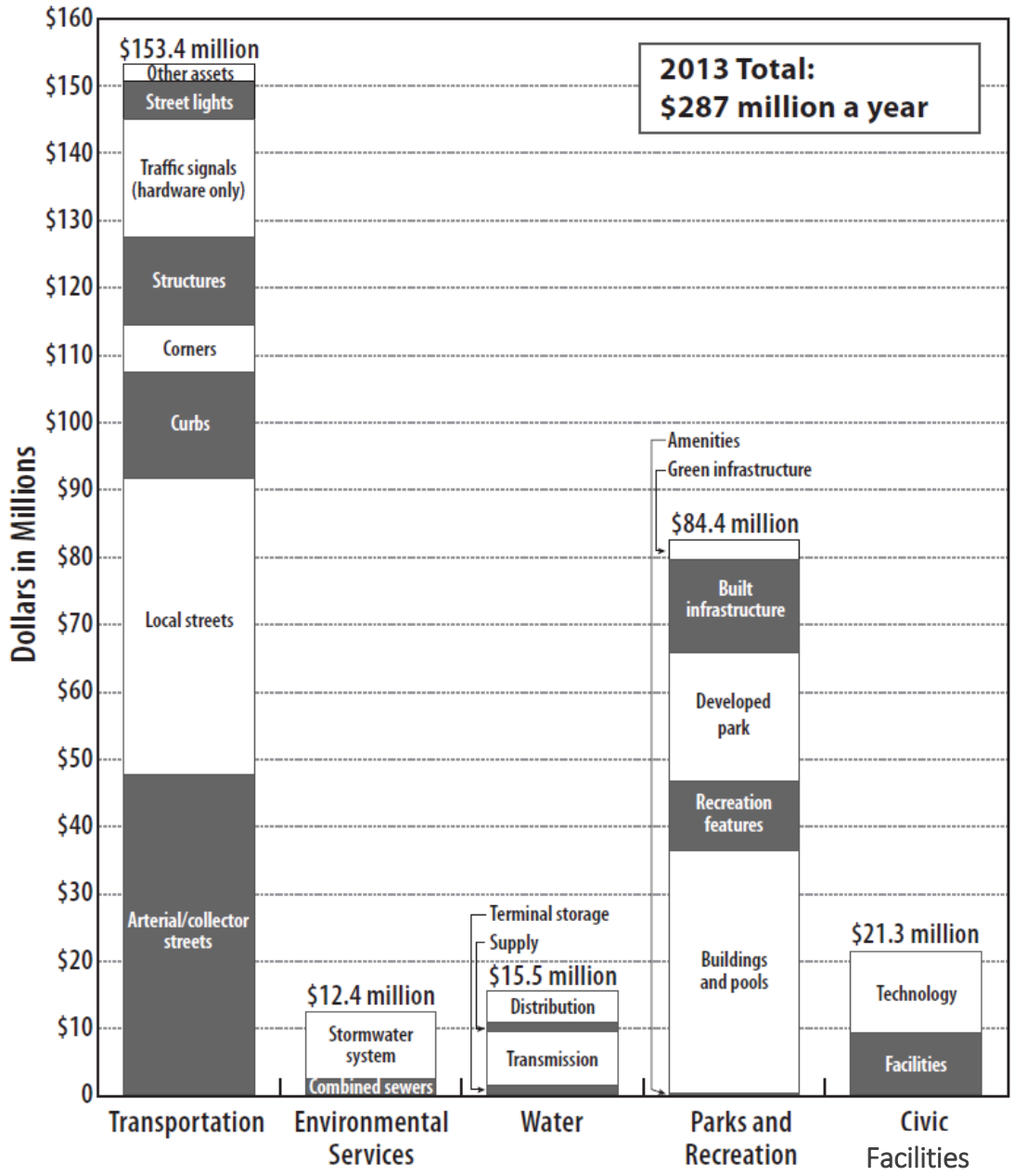
Infrastructure funding gaps

Conservatively, the City's infrastructure bureaus estimate that the City needs to invest approximately $287 million more than current funding levels per year for each of the next 10 years to replace existing aging assets, maintain existing facilities, address regulatory requirements, and/or meet service levels, see Figure 2.1. This gap will likely grow for each of the next 10 years. That level of reinvestment would require spending at least 25 to 40 percent more than the City currently spends on major maintenance and capital projects. New assets often add to ongoing operations and maintenance needs, potentially adding to the funding gap. Some new assets may also replace existing asset functions and add new functionality. The City's estimated annual funding gap includes:

- **Transportation**: Significant maintenance needs for the City's street system – one of City's most valuable assets – make up the largest portion of the City's annual $153.4 million transportation funding gap. The funding gap for collector and arterial streets is estimated at $47.6 million with another $44 million for local streets, based on pavement condition. There are also significant funding gaps for the sidewalk system ($15.7 million annually to repair, restore or replace curbs and $7.1 million annually to build and maintain ADA accessible corners); bridges ($12.9 million); signal hardware ($17.5 million); street lights ($5.8 million); and other assets ($2.8 million).
- **Environmental Services:** The City's $12.4 million annual funding gap for environmental services reflects unmet replacement and maintenance needs for sewer and stormwater systems. The estimated funding gap makes broad assumptions about the rehabilitation and capacity needs in the City's separated stormwater areas, for which more detailed assessment and planning is currently underway.
- **Water**: The City's annual $15.5 million funding gap for water assets includes unmet replacement and maintenance needs in the distribution system (including pipes, services, valves, and hydrants); needs to replace or upgrade sections of transmission conduits; and maintenance needs for the Bull Run watershed road system.
- **Parks & Recreation**: The City's parks and recreation system has an expected total capital annual funding need of $84.4 million for parks and recreation facilities for each of the next 10 years. This includes $47.8 million for expanding the system to provide standard levels of service for all residents in addition to $36.6 million in funding needed to maintain existing assets.
- **Other civic facilities:** The City's $21.4 million annual funding gap for civic facilities includes funding necessary to meet industry standards for major maintenance of City facilities, such as office buildings, police and fire facilities, spectator facilities, and maintenance facilities, as well as annual funding to ensure replacement and upgrades of technology on accepted schedules.

To maintain a high level of infrastructure services, the City will need to reassess service level standards, identify strategic investments, consider the full long-term costs of improvements, pursue innovative funding sources and partnerships, and work with the community to make tough choices about funding priorities. Chapters 6 through 10 of this document provide more detailed system-specific information on the asset management needs and approaches of the various City infrastructure bureaus.

Figure 2.1 Annual Funding Gap, by Asset Group (in millions per year, December 2013)



Managing the city's green infrastructure

The city's green infrastructure -- including natural areas, tree canopy, streams and rivers, and engineered features like green streets and ecoroofs -- provides many infrastructure and ecosystem services. For example, green infrastructure can manage stormwater, improve water quality, reduce flooding risk, provide wildlife habitat, provide areas for recreation, and improve resilience to natural hazards and climate change. A single green infrastructure asset may provide many different infrastructure services. For instance, a greenstreet facility might help retain and infiltrate stormwater, provide habitat and access to nature, and calm traffic.

Protecting and enhancing this green infrastructure is critical to the City's ability to provide public services in a cost-effective and sustainable way. However, green infrastructure presents unique asset management challenges:

- Some green infrastructure assets are owned and/or managed by the City (e.g. green streets, City-owned parks and natural areas), while many others are not (e.g. streams and rivers; private vegetated stormwater facilities; and natural areas and trees on land not owned by the City). However, the City relies on the infrastructure functions and ecosystem services provided by both public and private green infrastructure.
- From a financial planning perspective, green infrastructure assets cannot be accounted for in the same ways as grey infrastructure assets, like pipes. For example, the infrastructure service value of green infrastructure assets (e.g. trees) cannot be determined by its replacement cost and the value may appreciate over time.
- The nature and frequency of maintenance, replacement and/or restoration of green infrastructure assets is different than traditional infrastructure assets, such as pipes and streets, and has a bearing on operations and maintenance (O&M) budgets. Some green infrastructure projects have lower up-front capital costs than traditional infrastructure, but may require more regular maintenance. In other cases, capital funding (e.g., to purchase a new park or natural area) is available, but O&M funding is not.

The City is actively working to develop and improve asset management practices for green infrastructure that address these challenges. However, green infrastructure assets are not fully incorporated into the asset management information and tables (e.g. inventory, condition, replacement value) in the Citywide Systems Plan.

Growth forecasts and locations

Today, more than 605,000 people live in Portland. Over the last 30 years, Portland's population has increased by more than 200,000 residents, primarily due to annexations in east and west Portland during the 1980s and 1990s. According to the Metro 2040 regional forecast, by 2035, Portland is expected to grow by nearly 280,000 people (132,000 households) and 147,000 new jobs within its current boundaries.

In addition, the four-county Portland metropolitan area is anticipated to grow from approximately 1.6 million residents in 2010 to over 2.8 million residents in 2035.[3]

Portland's existing zoning has more than enough development capacity to accommodate anticipated future residential growth and most projected employment growth, except for industrial and institutional uses. This surplus capacity creates an opportunity to make choices about where to focus or prioritize growth.

Buildable lands inventory

The Buildable Lands Inventory (BLI) is an assessment of the city's capacity to accommodate projected changes in housing and employment. A series of maps documents potential physical and market constraints to achieving forecasted increases in households and jobs. These maps were used to determine whether land in the city has full, diminished, or no capacity to accommodate additional housing units or additional jobs forecasted for the next 20 years.

A number of infrastructure related constraints were considered to pose physical or market constraints on new development and were accounted for in the inventory. These constraints included:

- Transportation Vehicular Level of Service
- Transportation Street Improvements
- Water Service
- Sewage Conveyance
- Stormwater Constraints
- Airport Flight Limitations

More information on the Buildable Lands Inventory is available at http://www.portlandoregon.gov/bps/59296.

Growth scenarios and preferred development pattern

The Growth Scenarios report is a background report of the Comprehensive Plan and is a required element of Portland's Periodic Review work program (Task 3). The purpose of this report is to describe how and where Portland is expected to grow over the next 25 years, and to measure the performance of different alternate growth patterns and their ability to help meet Portland's goals and objectives. This analysis is rooted in the Measures of Success adopted in the Portland Plan.

The Growth Scenarios report offers a basis for making informed decisions about which investments and growth patterns will bring the greatest benefit to the most Portlanders, reduce disparities, increase opportunities, and move the city closer to meeting performance goals, such as improving access to living-wage jobs, providing safe and convenient access to goods and services within walking distance of where

[3] Metro, "Population and Housing Forecasts for 2035, by City and County." dated January 15, 2013; Online: http://www.oregonmetro.gov/index.cfm/go/by.web/id=42397.

people live, reducing risks due to natural hazards, enhancing watershed health, and reducing carbon emissions.

The initial Growth Scenarios analysis included four growth scenarios:

- Default – The Default Scenario is based on existing development patterns and development trends. This scenario distributes future growth in the same places Portland has seen growth over the past 15 years.
- Centers – The Centers Scenario focuses more growth in established centers like Lents, Hillsdale, and Gateway and less growth along the length of commercial and mixed use streets.
- Corridors – The Corridors Scenario focuses more development along streets like SE Powell, SE Foster, SW Barbur and N Lombard and less growth in centers.
- Central City Focused – The Central City Focused Scenario concentrates nearly all growth in the Central City and the inner neighborhoods near the Central City, both east and west of the Willamette River.

More information on the Growth Scenarios is available at http://www.portlandoregon.gov/bps/62384.

The Growth Scenarios analysis and public input were used to develop a preferred development scenario, in which growth is primarily accommodated in centers and corridors distributed throughout the city. This preferred development scenario guided refinement of the Comprehensive Plan Urban Design Direction and Comprehensive Plan Map. The Citywide Systems Plan is intended to provide a general plan for serving the land use designations and densities designated in the Comprehensive Plan Map.

Centers and Corridors as focus areas for growth

Metro 2040, the Portland Plan, the Growth Scenarios Report, and the Comprehensive Plan Update all support and/or examine continued residential and mixed use growth in centers and along key corridors. This focus is intended to improve access to services and opportunities for active transportation, enhance household and economic prosperity, help the city achieve its climate preparation and carbon emission reduction goals, and promote community and watershed health. Community conversations about the location, type, extent, and level of development in each center and corridor were part of the Comprehensive Plan Update.

These same plans, as well as the Economic Opportunities Analysis (EOA), expect high levels of employment growth and intensification in industrial sanctuaries, campus institutions, and dispersed industrial and employment areas throughout the city to accommodate future job growth.

Many centers, corridors, and employment areas will require additional public infrastructure investment over the next twenty years to resolve existing deficiencies, accommodate additional growth, encourage and support private investment and job creation, and develop complete communities. As more detailed area-specific planning is completed for these areas, future refinements to the Citywide Systems Plan may be necessary to fully reflect recommended infrastructure investments.

Investment strategies for centers and corridors

The Comprehensive Plan supports strategic public and private investments in housing, jobs, and infrastructure in centers and corridors. These investments will improve equity and help ensure Portlanders live in healthy, complete, and prosperous neighborhoods.

Centers and corridors vary in terms of their current and expected future size, character, and demographic makeup. They also vary in terms of how prepared they are, in terms of physical infrastructure and facilities, to be able to succeed as anchors to healthy connected neighborhoods.

The Comprehensive Plan supports four investment strategies that tailor the type of investment to the expected population of the area, infrastructure needs, and presence of people who might be vulnerable to displacement. Figure 2.2 shows how designated centers vary according to these factors. The combination of these factors plays out in four different investment strategies described below.

1. **Invest to reduce disparities and improve livability**
   This strategy is appropriate for centers and corridors that are not expected to grow significantly, but that have existing infrastructure deficiencies. Addressing these deficiencies will improve health and livability for area residents. For example, investments could fill gaps in streets, bicycle and pedestrian routes, and local parks. Economic development programs could support existing and new businesses and improve neighborhood prosperity and vitality.

2. **Invest to enhance neighborhoods, maintain affordability and accommodate growth**

   This strategy is aimed at centers and corridors that lack basic infrastructure or shops and services and that either have a lot of residents now, or will in the future. These areas also have many people who may be vulnerable to displacement as property values rise.

   In these areas, infrastructure investment could include improving streets, creating new parks, and addressing other deficiencies. Economic development programs could preserve and increase jobs, businesses, and community services in these areas. Housing security programs, like homeownership and rental assistance, could help keep the neighborhood affordable for a range of households.

3. **Respond to opportunities and maintain existing services**
   Some centers and corridors have limited infrastructure needs and are not expected to grow significantly. In these areas, investments focus on maintaining livability and existing infrastructure as well as responding to opportunities.

4. **Invest to fill service gaps, maintain affordability and accommodate growth**
   Some centers and corridors have already benefited from public and private investments in things like light rail, complete streets and neighborhood business districts. In these areas, future investments should focus on making sure infrastructure can serve new residents, filling remaining service gaps, and providing affordable housing.

Figure 2.2 Investment Strategies for Centers

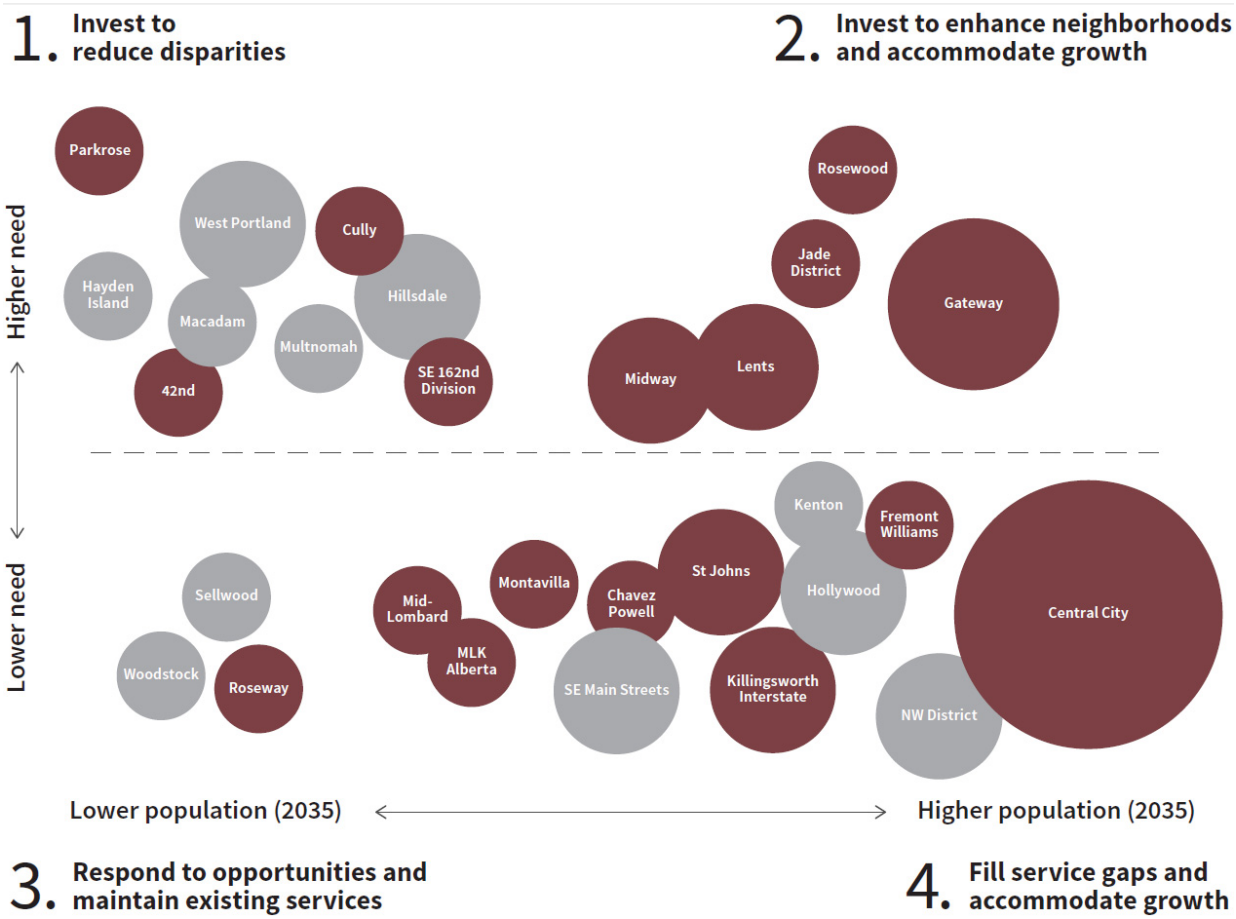


Figure 2.2 shows how Portland's Centers vary in future population, infrastructure needs, and presence of people who might be vulnerable to displacement. The four investment strategies are described in more detail above.

Vulnerability to displacement

In some centers and corridors, many households have the resources and financial security to benefit from and adapt to neighborhood growth and development. However, other centers and corridors – those shown in dark red on Figure 2.2 - are home to more people (renters, households with low income and education levels, and communities of color) that may not be poised to take advantage of growth or may be at risk of involuntary displacement as development occurs.

Summary of system capacity to accommodate growth

Environmental Services

The Bureau of Environmental Services (BES) plans for its facilities based on the maximum densities allowed within existing Comprehensive Plan land use designations. Additional investments in the sewer system will be necessary to address high risk assets, to provide stated levels of service, and to meet regulatory requirements. BES expects to be able to maintain and improve the sewer systems to handle growth needs as long as sewer rates are sufficient to finance system maintenance and capacity upgrades. However, site-specific issues, such as topography and the proximity of existing sewer or stormwater systems, mean that it may not be technically or economically feasible to serve all properties.

The City's stormwater system is composed of combined sewers (sanitary and storm) and separated storm sewers and drainage systems. Stormwater management also relies on the natural rivers and streams that convey stormwater and on stormwater management systems that are owned by other public agencies and private property owners. In areas of the city where the City's stormwater system is constrained, existing and possible future development may exceed the natural and built systems' ability to manage stormwater. This could contribute to flooding, erosion, and damage to homes, business, roads, natural areas, and streams.

Choices about how the city grows will have a substantial effect on the stormwater system. Adequately serving future growth will require investments in traditional piped systems and green infrastructure by the City, other public agencies, special districts, and private property owners to ensure effective stormwater management.

Water

The Portland Water Bureau's primary distribution system can reliably deliver water through 2035, mostly using existing facilities. The Water Bureau is planning water infrastructure improvements to address increasing retail demands within the city limits; demand is expected to increase from 61.5 million gallons per day in 2005 to 79 million gallons per day in 2030. Serving Portland's future population also relies on the continued adequacy and reliability of water systems owned by special districts that serve areas within Portland's urban services boundary.

The Water Bureau also supplies water to regional wholesale customers. Population in areas served through these wholesale contracts is expected to increase significantly, resulting in potentially large increases in water demand. The Water Bureau, in collaboration with the Regional Water Providers Consortium, will also continue investing in water conservation programs that help manage demand and extend the life of the water supply system.

Transportation

The success of Portland's transportation system in meeting future local and regional mobility needs will depend on the City's — and its partners' — ability to maintain existing assets and make strategic investments. The City faces significant funding challenges, maintenance backlogs for existing assets, and

deficiencies in service provision. Future transportation investments will be needed to provide complete, safe, and accessible pedestrian, bicycle, and transit systems and to support freight mobility and access.

Providing a well-functioning, multimodal transportation system for Portland's residents, businesses, and visitors also depends significantly on the ability of the City's partners, including Multnomah County, the Oregon Department of Transportation, TriMet to provide and maintain their facilities, which are critical components of the overall transportation system.

Parks & Recreation

To maintain Portland's quality of life while accommodating growth, it will be necessary to preserve and enhance access to a variety of high-quality park and recreation experiences by acquiring and protecting a range of parks and natural areas, maintaining existing facilities, and providing additional recreation facilities and services. The actual number and type of parks and recreational facilities needed will vary based on where and how growth occurs, the ability of existing facilities to serve additional users and meet diverse needs, and what opportunities arise to locate and build additional parks and facilities. Planning for Portland's future park and recreation system will require providing park experiences that are tailored to both a growing and diverse population and also to the unique characteristics of Portland's parks and natural areas.

Adequately serving current and future Portlanders will also require ensuring that the City's diverse park system provides a variety of active and passive recreational experiences that respond to the unique community and environmental context of different areas of the city. In addition, growth may also place additional pressure on heavily used facilities, such as swimming pools, and it may exacerbate service deficiencies in currently under-served areas. These pressures may be particularly acute in centers that currently lack sufficient park amenities, where both existing facilities and acquisition opportunities are scarce.

Other City Facilities and Systems

Meeting the needs of current and future Portlanders also relies on the City's ability to maintain and enhance other essential facilities and systems – including office buildings, technology, vehicles and apparatus – that are vital to the efficiency and effectiveness of all City agencies, and play an instrumental role in the City's capacity for emergency response.

Non-City Infrastructure Systems

The City does not directly provide public facilities for public education, energy, waste, telecommunications, library, public health, and justice services. However, the current and future capacity of these systems to meet the desired level of service is critical to the city's overall ability to serve current residents and businesses, meet the demands of growth, and be healthy, prosperous, and resilient. Because of this, the City of Portland has an interest in coordinating with these agencies and companies. For example:

- **Public Education:** The City partners with school districts on school facility planning and siting and has begun to consider school district capacity when planning for growth. In addition, the City

encourages school facilities to be multi-functional neighborhood anchors, designed and programmed to serve community members of all generations and abilities, helping Portland become a more age-friendly city.

- **Energy:** Private utilities and companies provide energy facilities and services in Portland. While the City of Portland does not directly provide energy facilities and services, it does regulate placement of these facilities within the right-of-way and on public property. In addition, the City promotes efficient, reliable, and sustainable energy resources, investments, and consumption practices. In particular, the City encourages the use of smart grid technologies; low-carbon and renewable energy sources; and onsite and district-scale renewable energy production to improve the efficiency, reliability, affordability, and sustainability of the energy supply and distribution system.
- **Solid waste, composting, and recycling:** Solid waste, composting, and recycling facilities and services are regulated and provided through a partnership between the City of Portland, Metro, and private companies. The City supports sustainable waste reduction, recovery, and management and acknowledges the important upstream impacts of consumption and disposal of goods and materials. The City also supports efforts to ensure materials are used and reused to the fullest extent possible prior to disposal.
- **Technology and communications:** Private utilities and companies provide technology and communication facilities and services to the general public. The City provides certain technology and communications services to support service delivery by the City and other governmental partners, and it promotes access to affordable and reliable technology and communications for all Portlanders. The City acknowledges that information and technology services have become essential infrastructure, and supports investments and partnerships to ensure all Portlanders are able to access and benefit from emerging technologies, keep Portland competitive, and build on the city's tradition of open-source collaboration and innovation.

Chapter 3
Guiding Principles

The Comprehensive Plan includes a set of integrated Guiding Principles – equity, prosperity, human health, watershed health, and resilience – that bridge policy approaches throughout the Comprehensive Plan. These Guiding Principles have direct implications for the City of Portland's infrastructure investment and management over the coming decades. The following sections address each of these principles and highlight supportive infrastructure investments and approaches intended to meet them.

Guiding Principles

The Guiding Principles encapsulate the Portland Plan's key priorities of equity, prosperity, health, and resiliency into the Comprehensive Plan and implementation tools. The Principles guide projects, programs, and land use decisions that are subject to the Comprehensive Plan. They are intended to be relevant to every project, program, or land use decision that updates or amends an element of the Comprehensive Plan or one of its implementation tools, including amendments to the Citywide Systems Plan. The Principles encourage balanced, integrated multi-disciplinary approaches among topics such as housing, economic development, and transportation.

Guiding Principles. When making and adopting legislative land use decisions, consider the impacts of:

- **Equity and environmental justice.** Encourage land use decisions that reduce existing disparities, minimize burdens, extend benefits, and improve socio-economic opportunities for under-served and under-represented populations.
- **Economic prosperity.** Encourage land use decisions that support the city's economy and foster employment growth, competitiveness, and equitably-distributed household prosperity.
- **Human health.** Encourage land use decisions that avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.
- **Environmental health.** Encourage land use decisions that recognize, incorporate, and sustain valuable ecosystem services related to air, water, and land quality, and the intrinsic value of nature.
- **Resilience.** Encourage land use decisions that improve the ability of individuals, communities, economic systems, and the natural and built environment to recover from natural and human-made disasters, climate change, and economic shifts.

Equity

Portland is becoming an increasingly diverse city, home to people of many races, ethnicities, ages, abilities, and incomes. To serve the needs of a diverse city, the Portland Plan identifies equity as a key strategic priority and a frame for decision-making, investment, community engagement, and measurement of success.

In keeping with the federal Civil Rights Act of 1964, “It is the policy of the City of Portland, that no person shall be denied the benefits of or be subjected to discrimination in any City program, service, or activity on the grounds of race, religion, color, national origin, English proficiency, sex, age, disability, religion, sexual orientation, gender identity, or source of income.”

The Portland Plan defines equity as “when everyone has access to the opportunities necessary to satisfy their essential needs, advance their well-being and achieve their full potential.” As part of adopting the Portland Plan in 2012, City Council directed the implementation of the City’s Civic Rights Title VI Plan to remove barriers and conditions that disadvantaged groups from receiving access to, participation in, and benefits of City programs, services, and activities.

The Comprehensive Plan Update’s Vision for 2035 highlights the importance of equity, including ensuring “everyone has access to opportunity and is engaged in shaping the decisions that affect their lives.” Equity is further integrated into the plan as a guiding principle and through a variety of goals and policies that support decisions that reduce existing disparities, minimize burdens, extend benefits, and improve socio-economic opportunities for under-served and under-represented populations.

Portland’s Demographics

Growing diversity and shifts in Portland’s population and household makeup have, and will continue to, bring corresponding changes in the values and needs of the community. These shifts result in changes in the types of transportation, water, park, and civic facilities needed to adequately serve the community.

Changing demographics may require the City to modify existing infrastructure practices or design systems that can anticipate and adapt to changing needs. For example, the City will need to continue to improve transportation infrastructure so all Portlanders, including older residents, families with children, people with disabilities, and residents with limited disposable income can walk, bike, or take transit in their neighborhoods and to destinations throughout the city. The City may also need to plan for improved or different parks and recreation facilities to accommodate diverse recreational needs and shifts in use patterns.

Race and Ethnicity

According to the U.S. census, communities of color made up approximately 15% of Portland’s population in 1980. In 2010, these communities represented 24% of the population, lower than the national average of 33%. In 2010, the City’s population was approximately 7% Asian, 6% Black or African American, 1% American Indian and Alaskan Native, 1% Native Hawaiian and Pacific Islander, 5% two or more races, 76% white, and 4% some other race. Additionally, approximately 9% of Portlanders identify as Latino or Hispanic, an increase of over 50% from 2000.

Portland’s youth, those 25 years old and younger, are more diverse than the city as a whole. In 2010, more than 36% of Portland youth are people of color — Black or African American, Native American, Native Hawaiian, Pacific Islander, Native Alaskan, Asian, or multiracial. In addition, more than 18% of all youth identify as Latino or Hispanic.

Age

The age of Portland's population has remained relatively constant over the past decade. In 2010, approximately 29% of Portlanders were 24 or younger, 36% were between 25 and 44 years of age, 25% were between 45 and 64, and 11% were 65 or older. In general, areas farther from the city's core, such as East Portland and St. Johns, tend to have higher youth populations.

Disability

In 2000, approximately 19% of Portlanders over age 5 had a disability that impacted their daily activities. These disabilities included sensory, physical, and mental disabilities. Rates of disability are highest for those over 65, at 42.5%, and lowest for people between 5 and 20 years of age, at 8.9%. The Americans with Disabilities Act (ADA), enacted on July 26, 1990, provides protections to individuals with disabilities in the areas of employment, State and local government services, public accommodations, and telecommunications.

The Title II of the ADA prohibits State and local governments from discriminating on the basis of disability, but moreover, its goal is to promote equal access and full participation for all. The City of Portland works to ensure every program, service, benefit, activity, and facility operated or funded by the City of Portland is accessible to people of all abilities. The City strives to eliminate barriers that may prevent persons with disabilities from accessing facilities or participating in City programs, services, and activities. The City is currently developing a citywide transition plan to determine what physical barriers might prevent persons with disabilities from accessing facilities owned or operated by the City.[4]

Income

In 2011, the median household income in Portland was $48,831. This was $7,023 less than the median household income in the Portland-Vancouver metropolitan region. The region's lowest median incomes can be found in North/Northeast Portland, Southeast Portland, and outer east Portland. Median household income has increased by approximately 21.6% since 2000, less than the rate of inflation. Approximately 28% of Portland households earn less than $25,000 annually, while 31% earn more than $100,000 annually.

Fourteen percent of Portland's families were living below the poverty level[5] in 2011. Poverty affects over a quarter of youth under 18 (27%) and 10% of people 65 and older. Similarly, 14% of local families access food stamp or SNAP benefits.

[4] City of Portland, Americans with Disabilities Title II Program. Online, available at http://www.portlandoregon.gov/bibs/62112

[5] In 2011, the poverty threshold was $22,350 for a family of four.

Investing to reduce disparities

To equitably serve Portlanders, the City must work to reduce existing disparities in infrastructure service. In order to meet the Comprehensive Plan's equity principle, the City's infrastructure must be provided in equitable ways to ensure all Portlanders have access to opportunity.

Providing basic infrastructure services in currently under-served areas is a challenge – particularly for transportation, parks and recreation, and stormwater services. Resolving these deficiencies and filling gaps in existing networks will aid the City in serving existing residents and accommodating new growth. The Citywide Systems Plan presents an opportunity to reduce these disparities through policies and investments.

The Bureau of Transportation faces some significant deficiencies, based on existing levels of service and design standards. Issues include street connectivity, pedestrian and bike access and facilities, safety improvements, and substandard streets. Resolving these deficiencies would provide Portlanders with greater transportation access to employment, housing, schools, parks, commercial and community services, and other destinations throughout the city and region. The transportation investment strategy, described in Appendix A and in the Transportation System Plan, includes investments to improve multi-modal connectivity by expanding the active transportation network, maintaining transportation infrastructure, and improving safety.

Portland Parks & Recreation bases its service on sufficiency and access to park and recreation facilities. Unfortunately, many areas of Portland – especially outer east, southwest and central northeast – lack sufficient facilities such as developed parks, community centers, and trails and natural areas. In addition, many areas lack the supporting pedestrian infrastructure to allow safe pedestrian access to parks and recreation facilities. In park-deficient areas, local residents may lack opportunities to recreate, experience nature, and take advantage of the physical, mental, and community health benefits parks provide. Portland Parks & Recreation has identified a need to acquire and develop parks and recreation facilities in currently deficient areas.

Environmental Services' investments in sewer and stormwater systems and wastewater treatment are prioritized by risk due to age, condition, capacity, and regulatory mandates. Typically, high-risk areas are located in Portland's inner neighborhoods, where infrastructure is the oldest. Sewer failures or stormwater issues can result in flooding in basements and streets, sewer backups, landslides, and erosion, posing hazards to residents, businesses, and the environment. In these areas, the Bureau's Investment Strategy, described in Chapter 6 and Appendix A, includes projects to reduce risks and improve sewer capacity. In East Portland, the sewer system is relatively new. There, and in other areas of the city, the Citywide System Plan identifies investments in programs to address stormwater and natural system deficiencies and ensure the benefits of green infrastructure are equitably distributed. Examples include the Johnson Creek flood mitigation program, as well as increased tree planting in canopy-deficient areas, and community watershed stewardship grants and education programs.

Responding to local context

Each area of Portland has its own distinctive characteristics that are valued by community members. Different places are distinguished by their communities and their unique topographies, natural features, histories, assets, patterns of development, and building types.

Instead of following a one-size-fits-all approach, growth, investment, and change can be used to enhance the strengths and assets of each area. The use of infrastructure service and design standards that reflect the unique physical and service needs of different areas of the city will ensure infrastructure is context-sensitive and provides appropriate levels of service. The public facility policies and investments in the Citywide System Plan reflect a move towards context-sensitive approaches. For example, transportation policies support a flexible approach to street design and development standards to respond to local context while ensuring multi-modal movement and access. Similarly, stormwater investments account for unique watershed conditions, including hydrology, natural resources, and level of development.

Promoting inclusive public process

The City supports appropriate and inclusive public involvement in infrastructure investment decision-making – from project identification and prioritization to design and construction. The Community Involvement chapter of the Comprehensive Plan's Goals and Policies, as well as guidance provided by the Community Involvement Program, support inclusive, meaningful, and transparent public involvement. Community involvement in infrastructure decision-making should be tailored to respond to the unique needs of the project and the impacted community.

Using an equity lens

Putting equity into practice requires considering relevant data and questions and setting priorities to advance equity in decision-making. City infrastructure bureaus have been working both internally and with community members and partners to improve common understanding of infrastructure equity. Meeting the needs of a diverse and changing population requires addressing existing disparities while remaining mindful of, and adapting to, changes in community needs over time. There is, and will continue to be, a need for capacity-building, data refinement, risk assessment, community involvement, and the evolution of policies and practices to fully understand and address the equity impacts of infrastructure decisions.

The following questions can serve as an initial step to implementing an equity lens to ensure equitable outcomes in infrastructure investment decision-making. These questions can be asked at different phases of an infrastructure project, policy, or program to begin to assess potential equity impacts:

- What is the existing level-of-service in the project area? How does it compare to the existing levels-of-service across the City?
    - If the level-of-service in the area is less than other areas in the city, what are the economic, social, and environmental impacts of that reduced level of service? Does the project remedy those impacts?
    - If the level-of-service in the area is equal to or greater than other areas of the city, what are the drivers, desired results, or outcomes of the infrastructure project or program?

- What are the demographics of the area?
- Are there current or historical disparities related to infrastructure service? How does the service provided by the proposed asset maintenance, rehabilitation or renewal relate to those disparities? Could the project be improved to further reduce existing disparities?
- Who benefits most from the infrastructure project? Does the infrastructure project positively benefit racial, ethnic, or low-income communities, or people with disabilities?
- Are there potential negative consequences, impacts or burdens of the infrastructure project on racial, ethnic, or low-income communities, or people with disabilities? If so, what are the strategies to mitigate these negative impacts?
- How does the infrastructure project support inclusive, meaningful, and transparent public involvement, particularly for those most impacted?
- Does the infrastructure project support local job creation and economic development opportunities for impacted communities? Will local residents and businesses have preference for construction contracts or employment?
- Based on the information gathered and the answers to these questions, does the project or program support increased equity in the City?

Investment, Gentrification and Displacement

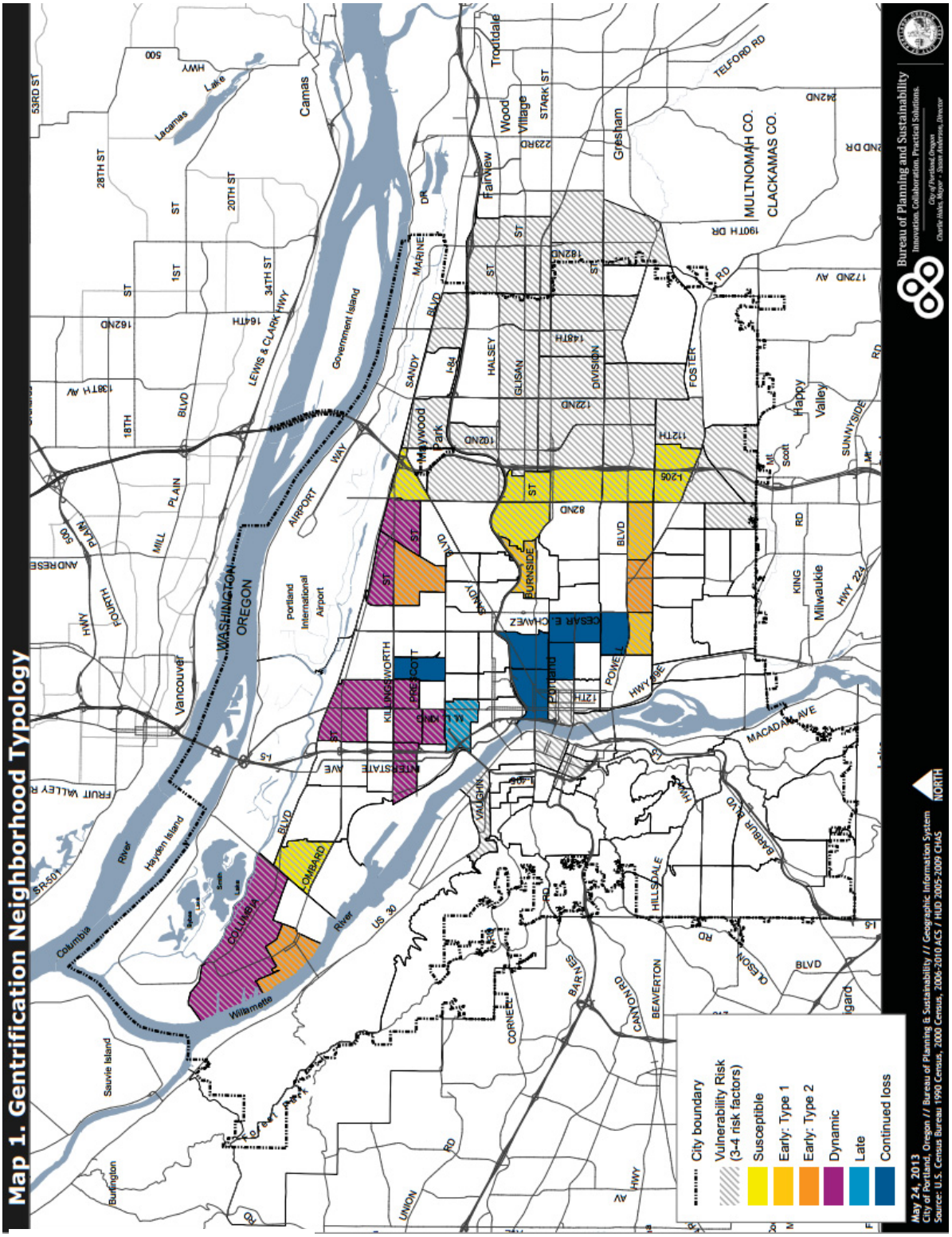
Public and private investments in Portland's neighborhoods have resulted in gentrification and displacement of communities of color, low-income people, and minority-owned businesses. The Portland Plan sets an expectation that an equitable city should be proactive about the inequitable impacts that neighborhood change and gentrification can have on vulnerable households. Specifically, it called for approaches to help evaluate and better manage potential gentrification impacts of new policies, programs, and investments.

Investment in public infrastructure can cause direct displacement, through the use of eminent domain and other tools to "make way" for a new public facility. Investment can also be an indirect factor – inducing gentrification by increasing property values and housing prices, resulting in displacement due to diminished neighborhood affordability.

As part of efforts to evaluate potential gentrification impacts on local communities, the Bureau of Planning and Sustainability (BPS) commissioned a Gentrification and Displacement Study, authored by Dr. Lisa Bates. The study provides a methodology for assessing the risk of displacement, based on vulnerable population criteria (People of Color, low-income, renters, low-education attainment), changing demographics, and real estate market activity. The resulting map of neighborhood typologies, see Figure 3.1, shows where neighborhoods fall on a spectrum of gentrification risk. The study also includes a review of national best practices, including policy tools and programs that Portland could use to mitigate gentrification such as community benefit agreements. This analysis forms the foundation for the assessment of "vulnerability to displacement" used in the investment strategy for centers and corridors, described on pages 21 and 22.

When planning public investments, the City should use this map and analysis to identify critical opportunities to use the equity lens described above, involve local communities in decision-making, and link planned public investments in at-risk areas with strategic housing, economic development and other tools to address displacement risk for impacted communities.

Figure 3.1. Gentrification Neighborhood Typology[6]



[6] Bates, Lisa. "Gentrification and Displacement Study: implementing an equitable inclusive development strategy in the context of gentrification." Commissioned by City of Portland Bureau of Planning and Sustainability, 2013. Available at: http://www.portlandoregon.gov/bps/62635.

Prosperity

Infrastructure can be an important component of a successful economic development strategy, or it can be a key barrier to competitiveness and sustainability. Planning efforts for economic development should consider the opportunities of existing infrastructure capacity, challenges or deficiencies, and strategies to finance priority improvements. Economic development also offers potential opportunities to fund infrastructure improvements through public/private partnerships and other financing mechanisms.

Economic Shifts and Employment Forecasts

Portland is the metropolitan area's regional job center and is home to 39% of the region's jobs, even though it is home to only 26% of the population. While Portland's job growth has been nearly flat (5%) since 2010, Metro expects the city will see higher rates of job growth over the next 20 years. It expects 147,000 new jobs in Portland, representing about 27% of the region's expected job growth. This level of growth is comparable to the city's historic "capture rate" of 25% of regional growth.

Manufacturing remains a key employment sector in the city. Jobs in the manufacturing sector offer opportunities for living-wage careers for residents, potentially without requiring higher education. They also have a high "employment multiplier" effect – one manufacturing job supports 3.69 total jobs in the region. Manufacturing output has been growing faster than output from service sectors. Beyond manufacturing, institutional and office are also leading employment sectors.

Over the next 20 years, Portland will see growth in all five employment geographies – in the Central City, industrial areas, commercial areas, institutions like hospitals and universities, and in residential areas. Supporting employment growth and the success of existing businesses in each of these areas may result in different infrastructure needs and investment priorities.

Building a resilient economy

Competitiveness

The growth of global markets and the tightening of employment land markets in the inner portions of the Portland region mean Portland must continue to provide sufficient, high-quality employment land and necessary infrastructure to remain competitive and attract and retain businesses. To accomplish this, the City strives to provide adequate industrial and employment lands, served by associated infrastructure services, and to keep utility and infrastructure costs competitive. The Portland region's growing export activity is concentrated in manufacturing (e.g. high tech, metals, and transportation equipment), where job growth has been modest but output growth continues to outpace service sectors. The region also has growing export specializations in software, apparel, and clean-tech.

The Citywide Systems Plan includes investments in basic infrastructure services, such as transportation, water, and sewer, necessary to support economic activity. It also includes investments in parks, recreation, natural areas, trails, and other quality of life improvements, which are key to attracting and keeping a quality workforce.

Capacity and Viability

To maintain its economic competitiveness, the City must provide adequate employment capacity and protect the viability of its industrial areas and harbor, which may require infrastructure improvements geared toward the types of industries in these areas. Infrastructure improvements will also be needed to allow economic development of new areas or more intense development of existing commercial and industrial zones.

Portland's Economic Opportunities Analysis (EOA) (2012), recommends infrastructure investment as a strategy to help meet Portland's future industrial and institutional capacity needs. It recommends prioritizing infrastructure investments that will result in greater utilization of existing industrial properties to meet capacity needs. Such infrastructure investments could include improvements to transportation and transit systems, sewer and water facilities, as well as telecommunications infrastructure. For institutional campuses, public transit infrastructure is the highest investment need.[7]

The Citywide Systems Plan identifies transportation, sewer, and water facilities that will be necessary to support employment designations identified in the Comprehensive Plan.

Transportation and Freight Movement

Many local industries and businesses depend on reliable and efficient transportation systems, particularly for freight. Portland's transportation system is critical to the regional economy, as it provides connections to major markets within the city, access to major rail, marine and air cargo routes, and is a key link in the interstate highway system.

Congestion can impede freight movement, cause delays to businesses and commuters, and increase the cost of doing business in Portland. In general, as roadways reach capacity, small increases in the number of vehicles result in large increases in delays.[8] Conversely, small decreases can also reduce congestion significantly. Successful travel reduction strategies, such as providing affordable, reliable, and connected alternative transportation systems, and investments in critical infrastructure can improve freight movement, reduce commute times, and help attract and keep a quality workforce in Portland.

Portland's Economic Opportunities Analysis (EOA) recommends "strategic investments in the freight transportation systems and infrastructure needed to grow Portland's competitive position in the rapidly growing and changing international marketplace."[9] The EOA highlights the importance of continued investments in Portland's transportation infrastructure as outlined in the City's adopted Freight Master Plan (2006), which details policies, strategies, and desired improvements to freight management and movement in the City. Priority is given to the Freight Master Plan's program of strategic investments to encourage reinvestment and industrial expansion in Columbia Harbor as Oregon's international trade

[7] City of Portland (2012). *Economic Opportunities Analysis – Section 4 Alternative Choices*. p. 26. Retrieved from http://www.portlandonline.com/portlandplan/index.cfm?c=51427&a=392786
[8] Dill, 2007.
[9] City of Portland (2012). *Economic Opportunities Analysis – Section 4 Alternative Choices*. p. 19. Retrieved from http://www.portlandonline.com/portlandplan/index.cfm?c=51427&a=392786

gateway, freight distribution hub, and international airport. The Transportation chapter of this Plan integrates recommendations and projects identified by the Freight Master Plan.

The Economic Opportunities Analysis also recommends prioritizing and better linking freight transportation improvements with other infrastructure investments in employment districts. To begin, it recommends working with regional partners to develop a regional freight rail strategy focused on enhancing rail access, travel time, and the efficiency of rail operations for competitive access to markets.

Funding investments

Portland, like many cities across the nation, faces infrastructure funding challenges. Although the City is implementing best management practices and working with public and private partners to improve the efficiency and effectiveness of its infrastructure systems, new ways to fund infrastructure will be needed in the future, either to replace currently outdated funding systems or supplement inadequate funding levels. Portland's Economic Opportunities Analysis (2012) recommends that the City, and the region, pursue alternative infrastructure investment and funding strategies to maintain a competitive and innovative business environment. In particular, the EOA lists maintenance and upgrades to the transportation system, particularly for freight mobility, and broadband investments to support high tech industry as key infrastructure investment areas in need of alternative funding strategies.[10]

Maintaining Affordability

In order to support community prosperity and affordability for households and businesses, the City aims to cost-effectively provide high-quality, reliable infrastructure services to the community. To accomplish this goal, the City is working to prioritize preventative maintenance to minimize future costs, compare the costs and benefits of proposed actions, employ risk management principles to direct public resources at the most urgent needs, and utilize diverse funding streams.

Education

Creating an educated Portland requires that all youth have the necessary support and opportunities to thrive – both as individuals and as contributors to a healthy community and a prosperous, sustainable economy.[11]

Supporting youth success

The City's infrastructure, particularly its transportation systems, parks and recreation facilities, natural areas, and police and emergency services are critical to creating neighborhoods that support youth success. The Portland Plan sets a 2035 goal that all youth live in safe and supportive neighborhoods with safe and affordable transportation options, multiple opportunities for daily physical activity and healthy eating, public safety services, and quality schools that offer multiple community-serving functions.

[10] City of Portland (2012). *Economic Opportunities Analysis – Section 4 Alternative Choices*. p. 11. Retrieved from http://www.portlandonline.com/portlandplan/index.cfm?c=51427&a=392786
[11] City of Portland (2012). The Portland Plan. p. 33.

The Citywide Systems Plan includes a variety of investments that help to create complete neighborhoods that support youth success. The Plan includes active transportation investments to create safe walking and biking routes throughout the city to key destinations like schools, centers, employment areas, transit, parks and natural areas. It also includes programs and investments to maintain and improve parks, recreation facilities and school grounds to increase access to recreation. The Plan supports investments, programs, and partnerships to bring nature into the city through enhanced habitat corridors, tree planting, and the use of vegetated stormwater facilities, like green streets and stormwater swales. Finally, the Citywide System Plan also supports continued collaboration between the City and local school districts around safe routes to schools, recreational programs, and neighborhood and police services.

Human and watershed health

A healthy city requires quality basic services to protect and promote human health and safety and watershed health. The City's transportation, water, sewer, stormwater, trails, green infrastructure, parks natural areas and recreation, and police and fire facilities and services are all critical to protecting and maintaining health and quality of life. The Citywide Systems Plan includes investments in projects and programs to manage and maintain these public infrastructure systems to provide these essential services.

Creating healthy, complete neighborhoods

In complete neighborhoods, people have safe and convenient access to the places, goods, and services needed in daily life. These neighborhoods include housing options, employment options, grocery stores and other commercial services, quality public schools, parks, trails, natural areas and recreational facilities, affordable active transportation options, and civic amenities. A complete neighborhood must also meet the needs of people of all ages and abilities.

Complete neighborhoods can improve human and watershed health by protecting air and water quality through more trees and other green infrastructure; creating safe and convenient options to walk, bike, or take transit; and providing access to nearby parks and natural areas. These elements further promote human and environmental health by reducing auto emissions and other pollutants, and by supporting community resiliency and preparedness in an emergency or disaster. Maintaining existing built and natural infrastructure, as well as providing new infrastructure, is critical to creating complete neighborhoods.

The Citywide Systems Plan includes a variety of investments aimed at creating healthy, complete neighborhoods – including investments in active transportation networks, parks and natural areas, green infrastructure, and emergency response.

Connecting people and places

Connecting Portlanders through active and low-carbon transportation options to their neighborhoods and to key destinations across the city and the region is integral to improving personal, public, and environmental health. These key destinations include places like work, school, shops, and parks and recreational opportunities. Such transportation choices reduce the need to drive, which can promote health by increasing physical activity, reducing household costs, increasing access to the outdoors, and

reducing carbon and other air and water pollutants. Making active transportation a safe and convenient option requires creating a network of safe, accessible and attractive streets, trails, and greenways that encourage active living and community interaction and that integrate nature into neighborhoods. In addition to human and environmental health benefits, shifting travel to active transportation can increase capacity on roadways for freight and automobile movement. Preserving this capacity supports economic prosperity and reduces the need for additional roadway capacity as the city and region grow. The Citywide Systems Plan includes projects and programs to improve active transportation and greenway networks and to improve the safety of the city's roadways.

Protecting and improving watershed health

Healthy watersheds provide a broad array of ecosystem services. Trees, natural areas and other green infrastructure help keep the air and water cool and clean, support stream flow and stormwater management, protect and enhance biodiversity, and reduce the risks and impacts of natural hazards and climate change. These "ecosystem services" are critical for protecting public health and safety and ensuring the effectiveness of Portland's infrastructure systems. They also help the City meet environmental regulations.

The Natural Resource Inventory, adopted as part of the factual basis for the Comprehensive Plan, will inform programs to protect and restore the rivers, streams, wetlands, and vegetation that provide these ecosystem services, and that are vital components of City's stormwater infrastructure system in many Portland neighborhoods. In addition, the Portland Plan establishes objectives and actions for protecting and improving watershed health and associated benefits by 2035.

Multiple bureaus, including Portland Parks & Recreation and the Bureau of Environmental Services, play a role in protecting, restoring, and enhancing watershed health in the city. The Citywide Systems Plan identifies priority projects and program investments needed to sustain and improve key watershed functions relating to hydrology (how water interacts with the natural and built landscapes), water quality, habitat and wildlife, and to meet existing and emerging regulatory obligations.

Designing with nature

The Citywide Systems Plan and the Comprehensive Plan Update's draft goals and policies encourage infrastructure design that protects and enhances watershed health and ecosystem services and avoids the costs associated with degraded natural resources. The updated goals and policies call for treating stormwater as a resource, protecting existing green infrastructure and adding tree canopy and landscaped stormwater facilities into development and street design in order to mimic the natural functions of a healthy watershed. The Citywide Systems Plan includes policies and investments intended to further integrate green infrastructure into infrastructure planning, design, and implementation, while complementing Comprehensive Plan policies that encourage environmentally-friendly development and building design.

Resilience

Preparing for climate change

Portland's climate is changing. Temperatures have increased by an average 1.3° F over the past century in the Pacific Northwest. Precipitation in the Pacific Northwest has generally increased, especially in the spring. The future impacts Portland experiences from climate change will depend largely on whether global carbon emissions decline quickly, plateau, or continue to rise.

In the Pacific Northwest, climate change projections indicate an increase in average annual temperature of 3.3° F to 9.7° F by the end of this century, with greater warming happening in the summers. These projections forecast decreases in summer precipitation (by as much as 30 percent) and increases in winter precipitation over the coming century. In the future, Portland will likely experience hotter, drier summers, and warmer, wetter winters, with more heat waves occurring during the summers.

Portland's infrastructure is vulnerable to several climate change risks including increased flooding and landslides in the winter, and high temperatures, drought, and wildfires in the summer. Portland's built infrastructure has been designed to withstand the historic climatic record. Events outside of that past experience, or an increased number of damaging events, can significantly impact important infrastructure services such as water, sewer, stormwater, flood management, and transportation. Climate change impacts can result in some infrastructure systems becoming more frequently stressed, overloaded, damaged, or at times, partially or totally unavailable. The Citywide Systems Plan includes investments to help ensure the reliability of the City's infrastructure, including improvements to water supply sources and stormwater management facilities.

Portland's green infrastructure, including trees, ecoroofs, green street facilities, natural areas, wetlands, natural waterways, and floodplains, could also be affected by climate change. For example, hotter summers can stress vegetation and make it more susceptible to diseases, pests, and invasive species. Increased flooding onto developed lands threatens homes, businesses, and roadways, and is likely to result in increased pollution and sediment entering streams, reducing water quality. However, investment in green infrastructure could mitigate stress on other assets and on Portland's residents and businesses. For example, increased tree canopy can reduce the severity of heat waves, and green streets can reduce urban flooding. The Citywide Systems Plan includes a variety of investments to protect, enhance, and restore the city's natural areas, urban canopy, and other green infrastructure.

Considering the impacts of climate change and identifying the vulnerabilities and risks of those impacts, enables the City to make more informed infrastructure investment decisions to better prepare and adapt for climate change and improve the resiliency of critical infrastructure. Climate change vulnerabilities must be incorporated into the risks of failure of the City's built and green infrastructure so assets can be appropriately maintained, designed, and replaced to improve the resiliency of systems to hotter drier summers, wetter winters, and storms of increased intensity.

Preparing for and responding to natural hazards[12]

The City of Portland faces potential impacts from a wide variety of natural hazards including earthquakes, severe weather, floods, landslides, urban wildland fires, and volcanic activity. The City's infrastructure facilities and services are vulnerable to natural hazards and are also key to recovering from such events. The City's Natural Hazard Mitigation Plan identifies natural hazards, assesses the related threat and vulnerability to the city's facilities, and recommends mitigation strategies to address high risk assets. The following types of infrastructure are important to hazard preparedness, response, and recovery:

- **Essential facilities** are necessary for continuation of operations and include police and fire stations, City Hall, the 1900 Building, the City's Emergency Coordination Center, the 911 Call Center, and the Justice Center.
- **Critical facilities and infrastructure** include "systems and assets necessary to ensure continuity of security, safety, health and sanitation services, support the area's economy and/or maintain public confidence. Incapacitation or destruction of any of these systems or assets would have a debilitating impact on the area either directly, through interdependencies and/or through cascading effects."[13] Critical infrastructure includes public services that have a direct impact on quality of life such as communication technology (phone lines or Internet access); vital services such as public water supply, sewage treatment; and transportation facilities, such as airports, heliports, highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots and waterways, harbors, and dry docks.
- **Lifelines** include utility systems (potable water, wastewater, oil, natural gas, electric power facilities, and communication systems) and transportation systems (airways, bridges, roads, tunnels, and waterways). Communications facilities are also important lifelines.
- **High Potential Loss Facilities** include facilities that would have a high loss (environmental, economic, or human life and safety) associated with their failure, such as nuclear power plants, levees, dams, and military installations. In Portland, City-owned high potential loss facilities include Portland Water Bureau reservoirs, such as those at Mount Tabor and Washington Park.

The Citywide Systems Plan includes investments to improve the resiliency of the City's infrastructure to natural and other hazards. These include projects to reduce risks to essential and critical infrastructure; improve and restore the city's green infrastructure; enhance the seismic resilience of facilities; and provide redundant (i.e. backup) infrastructure for assets like water and sewage pump stations.

Adapting to social and economic changes

Resilient infrastructure must be adaptable to social and economic shifts as well as natural and climactic changes. Many types of infrastructure built today – including roads, pipes, and parks – are expected to last for many decades. Planning, managing, and investing in the City's infrastructure in ways that reflect changing demographics and economic needs will be integral to meeting the needs of the community over coming decades.

[12] Adapted from City of Portland, Natural Hazard Mitigation Plan, 2010.
[13] Portland/Vancouver Urban Area Critical Infrastructure Protection Plan, 2009.

Chapter 4
Infrastructure and Service Delivery

Urban Service Provision

The City of Portland is the primary provider of infrastructure facilities and services, including transportation, water, sanitary sewer, stormwater, civic facilities, and parks and recreation, within the Portland urban services boundary (USB). The urban service area largely corresponds to areas within the city limits of Portland, but also includes additional unincorporated areas (see Figure 4.1 and the City's Comprehensive Plan Map).

The City of Portland partners with a variety of agencies and organizations to provide infrastructure services within the Portland urban service boundary, see below. While not explicitly discussed in this report, the capacity of these partner agencies to provide necessary services affects the City of Portland's service capabilities and demands. As part of the Comprehensive Plan Update, the City of Portland has or should establish intergovernmental service agreements with agency partners that provide urban services within the Portland Urban Service Boundary, in accordance with Oregon Revised Statute 195 and 197. These service partners are noted with an asterisk (*) below.

In some cases, the City of Portland provides infrastructure services to areas outside of the City of Portland urban services boundary, through service contracts with neighboring jurisdictions.

Service Responsibilities

The City of Portland provides the following public facilities and services within Portland:

Transportation

The City of Portland manages and/or regulates public rights-of-way and manages and maintains a variety of transportation facilities. Transportation facilities and services are also provided by a variety of other public agencies:

- Multnomah County* manages and maintains six Willamette River bridges.
- The Oregon State Department of Transportation* manages the State highway system, including the Marquam, Fremont, Interstate and Glenn Jackson bridges.
- TriMet* provides and operates the regional transit system, including the Tilikum Crossing bridge, with the exception of the Portland Streetcar which is owned by the City of Portland, operated with assistance from Portland Streetcar Inc, and funded in partnership with TriMet; and the Portland Aerial Tram, which is owned by the City and operated in partnership with the Oregon Health Sciences University (OHSU).
- The Port of Portland*, a regional agency, operates several marine terminals and the Portland International Airport.

- The BNSF Railway, Union Pacific Railroad, Portland and Western Railroad, Portland Terminal Railroad, Peninsula Terminal Railroad, and Amtrak move goods and people by rail.

Sanitary sewer, stormwater, and flood management

The City of Portland is the primary provider of sanitary sewers, wastewater treatment, stormwater management and conveyance, and flood management except as follows:

- Washington County's Clean Water Services*, the Port of Portland, and the Oregon Department of Transportation provide stormwater management and conveyance to some areas of Portland.
- Gresham, Milwaukie, Clackamas County Service District #1, and Clean Water Services provide conveyance and treatment of sewage in some areas of Portland.
- The Multnomah County Drainage District No 1*, Peninsula Drainage District No 1*, and Peninsula Drainage District No 2* provide stormwater management and conveyance services and flood mitigation and control in much of the Columbia Corridor. New agreements are in negotiations.
- Management of stormwater on private property has an impact on the amount and quality of stormwater entering public stormwater systems.
- The East and West Multnomah Soil and Water Conservation Districts, governmental agencies, provide technical, financial and educational assistance to support efforts to conserve and restore natural resources within their districts.
- Non-governmental associations, such as Watershed Councils and Friends groups, steward and support the protection, restoration and enhancement of the city's watersheds.

Water supply and distribution

The City of Portland is the primary provider of water supply and distribution, except in areas where service is provided under agreement with water districts, see below. Except as noted below, these water districts are wholesale customers of the Portland Water Bureau and therefore rely, to some degree, on the water supply, transmission, and storage infrastructure of the City of Portland.

- The Rockwood People's Utility District* provides water infrastructure and services to some areas of east Portland.
- The Burlington*, Tualatin Valley*, Valley View*, West Slope*, Palatine Hill*, and Alto Park* Water Districts and the Lorna Water Company provide water service to primarily unincorporated areas within the Portland urban service boundary to the west, southwest, and northwest of Portland.
- The Clackamas River Water District* and Sunrise Water Authority* provide water services to unincorporated areas within Portland's urban service boundary to the south of Portland. These water districts operate in partnership with each other through a cooperative agreement and use the Clackamas River as their main water supply source.

Parks and recreation

The City of Portland is the primary provider of public parks, recreational facilities, and natural areas. The City also manages Portland's urban forest, including regulation of street trees, public trees, and some

private trees, and development and implementation of strategies, education programs, and best management practices. Partners include:

- Oregon State Parks owns and operates Tryon Creek State Natural Area.
- Metro, the regional government, manages regional parks and natural areas, a number of spectator facilities, and the Oregon Zoo.
- Other non-governmental providers, such as the Audubon Society, own and maintain natural areas and public open spaces in Portland.
- Non-profit associations, "friends" groups, councils, and volunteer organizations help steward and support the City's parks, natural areas, trails, facilities, and arts and recreation programs.

Green infrastructure

The City of Portland protects, restores, constructs and manages a variety of green infrastructure assets, such as tress, natural areas, ecoroofs, green street facilities, wetlands, and natural waterways. Other governmental agencies, nonprofit organizations and private entities also play a large role in the protection and stewardship of these resources.

Within the City government, responsibility for green infrastructure assets is divided among various City bureaus, including the Bureau of Environmental Services, Portland Parks & Recreation, the Bureau of Transportation, Portland Water Bureau, and Office of Management and Finance. Bureaus make capital and programmatic investments, and maintain diverse partnerships, to support management of the city's green infrastructure. In addition, because green infrastructure provides multiple infrastructure services and functions, planning, acquisition, development, restoration, and long-term management of green infrastructure assets may be provided by individual bureaus or through cross-bureau partnerships.

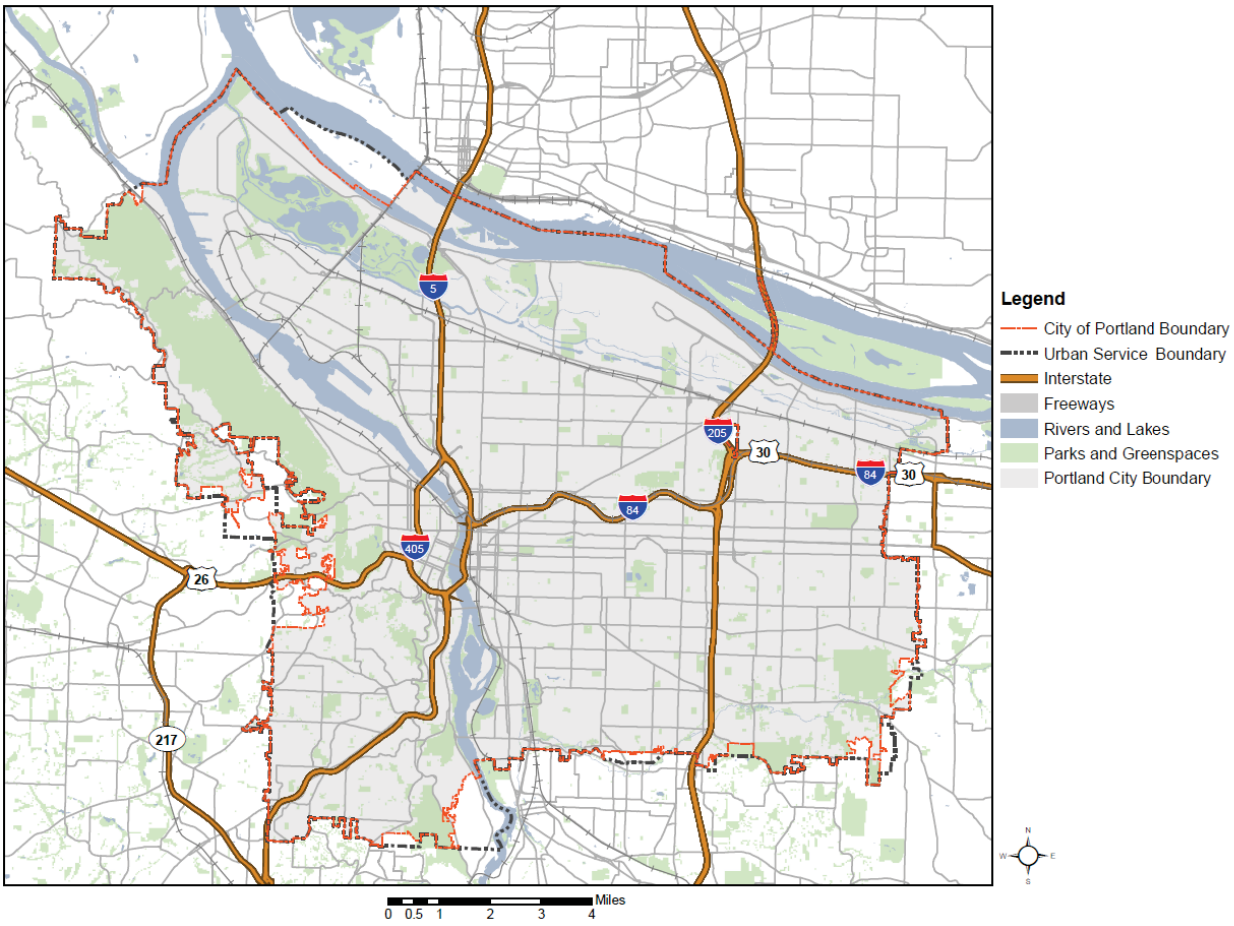
Public safety

Public safety and emergency services, including police, fire, and emergency management, are provided primarily by the City of Portland. Portland Fire & Rescue and the Portland Police Bureau participate in mutual aid agreements with all fire agencies bordering the City of Portland. The goal of mutual aid is to lend or receive fire protection and emergency medical services assistance across jurisdictional boundaries. The City also operates the regional 9-1-1 center and related systems. In addition, the Port of Portland provides police, fire, and rescue services for the Portland International Airport.

Solid waste, composting and recycling

The City of Portland regulates the collection and hauling of solid waste, compost, and recycling. Metro is the regional solid waste authority, charged with ensuring that the region's solid waste is managed in a manner that protects public health and safety and safeguards the environment. Metro regulates facilities and operates transfer stations; private companies collect, transfer, process, and dispose of solid waste, compost, and recycling. The City partners with Metro and supports Metro's work to ensure sound landfill management.

Figure 4.1. Portland's Urban Service Boundary and City Limits



Citywide inventory

The City of Portland provides and maintains infrastructure systems that supply water, sewer, transportation, parks and civic services. These infrastructure systems represent a significant investment and have a current replacement value of more than $31 billion.[14] Tables 4.1 and 4.2 summarize of the City's infrastructure inventory, including the status, value, and condition of assets. These tables only include assets owned and/or managed by the City of Portland and do not reflect assets owned by partner agencies or by private property owners (e.g. private trees). Assets owned by partner agencies and private entities contribute to the overall provision of public services in the City of Portland but are not a component of this Plan.

Table 4.1 Summary of the City of Portland's Infrastructure Systems (2013)

Transportation 	4,842 lane miles of roads 160 bridges 1,072 traffic signals 8.8 million square yards of sidewalks 37,813 improved corners 55,389 street lights	
Environmental Services 	1,454 miles of separated storm and sanitary sewer pipes 885 miles of combined sewer pipes 97 pumping stations 2 wastewater treatment plants 47,779 storm and sanitary sewer access structures 1,900 green stormwater facilities (green streets, ponds, and swales) 885,312 feet of culverts and ditches 8,587 underground injection control facilities (UICs) and sedimentation manholes	
Water 	Bull Run watershed Columbia South Shore wellfield 238 million gallons finished storage 75 miles of conduits 49 miles of transmission mains 2,200 miles of pipes 1,600 culverts 2 dams	33 wells 184,000 service lines 44,000 valves 184,800 meters 14,200 hydrants 38 pump stations 70 storage tanks
Parks & recreation 	11,546 acres of parkland and natural areas 5 golf courses 8 botanical / public gardens 1 motorsports raceway 4 stadiums 13 pools 14 community and arts centers	155 miles of regional trails 129 playgrounds 232 sports fields 48 community gardens 124 tennis courts 5 skate parks 33 dog off leash areas
Other facilities & systems 	Facilities: 8 Police precincts and facilities 8 office, PDC facilities, and other buildings 5 spectator and performing arts facilities 32 fire stations and facilities	Technology: Communications networks Production Services Strategic technology Electronic equipment and software

[14] City of Portland, "2013 City Assets Report".

Table 4.2 City of Portland's Infrastructure: Inventory, Value, and Condition (2013)

Capital Asset Class	Description	Replacement Value $ million	Replacement Value Confidence	Current Condition (in %) Very Good	Good	Fair	Poor	Very Poor	TBD	Confidence
Transportation		**$8,066.8**								
Arterial & collector streets	1,871 lane miles	$2,451.0	Moderate	18	21	21	32	8	0	High
Local streets	2,971 lane miles	$2,304.8	Moderate	12	19	22	36	11	0	High
Sidewalk system										
sidewalks	8,833,812 sq. yds	$1,113.1	High	10	25	30	25	10	0	Moderate
curbs	3,260 centerline miles	$533.6	Moderate	12	50	16	12	10	0	Moderate
corners	37,813 corners	$158.5	High	10	18	17	28	27	0	High
Structures (bridges only)	160 bridges	$378.5	Optimal	6	42	33	18	1	0	Optimal
Traffic signals (hardware only)	1,072 traffic signals	$275.3	Moderate	15	16	23	23	23	0	Moderate
Street lights	55,389 street lights	$194.3	Low	4	12	39	30	15	0	Low
Support facilities	various buildings	$6.9	None to Low	condition ranges from poor to very good						None to Moderate
Other transportation assets	Streetcar, aerial tram, signal controllers, traffic calming devices, street signs, pavement markings, meters, retaining walls, stairways, guardrails, harbor wall.	$650.8	Low to Optimal	condition range from poor to very good or tbd						Low to Optimal
Environmental Services		**$12,517.1**								
Combined sewers	885 mi. of pipe & access	$5,018.8	High	52	18	12	12	6	0	High
Sanitary sewers	1000 mi. of pipe & access	$4,104.4	High	72	20	6	2	0	0	High
Stormwater system	454 mi. of pipe; 1900 green stormwater facilities	$1,946.7	Moderate	27	29	15	22	7	0	High
Wastewater treatment	2 treatment plants & 97 pump stations	$2,168.0	Moderate	20	20	30	20	10	0	Low

		Replacement Value		Current Condition (in %)						
Capital Asset Class	Description	$ million	Confidence	Very Good	Good	Fair	Poor	Very Poor	TBD	Confidence
Water		**$5,472.0**								
Supply	126 miles of roads, 1609 culverts, 12 bridges, 1 200-ft high concrete dam, 1 110-ft high earth dam, ASR wells, 33 well sites with drilled wells, pumps and motors, monitoring wells, 1 groundwater pump station, treatment facility, tank, and collection mains to bring water from wells to pump station	$826.1	Moderate	4	54	39	3	0	0	Moderate
Transmission	75 miles of large diameter conduits, with various supports, 9 conduit trestles 7 river crossings, 49 miles of large diameter transmission mains	$1,202.4	Moderate	6	43	44	8	0	0	Moderate
Terminal storage	238 million gallons finished water storage, interconnecting piping, post-storage treatment facilities, and microhydro facility.	$786.9	Moderate	0	2	24	74	0	0	High
Distribution	2200 miles of distribution pipes, 184,000 service lines, 44,000 system valves, 6800 large meters, 178,000 small meters, 14,200 hydrants, 24,000 backflow devices, 38 pump stations, 70 storage tanks	$4,176.3	High	14	47	31	6	2	0	High
Support facilities	13 support buildings, SCADA, vehicles, construction equipment, lab equipment, computers, and infrastructure components in inventory	$105.0	High	24	17	10	16	32	0	Moderate

Capital Asset Class	Description	Replacement Value $ million	Replacement Value Confidence	Current Condition (in %) Very Good	Good	Fair	Poor	Very Poor	TBD	Confidence
Parks and Recreation		**$984.3**								
amenities				--	--	--	--	--	--	--
furnishings in developed parks	decorative elements and furnishings: memorials, plaques, display fountains, benches, tables, drinking fountains in developed parks and natural areas	$17.60	Low	10	38	37	9	2	4	Moderate
furnishings in natural areas				0	0	0	0	0	100	TBD
decorative elements				0	0	0	0	0	100	TBD
buildings and pools	community and arts centers, pools indoors and outdoors, restrooms, maintenance and utility buildings	$268.50	High	--	--	--	--	--	--	--
major buildings				61	9	26	0	4	0	High
minor buildings				42	19	29	6	3	0	High
recreation features	gathering places, play areas, sports fields and courts, water play areas, docks and boat ramps	$228.60	Low	--	--	--	--	--	--	--
gathering places				0	0	0	0	0	100	TBD
marine				71	0	6	23	0	0	High
off-leash areas				0	0	0	0	0	100	TBD
play areas				3	38	52	5	2	0	High
sports courts and fields				39	24	15	19	3	0	Low
water play				0	0	0	0	0	100	TBD
built infrastructure	circulation systems such as trails, walks, roads and parking lots; utilities	$63.80	Low	--	--	--	--	--	--	--
circulation				0	41	40	18	0	0	Moderate
utilities				0	0	0	0	0	100	TBD
green infrastructure	natural areas, gardens, turf, flower and shrub beds, trees	$405.8	Low	--	--	--	--	--	--	--
natural areas				50	31	6	12	1	0	Moderate
developed areas				10	34	45	7	4	0	Low

Capital Asset Class	Description	Replacement Value $ million	Replacement Value Confidence	Current Condition (in %) Very Good	Good	Fair	Poor	Very Poor	TBD	Confidence
Civic		**$1,318.5**								
Facilities (buildings, structures)										
Office buildings	Portland Building, 1900 Building, City Hall	$172.3	High	0	38	62	0	0	0	High
Other buildings	Archives and Records Center, Kerby Garage, and Portland Communications Center	$69.3	High	0	68	32	0	0	0	High
PDC facilities	Train station and related buildings and Centennial Mills	$48.7	Moderate	0	0	80	20	0	0	High
Spectator facilities	Memorial Coliseum, Rose Quarter parking garages, and Providence Park	$529.6	Moderate	0	37		63	0	0	High
Performing Arts facilities *	Five stages in three buildings (Arlene Schnitzer Concert Hall, Keller Auditorium, and Antoinette Hatfield Hall)	$111.2	Moderate	tbd	tbd	tbd	tbd	tbd	0	TBD
Fire facilities	30 stations, administration building and support facility	$96.8	High	0	98	0	2	0	0	High
Police facilities	Four precincts, Justice Center, property warehouse, equestrian division, and vehicle storage lot	$108.8	High	0	100	0	0	0	0	High
Technology Services										
BTS Communications	Data networks, WiFi network, 800 MHz radio system	$70.8	Moderate	0	97	3	0	0	0	High
BTS Production Services	Storage area network, core servers, email system	$2.8	Moderate	0	77	23	0	0	0	High
BTS Strategic technology	Large corporate applications owned and managed by BTS such as GIS	$6.2	Moderate	0	84	16	0	0	0	High
Electronic equipment and software-other bureaus	Video systems, electronic equipment, Office Suite software, bureaus' PC's and laptops	$8.2	Moderate	0	100	0	0	0	0	High
Strategic technology-other bureaus	Large corporate applications such as TRACS, CAD, PPDS, CIS, and EBS	$93.8	Moderate	0	88	12	0	0	0	High

* OMF is beginning to work with Metro/MERC on the status of performing arts facilities.

Infrastructure Coordination

Providing effective and efficient public facilities and services requires coordination across various City bureaus and offices. This coordination ranges from planning and asset management to long-range financing, annual budgeting, construction, and development review.

Coordinated Facilities and Services

In support of the City's overall mission, individual bureaus maintain distinct, but often complementary, missions and partner in multi-purpose facilities. A few examples include:

- The Bureau of Environmental Services and Portland Parks & Recreation share an interest in the protection, restoration, and enhancement of the city's green infrastructure, including the urban forest – as it provides stormwater, recreation, and natural resource value and services.
- Portland Parks & Recreation and the Bureau of Transportation cooperatively plan for and manage the City's trail systems and play a role in the provision of an interconnected, multi-modal transportation and recreation system.
- The Bureau of Environmental Services and Bureau of Transportation partner on right-of-way and street improvements to manage stormwater, including green streets.
- The Portland Water Bureau and Portland Parks & Recreation operate co-located facilities at places like Powell Butte Park, home to the City's largest water reservoir, and at the City's hydroparks.
- The Portland Police Bureau, Portland Fire & Rescue (PF&R), and the Office of Management and Finance, including the Bureau of Internal Business Services (BIBS) and the Bureau of Technology Services (BTS), provide buildings, facilities, technology, vehicles and apparatus that directly support the work of the Bureau of Environmental Services, Portland Water Bureau, Portland Bureau of Transportation and Portland Parks & Recreation.

Asset management

The City of Portland has asset management programs in the five major infrastructure bureaus – the Bureau of Transportation, Bureau of Environmental Services, Portland Water Bureau, Portland Parks & Recreation, and the Office of Management and Finance. While each bureau's asset management activities differ based on the needs of their unique systems, they coordinate with each other on a one-on-one basis and through the City Asset Managers Group (CAMG). The CAMG is a cross-bureau effort to establish best practices and continually improve performance-based information available to the public, bureaus, and city leaders. This information guides choices in the types and levels of service desired. The CAMG produces an annual City Assets Report that provides information on the value, condition, and funding needs for the City's assets. The information contained in this report helps decision-makers make more informed decisions in the annual budget process. More information on asset management can be found in Chapter 2.

Annual City Budget[15]

Every year, City bureaus participate in the annual budget process, which sets appropriation levels for operations and capital projects for the following fiscal year. The budget process is governed by Oregon's Local Budget Law, Chapter 294 of the Oregon Revised Statutes, which provides standard procedures for preparing, presenting, and administering local budgets, and ensures citizen involvement in budget preparation.

Budgeting in Oregon is an effort shared by citizens and elected and appointed officials. Citizens involved in the budget process work to ensure the services they require and want are adequately funded. City officials are responsible for building a budget that reflects the public interest and is structurally correct.

Budget Process

There are four primary steps in the creation of each year's budget – preparation of a proposed budget, approval, adoption, and amendment.

- **Preparing the Proposed Budget**: Acting as the Budget Officer, the Budget Director is responsible for overseeing the preparation of the Mayor's Proposed Budget for presentation to the City Council, sitting as the Budget Committee. The Proposed Budget is the culmination of an extensive process of budget development, analysis, and revision. Bureaus prepare Requested Budgets in accordance with direction given by the Mayor. These are submitted to the City Budget Office, which then analyzes the requests.
- **Approving the Budget**: In accordance with Local Budget Law, the City Council convenes to consider the Proposed Budget. The public is encouraged to attend and provide testimony on the Proposed Budget. The City Budget Office then summarizes the changes from the Mayor's Proposed Budget to the Approved Budget. This information and copies of the Proposed Budget are sent to the Tax Supervising & Conservation Commission for review, analysis, and certification.
- **Adopting the Budget:** City Council votes to officially adopt the budget before the start of the new fiscal year. Changes between the time the budget is approved and final adoption are limited to technical adjustments and other amendments defined by Local Budget Law.
- **Amending the Budget:** Changes after budget adoption are completed through the budget monitoring process (BMP), which also includes a supplemental budget. During the BMP, bureaus can request to transfer appropriation. In supplemental budgets, bureaus may ask to increase appropriation. The BMP and supplemental budgets provide Council the opportunity to change the budget three times a year.

[15] This section was adapted from the 2013-2014 City of Portland Annual Budget. The full description of the budget process can be found in Volume 1: Citywide Summaries and Bureau Budgets, pages 34-37.

Public Involvement Process

The City engages in a proactive public outreach effort as part of the budget process through:

Bureau Budget Advisory Committees: Bureau-specific Budget Advisory Committees, made up of City staff, community members, and technical experts, review the specific bureau's draft budget request, weigh in on the program and service rankings, and provide input on proposed reductions.

Community Hearings: In advance of the Adopted Budget, the City holds community hearings where Portlanders provide input. The feedback Portlanders provide helps Council prioritize services.

Portland Utility Review Board (PURB): The PURB is an appointed body of nine community members who provide independent and representative review of water, sewer, stormwater, and solid waste financial plans, budgets, and rates. PURB operates in an advisory capacity to the City Council. Council expects the PURB to provide common ground between the rate makers and the ratepayers through analysis of financial plans and budgets. PURB meets monthly to ensure a comprehensive understanding and assessment of the workings of the City's utilities.

Direct Public Testimony: Community members may directly contact the Mayor and Commissioners with input for the budget. In addition to participating in the budget advisory committees, PURB, and community budget forums described above, community members can also personally testify on bureau budget requests at annual budget hearings, at the Tax Supervising and Conservation Commission hearing, and at the adopted budget hearing.

Development review

Building permits are reviewed by multiple City bureaus, including the infrastructure bureaus discussed in this report. The bureaus consider potential impacts of proposed development on infrastructure levels of service, and may require improvements to infrastructure before a land use permit is issued. Bureaus also review requests for most land use adjustments, such as conditional uses and land divisions. In these instances, they may require improvements – such as building streets, sidewalks, sewer and water lines or planting trees – as a condition of approval. In some instances, system development charges (SDCs) are assessed instead of or in addition to requiring improvements to infrastructure. The SDCs are assessed based on the potential impact of the proposed development.

Annexation[16]

The City of Portland is the primary infrastructure provider within the City of Portland's limits of incorporation. Annexation is the process of changing municipal boundaries to bring in adjacent unincorporated areas into an existing city, typically to provide urban services not presently available. Either a city or property owner may initiate annexation.

[16] Adapted from City of Portland, "Annexation", accessed on July 15, 2013 at http://www.portlandoregon.gov/bps/article/363163.

The City of Portland has adopted an urban service boundary (USB) that establishes the area for which it intends to provide urban services at some point in the future. Portland's urban service boundary was adopted in cooperation with surrounding jurisdictions. Property owners within Portland's urban services boundary may apply to the City of Portland to annex in order to receive urban level services, such as connection to City sewer and water systems. In these areas, the City plans for eventual service provision to urban service standards upon annexation of these properties into the City of Portland.

The cities of Portland and Gresham annexed virtually all adjacent unincorporated areas of Multnomah County in the late 1980s and early 1990s to provide sewers and other urban services to this developing area. The City is not currently pursuing any large-scale annexations of nearby unincorporated areas; property owners initiate most small-scale annexations.

Utility Coordination

When utilities need to access pipes and other facilities below roadways for maintenance or replacement work, they must cut through and then patch the pavement. This can cause travel delays and community impacts during construction and can affect the quality, integrity and appearance of the pavement surface. The City of Portland aims to manage the pavement degradation and travel and community impacts of pavement cuts for utility work by coordinating capital projects and through a 5-year moratorium on new pavement surfaces. The moratorium limits new cuts on new pavement surfaces, including overlays, inlays, reconstruction, and new construction of at least a half street or greater.

Levels of Service

Levels of service establish a framework for characterizing system deficiencies, developing and evaluating alternative solutions, and selecting recommended improvements.

Water System

The Portland Water Bureau has established the following levels of service for the water system:

- 100% compliance with state and federal water quality regulations.
- No more than 5% of customers out of water for more than 8 hours a year.
- No customer out of water more than 3 times per year.
- At least one working hydrant within 500 feet of service connection.
- Maintain minimum pressure of 20 pounds per square inch (psi) during normal demands.

The Portland Water Bureau also maintains a variety of other customer service, financial health, infrastructure management, workforce, and sustainability service levels.

- Wastewater Collection System
- The Bureau of Environmental Services has established the following levels of service for the wastewater collection system:
- Provide sewage service to support development consistent with the Comprehensive Plan where feasible.

- Customers properly connect and maintain sewer connections per City standards.
- In the combined sewer area, convey combined sewage to prevent releases to buildings or streets up to a 25-year storm frequency (a storm with a 4% chance of happening in any year).
- Prevent combined sewer overflows to frequencies established by the NPDES permit.
- Public sanitary/combined conveyance facilities are maintained in accordance with standards.
- In the separated sewer area, sewage releases to surface waters (SSOs) are prevented for storm events up to a 5-year frequency (a storm with a 20% chance of happening in any year).

Wastewater Treatment System

- The Bureau of Environmental Services has established the following levels of service for the wastewater treatment system:
- Treatment plants are in compliance with NPDES effluent limits.
- 100% of biosolids are beneficially re-used.
- 90% of methane is beneficially re-used.

Stormwater System

The Bureau of Environmental Services is in the process of developing a comprehensive system plan for stormwater, including levels of service. In the interim, the Bureau has established the following service categories and related performance indicators for the stormwater system:

- Protect public health and safety and property:
    - In the separated area, sewage releases to surface water are prevented for storm events up to a 5-year frequency. In the combined sewer area, prevent releases to buildings or streets up to a 25-year storm frequency.
    - Limit risk claims due to City stormwater.
    - Design and manage infrastructure to limit nuisance flood events.
    - In the UIC area, facilities are managed to effectively reduce pollution to the groundwater.
- Protect biological communities and improve ecological function:
    - Address water quality and quantity consistent with requirements of the Endangered Species Act.
    - Mitigate contamination of surface water and sediments through use of pollution reduction facilities.
    - Minimize disruption to the hydrologic cycle by managing impervious area and through flow attenuation.
- Support community needs:
    - Address deficiencies that impede community improvements. Increased impervious surface area – whether public of private – requires an approvable discharge point for stormwater conveyance.

Parks & Recreation System

- Provide a developed park or natural area within ½ mile from every household
- Provide a full-service community center within 3 miles of every household

Per Vision 2020, PP&R also seeks to build out the recreational trail system. More asset-specific service goals are outlined in Technical Papers, and as Bureau Performance Measures, identified in the Portland Parks & Recreation Strategic Plan. As Portland Parks & Recreation continues development of its new System Plan, it will continue refinement of recreational feature levels of service.

Citywide Investment Strategy Summary

The Citywide Systems Plan contains a capital Investment Strategy, including overnearly $5.51 billion in projects, for the Bureau of Environmental Services, Portland Water Bureau, and Bureau of Transportation. For full information, see Chapters 6 through 8 and Appendix A. The projects and programs included in the Investment Strategy are intended to maintain existing assets, comply with regulatory mandates, and provide key levels of service to existing and future residents and businesses. The Investment Strategy is the basis for the Comprehensive Plan's List of Significant Projects, which identifies new facilities necessary to accommodate the residential and employment uses anticipated in the Comprehensive Plan.

Investment in the City's capital assets may utilize existing financial resources or may include issuance of long-term debt. A decision to issue debt as part of a capital investment strategy will include analysis of available resources to support full repayment of the debt, including whether repayment revenues are program-specific or City general funds. Recommendations regarding use of debt are centralized via the City's Debt Management program in the Office of Management and Finance, Public Finance & Treasury Division. Debt issuance must be authorized by City Council, and is conducted in conformance with the City's Debt Policy (FIN-2.12) and nationally recognized best practices.

Table 4.3 Investment Strategy Summary

Bureau	Estimated Investment Strategy Total* (2013-2033)
Environmental Services	$1,731,749,000
Water	$1,567,070,000
Transportation	$2,154,888,8041,857,036,516
TOTAL	$5,453,717,8045,155,955,516

** Includes financially-constrained total*

Though not required by State public facility planning statutes and rules, the Citywide Systems Plan also includes discussions of long-term investment and financial considerations for parks and recreation facilities (see Chapter 9) and other essential facilities and systems (see Chapter 10). The Plan does not provide detailed investment strategies for these systems.

System Summaries

Bureau of Environmental Services

The Bureau of Environmental Services focuses efforts on comprehensive, multi-purpose solutions across four program areas of the Investment Strategy – wastewater treatment, collection system maintenance and reliability, system development, and surface water (stormwater and watershed) management. These investments are driven by regulatory mandates, system risk (condition and capacity), and system plans including watershed planning and monitoring. The bureau anticipates nearly $2 billion in investment in these programs over the next 20 years – see Table 4.4, Chapter 6 and Appendix A for more information on anticipated investments. Additional investment in ongoing operations and maintenance, green infrastructure programs, and other non-capital investments to meet stormwater, sewer, and watershed health system needs are not included here.

Table 4.4 Environmental Services Investment Strategy Summary

Program	FY 2013-2018	FY 2018-33
Wastewater Treatment	$109,671,000	$305,964,000
Collection System	$328,896,000	$702,800,000
System Development	$23,462,000	$60,000,000
Surface Water Management	$73,441,000	$127,515,000
TOTAL	**$535,470,000**	**$1,196,279,000**

Portland Water Bureau

The Portland Water Bureau's Investment Strategy for the Citywide System Plan is divided into seven (7) primary programs: supply, transmission and terminal storage, distribution, treatment, regulatory compliance, customer service, and support. The Water Bureau anticipates over $1.5 billion in new investment in these programs over the next 20 years – see Table 4.5, Chapter 7 and Appendix A. The Bureau's Investment Strategy provides greater detail on anticipated water projects and investments.

Table 4.5 Portland Water Bureau Investment Strategy Summary

Program	FY 2013-2018	FY 2018-33
Supply	$14,291,000	$88,500,000
Transmission and Terminal Storage	$191,170,000	$242,000,000
Distribution	$244,197,288	$461,650,000
Treatment	$2,500,000	$150,000,000
Regulatory Compliance	$25,504,000	$30,000,000
Customer Service	$3,057,000	$53,700,000
Support	$10,000,000	$50,500,000
TOTAL	**$490,719,288**	**$1,076,350,000**

Bureau of Transportation

The Transportation System Plan (TSP) identifies projects and programs necessary to meet the mobility and access needs of Portland over the next twenty years. The Transportation System Plan is being updated to reflect the Comprehensive Plan Update and the update of the Regional Transportation Plan. The TSP serves as the transportation component of the Citywide Systems Plan. For reference, the TSP's project list is included in Appendix A.

Portland Parks & Recreation

Portland Parks & Recreation has identified many infrastructure needs over the next 20 years to meet the level of service goals outlined in the Parks 2020 Vision, including:

- Acquisition for developed parks, natural areas, trails, recreation, and maintenance facilities.
- Maintenance of existing parks, natural areas, trails, and facilities
- Development of new community centers
- Development of new parks
- Improvements at existing developed parks
- New trails/improvements to existing trails
- Natural area parks

Portland Parks & Recreation maintains a 20-year capital improvement plan (CIP) list, which includes known growth and maintenance related projects that have been identified at this time. The CIP list does not yet include projects for locations where Portland Parks & Recreation has not yet acquired property or developed a master plan for a site, or projects for tree maintenance and canopy expansion investments. Further information about the Portland Parks & Recreation CIP list, including currently identified projects, can be found on the City of Portland's website at: https://www.portlandoregon.gov/parks/63265.

The Citywide Systems Plan does not include a detailed 20-year project list for Portland Parks & Recreation. A comprehensive system plan that reflects asset management needs and community priorities and includes a list of needed investments, costs, and funding sources, will be developed over the next few years. In addition, this information is not required as part of this Plan under Statewide Planning Goal 11: Public Facilities and related statutes and administrative rules.

Other Essential Facilities and Systems

The Citywide Systems Plan does not include a detailed 20-year project list for public safety, technology, and other essential facilities and services because comprehensive system plans, including lists of needed investments, costs and funding sources, are not available at this time. In addition, this information is not required as part of this Plan under Statewide Planning Goal 11: Public Facilities and related statutes and administrative rules.

Chapter 5
Goals and Policies

All chapters of the Comprehensive Plan Goals & Policies contain goals and policies that may be relevant to the provision of public facilities and services. Chapter 8: Public Facilities and Services and Chapter 9: Transportation contain goals and policies for service delivery and system management for public rights of way, sanitary and stormwater systems, water, parks and recreation, transportation, and other City facilities and services. These chapters are included here for reference, but may be updated by future Comprehensive Plan post-acknowledgement amendments. The Comprehensive Plan Goals & Policies document contains the official versions of these policies.

Chapter 8: Public Facilities and Services

Planning and Sustainability Commission: *Please see the Draft Recommended Goals & Policies to review draft language. A copy of the final Public Facilities Goals & Policies will be inserted here for the Recommended Plan.*

Chapter 9: Transportation

Planning and Sustainability Commission *Please see the Draft Recommended Goals & Policies to review draft language. A copy of the final Transportation Goals & Policies will be inserted here for the Recommended Plan.*

Chapter 6
Bureau of Environmental Services

Overview

Portland's sewer and stormwater systems serve nearly all of the city's 588,000 residents, numerous commercial and industrial properties, as well as some customers from neighboring jurisdictions. The network of pipes, pump stations, stormwater facilities, and two wastewater treatment plants, with an estimated replacement value of $13.2 billion, is designed to protect public health, water quality, and the environment. In 2011, the city completed the largest public works investment in its history, the 20-year program to control combined sewer overflows (CSOs) to the Willamette River and Columbia Slough, adding significant new infrastructure (including the "Big Pipes") to the sewer system. Previously, as little as one-tenth inch of rain caused a CSO event. Now, the system can handle more than an inch without overflowing to the river. As a result, instead of sewage discharging in the Willamette 50 times a year, now it is unlikely to happen more than a few times in the winter and every few summers. Repayment of the "mortgage" on this $1.4 billion investment will continue to impact sewer utility rates for years to come. Rates will also be affected by the need for maintenance and improvement of systems, especially aging collection system infrastructure.

Managing Portland's 37 inches of average annual rainfall, much of it falling on pavement, rooftops, or other impervious surfaces, is an ongoing challenge that involves built and natural infrastructure to be managed in partnership with businesses, residents, and community organizations. Portland has become an international leader in innovative stormwater management and other sustainable practices. These sustainable practices support a high quality of life for residents and strengthen the local economy by attracting visitors and businesses.

Mission and Values

BES's mission is to serve the Portland community by protecting public health, water quality and the environment. The Bureau provides sewage and stormwater collection and treatment services to accommodate Portland's current and future needs. The Bureau protects the quality of surface and ground waters and conducts activities that promote healthy ecosystems in our watersheds.

The Bureau's motto is "*Working for Clean Rivers*" and the organizational vision is to be recognized as a trusted service provider and innovative environmental leader through a demonstrated commitment to clean rivers, healthy watersheds and our community.

In the 2011 Strategic Plan, the Bureau identified five priorities for the next five years:

- Responsibly manage ratepayer funds to provide services that address community needs now and in the future.
- Invest in natural and built systems to protect public health and improve watershed health.
- Protect, rehabilitate, and maintain our existing infrastructure for long-term reliability.
- Build and expand partnerships to better meet our Mission and Vision.
- Cultivate leadership and excellence in our workforce.

Purpose of this Chapter

This chapter describes the public facilities and services provided by the Portland Bureau of Environmental Services that are necessary to carry out its mission. It identifies desired levels of service, inventory and condition information for existing public facilities, and future facilities that will be necessary to support the land uses designated in the Comprehensive Plan, as required by Oregon Planning Goal 11: Public Facilities and Oregon Revised Statute 197. Carrying out the Bureau's mission and other City and community goals may also require programs, investments and practices that are not related to public facilities. This chapter may acknowledge--but does not comprehensively address--these measures.

System Services

BES provides sewage and stormwater management services in its service area through a complex set of infrastructure systems that are closely intertwined with the natural systems of Portland's watersheds and the historical development of the city. BES is the responsible bureau for compliance with several state and federal regulatory requirements for groundwater and surface water resources (streams and rivers), as well as the Endangered Species Act. (More information about these requirements is provided later in this chapter.) BES is the lead bureau for planning, implementing, monitoring, and reporting on watershed health improvement projects and programs. BES also administers the City's brownfield remediation program which provides financial and technical assistance to facilitate brownfield clean-up as a redevelopment tool for human and environmental health, environmental justice, water quality, job creation, and neighborhood revitalization.

The Bureau provides wastewater collection and treatment services within the city limits and to areas outside the city limits within the City's established urban services boundary (USB). BES provides sewer service to specific areas outside the USB via contract agreements with neighboring jurisdictions where sanitary sewers from outside the USB flow to a BES sewer or treatment facility (Clean Water Services and Lake Oswego in the southwest, Water Environment Services of Clackamas County in the southeast, and city of Gresham in the east). Similarly, some neighboring jurisdictions treat sewage from the BES system.

The Bureau operates and maintains the stormwater collection system and has an oversight and regulatory role for stormwater management within the City's USB. The City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit covers stormwater from approximately 15,500 acres within Portland's USB that drain to the City's MS4 system, which discharges to local streams, the Willamette River, and the Columbia Slough. The City also manages stormwater with sumps or drywells primarily on the east side of the city, under the Water Pollution Control Facilities (WPCF) for Class V Stormwater Underground Injection Controls (UICs) permit.

Due to the close connection between built infrastructure that manages stormwater (pipes, ditches, pump stations, etc.) and the natural system of streams, wetlands, floodplains and forests that convey, filter, infiltrate and reduce stormwater runoff, the city has adopted a watershed approach to managing stormwater and addressing related regulations, guided by the 2005 *Portland Watershed Management Plan*. The Bureau is the city's lead agency for watershed protection and restoration for Portland's five watersheds (Johnson Creek, Fanno Creek, Tryon Creek, Columbia Slough, and the Willamette River) within the USB. All of the watersheds extend beyond the city limits, requiring extensive collaboration with other local, regional, state, and federal agencies, and non-governmental organizations. Improving watershed health is critical to providing stormwater service, meeting regulations, and supporting the resiliency of Portland's built and natural systems.

Service Agreements

The City of Portland has service agreements with other jurisdictions that allow for treatment of each other's wastewater flows:

- Lake Oswego, for cost sharing of the Tryon Creek Wastewater Treatment Plant.
- Gresham, Milwaukie, Clackamas County Service District #1, and Clean Water Services, for treatment of sewer flows.
- Dunthorpe-Riverdale Service District, for which Portland provides operations and maintenance, engineering, permitting, and treatment services.
- The City also maintains agreements with the Port of Portland and other private entities for maintenance of private pump stations.

The City is negotiating and expects to have in place for Fiscal Year 2013-14 an agreement with Multnomah County Drainage District #1 covering District provision of stormwater management services.

Inventory Summary

The Bureau of Environmental Services is responsible for facilities associated with sanitary sewage and stormwater service. The sanitary and combined sewage systems include both collection and treatment facilities. Two municipal wastewater treatment plants serve the city: the Columbia Boulevard Wastewater Treatment Plant (CBWTP) and the Tryon Creek Wastewater Treatment Plant (TCWTP). Separated stormwater system assets include collection, conveyance, and management facilities. While the bureau

owns and maintains an extensive stormwater system, BES also relies on stormwater management infrastructure (particularly green infrastructure[1]) that it does not own or control as formal assets.

In 2013, the city's wastewater and stormwater systems combined had an estimated replacement value of $13.2 billion. In addition, the Bureau invests in and relies upon the city's green infrastructure and natural systems (such as natural areas, tree canopy, wetlands, and streams) for managing rainfall and stormwater runoff. The value of these natural systems is not included in the $13.2 billion.

Table 6.1 Estimated Replacement Value

System	Inventory	Estimated Replacement Value
Combined Sewers	885 miles of pipe & access structures	$5.0 billion
Sanitary Sewers	1,000 miles of pipe & access structures	$4.1 billion
Stormwater system*	1,900 water quality facilities & 454 miles of pipe	$1.9 billion
Wastewater Treatment	2 plants & 97 pump stations	$2.2 billion
Total		$13.2 billion

* Estimated replacement value does not include the value of the nearly 9,000 Underground Injection Controls (UICs).

The city's combined sewer system provides sanitary and stormwater service to approximately one-third of the city's area, and the majority of its population, through over 885 miles of pipes. Separate sanitary and storm sewer and drainage systems serve the remaining two-thirds (by area) of the city, primarily in the western and outer eastern areas. The separated sanitary sewer system includes a network of 1,000 miles of sanitary lines and associated access structures.

In addition to gravity sewer pipes and service connections, the wastewater system includes more than ninety pump stations and 57 miles of force main which move wastewater uphill as needed to two wastewater treatment plants, where a series of processes clean wastewater through removal of solids and organic materials and disinfects the effluent before discharging to the Columbia or the Willamette River.

The separated stormwater sewer and drainage system collects and conveys stormwater for discharge to local receiving waters (streams and rivers) and includes pipes, culverts, ponds, sumps, detention facilities, ditches, and drainageways, some of which are neither owned nor maintained by the city.

Condition and Capacity Summary

The Bureau has recent condition inspections for all but a small percentage of the sanitary sewer collection system. Comprehensive condition data is not available for the stormwater system.

Based on recent inspections or condition assessment, over 80% of the combined and sanitary only pipes are in good or very good condition. Although the completion of the CSO program allows capital resources to shift to rehabilitation and system improvements, projected investments are not keeping pace with the rapidly aging collection system. While age is a good predictor of pipe failure, materials must also be

[1] Green infrastructure: Public or private assets—either natural resources or engineered green facilities—that protect, support, or mimic natural systems to provide stormwater management, water quality, public health and safety, open space, and other complementary ecosystem services. Examples include tress, natural areas, ecoroofs, green street facilities, wetlands, and natural waterways.

considered. Unfortunately, a significant percentage of the pipe system is concrete pipe that was installed in the early 1940s. Because much of the concrete in that era was poor quality, these pipes are failing more rapidly than might be expected from age alone.

Based on recent inspection data, most (69%) combined sewer system pipes are in good to very good condition, but approximately 10% of pipes are at high risk of failure and in need of repair or upgrading. The sanitary sewer pipes are generally much newer than the combined system pipes and over 90% are in good to very good condition. An estimated $225 million is needed to address the highest risk pipe segments. Projects to address this backlog are included in the proposed Investment Strategy, see Appendix A.

BES has established levels of service consistent with our regulatory permits for both the combined and separated sanitary sewer systems. In the combined system, one benchmark is to convey the 25-year storm at full land use build-out (i.e., consistent with the zoning and the Comprehensive Plan) without risk of system overload, as evidenced by basement sewer backups or surcharging of trunk sewers. In the separated sanitary system, the benchmark is to convey the 5-year storm.

Some areas in the combined system are affected by localized hydraulic capacity limitations that increase the risk of basement sewer backups and/or street flooding. These areas are concentrated close in on the east side with scattered areas in other parts of the system. A number of projects to address this hydraulic deficiency are included in the proposed Investment Strategy.

In the separated sanitary system, hydraulic capacity is impacted by stormwater and groundwater entering the sanitary system. Because the source of stormwater inflow and infiltration can be difficult to identify, engineering solutions are challenging to design. Funds are included in the Investment Strategy to address this issue in the basins most impacted. These basins are concentrated in southwest Portland.

The pumping and treatment systems require regular and more frequent capital investment. While pipes have an estimated 100-year useful life, mechanical and electrical components have a useful life that ranges from 20 to 50 years. In general, all of the pump stations and Columbia Boulevard Wastewater Treatment Plant have sufficient capacity. However, Tryon Creek Wastewater Treatment Plant requires capacity upgrades to serve future growth projections and meet expected regulatory requirements. Projects to address both condition and capacity are included in the proposed Investment Strategy, see Appendix A.

Capacity issues for stormwater outside the combined sewer system vary by watershed. Unique challenges exist in the west hills, in the outer east buttes, and along the Columbia Slough. All of these locations have underserved areas, due to deficiencies in the built stormwater system (e.g., undeveloped right-of-way), or natural conditions that limit infiltration and on-site stormwater management, or make building new piped systems very costly or technically infeasible. All of Portland's major waterways, which are part of the stormwater conveyance network, are water quality limited due to temperature and/or contaminants and the habitat, hydrology and native fish and wildlife species are impacted by stormwater runoff. A number of projects to address stormwater conveyance and/or water quality are included in the proposed Investment Strategy.

Key Issues and Concerns

Serving Existing Residents: Wastewater

Both Portland's combined sewer system and its sanitary sewer system have hydraulic and condition deficiencies that impact the ability of these systems to serve existing properties at designated service levels. These deficiencies can result in higher risks for sewer backups, surcharging, and/or overflows. The greatest concentration of combined sewer pipe segments with capacity problems is located in the older central neighborhoods. The majority of the sanitary sewer system pipes have adequate capacity, however There are deficiencies, concentrated in the southwest (Fanno and Burlingame basins) where the system is impacted by stormwater entering the sanitary sewers.

Pipe segments that are in poor structural condition are widely distributed throughout the service area with the exception of outer east Portland where the collection system is relatively new.

Small geographic areas within the urban services boundary continue to treat sanitary sewage using some type of onsite system such as a cesspool or septic tank and drainfield. Development of new onsite systems is discouraged by the state and the county (the permitting authority) because of the high risk of bacterial contamination to surface and ground water. A program to extend sewers to some of the un-sewered areas is included in the proposed Investment Strategy. However, it is important to note that it may not be technically or financially feasible to provide sewer service to all properties within the USB.

Serving Existing Residents: Stormwater

In areas not served by the combined sewer system, most stormwater is conveyed through pipes, ditches, or drainageways to streams and rivers. In parts of both the combined and separated sewer basins stormwater from the right–of-way or city property is filtered into the ground through sumps (UICs). See Figure 6.1. In some cases, stormwater is managed in detention facilities, other vegetated facilities, or allowed to infiltrate in natural areas. Safe conveyance of stormwater is an issue in some areas, particularly in the hilly areas of west Portland and some parts of outer southeast which lack comprehensive conveyance systems and where infiltration is limited by geology or high groundwater. In some cases, solutions may not be technically or financially feasible.

Flooding continues to be an issue, particularly in the Johnson Creek area. The City is working with partners to restore more natural stream and floodplain conditions to manage 10-year storm events along Johnson Creek.

Maintenance of Existing Infrastructure

For 2013, sanitary and stormwater systems have an estimated annual capital maintenance funding gap of $12.4 million, including $2.4 million in combined sewers and $10 million for stormwater. The long-term financial forecast anticipates significant increases in the capital maintenance budget as the system continues to age. BES is applying new technologies and collecting improved data on its assets allowing for enhanced analysis, planning, and targeted implementation of corrective action.

The bureau's operating resources for operational maintenance needs are strained across all asset types. As of July 2012, the city's stormwater system included more than 1,900 water quality facilities including green streets, vegetated swales, constructed wetlands, and ponds. In addition, the City owns nearly 9,000 UICs and thousands of storm inlets, trash racks and sedimentation manholes. Although green infrastructure such as green streets and swales can have lower overall life cycle costs (capital and operating combined) than a piped solution, these facilities require more regular maintenance to be effective. As the Bureau's portfolio of stormwater infrastructure assets increases, additional operating resources are needed for maintenance. Increases to the operating budget have not been supported in recent years.

Meeting Regulatory Requirements

Bureau projects and programs address a wide range of regulations that focus on protecting human and environmental health. Major mandates stem from five federal acts: the Federal Clean Water Act, Safe Drinking Water Act, Water Resources Development Act, the Endangered Species Act, and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Whenever possible, the Bureau's approach to addressing regulatory requirements is to take a comprehensive "watershed approach" to achieve broader environmental health and other city goals. Projects to address known regulatory requirements are included in the proposed Investment Strategy. Looking ahead, potential changes in regulatory mandates or permit conditions could present additional financial challenges for the Bureau. More information on regulatory requirements and the watershed approach can be found later in this chapter.

In December 2000, Portland Harbor was listed as a Superfund site by the federal government because there is contaminated sediment in the river. The City is one of more than 100 parties that have begun a voluntary settlement process for allocating costs of investigating and cleaning up Portland Harbor. The Portland City Council designated the Bureau of Environmental Services as the lead agency for the City regarding City concerns in the Portland Harbor cleanup. If it is determined that the City's activities contributed contamination to the sediments, the city may need to participate in and pay for some of the cleanup work in the harbor. Because cleanup actions have not yet been determined, cleanup costs are not known at this stage. Therefore, no projects are included in the proposed Investment Strategy.

Accommodating Growth

The Bureau of Environmental Services plans for its facilities based on build-out densities allowed within the comprehensive plan land use densities. The Bureau expects to be able to maintain and improve the sewer systems to accommodate growth as long as sewer and stormwater rates are sufficient to meet capital investment needs.

The geographic distribution of new growth is potentially a concern for all BES services – sanitary sewer, stormwater management, and protection and improvement of watershed health. In parts of the city, it is difficult to provide traditional constructed sanitary and/or stormwater systems, both from a cost and engineering perspective. Coordinating growth and density in centers and corridors in areas with good infiltration or where constructed stormwater management is technically and economically feasible will help

address these concerns. Development of some currently underdeveloped areas may be limited by options for sanitary sewer service and/or stormwater management.

Climate Change

Climate change is expected to influence local hydrology, habitat, and water quality. Preliminary analysis regarding anticipated local impacts suggests that changing weather patterns and temperatures may affect local stormwater management, wastewater treatment, and watershed health. It is not possible to accurately predict the degree of change in climate variables; therefore an adaptive management approach is necessary. The climate variable with the most potential to cause problems for the stormwater system is changes to winter rainfall patterns.

Most of the stormwater pipes and sumps (UICs) in Portland have been in place for decades and were sized with assumptions about climate and land use that were appropriate at the time they were built. Some of these systems are already experiencing problems with the increased runoff caused by increased impervious area. Changing rainfall patterns during the winter months could exacerbate this problem. It could also cause increased erosion and sediment in stormwater runoff. Sediment can clog pipes, make greenstreet facilities less effective, and deteriorate water quality of receiving streams.

The combined sewers could also be impacted by changing rainfall patterns with the added concern of the potential for more frequent combined sewer overflows (CSOs). During very heavy rain storms, runoff from buildings, streets, and other impervious surfaces impacts combined sewer capacity potentially causing overflows.

Climate change predictions include higher summer air temperatures and resultant increases in water temperatures. When wastewater temperatures increase, the dissolved oxygen content decreases and the biological activity of wastewater treatment processes tend to increase. Higher temperatures could result in increased odor production in the collection system and increased oxygen requirements for some biological treatment processes.

Increased temperatures and shifts in the timing and amounts of precipitation could also affect the region's natural systems. These changes are likely to stress and change vegetation, including vegetated facilities (such as green streets, ecoroofs, and rain gardens), and natural areas, particularly wetlands and streams, that we depend on to manage stormwater naturally. Risk of wildfires, floods, and invasive plants and animals are expected to increase. These changes may make it more difficult to meet water quality standards, lead to increasing or more restrictive regulations especially as more fish and wildlife species are listed as threatened or endangered due to changes in habitat, and may lead to higher operations and maintenance costs for infrastructure.

Sanitary Sewer and Stormwater Rates

Construction of the recently completed $1.4 billion combined sewer overflow control (CSO) facilities has increased sewer and stormwater rates significantly over the past two decade. The CSO program and other capital projects are financed through bond sales. Bond repayment terms vary from 20 to 30 years. Approximately one-third of the bureau's annual budget is allocated to debt payments. Portland's rates are

high by regional and national standards; however, this is expected to change as other cities begin to undertake combined sewer overflow control capital projects. Planned operations and maintenance of, and capital improvements to, the sewer and stormwater systems will depend on continued predictable increases in sewer and stormwater rates. Continued public acceptance of rate increases is essential to meeting level of service standards and will require open and clear dialog with the public and decision makers.

Investment Strategy Summary

The work of the Bureau is focused on strategic and comprehensive project and program delivery to protect public health and restore the environment. The Bureau anticipates an annual average capital improvement program of $100 million or approximately $2 billion in capital investment over the next twenty years. Using a risk-based asset management approach, the Bureau budgets to maintain infrastructure and protect or enhance natural systems to meet regulatory requirements and enhance the health of watersheds. Asset management is a tool that addresses life-cycle costs, trade-offs between capital and operating expenditures, and prioritization of projects based on consequence and likelihood of failure, to achieve long-term system sustainability and acceptable levels of service. This approach is reflected in the Bureau's operating budget as well.

Regulatory Compliance

Environmental Services' projects and programs are largely guided by, or in response to, several federal regulatory mandates related to wastewater, stormwater, and natural resources. These regulations are focused on protecting human health and the environment, in line with the bureau's mission. Integrated planning efforts, including a comprehensive view of watershed health, guide the Bureau's response to many of these regulatory mandates. The watershed approach outlined in the 2005 *Portland Watershed Management Plan* provides a framework to coordinate and integrate regulatory response to achieve efficiencies and address the larger goals of clean and healthy rivers, while addressing issues and regulatory drivers such as flooding, contaminated sediments, or water quality in streams. Key regulatory mandates are described below. Except where otherwise indicated, projects and programs to address known mandates are included in the proposed Investment Strategy. While not recognized in the Investment Strategy in this document, the bureau also invests in programs such as outreach and education which have been determined to be cost-effective elements for effective service delivery.

Clean Water Act

The Clean Water Act (CWA), first adopted in 1978, establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating the water quality of surface waters. Several aspects of the CWA apply to the work of the bureau.

National Pollutant Discharge Elimination System Permits

The National Pollutant Discharge Elimination System (NPDES) permitting program was developed to control the discharge of point and certain non-point sources of pollution to the nation's waters. The NPDES program is administered in Oregon by the Department of Environmental Quality (DEQ). Several different types of NPDES permits apply to BES:

- **Wastewater Program**
  Portland has NPDES Waste Discharge permits for treated municipal wastewater discharges from the Columbia Boulevard Wastewater Treatment Plant (CBWTP) and the Tryon Creek Wastewater Treatment Plant (TCWTP). The permits include water quality-based effluent limits and requirements for programs for pre-treatment, 'Fats, Oils, and Grease,' and illicit discharge response. In addition to the treatment plants, both sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs) are regulated under this permit.
- **Stormwater Program**
  Portland has a Phase I NPDES permit for stormwater discharges from the municipal separate storm sewer system (MS4). The regulations do not prescribe specific pollutant discharge limits, rather they allow for the implementation of Best Management Practices to improve water quality to the "maximum extent practicable" based on location conditions, resources, and priorities. The City's compliance approach is outlined in the Stormwater Management Plan (2011) which includes the following elements: development standards; industrial and commercial controls; illicit discharge detection and elimination; structural controls; operations and maintenance; preservation and restoration of natural areas; and public involvement.

- **Industrial Stormwater Program**
  Portland is the agent for DEQ for administration of 1200-Z and 1200-COLS industrial stormwater permits within its jurisdiction. Some types of construction stormwater permits, such as 1200-C permits for large construction sites, are administered directly by DEQ.

Capacity, Management, Operations, and Maintenance (CMOM) Regulations

CMOM is a requirement of the CBWTP permit. It requires the bureau to improve the performance and reliability of the sanitary and combined sewer systems. Consistent with the 2011 NPDES Permit for CBWTP, BES submitted a Draft CMOM Program Report to DEQ in June 2013. The CMOM program is intended to reduce the likelihood of sewer releases by improving the overall reliability of the sanitary and combined sewer collection system. The strategies and activities defined align with the asset management approach to managing, operating, and maintaining the wastewater collection system. The approach uses risk-based strategies for the development, reinvestment, operations, and maintenance of the system.

Water Quality Standards and Total Maximum Daily Load Programs

Section 303 of the Clean Water Act established programs to develop and implement water quality standards and limits for pollutants received by water bodies. DEQ is responsible for developing water quality standards and total maximum daily loads (TMDLs) in Oregon. TMDLs specify the maximum amounts of certain pollutants (including heat) that a particular body of water is allowed to receive without exceeding water quality standards. The goal is to protect beneficial uses such as recreation, cold water fisheries (such as salmon), and municipal and industrial water supplies.

The City is responsible for addressing Environmental Protection Agency (EPA)-approved TMDLs in the Lower Willamette mainstem and its tributaries, as well as in Tryon, Fanno, and Johnson Creeks; and the Columbia Slough.

Amended Stipulated Final Order (CSO Program)

In 1991, BES entered into a legal agreement with DEQ concerning the city of Portland's CSO-abatement program, because overflows from the combined sewer system violated water quality standards for the Willamette River and the Columbia Slough. Completion of the CSO controls program in 2011 was a major milestone. Of relevance to this CSP, the agreement requires Portland to continue to further reduce CSO discharges using cost-effective methods that achieve other mission-based objectives such as watershed health, stormwater management, and wastewater operations and treatment. The Post-2011 CSO Facilities Plan was submitted on September 2010 and approved by DEQ in February 2011.

Safe Drinking Water Act

The Safe Drinking Water Act mandates a variety of programs to protect drinking water supplies. While the Portland Water Bureau is the primary entity regulated by this Act, Environmental Services does have to comply with a sub-set of the regulations through its UIC Program.

Underground Injection Control (UIC) Program

The National UIC Program was enacted in 1974 under the Safe Drinking Water Act. In Oregon, the program is administered by DEQ. In 2005, DEQ issued the City a Water Pollution Control Facility (WPCF) permit for stormwater discharges to approximately 9,000 city-owned UICs. The ten-year WPCF permit regulates the construction, operation, and maintenance of all City-owned UICs. The permit required the development and implementation of a UIC Management Plan, describing the measures the City will implement to control pollutants prior to discharge to a UIC to protect groundwater as a drinking water resource. The UIC Management Plan (2008, revised 2012) includes the following elements:

- Systemwide inventory, assessment and evaluation to determine compliance, prioritization and response actions.
- System management to prevent, minimize and control stormwater prior to discharge, including operations and maintenance, spill prevention and pollution control.
- Stormwater Discharge Monitoring Plan (2006, revised 2012) for data collection and evaluation to demonstrate public UICs are operated in a manner that protects groundwater as a drinking water resource.
- Corrective Action Plan (2006) to evaluate, select, and implement actions to address UICs that do not meet permit conditions.

The City has completed a significant amount of work to ensure compliance with the permit.

Endangered Species Act (ESA)

The Endangered Species Act (ESA) regulates the conservation of threatened and endangered plants and animals and the habitats in which they are found. All eight species of salmon and five species of steelhead that spawn, rear and migrate through waterways in the Portland area are listed as threatened or endangered under the ESA. In addition, ESA-protected Pacific Eulachon (smelt), Bull Trout and Green Sturgeon are present in the Columbia and Willamette Rivers and some local tributaries. Streaked Horned Lark (a bird found primarily in the Columbia Slough) was formally listed as a threatened species in 2013. Pacific lamprey is an ESA candidate species as well.

The basic requirements of the ESA are to avoid harming or harassing the listed species or adversely modifying their critical habitat, and to work to recover these species through the development and implementation of recovery plans. Critical habitat is federally identified and mapped. Portland's waterways are designated as protected critical habitat, which triggers specific requirements for any projects including City infrastructure projects, that involves federal actions such as funding or permitting.

The National Oceanic and Atmospheric Administration Fisheries, the federal agency with jurisdiction over salmon and steelhead, adopted a federal recovery plan for salmon and steelhead in the Lower Columbia River, including Portland, in 2013. BES recently signed a conservation agreement with the USFWS and 15 other state and federal partners regarding lamprey.

The City has a multi-pronged approach to comply with the ESA and advance the recovery plan. BES leads the City's ESA program and a streamlining team for city projects requiring ESA permits. Plans and

projects that help achieve other City objectives, such as culvert replacement, stream bank restoration and riparian protections, erosion control and revegetation, watershed monitoring, zoning, and climate change planning are part of the City's ESA response and critical to species recovery. Several city bureaus have programs and projects related to species recovery; BES implements those projects that are related to its sewer and stormwater mission.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA – Superfund) and Portland Harbor Cleanup

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA, also known as Superfund) was enacted in the wake of the discovery of toxic waste dumps in the US, such as Love Canal and Times Beach in the 1970s. It allows the U.S. Environmental Protection Agency (EPA) to clean up such sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-led cleanups.

In December 2000, the EPA listed a portion of the Lower Willamette River, known as Portland Harbor, as a Superfund site under the federal National Priorities Listing process. The Portland Harbor Superfund investigation is currently focused on a stretch of the Willamette River from River Mile 2 to River Mile 11.8, roughly the area from the Broadway Bridge to just short of the confluence with the Columbia River. The City operates stormwater and combined sewer overflow outfalls within the Portland Harbor area. The outfalls drain City-owned rights-of-way, industrial, commercial, residential, and vacant lands.

Under an intergovernmental agreement, the City and Oregon DEQ are working to identify sources that discharge significant contamination to the municipal conveyance system and to control these sources to reduce contaminant loads. The City is working closely with DEQ and EPA to develop a comprehensive plan to address future stormwater discharges under state and municipal programs to prevent recontamination of the harbor after clean up. If it is determined that the City's activities contributed contamination to the sediments in Portland Harbor, the city may need to participate in and pay for some of the cleanup work in the harbor. Because cleanup actions have not yet been determined, cleanup costs are not known at this stage. Therefore, no projects are included in the proposed Investment Strategy.

Goals & Policies

Draft Goals and Policies related to Sanitary and Stormwater Facilities and services can be found in Chapter 5. Key Infrastructure Policies.

Wastewater and Stormwater Systems

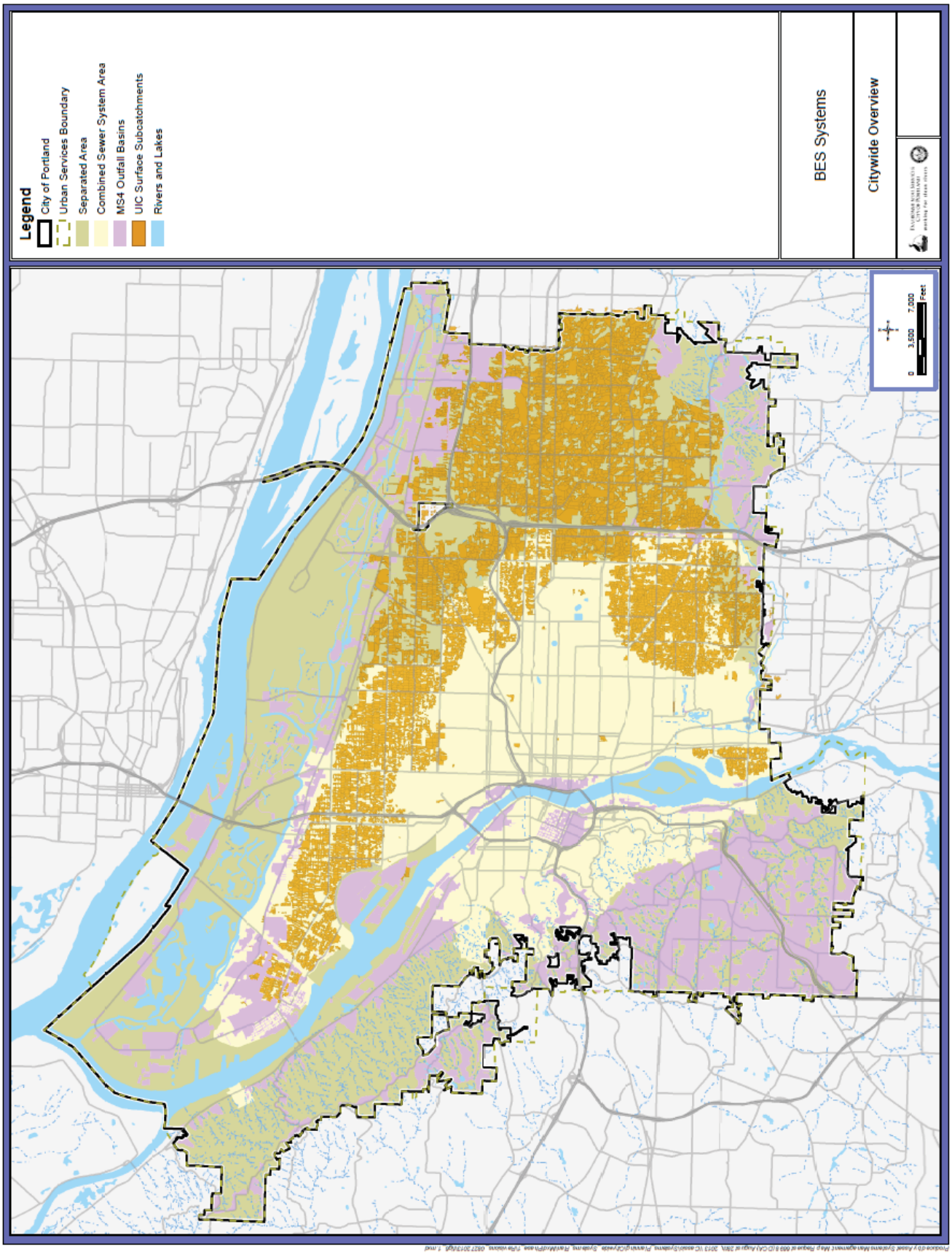
Systems Overview

Environmental Services provides sanitary sewage and stormwater collection through a complex set of infrastructure systems that are closely intertwined with the natural systems of Portland's watersheds and the historical development of the city. Wastewater and stormwater are conveyed through either combined pipes (wastewater and stormwater in a single pipe) or separated pipes (sanitary only or stormwater only). The combined and sanitary sewage pipes convey flow to one of the city's two wastewater treatment plants. In the separated area, stormwater is conveyed via pipes, ditches, swales, and natural drainageways, or simply flows overland to surface water (streams or rivers) or underground sumps (UICs). In portions of the combined sewer area, stormwater is also collected from the right–of-way or city property and discharged to UICs. See Figure 6.1, System Overview.

BES uses both "gray" (primarily pipes and pumps) and "green" infrastructure. Green infrastructure is a part of stormwater management in both the combined and separated stormwater areas. Green infrastructure solutions (such as trees, ecoroofs, natural areas, and green streets) capture and filter precipitation and urban runoff that may otherwise drain into the sewer system or directly into rivers and streams without benefit of pollution or velocity reduction. Green infrastructure can sometimes be the most cost-effective solution to protecting the piped infrastructure system. It can also contribute to other goals, such as climate change adaptation and mitigation. While the bureau owns and maintains an extensive stormwater management system, BES also relies on stormwater management infrastructure (particularly green infrastructure) that it does not own or control as formal assets. Portland's stormwater system depends on management and expansion of the city's tree canopy and natural areas that intercept rainfall, keeping it out of pipes and filtering it naturally. Natural streams and drainageways, although not owned by the bureau, are a critical part of the water conveyance network, Green infrastructure components of the stormwater system may be owned or managed by private property owners, other bureaus (most often, Portland Parks & Recreation), and other institutions and agencies (such as schools, the Oregon Department of Transportation (ODOT), and others).

BES conducts system planning to identify, characterize, and analyze (model) its systems. System plans recommend projects and programs to address condition, capacity, meet regulatory requirements, and growth goals. System planning is driven by an asset management approach (described below) and increasingly integrated with watershed planning. BES has current system plans for the combined and sanitary sewer system, the two wastewater treatment plants, but not for its pump stations or pressurized force mains. Stormwater system planning is underway.

Figure 6.1 Systems Overview



Portland's Watersheds

BES's sewer and stormwater systems are managed to protect or enhance human and environmental health and Portland's watersheds, see Figure 6.2. Each watershed has distinct characteristics and conditions, described below, which are relevant to existing and future infrastructure system planning and investments. All of Portland's watersheds include waterways that are TMDL-listed for water quality and have critical habitat for ESA-listed salmonids.

In 2006, Portland City Council adopted the *Portland Watershed Management Plan* (PWMP) in order to focus the City's efforts to protect and restore Portland's natural systems. The PWMP lays out an integrated set of strategies to improve watershed health, and provides a framework to coordinate and integrate responses to some of the City's regulatory requirements. A healthy urban watershed has the hydrologic, habitat, and water quality conditions suitable to protect human health and viable ecological functions and processes, including self-sustaining populations of native fish and wildlife species whose natural ranges include the Portland area." The City's and BES's goals under the PWMP are to achieve improvements in hydrology, water and sediment quality, habitat, and biological communities. Both the *Portland Plan* and the updated *PWMP Implementation Plan* (2012) reinforce the importance of improving watershed health through repair and maintenance of existing infrastructure, investment in built and natural stormwater infrastructure, environmentally-friendly development and the protection, enhancement and restoration of natural resources. While BES is the lead bureau for watershed health, implementation of the PWMP depends on the efforts of several city bureaus and coordination with other agencies and non-governmental entities. Watershed projects related to BES's mission are included in the Investment Strategy.

To inform future investments, the Bureau conducts comprehensive watershed monitoring to track changes in watershed health over time—including water quality trends. Now in the fourth year of monitoring, the Portland Area Watershed Monitoring and Assessment Program (PAWMAP) is establishing consistent citywide data through an efficient sampling approach modeled after EPA protocols. Every year BES samples a subset of the 298 inventoried miles of streams in Portland. Of the stream reaches sampled and analyzed so far, none meet the city's water quality benchmarks, in large part because of mercury and total suspended solids. Targets for in-water large wood, an indicator of in-stream habitat function and complexity, have been achieved in only 13% of the sampled reaches, and only 2.5% of sampled stream reaches meet the standard for a healthy macro-invertebrate population. (Macro-invertebrates include all species with exterior skeletons, including insects, which are a critical part of the food chain and an indicator of overall environmental health.) In sum, Portland's streams generally are not considered functional for water quality, habitat, and biological communities. Impervious area (roads, parking lots, and rooftops) covers between 22% and 40% of Portland's watersheds, generating large quantities of stormwater runoff and disrupting the natural water cycle. Due to implementation of public

and private stormwater management approaches, including surface water quality facilities like green streets and rain gardens, some of this impervious area is managed. However, effective impervious area—the runoff that remains unmanaged--ranges from 12% in the Johnson Creek watershed to 28% for the mainstem Willamette watershed.

Portland's six primary watersheds are described in more detail below. Specific stormwater system descriptions and challenges for each watershed are in the Stormwater System section.

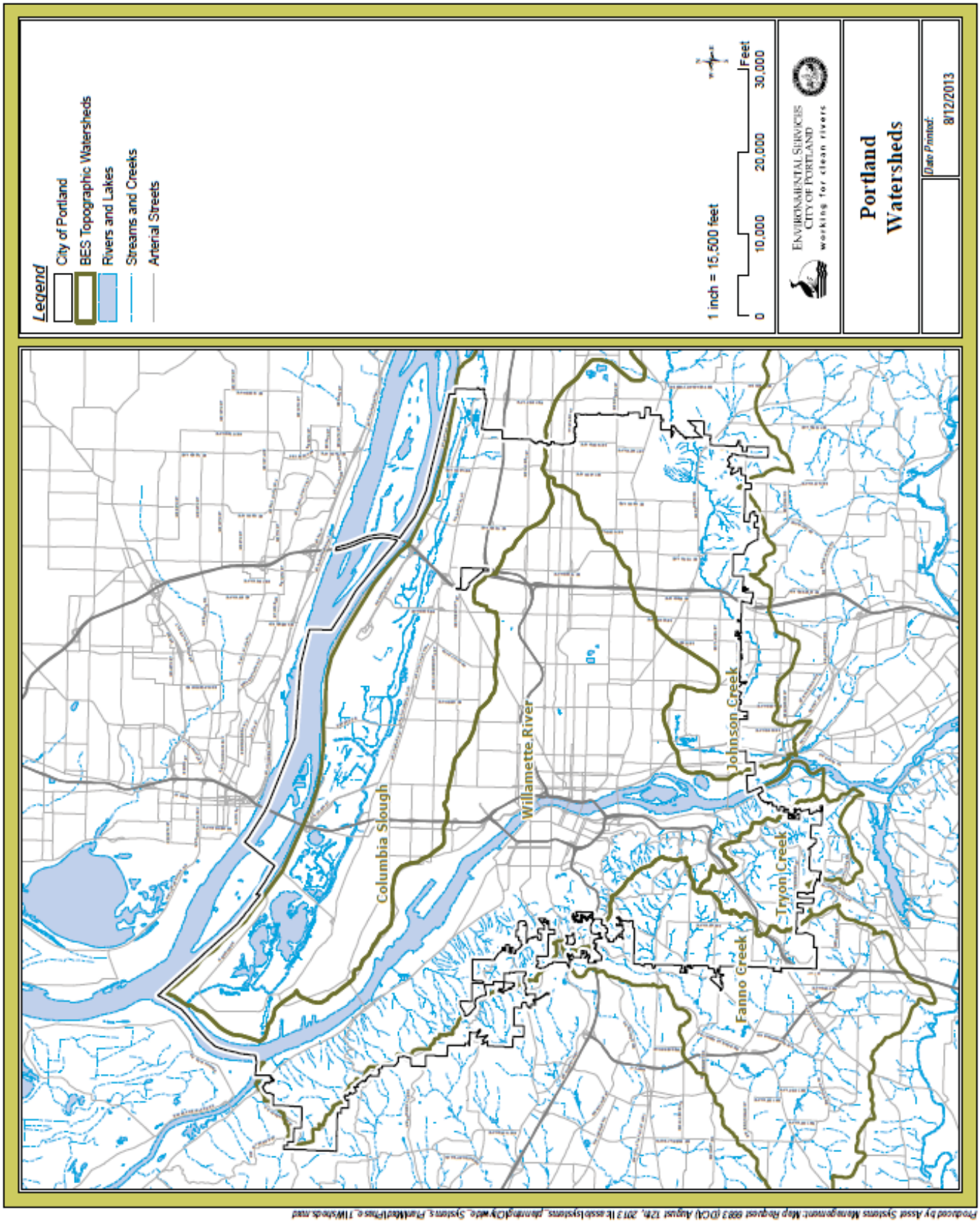
Portland Willamette River Watershed

The Willamette River Watershed in Portland is only 0.5 percent of the Willamette River's total drainage basin, which covers more than 11,000 square miles in western Oregon. Within the City of Portland, the watershed encompasses 69 square miles of land. Other city watersheds—Johnson Creek, Fanno Creek and Tryon Creek— drain to the Willamette River. The river flows north through the downtown core to the Columbia River and serves industrial, residential, commercial, and recreational uses. The highly altered stretch of the river through Portland is the gateway to the entire Willamette Basin for salmon, steelhead, lamprey, and other native fish and wildlife. Despite heavy urbanization, valuable habitat for feeding refuge, rearing, and mating still exists in this portion of the watershed. The river is also a significant place for people to encounter nature through active or passive recreation, and the working harbor is a major economic driver for the region.

The watershed includes the central city and much of inner southeast and northeast Portland, which is highly developed and covered by impervious surface, although relatively flat and with generally good infiltration. The watershed also contains Forest Park and several other large parks and open space areas, and includes smaller tributary streams on the west side of the river that are not part of the Fanno or Tryon Creek basins.

The Willamette River has water quality limitations, including established TMDLs for temperature, bacteria, and mercury. Completion of the Combined Sewer Overflow (CSO) Program in 2011 significantly reduced CSO discharge events to the Willamette River, which improved one aspect of river health, but more work remains to address water quality and habitat in the main stem river. Nine miles of the main stem Willamette River in Portland are designated as a federal Superfund site. In the west side tributaries, water quality challenges and stormwater-related high flows in natural channels lead to degradation of the physical and biological characteristics of these tributary systems. Protection and restoration of remaining natural areas on the Willamette escarpment and in the west hills are important to connecting existing high-quality habitat, preserving the natural hydrologic function of steeply sloped areas, and preventing further water quality impacts in the main stem river.

Figure 6.2 Portland Watersheds



Columbia Slough and Columbia River Watersheds

The Columbia Slough Watershed extends along the Columbia River shoreline and through north and northeast Portland to Alameda Ridge. The watershed drains approximately 51 square miles of land and is defined by the 19-mile long main channel (the slough) as well as approximately 30 miles of secondary waterways. The Upper Columbia Slough is a highly managed system, with piped stormwater, dikes and levees, and a system of pumps that provide area drainage and flood control. The lower nine miles of the slough—from NE 18th Avenue to Kelley Point Park—are tidal and directly connected to the Willamette River. The lower slough provides valuable habitat for migrating juvenile Columbia River and Willamette Basin salmon. The slough provides recreation and access to nature for the metro region, particularly underserved neighborhoods in north and northeast Portland. The Columbia South Shore Well Field, part of Portland's drinking water supply, is located in this watershed.

The watershed is an important economic and transportation hub, the location of thousands of jobs as well as 170,000 residents. Much of the northern section of the watershed has industrial land uses on large parcels. More information on the slough's unique stormwater management considerations is in the stormwater system section. Completion of the CSO program greatly reduced sewage overflows to the Columbia Slough, which has improved water quality.

However, the slough remains water quality limited, with established TMDLs for temperature, bacteria, nutrients, and toxics. Low levels of contamination in the sediment are also widespread. In 1994, the City of Portland established a Consent Order with DEQ related to sediment. The City entered the Voluntary Clean Up Program in 2006. The City and DEQ have adopted an approach that includes reducing pollutant sources, cleaning up specific sites, and long-term monitoring to track how the slough is responding to watershed management actions. BES has completed a predesign that identifies priority city-owned stormwater outfalls that need pollutant reduction facilities.

Protection of valuable natural resources like Smith and Bybee Wetlands and Big Four Corners Natural Area, ongoing work to revegetate the banks of the slough, construction of green street facilities, and stormwater pollution controls by businesses along the slough are improving conditions in the Columbia Slough watershed, but significant challenges remain.

The Columbia River watershed in Portland is a fraction of the river's overall drainage basin in North America and covers just over one square mile of the City of Portland along the river's south shoreline and Hayden Island. The City provides stormwater and sewer services to the residents and businesses in this area, and the Columbia Boulevard Wastewater Treatment Plant discharges Portland's wastewater effluent to the Columbia River. While development on Hayden Island is concentrated on the eastern side, the western portion is outside the City's service area and remains undeveloped. The island provides rare shallow water habitat and riverine woodlands. The Columbia River south shoreline is leveed for approximately 11 miles and the drainage districts are responsible for flood control in this area.

Johnson Creek Watershed

The Johnson Creek Watershed encompasses approximately 54 square miles of land, over half of which lies outside the City of Portland. Johnson Creek originates in Clackamas County east of Boring, Oregon,

and flows west approximately 25 miles to its confluence with the Willamette River. The watershed has a mix of land uses: agricultural, commercial, light industrial, and residential. Salmon, steelhead, and other native fish are found in significant portions of the watershed. Johnson Creek provides some of the city's best opportunities for native species recovery.

Fifteen miles of the creek channel is lined with concrete and rock from Works Progress Administration (WPA) attempts to control flooding in the 1930s, which has exacerbated storm-related flooding, particularly in the Lents neighborhood. In addition, development in the East Buttes area has disturbed natural drainageways, seeps, and springs that are an important part of the hydrologic cycle, and the entire creek has low flows during the summer.

Agricultural runoff, particularly in the headwaters (outside City limits), and legacy pollutants such as DDT are a significant challenge to stream health. Remediation efforts require collaboration among multiple jurisdictions. The creek has established TMDLs for bacteria, temperature, and toxics.

Through the implementation of the Johnson Creek Restoration Plan (JCRP), the City and partners have purchased more than 260 acres of frequently flooded property and are removing WPA alterations and restoring the natural stream channel. The goal of the JCRP is to curb impacts from nuisance flooding while improving water quality and habitat, reversing the damage from earlier attempts to control flooding that altered the natural channel of the creek. Several floodplain restoration projects completed in the past ten years are making cumulative improvements in the natural resource functions of the watershed, and additional priority projects are planned.

Fanno Creek and Tryon Creek Watersheds

The Fanno Creek Watershed covers approximately seven square miles of land in southwest Portland. The balance of the watershed's 32 square miles is mainly in Washington County. Several of the tributaries to Fanno Creek provide cool water and habitat for native fish, and Fanno Creek itself is a tributary to the Tualatin River.

Stormwater flows into stream channels and into Fanno Creek or is managed by the storm sewer system and surface water facilities. Impervious area from development, combined with local geology and steep slopes, results in highly variable flows that impact streams. Fanno Creek has water quality challenges, including established TMDLs for temperature, bacteria, and nutrients.

The Tryon Creek Watershed covers approximately six square miles of southwest Portland. About 21 percent of the watershed is outside the City of Portland's boundary in the jurisdictions of Multnomah County, Clackamas County, and the City of Lake Oswego. Most of the development is concentrated in the upper part of the watershed where impervious surfaces cover significant area. Tryon Creek State Natural Area and other parks and natural areas provide valuable, but fragmented, habitat. Native resident fish are found in the creek, but salmon and other migratory fish are largely excluded by the culvert under Highway 43 near the mouth of the creek.

Stormwater in this watershed flows quickly across soils that are slow to infiltrate and down steep slopes into stream channels that flow into Tryon Creek. Runoff from major transportation corridors including I-5

and Barbur Boulevard discharges to Tryon Creek or its tributaries. The creek has water quality challenges, including established TMDLs for temperature and bacteria. Stream bank erosion, channel incision and simplification, and fine sediment deposition are issues in both the Tryon and Fanno Creek watersheds. The Fanno/Tryon Watershed Management Plan calls for a dual approach in Tryon Creek of managing stormwater runoff, to reduce impacts to streams, especially in the upper watershed, while restoring and protecting existing natural areas to preserve the natural functions of the water cycle. In Fanno Creek Watershed, the primary focus is on managing stormwater runoff from commercial corridors and high-traffic streets.

Asset Management Approach

Although BES began incorporating asset management into its business practices more than 20 years ago, in 2010 the Bureau launched an Asset Management Improvement Program to better define asset management principles and practices as they should be applied to BES assets, identify opportunities for improvement, and establish a framework for implementing improvements. This helps the bureau prioritize investments within and across the different systems (sewage conveyance, treatment, and stormwater management). Asset management is a dynamic process, and the bureau's implementation of asset management varies by system and asset types.

The focus of the asset management approach is assessment and mitigation of business risk. Business risk is calculated as the product of consequences of failure to meet levels of service and likelihood of failure. In determining the consequences of failure to meet levels of service, the following triple bottom line risk factors were used:

- economic, including impacts on operations, maintenance, and/or replacement and emergency costs,
- environmental, including impacts on physical habitat, biological communities, and/or compliance with regulations, and
- social, including impacts on public inconvenience and perception and/or public health and safety.

Starting with these triple-bottom-line asset management factors, staff identified specific risks and associated dollar values for individual consequences of capacity and structural failures. The potential consequences of pipe failure include sewage backing up into private property, sewage overflows to the surface, and/or sinkholes opening to the surface.

Likelihood of failure is the probability an asset will fail. For structural deficiency risk, likelihood of failure was determined from condition assessment data and literature curves that relate pipe condition grades to remaining useful life for different pipe materials. For capacity deficiency risk, likelihood of failure was estimated by computer model simulation of flows for storms with different frequencies and under existing and future development conditions.

Sewer pipe segments were evaluated using a geographical information system (GIS) database tool to prioritize and map potential spot repairs and whole pipe rehabilitation/replacement. The database includes information from pipe inspection regarding condition, grade, and defects of the pipe as well as data concerning consequence of failure, likelihood of failure, estimated cost, and prioritization. This pipe

rehabilitation tool was utilized to identify rehabilitation/ replacement needs for the sanitary and combined sewer collection systems.

Pipe assets were evaluated to determine the current and potential future capacity risk. Alternatives were developed to address capacity and structural risks and were evaluated for cost-effectiveness in addressing level of service goals including reducing sewage backups into basements in the combined system. In the sanitary system, rainfall derived infiltration and inflow (RDII) is the biggest cause of capacity deficiencies. The effects of RDII were evaluated for the pipelines and pump stations using flow monitoring data and/or modeling assumptions based on pipes of similar age and location.

Wastewater Collection System

Wastewater is collected and conveyed via either combined sewers or separated sanitary sewers. Sewage is collected and transported through a combination of gravity pipes, pump stations, and pressurized force mains to major interceptors that convey the sewage to one of two wastewater treatment plants.

Wastewater Collection System Inventory

The collection system consists of a network of approximately 1,900 miles of collection system piping (1,000 miles of sanitary sewer, 885 miles of combined sewer, and 13 miles of sewers Portland maintains by agreements with other agencies), ranging from six inches to 22 feet in diameter. The system includes 39,760 access structures, 57 miles of force mains, and 25 outfalls. The City is responsible for operation and maintenance of 97 pump stations (80 that are owned by the City; six owned by other public agencies and 11 privately-owned septic tank effluent pumping (STEP) systems). The total wastewater service area is approximately 92,500 acres.

The combined sewer system collects and transports sewage and stormwater flow in a single pipe network to the CBWTP for treatment. It is divided into 41 basins[2], which are grouped into four major CSO service areas: West Side Willamette, East Side Willamette, North Willamette, and the Columbia Slough, see Figure 6.3. This area is approximately 31,700 acres in size and is bounded on the north by the Columbia Slough, on the south by Johnson Creek, on the west by the Portland West Hills, and on the east by 82nd Avenue (approximately). It includes most of downtown Portland and many older residential areas.

In the combined system, raw sewage is collected from local properties and stormwater runoff is collected from the public right-of-way, rooftops, parking areas, and other impervious surfaces. The system includes publicly-owned stormwater control facilities (such as green streets and sumps) that divert stormwater from the pipe system and 14 pumps stations. The city also relies on privately-owned vegetated stormwater facilities such as rain gardens, to reduce stormwater volume entering the combined system. Combined sewage is conveyed through a series of collector sewers and trunk sewers to diversion structures located at the downstream ends of the basins. The diversion structures route the combined sewage from the basins into the interceptor system that conveys the flow to the CBWTP. When capacity is not available in the interceptors, the diversion structures overflow to the CSO control facilities (storage tunnels and pumping systems) to deliver captured CSOs to the CBWTP for treatment. During large, infrequent storms when the tunnels fill, the excess combined sewage spills over the control dams in the tunnel shafts and discharges to the Willamette River or the Columbia Slough.

The sanitary sewer system includes the network of pipelines and pump stations that collect and convey wastewater only. The area served by sanitary sewers is divided into 29 basins, totaling 60,800 acres, and covering most of outer east and southwest Portland, see Figure 6.3. The basins are defined by the network of sanitary sewers that collect wastewater and convey it to either a major sanitary trunk sewer or a combined interceptor sewer. Seventy-four of the City's pump stations pump separated sanitary flow of

[2] BES has defined multiple basins for the combined sewer, sanitary sewer, and stormwater systems. Basin boundaries are based on the routing of flows to downstream discharge locations. The basins are delineated separately for each type of sewer – combined, sanitary, and stormwater. Within one watershed, there may be combined sewer basins, sanitary sewer basins, stormwater basins, or a combination of each.

which 55 are located in the Columbia Slough Service Area. The sanitary flow from the Tryon Creek Service Area (Tryon Creek and Dunthorpe-Riverdale basins) is treated at the Tryon Creek Wastewater Treatment Plant.

Flow from the Durham Service Area (Skyline and Clean Water Service South basins) flows to the Durham Advanced Wastewater Treatment Facility, owned and operated by Clean Water Services of Washington County. Aside from the few customers served by Gresham, the remaining flow is treated at CBWTP.

Wastewater Collection System Levels of Service

Levels of service for the wastewater sewer system establish a framework for characterizing system deficiencies, developing and evaluating alternative solutions, and selecting recommended improvements. The following levels of service are specific to the collection system:

- Provide sewage service to support development consistent with the Comprehensive Plan where feasible.
- Customers properly connect and maintain sewer connections per City standards.
- In the combined sewer area, convey combined sewage to prevent releases to buildings or streets up to a 25-year storm frequency (a storm with a 4% chance of happening in any year).
- Prevent combined sewer overflows to frequencies established by the NPDES permit.
- Public sanitary/combined conveyance facilities are maintained in accordance with standards.
- In the separated sewer area, sewage releases to surface waters (SSOs) are prevented for storm events up to a 5-year frequency (a storm with a 20% chance of happening in any year).

The Bureau has evaluated the sanitary and combined sewer pipe systems for structural integrity and the capacity to convey design flows. Pump station capacities have been evaluated to determine whether they could adequately pump the collection system design flows. Characterization of these systems is presented in terms of the risk of not meeting the technical levels of service. The estimated total sewer system capacity and structural deficiency risk is shown in Figure 6.4. In this figure, risk is expressed in dollars per acre and summarized in 25-acre grid cells color coded to signify a risk range. This figure illustrates the areas of the system where total sewer risk is currently highest. The Bureau has included a number of projects in its Investment Strategy to reduce this risk.

Figure 6.3 Sanitary and Combined Sewer Basins and Service Areas

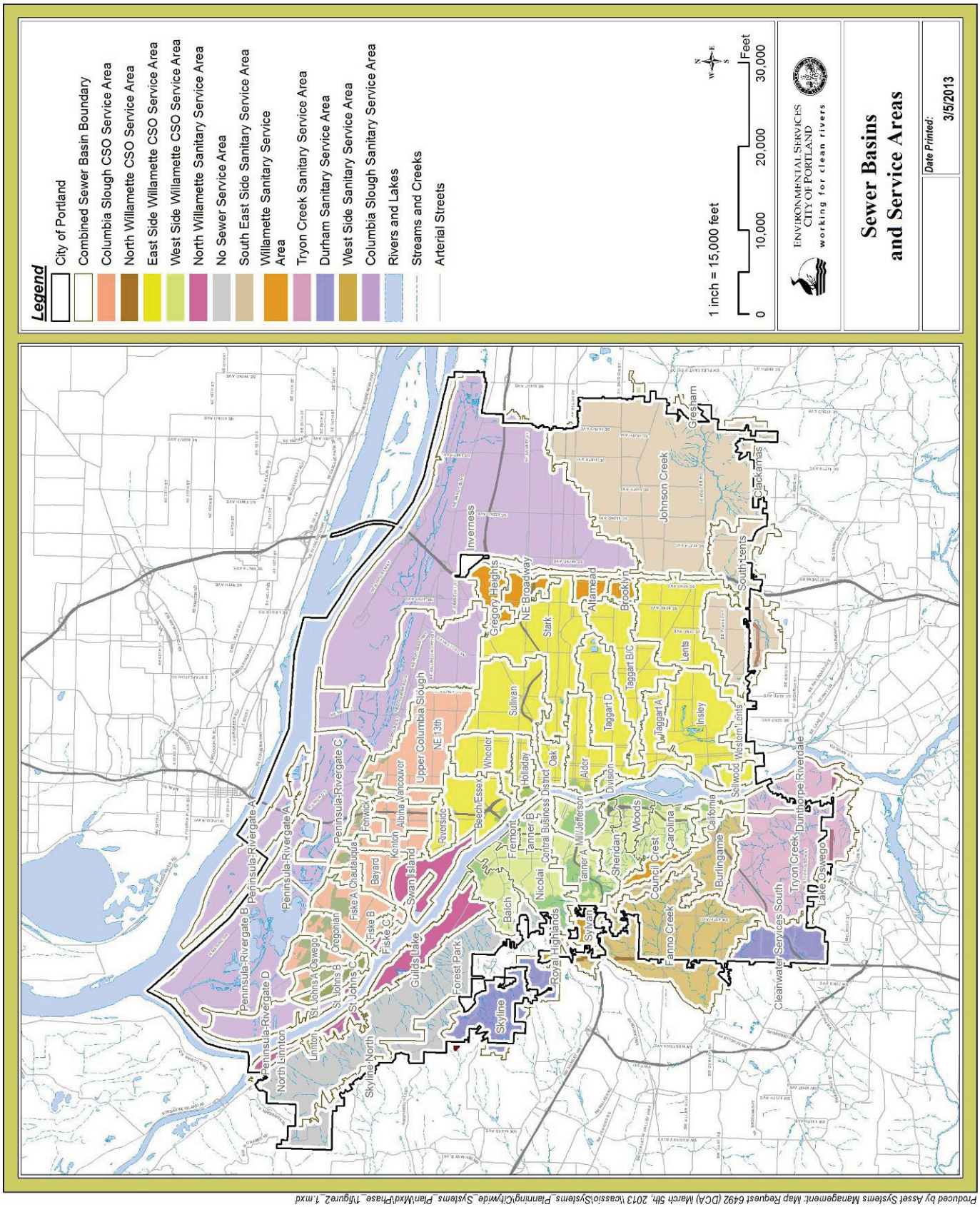
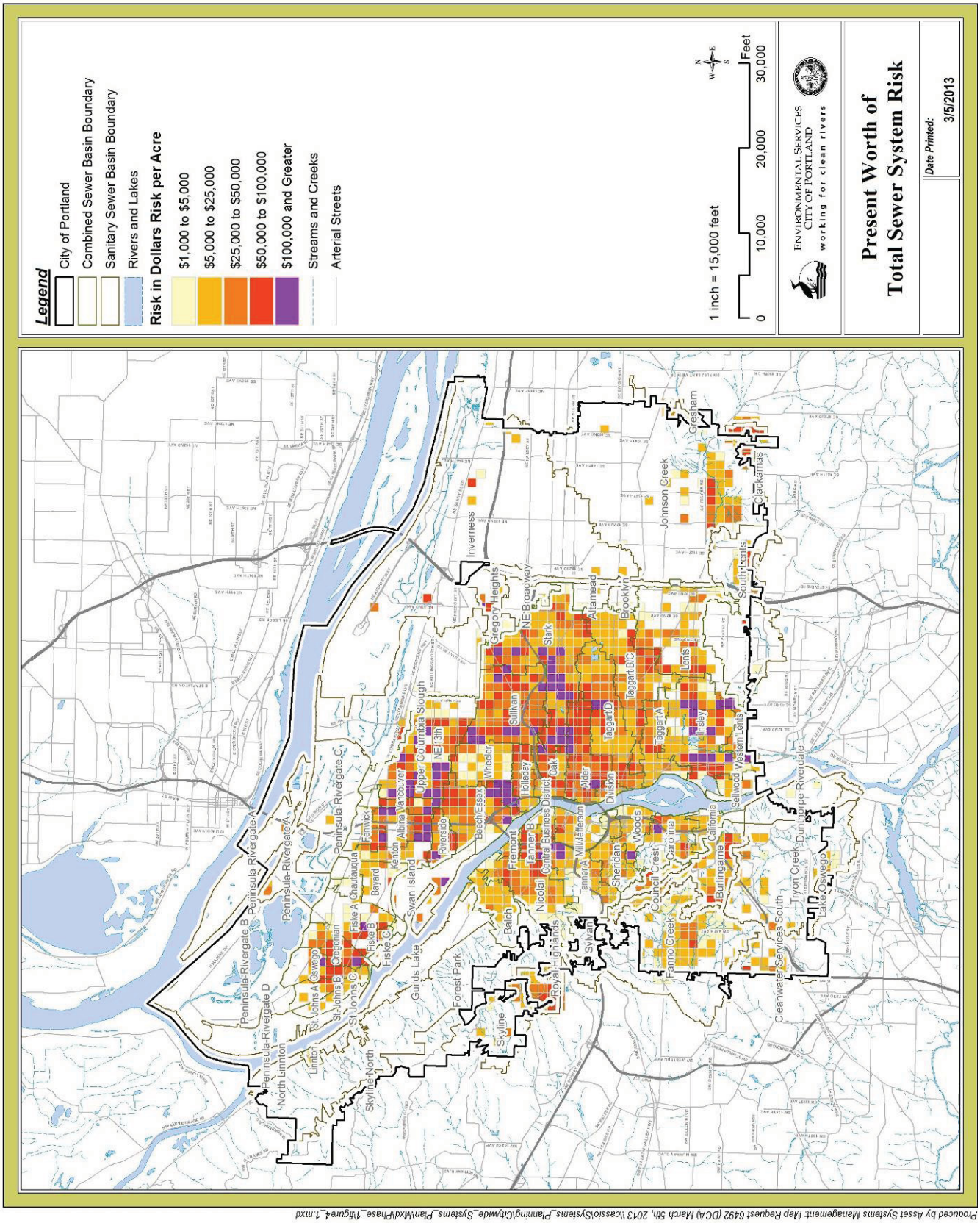


Figure 6.4 Sanitary and Combined Sewer System Risk



Wastewater Collection System Current and Projected Condition

Sewer pipes are inspected to determine both structural and operational condition. Over the past 40 years, most of the collection system has been inspected. Approximately three-quarters of the pipe segments have been inspected over the last ten years. Of the remainder, approximately 65% were constructed within the past 20 years and are therefore assumed to be in excellent condition.

Table 6.2 Pipe Condition

Combined Sewer System	Miles	Very Good	Good	Fair	Poor	Very Poor	TBD
Pipes Total	878	51%	18%	11%	12%	6%	0.57%
Pipes 8” or less	321	45%	22%	8%	16%	8%	0.93%
> 8 and < 24"	401	54%	18%	14%	10%	4%	0.25%
>= 24 and < 36"	68	66%	13%	7%	9%	4%	0.03%
36" and larger	88	65%	8%	8%	15%	3%	1.14%
Sanitary Sewer System	**Miles**	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**	**TBD**
Pipes Total	1,012	71%	20%	5%	2%	0%	0.40%
Pipes 8” or less	770	78%	18%	2%	2%	1%	0.13%
> 8 and < 24"	142	54%	31%	12%	2%	0%	1.41%
>= 24 and < 36"	50	46%	32%	16%	4%	0%	2.00%
36" and larger	50	52%	16%	26%	6%	0%	0.00%

As inspections are conducted, structural defects are noted and scored. The condition scoring method for sewer mains uses five grade ranges as shown below:

Table 6.3 Structural Condition Rating System

Grade	Condition	Description	Structural Score Range
1	Excellent	No defects or few minor defects	0 - 9
2	Good	Minor defects or few moderate defects	10 - 99
3	Fair	Moderate defects that will continue to deteriorate	100 - 999
4	Poor	Moderately severe defects that will become Grade 5 defects in the foreseeable future	1,000 - 9,999
5	Very poor/ immediate attention required	Defects requiring immediate attention. (Failed or failure imminent.)	10,000+

All pipes are at risk of structural failure at some point in time. Pipes in poor condition are at risk to fail sooner than pipes in good condition. In accordance with the asset management approach, the business risk of a structural failure for any given pipe is estimated by calculating the potential cost of consequence of failure, estimating the likelihood of failure, and developing a risk distribution as a function of time. To assess structural deficiency risk for the entire sewer system, this process was applied to every pipe in the city's inventory for the service area. Figure 6.5 shows the 100-year present worth value of structural deficiency risk for all condition Grade 4 and 5 pipes summed by 25-acre grid cells. Only Grade 4 and 5 pipes are shown in this figure because they represent pipe rehabilitation needs within the 20-year planning horizon. The Bureau is in the fourth year of a multi-year $123 million rehabilitation program to address the highest risk pipes. Assuming adequate funding, the Bureau anticipates reducing its highest risk. Unfortunately, the collection system is degrading more rapidly than investment projections.

A significant percentage of the pipe system is concrete pipe installed in the early 1940s. Much of that era's concrete was of poor quality, so pipes are failing more rapidly than expected from age alone.

Pump stations, components and force mains require more frequent renewal than the gravity pipe system. The Pump Station Improvement Program was established to keep pump stations in good working order to maintain reliability and efficiency within the conveyance system. The program addresses capacity, mortality, reliability, and code compliance. Funding for this program is proposed to increase in future years to allow for timely capital renewal at each of the 97 pump stations. In general, pump stations are assumed to have a 50-year useful life; however, major components require renewal after about 25 years.

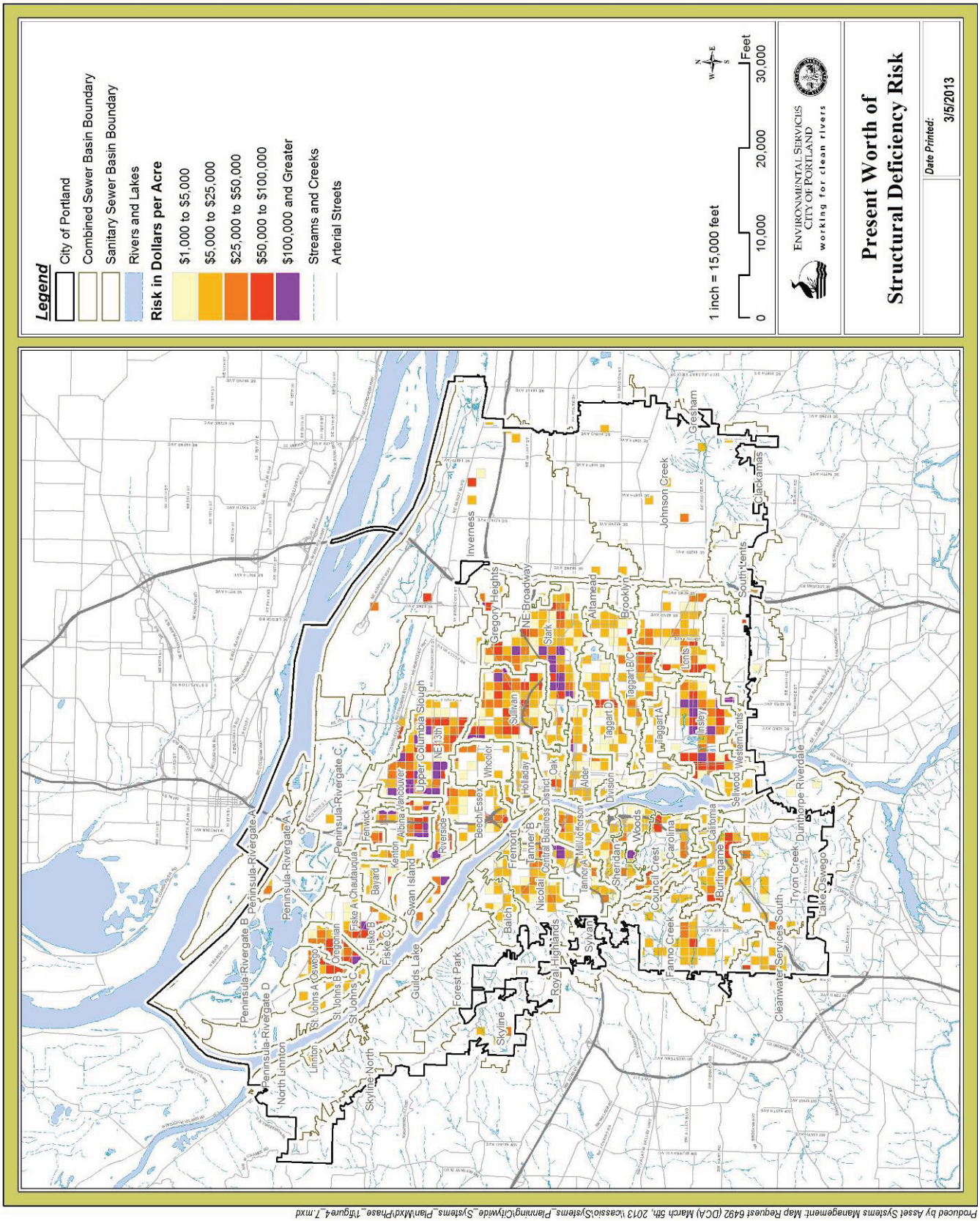
Vegetated stormwater facilities (green streets, etc.) in the combined sewer system are not included in this condition assessment, as most of them are relatively new. However, it is important to recognize the fact that these facilities, which reduce stormwater pollutants in the separated system and reduce the capacity demand in the combined sewer system, require regular maintenance to be effective. Budget requests for increased funding to maintain these facilities have not been supported. Lack of maintenance could lead to system failure.

Wastewater Collection System Current and Projected Capacity

To support the capacity and performance analyses of the sewer system, BES developed a highly detailed simulation technique called explicit modeling. The technique is explicit in that it models public and private facilities (manholes, pipes, green streets, onsite vegetated facilities, etc.) and impervious surfaces at the property level. Explicit modeling enables BES to more clearly define the sources of basement sewer backup risk and capacity problems throughout the basins, to efficiently calibrate flow monitoring data with more certainly than traditional models, and to evaluate the cumulative benefits of green infrastructure stormwater controls for streets, parking areas, and roofs.

The models are specific to each sewer basin and three of the interceptors. The basin model calibrations were performed by comparing basin model results against flows measured by temporary flow monitors installed within the basins. For the interceptors, flow data is available from more permanent monitors. The good correlation between the model predictions and the physical measurements at the monitors gives BES confidence in the model's ability to predict hydrologic and hydraulic response from rainfall events.

Figure 6.5 Structural Deficiency Risk (Sanitary and Combined Sewer Pipes)



The hydraulic capacity characteristics of the combined sewer system are evaluated for five different design storm scenarios: three storms (2-year, 5-year, and 25-year) for existing conditions, one storm (25-year) for future conditions (build out of the Comprehensive Plan), and the 3-year summer storm (Regulatory criteria). Each of the existing-condition design storms represents a different level of risk. The combined sewer system performance measures focus on providing sufficient capacity to eliminate or significantly reduce street flooding risk and basement sewer backup risk for the 25-year design storm under future (2050) conditions. An additional regulatory requirement is to eliminate untreated CSO discharges to the Willamette River from May 1 to October 31 of each year except during storms greater than or equal to a summer storm with a 3-year return frequency under future conditions. Typically, this requirement impacts only the stormwater control facilities and the CSO tunnels and not the balance of the collection system capacity.

The greatest concentration of pipe segments with capacity problems is located in the older central neighborhoods. These capacity problems lead to the risk of the combined sewer backing up into basements during intense storm events. The highest risk of basement sewer backups on the east side of the Willamette River are in an area roughly bounded by NE Prescott Street to the north, SE Holgate Blvd to the south and SE 45th Avenue to the east. On the west side of the river, the highest predicted risk of basement sewer backups is in NW Portland in an area roughly bounded by NW Yeon Avenue to the north, West Burnside Street to the south and NW 23rd Avenue to the west.

The performance measure for identifying locations of potential capacity deficiency is basement sewer backup. Individual tax lots are determined to be at risk for basement sewer backups when the maximum water surface elevation in the sewer pipe is within eight feet of the estimated main floor elevation of the property. The estimated main floor elevation is three feet above the estimated ground elevation. The accuracy of the basement sewer backup risk is limited by the estimated main floor and ground level elevations which were determined with a digital terrain model. In the absence of reliable and systematic data, it was assumed that each tax lot has a basement. In additional to basement sewer backup risk, there is the risk of SSOs, CSOs, and the risk of surcharging of trunk sewers to degradation of pipe material.

The capacity-related sanitary sewer system technical levels of service are for storm events up to a 5-year frequency to convey sewage to prevent releases to buildings or streets and to prevent releases to surface waters. The performance measures for these are the same as for the combined system for basement backups, street flooding, surcharging in pipe constructed of brick, and pipe surcharge for a duration greater than 30 minutes. There is an additional performance measure related to pump stations: Separated sanitary pump stations should have adequate firm capacity to pump the peak hourly and peak instantaneous flows associated with the 5-year, 24-hour storm intensity of its tributary area, without overflows. Firm capacity is defined as the capacity of the pump station with the largest pump out of service.

Most of the sanitary sewer basins meet the service levels for conveyance. Exceptions are the Fanno Creek and Burlingame basins where street flooding and basement sewer backups may occur during storms smaller than the service level design storms. During rain events, stormwater enters the sanitary pipes either through inappropriate connections or through cracks in the pipe material. This Rainfall

Derived Inflow and Infiltration (RDII) is impacting the capacity of the sanitary pipe system. During intense storms, the Fanno Basin Pump Station is unable to keep up with the additional flow. A capital improvement project is underway to address this issue. The capacity of the Tryon Creek Wastewater Treatment Plant is also impacted by RDII. Capacity upgrades to the plant are discussed below. Note that in this same geographic area, there are other stormwater management issues such as incomplete conveyance systems. These are discussed below as part of the stormwater system.

Figure 6.6 illustrates the present worth of pipe capacity deficiency risk associated with the piped system.

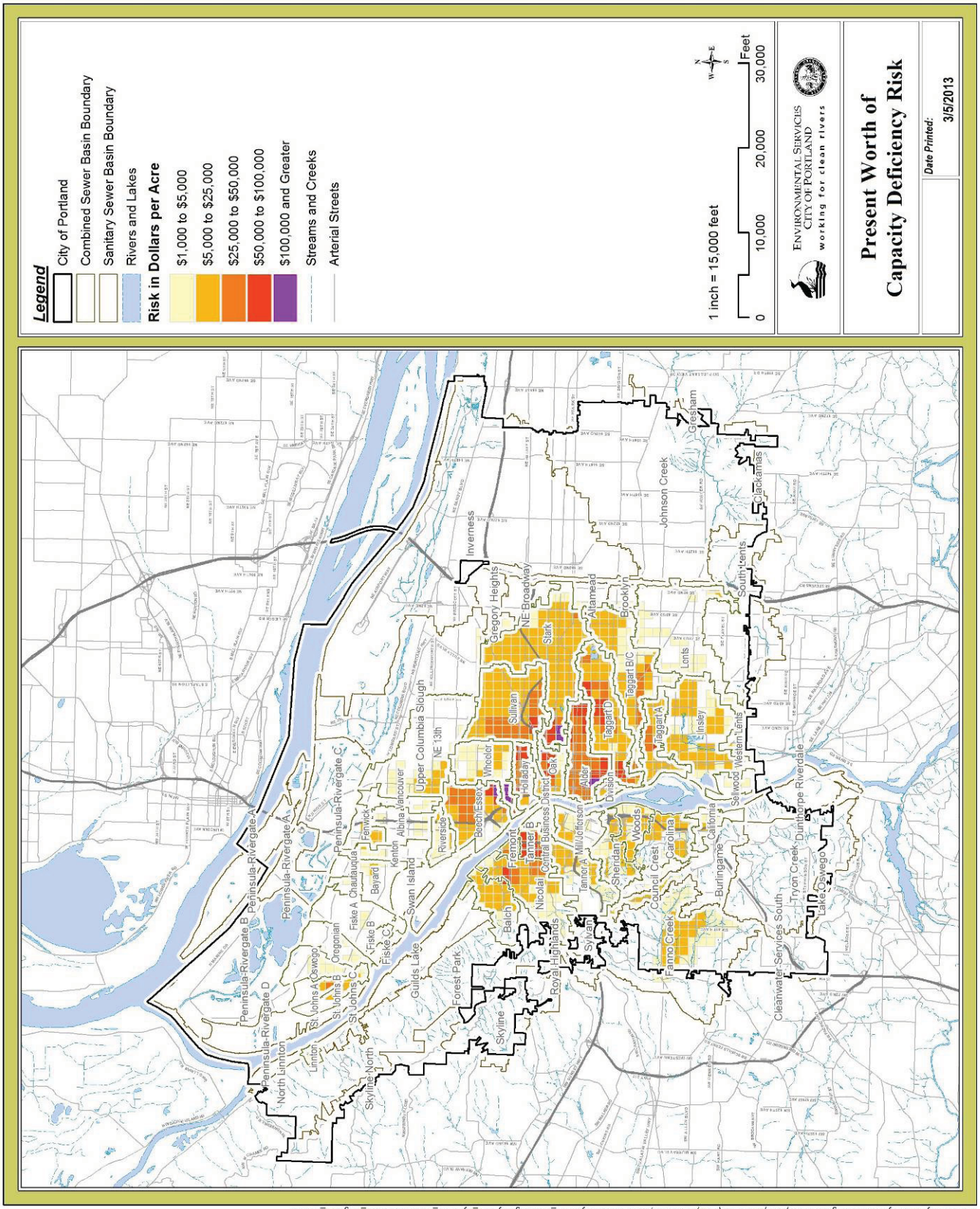
The capacity assessments of city pump stations were performed using basin-wide hydrologic and hydraulic models that estimate the base and peak design storm flows coming to the pump stations from the sanitary and combined sewer systems. The models are based on EPA-SWMM, which simulates the upstream hydrologic inputs including direct storm runoff and hydraulic routing of both the sanitary and wet weather flow components. For the separated sewer areas, the modeling system relies on a site-specific set of regression equations to create generate the RDII flows. The regression equations were developed using the city's HYDRA rain gauge system data and actual flow monitoring data to define the hydrologic response of the collection system to the rainfall inputs. A calibration assessment was performed to evaluate the quality of the monitoring flow data and the "goodness of fit" for models

Using this integrated method of EPA-SWMM and regression equations, the full wet weather flow rates from the collection system to each pump station were developed for the appropriate design storm. The estimated flows were then routed in the model through each pump station to determine whether or not the installed station capacity was able to fully convey the design storm. This capacity assessment was performed for both the existing collection system conditions as well as the future (2040-2050) system conditions.

- **No Capacity Deficiencies:** Pump station "Firm Capacity" is able to safely convey the peak design storm flows, which means the station is able to keep one pump in reserve for emergency conditions
- **Insufficient Firm Capacity:** Pump station must use "Full Capacity" (all available pumps) in order to safely convey the peak design storm flows.
- **Insufficient Full Capacity:** Pump station is not able to fully convey the peak design storms even using all available pumps.

The 14 pump stations in the combined area have sufficient capacity to convey flows. Three pump stations in the separate area have insufficient firm capacity and two have insufficient full capacity. Projects to address these capacity issues are included in the proposed Investment Strategy.

Figure 6.6 Capacity Deficiency Risk (Sanitary and Combined Sewer Pipes)



Providing Sanitary Sewer Service to Unserved Areas

The City's level of service for wastewater collection is to provide sewage service to support development consistent with the Comprehensive Plan where feasible. In order to identify system needs and serve unconnected areas, properties that are currently not connected to the sanitary sewer system were reviewed to determine whether tax lots met the conditions required for sewer service connection:

- No gravity sewer exists close enough to allow for a lateral to connect to the sewer.
- It must be feasible to provide service to the lot. Pump stations are not considered feasible for fewer than five properties.

There are significant areas currently unserved by sanitary sewers within the USB, primarily in the Johnson Creek and Skyline basins. It is estimated that 1,500 developed properties have some type of on-site sewage system and are not connected to the piped sewer system. Some of these properties are zoned for development; others are already developed with on-site systems such as cesspools and/or drainfields. In some cases, with current technology, it may not be technically or financially feasible to connect these properties to the sewer system. Estimates to serve individual properties range as high as over $1 million. Lack of sanitary sewer service may cause existing developed properties to become uninhabitable and may deem some vacant lots to be undevelopable.

Recommended Wastewater Collection System Improvements

BES developed and evaluated alternatives to address the structural and capacity pipe deficiencies identified during the characterization of the system and to meet the levels of service summarized above.

For pipes with structural deficiencies, the alternatives include whole pipe replacement (which may include lining) or a spot repair. Ongoing monitoring is recommended when the defects do not warrant rehabilitation at this time. The preferred alternative is illustrated in Figure 6.7. Given the age of the collection system, pipe rehabilitation is expected to be an ongoing need.

There are two primary alternatives for providing capacity in the combined system – conveyance or stormwater control. The conveyance alternative is a traditional pipe upsizing approach (replacing existing pipes with larger pipes). The stormwater control alternative uses green infrastructure to detain and/or infiltrate stormwater through vegetated facilities. In the sanitary system, the capacity alternatives include pipe upsizing, pump station expansion, RDII (rainfall derived infiltration and inflow) removal (usually pipe repair or replacement, and wastewater treatment plant expansion. In areas currently unserved by any sanitary sewer system, alternatives have been developed and evaluated to provide new sanitary sewer service where technically and financially feasible. The preferred alternative is illustrated in Figure 6.8.

The recommended plan for the combined sewer system includes projects that reduce basement sewer backup risk, replace structurally deficient pipes, reduce surcharging in major trunk lines, and contribute to CSO reduction through the incorporation of stormwater control facilities. The primary focus of these projects is to provide adequate capacity in the combined sewer system to convey the design flow and resolve basement sewer backup risk. For the most part, this is completed by either increasing pipe capacity through upsizing of pipe diameter or by routing stormwater runoff to stormwater control facilities to reduce the runoff that enters the system. In a few basins the resolution of basement sewer backup risk is achieved through stormwater separation, redirection of flow, or underground pipe storage facilities.

Based on asset management principles, only cost-beneficial projects – projects for which the cost of doing them now is less than the amount of risk from failure as expressed in dollars - (either as stand-alone projects or when combined with hydraulically dependent projects) are recommended as they will cost-beneficially reduce the risk within the combined sewer system. Of the estimated $930 million in capacity-related risk in the combined sewer system, only $200 million in projects were recommended to move forward in the March 2012 plan. One key assumption in the recommendation is development of some private stormwater management facilities to address the some of the capacity issues.

In the long-term, capacity improvement projects will be drawn from the list of projects that are currently not considered cost-beneficial. It is expected that some will become cost-beneficial in the future due to one or more of the following factors:

- The sewer system is aging so pipe segments proposed for upsizing will have a higher risk of having a structural failure. Because the risk is greater, the project will resolve more risk.
- The dollar value of basement sewer backup risk might increase to be more than the current estimate of $5,000 per basement sewer backup.
- Other risk reduction (such as operations and maintenance efficiencies) may be quantified and included in the risk calculation.
- More stormwater control facilities might be implemented on private property through a stormwater retrofit program and reduce the maintenance costs assumed in the system plan because maintaining the facilities will be the responsibility of the property owners.
- Changes to the zoning might alter the future base assumptions changing the number of properties predicted to be at risk of basement sewer backups.

In the sanitary sewer system, the most critical capacity issues are the deficiencies in the Fanno Creek and Burlingame Basins. Significant wet weather flow and capacity problems in this area require a system-based solution that combines capacity upgrades with RDII reduction. Major elements of the recommended plan include increasing the capacity of Fanno Basin Pump Station, constructing a surge tank facility to protect recently completed force mains, near-term RDII reduction and pipe upsizing to resolve local capacity issues, long-term RDII reduction to reduce the risk of flows exceeding the capacity of the Fanno Creek Interceptor and the Fanno Basin Pump Station, and increasing the capacity of a short section of the Southwest Parallel Interceptor.

The recommended plan for the sanitary sewer system includes projects to extend sewer service to unserved areas that are both technically and financial feasible.

Figure 6.7 Recommended Sanitary and Combined Pipe Rehabilitation Projects

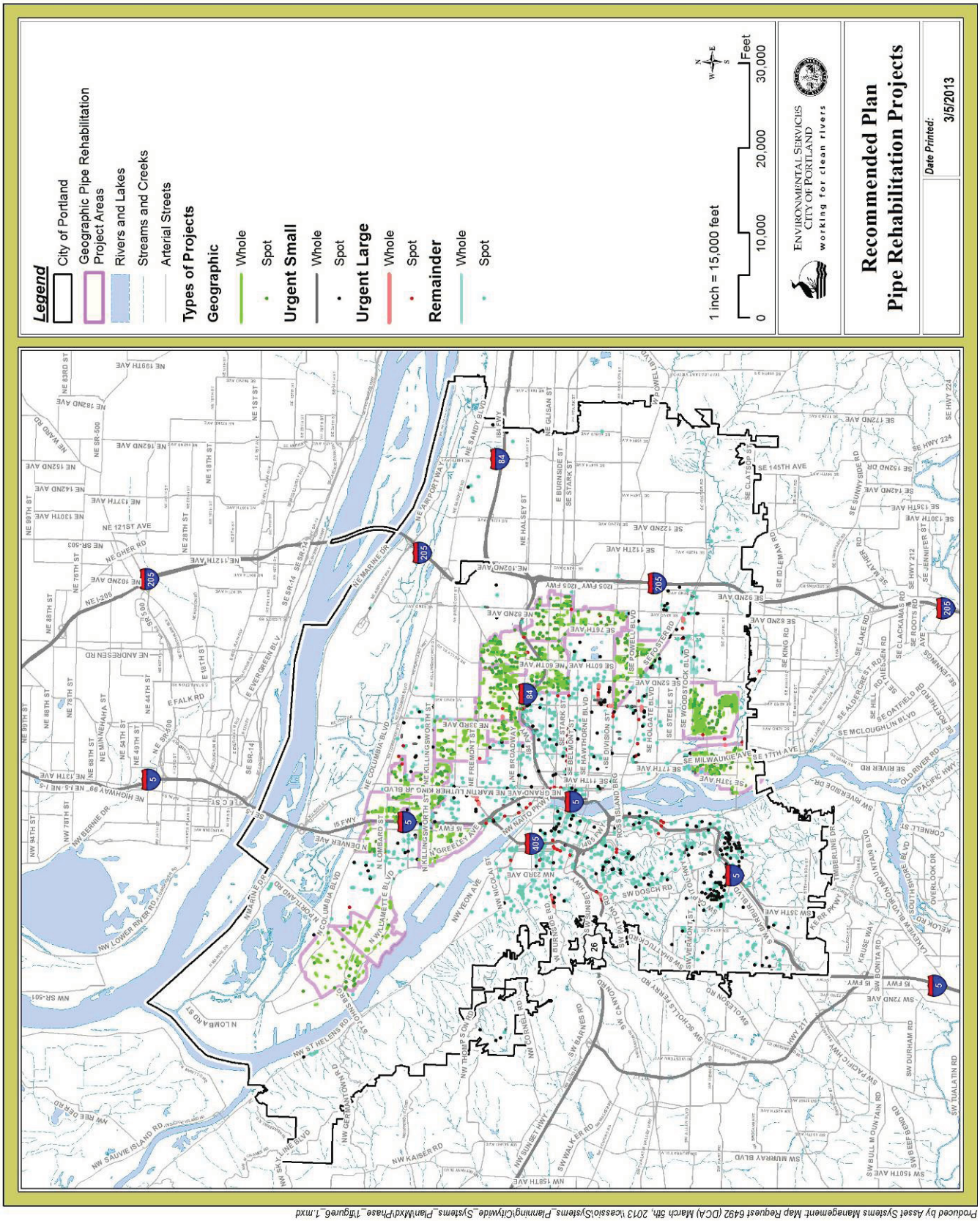


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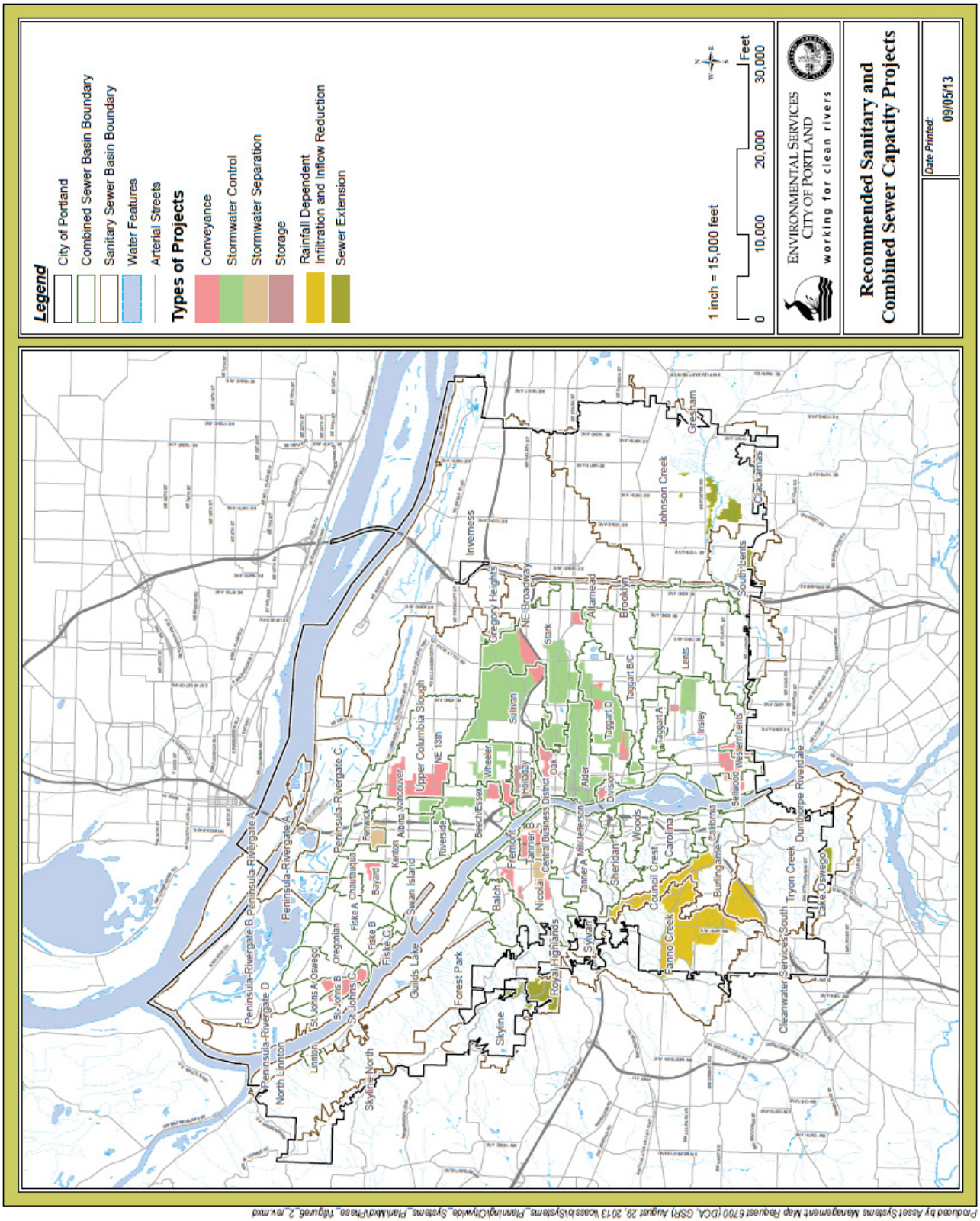
Figure 6.8 Recommended Sanitary and Combined Sewer Capacity Projects



Collection System Investment Strategy

The Investment Strategy (Appendix A) includes the following projects and programs for the collection system:

- **Pump Station Improvement Program**: Program to refurbish or upgrade pump stations not in compliance with current codes, not operating reliably, need improvements because of growth in the receiving sewage basin, and/or are over 20 years old with out-of-date equipment. The Pump Station Improvement Plan guides the selection of projects. This program was developed to ensure the 97 pump stations are maintained in accordance with a scheduled plan to increase pump station reliability.
- **Sewage Pipe Rehabilitation Program**: Based on regular inspection, this program rehabilitates the highest risk pipes.
- **Capacity Upgrades**: Based on the Systems Plan, these programs add capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized based on risk and benefit/cost. Work also includes cost-effective pipe rehabilitation, if located within the project area. Capacity upgrade projects are anticipated in the following basins: Holladay/Stark/ Sullivan, Beech/Essex, Oak, Taggart/Insley, Wheeler, Alder, NE 13th Ave, Northwest Neighborhoods, and North Portland.
- **Sanitary Sewer Collection System Capacity**: A series of projects is proposed to address infiltration and inflow (RDII) in the sanitary sewer system in SW Portland. Projects typically involve rehabilitation of main lines and laterals and disconnecting storm inlets from the sanitary sewer.
- **Sewer Extension Program**: Where technically and financially feasible, sewer extensions are proposed to relieve septic systems at risk of failure, to correct party sewer situations, and to provide service where development will be occurring soon and service is currently not available.

Wastewater Treatment System

Wastewater Treatment System Inventory

The City of Portland owns and operates two municipal wastewater treatments plants, where wastewater is processed through removal of solids and organic materials and the addition of disinfection. The Columbia Boulevard Wastewater Treatment Plant (CBWTP), located in north Portland, serves as the city's main sewage treatment facility, cleaning and discharging most of Portland's wastewater. The plant provides service to nearly all of Portland's 583,000 residents. The service area for the wastewater collection and treatment system totals 94,000 acres, including 9,000 acres outside the city limits. The Tryon Creek Wastewater Treatment Plant (TCWTP), located south of Portland in the city of Lake Oswego, serves Lake Oswego and a small portion of southwest Portland, see Figure 6.9.

The CBWTP campus is generally bound by N. Columbia Boulevard on the south, N. Portland Road on the west, the Columbia Slough on the north, and Union Pacific rail lines on the east and southeast. Two other parcels are part of the 147-acre campus: a 36-acre site known as Triangle Lake is located just north of the slough and a 24-acre future expansion site is located west of N. Portland Road on the south bank of the slough. Site zoning is Heavy Industrial (IH) and General Industrial (IG). A narrow strip along the Columbia Slough has environmental overlays for conservation (c) and protection (p). The northern tip of the site has an aircraft landing overlay (h). The entire campus is designated as a conditional use.

As currently configured, the CBWTP includes nearly 350,000 square feet of buildings and over 700,000 square feet of tanks, pumps, and other structures. In October 2011, an updated Master Plan was approved for the campus, see Figure 6.10. The Master Plan allows for development of an additional 122,000 square feet within the campus boundaries without conditional use review, as long as Master Plan standards are met. As part of the land use approval, mitigation activities are proposed to protect the community in the areas of transportation, facilities design, landscaping and screening, open space, neighborhood livability, safety, physical services such as waste disposal and water supply, protection of designated resources, and enhancement of environmental and recreational resources. Odor monitoring and control systems include retrofits to existing facilities and installation of odor controls in all new facilities. The odor monitoring and control systems were developed in collaboration with the CBWTP Citizen Advisory Committee and treatment plant neighbors and are intended to assure compliance with City Council Resolution 35453.

Columbia Boulevard Wastewater Treatment Plant

In addition to process facilities, maintenance facilities, storage, and office areas, the campus also provides space for Multnomah County Vector and Nuisance Control (four buildings totaling 10,500 square feet) and is one of five fueling stations for publicly-owned vehicles. The site is also designated as one of the City's incident command centers to handle emergencies such as floods or earthquakes.

The TCWTP is a 13.5-acre plant located in the City of Lake Oswego with a rated treatment capacity of 8.3 million gallons per day. It is bounded by the Willamette River to the east, Tryon Creek to the north, and privately owned Industrial zoned properties to the west and south. Development on the plant site includes 80,000 square feet of tanks and 13,000 square feet of building structures. The plant's service area includes part of southwest Portland, unincorporated Multnomah County, and the City of Lake Oswego.

Wastewater Treatment System Levels of Service

The following bureau levels of service are specific to the wastewater treatment plants:

- Treatment plants are in compliance with NPDES effluent limits.
- 100% of biosolids are beneficially re-used.
- 90% of methane is beneficially re-used.

Wastewater Treatment System Current and Projected Condition and Capacity

Columbia Boulevard Wastewater Treatment Plant

The Columbia Boulevard Wastewater Treatment Plant is an activated-sludge, secondary treatment plant with a designed capacity (average dry weather flow (ADWF)) of 100 million gallons per day (mgd) for secondary treatment. The headworks and the primary treatment process have a design capacity of 450 mgd. The plant receives an ADWF of approximately 63 mgd. The major processes at the plant are liquids handling (pretreatment, primary treatment, secondary treatment, disinfection, and discharge), solids handling, methane utilization, and water re-use.

Liquid processes include:

- Influent pumping;
- Preliminary treatment: bar screens with screen presses, grit basins with grit washer-separators and grit disposal facilities, septage receiving and testing station, and an emergency bypass to the primary clarifiers;
- Flow monitoring and controls;
- Dry weather primary treatment: standard physical clarification for 120 MGD minimum;
- Wet weather primary treatment: fine screening, chemically enhanced primary treatment (CEPT), standard clarifiers and bypass to route excess flows to disinfection and outfalls;
- Secondary treatment: aeration basins, secondary clarifiers, and sludge collectors;
- Chlorine disinfection with dechlorination;
- Effluent pumping: to a 72-inch line that carries flows to the dechlorination facility at Hayden Island, then to an alternative dry weather outfall/diffuser in the Columbia River, and to a 102-inch diameter pipeline that carries treated effluent to the dechlorination facility, then to an alternative wet weather discharge outfall and diffuser in the Columbia River.

Solids handling includes:

- Degritting;
- Transport, storage, handling, processing grit and sewer cleanings;
- Gravity thickening of primary sludge;
- Gravity belt thickening of the waste activated sludge;
- Two-stage anaerobic digestion of primary and secondary sludge;
- Gas collection, storage, and energy generation;
- Seasonal lagoon storage for secondary sludge; and
- Belt press dewatering of anaerobically digested biosolids.

The plant generates approximately 13,000 dry tons of biosolids annually. The solids, in the form of dewatered cake, are transported in trucks to farms in central and eastern Oregon for direct land application, providing for beneficial reuse.

Figure 6.9 Columbia Boulevard and Tryon Creek Wastewater Treatment Plants Service Areas

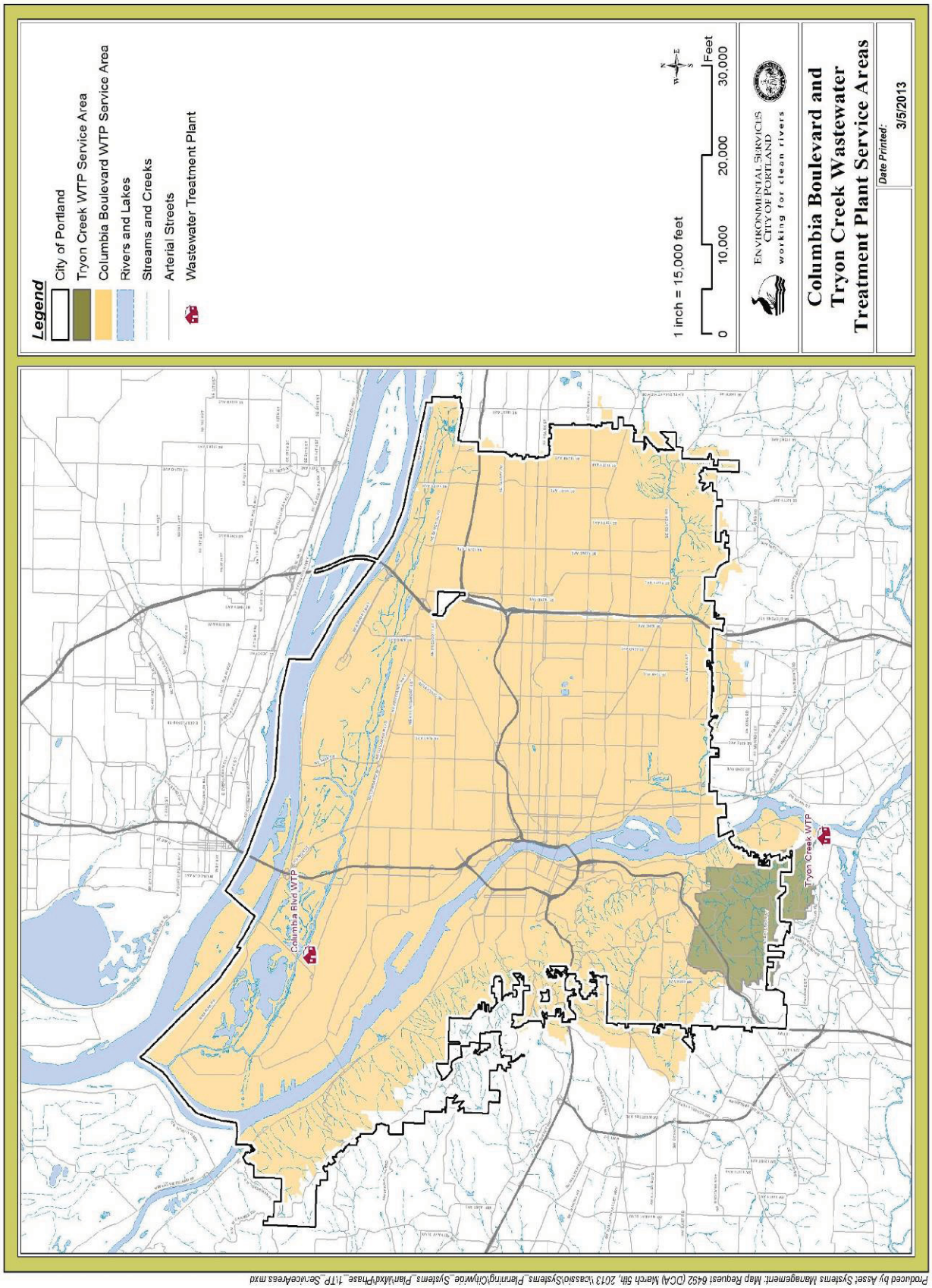
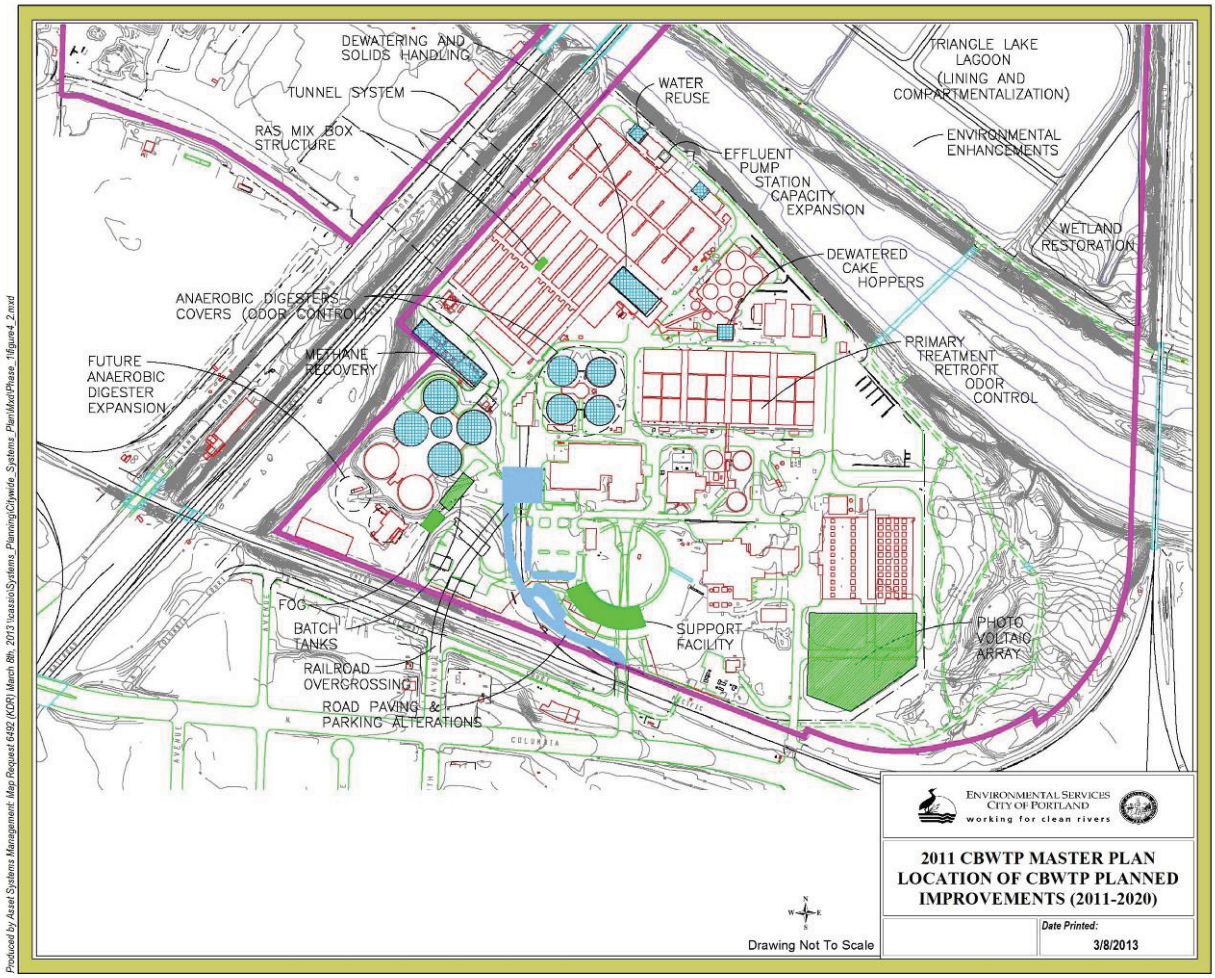


Figure 6.10 Columbia Boulevard Wastewater Treatment Plant Master Plan



As the anaerobic digesters at CBWTP stabilize wastewater solids, they produce a gas that contains methane. Methane is a primary constituent of natural gas. The CBWTP currently collects and uses a portion of its digester gas to fuel boilers, for heating the digesters, and for space heating. The plant also produces electricity by using digester gas to fuel two 850 KW generators. The on-site generated electricity offsets demand for 40 – 50% of previously purchased power. Some gas is sold to a nearby industrial customer. Excess gas is burned in flares on site. A study is looking at alternative uses for the excess gas including expanded electrical generation or conversion to vehicle fuel.

The current hydraulic capacity of the Columbia Boulevard Wastewater Treatment Plant is sufficient to accommodate future twenty-year growth. However, many of the existing process facilities are aging and in need of rehabilitation to ensure maximum efficiency. Projects to address capital maintenance are proposed in the 20-year planning horizon. In addition, changing regulatory requirements impact operations. A number of projects are proposed to maintain the plant and to continue to address regulatory requirements. This is likely to require new process facilities to be located on the west side of Portland Road.

Tryon Creek Wastewater Treatment Plant

The Tryon Creek Wastewater Treatment Plan is located in north Lake Oswego and receives sanitary flow from sanitary basins in southwest Portland and the city of Lake Oswego. It has an ADWF design capacity of 8.3 mgd and a peak wet weather flow capacity of 37.5 mgd. The plant currently has an ADWF of 4-6 mgd, with Lake Oswego contributing 65% of the flow volume. Treated wastewater is discharged to the Willamette River via an outfall system. Solids are trucked to CBWTP for processing.

The draft update to the Tryon Creek Wastewater Treatment Plant Facilities Plan recommends significant improvements to address projected increases in peak flows to 50 mgd, anticipated new permit requirements, and functional obsolescence of existing facilities. The Plan recommends acquisition of additional property to increase peak flow hydraulic capacity and allow for gravity flow through the treatment process. Solids will continue to be trucked to CBWTP. Figure 6.11 illustrates the recommended 30-year site plan for the Tryon Creek Wastewater Treatment Plant.

Required improvements can be divided by process needs. Improvements to the liquid treatment processes include:

- improvements to the influent collection systems – both the Lake Oswego Foothills Interceptor and the BES Tryon Creek Interceptor, and the Tryon Creek Pump Station;
- demolition of the existing headworks and construction of a new headworks and dry weather clarifiers to be located on property to be acquired which is currently occupied by a self-storage facility;
- construction of an influent pump station to flow from Portland's Tryon Creek Interceptor;
- enhancements to the existing aeration basins an secondary clarifiers;
- enhancements to the disinfection processes including conversion of former primary clarifiers to chlorine contact basins; and
- construction of an additional outfall for effluent disposal when plant flow and Willamette River levels are both high.

Improvements to the solids treatment processes include:

- Construction of a new solids thickening facility and
- Conversion of the existing digesters to blended storage facilities.
- Thickened, blended raw solids will be hauled to CBWTP for processing. A new enclosed loading facility will be constructed for odor control.

Other site improvements will address the non-potable water system; odor control; site design, security, and circulation; architecture, landscape architecture, and site aesthetics; support buildings; and electrical and instrumentation and controls.

Recommended Wastewater Treatment System Improvements and Investment Strategy

Significant improvements have been made at CBWTP to accommodate the increased wet weather flows resulting from the completion of the CSO controls. A limited number of future improvements to accommodate growth and anticipated regulatory requirements are recommended in the March 2010 Facilities Plan Update:

- Completion of the phased reconstruction of the lagoon
- Secondary Process Improvements (anticipated to meet changing permit requirements) – requires expansion to the west side of Portland Road
- On-site disinfection
- Solids dewatering
- 2 additional digesters
- Thermophillic equipment, blend and batch tanks (for Class A biosolids)
- 2 potential waste re-use projects: expansion of co-generation or alternative uses for methane gas such as conversion to vehicle fuel and improvements to the solids handling processes to create Class A biosolids which have a higher commercial value for fertilizer and could also result in savings in transportation costs.

In addition to the above projects from the Facilities Plan, a series of capital maintenance projects are planned in the 20-year planning horizon. The Investment Strategy includes three investment categories related to wastewater treatment:

- **Columbia Boulevard Wastewater Treatment Plant (CBWTP) Improvements:** This program includes a number of mid-size improvements at the Columbia Boulevard Wastewater Treatment Plant including Seismic Improvements, Outfall Diffuser Extension, Access / Egress Improvements, Bio-Solids Dryer, Dewatered Sludge Hopper, TWAS Piping Upgrade, Centrifuge. Also included is an expansion to Secondary Treatment, if required, to be located on the west side of Portland Road. All are consistent with the Facilities Plan and the Conditional Use Master Plan.
- **Tryon Creek Wastewater Treatment Plant (TCWTP) Improvements**: This program includes improvements identified in TCWTP draft Facilities Plan. Projects include construction of new headworks and dry weather clarifiers, a new influent pump station, odor control facilities, electrical upgrades, and site enhancements. The acquisition of an adjacent parcel will facilitate gravity flow (resulting in potential operational savings from reduced pumping) through the updated processing facilities.
- **Rehabilitation, Repair, and Modification Program**: This program provides for annual reinvestment in the treatment facilities to protect capital investment and enhance system reliability. It provides best management practice to prevent probable violations of the NPDES permit. The aging Columbia Boulevard and Tryon Creek plants require regular investment. Projects include equipment replacement, minor capacity upgrades, restoration of a facility to its original condition and renewal of useful life for more than 10 years, and regulatory mandates.

Figure 6.11. Tryon Creek Wastewater Treatment Plant Recommended Site Plan

Stormwater System

Sanitary sewage and stormwater are managed very differently. In the sanitary system, sewage is collected and conveyed to wastewater treatment plants and finally discharged to the Columbia or Willamette River. Conversely, the City's goal for stormwater is first on-site management for pollution reduction and flow control, as regulated by the *Stormwater Management Manual (discussed in more detail* . Any flow not managed on site is then routed to the nearest conveyance system, which includes pipes and natural drainages. BES distinguishes two primary stormwater management systems in the USB: the combined sewer system and the "separated" stormwater area.

In the combined sewer area, stormwater is managed to reduce peak flows to avoid combined sewer overflows to the Willamette River and Columbia Slough and/or releases to streets or private properties (including basement sewer backups). Surface stormwater facilities – including green street facilities, rain gardens, ecoroofs, trees and other vegetation – detain stormwater, reducing peak flow to the combined sewer and allowing the system time to accommodate the increased flow from rain events. UICs are also used in parts of the combined sewer areas to collect stormwater from the right-of-way and city-owned property and allow that water to infiltrate into the ground. Once stormwater enters the combined sewer, it becomes part of the wastewater flow and is treated at the treatment plant. The pipes and other facilities managing this stormwater are discussed above in Wastewater Collection System.

Within the separated sewer areas of the city, stormwater is not conveyed to the wastewater treatment plants. Instead, stormwater management and conveyance depends on a combination of built and natural infrastructure systems. Approximately two-thirds of the city's land area drains to the city's MS4 system and UICs, both of which are managed under regulatory permits. Flow enters the system from overland runoff and impervious surfaces, including roadways, parking lots, and rooftops. Stormwater in these areas is conveyed through swales, drainage ditches, pipes, and stormwater inlets/catchbasins and discharged to receiving waters (streams and rivers) or to UICs for subsurface infiltration. In some areas, the stormwater system includes facilities that detain peak stormwater runoff and control flow release, and treatment facilities that remove or reduce pollutants.

As development occurs, impervious surfaces reduce the ability of stormwater to soak into the ground and increase the amount of stormwater runoff, disrupting the natural water cycle. Without appropriate stormwater management, these conditions erode stream channels, increase the risk of landslides, contribute to street and stream flooding, and prevent groundwater recharge. Parking lots, roadways, rooftops, and other impervious surfaces increase the pollution levels and temperature in streams, rivers, and groundwater resources.

The city's stormwater management requirements for all areas are defined in the Stormwater Management Manual (SWMM). The SWMM applies to all development and redevelopment projects within the City of Portland on both private and public property.

The City of Portland's approach to stormwater management emphasizes the use of vegetated surface facilities to manage and infiltrate stormwater on the property where the stormwater runoff is created. Infiltrating stormwater onsite with vegetated surface facilities provides a number of benefits, including but

not limited to pollution reduction, volume and peak flow reduction, and groundwater recharge. These benefits play a critical role in protecting stormwater infrastructure and protecting Portland's water bodies, including about 300 miles of streams and rivers that ultimately receive and convey stormwater. This in turn benefits human health, fish and wildlife habitat, recreational resources, and drinking water. The SWMM complements and supports the Portland Watershed Management Plan and other City standards and practices. Protecting and restoring existing natural resources, open spaces and tree canopy is also a component of the City's stormwater management strategy. BES relies on, and collaborates with, other bureaus (particularly Portland Parks & Recreation and the Bureau of Planning and Sustainability) in the protection, management and restoration of resources that reduce impacts on the built stormwater system and help address clean water regulations.

Not all stormwater is managed by the City's systems. Some of it simply flows over land via private property and/or public right-of-way directly to a receiving water body. Some stormwater management in Portland is the responsibility of other agencies and jurisdictions, including the drainage districts and entities like Oregon Department of Transportation. Stormwater management is further complicated by ownership. In the sanitary system, once sewage enters the system, it is the responsibility of BES. The stormwater system is not a closed system. Stormwater from public property may flow across private property and the reverse, which blurs lines of responsibility. Management and conveyance relies on public-private partnership and innovative solutions that recognize site-specific conditions.

In parts of Portland that lack constructed storm sewers or public drainage facilities, surface water flows over land through private properties. Often this water collects in some kind of open conveyance, or drainageway, which carries it across private property. These drainageways may be naturally formed (such as streams or creeks) or constructed (such as ditches or man-made channels). Drainageways often receive stormwater runoff from multiple sources, accumulating impacts from upstream development on downstream properties. Preserving the natural functions of drainageways protects properties by reducing the impacts of ponding, flooding, erosion, and other effects of excess flows. Especially in areas not specifically protected by zoning, drainageway protections help limit site and off-site impacts of stormwater discharges and flows, mitigate runoff, prevent erosion, and protect the privately owned elements of the watershed drainage network. The City administers drainageway protections, or drainage reserves, during review of private property development proposals. The Stormwater Management Manual allows stormwater to be conveyed from private property to stormwater systems, including drainageways, if onsite stormwater disposal is not feasible.

Stormwater System Inventory

The City's separated storm sewer and drainage system consists of a 458 miles of stormwater pipe and approximately 144 miles of drainage channels that discharge to streams and rivers. In addition, approximately 9,000 stormwater infiltration sumps (UICs) discharge stormwater underground. The storm sewer and drainage system service area is shown in Figure 6.11. Citywide (in both the combined and separated sewer basins), the Bureau owns and/or maintains approximately 1,900 surface water quality facilities, including detention ponds, swales, constructed wetlands and green street facilities, and approximately 8,000 sedimentation manholes (located upstream of a UIC) that provide some level of detention and pollution reduction.

The City's MS4 area includes stormwater conveyance infrastructure such as pipes, ditches, roads, catch basins, curbs, gutters, and manmade channels that discharge to waters of the State. Portland's MS4 area is approximately 15,500 acres. The City's MS4 permit does not cover:

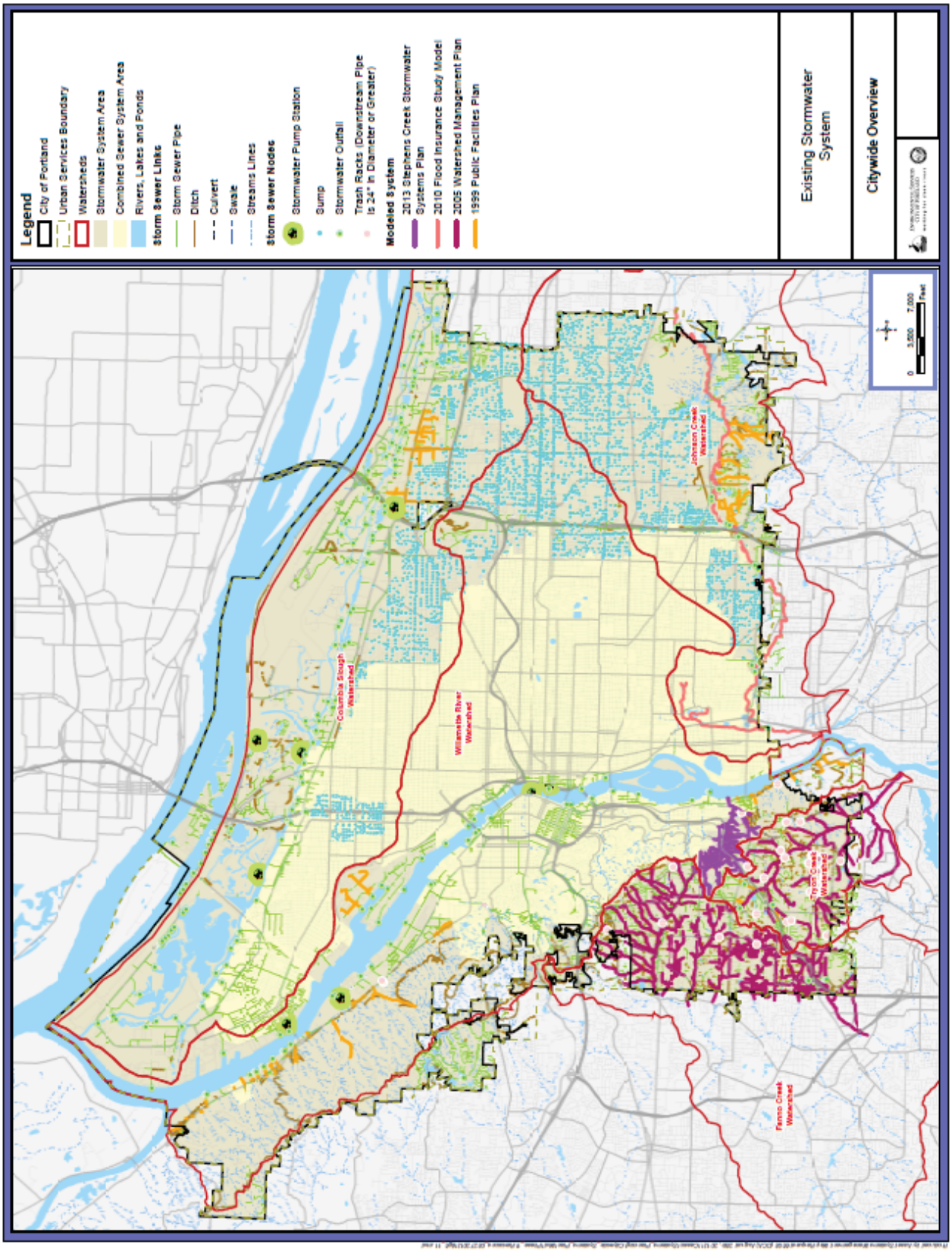
- Stormwater that flows to UICs (WPCF permit applies)
- Stormwater that flows to the combined sewer system
- Natural drainageways and stream systems
- Direct stormwater discharges from private property to natural stream systems (without entering the MS4)
- Areas with no public stormwater infrastructure
- Areas with individual, general, or industrial stormwater permits

The NPDES stormwater regulations do not prescribe specific pollutant discharge limits. Instead, they allow for the implementation of Best Management Practices (BMPs) to improve water quality to the "maximum extent practicable" based on local conditions, resources, and priorities. The City developed, updates and implements a Stormwater Management Plan (SWMP) that describes measures the City will implement throughout the five-year (2011-2016) permit term to reduce pollutant discharges in the MS4 storm sewer system. Best Management Practices include both programs and capital projects in the following categories: development standards; industrial and commercial controls; illicit discharge detection and elimination; structural controls; operations and maintenance; preservation and restoration of natural areas; and public involvement. These BMPs are reflected in the bureau's Investment Strategy.

The City's stormwater system includes approximately 9,000 UICs that collect stormwater from the public right-of-way and City-owned properties and discharge it to the subsurface. Approximately 90 percent of the UICs include a sedimentation manhole prior to the sump. UICs are most prevalent east of the Willamette River where soils better support infiltration. The City's WPCF permit regulates the construction, operation, and maintenance of all City-owned and operated UICs. Unlike the MS4 permit, the WPCF permit includes numerical standards, based on national drinking water standards, for stormwater discharges to a UIC. The permit also establishes the requirements the City must implement throughout the ten-year (2005-2015) permit term to control pollutants prior to discharge to a UIC to protect groundwater as a drinking water resource. These requirements are included in the bureau's Investment Strategy.

As discussed earlier in this plan, the city's stormwater management approach also relies on assets not owned or controlled as part of the BES system. This includes nearly 300 miles of surface streams and rivers, numerous acres of natural area and open space that convey, absorb, and filter rainfall and stormwater, and the tree canopy that intercepts rain and reduces stormwater volumes citywide. To help protect water quality and reduce stormwater runoff, BES and other bureaus invest in protecting and restoring natural areas and expanding the urban tree canopy on public and private property. For more information about Portland's natural and green infrastructure see the City's Natural Resource Inventory, urban canopy studies, and the Portland Parks & Recreation chapter in this document.

Figure 6.11 Existing Stormwater System



Stormwater System Levels of Service

Recently, the Bureau has intensified its stormwater planning activities, especially outside of the combined sewer system. Efforts are underway to update the *Stormwater Management Manual* (SWMM) and develop a comprehensive system plan for stormwater. The proposed stormwater system plan will focus first on identifying risk associated with failing to meet defined levels of service and then performing a targeted alternatives analysis with the goal of identifying and addressing the greatest sources of stormwater-related risk. The Bureau established service categories and related performance indicators to help frame the characterization of system deficiencies, development and evaluation of alternatives, and selection of recommended improvements. These categories include:

- Protect public health and safety and property:
    - Sanitary sewage releases: In the separated area, sewage releases to surface water are prevented for storm events up to a 5-year frequency. In the combined sewer area, prevent releases to buildings or streets up to a 25-year storm frequency.
    - Erosion and landslide hazards: Limit risk claims due to City stormwater.
    - Localized/nuisance flooding: Design and manage infrastructure to limit nuisance flood events.
    - Groundwater contamination: In the UIC area, facilities are managed to effectively reduce pollution to the groundwater.
- Protect biological communities and improve ecological function:
    - Loss of habitat: Address water quality and quantity consistent with requirements of the Endangered Species Act.
    - Mitigate contamination of surface water and sediments through use of pollution reduction facilities.
    - Minimize disruption to the hydrologic cycle by managing impervious area and through flow attenuation.
- Support community needs:
    - Address deficiencies that impede community improvements. Increased impervious surface area – whether public of private – requires an approvable discharge point for stormwater conveyance.

Since 1999, the Stormwater Management Manual (SWMM) has provided policy and design requirements for stormwater management throughout the City of Portland. The requirements apply to all development, redevelopment, and improvement projects within the City of Portland on private and public property and in the public right-of-way. Portland's approach to stormwater management emphasizes the use of vegetated surface facilities to treat and infiltrate stormwater on the property where the stormwater runoff is created. Infiltrating stormwater onsite with vegetated surface facilities is a multi-objective strategy that provides a number of benefits, including but not limited to pollution reduction, volume and peak flow reduction, and groundwater recharge. These benefits play a critical role in protecting stormwater infrastructure and improving watershed health. Revisions to the SWMM will incorporate a systems-based approach, which will focus on the needs of the system to which stormwater is being conveyed. For example, the risks and

requirements for protection of groundwater when stormwater is infiltrating into the ground are different than the risks and requirements for protecting the capacity and treatment needs of the combined sewer system. The SWMM will continue to emphasize a management hierarchy, requiring onsite stormwater management prior to conveyance offsite. As stormwater system and facility planning evolves, the SWMM will focus regulatory and design approaches by local stormwater systems, including storm-only sewers, drainageways and waterbodies, and combined sewer systems.

Stormwater System Current and Projected Condition and Capacity

Comprehensive condition data is not available for the stormwater system in the separated stormwater areas. Of particular concern for stormwater management are the many miles of public right-of-way that are undeveloped or otherwise lack adequate stormwater infrastructure, see Figure 6.12

While comprehensive stormwater system planning is underway, existing plans and modeling information reveal some of the condition and capacity issues related to the stormwater system in each watershed. These are summarized below.

Portland Willamette River Watershed

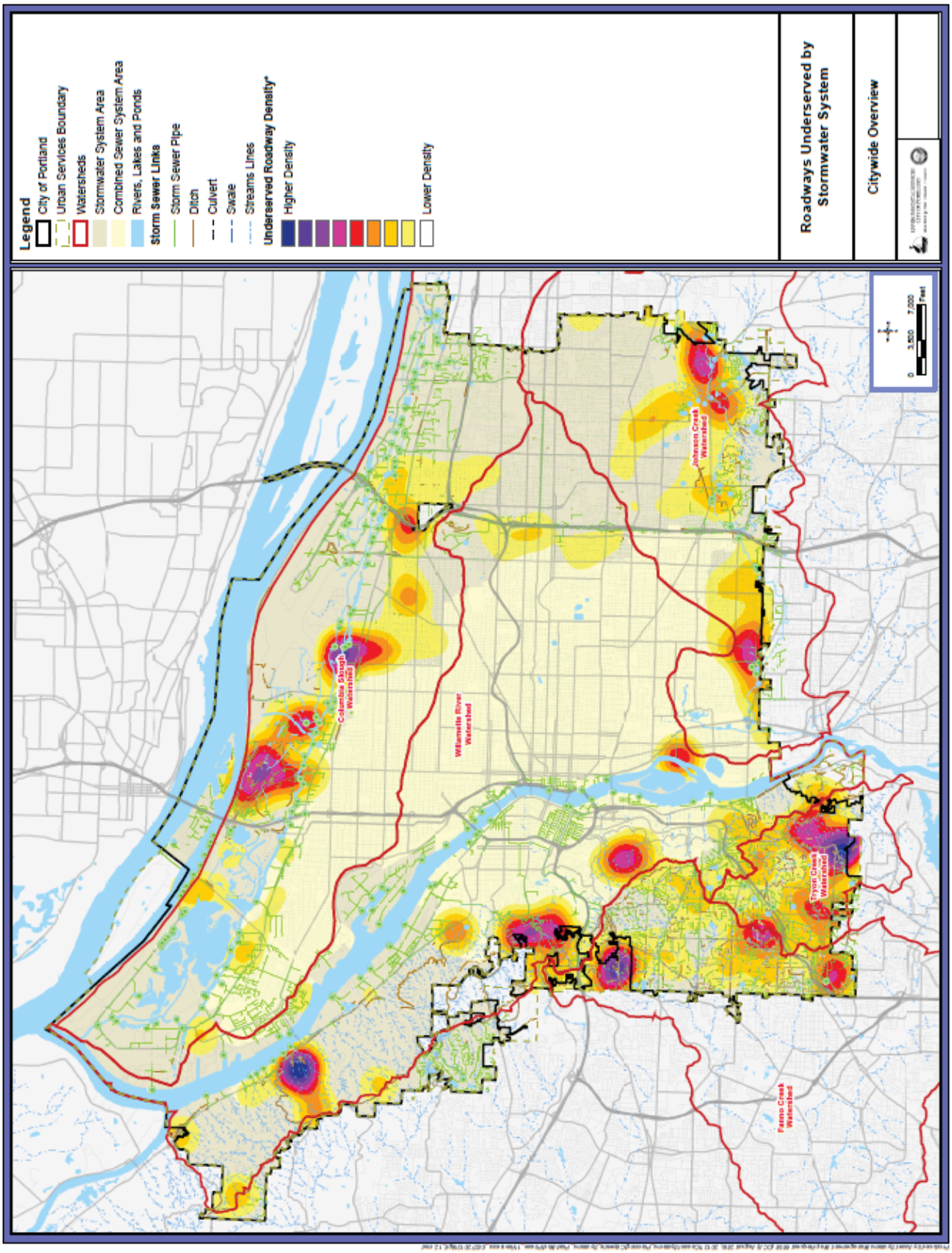
The Willamette Watershed's developed areas are largely served by the combined sewer system, but portions of the area are also served by UICs and the City, Port of Portland, and ODOT MS4 systems and private systems. The areas within the watershed that have been analyzed with modeling are shown in Figure 6.11.

Studies such as the Westside Streams Water Quality and Trend Analysis Status Report (2010) and the Tanner Creek Water Quality Characterization (2011) identify sources of water quality deficiencies in the watershed and guide the development of pollution reduction projects.

Primary deficiencies in the Willamette watershed are water quality and high flows in the natural channels of the west hills that lead to degradation of the streams. Similar to the Fanno Creek and Tryon Creek watersheds, steep slopes and low infiltration capacity of soils presents challenges for on-site stormwater management in some areas, and makes innovative solutions and protection of the existing natural resources that manage water important.

The Stephens Creek subwatershed of the Willamette has had the most complete and recent stormwater evaluation (2013). It was the first watershed analysis that evaluated not only conveyance system capacity and water quality, but also the hydrologic indicators of stream health. In this area, approximately 22% of taxlots do not have an approvable stormwater discharge point and approximately 25% of the city-managed rights-of-way in the subwatershed do not have an approved stormwater conveyance system.

Figure 6.12 Roads Underserved by Stormwater System



Columbia Slough and Columbia River Watersheds

The existing stormwater systems in the Columbia Slough watershed and on Hayden Island are shown in Figure 6.11. The Columbia Slough watershed is flat, primarily sandy alluvium with good infiltration, but a high water table, which limits the use of sumps and surface infiltration facilities in some areas.

Several entities are responsible for conveying and treating stormwater runoff in the Columbia Slough watershed, which creates unique management challenges. The City of Portland is only responsible for systems that convey stormwater from public right-of-way to the slough. The City manages stormwater in the southeast portions of the watershed using approximately 3,500 UICs. In the Columbia South Shore Well Field, wellhead protection area regulations limit infiltration of stormwater. Private and public UICs in this area are required to protect the groundwater through measures to control and treat spills that could pollute runoff.

Three public drainage districts, operating separately from the City of Portland, are responsible for flood control within their respective district boundaries. Flood control responsibilities include preventing Columbia River water and local stormwater from flooding property by operating pump stations to convey flow into the Columbia Slough and Columbia River. There are over 600 privately-owned stormwater conveyance systems that discharge runoff from private properties into the slough. The Portland International Airport and the Oregon Department of Transportation (ODOT) own and operate stormwater systems that discharge to the slough at 15 different outfall locations. The Port of Portland operates several more private stormwater systems that discharge stormwater from their properties into the slough.

The City is currently using hydrologic and hydraulic modeling to assess stormwater system capacity deficiencies for much of the service area through a cooperative project with Multnomah County Drainage District #1 (MCDD) to recertify the district's levee system with the Corps of Engineers. In addition, stormwater system deficiencies related to sediment quality in the slough are being evaluated as part of a DEQ Consent Order. BES has identified 52 priority city-owned stormwater outfalls that need pollution control. The investment strategy includes an estimate for these projects.

Johnson Creek Watershed

The existing stormwater systems in the Johnson Creek watershed are shown in Figure 6.11. Stormwater sumps, or UICs, are the primary stormwater management system within the watershed. Currently, the watershed has about 2,400 active sumps.

Flooding along Johnson Creek is a significant stormwater-related issue. Under the Johnson Creek Restoration Plan (2001), the City is working to reduce "nuisance floods" (floods that have about a 10% chance of occurrence in any given year, or an average of once every 10 years), while also improving water quality and habitat. Until recently, Johnson Creek flooded Foster Road in the Lents area about every other year. With the completion of the Foster Floodplain Natural Area restoration project in 2012, flooding is expected to be reduced to a six to eight year recurrence, and further implementation of projects from the restoration plan will continue to improve conditions. In addition, a multi-bureau team is studying the feasibility of managing larger floods (those that have about a 1% change of occurrence in any given year, or occur on average once every 100 years).

Resources have recently shifted to study and understand the stormwater flows from East Buttes, Johnson Creek tributaries and other upland areas into Johnson Creek. Stormwater system planning is expected to comprehensively identify system deficiencies. Based on hydraulic modeling and field observations, stormwater system capacity deficiencies are expected to be identified in the steep, natural channels south of Johnson Creek and east of Interstate 205. Soils in this area have limited capacity to infiltrate stormwater. Natural drainage and local seeps and springs make on-site stormwater management difficult. Disruption of these resources has caused problems for development. Steep slopes present potential landslide risks and many streets lack stormwater management infrastructure. The relatively recent development in some neighborhoods east of I-205 and south of Powell Boulevard has increased the amount of impervious area and decreased vegetation, contributing to the flashiness (rapid rise and fall) of Johnson Creek and its tributaries and exacerbating stormwater problems downstream.

Fanno and Tryon Creeks Watersheds

The existing stormwater systems that contribute flow to Fanno Creek, other Tualatin River tributaries, and Tryon Creek are shown in Figure 6.11. This figure also shows the portions of the stormwater system that have been assessed using hydrologic and hydraulic models.

Water quality is a primary challenge related to stormwater in these watersheds. As a part of the Fanno and Tryon Creeks Watershed Management Plan (2005), pollutant loading from different land uses was modeled. These results were used to estimate the source of water quality deficiencies in these watersheds and serve as a guide for the development of pollution reduction projects. High traffic commercial corridors are a significant source of pollutants. Some existing stormwater detention ponds contribute to temperature problem.

The 2005 Fanno/Tryon Watershed Management Plan also identified numerous stormwater capacity deficiencies at culvert crossings and within piped systems. In addition, most of Portland's properties and streets that lack adequate stormwater systems are located in the Fanno and Tryon watersheds. These areas tend to have soils with low infiltration capacity that do not allow for on-site stormwater discharge; steep slopes that have potential landslide hazards; and streets that lacking drainage infrastructure for off-site stormwater discharge.

Recommended Stormwater System Improvements

Recommended improvements can be divided into two categories: retrofits to address stormwater issues that impact existing development and proactive options that can reduce the need to expand the stormwater management system. These vary somewhat by watershed and by stormwater basin.

In the combined sewer basins, priority will continue to be on managing stormwater as close to the source as the possible (i.e., keep water out of the sewer), as called for in the City's NPDES permit. This strategy will be implemented through projects such as private property retrofits (eco-roofs, rain gardens, parking lot retrofits) and public stormwater infiltration facilities in the rights-of-way. The investment strategy includes these multi-objective green infrastructure projects, which also address basement sewer backups. Within in the combined sewer basins, there also may be opportunities to separate stormwater from the sanitary sewer system. This approach is currently under review in the Lloyd District area.

In the separated stormwater areas, the Bureau has identified a variety of projects and programs to address stormwater system needs. In addition to the types of projects identified for the combined area, there are also projects to address flood management, pollution reduction, and overall watershed health. However, it is important to note that the Bureau anticipates that there will be areas where it is neither technically nor financially feasible to provide stormwater management services. It may be desirable to encourage increased density in areas that are already highly impervious. Allowing for higher density may make neighborhood stormwater management system improvements more cost effective by increasing the number of properties served in proportion to the public investment.

Citywide, the bureau continues to invest in programmatic approaches that protect the existing stormwater system and natural resources, and help avoid the need for future costly capital projects to treat stormwater. These programmatic approaches include capital programs included in the investment strategy, such as land acquisition for protecting high-quality natural resources that are part of the water cycle, and green street projects. Non-capital programs, such as community education and outreach, tree planting, revegetation and control of invasive species are also critical parts of the bureau's strategy to protect water quality and address other regulatory drivers.

While citywide stormwater system planning is not yet complete for all areas, existing watershed and stormwater plans recommend the following investments. Additional stormwater system improvements to address system risk will be recommended in the coming years.

In the **Columbia Slough** Watershed, projects will focus on water quality with a primary goal of improving the quality of the sediments in the Slough. Specific water quality projects are being identified as part of the Columbia Slough Sediment Order. Flood control is also an issue in the slough, both keeping Columbia River water from flooding property within the drainage districts' boundaries and keeping stormwater generated from within the drainage districts from flooding properties. A study will determine whether or not a new stormwater pump station is required. The bureau continues to invest in protection, restoration, and enhancement of natural resources as well as built infrastructure improvements.

In the **Johnson Creek** Watershed, projects will continue to focus on floodplain restoration and management through restoration in target areas along the main stem of the creek. These projects are multi-objective: providing flood mitigation, improving water quality, and enhancing fish and wildlife habitat. The CIP identifies larger flood mitigation projects in West Lents and in East Lents. Restoration is underway on Crystal Spring Creek, a tributary stream that is a source of clean, cold, and constant flows. Projects are also underway to protect and restore natural resources in the uplands and tributaries. Future work will begin to address upland stormwater system conveyance and capacity.

In the **Fanno/Tryon** Watershed, projects will focus on stormwater system improvements including flow control and treatment to improve water quality, protect streams, and ensure storm system reliability. Stormwater retrofits will focus on managing stormwater from existing impervious area in major transportation corridors such as Beaverton-Hillsdale Highway and SW Barbur Boulevard. Projects to increase culvert capacity and improve fish passage in the streams and their tributaries are underway or planned. Additional projects include stream daylighting, sewer infrastructure protection, stream enhancement, and roadside drainage and shoulder improvements. The bureau and partners continue to focus on protecting, restoring, and enhancing natural resources that support water quality, hydrology, and habitat.

In the **Willamette River** Watershed, the Bureau will continue to implement stormwater projects to address capacity in the combined sewer system to limit sewer overflows and improve watershed health. In the separated sewer system projects will address other stormwater-related impacts to the river, tributaries and their watersheds. Projects will focus primarily on controlling the flow of stormwater and improving water quality through projects to retrofit existing impervious area with stormwater facilities along public right-of-way and on private property. Construction of new neighborhood-scale water-quality facilities could be a cost-effective solution in some areas. As in the Fanno/Tryon Watershed, projects often require partnering with other public agencies (such as ODOT) or private property owners. Restoration and enhancement of remnant habitat areas along the main stem Willamette River to create habitat "stepping stones" through the industrial harbor and downtown core is important for ESA-listed species migrating to upstream habitats.

Investment Strategy

Process

Each year, the Bureau prepares capital and operating budgets for the upcoming fiscal year and for the five-year planning horizon. The work of the Bureau is focused on strategic and comprehensive program delivery protecting public health and restoring the environment within a prescribed, but negotiated, regulatory framework. Using asset management principles including reducing risk and the likelihood of failure, the Bureau develops budgets to maintain infrastructure and natural systems to meet regulatory requirements and enhance the health of watersheds. Asset management addresses life-cycle costs, trade-offs between capital and operating expenditures, and prioritization of projects based on risk and consequence of failure, to achieve long-term system sustainability and acceptable levels of service. The Bureau uses an integrated approach, rather than one that addresses only single subject regulatory requirements, whenever possible. Taking an integrated approach is often more cost-effective and results in better watershed health outcomes – hydrology, water quality, habitat, and biological communities – while also addressing other urban environmental problems.

In order to be best stewards of ratepayer dollars, the bureau delivers its services through a wide array of operating programs that complement the capital investments. Public education has proven to be a particularly cost-effective approach to reducing the volume and pollutant load entering the sewers. Investing in public engagement and community stewardship has yielded a number of stormwater management benefits such as extensive tree planting, clearing of invasive species in parks and other

natural areas, and construction and maintenance of stormwater facilities by private entities (such as eco-roofs and rain gardens). The bureau works closely with a number of non-governmental organizations including watershed councils, environmental groups, and neighborhood groups, which often leverages volunteer contributions and other sources of funding to meet multiple community benefits.

The Bureau has been implementing an asset management approach to guide investment for several years. To date, extensive work has focused on the Combined and Sanitary Collection System where an updated Systems Plan has evaluated projects using a risk-based asset management framework. This approach will be expanded to the Bureau's other systems and asset types as resources are available to do the required analysis. Watershed monitoring data, regulatory requirements and watershed planning (such as the Johnson Creek Restoration Plan) guide prioritization of stormwater and watershed investments. Applying asset management approaches to the natural systems and green infrastructure is an emerging effort for the Bureau.

The Capital Improvement Plan (CIP) is developed utilizing a multi-step process to identify, develop, review, score, and rank projects to determine funding and scheduling priorities and ensure that the core sanitary sewer and stormwater systems are met to serve the community. A bureau-wide stakeholder review team investigates, scores, and ranks all CIP projects in accordance with identified CIP criteria. CIP weighted criteria, scoring, instructions, scheduling guidelines, estimating procedures, and project request forms are used to ensure each project is developed, reviewed, and scored based on detailed and consistent information. A CIP development strategy guides project selection and scheduling. Projects are reviewed by managers in finance, program areas, operations, and engineering to ensure financial resources are expended effectively and appropriately. The bureau director reviews the final CIP plan and submits it to City Council during the annual City budget process.

The public is involved in the budget development process through the Bureau's Budget Advisory Committee and the Public Utilities Review Board. All CIP projects that affect the public include public involvement and outreach plans.

Projects and Programs

The major components of the sewer system define the program categories within the capital budgeting process: Sewage Treatment, Maintenance and Reliability, Surface Water Management (i.e., stormwater and watershed health), and Systems Development.

The Bureau focuses efforts on comprehensive, multi-purpose solutions in the highest priority areas for work in all four program areas of the CIP, guided by both regulatory requirements and the Bureau's mission and Strategic Plan. The Bureau anticipates nearly $2 billion in capital investment in these programs over the next twenty years. Capital projects and programs are drawn from the recommended system improvements discussed in earlier sections. It is important to note that the proposed Investment Strategy represents a conservative financial approach to addressing system needs. The Bureau's 20-year Investment Strategy (included in Appendix A) is summarized in Table 6.4.

Table 6.4 Investment Strategy Summary

Program	FY 2013-2018	FY 2018-33
Wastewater Treatment and Pumping	$109,671,000	$305,964,000
Maintenance & Reliability	$328,896,000	$702,800,000
System Development	$23,462,000	$60,000,000
Surface Water Management	$73,441,000	$127,515,000
TOTAL	**$535,470,000**	**$1,196,279,000**

Specific objectives for the program areas are described below.

Sewage Pumping and Treatment Systems

Regulations, primarily through the NPDES Waste Discharge permits, require investment in the ten year planning horizon with a focus on process improvements at Columbia Boulevard Wastewater Treatment Plant (CBWTP), including secondary process improvements and upgrades to the mixing systems in the digesters. Other investments in this program area will focus on ongoing maintenance at the CBWTP and the Tryon Creek Wastewater Treatment Plant through the Repair, Rehabilitation and Modification program and the Pump Station Improvement program. An updated Facilities Plan for CBWTP was completed in March 2010; no new projects were identified for the near term. The draft TCWTP Facilities Plan identifies extensive investments to be made at this site including acquisition of property for a new headworks facility which will allow for gravity flow through the plant and upgrades to nearly all the existing facilities on site.

Collection System Maintenance and Reliability

This program area is focused on improving and maintaining the existing sanitary and combined sewer collection system to provide accepted levels of service. The March 2012 Systems Plan (for sanitary and combined sewers) recommends grey and green infrastructure projects that have a favorable benefit/cost ratio and reduce system risk. The plan identified approximately $175 million in pipe rehabilitation for near-term investment. Additional projects are planned to address the highest risk of basement sewer backup. In response to system failure in the Fanno Basin, an extensive improvement program is underway through fiscal year 2016, including a new pump station to augment the existing pump station. A small amount of work remains to meet ongoing requirements for the Combined Sewer Overflow Program to provide increased efficiency of system operations.

Surface Water Management

This program area focuses on systematically protecting and restoring surface water assets (such as drainageways, streams and wetlands) and improving overall watershed health to protect public health and safety and comply with state and federal regulations. Projects often involve collaboration with other public agencies, nonprofits and community partners. The Bureau prioritizes projects that protect the most critical existing watershed functions and/or preserve those locations at the greatest risk of damage. This is accomplished by implementing the Watershed Management Plan recommendations for restoring important natural functions and/or using green infrastructure to reduce or avoid stormwater impacts. A stormwater system plan for the Stephens Creek subwatershed was completed in 2012 which identified

investment needs for that area. A citywide stormwater system planning process is now underway to identify projects to improve stormwater conveyance, capacity and water quality. Other near-term priorities for this program area include continuing restoration of Johnson Creek and its floodplains; stormwater retrofit projects in Fanno/Tryon and the Columbia Slough; and restoration and enhancement projects along the main stem Willamette River and its tributaries, and the Columbia Slough.

Systems Development

In support of Metro's 2040 Growth Concept, this program area funds projects that cost effectively and incrementally expand the sewer collection system to serve planned development. Work is underway to identify clusters of properties that are currently served by on-site sewage systems, such as septic or cesspools, and to plan for alternatives prior to failure of on-site systems. This program also funds sewer improvements in association with public works projects by others, primarily transportation projects – both road and transit. In response to City Council action, the Bureau has developed a program to address non-conforming sewer connections. Most of the work to date has been in response to either a service failure or a property sale. Some work has been accomplished in conjunction with planned pipe rehabilitation projects.

Financial Strategy

The Bureau annually prepares a five-year financial plan. Periodically, the Bureau forecasts on 10-year and 20-year horizons to gain additional understanding and insight into long-term financing needs and rate implications. The five-year financial plan has three key elements. Initially, operating and capital expenditure requirements for the Bureau are developed through separate operating and capital planning processes and then they are brought together. Overall revenue requirements and a corresponding five-year funding program are developed taking into account the impact of capital construction on future operations and maintenance requirements.

The financial planning process lays the groundwork for setting utility rates, which are formally adopted each year by the City Council. Rates are set on a cost of service basis, meaning that rates are designed to charge customers for their proportional cost of collecting, transporting, and treating discharges. Debt obligations ("mortgage payments") have a significant impact on the bureau's financial plan and its rates. In fiscal year 2013-14, approximately one-third of the budget was allocated to debt payments.

Existing Financial Strategies

Environmental Services receives revenue for capital investment from sewer fees, charges and permits; line and branch and system development charges; cash transfers from the Sewer System Operating Fund; and Bond proceeds, the latter are the primary funding source of the Bureau's capital expenditures.

System Funds

The Bureau's financial reporting system is organized into five separate funds:

- The Sewer System Operating Fund provides for the day-to-day operation, maintenance and management of Bureau programs.

- The Sewer System Construction Fund holds equity contributions and net bond proceeds for transfer to the Sewer System Operating Fund to reimburse capital-related expenditures.
- The Sewer System Debt Redemption Fund provides for payment of debt incurred for capital construction.
- The Sewer System Rate Stabilization Fund functions as a reserve that enables the Bureau to level its projected annual revenue requirements to reduce significant changes in sewer and stormwater rates from year to year.
- The Environmental Remediation Fund was created to provide funding to remediate former solid waste disposal sites. The Environmental Remediation fund now also provides funding of the City's share of the Portland Harbor Superfund program remedial investigation and feasibility study costs and the City's source investigation program

Debt Service Coverage

The Bureau's current financial planning standard is to set rates adequate to provide Net Revenues (gross revenues less operating expenses) including transfers from the Rate Stabilization Fund equal to or greater than 1.50 times the annual debt service requirement on first lien debt, and 1.30 times the annual debt service requirement on all (first and second lien) debt. These targets exceed the requirements specified in the existing debt covenants. This approach helps the bureau maintain a high bond rating, which reduces the cost of borrowing money to pay for capital projects.

Ending Fund Balances

The Bureau's current policy is to maintain combined ending fund balances within the Operating Fund and the Rate Stabilization Funds equal to or greater than 10 percent of each year's operating expenses.

The Construction Fund ending fund balance is targeted at 35 percent of the next year's CIP, or $500,000, whichever is greater, for planning purposes. Actual ending fund balance will differ depending on the rate of expenditures and the timing of CIP borrowings.

Projected revenues and expenditures

Table 6.5 depicts forecast resources and requirements for the Operating Fund. While the Bureau annually prepares a five-year financial plan, Table 6.5 includes an FY2019 – FY2033 summary column to provide a 20-year extended outlook.

Table 6.5 Sewer system operating fund forecast sources and use of funds ($1,000)

Item	2014	2015	2016	2017	2018	FY2019 – FY2033
Resources						
Service Charges & Fees	$275,404	$294,507	$315,179	$335,524	$353,283	$6,733,906
Connection Fees	9,910	9,364	9,909	10,494	10,773	266,070
Wholesale Contracts	3,445	3,555	3,669	3,787	3,909	77,778
Other Service Charges & Misc.	7,907	6,335	6,475	6,681	6,872	140,826
Cash Transfers In -						
Rate Stabilization Fund	10,400	-	-	-	-	32,250
Sewer Construction Fund	86,400	112,100	110,345	108,732	112,424	2,080,868
Capitalized Overhead	8,255	8,413	8,574	8,738	8,905	155,960
Other Funds	697	181	186	192	199	3,951
Interest Income	81	36	54	53	48	652
Beginning Fund Balance	52,999	58,176	62,214	66,539	70,786	74,404
Total Resources	**$469,226**	**$491,052**	**$515,200**	**$544,623**	**$567,356**	**$9,566,665**
Requirements						
Personal Services	45,637	47,014	50,498	51,878	54,149	1,072,772
Materials & Services	36,893	38,470	40,657	43,172	44,897	820,078
Internal Services	33,153	34,689	36,233	37,722	38,986	759,166
Capital Outlay (1)	113,121	111,623	111,548	117,357	112,837	2,156,169
Int. Accruals/Lease Purchase	71	46	67	79	73	277
Cash Transfers -						
General Fund Overhead	6,965	7,348	7,753	7,966	8,186	156,865
Construction Fund	18,759	20,096	20,916	22,963	29,153	1,660,573
Rate Stabilization Fund	1,550	5,550	5,825	4,750	-	28,875
Debt Redemption Fund	151,949	160,579	171,426	183,984	200,474	2,741,297
Other Cash Transfers	2,977	3,401	3,727	3,972	4,205	59,763
Ending Fund Balance	58,176	62,214	66,539	70,786	74,404	110,830
Total Requirements	**$469,226**	**$491,052**	**$515,200**	**$544,623**	**$567,356**	**$9,566,665**

(1) Includes capitalized personal services, materials & services, internal services, land, equipment and capital improvements

Revenues from service charges and fees, and transfers from the Sewer Construction Fund are the largest resources for the Operating Fund. Projections for expected new customers, average water use per account, increases in impervious area, and planned rate increases are used to forecast revenues over the forecast period.

Operating expenses include personal services, materials and services, internal services, transfers for general fund overhead, and transfers to the Rate Stabilization, Construction, Environmental Remediation, and Debt Redemption Funds. The operating expense forecast reflects the Bureau's existing operating budget, assumed cost escalation factors and service additions associated with CIP and other programs.

Factors Influencing the Forecast

The following are considered risks to the forecast as their potential effects were not explicitly included in the investment strategy or financial forecast. Potential costs are not known in all cases.

- **Portland Harbor**
  The Portland Harbor Superfund Site investigation is currently focused on a stretch of the Willamette River from River Mile 2 to River Mile 12. The City is one of the potentially responsible parties actively engaged in assessment and evaluation of cleanup alternatives in this section of the river. The total cost associated with the cleanup and restoration activities and the City's ultimate share of those costs are unknown at this time.
- **Willamette Basin TMDLs**
  The DEQ intends to finalize a mercury TMDL within the next few years and an update of the temperature TMDL is also pending. Changes may affect operations at the Tryon Creek Wastewater Treatment Plant and some projects and programs, but specific implications and the ultimate costs are unknown at this time.
- **MS4 Permit**
  The City's MS4 permit includes requirements to evaluate program effectiveness at reducing applicable TMDL parameters. As new TMDLs are developed and approved, technical work and associated budgets will likely increase.
- **Sanitary Sewer Overflows (SSOs)**
  State and federal regulators continue to study the operations and maintenance of municipal sewer systems and potential guidelines regarding SSOs. Should SSO rules similar to those proposed in 2001 eventually become effective, the Bureau's sewer system would be affected. Such rules could have significant financial impacts to both capital (via upsizing of facilities) and operating (increased system oversight) budgets.
- **Sanitary and Stormwater Service to Residents**
  As discussed in earlier sections, there are challenges to providing sanitary sewer service to all properties within the USB. These include properties with onsite disposal, undeveloped properties, and properties serviced by under capacity sewer lines. While some of the solutions are included in the financial forecast, the full extent of the need is not fully known. Similarly, the Bureau recognizes the need to make improvements to the stormwater system, however, the extent of these improvements is not fully known at this time.
- **Sanitary Sewer and Stormwater Rates**
  The bureau's capital and operating budget forecasts are influenced by annual sewer and stormwater rates approved by the City Council. Planned operations and maintenance of, and capital improvements to, the sewer and stormwater systems will depend on continued predictable increases in rates. Annual rate increases determine the bureau's ability to address the key issues and concerns listed in the Overview section. Lower rate increases than planned would require either reduced operation and maintenance expenditures or delays in maintenance of existing infrastructure and new capital system improvements, which may increase future costs.

In addition, the financial forecast makes assumptions about factors internal to the Bureau and the City, such as program levels, and external factors, such as inflation and borrowing costs. Changes to these factors may change the financial forecast. This is particularly true of an extended forecast such as the 20-year forecast shown in Table 6.5. The following describes some of the factors and risks involved in unanticipated changes:

- The financial forecast is based on a 1.5% decrease in average use per single-family residential customer (based on winter water consumption), and a 0.75% decrease in average use per multi-family, commercial and industrial customer, roughly consistent with recent history. The forecast also assumes an account growth rate of 0.5% per year. Should consumption or account growth be lower than anticipated, revenues would be adversely affected.
- Changes in interest rates will affect the cost of new debt. Any significant increase in interest rates over the forecast interval will increase revenue requirements for interest on new debt. Conversely, lower-than-anticipated interest rates would reduce borrowing costs and therefore revenue requirements.
- The forecast rate increases are based on best estimates of inflation over the forecast interval. An increase in the actual rate of inflation above the forecast inflation rate will lead to correspondingly higher revenue requirements.
- The current economic recession has resulted in a drastic drop in all construction related fees and permits, most notably System Development Charges, which are a material revenue source. The financial plan assumes construction activities will rebound. If construction activity does not rebound as assumed, revenues would be adversely affected.

Chapter 7
Portland Water Bureau

Overview

The Portland Water Bureau has supplied domestic water to residents of the Portland area for more than 100 years and is the largest supplier of domestic water in Oregon. The Portland water system serves drinking water to about 940,000 Oregonians, almost one-quarter of the state's population. In 2012-13, the Portland Water Bureau directly served a retail population of over 570,600 people in 163,000 residential households (both single and multi-family residences) and about 20,000 commercial and industrial customers. Portland's wholesale customers served an estimated population of approximately 450,000 in 2012-13.

Vision, Mission & Values

The mission of the Portland Water Bureau is to provide reliable water service to customers in the quantities they desire and at a quality level that meets or exceeds both customer and regulatory standards; to provide the highest value to customers through excellent business, management, and operational practices, and appropriate application of innovation and technology; to be responsible stewards of the public's water infrastructure, fiscal and natural resources; and to provide the citizens and City Council with a water system that supports their community objectives and overall vision for the City of Portland.

Purpose of this Chapter

This chapter describes the public facilities and services provided by the Portland Water Bureau that are necessary to carry out its mission. It identifies desired levels of service, inventory and condition information for existing public facilities, and future facilities that will be necessary to support the land uses designated in the Comprehensive Plan, as required by Oregon Planning Goal 11: Public Facilities and Oregon Revised Statute 197. Carrying out the Bureau's mission and other City and community goals may also require programs, investments and practices that are not related to public facilities. This chapter may acknowledge – but does not comprehensively address – these measures.

System Services

Service Area

Approximately 940,000 people living within a 225-square-mile service area around Portland are served by the Water Bureau's retail and wholesale water sales, see Figures 7.1 and 7.2. The Water Bureau delivered 33 billion gallons (BG) to customers during fiscal year (FY) 2012-13. The 20 wholesale water customers are located in Multnomah, Clackamas and Washington counties.

Services Provided

The Water Bureau provides reliable water service to customers in the quantities they desire. Water from two sources, the Bull Run watershed and the Columbia South Shore Well Field, is of consistently high quality and meets all regulatory standards.

Service Agreements & Partnerships

The Portland Water Bureau currently has wholesale water sales agreements with 20 water providers in Portland's metropolitan area -- including cities, water districts, and private water companies. Eight of these water providers have service areas within the Urban Services Boundary of the City of Portland. These include: Burlington Water District, Lorna Water Company, Palatine Hills Water District, Raleigh Water District, Rockwood PUD, Tualatin Valley Water District, Valley View Water District, and West Slope Water District. Some wholesale providers also provide service to small groups of Portland citizens through “wheeling” agreements. These agreements are used where it is difficult or overly expensive to provide water directly from Water Bureau facilities.

The Clackamas River Water District and Sunrise Water Authority provide water services to unincorporated areas within Portland’s urban service boundary to the south of Portland. These water districts operate in partnership with each other through a cooperative agreement and use the Clackamas River as their main water supply source.

The Portland Water Bureau is a member of the Regional Water Providers Consortium. Members include more than 20 municipalities (including the City of Portland), water districts and Metro. (Metro is the regional growth management agency serving Clackamas, Multnomah, and Washington counties.) The Consortium serves as a collaborative and coordinating organization to improve the planning and management of regional municipal water supplies, including regional water conservation implementation and emergency preparedness coordination. The Consortium and its members endorse the Regional Water Supply Plan as the region's water supply strategy for the future. Water providers belonging to the Consortium retain full authority to operate and upgrade their systems and infrastructure.

The Portland Water Bureau maintains partnerships and agreements with other city bureaus and regional and state transportation agencies, providing services such as relocating water mains as directed by City Council. The bureau also has agreements with the U.S. Forest Service for activities within the Bull Run watershed, which is located in the Mt. Hood National Forest.

The City of Portland also maintains partnerships with the cities of Gresham and Fairview regarding participation in the Columbia South Shore Well Field Wellhead Protection Program.

Figure 7.1 Drinking Water Supply System Retail and Wholesale Service Areas

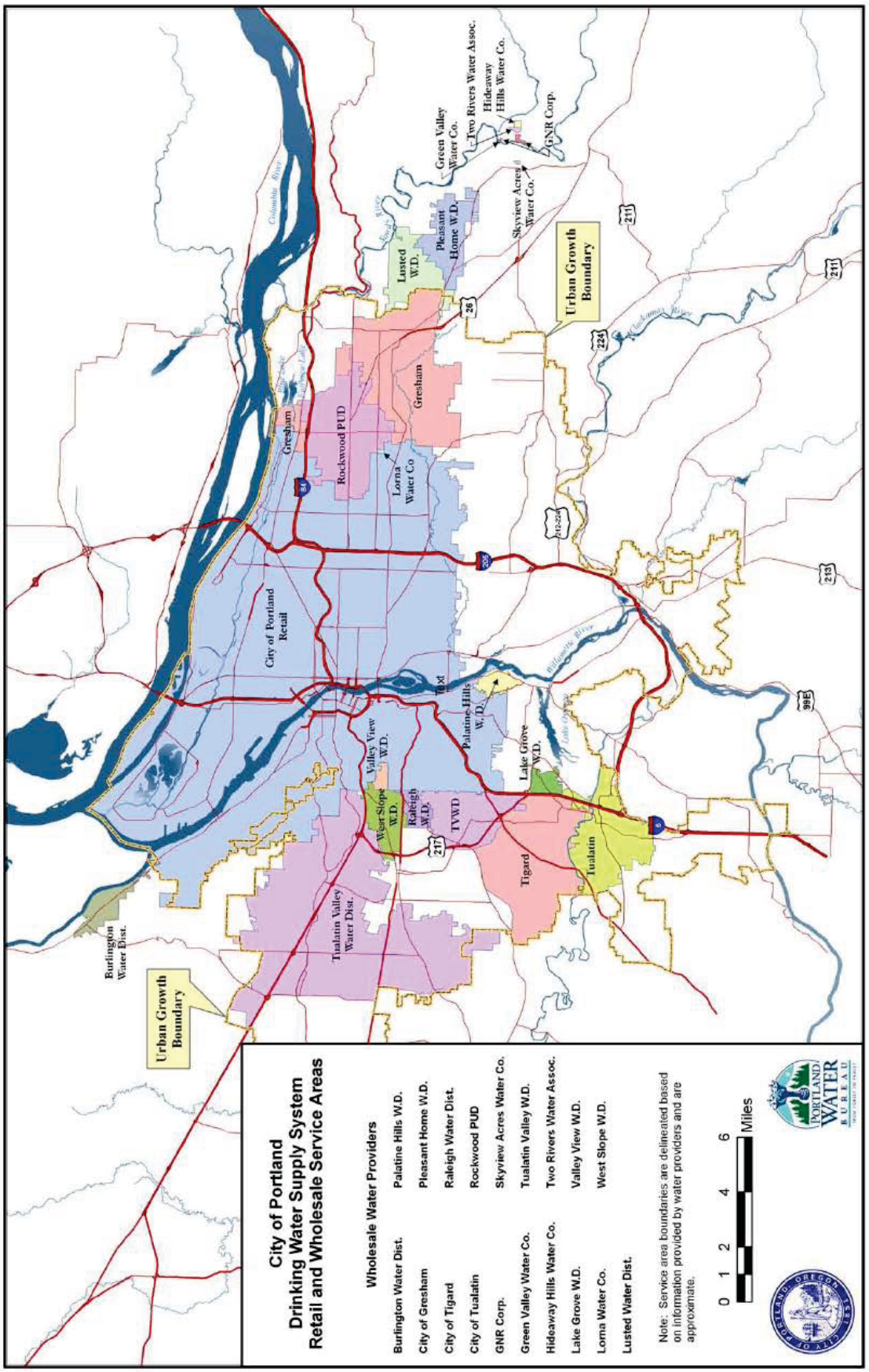
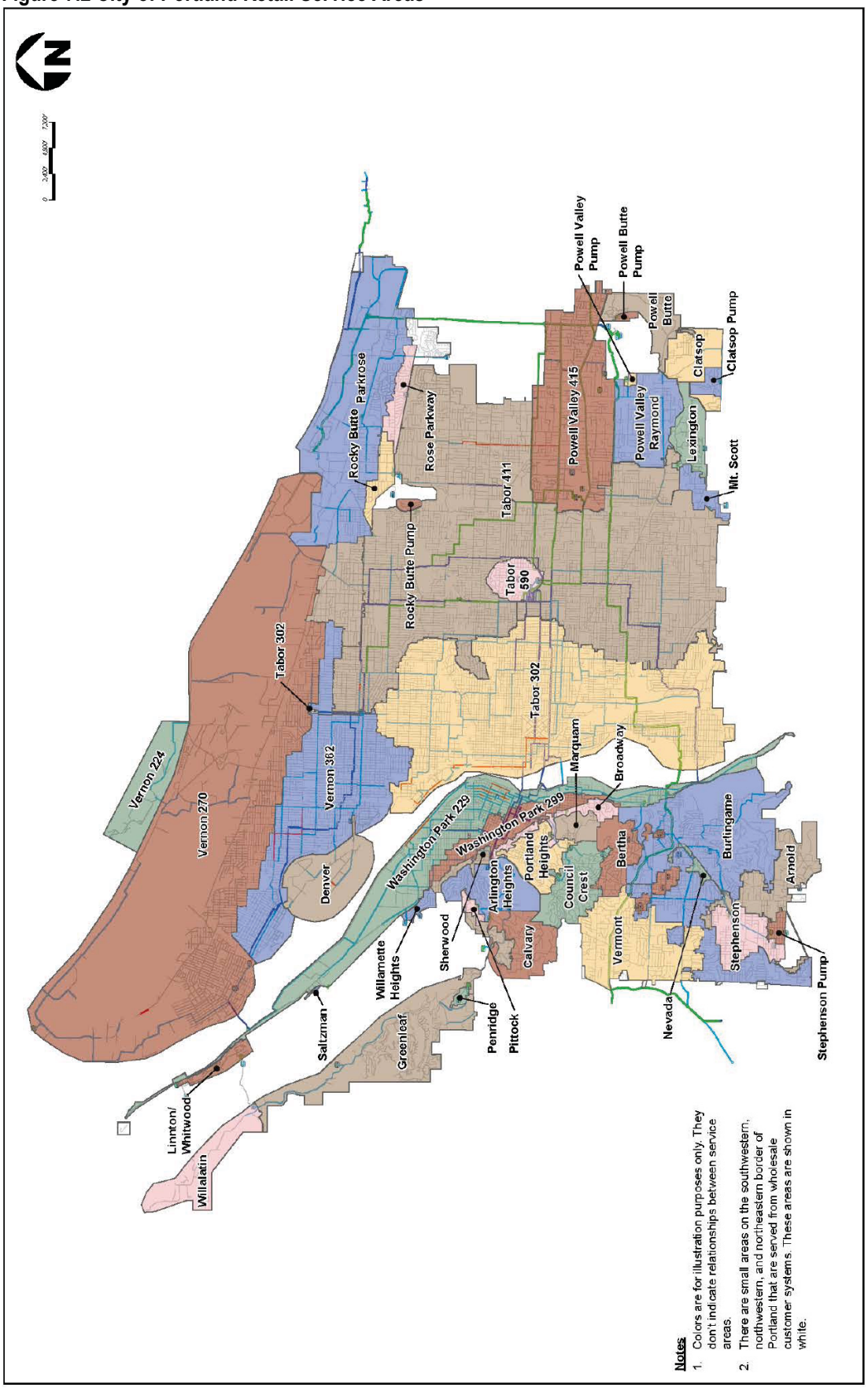


Figure 7.2 City of Portland Retail Service Areas



Inventory Summary

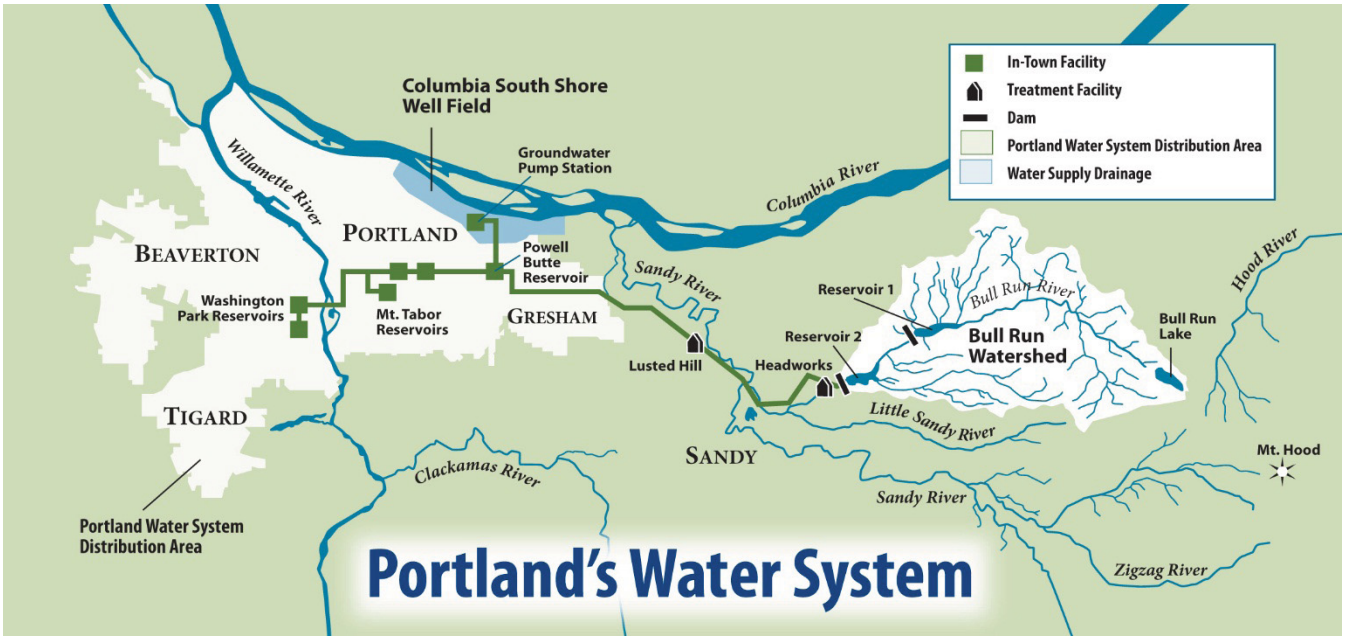
Water is supplied from the Bull Run watershed, located between the city and Mt. Hood, and the Columbia South Shore Well Field, located along the Columbia River, through approximately 2,250 miles of pipes within the City's boundaries. In 2013, the water system was valued at about $7.6 billion.

The City's water system includes five integrated sub-systems:

- a supply system, which collects water from the Bull Run watershed and Columbia South Shore Well Field;
- a transmission system of conduits, which moves water to a number of reservoirs;
- a terminal storage system of reservoirs;
- a distribution system of mains, service lines, pumps and tanks, which distribute water to residences and businesses; and
- support facilities to assist in the operation and maintenance of the water system.

Figure 7.3 illustrates the main components of Portland's water system. The components are described in more detail in Tables 7.1 and 7.2.

Figure 7.3 Portland's Water System



Condition Summary

The most recent Inventory and Condition Report prepared by the Water Bureau is summarized in Tables 7.1 and 7.2. The replacement value of the water system is estimated at $7.6 billion in 2013 dollars. About 63% of the value of the water system is in the distribution system. The supply system constitutes about 13% of the value of the water system, transmission accounts for 16%, terminal storage is 6%, and support facilities account for 2% of the Bureau's asset value.

Roughly 47% of the water system is estimated to be in good condition with 22% being considered very good. Approximately 23% of the water system is considered to be in fair condition, 6% is poor and 2% is considered to be very poor. Table 7.2 provides additional detail on asset value and condition.

Table 7.1 Portland Water Bureau Summary of Value and Condition of Assets, 2013

	Value ($ million)					
Asset Group	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**	**Total Value**
Supply	$131.8	$457.2	$276.0	$82.3	$18.2	$967.0
Transmission	$64.9	$513.2	$518.7	$109.7	$0.2	$1,207.0
Terminal Storage	$218,9	$133.8	$18.1	$84.7	$0.0	$455.7
Distribution	$1,182.1	$2,434.1	$912.0	$190.1	$65.7	$4,785.4
Support Facilities	$40.8	$29.2	$18.0	$16.7	$59.3	$163.7
Total	**$1,638.5**	**$3,567.6**	**$1,742.7**	**$483.6**	**$143.4**	**$7,578.8**

Table 7.2 Portland Water System Inventory and Condition, 2013

	Value ($ million)					
Asset Group	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**	**Total Value**
Supply	**$131.8**	**$457.2**	**$276.0**	**$82.3**	**$18.2**	**$967.0**
Bull Run Roads	16.6	60.8	95.4	57.4	18.2	249.9
Bull Run Lake Facilities	0	17.2	.1.4	1.8	0	20.4
Dam 1 Facilities	0	119.9	102.1	0	0	222.0
Dam 2 Facilities	30.0	1161.3	34.9	13.8	0	240.0
Headworks & Lusted Hill Facilities	0	33.3	11.4	4.8	0	49.5
Groundwater Well Sites	0	36.5	26.6	2.9	0	66.0
Groundwater Pump Station and Treatment	27.7	27.1	4.2	1.6	0	60.6
Groundwater Collection System	57.5	1.1	0	0	0	58.7
Transmission	**$64.9**	**$513.2**	**$518.7**	**$109.7**	**$0.2**	**$1,207.0**
Bull Run Transmission	46.2	204.6	305.1	76.1	0.2	**619.8**
Transmission Mains	18.8	308.6	213.6	33.7	0	**574.8**
Terminal Storage	**$218.9**	**$133.8**	**$18.1**	**$84.7**	**$0.0**	**$455.7**
Distribution	**$1,182.1**	**$2,434.1**	**$912.0**	**$190.1**	**$65.7**	**$4,785.4**
Distribution & Transport Mains	721.3	1,549.3	254.0	47.7	9.0	**2,582.5**
Services	112.6	323.2	381.1	65.3	17.1	**899.4**
Valves	211.9	287.7	72.2	19.9	12.1	**603.8**
Meters	23.9	24.0	19.4	15.0	5.3	**87.9**
Hydrants	5.1	81.6	59.2	17.5	20.6	**183.7**
Regulators	0.0	7.9	7.9	8.1	0	**24.0**
Fountains	1.9	7.0	7.0	2.8	0.9	**19.4**
Pump Stations	40.6	54.3	19.9	2.9	0.8	**118.5**
Tanks	64.8	99.0	91.4	10.9	0.0	**118.5**
Support Facilities	**$40.8**	**$29.2**	**$18.0**	**$16.7**	**$59.3**	**$163.7**
Interstate Facility	16.0	5.7	0.8	1.5	49.6	73.5
Other Facilities	24.8	23.5	17.1	15.2	9.7	90.2
TOTAL	**$1,638.5**	**$3,567.6**	**$1,742.7**	**$483.6**	**$143.4**	**$7,578.8**

Capacity Summary

Population Growth and Water Use

The population in the Portland metropolitan area is expected to continue to increase. Although the physical boundaries of the retail service area are not expected to be redefined beyond the limits of the urban growth boundary (UGB), vacant land and redevelopment lots within the retail service area are increasingly being developed with higher-density housing and more mixed-use development than in the past. In addition, several of the bureau's 20 wholesale customers have identified growth in existing service areas as well as some small additions to the UGB in 2004.

Historical water use, both retail-only and combined retail and wholesale demand, has not kept pace with the increase in the service area population. Since 1992, the number of gallons per capita per day for the entire retail and wholesale area has declined while the population has grown.

Demand Forecast

Although the growth in demand does not increase at the same rate as the growth in population, analysis of future demand and population shows that demand will increase over time. Using a single-equation econometric model, the Water Bureau estimated the mathematical relationship between the overall demand for water and a series of explanatory variables including population change, weather factors such as precipitation and temperature, the average price of water, weekend use, climate change, and others. The result is a weather-normalized demand forecast for annual demand. The forecast also estimates demand under weather conditions that generated the highest average daily demand during the peak season (1967) and the highest single peak-day water demand (1981). Forecasts for Portland's retail and wholesale annual average daily demand (ADD) have been developed to 2030 for both weather-normalized and 1967 weather conditions for the entire year and for the peak season, respectively.

Population estimates generated as a part of the population and allocation forecasts prepared for the Regional Transportation Plan were provided by METRO. Estimates were made based on approximate service territories of Portland and each wholesale customer. No estimate for future growth outside the existing service territories was included, although some growth outside the existing service territory is likely for some providers as the UGB is expanded to accommodate the required 20-year land supply.

According to the Water Management and Conservation Plan (2010), the average annual daily retail demand for 2030 is predicted to be around 70 million gallons a day (MGD). The average annual daily retail plus wholesale demand for 2030 is predicted to be around 135 million gallons a day (MGD). Both numbers would be a substantial increase from current demands. An update of the Water Management and Conservation Plan is scheduled for 2020.

Key Issues & Concerns

Regulatory Compliance

Many large system projects are moving forward to achieve compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule) of 2006. The rule requires that water systems with uncovered

finished water reservoirs, like those at Mount Tabor and Washington Park, either cover the reservoirs or provide treatment at the outlets of the reservoirs to remove or inactivate *Cryptosporidium*, *Giardia* and viruses. All of the compliance projects are in the Terminal Storage Program. These projects include design and construction for an additional enclosed water storage reservoir at Powell Butte, a replacement storage reservoir at Kelly Butte as well as design work for adjustments necessary to disconnect the uncovered reservoirs at Mt. Tabor and Washington Park from the drinking water system Additional work to replace storage at Washington Park is also necessary. It is expected to cost between $330 million and $400 million to fulfill these requirements.

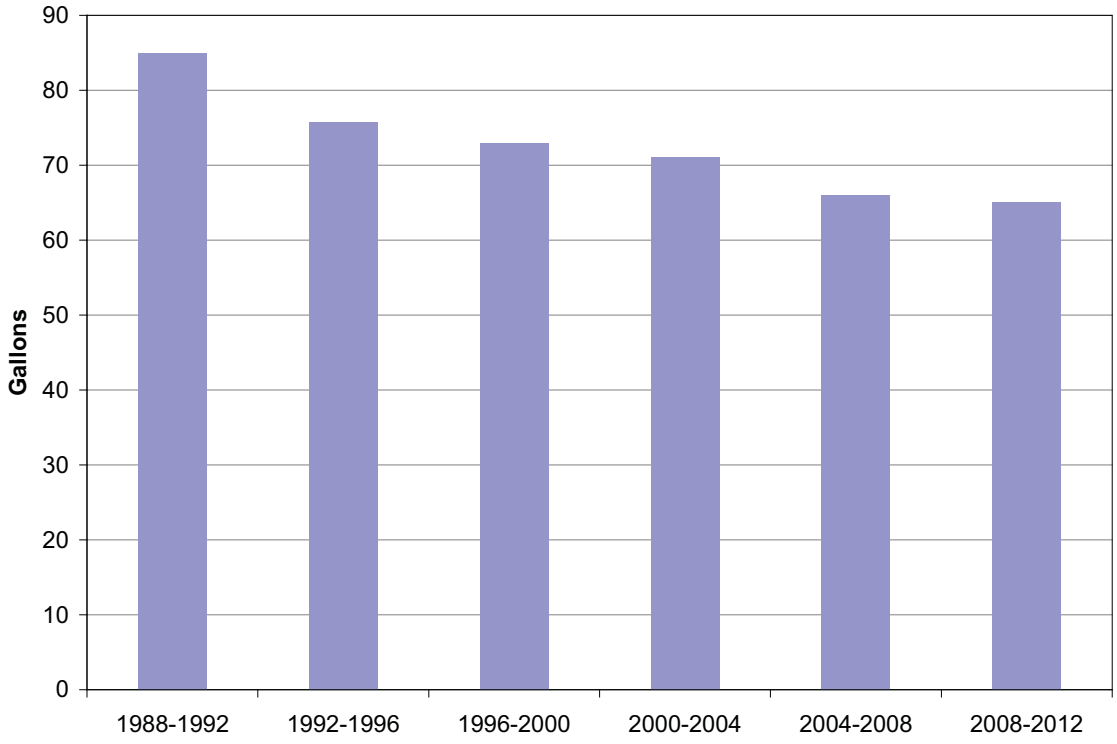
In addition, the bureau has capital projects in and around the Bull Run watershed to achieve compliance with regulations of the Clean Water Act and the Endangered Species Act. These projects are described in the bureau's Bull Run Water Supply Habitat Conservation Plan.

Declining Water Demand

As discussed previously, total water demand for the Portland system has fallen over the last few years, as retail and wholesale customers use less water. Per capita water use for retail single-family residential customers has gone down significantly since 1992. The average consumption for retail single-family customers between 1987 and 1992 was 87 gallons per capita per day (GPC), is now down to about 66 GPC, and has been as low as 62 GPC. Variables such as the water shortage of 1992, updated state and national plumbing codes, the change from flat rates to consumption-based rates for wastewater (in 1994), and behavioral changes resulting from conservation education have helped to reduce each household's overall consumption. Figure 7.4 shows the average annual GPC from 1988–2007.

Water demand forecasts developed by the Water Bureau anticipate that while per capita water demands will continue to decline somewhat over time, the overall demands on the Portland water system will increase due to population growth. The status of continued wholesale water sales is not known at this time, but the bureau anticipates continuing to sell water to wholesale customers.

Figure 7.4 Average Residential Per Capita Daily Water Use[1]



Accommodating Growth

The City of Portland provides water to retail customers within the city limits, as well as a significant number of large wholesale customers. Average daily demand for retail customers in 2012 was 62 million gallons per day (MGD). This is expected to grow to approximately 70 MGD by 2030. While this is not a huge growth rate within the City, it is something that needs to be addressed in the planning of infrastructure.

A larger issue is the impact of regional growth, as the total population in areas served through wholesale water sales agreements is expected to increase significantly. However, as wholesale customers make decisions on future supply sources which may or may not include supply from the City of Portland, it is unknown how this growth will impact the Water Bureau.

Maintaining Existing Infrastructure

The replacement value of water system assets was estimated at $7.6 billion in 2013. Many water system facilities are nearing the end of their useful lives. Half of distribution mains are older than 50 years. The uncovered reservoirs are all over 100 years old. Transmission conduits are 60 to 100 years old. Dams and reservoirs are 50 to 80 years old. The Water Bureau faces new costs to maintain and replace aging infrastructure, respond to security and vulnerability issues, and comply with regulatory requirements. In the meantime, there is pressure to hold down rate increases.

[1] Each bar is an average of the gallons-per capita for the four-year period.

For 2013, the Water Bureau estimates a $15.5 million annual funding gap, primarily in the replacement of assets in poor condition, including distribution system components, transmission conduits, and the seismic upgrades of tanks and other facilities. Over the next 5 years, the Water Bureau expects to invest over $490 million on water-related capital improvements, primarily on the Distribution Program, which will help reduce the funding gap.

Vulnerability and Security

The City of Portland Water Bureau is dedicated to protecting public health and safety by ensuring that key components of the water system will withstand most human-caused or natural disasters. The Water Bureau has completed a number of studies on vulnerabilities within the system. Significant funding will be required to increase protection of more than 80 critical facilities, including dams, reservoirs, water supply pipelines, pump stations, and operations facilities.

Climate Change

The Water Bureau studies the issue of climate change and is establishing both preparation and mitigation strategies. The ability of Portland's two water systems to meet future demands, as well as the need for conservation and efficiency programs, will be important considerations as climate change impacts become more evident..

The City of Portland has kept detailed climate records for the past 70 years and continues to research and model climate patterns and their effects in the Bull Run watershed. The City also monitors current global and regional climate change information. Information available to date indicates that average winter season precipitation could increase. The average length of summer season, when the water system is drawing more water out of reservoir storage than is being refilled, could also increase. This period is referred to as "reservoir drawdown". In simpler terms, it is approximately the period from when spring rains stop and when fall rains begin. Storage in the Bull Run system is still expected to refill each year, because total flows in the watershed over the winter season are much greater than the amount needed to refill the storage reservoirs.

The City is preparing for climate change through research and monitoring, revising long-term planning models, working with other large drinking water utilities on preparation and mitigation strategies, developing its rights in the Columbia South Shore Well Field to provide summer supply and emergency backup capacity, and supporting efficient water use practices.

Regulatory Compliance

Federal Mandates

The City of Portland must comply with a variety of federal mandates, including the Clean Water Act, the Safe Drinking Water Act, the Lead and Copper Rule, and several mandates related to the protection and management of the Bull Run watershed. Programs and projects to maintain compliance are included in the Bureau's investment strategy.

Safe Drinking Water Act (SDWA)[2]

Under the Safe Drinking Water Act, which is implemented through Oregon Revised Statutes and Administrative Rules, the Portland Water Bureau is required to conduct water quality sampling and submit results to Oregon Health Authority, in order to demonstrate compliance with maximum contaminant levels. The bureau also participates in on-site inspections (sanitary surveys) of treatment and distribution facilities by State Drinking Water Program personnel every three years, and participate in annual inspections. The Portland Water Bureau is also required to submit a Water System Master Plan every 20 years, submit a list of completed projects annually, produce and distribute annual Consumer Confidence Reports, meet operator certification requirements, and submit annual cross-connection reports.

Unregulated Contaminant Monitoring Rule (UCMR)[5]

The UCMR is administered under direct authority of the U.S. EPA and requires monitoring for 25 unregulated contaminants using five analytical methods during 2008-2010. The U.S. EPA uses the data generated by the UCMR to evaluate and prioritize contaminants on the Drinking Water Contaminants Candidate List, a list of contaminants EPA is considering for possible new drinking water standards.

Stage 2 Disinfection Byproducts Rule[3]

The Stage 2 Disinfection Rule is administered under direct authority of the U.S. EPA and requires the Portland Water Bureau to submit a sample plan and conduct sampling for disinfection byproducts.

Long Term 2 Enhanced Surface Water Treatment Rule, LT2[4]

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2) was promulgated in January 2006. This federal rule applies to surface water or groundwater under direct influence of surface water (GWUDI) systems, and increases regulations regarding *Cryptosporidium* in the water supply. LT2 also addresses the regulation of *Cryptosporidium, Giardia* and viruses in uncovered finished drinking water reservoirs.

Compliance with LT2 has impacts on two separate parts of Portland's water system. First, the rule requires the city to provide additional treatment to its Bull Run supply to either remove or inactivate *Cryptosporidium*. Portland developed a comprehensive treatment variance request based on the results of a one-year water-quality sampling program and study of Bull Run water. A variance to this part of the rule was granted to the Water Bureau by the Oregon Health Authority on March 14, 2012.

In 2002, new treatment facilities were estimated to cost between $55 and $204 million to construct and millions more to operate on an annual basis. If OHA's variance is revoked, the Water Bureau would likely be required to construct these new treatment facilities. [5]

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[2] of 1974, 1986, 1996 as administered under the U.S. EPA Primacy Agreement by the Oregon Department of Human Services (ODHS) under Oregon Revised Statutes (ORS) 448 and Oregon Administrative Rules (OAR) 333-061

[3] U.S. EPA Safe Drinking Water Act of 1974, 1986, 1996 - 40 CFR Parts 9, 141, and 142 - Federal Register: January 4, 2006 (Volume 71, Number 2), Rules and Regulations Page 387-493.

[4] U.S. EPA Safe Drinking Water Act of 1974, 1986, 1996 - 40 CFR Parts 9, 141, and 142 - Federal Register: January 5, 2006 (Volume 71, Number 3) - Rules and Regulations Page 703-752

Second, the rule requires changes to how uncovered finished drinking water reservoirs are managed and operated. The rule requires that water systems with uncovered finished water reservoirs, like those at Mount Tabor and Washington Parks, either cover the reservoirs or provide treatment at the outlets of the reservoirs to inactivate *Cryptosporidium* and viruses. A regulatory schedule for this work has been approved by to the Oregon Health Authority. The bureau is required to eliminate the use of uncovered reservoirs at Mt. Tabor by December 31, 2015 and those in Washington Park by December 31, 2020.

In its 2009 LT2 Storage Recommendation, the Water Bureau estimated that it will cost approximately $400 million to come into compliance with the uncovered reservoir requirements of the rule.

Lead and Copper Rule

Lead and copper enter drinking water primarily through plumbing materials. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage. On June 7, 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR or 1991 Rule).

In January 1997, the Portland Water Bureau began corrosion treatment, raising the pH of the water to make it less acidic and less likely to leach metals. Corrosion treatment has reduced lead levels at the tap by more than 50% since the City began this treatment in 1997.

Americans with Disabilities Act[6]

The Americans with Disabilities Act of 1990 (ADA) prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, State and local government services, public accommodations, commercial facilities, and transportation. ADA requires some new Portland Water Bureau facilities, and in some instances existing facilities, to be brought up to specified accessibility standards.

Bull Run-Related Legislative and Administrative Protections

A variety of federal legislation, regulatory requirements, administrative actions and agreements affects protection, management, and use of the Bull Run watershed that in turn enables the Water Bureau to provide a reliable water supply to the City of Portland. These include federal statutes specific to Bull Run, federal requirements applicable to national forest land, requirements of other federal agencies applicable to Bull Run, and agreements between the City and the Mt. Hood National Forest. Primary examples include the following:

Federal Statutes and Regulations Specific to Bull Run

- Bull Run Watershed Management Act, P.L. 95-200, (1977) directs the Forest Service to consult and coordinate with the City of Portland to ensure management programs, practices, and standards on watershed lands are protective of drinking water quality

[5] The Water Bureau has plans for an ultraviolet light (UV) treatment facility (completed in early 2012) to address treatment requirements, should the variance be revoked. The UV treatment option was selected by the Portland City Council as the preferred treatment option in 2009 (Resolution 36720).

[6] 1990, administered through Oregon Structural Specialty Code Oregon Administrative Rules 918-460

- 2012 Mt. Hood National Forest Closure Order for the Bull Run Watershed Management Unit—Closure Order MH-2012-05 closes forest service lands within the BRWMU to the public
- Oregon Resource Conservation Act (ORCA), P.L. 104-208 (1996), prohibits timber cutting within the hydrographic boundary of the Bull Run River drainage, except as necessary to protect or enhance water quality or for the construction, expansion, protection, or maintenance of water supply, energy transmission, or approved hydroelectric facilities
- Little Sandy Protection Act, P.L. 107-30 (2001), extends the boundaries of the Bull Run Management Unit and applies the land management protections of the 1996 ORCA to the entire management unit

Federal Requirements Implementing Policy Applicable to National Forest Land

- 1990 Mt. Hood National Forest Land and Resource Management Plan provides guidance for natural resource management.
- 1994 Northwest Forest Plan set management direction for the lands within the range of the northern spotted owl.

Requirements of Other Federal Agencies

- 1995 Bureau of Land Management (BLM), Salem District, Record of Decision and Resource Management Plan provides guidance for the management of non-native species
- BLM Permanent Closure Order for the Bull Run Watershed Management Unit (2011) closes BLM lands within the BRWMU to public access
- Bull Run Water Supply Habitat Conservation Plan (2009) defines the actions the City will take to address impacts of the Bull Run water supply system on native fish species in the Bull Run River, as regulated by the federal Endangered Species and Clean Water Acts and administered by the National Marine Fisheries Service and the Oregon Department of Environmental Quality

Agreement with the Mt. Hood National Forest

- The Bull Run Watershed Management Unit Agreement was established in 2007. Under this agreement, the city participates in collaborative efforts to maintain and manage various aspects of the watershed.

State Mandates

In addition to federal mandates, the City of Portland must also comply with state and regional mandates set through Oregon Revised Statutes and Administrative Rules. Projects to maintain compliance are included in the Bureau's investment strategy.

Statewide Planning Goals and Guidelines[7]

Statewide Planning Goals and guidelines require the City to maintain policies, service agreements, public facilities plans, and project lists for water service, through the City's Comprehensive Plan and public facilities plan. These plans must be submitted to the Oregon Department of Land Conservation and Development (DLCD) for acknowledgment as consistent with statewide goals.

Water Rights[8]

To maintain water rights granted by the state, the Portland Water Bureau developed a Water Management and Conservation Plan. This plan was approved by the state in 2010, and reports annual water use. Portland has state statutory right to full flow of the Bull Run and Little Sandy Rivers. The state also granted full extensions for the four primary CSSWF groundwater rights in 2009. The bureau is required to provide plan updates every five years.

Oregon Structural (OSSC), Mechanical (OMSC) and Electrical (OESC) Specialty Codes[9]

Requires new facilities and in some instances existing facilities to be brought up to new building code standards.

House Bill 3543 (2007)

The Oregon Legislative Assembly declared that it is the policy of the state of Oregon for state and local governments, businesses, nonprofit organizations, and individual residents to prepare for the effects of global warming and, by doing so, prevent and reduce the social, economic and environmental effects of global warming. House Bill (HB) 3543 (2007) sets greenhouse gas emissions targets for the state of Oregon with goals for progressively lower greenhouse gas emissions every decade until 2050.[10] The City of Portland and Multnomah County have adopted a Climate Action Plan (2009) with a goal of reducing carbon emissions by 80 percent by the year 2050.[11] The City also adopted Resolution No. 36749 directing its bureaus to implement policies and programs related to the Climate Action Plan.[12]

Regional Plans

Regional Water Supply Plan

The Regional Water Supply Plan (RWSP) (2004) was adopted by most of the region's individual water providers and is coordinated by the Regional Water Providers Consortium. The RWSP provides a

[7] SB 100, Statewide Planning Goals and Guidelines (OAR 660-011), Compliance procedures (ORS 197, and) Goal 11-Public Facilities and Services

[8] ORS 436 and 437 and OAR 690-086, 690-410, and 690-315 Water Rights - Oregon Water Resources Department (OWRD) Oregon Revised Statutes 436, 537 Oregon Administrative Rules 690-086, 690-410, 690-315

[9] 2007 OSSC – OAR 918-460, 2007 OMSC – OAR 918-440, 2005 OESC – OAR 918-305

[10] Oregon Legislative Assembly. 2007. House Bill 3543. An Act relating to climate change; appropriating money; and declaring an emergency. Salem, Oregon.

[11] City of Portland and Multnomah County. 2009. Climate Action Plan. Portland, Oregon. Available at http://www.portlandoregon.gov/bps/index.cfm?c=49989&a=268612. Accessed November 11, 2009.

[12] City of Portland. 2009. Portland City Council Resolution No. 36749. Adopt the joint City of Portland and Multnomah County Climate Action Plan to reduce local greenhouse gas emissions by 80 percent from 1990 levels by 2050.

comprehensive, integrated framework of technical information, resource strategies and implementing actions to meet the water supply needs of the Portland Metropolitan Area to the year 2050.

Metro Regional Framework Plan (2005) - METRO

In 1992, the region's voters adopted a Metro charter for Metro which gave Metro jurisdiction over matters of metropolitan concern and required the adoption of a Regional Framework Plan. The Regional Framework Plan unites all of Metro's adopted land use planning policies and requirements. The charter directs Metro to address the water sources and storage in the plan. The Regional Framework Plan, originally adopted in 1997, was amended in 2005, 2010 and 2011 and contains regional policies contained in the Regional Urban Growth Goals and Objectives (RUGGO), 2040 Growth Concept, Metropolitan Greenspaces Master Plan and Regional Transportation Plan to create a coordinated, integrated Regional Framework Plan.

The Metro 2040 Growth Concept provides a structure for the preferred form of regional growth and development in the Portland metropolitan region. The Water Bureau will need to provide the water infrastructure to meet demands associated with projected population densities.

Section 4.1 of the Regional Framework Plan acknowledges the Regional Water Supply Plan developed and adopted by the Regional Water Providers Consortium. It is the policy of Metro to:

- Promote and achieve regional water conservation and demand management goals as defined in the Regional Water Supply Plan;
- Promote the coordination between regional growth management programs and water supply planning;
- Promote the coordination between land use planning and achieving goals of the Regional Water Supply Plan and;
- Set benchmarks and evaluate achievement of the targets and goals established in the Regional Water Supply Plan in coordination with the region’s water providers.

Urban Growth Management Functional Plan - Title 6 (Metro Code Sections 3.07.610 - 3.07.650) - Centers, Corridors, Station Communities and Main Streets - METRO

The Urban Growth Management Functional Plan was adopted by the Metro Council and codified in Section 3.07 of the Metro Code. The purpose of this functional plan is to implement regional goals and objectives contained in the Regional Framework Plan.

The Regional Framework Plan identifies Centers, Corridors, Main Streets and Station Communities throughout the region and recognizes them as the principal centers of urban life in the region. Title 6 calls for actions and investments by cities and counties, complemented by regional investments, to enhance this role. The Portland Water Bureau is expected to complete infrastructure improvements as needed in order to support activities related to development of these urban environments.

Portland Watershed Management Plan

The Portland Watershed Management Plan (PWMP) is intended to guide City decisions and projects by providing a comprehensive approach to restoring watershed health. The Water Bureau collaborates with other City bureaus on projects like green streets, land acquisition, floodplain restoration and fish and wildlife habitat protection.

Goals & Policies

Draft Goals and Policies related to Water Facilities and services can be found in Chapter 5. Key Infrastructure Policies.

Water System Levels of Service

Levels of service establish a framework for characterizing system deficiencies, developing and evaluating alternative solutions, and selecting recommended improvements. The Portland Water Bureau's Strategic Plan includes the following service levels for water infrastructure:

- 100% compliance with state and federal water quality regulations.
- No more than 5% of customers out of water for more than 8 hours a year.
- No customer out of water more than 3 times per year.
- At least one working hydrant within 500 feet of service connection.
- Maintain minimum pressure of 20 pounds per square inch (psi) during normal demands.

The Bureau also maintains a variety of other customer service, financial health, infrastructure management, workforce, and sustainability service levels.

Investment Strategy

The Portland Water Bureau's Investment Strategy for the Citywide System Plan is divided into seven (7) primary programs: Supply, Transmission and Terminal Storage, Distribution, Treatment, Regulatory Compliance, Customer Service, and Administration & Support. The Water Bureau anticipates over $1.5 billion in new investment in these programs over the next twenty years, see Table 7.3. This chapter and Appendix A. Investment Strategy provides greater detail on anticipated water projects and investments.

Table 7.3 Investment Strategy Summary

Program	FY 2013-2018	FY 2018-33
Supply	$14,291,000	$88,500,000
Transmission and Terminal Storage	$191,170,000	$242,000,000
Distribution	$244,197,288	$461,650,000
Treatment	$2,500,000	$150,000,000
Regulatory Compliance	$25,504,000	$30,000,000
Customer Service	$3,057,000	$53,700,000
Support	$10,000,000	$50,500,000
TOTAL	**$490,719,288**	**$1,076,350,000**

Supply System[13]

The primary drinking water source for Portland is the Bull Run watershed, supplemented by a groundwater supply from the Columbia South Shore Well Field (CSSWF) and the wells in the former Powell Valley Road Water District. The Bull Run watershed is located east of Portland and just north of the western foothills of Mt. Hood; the CSSWF is south of the Columbia River and east of the Portland International Airport, see Figure 7.5. The former Powell Valley Road Water District is located in southeast Portland, near Powell Butte.

Since 1895, Portland has relied on the Bull Run watershed as its principal source of supply. Rainfall runoff and snowmelt from within the watershed are captured in the Bull Run storage system, which includes Bull Run Lake, and Reservoirs 1 and 2, all located on the Bull Run River. At Reservoir 2, water enters the Headworks, the origination point of the three conduits that convey water from the Bull Run system to Powell Butte Reservoir. Until 2015 and 2020 respectively, water from Powell Butte will be supplied to Mt. Tabor and Washington Park reservoirs. These reservoirs have served as terminal storage for the water supply transmission system, and as central points for distributing water into the retail water system. As these facilities are decommissioned, water from Powell Butte will follow one of three paths: to Kelly Butte, an enclosed underground storage facility; to other terminal storage-system reservoirs; or through large transmission mains to the distribution system and/or wholesale customers.

The federal Safe Drinking Water Act, which regulates public drinking water supplies, typically requires surface water supplies to be filtered to meet federal drinking water standards. Because the Bull Run source water quality is very high and Portland implements source water protection measures, Portland is currently exempt from filtration requirements. Portland's water supply is disinfected using chloramines. Water is chlorinated at the Headworks at Reservoir 2. Ammonia and caustic soda are added at a second treatment facility, Lusted Hill.

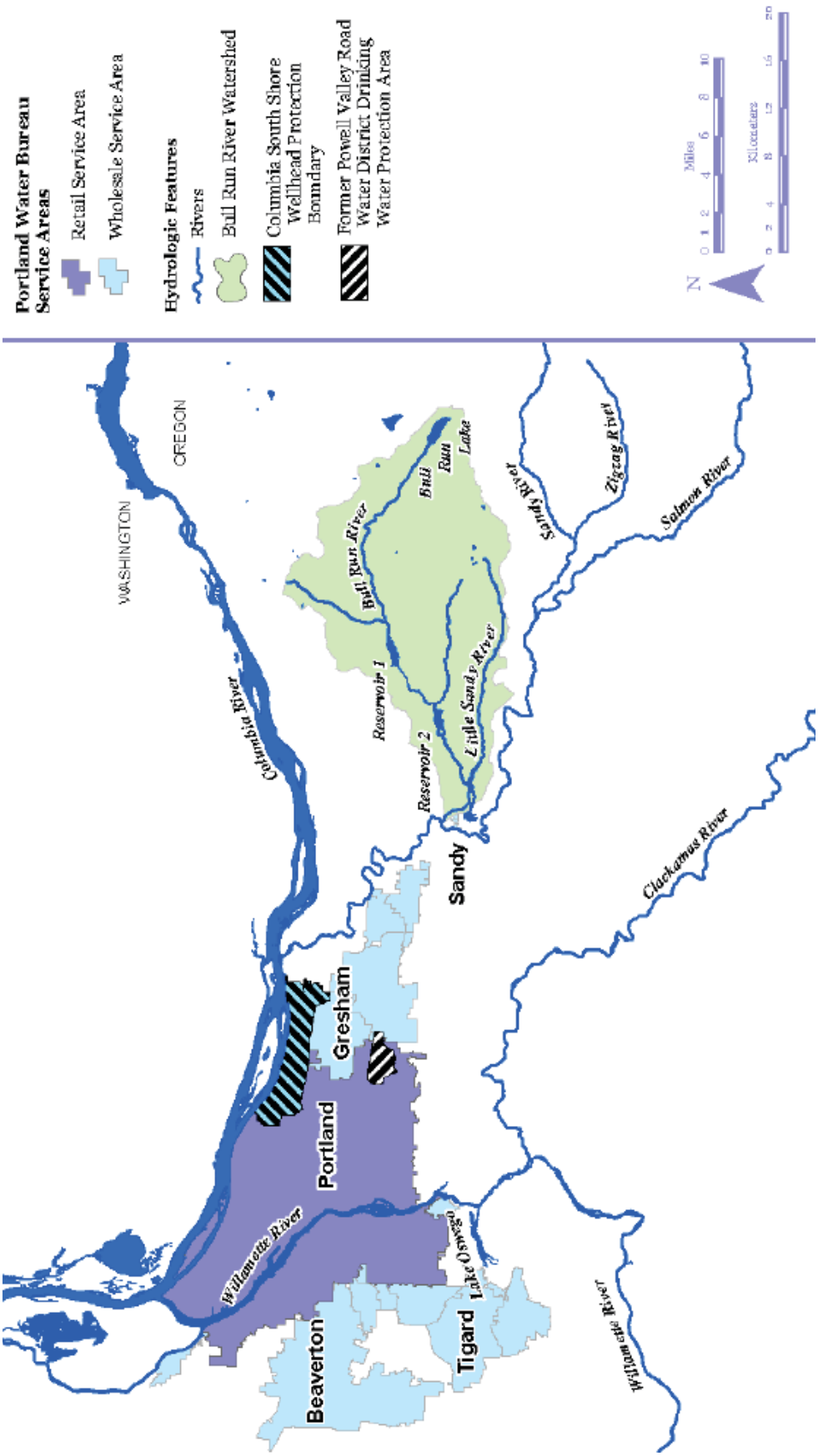
Since 1985, Portland has used groundwater from the Columbia River South Shore Well Field as an emergency seasonal supply and as a backup supply when winter storms cause high turbidity in the Bull Run watershed. The groundwater supply comes from three aquifers along the south shore of the Columbia River. The system includes 27 wells, one storage tank, a groundwater booster pump station, and a treatment facility. Portland also has access to wells previously owned by the Powell Valley Road Water District.

Wholesale Customers

The Water Bureau supplies water to its wholesale customers; the City of Portland does not typically receive water from any sources owned or operated by its wholesale customers. The City's water supply system is interconnected with other water suppliers including the City of Lake Oswego, the City of Milwaukie, and Clackamas River Water. Portland is able to receive water from these other sources on a limited basis in an emergency.

[13] Portland Water Bureau, Distribution System Master Plan and Portland Water Bureau, Water Management and Conservation Plan

Figure 7.5 Drinking Water Supply System Water Sources



Bull Run Watershed

Inventory

The water of the Bull Run River is primarily impounded in two reservoirs: Reservoir 1, completed in 1929, and Reservoir 2, completed in 1962. Periodically, the Water Bureau relies on storage capacity in Bull Run Lake, a natural lake that is upstream of the headwaters of the Bull Run River, to enhance the supply of the two reservoirs.

At the Headworks facility below Dam 2, the raw water is disinfected. The water then flows to the Lusted Hill facility for further treatment, and is fed by gravity to the terminal storage, transmission, and distribution systems. The Bull Run water system includes facilities for generating hydropower. The Portland Hydroelectric Project's hydropower facilities at Dams 1 and 2 generate electricity that the city sells to Portland General Electric (PGE).

The Water Bureau's facilities in the Bull Run Supply system are served by a network of 123 miles of roads and 11 bridges. In total, infrastructure assets in the Bull Run supply system have a 2013 replacement value of $782 million.

Current Condition

The vast majority of assets in the Bull Run watershed are in fair to good condition, see Table 7.2. Eight percent of assets are in poor condition; two percent are in very poor condition.

Adequacy and Reliability of Supply

The Bull Run watershed is the city's primary water source. The approximate median annual water yield from the Bull Run watershed (measured at Headworks) is 180 billion gallons. The median annual diversion for water supply is approximately 20 percent of the total median yield. The reservoirs in the Bull Run are recharged during the fall, winter, and spring when rainfall is abundant. During the dry summer months (starting in June or July), the reservoirs are drawn down. This drawdown period typically lasts until early October but can sometimes last until November or December. During this period, the water flowing out of the reservoirs exceeds the water flowing into the reservoirs from rainfall and tributary flow.

Water demand varies annually, driven primarily by weather. In warm, dry summers when demand is high, the yield from the Bull Run watershed is at its lowest. In cool wet summers, water demand is often lower and yield from the Bull Run tends to be higher.

The duration of the dry season is also important because it determines the time period during which the city will rely on the limited storage in the watershed's reservoirs. Long dry seasons increase the proportion of groundwater that the city uses to meet demand before fall rains return.

The two Bull Run reservoirs are relatively small in comparison to the amount of precipitation and stream discharge in the basin. The reservoirs are not large enough to provide a multi-year water supply. Refill each winter is necessary to ensure supply for the following summer.

Over the last 20 years, the city has examined a number of options for increasing water storage in the Bull Run system. In the future if necessary, the city will continue to explore these and other options, such as water efficiency and conservation, to meet long-term water supply needs.

Columbia South Shore Well Field

The Columbia South Shore Well Field (CSSWF) is the second-largest developed water source in the state (after the Bull Run Supply), and the largest developed groundwater source in the state. Located on the floodplain of the Columbia River northeast of downtown Portland, this 11-square-mile area spans the boundaries of three cities: Portland, Fairview, and Gresham. The wells in the well field provide water when the Bull Run supply is shut down due to emergency conditions such as turbidity events, landslides, fires, or other natural or human-caused disruptions. The groundwater system is also a supplemental supply to meet demands during the summer peak season as needed.

Inventory

As of 2013, there are 27 wells in the CSSWF.[14] These wells draw on three aquifers: the Sand and Gravel Aquifer (SGA); the Troutdale Sandstone Aquifer (TSA), and the Blue Lake Aquifer (BLA). The sum of the nominal instantaneous pumping capacity for all of these wells is approximately 103 to 118 million gallons a day (MGD), based on the maximum pumping rates of the individual wells. In use, the well field has an empirically determined initial 30-day operating capacity of approximately 90 MGD. A large pump station moves water to the city's Powell Butte Reservoir, where it is mixed with Bull Run water (unless the Bull Run supply is off-line).

Current Condition

The wells in the CSSWF are primarily in good or fair condition (53% and 41%, respectively). Collection mains are primarily in good to very good condition (85% and 13%, respectively). The treatment facility is in good condition and the pump station is in fair to good condition. Additional condition information can be found in Table 7.2.

Supplemental and Emergency Use of the CSSWF

According to the Seasonal Water Supply Augmentation and Contingency Plan—also referred to as the Summer Supply Plan (SSP), the CSSWF is used for supplemental and emergency supply under the following conditions:

- Supply Augmentation: Groundwater may be used to augment the Bull Run supply to meet demand during seasonal warm dry periods when the Bull Run water supply is not sufficient to meet the needs of the bureau's retail and wholesale customers; to maintain in-stream flows for fish habitat; or if water demand exceeds the conduit capacity long enough to deplete in-town storage below safe levels.[15]

[14] A map of the Columbia South Shore Well Field can be found in Figure 2-3 of the *Water Management and Conservation Plan*, 2010.
[15] Conduit capacity may be exceeded if demand is exceptionally high or if one or more of the conduits is out of service.

- Turbidity Event Augmentation: Groundwater may be needed to augment or replace the Bull Run surface supply to avoid violating state and federal drinking water standards for turbidity. Turbidity in the surface water supply is typically caused by storm events in the Bull Run watershed.
- Emergency Use: Groundwater may be needed during catastrophic events (in addition to turbidity events) that would cause a loss of part or all of the Bull Run surface water supply. Catastrophic events include, but are not limited to, severe or extended drought, fire in the watershed, flood, landslides, volcanic activity, earthquakes, and acts of vandalism or terrorism. Any of these events could cause significant water quality problems or result in damage to, or shutdown of, the conduits or other critical infrastructure used to transfer Bull Run water to the Bureau's in-town reservoirs. An example of a catastrophic event in the watershed was a landslide in 1995 that damaged two conduits. Groundwater was used for 27 days and provided an average of 25.4 MGD to the distribution system.[16]

Contamination and Remediation

The City of Portland has an extensive network of monitoring wells. The bureau tracks groundwater quality and changes in groundwater levels over time in multiple aquifers within the CSSWF. Data from city groundwater quality monitoring indicate that the deep confined aquifers Portland uses for drinking water are free of contamination within the capture zones of active wells.

Anthropogenic, or human-related, contamination was first discovered in shallow groundwater aquifers near the well field in the 1980s. Since the early 1990s, the city has worked closely with the Oregon Department of Environmental Quality (ODEQ) to expedite the discovery, assessment, and remediation of contaminant sources and plumes, and to keep the well field operational. Remediation technologies used to remove contaminants from soil and groundwater include pump-and-treat, soil vapor extraction, electro-resistive heating, air sparging, and chemical and biological treatment. Remediation in the CSSWF is nearly complete.

High concentrations of naturally-occurring manganese in two wells have limited the ability of the Water Bureau to utilize these wells. Manganese can cause water discoloration which can affect laundry businesses served by the Water Bureau. The Water Bureau avoids using the high-manganese wells unless no Bull Run supplies are available and the full capacity of the well field is needed.

Groundwater Protection Program

The Groundwater Protection Program, adopted in 2003 and updated in 2010, replaced existing programs in Portland and Fairview and initiated a program in Gresham. The Groundwater Protection Program requires businesses that use, store, or transport hazardous material above a certain threshold amount to implement best management practices to prevent chemical spills.

Regulated businesses in Portland are inspected every two years as part of their regular fire inspection to ensure the business is in compliance with the program requirements. In Gresham and Fairview,

[16] Although the average is 25.4 MGD, the actual amounts per day varied widely.

inspections are conducted by Gresham watershed management staff. The Water Bureau and its partners provide free technical assistance to businesses on compliance issues.

The Columbia South Shore Well Head Protection Area delineation was certified by the Oregon Health Authority Drinking Water Program in 2003. A certified wellhead protection area is considered a significant groundwater resource under Statewide Planning Goal 5 if the public water system served by the wellhead area has a service population greater than 10,000 and relies on groundwater as the primary or secondary source of drinking water. Local governments are required to develop a program to reduce the risk of groundwater contamination in such areas. In June 2008, the Department of Environmental Quality certified the Columbia South Shore Well Field Protection Program, which addresses Goal 5 requirements for protecting these groundwater resources.

Adequacy and Reliability of Supply

The Portland Water Bureau has not experienced any major supply deficiencies in the last 10 years. Supply capacity and reliability were both enhanced in the mid-1980s by the development of a high-quality secondary source of drinking water in the Columbia South Shore Well Field (CSSWF). The CSSWF can be used in the event of a supply shortage in the Bull Run watershed. In the past ten years, water from the CSSWF has been used to augment Bull Run supply due to turbidity, for summer supply augmentation, and for maintenance runs. As of December 31, 2012, the CSSWF has been used a total of 29 times—10 times for turbidity events in Bull Run, once for a landslide that took two of the three conduits out of service, 13 times for summer supply augmentation, and five times for maintenance reasons.

Current well field capacity is sufficient to meet short-term (less than 30-day) emergency needs during the non-peak-season. The current capacity of the well field system is not sufficient to meet demand during a full shutdown of the Bull Run system due to emergencies or catastrophic events for periods longer than 30 days. Groundwater availability may also be limited in the future due to increased withdrawal from the aquifer by full-time and growing municipal users in Oregon and Clark County, Washington.

The city has evaluated several options for maintaining and improving the adequacy and reliability of supplies from the Bull Run watershed and the CSSWF... The results of these studies indicate that developing supplies in the CSSWF is the most cost-effective option.

The Water Conservation and Management Plan (2010) anticipates the potential development of 53 MGD in the CSSWF by 2028 to meet the annual average water demand of the current retail and wholesale service areas.

Former Powell Valley Road Water District Wells

On July 1, 2005, the City of Portland annexed areas served by the Powell Valley Road Water District (PVRWD) in southeast Portland, northwest of Powell Butte. Residents of this former water district are now served by the Portland Water Bureau's retail system. Under an intergovernmental agreement, Portland assumed control of all of the district's assets, including six active wells.[17] The PVRWD assets included water rights and water infrastructure. The installed capacity of the Powell Valley wells can be as much as 8.6 MGD, however less than half of this capacity is currently available.[18] Several capital improvement projects are planned to repair various facilities and fully integrate the wells into the Water Bureau system. These projects may be completed in three to ten years.

The former Powell Valley Road Water District wells are in good condition, are productive, and do not have significant water quality issues. In the future, the Water Bureau intends to upgrade these facilities to allow connection of these wells to the main system through Powell Butte. This integration would allow the bureau to increase capacity if needed and to blend well water with water from the Bull Run watershed and/or CSSWF before it enters the distribution system. The Powell Valley Road Water District's wells had a state certified delineation and approved wellhead protection plan (July 1998) at the time of annexation. This protection plan is non-regulatory and relies on best management practices. The Portland Water Bureau reassessed the delineation with an updated methodology and received certification from OHA in October 2010. The protection plan needs to be updated and submitted for re-approval.

The state-approved WMCP includes the potential use of 7.36 MGD of the developed supply to meet future demands.

Current & Projected Demands

Table 7.4 summarizes existing and 2030 retail demands for the distribution system by service area. The 2005 average daily demand was 61.5 mgd.[19] The Distribution System Master Plan, finalized in 2007, estimated that the average daily retail distribution-system demand for 2030 is projected to increase to 70 mgd. Historically, per capita demand in the retail area has shown a steady downward trend since 1993. However, current demand forecasts project relatively steady total demand through 2015, with an upward trend thereafter based on population increase.

Regional population forecasts from Metro, the state-approved Water Management and Conservation Plan, finalized in 2010, estimate the average system-wide demand to be between 132 and 138 million gallons a day. According to the Water Management and Conservation Plan (2010) the average and peak demand for the total service area is anticipated to increase 21% between 2007 and 2030.

[17] A map of the former Powell Valley Road Water District can be found in Figure 2-4 of the *Water Management and Conservation Plan*, 2010.
[18] Additional information on these wells, including size, depth, and capacity can be found in Table 2-2 of the Portland Water Bureau's Water Management and Conservation Plan.
[19] A 2005 demand of 64 mgd was used in capacity evaluations, projected from 2002 demand data at the outset of the study.

Table 7.4 Existing and Projected Retail Water Demands[20]

Service Area	2005 - Daily Demand Avg (mgd)	2005 - Daily Demand Peak (mgd)	2030 – Daily Demand Avg (mgd)	2030 – Daily Demand Peak (mgd)	Service Area	2005 - Daily Demand Avg (mgd)	2005 - Daily Demand Peak (mgd)	2030 – Daily Demand Avg (mgd)	2030 – Daily Demand Peak (mgd)
Arlington Heights	0.7	1	0.9	1.3	Powell Butte Pump	0.02	0.03	0.03	0.05
Arnold	0.5	1	0.6	1.2	Powell Butte	0.2	0.4	0.4	0.7
Bertha	0.5	1.1	0.6	1.3	PV Pump	0.03	0.05	0.03	0.1
Broadway	0.2	0.4	0.3	0.5	PV Raymond	1	1.8	1.3	2.3
Burlingame	1.9	3.3	2.1	3.7	PV 415	2.9	5.1	3.6	6.5
Calvary	0.6	1	0.8	1.3	Rocky Butte Pump	0.02	0.03	0.02	0.04
Council Crest	0.3	0.8	0.4	1.1	Rocky Butte	0.2	0.3	0.2	0.4
Clatsop Pump	0.1	0.2	0.1	0.2	Rose Parkway	0.3	0.6	0.3	0.7
Clatsop	0.2	0.3	0.2	0.4	Saltzman	0.001	0.003	0.002	0.004
Denver	0.9	1.6	1	1.7	Sherwood Field	0.5	0.9	0.6	1.2
Greenleaf	1	1.6	2.1	3.5	Stephenson	0.4	0.7	0.4	0.7
Lexington	0.2	0.4	0.3	0.5	Stephenson Pump	0.1	0.1	0.1	2
Linnton/Whitwood	0.1	0.2	0.2	0.3	Tabor 302	10.6	15.6	12.7	18.7
Marquam	0.7	1.2	0.9	1.6	Tabor 4112	15.1	22.7	16.9	25.4
Mt Scott	0.2	0.4	0.3	0.5	Tabor 590	0.3	0.5	0.3	0.5
Nevada	0.1	0.2	0.1	0.2	Vermont	1.6	2.5	1.8	2.7
Parkrose	1.9	3.6	2	3.9	Vernon3	10	15.2	12.1	18.2
Penridge	0.04	0.1	0.1	0.2	Willalatin	0.1	0.3	0.3	0.8
Pittock	0.04	0.1	0.1	0.1	Washington Park 229	6.2	9.8	8.9	14
Portland Heights	0.6	1	0.8	1.3	Washington Park 299	3.7	5.8	5.2	8.2
Totals[4]	**64.2**	**102.6**	**79.2**	**126.6**					

1 Willamette Heights service area demands are included in Sherwood service area total.
2 The demands for Tabor 411 include Tabor 338.
3 The demands for Vernon include Vernon 224, Vernon 270 and Vernon 362.
4 The area served via Rockwood WD is not included in the total. The average daily demand for this area is estimated to be 0.3 mgd with a peak demand of 0.5 mgd. In the future the average daily demand will remain the same and the peak demand will rise to 0.6 mgd.

Wholesale Water Agreements

The Portland Water Bureau has wholesale water sales agreements with 20 water purveyors in the Portland, Oregon metropolitan area, including cities, water districts, and private water companies.

Portland can potentially sell water to a wholesale population of 450,000 and routinely provides wholesale service to over 375,000 people. Annual wholesale water sales account for 12 percent of annual water sales and about 40 percent of annual water demand. These agreements require the Portland Water Bureau to meet specific levels of service.

[20] Portland Water Bureau, Distribution System Master Plan, June 2007 (Table 2-4)

Table 7.5 Portland Water Bureau Wholesale Agreements[21]

5-Year Agreement	10-Year Agreement	20-Year Agreement
GNR Water Company	Pleasant Home Water District	Burlington Water District
Green Valley Water Company	Lake Grove Water District	City of Gresham
Hideaway Hills Water Company	City of Tigard	City of Sandy
Lorna Water Company	City of Tualatin	Lusted Water District
Skyview Acres Water Company	Tualatin Valley Water District	Palatine Hill Water District
Two Rivers Water Association		Raleigh Water District
		Rockwood Water PUD
		Valley View
		West Slope Water District

Needs & Approach

Bull Run Supply

Although the demand needs are not critical at this juncture, the City will, if it becomes necessary, explore options for increasing water storage in the Bull Run system in order to meet long-term water supply needs.

Groundwater Supply

Current well field capacity is sufficient to meet short-term (less than 30 days) emergency needs during the non-peak-season. The current capacity of the well field system is not sufficient to meet demand during a full shutdown of the Bull Run system due to emergencies or catastrophic events for periods longer than 30 days. Groundwater availability may also be limited in the future due to increased withdrawal from the aquifer by full-time and growing municipal users in Oregon and Clark County, Washington.

Asset Management Plans

Asset management plans are being developed for the Bull Run Supply and Groundwater Supply. These plans will help identify maintenance, repair and replacement strategies necessary to maintain and improve the water system.

Recommended Supply System Improvements

Bull Run Watershed

The function of this program is to allocate funds for the capital projects necessary to maintain, improve, and protect the watershed facilities that are not directly related to the water supply system facilities. This includes Bull Run watershed road reconstruction to ensure continuous, reliable, and safe access to all facilities, as well as maintenance of other city-owned infrastructure within the watershed.

The Dam 2 Tower Improvements Project provides for modification of the north tower inlet to allow selective-depth withdrawal from Bull Run Reservoir 2. The intent is to help regulate temperatures for flows

[21] Portland Water Bureau, 2014.

released to the lower Bull Run River to comply with Clean Water Act requirements and to improve water quality by providing flexibility during turbidity events. The anticipated completion date is 2014.

Dams and Headworks Repair and Rehabilitation

This program provides for assessment of the condition and rehabilitation of dams and facilities at Headworks. As many of these facilities are between 50 and 70 years old, their safe and reliable operation requires ongoing investment. The program includes preliminary engineering and design of needed repairs, rehabilitation of these facilities, and actual repair work.

Columbia South Shore Well Field

The Columbia South Shore Well Field (CSSWF) is Portland's alternative supply of water should the Bull Run watershed supply be interrupted for any reason. Projects funded in this program improve the maintenance of this aging infrastructure, including repairs, selective replacements and upgrades.

Groundwater Collection Main Hardening

Much of the piping connecting the wells to the Groundwater Pump Station is located in liquefiable soils which are vulnerable during a seismic event. This project would design and install measures to "harden" the piping and reduce this vulnerability.

Groundwater Electrical Improvements

This project designs and constructs a new 115kV/4160V transformer and other components to complete a double-ended electrical substation at the Groundwater Pump Station. It will also design and construct a 5kV main breaker replacement and purchase selected spare components.

Groundwater Pump Station (GWPS) Expansion

As water demand increases, the bureau will need to increase the available flows from the groundwater system. The system expansion will include upgrade of the Groundwater Pump Station to provide additional capacity.

Groundwater Well Field Expansion

As water demand increases, the bureau will need to increase the available flows from the groundwater system. The system expansion will include additional well development and collection mains in the Columbia South Shore area.

Groundwater Well Field Reliability Enhancements

The bureau is attempting to increase its flexibility and preparedness to meet the future challenge of an interruption of Bull Run water. The bureau is improving its emergency preparedness by evaluating electrical vulnerability for the pumping system, reviewing the flood inundation vulnerability of the site, and developing a groundwater intertie that would reduce transmission system vulnerability. The inundation review may be partially completed through a partnership with Multnomah County Drainage District.

Powell Valley Well Improvements

The project includes upgrade of the facilities in the previous Powell Valley Road Water District area and connection and integration of these facilities to the Portland Water Bureau's water system.

Transmission and Terminal Storage System

Inventory

Three large-diameter conduits carry the water from the Bull Run watershed to the Water Bureau's in-town storage and distribution system. The conduits have interconnections in three places to ensure reliability, should one or two conduits fail. The water flows downhill from an elevation of 735 feet above mean sea level (MSL) then through the Lusted Treatment facility to Portland's easternmost storage reservoir on Powell Butte, at 530 feet above MSL. Alternatively, groundwater can be pumped to Powell Butte from the Columbia South Shore Well Field through the Groundwater Pump Main when the Bull Run Supply is not available or limited. When water is supplied from both Bull Run and the Columbia South Shore Well Field, the water is blended at Powell Butte. See Figure 7.6 for a schematic diagram of the City's water system.

The Water Bureau maintains water storage, or reservoirs, to provide for daily fluctuation of water use, to fight fires, and to provide time to connect to emergency sources of supply when primary sources are unavailable. In 2012, the terminal storage in Portland's water system consists primarily of Powell Butte Reservoir 1, Mount Tabor Reservoirs 1, 5 and 6, and Washington Park Reservoirs 3 and 4. It also includes storage at Kelly Butte, Sam Jackson and Mayfair. After 2012, the terminal storage system will undergo changes in response to regulations. The system will be reconfigured so that water from Powell Butte will be directed along multiple paths: to Kelly Butte, an enclosed underground storage facility; to the terminal storage-system reservoirs, or through large transmission mains to the distribution system and/or wholesale customers.

Current Condition

The transmission system's 75 miles of conduits is primarily in fair to good condition, although an estimated 12% is in poor or very poor condition. More detailed condition assessments of the conduits are needed. The Washington County Supply Line and Groundwater Pump Main are primarily in good condition (91%), while the Mt. Tabor to Washington Park transmission mains are in fair to good condition.

Terminal storage located at Mount Tabor and Washington Park are classified as uncovered reservoirs, and therefore must be decommissioned or covered as part of the federal LT2 regulations. The Mount Tabor and Washington Park reservoirs are ranked in the condition assessment as poor. As a result of the LT2 regulations, plans are currently underway to build additional terminal storage at Powell Butte (Reservoir #2) and replacement storage at Kelly Butte to replace the function of the Mount Tabor Reservoirs. Design work to replace the uncovered reservoirs at Washington Park is under way.

Terminal storage at Sam Jackson and Mayfair is considered to be in fair condition.

Current Capacity

The conduits have a combined maximum capacity of approximately 212 MGD. The current average annual demand (retail plus wholesale) is approximately 100 MGD. Peak-day demand is approximately 170 MGD. At this time, transmission capacity is available to meet demands when all facilities are in operation. However, transmission system outages and vulnerability remains a concern.

Total storage capacity of the terminal storage reservoirs is currently approximately 195 million gallons (MG). This will be reduced to 148 MG through the elimination of the uncovered reservoirs and construction of new covered storage.

Projected Capacity

At the point in time that peak-day demands are projected to exceed the capacity of the three conduits, Conduit 5 will likely be required. Peak-day demands are not expected to exceed the capacity until near the end of the time period covered by this plan, or later.

Terminal storage capacity will be 148 MG for the time period covered in this plan.

Needs & Approach

The conduits are a critical part of the supply system and represent a significant financial investment for the Water Bureau. Gaining better information on the condition of the conduits and providing the necessary maintenance is therefore of great importance to the Bureau. This work has begun with the completion of a Conduits Asset Management Plan. Over the next few years, the City will need to invest to help improve knowledge of the condition of the conduits. The recently constructed Sandy River crossing reduced vulnerability and replaced conduit sections that were considered in poor condition. A new seismically hardened Willamette River crossing is also planned and included in the capital improvement plan.

Replacement of terminal storage reservoirs is expensive—significant funding is needed to complete the new storage within the time frames required by EPA.[22] Additional transmission main improvements will also be required as part of the reservoir replacement work. An asset management plan for terminal storage is currently being developed. This plan will help identify projects and replacement strategies necessary to maintain and improve the system.

An overall seismic evaluation of the Transmission and Terminal Storage system is recommended.

Recommended Transmission and Terminal Storage System Improvements

Conduits and Transmission Mains

The conduits that bring water to Portland from the Bull Run watershed are large pipes - 56 to 72 inches in diameter. This program funds repairs, replacements and upgrades to the conduits. In future years, the

[22] See the bureau's website on Uncovered Reservoirs, http://www.portlandoregon.gov/water/article/330807, for the most up-to-date information.

Portland Water Bureau plans to upgrade 4-5 miles of conduits each year at an estimated cost of $4-$5 million per mile.

Conduit 5

This project would include installation of sections of a new Conduit 5 as growth occurs and the condition of the existing conduits worsens.

Kelly Butte Reservoir

This project would increase storage capacity from 10MG to 25MG by replacing the existing tank with a buried reservoir. The project includes site access, construction access and easements, staging areas, and on-site storage areas. This project establishes Kelly Butte as a key facility that will be used for system pressure equalization and in-town terminal storage in lieu of the Mt. Tabor uncovered reservoirs.

New Conduit Intertie

This project would address concerns about the capability of the conduit system to withstand hazards and deliver an uninterruptible supply to the City. The project will connect the conduits through additional piping and valving to improve reliability of flow during emergency conditions and for maintenance by providing additional isolation and interconnectivity.

Powell Butte Reservoir 2

This LT2-related project is being constructed in two phases – Phase 1 is complete. The project is currently in Phase 2, the construction of a 50-million-gallon buried reservoir at Powell Butte. It includes a short section of Conduit 5, construction of a maintenance and storage facility, replacing the caretaker's house, construction of an interpretive center and restrooms, reservoir overflow facilities, park improvements and mitigation requirements (required in the 2003 Land Use Review Type III Conditional Use Master Plan).

Powell Butte Reservoir 3

This project constructs a third reservoir at Powell Butte and possible bypass piping around the Butte for additional system reliability.

Sandy River Conduit Relocation, Phase II

The bureau is committed to increasing the flexibility and preparedness to meet the future challenge of a natural disaster. Conduits 2, 3, and 4 were identified in the system vulnerability study as vulnerable to seismic, volcanic, flood, and other natural and human-caused hazards. This project will relocate the Sandy River crossings of Conduit 3. The replacement of crossings of Conduit 2 and 4 have already been completed.

Sandy Wholesale Connection

The project consists of the design and construction of a wholesale meter connection for the City of Sandy to the Portland Water Bureau's supply and is anticipated to be completed early 2014.

Tabor Reservoir Adjustments

This project includes adjustments to piping, structures and other features at Mt. Tabor in order to move storage elsewhere and physically disconnect the uncovered reservoirs from the public water system for compliance with LT2. The project does not include disposition of the reservoirs after they have been disconnected from the public water system.

Washington Park Reservoir 3

The project will plan, design and construct a new buried reservoir to replace uncovered Reservoir 3. This project is one solution toward compliance with LT2 replacement of the uncovered reservoirs. It is assumed that Reservoir 4 will be used as the overflow detention structure. The covered Reservoir 3 will likely retain its visual characteristics and historical features.

West Side Transmission Main Improvements

These mains include the Sam Jackson to Downtown Pipeline and the Jefferson Street Supply mains. These new large transmission mains will strengthen the supply to terminal storage located on the west side of the Willamette River.

Wholesale Connections

This project provides for facilities serving wholesale customers including repairs, replacements, and upgrades of pump stations and meters.

Distribution System

The retail distribution system within the City of Portland comprises approximately 2,200 miles of mains connected to 67 active storage tanks and reservoirs and 39 pump stations, located in 42 service areas. The distribution system configuration has evolved over the past 100+ years in response to changing requirements and regulation. Many parts of the system originated as small, independent water districts that have been incorporated into the Portland Water Bureau's system over the years. Table 7.6 lists the retail distribution service areas and the number of service connections (according to Water Bureau maps as of August 2006). The distribution systems for wholesale water customers are owned and managed by other water service providers and are not included in this report.

Table 7.6 Service Connections by Service Area

Service Area	# of Connections	Service Area	# of Connections
Arlington Heights	825	Powell Butte Pump	50
Arnold	1,548	Powell Valley Road 415	3,782
Bertha	1,730	Powell Valley Road Pump	15
Broadway	604	Powell Valley Road Raymond	2,000
Burlingame	7,816	Rocky Butte	892
Calvary	643	Rocky Butte Pump	46
Clatsop	438	Rose Parkway	766
Clatsop Pump	277	Saltzman	8
Council Crest	1,334	Sherwood	679
Denver	225	Stephenson	1,383
Greenleaf	2,414	Stephenson Pump	379
Lexington	526	Tabor 302	32,362
Linnton/Whitwood	192	Tabor 411	59,070
Marquam	170	Tabor 590	888
Mt Scott	699	Vermont	3,650
Nevada	144	Vernon 224 & 270	15,932
Parkrose	4,167	Vernon 362	18,545
Penridge	37	Washington Park 229	5,223
Pittock	78	Washington Park 299	4,297
Portland Heights	1,323	Willalatin	213
Powell Butte	431	Willamette Heights	292
Total Service Connections	**176,093**		

Figure 7.2 presents a map showing the locations of service areas. Figure 7.6 is a schematic of the City's system, showing key Bull Run and CSSWF supply and transmission facilities, and key distribution system pipelines, pump stations and storage tanks.

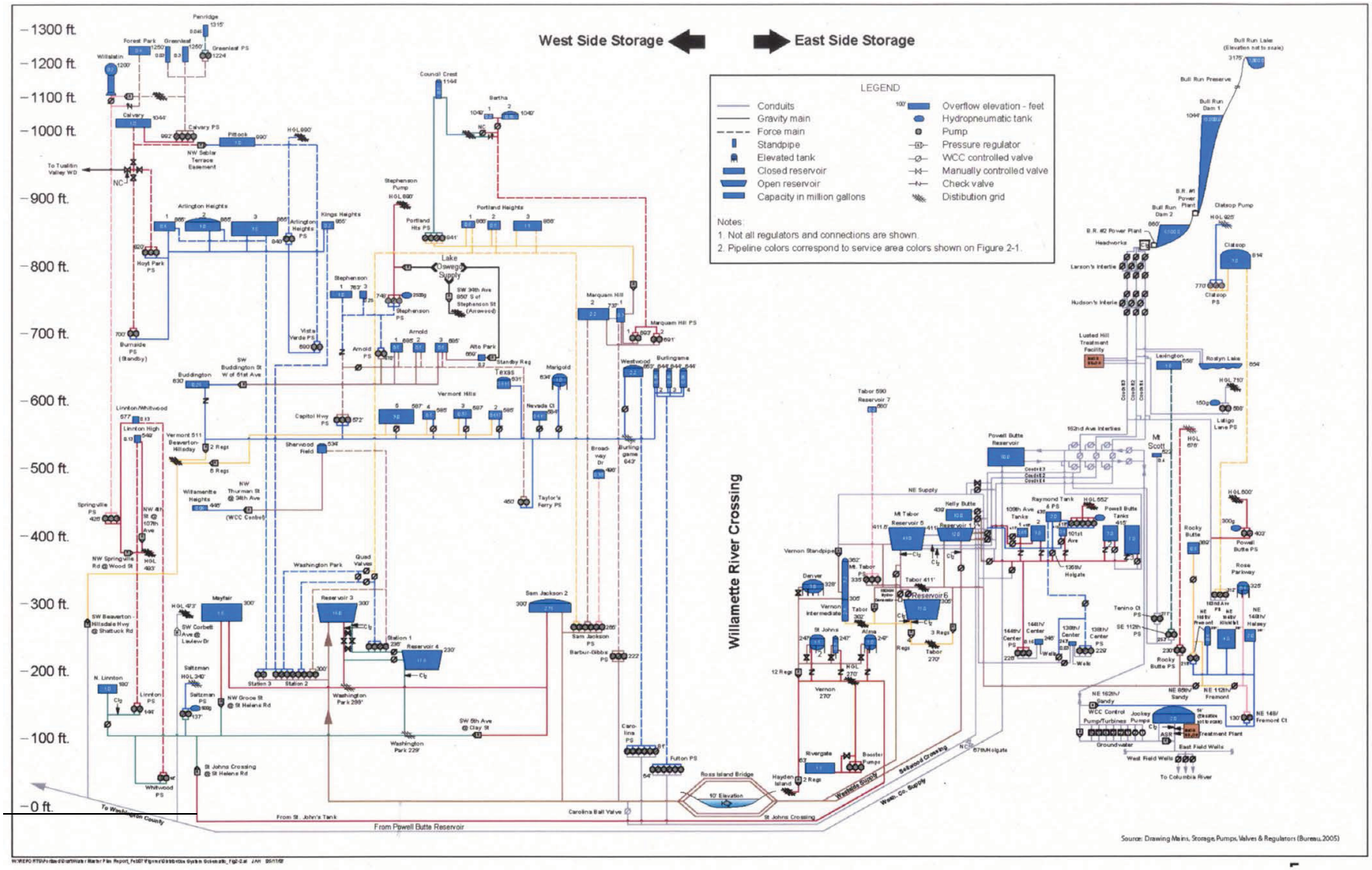
Service areas east of the Willamette River are shown on the right side of Figure 7.6. Most of the areas east of the Willamette are supplied by gravity (without pumping) from Powell Butte and the Mount Tabor Reservoirs, which are fed from the supply and transmission system. Exceptions are small areas in southeast Portland, in and around Powell Butte, the Tabor 590 Service Area, which is located on Mount Tabor, and some areas of northeast Portland, shown on the far right-hand side of the schematic.

Service areas west of the Willamette River are shown schematically on the left side of Figure 7.6. Higher elevation service areas west of the Willamette are served from several key pump stations (Carolina, Fulton, Sam Jackson, and Washington Park) that draw from major transmission lines that currently run from the Mt. Tabor Reservoir complex to the Washington Park Reservoirs.

Inventory

Portland's retail water distribution system is composed of vast networks of distribution mains, service lines, pump stations, and tanks, as well as hydrants, meters, valves, and fountains.

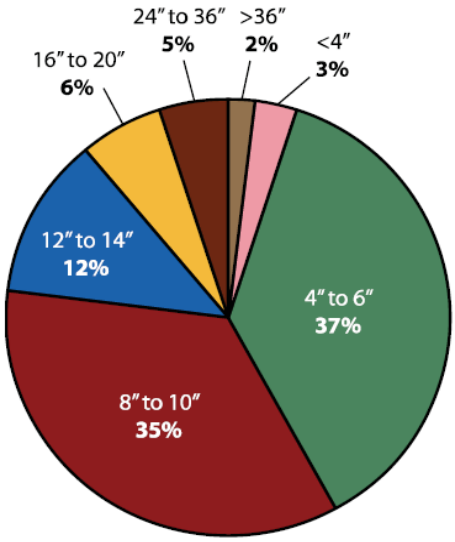
Figure 7.6 City of Portland Water Supply Schematic[23]



Mains

Portland's retail distribution system comprises approximately 2,100 miles of pipeline. Figure 7.7 summarizes pipeline diameters in the distribution system. Distribution piping includes a number of materials, including unlined and lined cast iron (65%), ductile iron (29%), steel (2%), and a small percentage of other materials. The City's distribution mains have a combined replacement value of over $2.2 billion.

Figure 7.7 Pipeline Diameters in the Distribution System[24]



Service Lines

The retail distribution system also includes over 183,000 service lines. The vast majority of these lines (94%) are smaller than 2" in diameter, although larger lines do exist in some areas. The network of service lines has a replacement value of $899 million.

Tanks

The retail water system is served by 67 active storage tanks with a total storage capacity of approximately 270 million gallons. Table 7.7 lists the tank, its service area, capacity information, and whether the condition of the tank was assessed in 2006 as a part of the Distribution System Master Plan. Portland's storage tanks have a replacement value of $266 million.

Pump Stations

The distribution system includes 35 pump stations, valued at $118 million. Table 7.7 lists the capacity of each pump station, and whether a condition assessment was performed in 2006 as a part of the Distribution System Master Plan.

[24] Portland Water Bureau, Distribution System Master Plan, 2007

Meters

The Portland Water Bureau has nearly 180,000 meters worth approximately $88 million. Small meters are replaced every 30 years while large meters are tested and replaced based on condition and criticality.

Valves

The water distribution system contains approximately 43,800 system valves, with a replacement value of $604 million.

Hydrants

The distribution system includes about 14,400 hydrants, with a combined replacement value of $184 million.

Table 7.7 Distribution System Service Areas, Storage Reservoirs and Pump Stations[25]

Service Area and # of Connections		Reservoirs/ Tanks	Capacity (mg)	Pump Stations	Capacity (mg)
Arlington Heights	825	Arlington 1	0.5	Arlington Heights	NA
		Arlington 2	1	Sam Jackson	1700
		Arlington 3	3	Wash. Park 1	3200
		Kings Heights	0.2	Wash. Park 2	7500
				Wash. Park 3	1300
Arnold	1,548	Alto Park	0.2	Capitol Hwy	2500
		Arnold 1	0.5	Taylors Ferry	2000
		Arnold 2	0.5		
		Arnold 3	0.6		
Bertha	1,730	Bertha 1	0.2	Marquam Hill 1 & 2	2410
		Bertha 2	0.9		
Broadway	604	Broadway Drive	0.4	Sam Jackson	800
Burlingame	7,816	Buddington	0.3	Carolina	10800
		Burlingame 2	1.6	Fulton	6400
		Burlingame 3	0.4		
		Burlingame 4	0.9		
		Marigold	1		
		Texas	0.7		
		Westwood	1		
Calvary	643	Calvary	1	Burnside	470
				Hoyt Park	2800
Clatsop	438	Clatsop	3	162nd Avenue	880
Clatsop Pump	277			Clatsop	775
Council Crest	1,334	Council Crest	0.5	Portland Heights	4300
Denver	225	Denver	3		
Greenleaf	2,414	Forest Park	0.5		
		Greenleaf 1	0.03	Calvary	1900
		Greenleaf 2	0.3		
Lexington	526	Lexington	1	112th Avenue	1100
Linwit	192	Whitwood	0.1	Linnton	130
				Whitwood	640
Marquam	170	Marquam Hill 1	0.3	Barbur Gibbs	1300
		Marquam Hill 2	2.3	Sam Jackson	2100
Mt. Scott	699	Mt. Scott	0.4	Tenino Ct.	320
Nevada	144	Nevada Ct	0.6		
Parkrose	4,167	104th/Klickitat	4		
		148th/Halsey	2		
Penridge	37	Penridge	0.1	Greenleaf	130
Pittock	78	Pittock	1	Verde Vista	1000
Portland Heights	1,323	Portland Heights 1	0.6		
		Portland Heights 2	0.5		
		Portland Heights 3	1.9		
Powell Butte	431	Powell Butte N/S	50	1st & Kane	N.A.

[25] *Portland Water Bureau, Water Management and Conservation Plan, 2010 (Tables 2-21 and 2-22)*

PB Pump	50			PB Heights	1480
Powell Valley Road 415	3,782	101st Ave	0.5		
		109th Ave 1	3		
		109th Ave 2	0.7		
		160th Ave 1	7		
		160th Ave 2	3		
		PV 144th/Center	0.2		
PV Rd Pump	15			PV Raymond St	440
PV Road Raymond	2,000	PV 138th/Center	0	PV 138th / Center	1100
		Raymond	2		
Rocky Butte	892	Rocky Butte	0.5		
RB Pump	46			Rocky Butte	200
Rose Pkwy	766	Rose Parkway	0.5		
Saltzman	8			Saltzman	75
Sherwood	679	Sherwood	0.4	Washington Park 2	1400
Stephenson	1,383	Stephenson 1	1.3	Arnold	1000
		Stephenson 3	0.3		
Steph. Pump	379			Stephenson	500
Tabor 302	32,362	Mt. Tabor 6	37.8		
		Vernon 2	2.5		
Tabor 4113	59,070	Kelly Butte	10		
		Mt. Tabor 1	12		
		Mt. Tabor 5	49		
Tabor 590	888	Mt. Tabor 7	0.2	Mt. Tabor	1200
Vermont	3,650	Vermont Hills 2	0.6		
		Vermont Hills 3	0.9		
		Vermont Hills 4	0.5		
		Vermont Hills 5	2.8		
Vernon 224 & 270	15,932	Alma	1		
		St Johns 2	1.5		
Vernon 362	18,545	Vernon 3	3.2		
Washington Park 229	5,223	North Linnton	1		
		Washington Park 3	16		
		Washington Park 4	17.6		
Washington Park 299	4,297	Sam Jackson 2	2.8		
		Mayfair	5.6		
Willalatin	213	Willalatin	0.2	Springville	630
Willamette Heights	292	Willamette Heights	0.1		

Current Condition

In general, the majority of the Water Bureau's distribution system asset groups are in fair to very good condition. However, almost half of the bureau's galvanized steel distribution mains (45%) are in poor to very poor condition, as are over one-fifth of the meters (23%), and hydrants (20%), by value. Half of the 2,200 miles of distribution mains are older than 50 years. More information on the condition of major asset groups can be found in Table 7.2. The Water Bureau evaluates asset condition as one factor in asset management decisions.

Service Area Assessment

In 2007, the Portland Water Bureau completed a series of hydraulic evaluations of the "backbone" distribution system, or the essential distribution-system components. The purpose of the evaluation was to assess the ability of the system to meet demands under both existing (i.e., 2005) peak-day conditions and 2030 peak-day conditions.[26] The evaluation found that the system that will reliably deliver water through 2030. Of the 42 service areas evaluated representing the retail system, 20 service areas, accounting for 86 percent of the 2030 peak-day demand, have no deficiencies.

Table 7.8 summarizes the results of the preliminary screening. Of the remaining 22 service areas, accounting for 14% of 2030 peak day demand:

- Six service areas (Clatsop Pump, Powell Butte Pump, PV Raymond Pump, Rocky Butte Pump, Saltzman Pump, Stephenson Pump) are direct-pump service areas with no storage. Deficiencies are based on providing sufficient capacity to meet fire flows. In some instances, pump stations were designed for lower fire-flow requirements, in place at the time of pump station design. In other instances, the Bureau has designed pumps to meet fire-flow requirements with all units in service. If all units are used in the screening, three (3) service areas show no deficiencies (Powell Butte Pump, PV Raymond Pump, Stephenson Pump).
- Eight service areas have recognized deficiencies and are being evaluated by the Bureau in other studies. These are: Calvary, Council Crest, Greenleaf, Linnton/Whitwood, Penridge, PV Raymond, Willalatin, and Willamette Heights.
- Five service areas were flagged for further assessment in the hydraulic evaluation. These are: Broadway; Mt Scott; Sherwood; Stephenson; and, Tabor 590. Although the preliminary screening did not identify deficiencies in the Burlingame service area for the planning scenarios evaluated, the Bureau has recently completed a Master Plan for the service area that includes several capital projects to remedy previously identified deficiencies.
- The remaining three service areas have mitigating circumstances that relieve some of their identified deficiencies. The Lexington service area was deemed deficient in the outage screening, but the Bureau has purchased a generator to supply the service area in a power outage situation. However, the generator would not address a service outage of the pump main, so the service area was still deemed deficient. The second, Bertha, was deficient for both storage and outage. However, the service area has additional regulated supply from other service areas. The third, the Vernon 362 service area, has a large number of regulators that supply the zone, which addresses the storage deficiencies.

[26] More information can be found in the Portland Water Bureau's Distribution System Master Plan, 2007. Options to integrate the former Powell Valley Road 415 service area with the Tabor 411 service area, and supply capacity through Washington Park were also assessed in this plan.

Table 7.8 Results of 2007 Preliminary Screening of Service Areas[27]

Service Areas that Passed Preliminary Screening for Pumping, Fire, Storage and Outage Service Goals; or Are Being Addressed in Other Studies*

Arlington/Portland Heights **	Arnold	Burlingame
Clatsop	Denver	Marquam Hill
Nevada	Parkrose	Pittock
Powell Butte	PVRWD 415	Rocky Butte Tank
Rose Parkway	Tabor 302	Tabor 411
Vermont	Vernon 270	Washington Park 229
Washington Park 299		

Service Areas that were Deficient for One of More Screening Service Goals

Service Area	Pumping	Fire	Storage	Outage	Notes
Bertha	✓	✓	X	X	Additional regulated supply available
Broadway	X	X	X	X	Additional regulated supply available
Calvary	X	X	X	N/A	Being evaluated in NW Hills study
Clatsop Pump	X	X	N/A	X	
Council Crest	✓	✓	X	X	Being evaluated by Bureau
Greenleaf	✓	✓	X	X	Being evaluated in NW Hills study
Lexington	✓	✓	✓	X	The Bureau has purchased a generator with an automatic transfer switch for 112th St Pump Station. The generator would not address outages due to a pump main break
Linnton / Whitwood	X	X	X	X	In Upper Linnton Tank Analysis
Mt. Scott	X	X	X	X	Additional regulated supply available
Penridge	X	X	X	✓	Being evaluated in NW Hills study
Powell Butte Pump	X	X	N/A	✓	Not deficient if all pumps used
PV Raymond Pump	X	X	N/A	✓	Not deficient if all pumps used
PV Raymond	X	X	X	X	Being evaluated by Bureau
Rocky Butte Pump	X	X	N/A	✓	
Saltzman	X	X	N/A	✓	
Sherwood	X	X	X	X	Additional regulated supply available
Stephenson	X	X	X	✓	
Stephenson Pump	X	X	N/A	✓	Not deficient if all pumps used
Tabor 590	✓	X	X	X	
Vernon 362	N/A	X	X	N/A	Large regulated supplies available
Willalatin	X	X	X	X	Being evaluated in NW Hills study
Willamette Heights	N/A	X	X	X	Being evaluated in Willamette Heights Tank study

* Passed all screening criteria (Arnold, Clatsop, Denver, Marquam Hill, Nevada, Rocky Butte Tank, Vermont), were only deficient in storage screening (Parkrose, Rose Parkway), or passed pumping, storage, and fire screening goals, but were not screened for outages, since these are being addressed by other studies, or are large service areas with adequate redundancy (Arlington/Portland Heights, Burlingame, Powell Butte, PVRWD 415, Tabor 302, Tabor 411, Washington Park 229, Washington Park 299).

** Arlington Heights and Portland Heights service areas are hydraulically interconnected and were evaluated together.

N/A = Not applicable, or not evaluated in DSMP ✓ = Passed screening X = Failed screening

[27] Portland Water Bureau, *Distribution System Master Plan*, 2007

Backbone Hydraulic Evaluation

The backbone evaluation assessed system operation, taking into account system hydraulics, to find further deficiencies not evident in the preliminary screening. The model simulated a 24-hour period on the peak-demand day for 2005 and 2030 demand conditions. Results of the hydraulic evaluation were consistent with the preliminary screening. No additional deficiencies were identified.

Three service areas, however, that had deficiencies in the screening evaluation showed no deficiencies in the hydraulic evaluation. All three (Broadway, Sherwood Field, and Stephenson) have adequate pumping capacity to meet normal demand, but insufficient capacity to meet peak-day demand plus re-fill of storage following a fire within the service area.

Assessment of Pump Stations and Tanks[28]

Condition assessments have been conducted for 35 pump stations and 66 tanks in the distribution system. The pump station assessment found that, in general, the pump stations originally constructed by the Bureau were in good condition. With the exception of the recently acquired Powell Valley system pump stations, pump stations acquired from other formerly independent water systems had more deficiencies.

- 15 pump stations are in good condition with only minor corrective maintenance needed;
- 20 pump stations are operationally and functionally sound, but exhibiting some signs of wear, with some need for corrective action;
- Deficiencies were identified in the Fulton, Linnton, Portland Heights, Sam Jackson, and Taylors Ferry service areas.
- Of the 66 tanks assessed, 4 tanks are in conditions that substantially diminish performance; 55 tanks are operationally and functionally sound, but exhibiting some signs of wear, with some need for corrective action; and 7 tanks are in good condition with only minor corrective maintenance needed.

The tank assessments found that coating and painting for tanks has not been performed routinely in recent years. A strategic coating and painting program was recommended. The analysis also found seven tanks that require further evaluation to address extensive cracks observed during inspections. Fifty-two tanks also had minor repair or maintenance recommendations, and several tanks require anchoring and/or flexible piping connections to reinforce tanks to withstand an earthquake. All work will be performed as part of ongoing capital and maintenance programs.

Seismic Assessment

As part of the Distribution System Master Plan (2007) a qualitative seismic assessment was provided for 32 tanks to identify conceptual-level seismic improvements. The analysis used condition information collected in the tank inspections, along with probabilistic ground-motion data from U.S. Geological Survey, to assess which tanks would be most vulnerable in a large-scale earthquake in the Portland area

[28] Portland Water Bureau, *Distribution System Master Plan*, 2007

(100- year to 500-year frequency). For tanks identified to be the highest risk, conceptual-level improvements were identified to reinforce the tanks.

Needs & Approach

Backbone Hydraulic Evaluation

In selecting improvements, service areas were reviewed to identify water supply issues including service pressures, fire flow requirements, water quality goals and sizing for new facilities.

For direct-pumped service areas, the improvements were developed based on a criterion of meeting peak-hour demands plus fire flow with one pumping unit out of service, rather than peak-day plus fire flow, since direct-pumped areas have no storage and pumps and must be able to meet both normal and fire demands. In some instances, the bureau has designed pump stations to meet fire flows with all units in service. In the Powell Butte Pump, Powell Valley Road Water District Pump and Stephenson Pump service areas, pump stations can provide adequate fire flow if all units are used. The bureau will need to determine whether these pump stations - built to then-current standards - should be upgraded based on the Distribution System Master Plan criteria of meeting peak-hour demands plus fire flows with one unit out of service.

Condition Assessment of Pump Stations and Tanks[29]

All of the pump station projects generated from the pump station condition assessment will be constructed as part of ongoing capital and maintenance programs, or as part of larger planned pump station rehabilitation projects.

Asset Management Plans

Asset management plans are being developed for all assets within the distribution system. These plans will help identify additional projects and replacement strategies necessary to maintain and improve the system. These plans may identify additional projects to be included in the 20-year Project List.

Recommended Distribution System Improvements

Burnside Pump Station Replacement

This project will decommission the old undersized pump station and modify the nearby Verde Vista pump station to serve the Burnside pumping needs for the next 50 years. The project will also acquire property for the future Burnside pump station to be built 50 years from now.

Carolina Pump Main Extension

This project will connect the existing Carolina Pump Main (Westwood Tanks) and the Fulton Pump Main (Burlingame Tanks) together. This will be a pump main from the intersection of SW Capital Hwy and SW Terwilliger Blvd to the Burlingame Tank site. Phase 1 is replacing the existing 16" Fulton pump main with

[29] Portland Water Bureau, *Distribution System Master Plan*, 2007

a 24" pump main from Burlingame Tank site to SW Chestnut and SW Burlingame as well as improvements at the Burlingame Tank site. Phase 2 is the new construction of a 24" pump main from SW Chestnut and SW Burlingame Ave to tie into the existing Carolina Pump main at Capitol Hwy and Terwilliger Boulevard.

Control Center SCADA Server Replacement

This project replaces the aging supervisory control and data acquisition (SCADA) system at the Water Control Center with a secure, Windows based system. The bureau will add, as part of the upgrade, a disaster recovery SCADA system to our Lusted Treatment site. The new system will have better system functionality, improved integration tools, management tools and security and will provide the Water Bureau with critical water supply monitoring and control for 10 years plus. The system includes hot standby real-time and historical servers, client workstations at various facilities, a decision-support server, and a terminal server for remote access.

Distribution Mains

This program includes rehabilitation and replacement of mains with high leakage or break rates, substandard mains (2-inch galvanized steel), expansion due to applications from private developers, increasing supply for fire protection, improving water quality and water system upgrades due to local improvement districts (LIDs), and street improvements. Water main replacements also include appurtenances such as fire hydrants, valves, pressure regulators, service branches, and other facilities.

Field Support

This project funds vehicles and major equipment purchases, including heavy construction equipment such as dump trucks and backhoes, and Bureau-owned computer software with a unit cost greater than $5000.

Forest Park Low Tank

This project will plan, design and construct a single 1.3 million gallon tank at NW Cornell and NW Skyline Drive for the Greenleaf 1034 pressure zone. This storage is to augment regular system capacity and increase fire flow to a large area of Northwest Portland.

Fulton Pump Station Improvements

This project will replace the Fulton Pump Station with a new pump station located in Willamette Park.

Greenleaf Pump Station

This project will plan, design and construct a replacement Greenleaf pump station at the existing site. Flow upgrades will remove the Penridge tank from the system. The new pump station will pump directly to the distribution system.

Hydrants

The bureau maintains about 16,000 fire hydrants. These hydrants allow Portland the flexibility and preparedness to respond to a fire emergency through coordination with the Fire Bureau. This project provides for the replacement of fire hydrants that are no longer repairable. Replacements may also occur as part of the bureau's ongoing efforts to standardize hydrant types for more efficient and effective management of maintenance and repair activities.

Meters

This project funds the purchase and installation of water meters. The Bureau's objective is increase accuracy based on replacing high usage meters. High usage meters typically wear out faster than others.

Portland Heights Pump Main

This project will replace the portion of the 12" pump main in SW Montgomery Drive between the southern end of the 16" pump main from Washington Park and the Portland Heights Tank site with approximately 3,500 feet of 16" main in Montgomery Drive and Greenway Avenue. The new main will replace a poor condition main and provide additional supply capacity to the area.

Portland Heights Pump Station Electrical Improvements

The project will design and construct a new prefabricated building at the Portland Heights Pump Station to house electrical and control equipment, and also install in the existing pump vault a new 100hp pump and vault improvements.

Portland to Milwaukie Light Rail

This project consists of relocation of over 5,000 feet of main impacted by TriMet's SE Corridor Light Rail project.

Pump Stations and Tanks

This project includes a large variety of infrastructure consisting of water storage tanks, pumps, and pump and control facilities. The bureau uses a reliability centered maintenance (RCM) approach to manage its assets. A key focus of the next twenty years will be to replace the remote telemetry units at over 140 remote sites. The existing units are over 15 years old, and are becoming obsolete. The servers are at the end of their service cycle, and must also be replaced.

Sam Jackson Pump Station and Mains

This project will make multiple capital improvements to the Sam Jackson Pump Station, including seismic improvements, replacement of RTU and motor controllers, installation of pump control and check valves, extension of the crane rail, a concrete pad, and installation of a security fence and gate.

Services

This project constructs replacement and customer requested water services. A water service is the connection between the water main and any given customer's service meter. Service connections are always performed by Water Bureau crews directed by a certified Water Service Mechanic. An ongoing budget of approximately $5 million per fiscal year provides for installation of about 1,000 water service connections annually and other upgrades to existing water services.

Willamette River Crossings

The project replaces major pipelines to strengthen the transmission link between Powell Butte and the service areas west of the Willamette River, including downtown and the storage reservoirs at Washington Park. It includes construction of a new seismically strengthened river crossing to replace the first one of potentially two Willamette River crossings, and new transmission piping on both sides of the Willamette.

Treatment System

Inventory

The Federal Safe Drinking Water Act, which regulates public drinking water supplies, typically requires surface water supplies to be filtered to meet federal drinking water standards. Because the Bull Run source water quality is very high and Portland implements source water protection measures, Portland is currently exempted from filtration requirements. Portland’s water supply is disinfected using chloramines. Water is chlorinated at the Headworks at Reservoir 2. Ammonia and sodium hydroxide are added at a second treatment facility, Lusted Hill.

Ammonia ensures that disinfection remains adequate throughout the distribution system. Sodium hydroxide increases the pH of the water helping to control lead and copper levels at customers' taps should these metals be present in the customers' home plumbing.

Future federal regulations may require additional treatment processes in the future.

Treatment is also required for the groundwater supply.

Facilities used to provide water treatment include a chlorination building and equipment, and flow metering at Headworks; treatment facilities and equipment at Lusted Hill; and treatment facilities and equipment at the Groundwater Pump Station.

Current and Projected Condition

Headworks treatment facilities are rated as good to fair. The flow meters are rated as poor.

The Lusted Treatment Facility was constructed in 1992. Condition is assessed at good to fair. However, buildings at this site were built as temporary structures and do not reflect the full cost of replacing the facility with permanent buildings. Future facility upgrades will include permanent structure replacements.

The treatment facilities at the Groundwater Pump Station were recently upgraded and are rated in very good to good condition.

Current and Projected Capacity

Due to changing regulations, the suitability of a treatment facility is a moving target. As federal and state rules are modified and as technology changes, treatment facilities must change as well.

With the State granting the Bureau a variance on the treatment provisions of the LT2 rule, many related facility improvements planned at Headworks were postponed as well. Among these improvements were replacement of the chlorination system and the operators' station. Both of these will need significant upgrades within the next 20 years.

Needs & Approach

Asset management plans are being developed for the Bull Run Supply and Groundwater. These plans should help identify needed improvements.

Recommended Treatment System Improvements

Headworks Flow Meters

This project would install new flow meters on the Primary Intake conduits; install new flow meters and flow control valves on Screen house #3 conduits; and address the sump pump drainage system in Bailey pressure-reducing valve vault.

Treatment Facilities Improvements

This project includes several related projects for treatment facilities for the Bull Run water supply, at both the Bull Run Headworks and the Lusted Hill Facility. Specific treatment improvements have not been determined at this time. Projects would likely be driven by state and federal regulations.

Support System

Inventory

The Support system includes miscellaneous facilities and equipment necessary to support the Water Bureau's mission. Support system assets are shown in Table 7.2. Chief among these assets are the Interstate Facility, and Sandy River Station.

Funding for Support system projects often resides in budget programs other than "Support". The Interstate Rehabilitation Project is currently funded through the Distribution program in the CIP.

Current and Projected Condition

The Interstate Maintenance Building is more than 85 years old. Studies have indicated that this building is highly vulnerable to collapse during an earthquake. This building fails to meet building codes in many

areas including structural, mechanical and electrical requirements. Renovations required to bring the building up to code are extensive. A major rehabilitation plan has been developed that will result in the demolition and reconstruction of this building, anticipated to be completed in 2016.

Other buildings include Sandy River Station which is primarily in good to fair condition.

Current and Projected Capacity

Needs & Approach

Buildings classified as part of the Support system will require maintenance and rehabilitation over the next 20 years. An asset management plan for facilities/buildings is being developed that should help identify work that is needed.

Recommended Support System Improvements

Building Maintenance

The bureau maintains hundreds of structures from the Bull Run watershed to downtown Portland. These structures range in size from small pump houses to the maintenance hub on Interstate Avenue. The necessary work involves structural repairs and maintenance.

Interstate Facility Rehabilitation

The project rebuilds the Portland Water Bureau's main maintenance facility. A four-year master planning effort from 2002 – 2006 developed the baseline requirements for both current and long-term needs. Recent updates to the master plan along with additional program summary work has created the basis for the design of the facility now underway. Two new buildings will replace the eighty-five year old Maintenance Building that currently serves as the main office and warehouse. Site improvements to the 11 acre campus improves vehicle and employee circulation. It also brings the property up to current code requirements for storm water management and landscaping.

Planning

This program consists of general planning studies for projects needed to improve the operation of the water system. These include pressure zone adjustments, facility modifications, and system element studies.

Sandy River Station Upgrades

This project consists of upgrades to the Sandy River Station facilities including an evaluation of a potential move to a different site.

West Side Maintenance Facility

A hub is needed on the west side of the Willamette River for maintenance and construction crews, vehicles, equipment and materials, and emergency operations. Property previously owned by the Federal

government (the Jerome Sears site) has been acquired by the City for this purpose. This project includes improvements to the facility over the next 20 years.

Regulatory Compliance

Inventory

The Regulatory Compliance program ensures that water throughout the system meets Federal and State of Oregon drinking water quality standards and environmental protection standards. Included in this program is implementation of the federally approved Habitat Conservation Plan (HCP) and the multiple easements and improvements required by this plan. Chief among these is the Bull Run Dam 2 tower intake structure which will allow the bureau to better control the release of water to enhance downstream conditions for anadromous fish species in compliance with the Endangered Species and Clean Water acts.

Regulatory Compliance system assets are included in Table 7.2.

Needs & Approach

The focus of this program is implementation of the federally approved Habitat Conservation Plan and the multiple easements and improvements required by this plan.

Recommended Regulatory Compliance System Improvements

Bull Run Dam 2 Tower

The Water Bureau is installing steel multi-level intake structures onto the North Dam 2 Tower located in the Bull Run watershed. Modifications are designed to allow selective water withdrawal, proper operation during flood conditions, and enable the tower to better withstand seismic events.

HCP Alder Creek Fish Passage

This project will design and install two fish passage facilities as planned in the Habitat Conservation Plan (HCP). The project is in Alder Creek, a tributary to the Sandy River. There will be a fish ladder at the waterfall and a fish ladder at a water diversion.

Regulatory Compliance

This project responds to requirements of the Endangered Species Act (ESA), including the implementation of the Habitat Conservation Plan (HCP) Consistent with HCP commitments, this project funds easements, purchases land, and also supports projects jointly conducted with other watershed partners.

Customer Service

Inventory

The Customer Services Program includes facilities that provide services for customers other than the direct supply of water. It includes customer billing, collection, and call center facilities and equipment, which is the largest part of the program. It also includes conservation, security, emergency management and grounds maintenance for Bureau-owned properties. Specific assets included in the Customer Services program are Dodge Park and the Security and Emergency Management facilities, including the new City Emergency Coordination Center.

Customer Service system assets are included in the Distribution section and the Support Facilities section in Table 7.2.

Current and Projected Condition

Dodge Park is considered to be in good condition. Upon completion of the new Emergency Coordination Center in 2014, the Security and Emergency Management facilities (including the Ranger Station and security gates) should be in very good condition.

Current and Projected Capacity

Needs & Approach

Automated meter reading would reduce operational costs and provide better customer service (i.e. access to more current consumption data).

Maintenance and upgrades of Water Bureau facilities including Dodge Park and Security and Maintenance facilities will be a continual need. An asset management plan for facilities/buildings has been developed that should help identify work that is needed.

Recommended Customer Service System Improvements

Automated Meter Reading (AMR) Implementation

This project provides for the replacement of customer meters throughout the City with automatic water meter reading equipment.

Emergency Coordination Center

This project designs and constructs the City's Emergency Coordination Center. The bureau will locate its emergency response and security staff at this location. The project location is adjacent to the City's 911 Call Center at SE 99th Ave and Powell Blvd. The total project cost is $19.85 million and Portland Water Bureau is a contributing bureau.

Security and Emergency Management

The bureau is committed to increasing flexibility and preparedness to meet future security challenges, to enhance security throughout the water system and to modernize security practices and infrastructure. This program includes physical security improvements to major and minor facilities as well as improved security in the overall water distribution system and control/communications system.

Investment Strategy

Process

Annually, the Portland Water Bureau prepares capital budgets for the upcoming fiscal year and for the five-year planning horizon. The major components of the water system define the program categories within the capital budgeting process. These capital programs are: Supply, Transmission and Terminal Storage, Distribution, Treatment, Regulatory Compliance, and Customer Service. The Capital Improvement Plan (CIP) is an annual planning process which allows a review of capital projects and programs. The Portland Water Bureau engages the public in developing its budget and the CIP. All Water Bureau CIP projects that affect neighborhoods or that require city, state, and/or federal permit review processes include public involvement elements.

The Engineering Services Group (ESG) receives requests and ideas for CIP projects from a number of sources. Internal bureau stakeholders groups including Asset Management, Development Services, Design or Construction, Operations, Maintenance and Construction, and Resource Protection all may identify the need for a capital project. Other sources include projects generated from ESG CIP Planning Section listed in Master Plans or Public Facility plans, and recommendations from the Asset Management group that include business case studies. In addition, the Portland Water Bureau receives notifications from other agencies or bureaus planning or producing work that may impact the water system. External requests may also come from citizens, wholesale customers, the City Council, and developer requests for projects administered through ESG's Development Services Branch.

The Water Bureau performs economic analyses and/or business cases for new projects, and ensures that investment decisions are economically justified.

Contributing Plans

Asset Management

The Bureau's Asset Management Program is intended to guide the strategic management of physical assets to best support the delivery of identified services. It helps the Bureau to better manage existing assets, and plan for future needs. This process is guiding decisions as to the effective mix of maintenance, repair, renewal or replacement of the water system components, and has led the Bureau to focus on critical assets. A risk analysis methodology has been applied to assess the relative risks of asset failure; those assets with the highest risks are then identified for follow-up actions.

Asset condition assessments have been completed or are underway for many asset classes. Business case methodology is helping ensure that investment decisions deliver good value by comparing the cost of an investment to the benefits it provides. Benchmarking with best practices helps the Bureau better understand process improvement opportunities. Asset Management Plans have been prepared for almost all asset classes, capturing current information on service levels, inventory, condition, failure modes, risks of asset failure, and asset strategies.

System Plans

A number of plans are consulted in preparation of the CIP. These include the Infrastructure Master Plan (2000), the Distribution System Master Plan (2007), the Bull Run Water Supply Habitat Conservation Plan (2008), the Water Management & Conservation Plan (2010), and various master plans and project specific planning documents developed by the Portland Water Bureau.

Alternatives Analysis and Prioritization Process

The Portland Water Bureau's methodology and criteria for the selection and ranking of capital projects depends on the magnitude of the project and duration of the project's lifecycle. For major projects, an initial concept report is developed evaluating possible project alternatives and recommending potential capital projects. Senior management approves projects to continue with a larger planning effort to create a Basis of Design Report. To develop this report, the Water Bureau's Planning section uses industry practices in cost-benefit analysis and risk assessment to identify and weigh alternative solutions, and compare them with service standards. The Portland Water Bureau selects projects based on these quantitative analyses but also considers the logistics of rate impacts, sharing cost with interagency partners, creating revenue opportunities, and achieving compliance with regulatory requirements.

The criteria used to select projects for inclusion in the budget include fulfilling service levels (such as maintaining pressure and limiting customer outages), mitigating high risks of asset failure, operating assets at the most efficient and cost-effective levels, contributing to local and regional sustainability and energy-conservation goals, providing appropriate redundancy within the supply system, complying with all state and federal water-quality regulations, ensuring access to key water-supply facilities, and coordinating with other agency infrastructure projects.

Projects & Programs

The FY 2013-18 CIP provides balance between longer-term infrastructure replacement and maintenance needs and short-term water system infrastructure needs to ensure compliance with drinking water regulations. The CIP priorities for the bureau's budget and capital program include:

- Implement improvements necessary to assure compliance with current safe drinking water regulations, including the LT2 rule.
- Continue to expand the utilization of an asset management system plan and the computerized maintenance management system to support planning and implementation of system maintenance activities.
- Implement the Bull Run HCP, a comprehensive multi-decade Clean Water and Endangered

Species Act compliance agreement for the Bull Run watershed.

- Support other governmental agency capital improvement projects (e.g., light rail, Sellwood Bridge, Columbia River crossing) as directed by City Council.

The 5-year CIP is summarized within the following seven Bureau programs with key projects identified:

Customer Service

The Bureau's participation in the City Emergency Coordination Center is the primary project included within this program over the first five years. Bureau security staff will operate from this location with the Portland Bureau of Emergency Management. In the event of a major emergency, all City coordination staff will operate from this center.

Distribution

Over the first five years, approximately $244 million of the CIP is for improvements to the distribution system. Of the total, about $83 million is to be used for direct water line replacement projects, including work initiated by other bureaus and agencies, as well as replacement of the oldest or most deteriorated portions of the distribution system. About $35 million is to continue rehabilitation of the Interstate maintenance building. There is $57 million for the Willamette River Pipe Crossing Project. Almost $16 million is for pump stations and tanks. Other improvements include services, meters, hydrants, fountains, and vehicle and equipment replacement.

Regulatory Compliance

Over the first five years, more than $25 million has been planned for improvements to the water supply from the watershed, principally the Dam 2 Tower Improvements. Construction continues on the HCP Alder Creek project to enhance fish habitat.

Support

The Support Program includes funding for master system planning, focusing on identifying the need for, and timing of, improvements to or acquisitions for the water system. Master planning uses asset management methods to determine the most cost-effective investments. Individual asset studies help guide the selection of major capital projects for the short and long term. The Portland Water Bureau has included funds for some of the planned studies on vulnerable and aging infrastructure in upcoming fiscal years.

Supply

This program includes projects to improve existing facilities and roads in the Watershed and to improve the groundwater system. An example is the Groundwater Electrical Supply Improvements project that will reduce the risk of an extended electrical supply outage to the groundwater pump station.

Transmission and Terminal Storage

Over the first five years, the major projects in this program include $35 million to continue construction of an additional 50-million-gallon water storage tank at Powell Butte and $119 million for other enclosed storage including Kelly Butte reservoir and Washington Park reservoir. Also included is $33 million for other conduit and transmission main projects.

Treatment

Headworks Flow Meters project, to accurately record treated water flow and regulate chemical additions to the system in compliance with drinking water regulations, is the only project in the first five years.

Financially Constrained Investment Strategy

The Bureau focuses its efforts on regulatory compliance elements, improving the condition of its aging infrastructure, and addressing operations and maintenance needs. The CIP addresses longer term infrastructure replacement and maintenance needs, while addressing short-term water system infrastructure needs to ensure compliance with drinking water regulations.

Recently, the primary focus of the bureau's capital Investment Strategy has been responses to EPA's LT2 rule (reservoir replacement projects), the HCP (Dam 2 towers project), and the Interstate Facility Improvement project. Upon completion of these projects, the focus will return to improving the maintenance and reliability of existing facilities. As facilities within the water system begin showing their age, major reconstruction and maintenance projects will need to be undertaken.

Planned CIP outlays (excluding capitalized overhead) total $491 million over the five-year forecast period.

Table 7.9 Investment Strategy Summary

Program	FY 2013-2018	FY 2018-33
Customer Service	$3,057,000	$53,700,000
Distribution	$244,197,288	$461,650,000
Regulatory Compliance	$25,504,000	$30,000,000
Supply	$14,291,000	$88,500,000
Support	$10,000,000	$50,500,000
Transmission and Terminal Storage	$191,170,000	$242,000,000
Treatment	$2,500,000	$150,000,000
TOTAL	**$490,719,288**	**$1,076,350,000**

Financial Strategy

Existing Financing Strategies

As part of the Bureau's overall mission and values, its financial objective is to "maintain fiscal integrity, undertake sound financing practices and ensure auditable results" which:

- Provides for sufficient annual funding of operating, maintenance, and capital programs approved

by City Council.

- Provides for rates and charges to customers that are equitable and based on generally accepted cost of service principles unless otherwise directed by City Council.
- Strives for a natural optimal balance between financial health, operational effectiveness, infrastructure condition, effective management, rate affordability, and a skilled and experienced workforce.
- Strives to optimize capital financing strategies, today and into the future.
- Ensures the maintenance of appropriate and adequate cash balances (operating fund, construction fund, sinking fund, and rate stabilization account) consistent with City policies, bond covenants, and industry standards

Rates and charges for water services are established annually based, in part, upon cost-of-service principles and methodologies recommended by the American Water Works Association (AWWA). The process used by the Bureau follows the Commodity Demand method set by the AWWA. Under this approach, developed for the Bureau by Raftelis Financial Consultants, Inc in 2006, water system costs are allocated to customers based on their average and peak water demand characteristics and use of the system. Retail rates are then established based on the residual financial requirements of the system.

The Bureau assesses both a volumetric usage charge and a fixed monthly base charge. A monthly base charge is imposed on water services connected directly to the water system. The base charge is in addition to the rates charged for water usage.

Financial Plan and Rate Setting Process

The Bureau annually prepares a requested budget and five-year financial plan. The Bureau's budget process includes a Budget Advisory Committee (BAC). The BAC meets between October and January to review and provide input on the requested budget including the five-year capital improvement plan and proposed retail rates. The financial plan includes operating and capital expenditure and expected rates for each year of the five-year forecast period. The requested budget and financial plan reflects the financial implications of the bureau's priorities, strategies, and service levels.

The financial planning process lays the groundwork for setting rates. Section 11-105 of the City Charter authorizes the City Council to fix fees and charges for connection to and use of the Water System. Water user fees and connection charges are formally reviewed every year by the Bureau. Rates required to support proposed activities for the next year are submitted by the Bureau Administrator to the City Council for review and approval.

Water Funds

The Bureau's financial system is organized into three separate funds:

- The Water Operating Fund serves as the operating fund of the Bureau and, with the exception of debt service; all expenditures made from this fund are for operation and maintenance of capital assets. Receipts from the sale of water are the primary source of revenue for the Water Operating Fund. The cash flow in this fund determines the need for rate increases. The Rate

Stabilization Account is within the Operating Fund.

- The Water Construction Fund is the recipient of proceeds from bond sales to provide for the funding of water system capital improvements. Other sources of revenue include reimbursements for capital expenditures, such as main extensions and service installations, system development charges and sale of assets. Also, a portion of the water sales revenues is transferred to this fund to finance routine system repair and replacement. The Water Construction Fund reimburses the Water Operating Fund for capital asset requirements including capitalized overhead, capitalized interest, and the cost of issuing bonds.
- The Water Bond Sinking Fund provides for the repayment of bonded debt and interest incurred in conjunction with construction of water system facilities. The revenue bond reserve accounts are also maintained in the Sinking Fund. The source of revenue for this fund is a transfer from the Water Operating Fund, reduced by interest earnings on fund balances and a transfer from the Water Construction Fund of interest earnings on bond proceeds.

These three funds enable the Bureau to segregate resources for specific uses and ensure that reserves are not used to supplement daily operating needs. Maintenance of the fiscal integrity of each fund is a key objective of the Bureau's financial planning and analysis efforts.

Anticipated Revenues

The bulk of the Bureau’s CIP is financed by Water revenue bonds. Though not required by bond covenants, the Bureau’s planning standard is to set rates such that Net Revenues provide at least 1.90 times debt service coverage on First Lien Bonds. Additionally, the Bureau maintains a planning standard that results in Stabilized Net Revenues providing at least 1.75 times coverage on the Combined Annual Debt Service (as defined in the Master Second Lien Water Revenue Bond Declaration) for both First and Second Lien Bonds. These standards exceed the debt service coverage required by bond covenants.

Additional revenues to support the capital plan include cash financed capital funding from rate revenues, system development charges, new services and main reimbursements, City interagency reimbursements on capital projects, and sales of assets.

Revenue and expenditure comparison

The Bureau plans for a minimum fiscal year-end operating cash reserve of $15.0 million in the Operating Fund. This represents about 45 to 60 days of operating costs. This standard conforms to the generally accepted industry standard for such reserves, and has been approved by the Office of Management & Finance as a reasonable amount for this reserve.

The Bureau also has a Rate Stabilization Account (RSA) within the Water Operating Fund that is used to smooth rate increases over the financial planning period and beyond. This smoothing is one of the Bureau’s key financial planning objectives and is aimed at maintaining financial stability and predictability.

Financial challenges, unmet needs and risks

The Bureau’s financial projections include key assumptions underlying the revenue and expenditure forecast. Key assumptions in the revenue forecast include:

- Retail water demand
- Wholesale water sales
- User charges
- Issuance of additional First Lien Bonds or Second Lien Bonds to fund capital program requirements

Key assumptions in the expenditure forecast include:

- Annual inflation
- The bureau's cost related to the City's outstanding pension obligation bonds
- Pension system contribution rates
- All costs related to compliance with the LT2 rule including regular monitoring and capital projects
- Continuing to operate under the Bull Run Treatment Variance[30]

[30] On March 14, 2012, OHA issued a Final Order granting the City a variance to the treatment requirements of the LT2 Rule. The variance went into effect on April 1, 2012, and will be in effect for ten years as long as the City is able to meet a set of important conditions designed to protect the health of Portland drinking water customers. These conditions require the Bureau to continue to monitor Bull Run source water for *Cryptosporidium*, maintain all legal protections in the Bull Run, and monitor and manage any potential sources for *Cryptosporidium* contamination in the watershed. In the event of a first detection of *Cryptosporidium,* the Bureau is required to increase its monitoring efforts, coordinate with health officials to determine what, if any, impacts the detection may have, and communicate this information to its customers. The communications requirement in the variance conditions requires, at minimum, a press release to Portland-metro media outlets and posting of the information on the Bureau website if *Cryptosporidium* is detected at the intake. If one or more detections occur during this one-year period of increased monitoring, it is likely that OHA will revoke the variance.

Chapter 8
Portland Bureau of Transportation

Portland's Transportation System

Portland's transportation system served nearly 584,000 residents in 2010, and tens of thousands of individuals who live, work, or spend time in the Portland Metro area. Transportation assets include facilities for pedestrians, bicyclists, transit users, all motorists, and emergency vehicles. Portland's transportation system, provided by the City and a variety of other jurisdictions and agencies, includes not only the networks of roads and highways but also right-of-way, sidewalks and paths, bikeways, bridges and other structures, transit (light rail, bus, streetcar, and tram), and thousands of supporting assets (lights, signals, signs, etc.).

The $8.1 billion the public has invested in the City's transportation system enables individuals to get to work, school, recreation, and activities to sustain daily household needs. The transportation system is a fundamental component of regional access and mobility, serving residents, businesses, and travelers and providing connections to local, regional, interstate, national and international destinations. The City's transportation system also creates the foundation for a variety of activities essential to our lives: livable and safe neighborhoods, land uses and managing growth, commerce and job creation, environmental protection, freight mobility, and revitalization.

Transportation System Plan

The City of Portland's Transportation System Plan (TSP) serves as the transportation component of the Citywide Systems Plan.

The TSP is the long-range plan to guide transportation investments in Portland. It meets state and regional planning requirements and addresses local transportation needs for cost-effective street, transit, freight, bicycle, and pedestrian improvements. The TSP plans for transportation options for residents, employees, visitors, and firms doing business in Portland, making it more convenient to walk, bike, take transit -- and drive less -- while meeting their daily needs. The TSP provides a balanced transportation system to support neighborhood livability and economic development.

The Bureau of Transportation is updating the TSP to align with the Comprehensive Plan update. More information on the TSP update project is available at:
http://www.portlandoregon.gov/transportation/63710

The currently adopted Transportation System Plan can be found at:
http://www.portlandoregon.gov/transportation/52495

Chapter 9
Portland Parks & Recreation

Note: Parks and recreation facilities are not a required urban service under the Oregon public facility planning goals and statutes. The City of Portland considers parks, natural areas, trails and recreation facilities to be essential infrastructure systems and has included this chapter in the interest of comprehensive infrastructure planning. However, the City does not intend for this chapter to be reviewed for compliance with public facility planning rules, including Oregon Statewide Planning Goal 11: Public Facilities, Oregon Statute 197 or Oregon Administrative Rule 660.

Overview

Portland Parks & Recreation (PP&R) cares for over 11,000 acres of parks and natural areas, manages the urban canopy and the city's community gardens and offers thousands of programs for all ages at its community centers, swim pools, and other recreation facilities. In 2013, 86% of Portland residents rated the overall quality of parks as good or very good, making Parks the highest rated city service. Public investment in these important recreation facilities, natural areas, and gathering spaces supports a high level of use by Portland residents and visitors. In 2013, there were 4 million visits by Portlanders to community centers, pools, and recreation programs and 88% of Portlanders visited a city park at least once during the year. People from around the world and Portland's neighborhoods visit the Washington Park International Rose Test and Classical Chinese gardens. There are 155 miles of regional trails used for recreation and active transportation that keep Portlander's moving and healthy. Annually Portland community members volunteer over 475,324 hours to help maintain parks and assist others at our community centers.

Portland's treasured parks, trees, gardens, natural areas, and trails are infrastructure that beautify the city, provide important habitat, water quality, and environmental benefits, and add to the quality of life for both residents and visitors. Events and programs stimulate understanding and appreciation of the arts, celebrate diversity, encourage healthy lifestyles, benefit the local and state economy, and contribute to the public safety and stability of Portland neighborhoods. The continued investment in these important public spaces makes Portland a great place to live, work, and play.

Portland Parks & Recreation has adopted the following vision, mission, organizational values, equity statement and Parks 2020 goals to guide the Bureau's work.

Vision

"Portland's parks, public places, natural areas, urban forest, community gardens, and recreational opportunities give life and beauty to our city. These essential assets connect people to place, self, and others. Portland's residents treasure and care for this legacy, building on the past to provide for future generations."

Mission

"The mission of Portland Parks & Recreation is to help Portlanders play – providing the safe places, facilities, facilities, programs, and nature experiences which promote physical, mental, and social activity. We get people, especially kids, outside, active, and connected to the community. As we do this, there will be an increase in the wellness of our residents and the livability of our city. We accomplish this through:

- Establishing, safeguarding and restoring the parks, natural areas, public places, community gardens and urban forest of the city, ensuring that these are accessible to all;
- Developing and maintaining excellent facilities and places for public recreation and community building;
- Providing dynamic recreation programs and services that promote health and wellbeing for all;
- Partnering with the community we serve.

Organizational Values

Portland Parks & Recreation has the following organizational values:

- Quality, responsive service to our diverse customers and partners.
- Community participation in program and project planning.
- Innovation, creativity, and excellence in all we do.
- Openness, honesty, and respect in all relationships.
- A diverse and culturally competent workforce.
- Transparent, ethical, and accountable decision making.

Equity Statement

"We recognize, understand and encourage celebration of the differences that surround us. Diversity and equity are vital to Portland Parks & Recreation's ideals and values."

Parks 2020 Vision Goals

The Parks 2020 Vision outlines the following five goals for the park system:

- Ensure Portland's park and recreation legacy for future generations;
- Provide a wide variety of high quality recreation services and opportunities for all residents;
- Preserve, protect, and restore Portland's natural resources to provide 'Nature in the City';
- Create an interconnected regional and local system of paths and walks to make Portland 'The Walking City of the West'; and
- Develop parks and recreation facilities and programs that promote 'Community in the City'.

Purpose of this Chapter

This chapter describes the public facilities and services provided by Portland Parks & Recreation that are necessary to carry out its mission. It identifies desired levels of service, inventory and condition information for existing public facilities, and desired future facilities. Carrying out the Bureau's mission and other City and community goals may also require programs, investments and practices that are not related to public facilities. This chapter may acknowledge – but does not comprehensively address – these measures.

System Services

Service Area

Portland Parks & Recreation manages a system of developed parks, natural areas, the urban forest, community gardens, trails, community centers, and special recreation features that serve residents and visitors. See Figure 9.1 for a map of park facilities.

Core Services Provided

Portland Parks & Recreation's built and green infrastructure forms the base by which Portland Parks & Recreation provides a wide variety of programs and services for the public. The focus of this chapter is built infrastructure, but Portland Parks & Recreation has five service areas:

- Community Services (includes Community Engagement, Leadership & Advocacy, Marketing & Business Development, and Visitor Services)
- Infrastructure Services (includes Capital Development, Maintenance, and Property)
- Support Services (includes Business Services and Planning), and;
- Recreation Services (includes Aquatics, Arts, Community & Socialization, and Sports & Games).
- Natural Resources Services (includes Natural Areas, Community Gardens, and the Urban Forest).

Service Agreements & Partnerships

Partnerships are an important strategy for Portland Parks & Recreation. Healthy, robust partnerships increase the visibility of our programs and work, they can help inform our communities about our strengths and our challenges, they extend our services and bring different skills to help manage resources and they provide us with important information about our communities. Working with community partners is a skill and work ethic that permeates all levels of Portland Parks & Recreation.

Portland Parks & Recreation regularly partners with a variety of agencies and organizations that provide park and recreation services to Portland residents. Governmental agencies include Metro, Multnomah County, School Districts (there are five in Portland that PP&R works with), the State of Oregon and many other regulatory bodies that govern land use and environmental work. Additionally, PP&R has more than 100 formally recognized “Friends and Partner” groups that range in capacity from half a dozen episodic volunteers, to fully developed non-profit organizations that completely manage specific assets. Altogether, Friends, Partners and volunteers contribute more than 470,000 hours annually, comparable to more than 220 full-time staff.

To facilitate efficient and effective provision of services, Portland Parks & Recreation has a number of identified service and partnership agreements. For example, Portland Parks & Recreation has a joint facilities agreement with Portland Public Schools, and agreements for the Schools Uniting Neighborhoods (SUN) program, Hoyt Arboretum, Pittock Mansion, Leach Botanical Gardens, Japanese Gardens, and many other Friends groups who help manage and maintain the park system.

The Portland Parks Foundation, an independent, nonprofit organization, formed in 2001 to assist in bringing long-term stewardship to Portland’s parks and programs. The foundation works closely with Portland Parks & Recreation to raise awareness of the funding and stewardship needs of the park system. They cultivate donors to deliver private dollars in three aspects of urban parks: the land, the amenities and the people.

Inventory Summary

In 2013, the Portland Parks & Recreation system consisted of 11,546 total acres, and includes five main facility types:

- Developed Parks: 209 Parks on 3,455 Acres

- Natural Areas: 77 parks on 7,887 acres
- Undeveloped Properties: 214 acres
- Trails: 155 Miles of Regional Trails
- Community and Arts Centers:14 Facilities

In addition to the capital infrastructure, Portland Parks & Recreation oversees the City's urban forestry program, which is responsible for managing the urban forest on City-owned or managed land, and certain private properties, and which coordinates implementation of the City's Urban Forest Management Plan. In 2010, the urban canopy covered 29.9% of the City.

Condition Summary

Portland Parks & Recreation has inspected most of its assets, and strives to re-inspect 20% of its assets each year so that condition information is never more than five years old for any given asset. In 2013, 37% of Portland Parks & Recreation inspected assets were in good or very good condition, 19% were in fair condition, and 13% were in poor condition. Another 32% of the assets have not yet been inspected and given a condition rating. Percentages are based on counts of individual assets, which range in value and complexity, e.g. from pools to playgrounds.

Capacity Summary

Portland Parks & Recreation strives to serve all Portlanders, and the park system needs to respond to population growth and recreational trends. In 2013, 4 million visits were recorded to a Portland Parks & Recreation recreational programs. Thirty-two percent of Portlanders participated in a city recreation activity, and 88% of Portlanders visited a city park at least once in 2013. While the park system needs to have the capacity to continue serving the large number of Portlanders using parks and recreation programs, Portland Parks &Recreation is also working to deliver equitable access to parks and recreation facilities geographically across the city. These level of service goals are outlined in the Portland Parks & Recreation Vision 2020, and include the goals to have:

- 100% of households within ½ mile walk of a park or natural area,
- 100% of households within 3 miles of a full service community center.

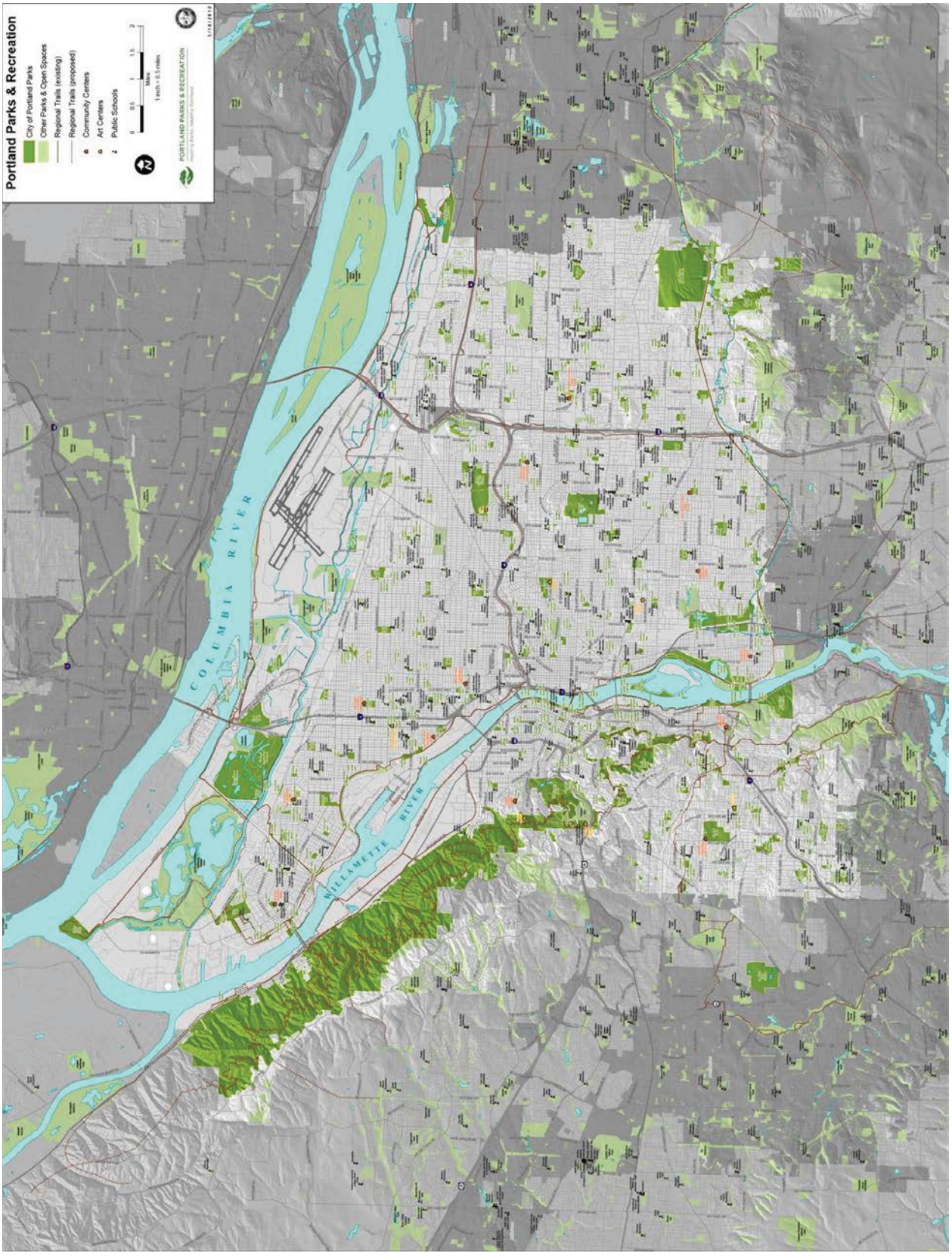
In 2013, 80% of households were within a ½ mile walk of a park or natural area, and 70% were within 3 miles of a full service community center. For service area maps, see Figure 9.3 and 9.4.

Key Issues & Concerns

Providing Services in Underserved Areas

Unfortunately, not everyone in Portland has equitable access to the benefits of parks and recreation. Virtually every district of the city has at least one parkland deficiency. In East, Northeast, and Southwest Portland, where there are fewer developed parks and often fewer trees and canopy cover, residents receive fewer benefits from the social and recreational opportunities parks provide. Since there are few remaining sites appropriate for larger developed parks available in the city, remedying park deficiencies

Figure 9.1 Portland Parks & Recreation Parks, Trails, Community Centers, and Natural Areas (2012)



presents a formidable challenge. See Figure 9.3, which shows the areas currently being served and unserved using the ½ mile from a park or natural area level of service.

Although community centers provide the recreational programs and community gathering places that give appeal to urban living, those benefits are unavailable to some residents. Certain areas of the city have no community centers, and others have centers that are housed in old, ill-adapted buildings that lack fundamental elements. Sellwood Community Center (SCC), for example, was built in 1909 as a rooming house. It does not have adequate security surveillance, ADA accessibility, or storage, and many rooms lack basic equipment for classes and programs. Yet, the neighborhood depends on SCC to fulfill its recreation needs. Since recreation programs and facilities are inextricably intertwined, the shortage of quality community centers limits the availability, breadth, and quality of recreation programs. See Figure 9.4, which shows the areas currently being served and unserved using the 3 miles from a full service community center level of service.

Portland's park system also lacks sufficient quantities of certain types of recreation facilities, like aquatic facilities and sports fields. Both are heavily used, highly programmed, and in short supply. Waiting lists also indicate that the Portland Parks & Recreation community garden program needs to keep expanding. While Portland Parks & Recreation currently has 48 community garden sites, only 7 gardens had plots available and there were almost 1400 individuals on the waiting list for garden plots in 2013.

As more people crowd into existing parks and facilities, user conflicts are increasing and the quality of park resources are declining. Portland Parks & Recreation works to balance the need for expansion of the existing system to address level of service gaps and address equity issues, with the need to adequately reinvest in existing infrastructure.

Improving Access to Parks and Facilities

Lack of access to parks and few connections between parks limits the benefits of the system. Highways, heavy traffic, large taxlots, and industrial properties prevent many Portland residents from accessing park and recreation opportunities. In some situations, if better access to parks were available, including completed sidewalk systems or public access easements acquired, some households not currently considered within ½ mile of an existing park or natural area due to existing street conditions would now be served. Fragmentation reduces optimal conditions and forfeits the immense benefits of a holistic

system, because it is more difficult for people to safely and conveniently access a variety of park and recreation facilities.

Within parks and natural areas, there are also numerous ADA barriers that impact users from fully accessing the park system. Through development of the citywide ADA Transition Plan, PP&R has determined that there are over 20,000 individual barriers to accessibility that need to be addressed. Missing handrails, inaccessible paths, outdated wheelchair lifts, and steep slopes are examples of barriers that prevent people with disabilities or mobility challenges from fully enjoying parks and natural areas. The Transition Plan, with public input, will prioritize the needs and devise a schedule for addressing and funding the improvements given available resources.

Maintaining Existing Infrastructure

In 2013, Portland's extensive park and recreation system had a current replacement value of over $1.02 billion, not including the underlying land which also adds additional value to the system. The condition of the system directly influences its ability to provide users with quality recreation experiences.

Preserving and improving the condition of a park, facility or natural area requires regular maintenance, which in turn requires sufficient funding. However, Portland Parks & Recreation is currently only able to reinvest 1-2% of facilities current replacement value annually, half of the industry standard of 2-4% for built facilities such as pools and community centers. Reinvestment standards for parks and natural areas are in development.

While the Bureau has identified specific maintenance needs and is currently addressing the most serious needs, Portland Parks & Recreation continues to lack sufficient funds to maintain its assets properly. Improving the level of maintenance and repair of the existing system to sustainable levels would require nearly $36.6 million more in resources each year (based on 2013 calculations, see Table 9.6).

Portland Parks & Recreation has instituted an asset management program to ensure the provision of high-quality facilities, provide for long-range capital planning, and develop best management practices.

However, the asset management program does not account for trees and other green infrastructure found in the Bureau's parks and natural areas. PP&R, BES, and the Water Bureau are investigating the possibility of modifying asset management and capitalization practices to include important green infrastructure assets, including trees.

Asset Management takes a full life-cycle approach, informing decisions from design through operations and maintenance to renewal and eventual replacement. The goal is to deliver expected levels of service with adequate funding at acceptable levels of risk. Asset Management shifts the operations and maintenance perspective from reactive maintenance and repair to a proactive approach of predictive maintenance and renewal, reducing costs and avoiding unplanned loss of service. Ideally, design and capital construction decisions are made in light of ongoing operations and maintenance costs to achieve the lowest total lifecycle costs. For the Bureau to have a full understanding of its assets, the asset management program will need to be expanded to incorporate green infrastructure, including trees.

Accommodating Growth

Parks and recreation facilities are an important contributor to quality of life in the City of Portland and essential public infrastructure. They provide places to recreate and find respite, and improve the environmental, social, and physical health of the community. Maintaining Portland's quality of life will require preserving access to high quality park and recreation experiences by acquiring and protecting park lands, maintaining and upgrading existing facilities, and providing additional recreation facilities and services. The actual number of parks and facilities necessary will vary based on where and how growth occurs, the ability of existing facilities to serve additional users, and opportunities to locate and build additional parks and facilities.

Growth and increasing density will provide other challenges as well, including:

- Making acquiring new parks more difficult, as development reduces the number of parcels available for parks and natural areas. It may also increase competition for a fixed amount of land, thereby driving up land prices.
- Heightening the need to retain tree canopy, while causing tree removal.
- Increasing the number of users of already heavily utilized facilities, such as pools, Greater use of trail systems could increase user conflicts on multi-modal pathways.
- Exacerbating needs in currently underserved areas. These pressures may be particularly acute in dense urban centers that currently lack sufficient park amenities, where both existing facilities and acquisition opportunities are scarce.

In planning for growth, PP&R will look for opportunities to acquire sufficient parkland to meet needs and will improve and maintain parks, trails, and other facilities to accommodate more users while preserving a quality user experience. The Bureau will also explore options to create separated bike and pedestrian pathways on anticipated heavily used regional trails. Finally, PP&R will continue to work to preserve and enhance the City's natural areas and urban tree canopy for its critical environmental and community functions.

Currently, the City assesses a Park Systems Development Charge (SDC) on new residential and commercial construction to partially offset the costs associated with providing park services to new development. SDC funds are restricted to land acquisition and capital improvements in areas of population growth and new development. SDC funds cannot be used to correct existing parkland deficiencies, nor can they be used to meet the equally vital operations or maintenance needs. At a rate that is 75% of the targeted recovery rate, the SDC assessment does not fully offset the true costs of park development in Portland.

Meeting Increasingly Diverse Community Needs

Portland's system of parks and recreational activities includes a wide variety of facilities and programs. Over time, the recreational needs of Portland have and will continue to grow and evolve. Pickle ball has been replaced with Footsal, the waitlist for community gardens is growing and wading pools are being replaced with splash pads. Senior recreation programs may have different amenity needs than youth programs.

Meeting the needs of a growing and diversifying population is a fundamental challenge for Portland Parks & Recreation. Open space is generally viewed as our most flexible and valuable asset. We are, however, asked to accommodate an increasing number of single use and specialized activities that require dedicated land. These facilities, including off-leash dog areas, community gardens, spray parks, skate parks, and disc golf courses provide valuable recreation opportunities to a wide variety of users but limit the acreage available for more general uses. As Portland's demographics continue to change, recreational facilities and programs need to be able to accommodate the needs of growing cultural and ethnic communities. PP&R needs to continue to reduce barriers that may be experienced due to race, socio-economic status, or geographic location to ensure that park service is being provided equitably. Currently, to address the needs of diverse communities, PP&R incorporates community feedback into the planning of new park facilities, and to the programming of facilities. Parks will need to further increase its investment in the diverse populations of the city by deepening its inclusion efforts in decision making to advance equity goals.

Different perspectives will provide a richer analysis to factors including current distribution, service areas, and capacity; current and projected demand; available locations; demographics; and resources when planning for and siting new facilities.

Protecting Portland's Natural Resources

Portland's natural areas and urban forest provide innumerable environmental, economic, and health related benefits to the city. Natural area settings in Portland include forests, meadows, wetlands, streams, and riverbanks. Portland Parks & Recreation currently protects more than 7,885 acres of natural areas. These natural areas are primarily forest and represent the range of forest types naturally occurring in the region including Douglas fir stands, ash and cottonwood riparian forests, and mixed deciduous and confier forest. The system includes some open woodlands, often dominated by Oregon white oak, and less frequently shrublands and grasslands, including wetland marshes, which offer unique habitat features. Hybrid Parks are managed both as natural areas, and have portions that are developed.

Protecting natural resources is very important to residents who value access to nature, improving the quality of life and environment. As existing open space is developed, more people will seek and use park system resources — crowding into existing parks and facilities, escalating user conflicts, and degrading resource quality. Natural areas are also important for providing wildlife habitat, cleaning the air and water, and enhancing resiliency to the impacts of climate change.

Portland Parks & Recreation's approach to natural area acquisition, restoration, and management is described in The Natural Area Acquisition Strategy (2006) and Natural Areas Restoration Plan (2010). The plan integrates the goals and objectives established in the Salmon Safe Certification (2004), the Portland Watershed Management Plan (2005), and the Oregon Conservation Strategy (2006). When appropriate, PP&R and the Bureau of Environmental Services (BES) collaborate on the acquisition and/or restoration of natural areas, when the property meets the objectives of both Bureaus.

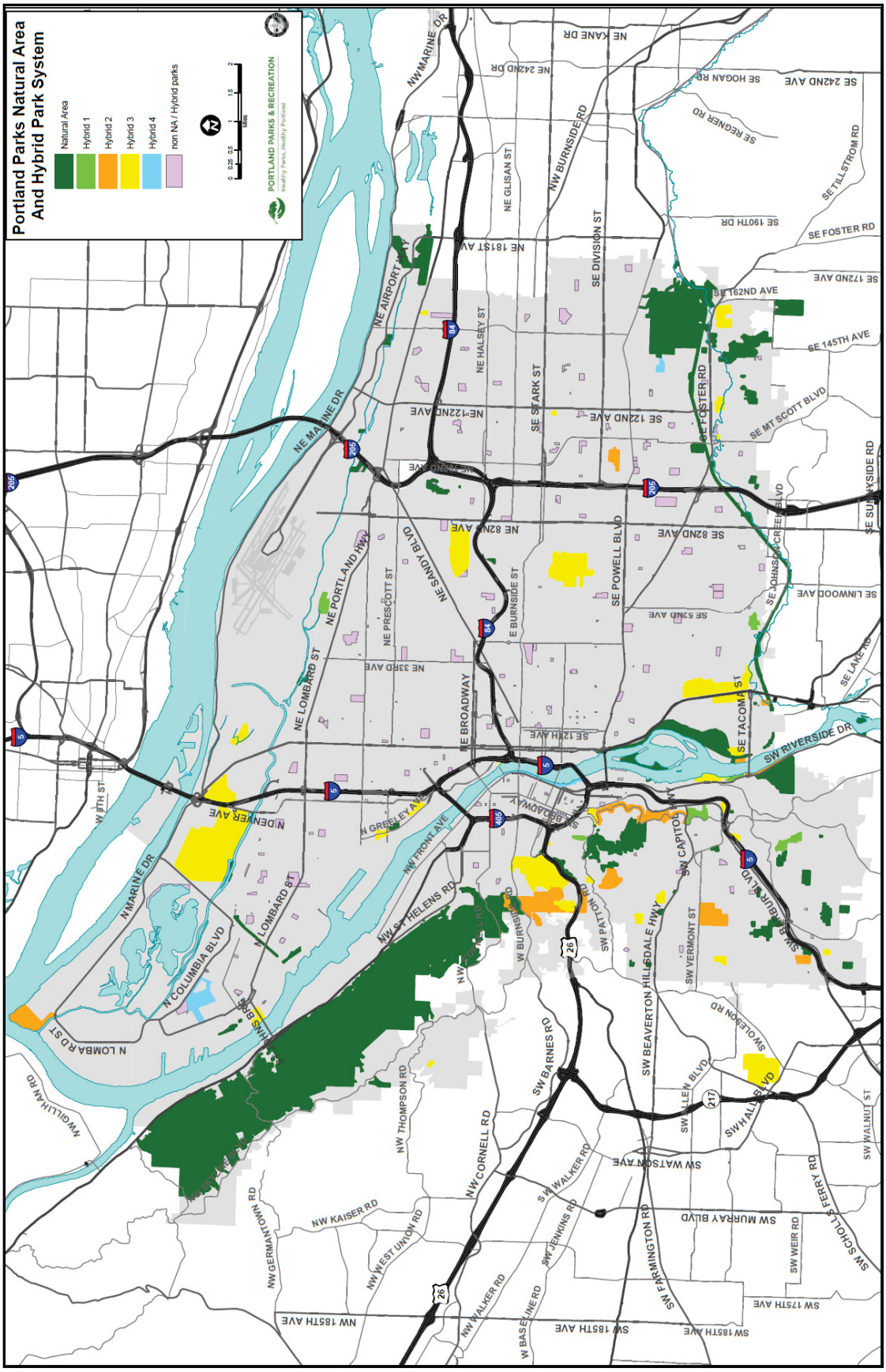
Portland Parks & Recreation used an Ecosystem Management framework to develop specific, science-based restoration actions for each natural area. The framework is based on six steps:

1. Vegetation Inventory
2. Desired Future Condition (25-year timeframe)
3. Assessment: gap analysis between the inventory and the desired future condition
4. Prescription: specific, localized actions necessary to reach the desired future condition
5. Intervention: on-the-ground work
6. Monitoring: observations and data collection to measure the success of the intervention and to modify the prescriptions.

This frameworks sets the trajectory for enhancing ecological health and building resiliency for natural area sites. Portland Parks & Recreation is the only park system certified Salmon Safe (2004, recertified in 2012). Certification standards constitute a set of best management practices that are applied across a variety of landscapes from natural areas to golf courses to sports fields. These best management practices – integrated pest management program, reduction in irrigation and runoff, riparian restoration, removal of invasive species, assist the City in meeting its obligations for the Clean Water and Endangered Species acts.

Portland Parks & Recreation faces ongoing funding challenges in its efforts to implement the Natural Areas Acquisition Strategy (2006) and Natural Areas Restoration Plan (2010). PP&R has not had available funding to acquire all the targeted natural areas identified in the Acquisition Strategy, and has not had sufficient levels of funding to fully implement the restoration and management actions called for in the Restoration Plan. Operation and maintenance funding for natural areas is scare. For example when Forest Park was acquired in 1947, no operation and maintenance funds were allocated for its protection and enhancement, and to date there are still no dedicated funds. The current cost estimate for controlling invasive species in Forest Park – which represents only a portion of the park's operation and maintenance needs – is $10 million.

Figure 9.2 Natural Area System



Stewarding the City's Urban Forest

The urban forest, which includes all the trees and shrubs in the city, provides environmental, social and economic benefits to Portland's residents in the form of increased biodiversity, improved air quality, stormwater mitigation, improved neighborhoods and increased property values.. Regulation of this important resource is led by Portland Parks and Recreation although management is shared among many city bureaus that have an interest in its improvement and well-being, as well as private property owners. These bureaus have developed an action plan to realize the goals of the 2004 Urban Forest Management Plan. The action plan calls for diverse activities to meet Urban Forest Management Plan goals and outcomes; activities such as education and stewardship, research and monitoring, planting and maintenance, and policy and regulatory improvements. The 2009 estimated operation and maintenance needs for operation and maintenance needs of the City's street trees is $13 million.

The city's urban forest faces a number of challenges that have implications for multiple City bureaus and goals. First, canopy cover is being lost to development, particularly in areas of southwest and outer east Portland. Traditional development patterns often involve significant losses of tree canopy cover and increases in impervious surfaces which limits areas for replanting, particularly large tree species. These changes can result in increased stormwater volumes and air temperatures, and heighten pressures placed on hillsides and streams. The urban forest is also threatened by invasive plants and insects. These invasive species can stress the ability of natural species to survive. Invasive pests and diseases can have sudden and devastating effects on the urban forest especially in areas that lack age and species diversity. Climate change will also impact the urban canopy and the tree species survival. The City will need to update the street tree list and plant drought resistance species to increase the resiliency of the urban forest.

Portland's street and park trees form a sustainable resource vital to the city's environmental, social, and economic health. Portland's street and park trees cost the city and private property owners just over $6.5 million annually to maintain, yet provide nearly $27 million worth of environmental and aesthetic benefits[1]. For every dollar invested, $3.80 worth of benefits is returned. Portland Parks & Recreation's approach to managing the urban forest is described in The Urban Forest Management Plan (2004) and The Urban Forest Action Plan (2007). Portland Parks & Recreation, Bureau of Environmental Services, Bureau of Planning and Sustainability and Bureau of Development Services also recently partnered in an effort to update the tree code, which covers privately owned land and was adopted by City Council in April 2011 but has not been fully funded for implementation.

Managing Park, Recreation, and Natural Resources

Portland Parks & Recreation is developing a System Plan that will provide a holistic and comprehensive approach to park acquisition, management, programming, and resource protection. Portland Parks & Recreation is also developing master and management plans to guide development, management and funding decisions to optimize resources and meet needs.

Portland Parks & Recreation is developing accurate inventory and assessment information for all assets, both capital and non-capital. Without valid, reliable information on which to base management decisions, it is difficult to effectively anticipate and prepare for new park uses, or manage green infrastructure resources like the urban forest and natural areas. For example, the City does not have a complete inventory of private trees, but recognizes that more than half of the tree canopy of the urban forest is located on privately owned land. Basic information such as canopy cover, species diversity and distribution is needed for proactive management.

Preparing for Climate Change

Hotter, drier summers and warmer, wetter winters due to climate change will likely have impacts on park habitat areas, tree species, natural areas, waterways, and built infrastructure. For example, warmer, drier summers may result in increased demand for water-related recreation and air-conditioned indoor recreation spaces, or may require adjustments to management practices for the urban forest to ensure resilient tree canopy. Changes in rainfall could impact asset lifespan, increasing maintenance requirements for structures, trails, docks, trees and landscaping, and other facilities. Trails and other assets may be impacted by increased landslides.

To help prepare the city for the impacts of climate change, Portland Parks & Recreation will need to take into account trends in river levels, temperatures, and rainfall when locating and designing future park facilities. In addition, the bureau may need to design and maintain bridges, docks, or park features in flood areas differently, to adjust to changing flooding patterns and water levels. Adding tree and shrub cover where appropriate and selecting planting species that are resilient and water-efficient will help mitigate heat and air quality impacts. Portland Parks & Recreation will also need to continue to increase energy efficiency, water conservation, maintenance efficiency, and the use of resilient materials to help prepare for climate change related impacts.

Funding the City's Park, Recreation, and Natural Area System

In the fiscal year 2013/14 adopted budget, Portland Parks & Recreation will spend just under $100 million to operate, maintain, and expand Portland's park system. Over 40% of Portland Parks & Recreation's financial support comes from the city's General Fund (i.e., discretionary resources that the Council allocates). In addition to the discretionary General Fund revenue, Portland Parks & Recreation receives revenue from system development charges, user fees, interagency agreements, and a variety of other sources. A small (and unpredictable) fraction of Portland Parks & Recreation's budget comes from grants and donations. Portland Parks & Recreation also periodically raises fees to provide the variety and scope of programs that the public needs and wants. Scholarships are available to mitigate the effect this may have on those on fixed incomes or with lower incomes.

Portland Parks & Recreation operating expenses have risen steadily in recent years due to increasing use, utility costs and an aging park infrastructure, as well as construction of new facilities to accommodate a growing population and demand for different recreation activities. Unfortunately, over many decades, park system funding has not kept up with needs. Numerous parks need major renovation and many recreation facilities are in poor condition. Funding is not available for routine maintenance of park trees, and Portland Parks & Recreation's Urban Forestry program does not have a sustainable source of funding for tree replacement or canopy expansion.

Insufficient funding for public schools also has budget impacts on parks and recreation. As public schools cut youth programs, Portland Parks & Recreation's role as the state's second-largest provider of youth programs becomes even more vital. Portland Parks & Recreation now provides many of the arts, athletics and recreation programs that schools cannot.

Regulatory Compliance

Portland Parks & Recreation works to meet all regulatory requirements in the development and maintenance of its assets. Federal, State, Regional, and City legislation and mandates affect how Portland Parks & Recreation operates and manages its park system. Examples of legislation at all levels that affect Portland Parks & Recreation include:

Federal

- The **Federal Emergency Management Agency (FEMA)** requires communities to take into account floodplain hazards in all official actions related to land management and use. Relevant projects must be reviewed and permitted by the Bureau of Development Services to ensure no net rise in stream or river elevations that would harm downstream properties.
- The **Endangered Species Act** is intended to protect and recover endangered or threatened species, and the habitat and ecosystems upon which they depend. PP&R has been working towards recovery of salmon in the region to help the city meet Endangered Species Act compliance. This includes watershed and fish habitat restoration, removal of invasive plants, redesign of parks and their features, and careful review of management practices. Waterways in parks receive special consideration with specific actions such as invasive species removal, planting native species and working with BES to restore and protect their functions. The IPM Program contributes to the success of the endangered/threatened salmon and steelhead program. PP&R is committed to maintaining Salmon Safe Certification, which requires the use of best management practices throughout the park system to improve aquatic ecosystem and to ensure that any harmful impacts on water quality and fish habitat are minimized.
- The **Americans with Disabilities Act** (ADA) requires that public spaces and programs be accessible, or, where full accessibility cannot be provided in an integrated setting, jurisdictions are required to provide equivalent facilitation opportunities. All new development is required to meet ADA standards, and the City of Portland's ADA Transition Plan, currently under development, will provide an approach for addressing accessibility barriers in existing public spaces to ensure compliance.
- The **National Historic Preservation Act** is intended to preserve significant historical and archaeological sites. Portland Parks & Recreation's portfolio includes several facilities and sites that are listed on the National Historic Register.
- The **Clean Water Act** regulates discharges of pollutants into waters of the United States, and quality standards for surface waters. PP&R's Water Quality Testing Program helps the City achieve compliance by providing specific feedback on the effectiveness of the PP&R Integrated Pest Management (IPM) program at protecting water quality, and providing direct accountability for practices most likely to influence water quality such as fertilizer applications and pesticide use.
- The **Migratory Bird Treaty Act** protects migratory birds, and their habitat and ecosystems. PP&R sponsors the Festival of the Birds to educate the public about migratory birds. Additionally, work PP&R does to remove of invasive species and plant native species enhances native bird habitats throughout the city.

State

- The **Department of Environmental Quality** (DEQ) is a regulatory agency whose job is to protect the quality of Oregon's environment Projects are required to comply with DEQ regulations impacting air quality, water quality, and general environmental health (including pollutants, hazardous materials, etc.)
- The **Statewide Comprehensive Outdoor Recreation Plan (SCORP)** looks at recreational trends and needs in the state of Oregon, and provides guidance for delivering quality outdoor recreational opportunities for Oregonians and visitors. The SCORP is also used to provide guidance for state administered grant programs.
- Many of **Oregon's Statewide Planning Goals** have impacts on Portland Parks & Recreation projects, including Goals 2, 4, 5, 7, 8, 9, 10, 11, and 15. Goals that most directly impact Portland Parks & Recreation work include:
    - Goal 5 (Open Space, Scenic and Historic Areas and Natural Resources), which requires inventory of these important resources, and policies that guide treatment of these resources;
    - Goal 8 (Recreation Needs), which requires jurisdictions to evaluate its recreation facilities and develop plans to ensure that recreation opportunities will meet projected recreation demand. The Parks Vision 2020 outlines the broad system goals to ensure that Portland Parks & Recreation will be able to address anticipated recreation demands; and
    - Goal 15 (Willamette Greenway), which sets forth procedures for administering the 300 miles of greenway that protects the Willamette River. PP&R's management of public spaces, trails, and access points along the Willamette River Greenway helps the city to be in compliance with Statewide Planning Goal 15.
- The **Oregon Recreation Trails System Act** designates a system of recreation trails statewide to provide outdoor recreation opportunities and access to scenic areas.

Regional

- The **Metropolitan Greenspaces Master Plan** details the vision, goals, and framework for a regional system of natural areas, trails, and greenways in the Metro region.
- The **Metro 2040 Growth Concept** a long-range plan guiding growth and development in the Portland Metro area, including open space, park, and regional trail goals.
- The **Regional Framework Plan** includes Metro's adopted land use planning policies and requirements, including requirements for parks, open spaces, and recreational facilities, and protection of lands for natural resources.

Local

- Portland Parks & Recreation projects must also comply with **City of Portland Zoning and Building Permit Code Requirements**, often including environmental review. All projects must also comply with the Portland Stormwater Management Manual.

Goals & Policies

Draft Goals and Policies related to Parks & Recreation facilities and services can be found in Chapter 5. Key Infrastructure Policies.

Desired Levels of Service

Portland Parks & Recreation has two defined level of service goals, from its adopted Parks Vision 2020:

- Provide a developed park or natural area within ½ mile from every household
- Provide a full-service community center within 3 miles of every household

Per Vision 2020, PP&R also seeks to build out the recreational trail system. More asset-specific service goals are outlined in Technical Papers, and as Bureau Performance Measures, identified in the Portland Parks & Recreation Strategic Plan. As Portland Parks & Recreation continues development of its new System Plan, it will continue refinement of recreational feature levels of service.

Capital Improvement Program (CIP) Strategy

Portland Parks & Recreation's Capital Planning Process is outlined in the Portland Parks & Recreation Capital Planning Manual (2009). The goals of the Capital Planning Process are to:

- Protect and maintain those existing assets that provide desired levels of service through maintenance, rehabilitation and renewal that extend the life of the asset.
- Provide new service and expand capacity that accommodates growth and provides equitable levels of service through the expansion of existing facilities and the construction of new parks and facilities. Improve efficiency, environmental quality and energy conservation wherever possible.

Portland Parks & Recreation updates its Capital Project List annually. The list identifies projects on a 1-5 year CIP timeframe, a 5-10 year CIP timeframe, and a 10-20 year timeframe. See the Investment Strategy section later in this chapter for more detail on the Portland Parks & Recreation Capital Planning process and project criteria.

Inventory

Built Infrastructure

Portland Parks & Recreation's built infrastructure system is currently valued at over $1.02 billion, see Table 9.1. This is based on 5 main types of assets, with green infrastructure being the largest percentage of the overall replacement value, at $419 million. PP&R defines its green infrastructure asset group as the urban forest, turf, shrub beds, and botanic gardens located on its properties. Buildings and pools are the next largest category, at $280 million. This multitude of parklands, recreation facilities, support facilities, trees, and natural areas contribute to access to nature, recreational opportunity, environmental quality, and livability within the city.

Besides Portland Parks & Recreation, Metro is the largest park and natural area provider in the city. Metro's inventory includes significant natural habitat areas, including the over 2,000 acre Smith & Bybee Wetlands, as well as Glendoveer Golf Course, the M. James Gleason Memorial Boat Ramp on the Columbia River, and fourteen pioneer cemeteries. Metro also owns and operates the Oregon Zoo, Oregon Convention Center, Portland Center for the Performing Arts, and Portland Metropolitan Exposition Center. State parks, public schools, cemeteries, and other open spaces also provide park and natural area opportunities.

Table 9.1 Parks & Recreation Asset Groups and Replacement Values, 2013

Capital Asset Class	Value (in millions)
Amenities	$21.4
Buildings and pools	$280.6
Recreation features	$236.6
Built infrastructure	$68.0
Green infrastructure	$419.2
Total Parks	**$1,025.8**

Table 9.2 Inventory of Portland Parks & Recreation Facilities by Type, 2013

Inventory by Facility Type	
Developed Parks	3,445 acres
Natural Areas	7,887 acres
Regional Trails	155 miles
Community and Arts Centers	14 facilities
Aquatic Facilities	13 pools
Tennis Facilities	124 courts
Athletic Fields	232 fields
Golf Courses	5 courses
Restroom Buildings	97 facilities
Basketball Hoops	229 hoops
Spray Features and Interactive Fountains	24 facilities
Skate parks	5 facilities
Community Gardens	48 gardens
Playgrounds	129 areas
Stadiums and Sports Complexes	4 facilities
Botanical/Public Gardens	8 gardens
Administrative Facilities	12 facilities
Maintenance Facilities	44 facilities
Off-Leash Dog Areas	33 areas
River Beaches	5 areas
Motorsports raceway	1 area
Reservable Picnic Areas	86 areas

Urban Forest

Portland's public streets, parks, and natural areas host a diverse array of tree types. Nearly 1.5 million trees grow in these public spaces. The street tree population includes 171 different types, and over 41

tree types are found in developed parks and natural areas. Replacement of the city's urban forest is estimated at $6 billion.

Table 9.3 Inventory of Portland's Trees, 2007

Tree type	Number
street trees	236,000
developed park trees	39,000
natural area trees	1,200,000

Broadleaf deciduous trees dominate the landscape, accounting for 85% of street trees and 77% of park trees. Tree size designations (small, medium, and large) are determined by both the functional type and mature tree size of the tree. Parks contain more large-at-maturity trees (64%) and more conifers (23%) than do street rights-of-way. Streets host four times the diversity of tree types than parks, one-third of which are small when mature.

Current Condition

Portland Parks & Recreation is in the process of developing a more formal Asset Management program. Portland Parks & Recreation is working to develop an Asset Register to maintain collected inventory and condition information about its assets. The Bureau has developed an inspection program work plan, and has begun the process of adding routine inspection and condition assessment information into annual operations practices. In general, 20% of all Portland Parks & Recreation assets would be inspected each year, so that condition information on an asset would never be more than five years old.

Table 9.4 illustrates the condition of PP&R's capital assets, as reported in 2013. Some assets have yet to be assessed, but of those that have been, the majority of assets were in fair or better condition. However, 43% of park furnishings were in poor or very poor condition, 4% of major buildings were in poor or very poor condition, 12% of minor buildings were in poor or very poor condition, 23% of marine facilities were in poor condition, 23% of play areas were in poor or very poor condition, 13% of sports courts and fields were in poor or very poor condition, 19% of community gardens were in poor or very poor condition, 19%

of circulation systems (roads and trails) were in poor or very poor condition, 13% of natural areas were in poor or very poor condition, and 11% of developed park landscapes were in poor or very poor condition.

Table 9.4 Current Condition: Parks and Recreation System, 2013

Capital asset type	Current Condition (in %)					
	Very Good	Good	Fair	Poor	Very Poor	To Be Determined
amenities						
furnishings in developed parks	12	14	31	41	2	0
furnishings in natural areas	0	0	0	0	0	100
decorative elements	28	31	19	21	1	0
buildings and pools						
Major buildings	61	9	26	0	4	0
Minor buildings	40	16	32	8	3	0
recreation features						
gathering places	0	0	0	0	0	100
marine	71	0	6	23	0	0
off-leash areas	0	0	0	0	0	100
play areas	17	35	25	18	5	0
sports courts and fields	33	22	21	9	4	11
water play	0	0	0	0	0	100
community gardens	19	17	45	15	4	0
built infrastructure						
circulation	0	41	40	19	0	0
utilities	0	0	0	0	0	100
green infrastructure						
natural areas	50	31	6	12	1	0
developed areas	10	34	45	7	4	0

Condition of Urban Forest

Tree condition is the health of the tree as manifest in the condition of its bark and leaves. The condition of urban trees reflects species hardiness, site conditions, and maintenance history. Trees that are well suited to Portland's climate, that can adapt to the challenges of growing in an urban environment, and that have been maintained using proper arboricultural techniques are generally the most successful. Urban forest condition also includes the distribution of trees and make-up of the forest in terms of tree species; more even distribution of trees and a wide array of tree species comprise a healthier forest which is more resilient to pests, pathogens and catastrophic events such as storms or climate change

Table 9.5 Current Condition: Street and Park Trees, 2007[2]

Tree type	Current Condition (in %)			
	Good	Fair	Poor	Dead/Dying
Street trees	64	28	7	1
Park trees	88	7	5	1

Portland's park trees are in generally better health than its street trees. While roughly the same proportion of park (94%) and street (91%) trees are in fair to good condition, 24% more park trees are classified in good condition. Compared with parks and natural spaces, the street environment – where growing space is limited, soils are generally poor, and automobile exhaust reduces local air quality – is far less hospitable to trees.

Projected Condition

Portland Parks & Recreation is in the process of developing a full Asset Management program, which will provide projected condition information for assets. At this time, Portland Parks & Recreation does not have projected condition information.

Current Capacity

Portland Parks & Recreation has not yet met its level of service goals to have every household within ½ mile of a park or natural area, and within 3 miles of a full service community center. In 2013, 80% of households were within ½ mile of a park or natural area, and 70% of households were within 3 miles of a

full service community center.

Park Experience

PP&R's 2020 Vision includes a goal to "Provide a wide variety of high quality recreation services and opportunities for all residents." An objective of this goal, and a measure of our level of service, is to

[2] Portland Parks & Recreation, *Portland's Urban Forest Canopy Assessment and Public Tree Evaluation*, October 2007

provide a park experience within a half mile (approximately 10 to 15 minute walk) of every Portland resident. The park experience includes developed parks (parks with, at a minimum, grass, trees, circulation, open play areas and seating), and accessible natural areas over 1/6 of an acre in size.

Figure 9.3 shows the areas of the city (in blue) that are within 1/2 mile walk of a park or natural area. The 1/2 mile distance is calculated using the walkable street and trail system, so parks in areas with poor transportation circulation systems have smaller service areas and serve fewer people. The calculation also takes into account walkability to actual park entry points.

Typically, the districts with lower levels of service are the more recently annexed parts of the city, where former county parks with fewer amenities were added to the system. PP&R is actively working to improve that level of service. For example, in 2015 PP&R will be constructing Beech Park and Gateway Park in East Portland using SDC funds. These parks represent a $12.4 million investment in East Portland and will serve more than 1,790 new households. PP&R is presently working with Verde, a nonprofit group, and Let Us Build Cully Park! Coalition to build Cully Park in northeast. The funding for Cully Park is from grants and $1.25 million in from SDC.

As PP&R works to meet the ½ mile goal, it faces the following challenges:

- Properties with the capacity and characteristics to provide a reasonable park experience are not always available in the areas of greatest need.
- Funds for acquisition of new park land often come with restrictions on how or where they can be used. For example, Service Development Charges (SDC) funds can only be used to address needs created by population growth, not to remedy deficiencies in levels of service. Funds that come from Urban Renewal Areas (URA) are restricted to parks within those geographic areas. These restrictions slow progress in meeting the goal.

The percentage of households within a ½ mile walk of a developed park or natural area does not include undeveloped properties or properties not owned or managed by PP&R.

Community Centers

PP&R's 2020 Vision includes a goal to "Provide a wide variety of high quality recreation services and opportunities for all residents." An objective of this goal, and a measure of the level of service, is to provide a full-service community center within 3 miles of every Portland resident. A full service community center includes a gymnasium, fitness and classrooms, and a pool.

The 3 mile distance is calculated using the walkable street and trail system, so community centers in areas with poor transportation circulation systems have smaller service areas and serve fewer people. The calculation also takes into account walkability to actual community center entry points.

PP&R is actively working to improve that level of service. In 2002, the percentage of households within 3 miles of a full-service community center was 36%; in 2013, it was 70%.

As PP&R works to meet the 3 mile goal, it faces the following challenges:

- Development of a new full-service community center is a major undertaking. Properties with the

capacity and characteristics to support a full-service community center are not always available in the areas of greatest need. Furthermore, experience shows that co-locating any community center with a park expands recreation programming options and enriches the participant experience.

- Funds for acquisition of new land and facilities often come with restrictions on how or where they can be used. For example, Parks Service Development Charges (SDC) funds can only be used to address needs created by population growth, not to remedy deficiencies in levels of service. Funds that come from Urban Renewal Areas (URA) are restricted to facilities within those geographic areas. These restrictions slow progress in meeting the goal.

The percentage of households within a 3 miles of a full-service community center does include smaller community centers or other facilities owned by PP&R and managed by partners. Figure 9.3 shows the

areas of the city currently meeting the 3 mile to a full service community center level of service goal.

Trails

The Parks 2020 Vision also includes a goal to create an interconnected system of trails to serve both recreational and transportation needs. PP&R has been working to build out its trail system, as outlined in the Parks Recreational Trail Strategy (2006). The Recreational Trail Strategy calls for 220 miles of a connected trail system; however, only 155 miles are built, leaving 65 miles of future trails that need to be constructed. As PP&R works to build out the trail system, it faces the following challenges:

- Trail easements on private property are acquired when a property develops or redevelops, or through a willing seller program. Waiting for one of these conditions to occur before an easement can be acquired has resulted in a slow process for filling in trail gaps.
- As use, both recreational and transportation, continues to increase on trail systems, PP&R needs to continue to coordinate with other partner groups and agencies to ensure that the existing trail systems are able to handle growing capacity and respond to increased maintenance needs.

Figure 9.5 shows the PP&R trail system, existing and future, as shown in the Recreational Trail Strategy.

Figure 9.3. Portland Parks & Recreation ½ Mile to Park or Natural Area Service Area

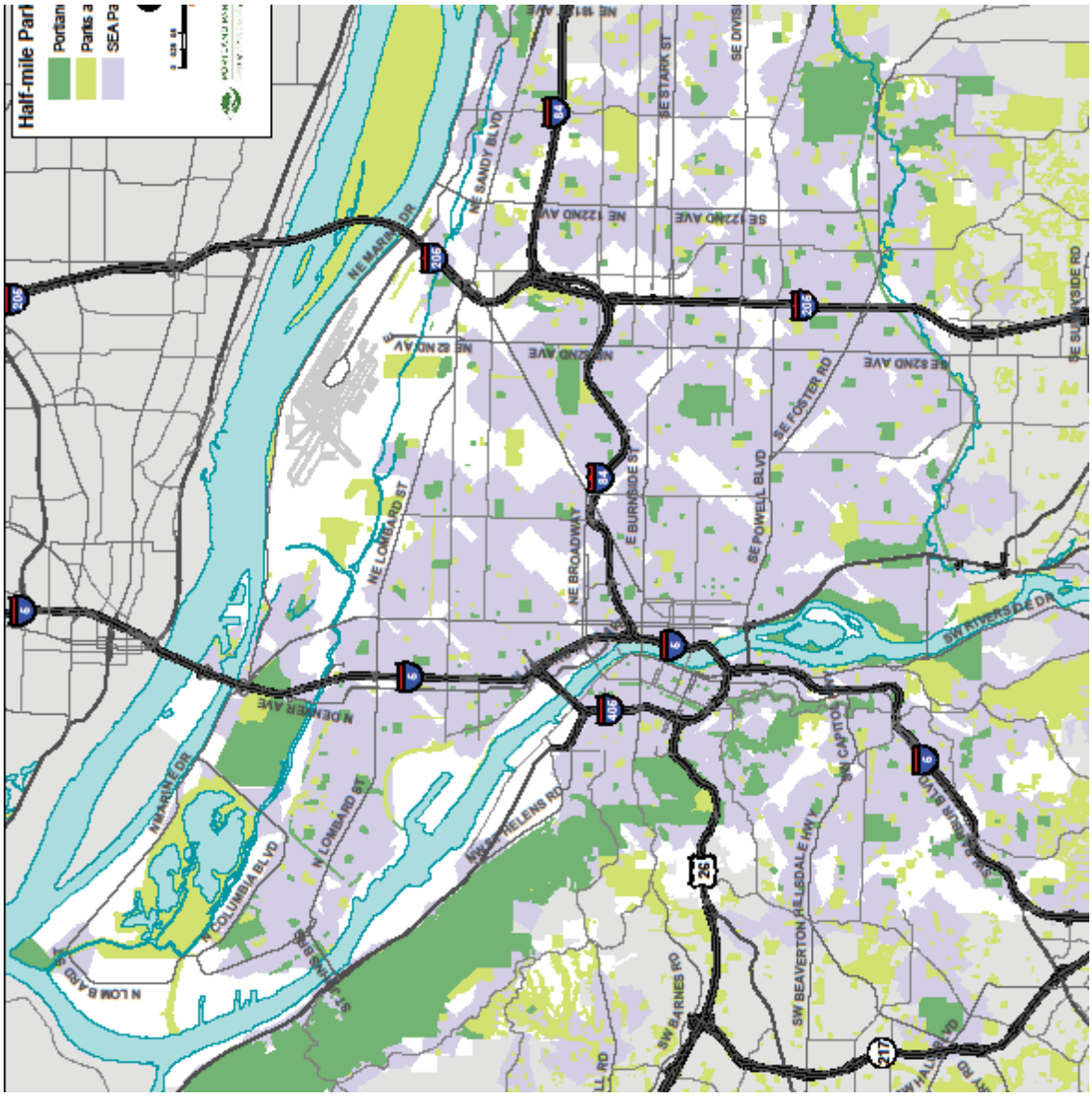
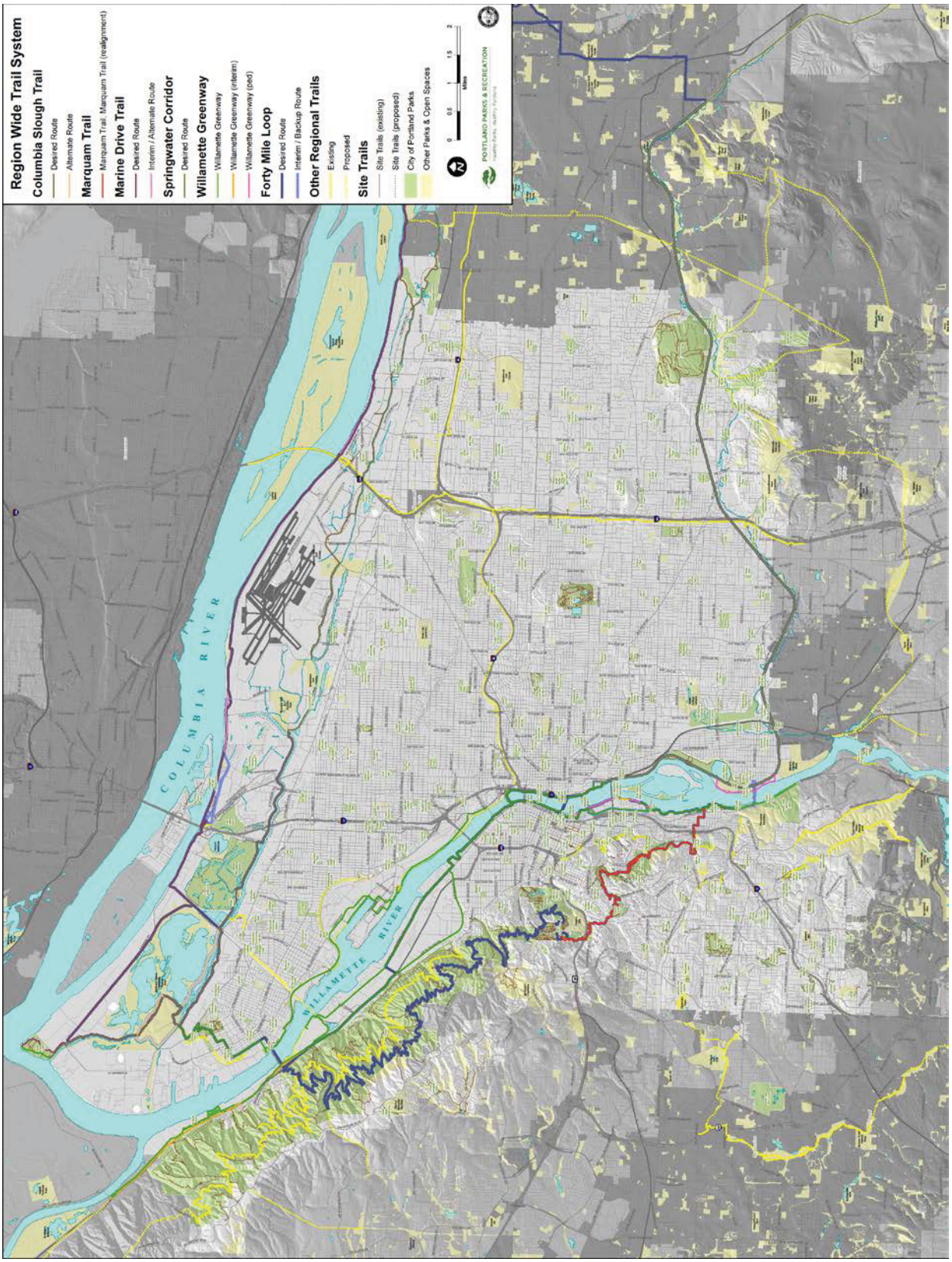


Figure 9.4. Portland Parks & Recreation 3 Mile Full Service Community Center Service Area

Figure 9.5 Portland Parks & Recreation Recreational Trail Strategy System Map



Needs & Approach

Built Infrastructure

Portland Parks & Recreation uses community outreach processes to inform design of new park and facility master plans. It occurs in the form of surveys, trend analysis, project committees, open houses, and other specific targeted outreach. Public involvement during initial project planning helps to inform creation of capital projects that are added to the 20-year project list.

Portland Parks & Recreation has strategically mapped the areas of the city that are currently not meeting the ½ mile desired service level for proximity to a park or natural area (see Figure 9.3) and areas not meeting the 3-mile desired service level for proximity to a full-service community center (see Figure 9.4). The Bureau is actively working to fill in those gaps. At the same time, Portland Parks & Recreation needs to invest in and maintain existing infrastructure. Portland Parks & Recreation balances the needs for system expansions and maintenance in decision-making.

The PP&R 20-year Capital Project List includes projects to maintain the existing system, and projects to expand or grow the system to meet service level goals. Typically, the 20-year Capital Project List includes development of those new parks where PP&R has acquired property and created a master plan. If all the parks and park facilities on the 20-year Capital Project List were implemented, there would still be some level of service gaps. Additional acquisition is necessary to continue to address those level of service needs, and that acquisition is represented on the 20-year Capital Project List, though until development plans are in place for those future properties, development expenditures are not represented.

Natural Resources

The City's Natural Area Acquisition Strategy (2006), focuses future acquisitions on protecting large, sustainable tracts of land and examples of exceptional value for habitat and watershed health. Of primary importance is protecting a large forested site on Portland's east side, including additional land at Kelly, Powell, and Clatsop Buttes. These, and other "last, best places" in Portland must be protected, as once developed they can never be returned to their natural state.

Portland Parks & Recreation Natural Areas Restoration Plan (2010) is a system-wide, watershed based strategic plan that guides habitat enhancement in natural areas. The plan includes a prioritized list of projects with their objectives and desired ecological outcomes. It guides PP&R in reaching the desired outcome of protecting and enhancing the biodiversity and ecological health of our natural areas, provides direction for near and long-term actions, and establishes management priorities.

Urban Forest

The Urban Forest Management Plan (2004) calls for expanding the urban forest canopy to cover 33 percent of the city and increasing street tree stocking levels, especially in underserved neighborhoods. The Urban Forest Action Plan (2007) contains the major goals and desired outcomes of the management plan, along with sixty-three actions items. Although these public trees provide a large return for the investment, opportunities exist to further improve the structure and management of the urban forest on

public and privately owned property. To maximize benefits, Portland Parks & Recreation and its partners are focusing efforts on retaining and expanding existing canopy, planting the right tree in the right place, planting large-growing species where appropriate, and keeping trees healthy.

Recommended System Improvements

Portland Parks & Recreation's park system has existing areas that do not meet service level goals. To resolve these deficiencies and to meet goals established in Parks 2020 Vision, Portland Parks & Recreation has identified a need for:

- Approximately 150 acres of new parkland throughout the City, and the development existing park properties, to meet the goal of providing a park within ½ mile of all city residents;
- 75 miles of multi-use trails within the City to connect people and places and address both recreational and transportation needs;
- Civic spaces in dense urban centers;
- Community centers to serve recreation needs in inner southeast, central and outer northeast and distant southeast.
- Additional pools, particularly in outer northeast Portland.
- Play areas, particularly in central northeast and outer east;
- Additional facilities, including skate parks, courts, fields, and community gardens in areas throughout the city.
- 33% tree canopy cover city-wide, canopy increase in low canopy and low-income areas, and tree species composition of no more than 10% of any one species, 20% of any one genus, and 30% of any one family.
- Continuing to treat and remove invasive species from 1000 acres of natural area sites per year to improve forest health and enhance wildlife habitat.
- Working with our partners to control invasive species in Forest Park in accordance with the Greater Forest Park Conservation Initiative.

Portland Parks & Recreation also continually looks to expand the system to respond to new and emerging recreational trends, and meet changing community needs.

Investment Strategy

Process

Portland Parks & Recreation gathers requests for capital projects from various sources including staff-identified needs, policy documents such as Parks 2020 Vision, park master plans, technical papers, asset register reports as well as from residents and other public agencies. Potential projects are screened and reviewed against community priorities and system-wide needs annually by a review committee, per the criteria outlined on the next page. Each project is given a Capital Project score.

The review committee recommends projects for either the 1 to 5 year Capital Forecast track for implementation, or for the long-range 20 Year Forecast for future consideration. Projects needed to fulfill the bureau's strategic direction or take advantage of project-specific funding opportunities go to the 1-5 Year Capital Project list. Projects with lower priorities and uncertain funding are put on the 20-Year Long-Range Planning Master List. The 20-Year list is reviewed annually and projects are advanced to the 1 to 5-Year list if they are deemed necessary, have funding, and there is sufficient staff to manage and implement the projects. Both lists are adjusted annually based on changing needs, funding, resource availability and priorities. The final list of recommended projects is considered by the Parks Budget Committee (in 2012-2013 this was the Portland Parks Board), the public and the mayor during the annual budget process.

Once projects are completed, they will be entered into the Bureau Asset Register (under development). Once assets are built, the Bureau tracks asset condition, value, and maintenance of replacement needs. These needs are then submitted as capital requests in ensuing years.

Contributing Plans

Projects added to the Portland Parks & Recreation Capital Project List come from many different sources. Plans referenced include Parks 2020 Vision, Master Plans, Technical Papers, System Plans, and Asset Management Plans. Other sources include field staff requests, community-initiated requests through the Park Proposal Process, or projects that originate through specific funding opportunities like grants, gifts, or sponsorships.

Alternatives Analysis/Prioritization Process

Portland Parks & Recreation has developed prioritization criteria for its capital projects. The criteria are included in the Portland Parks & Recreation Capital Planning Manual (2008). Each project is rated and given a score, based on the following considerations:

- **Legal Compliance**: Project is necessary to meet a legal mandate, directive by Council, condition of Land Use Review, contractual obligation, etc. Excludes ADA.
- **ADA Compliance**: Project is necessary to meet ADA compliance.
- **Public Support**: Project has documented or anticipated public support.
- **Conforms to City or Portland Parks & Recreation Plans**: Project is vital to Portland Parks & Recreation mission and Vision 2020 goals, is part of a Portland Parks & Recreation master plan, City plan, Urban Renewal Area plan, or continues a prior project.
- **Improves Level of Service**: Provides new service or improves existing service for identified need to a significant population.
- **Equity:** Households in project service area are above city average for populations of color, students in free and reduced lunch, or low income.
- **Human Health & Safety**: Project alleviates significant, minor or potential existing health or safety hazard; improves general health and safety.
- **Protects Capital Assets or Facilities**: Project is critical to save structural integrity of existing

facility or repair significant structural deterioration, or repairs important systems/deters major future expenditure, or increases life expectancy of the asset.

- **Environmental Quality**: Improves environmental quality of a large area, facility, or neighborhood, or improves local environmental quality or prevents environmental damage.
- **Financing/Business Opportunity**: Project has outside financing, donation, or business opportunity that covers 50% or more of the cost.
- **Maintenance Financing**: Project has outside funding to cover 50% of ongoing maintenance costs.
- **Effect on Operating Budget**: Project will reduce operations and maintenance costs, or increase revenues.

Investment Strategy

Portland Parks & Recreation has identified many infrastructure needs over the next 20 years to meet the level of service goals outlined in the Parks 2020 Vision, including necessary expansions to the system, and maintenance of existing assets. Portland Parks & Recreation maintains a 20-year capital improvement plan (CIP) list, which includes known growth and maintenance related projects that have been identified at this time. Where Portland Parks & Recreation has not yet acquired property or developed a master plan for a site, those projects are not reflected on the Portland Parks & Recreation CIP list. Tree maintenance and canopy expansion investment amounts have yet to be identified.

Further information about the Portland Parks & Recreation CIP list, including currently identified projects, can be found on the City of Portland's website at: https://www.portlandoregon.gov/parks/63265.

The Citywide Systems Plan does not include a detailed 20-year project list for Portland Parks & Recreation because a comprehensive system plan, that reflects asset management needs and community priorities and includes a list of needed investments, costs, and funding sources, will be developed over the next few years. In addition, this information is not required as part of this Plan under Statewide Planning Goal 11: Public Facilities and related statutes and administrative rules.

Examples of projects and programs PP&R will be working to implement are summarized below.

Acquisition Program

- Acquisition for developed parks, natural areas, trails, recreation and maintenance facilities. Priorities would include acquisition of land to:
    - Accommodate growth by maintaining a relatively equivalent city wide level of service in areas where growth is occurring
    - Correct deficiencies by providing parks in park-deficient areas
    - Connect to and complete trail systems
    - Protect and enhance natural resource systems
    - Eliminate park in-holdings or expand existing park land, and
    - Effectively operate and maintain Portland's park system.

Maintenance of Existing Parks, Natural Areas, Trails, and Facilities

- Maintenance or replacement of assets that have reached the end of their useful life

Development of New Community Centers

- Washington-Monroe
- Additional Community Centers in areas not currently within 3 miles of an existing full service community center

Development of New Parks

- Beech Park – funded for construction in 2015
- Cherry Park
- Chimney Park
- Clatsop Butte Park
- Errol Heights Park
- Floyd Light Property
- Gates Property
- Gateway Green
- Gateway (urban plaza)
- Gilbert Primary Park
- Hazeltine Property
- Lynchwood Park
- Mill Park
- Mock's Crest
- North Powellhurst Park
- Parklane Park
- SW Thomas & 53rd Property
- Thomas Cully Park – under construction
- Thompson park
- Werbin Property – funded for construction in 2014
- Wilkes Headwaters Property
- Development of additional new parks or natural areas in areas not currently within ½ mile of an existing park or natural area

Improvements at Existing Developed Parks

- Cathedral Park
- Columbia Children's Arboretum

- Couch Park
- Crystal Springs Rhododendron Garden
- East Holladay Park
- Hillsdale Park
- Leach Botanical Garden – funded for partial improvements in 2015
- Lents Park
- Mt. Tabor Park and Yard
- Spring Garden Park – funded for improvements in 2015
- Washington Park
- Waterfront Park
- Westmoreland Park
- Willamette Park – funded for improvements in 2015

New Trails / Improvements to Existing Trails

- Columbia Slough/ Columbia South Shore Slough Trail
- Marine Drive / Bridgeton Trail
- Mt Scott / Scouters Mountain Trail
- North Portland Greenway
- Red Electric Trail
- Sullivan's Gulch
- Springwater Trail – construction to complete the 'gap' funded in 2016

Natural Area Parks

- April Hill Natural Area – funded for construction in 2015
- Beggars Tick Natural Area
- Buttes Natural Area Complex (Clatsop Butte, Buttes NA, Mitchell Creek Natural Area, Kingsley D. Bundy)
- Elk Rock Island Natural Area
- Errol Heights
- Forest Park
- Deardoff Creek and Wahoo Creek Natural Areas
- Lower Powell Butte Floodplain
- Marshall Park (including Jensen and Foley Balmer properties) – funded for improvements in 2014
- Oaks Bottom/ Ross Island/ Oaks Crossing
- River View Natural Area
- Stephens Creek Nature Park

- Southwest Waterfront Parks (Powers Marine, Willamette Moorage, Butterfly and Cottonwood Bay)
- West Portland Park Natural Area
- Whitaker Ponds – funded for improvements in 2016
- Woods Park Natural Area

The Citywide Systems Plan does not include a detailed 20-year project list for Portland Parks & Recreation because a comprehensive system plan, including a list of needed investments, costs and funding sources, is not available at this time. The project list will be developed over the next few years. In addition, this information is not required as part of this Plan under Statewide Planning Goal 11: Public Facilities and related statutes and administrative rules.

Financial Strategy

Existing Financing Strategies

Definition and Use

The primary sources of revenue to the Parks Capital Improvement Program Fund include service charges and fees from the System Development Charges (SDC) program, Metro Bond local match, General Fund discretionary, local, state & federal grants, and the Portland Development Commission. The Portland Parks & Recreation system has also grown and replaced assets when necessary due to the passage of a bond or levy approximately every decade.

As Portland Parks & Recreation creatively seeks alternative funding sources to respond to priority needs, some types of projects are more readily funded than others. The System Development Charge (SDC) and tax increment financing in urban renewal areas are sources of funding for land acquisition and project development. This is especially true where population growth and capacity-driven needs are the underlying premise to development, since SDC funds are specifically intended to be used to build new parks and facilities to respond to increased park demand that results from new development and growth, and urban renewal area funds are required to be used in those specific geographic urban renewal areas. However, for most existing infrastructure these types of resources are not available. Finding alternative solutions to fund major capital improvements for existing infrastructure as well as improved ongoing operations and maintenance are major challenges. However, options are being explored to meet these challenges.

Anticipated Revenues

On average, Portland Parks & Recreation has been receiving approximately $1 million annually from General Fund discretionary to address major maintenance, and approximately $8 million from System Development Charges (SDC), Portland Development Commission (PDC), and grants/donations. These figures fluctuate and will change over time. As more development occurs, Portland Parks & Recreation will receive more SDC funds. PDC funding has been reduced as Urban Renewal Areas expire and PDC shifts its investment focus from community infrastructure development to economic development.

Financial Challenges, Unmet Needs and Risks

Portland Parks & Recreation does not receive adequate capital revenues annually to address identified capital needs. Portland Parks & Recreation reported an estimated $844 million annual capital funding gap in 2013, including both maintenance to existing assets and expansions of the system to address deficiencies in service. This funding gap represents the total of projects on Portland Parks & Recreation's 1-10 year Capital Improvement Project list, minus anticipated annual revenues for capital projects, amortized over 10 years.

PP&R has an expected total capital annual funding need of $93.4 million for each of the next 10 years. PP&R receives an average of $8 million annually in System Development Charge funds, plus grants and donations. Additionally, City Council has been able to provide about $1 million annually to address some of the most urgent needs for repair, rehab and replacement and mandated work. This totals an average of $9 million annually available for capital, leaving a funding gap of $84.4 million. This includes $47.8 million for expanding the system to provide standard levels of service for all residents, in addition to $36.6 million in funding needed to maintain existing assets. Where Portland Parks & Recreation has not yet acquired properties to fill service level gaps, there will be additional need to acquire and develop those properties, which are not currently represented on the Capital Improvement Project list. This would further increase the funding gap.

Table 9.6 Portland Parks & Recreation Annual Funding Gap, 2013

Capital asset type	Value* (in millions)			
	R/R/R	Mandate	Capacity	Total
amenities	$0.2	$0.1	$0.0	$0.3
buildings and pools	$11.0	$3.0	$23.0	$37
recreation features	$4.8	$2.2	$3.5	$10.5
developed park	$4.1	$1.7	$13.9	$19.7
built infrastructure	$5.5	$1.5	$7.0	$14.0
green infrastructure	$2.5	$0.0	$0.4	$2.9
Total	$28.1	$8.5	$47.8	**$84.4**

R/R/R: (Repair, Rehabilitation, Replacement): Additional funding necessary to repair, rehabilitate and replace existing assets to bring them up to established service levels. Also includes replacement of assets considered functionally obsolete (not meeting established service levels).
Mandate: Additional funding necessary to improve existing assets to meet regulatory requirements, exclusive of improvements that fall under R/R/R or Capacity
Capacity: Additional funding necessary to meet the demands of existing customers, based on established levels of service.

Alternative Strategies

Portland Parks & Recreation will need to examine options to increase available funding for expansion and maintenance of its park system. Some options could include:

Park Bonds

Continue working with City Council and Portland taxpayers to periodically pass park general obligation "G.O." bond measures to address capital projects and system expansion. Historically, Portland Parks &

Recreation's park system has developed with the assistance of a park G.O. bond measure approximately every decade.

Dedicated Funding for the Natural Resources and the Urban Forest

Portland Parks & Recreation will need to continue to seek dedicated sources of funding for ongoing natural area restoration and maintenance, including activities such as continued removal of invasive species, planting native species, and safely managing public access to natural areas. The Urban Forest Management Plan calls for the establishment of sustainable funding for the urban forest. Funding sources considered in a 2009 study by Davey Resources Group includes a property frontage fee, among other options.

Increasing Partnerships

Portland Parks & Recreation continues to look for opportunities to develop public-private partnerships to help expand the park system.

Maximizing public use of sports fields

Portland Parks & Recreation has developed a joint-use agreement with Portland Public Schools regarding use of some sports fields, and continues to work with surrounding school districts and organized sports groups to look for mutually beneficial joint use opportunities. A recent partnership in the enhancement of Buckman Field is a good example.

Summary

Portland Parks & Recreation will need to continue to be aware of and implementing best practices and innovative funding techniques used in other jurisdictions may yield other alternative strategies.

If Portland Parks & Recreation is not able to increase funding to address its funding gap, the condition of its assets will worsen, and Portland Parks & Recreation will need to either:

- Reduce levels of service (remove some assets from the system) or;
- Manage a system of assets that is operated with higher levels of risk to the user and organization.

Chapter 10
Other Essential Facilities & Systems

Note: Other essential facilities and systems are not a required urban service under the Oregon public facility planning goals and statutes. The City of Portland recognizes that facilities, technology systems, and vehicles are essential infrastructure and has included this chapter in the interest of comprehensive infrastructure planning. However, the City does not intend for this chapter to be reviewed for compliance with public facility planning rules, including Oregon Statewide Planning Goal 11: Public Facilities, Oregon Statute 197 or Oregon Administrative Rule 660.

OVERVIEW

This chapter describes facilities, technology systems, and vehicles that are vital to the efficiency and effectiveness of all City agencies. This chapter recognizes the critical role this infrastructure plays in meeting the needs of Portlanders and supporting the overall mission of the City of Portland, including emergency response and preparedness. The assets covered in this chapter are used to one degree or another by nearly every City agency that utilizes office space, vehicles, or technology. In total, the combined replacement value for technology and facility assets is over $1.25 billion dollars.

The decision to include other essential facilities[1] and systems in citywide infrastructure planning represents a different way of thinking about these public assets, one that recognizes the extensive investments in facilities and systems that enable bureaus to provide the urban services within their purview. This consideration goes above and beyond the set of State-mandated public facilities and services addressed elsewhere in the Citywide Systems Plan.

The infrastructure described as other essential facilities and systems is necessary for the provision of some direct public services, including emergency communications, emergency response, and life safety. Other infrastructure provides internal support to every City Bureau that occupies a City building or uses City technology. The assets covered in this chapter contribute to service provision in both direct and indirect ways. For instance, some computer equipment makes it possible for Portlanders to directly access City websites and internet databases. Other equipment facilitates communications through phones and email systems.

This chapter includes three sections – Civic Facilities & Assets, Technology Systems, and Emergency Response. These sections were created using asset groupings from Portland's annual Citywide Assets Report. For administrative efficiency, these asset groupings do not always correspond with a particular system or set of infrastructure. For instance, Portland's emergency response infrastructure is included in the "fire facilities", "police facilities", and "other buildings" asset groups. See Table 10.1 for more

[1] This definition of essential facilities is different than the "essential facilities" designation utilized in the City's Natural Hazard Mitigation Plan (p. 38) to identify facilities that are necessary for the continuation of City operations.

information about asset groups covered in different sections of the Other Essential Facilities & Systems chapter.

Table 10.1 Other Essential Facilities & Systems Sections and Asset Groups

Chapter Section		Asset Groups* Covered
Civic Facilities & Assets		Office buildings Other buildings PDC facilities Spectator facilities Performing arts facilities
Technology Systems	BTS:	Communications
		Production services
		Strategic technology
	Other bureaus:	Equipment and software
		Strategic technology
Emergency Response		Fire facilities Police facilities

* Asset groups are based on Citywide Asset Management Group categories. The Emergency Coordination Center and 9-1-1 Center are included in the "other buildings" asset group.

Description of Other Essential Facilities & Systems

For the purposes of this chapter, other essential facilities and systems includes a wide range of assets, such as offices and special purpose buildings, sports and entertainment venues, emergency response facilities, and transmission towers. It covers technology systems such as computer hardware and software, voicemail systems, video systems, microwave radio systems, and other radio equipment, as well as motorcycles, passenger vehicles, vans, SUVs, pickups, dump trucks, loaders, trailers, and other specialized vehicles. It also addresses emergency response infrastructure like police and ~~fire station~~fire & rescue stations, specialized mobile response units, fire trucks, fireboats, and police cars.[2]

The chapter focuses on planning for these City-owned assets, but not on planning for the services provided through the use of these assets. For instance, it can inform decisions to align the number and location of ~~fire station~~fire & rescue stations with growth assumptions in the Comprehensive Plan, but does not directly plan for the manner in which Portland Fire & Rescue will provide services over the next 20 years.

The assets covered in this chapter are owned, managed, or used by several different bureaus and non-City agencies. These bureaus include the Bureau of Emergency Communications (BOEC), the Bureau of Internal Business Services (BIBS), the Bureau of Technology Services (BTS), the Portland Bureau of Emergency Management (PBEM), Portland Fire & Rescue (PF&R), the Portland Police Bureau (PPB), and the Portland Development Commission (PDC). This makes it difficult to compare the Other Essential Facilities & Systems chapter to other chapters oriented around the operational scope of one bureau or

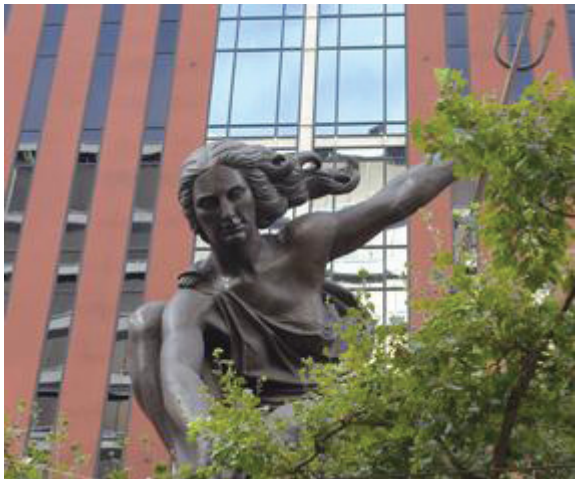
[2] Vehicles are not typically considered "public facility assets" in this plan or in the Asset Report, with the exception of certain, significant, long-lived fire apparatus. Vehicles are included in this chapter to acknowledge the City's substantial investment in these assets and the essential role they play in the provision of most City services.

agency. Though assets covered in this chapter differ in many important ways from other public facilities and systems, the sections in this chapter have been structured similarly to other chapters in the Citywide Systems Plan to maintain consistency within the document.

Role of Other Essential Facilities & Systems

The behind-the-scenes support provided by other essential facilities and systems is critical for maintaining a healthy, prosperous city and ensuring the delivery of services that contribute to Portland's high quality of life. Other essential facilities and systems include the buildings where city employees work on a daily basis, the software they use to display and communicate ideas, the vehicles necessary to provide public services, and the data needed to make informed decisions. This contributes to a high quality of life in an indirect yet integral way, incorporating several city functions often left out of long-term planning discussions. Certain assets in this chapter play an essential role in the City's emergency response and continuation of operations strategies designed to protect the health and safety of Portlanders in the event of an emergency or natural disaster.

This chapter is the result of the city's decision to go beyond the minimum statewide planning requirements, to make sure that the full set of services and facilities necessary to support a prosperous, thriving and sustainable city are included in long-term planning conversations. This chapter is intended to inform future investments in these facilities to maintain existing systems, resolve identified deficiencies, serve new population growth, and address other long-term infrastructure needs.



Major Needs and Trends for Other Essential Facilities & Systems

The facilities, technology systems, and vehicles included in this chapter experience similar trends and share a few common needs.

Financial Environment

These facilities and systems exist within a complex financial environment where revenue streams are limited and investments are often the result of opportunistic partnerships between agencies. In addition,

disparate funding sources, shared responsibilities between multiple City bureaus, a lack of centralized management, and limited long-term planning create challenges that limit the City's ability to holistically manage these assets. In general terms, a more integrated approach is needed in order to perform analysis and make investment decisions that result in cost savings, capitalize upon operational efficiencies, and maximize shared benefits across City agencies. City agencies and elected officials could also benefit from improving asset management processes to assess and prioritize facility needs across bureaus using consistent evaluation metrics.

Planning for Resiliency

Many assets in this chapter help the City meet goals and policies related to resiliency and climate change, issues that are being increasingly recognized by a wide range of disciplines and institutions. Projects such as the recently completed Emergency Coordination Center and the ongoing Public Safety Systems Revitalization Project (PSSRP) support the City's goals to enhance disaster preparedness and emergency response capacity. Technology featured in this chapter, such as Next-Generation 9-1-1 and renewable microgrid energy systems, has the potential to open up new possibilities to achieve resiliency in the field of emergency preparedness and response. These facilities and systems help Portland prepare for emergencies of different types and magnitudes, allowing for successful long- and short-term recoveries following significant climate-related events or natural or man-made disasters.

Technological Landscape

Other technological advancements could have a significant impact on the management, maintenance, and construction of other essential facilities and systems. These developments have the potential to present new opportunities to manage City assets more effectively, improve communication, and increase safety and health for all Portlanders. While it is difficult to predict exactly how or when these opportunities will arise, the current pace of technological change could warrant more frequent assessments throughout the next twenty years.

Purpose of this Chapter

This chapter describes other essential facilities and systems, highlighting the significant role these assets play in supporting fundamental parts of the City's mission. It outlines desired improvements and levels of service related to these assets, discusses the financial challenges and realities that affect them, identifies a few pressing needs, and makes some recommendations to address those needs.

Though this chapter attempts to provide a comprehensive look at these facilities and systems, a holistic long-term plan is not within the scope of this effort. Instead, the chapter identifies some first steps that can be taken to streamline management processes and more successfully incorporate other essential facilities and systems into public decision-making processes. While there is no State requirement to perform planning for this set of assets and systems, the City has recognized their importance and is engaging in conversations about how to better integrate them into long-range planning discussions.

Bureau Names and Acronyms

The following list includes names and acronyms for bureaus that own, manage, or are the primary users of the other essential facilities and systems included in this chapter:

- OMF – Office of Management and Finance
- BIBS – Bureau of Internal Business Services, a Bureau within OMF
- BIBS Facilities – the Facilities division within BIBS
- CityFleet – the CityFleet division within BIBS
- Office of the CAO – OMF Office of the Chief Administrative Officer (CAO)
- BTS – Bureau of Technology Services, a Bureau within OMF
- PPB – Portland Police Bureau
- PF&R – Portland Fire & Rescue
- PBEM – Portland Bureau of Emergency Management
- BOEC – Bureau of Emergency Communications
- PDC – Portland Development Commission

In addition, all City bureaus occupy and/or use other essential facilities and systems. Specific bureaus mentioned in the various sections include:

- PP&R – Portland Parks and Recreation
- PWB – Portland Water Bureau
- BES – Bureau of Environmental Services
- PBOT – Portland Bureau of Transportation

CIVIC FACILITIES & ASSETS

Introduction

This section includes a broad array of City-owned buildings, facilities, vehicles, and equipment, the majority of which are managed by Facilities and CityFleet divisions in the Bureau of Internal Business Services (BIBS). These assets include offices and special purpose buildings, sports and entertainment venues, emergency response facilities, and wide variety of City-owned vehicles. This collection can be difficult to discuss as a coherent whole, because many different bureaus utilize the assets covered in this section to provide a number of different public services. Civic facilities and assets are nonetheless vital to all City operations, with considerable effects on service provision for each of the other infrastructure systems in the Citywide Systems Plan. Without well planned and managed civic facilities and assets, many City employees would not have a place to work, emergency communications systems could be compromised, and the ability of Portland residents to depend upon basic public services could be eroded.

Similar to other sections within the chapter, civic facilities and assets are being incorporated into long-range planning for infrastructure systems for the first time. As such, work will need to be done to bring civic facilities and assets to a similar level of knowledge and understanding as other infrastructure systems like those for water and environmental services.

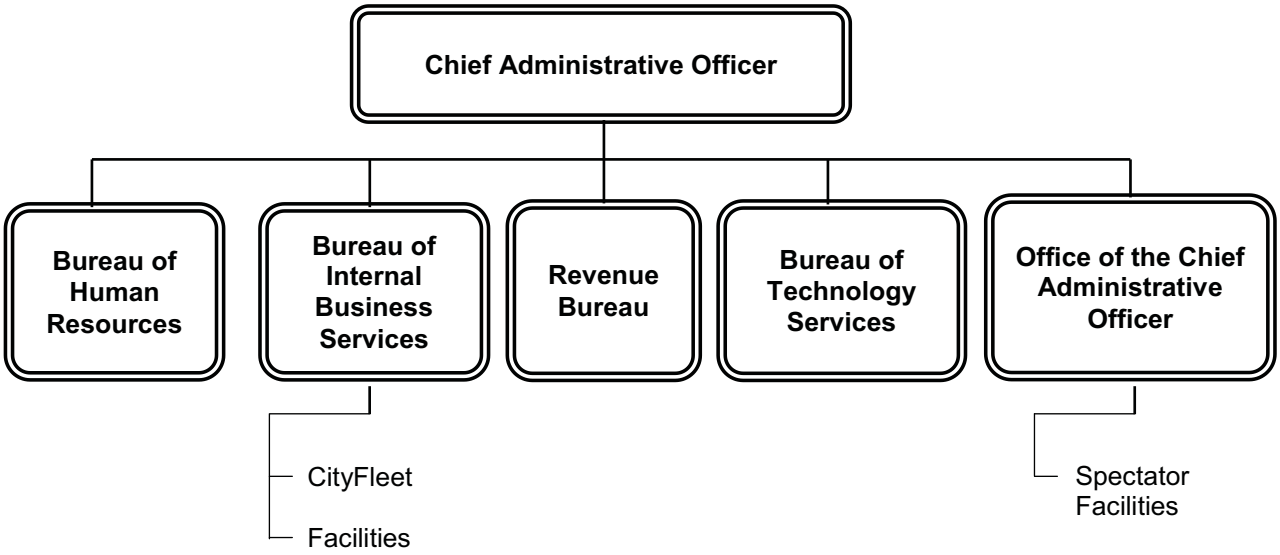
This section outlines the City's vision for civic facilities and assets and provides an assessment of the current status of planning efforts and other related management techniques. It includes a description of these assets, the services they affect, and relevant trends and issues. The section also assesses a few major needs and recommendations, and summarizes the financial landscape that will impact these assets over the next twenty years.

Agency Organizational Structure

Unlike other chapters within the Citywide Systems Plan, civic facilities and assets are owned and managed by multiple City agencies. Much of this responsibility falls within the purview of the Office of

Management and Finance (OMF), a large agency that brings together several bureaus – including the Bureau of Internal Business Services (BIBS) and the Office of the Chief Administrative Officer (CAO). Two divisions of BIBS (Facilities and CityFleet) manage a majority of the facilities and assets covered in this section. The Office of the CAO has responsibility for City-owned spectator facilities, such as Providence Park, and serves as liaison for City-owned performing arts facilities, such as Keller Auditorium. Refer to Figure 10.1 for more information about the structure of OMF as an agency.

Figure 10.1 Office of Management and Finance Organizational Chart



Other assets covered in this section are subject to more complex ownership and management arrangements. For instance, although BIBS Facilities owns and handles maintenance responsibilities for most of the Portland Building, the Portland Water Bureau and the Bureau of Environmental Services own most of the floors that they occupy within the building. For more detail regarding these types of shared arrangements, see Service Agreements later in this section.

Vision

There is no consolidated vision for civic facilities and assets at this point in time, though BIBS Facilities and CityFleet have developed their own bureau-specific vision statements. Based on these statements and other City language surrounding these particular assets, the following vision statement has been developed for civic facilities and assets for the purposes of this document:

City-owned buildings, facilities, vehicles, and apparatus allow City agencies to deliver essential services to the public.

The Office of Management and Finance's and BIBS Facilities' vision statements include aspirations to "demonstrate a commitment to the city's past, present, and future" through enduring form, resilient design, and the use of sustainable operational practices. Other vision language states that these structures "enhance a sense of comfort and beauty in Portland's built environment" and increase the usefulness of City programs by providing quality workplaces for City employees. CityFleet's vision, as stated in their Strategic Plan, is to serve as an "international model for equity and sustainability" and to offer services that illustrate the "power of forward-thinking leaders working together" through the management of City-owned vehicles and apparatus.

Mission and Levels of Service

Civic facilities and assets also lack a consolidated mission statement relevant to this document. Similar to the vision statements, there are a few bureau-specific mission statements that apply to the assets in this section. The following mission statement was developed for the purposes of this document, and is intended to incorporate bureau-specific language through the lens of civic facilities and assets:

Civic facilities and assets provide the infrastructure necessary for efficient and accountable delivery of public facilities and services. This infrastructure includes the buildings, facilities, vehicles, and apparatus that City employees utilize on a daily basis, as well as critical facilities that can be depended upon in the event of an emergency.

The City of Portland is committed to developing and maintaining high performance buildings that limit their environmental impact, contribute to Portland's civic character and make Portland a better place to

live and work. This interconnected system of buildings, facilities, vehicles, and apparatus is provided in a cost-effective manner to City and other municipal agencies. BIBS Facilities provides a wide range of preventative, regular, and demand maintenance services designed to ensure that City buildings stay functional throughout their maximum useful life cycle. CityFleet provides a similarly comprehensive range of services for the City's rolling stock of vehicles, offering acquisition and outfitting, fuel management, both preventative and regular maintenance, repair, and other fleet management services.

Services Provided

Most of the services related to civic facilities and assets are not provided directly to the general public. Nevertheless, these services support the everyday operations of nearly every City agency, and have a direct impact on the City's capacity to provide public services. These services include:

- The provision, management, and maintenance of office and special use space for City bureaus and employees;
- Life safety and emergency communications, coordination, prevention, and response services; and
- The procurement, storage, and maintenance of City-owned vehicles and apparatus.

Some of the services related to civic facilities and assets are provided more directly to the public. These include:

- Publicly-accessible facilities to facilitate payments, review development plans, and respond to other inquiries;
- Publicly-accessible spaces to facilitate participation in the government process;
- Publicly-accessible archival services for important historical records and documents; and
- The provision of spectator and performing arts facilities for sports, entertainment, the arts, and community events.

Service Area

For the most part, services related to civic facilities and assets are provided within the Urban Service Boundary (USB) of the City of Portland (see Figure 4.1 on p. 32). However, there are a few exceptions:

- CityFleet has entered into a variety of intergovernmental agreements, several of which involve service provision to organizations or agencies outside of the Portland USB.
- Spectator and performing arts facilities and Union Station are accessible to anyone and provide benefits to residents throughout the region.

Service Agreements

The majority of BIBS Facilities services are financed through interagency agreements (IAs) with City bureaus. There are also a number of intergovernmental agreements (IGAs) that allow City agencies to

provide their services to other entities. For instance, CityFleet uses IGAs to offer maintenance and repair services to Portland Public Schools, Multnomah County, and other public agencies.

Private contractors and other public entities (e.g. Metro) handle management and operations oversight for certain civic facilities and assets. These agreements can take the form of contracted service agreements, condominium lease agreements or partnerships, or more general arrangements to deliver services on an as-needed basis.

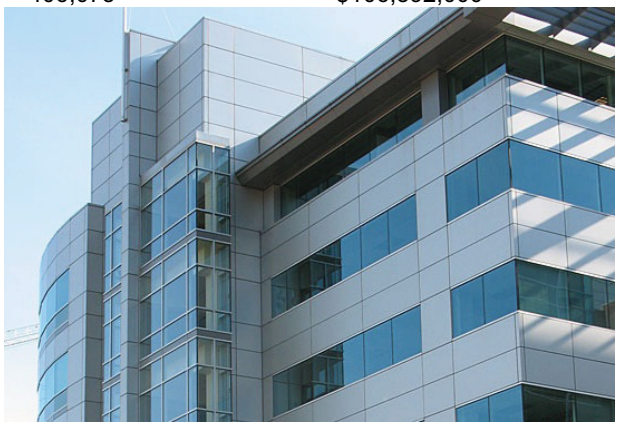
Other partnerships can arise as the City identifies the need for particular improvements or investments. This occurred when the City issued an RFI (Request for Information) for space to store historical records and documents. The identification of shared needs between the City and Portland State University (PSU) led to the eventual creation of the City of Portland Archives and Record Center on the PSU campus.

Inventory Summary

The Civic Facilities & Assets section includes a range of civic buildings, public facilities, vehicles, and equipment.

This collection includes the office buildings that house City bureaus and employees, such as the Portland Building, the 1900 Building, and City Hall. It includes other buildings for special uses like the Archives and Records Center, where important historical documents are kept, the 9-1-1 Center, where critical emergency communications systems are operated and maintained, the Kerby Garage, where City-owned vehicles are housed and serviced, and Union Station, Portland's passenger rail depot. It also includes spectator facilities for sports and entertainment like the Veterans Memorial Coliseum and Providence Park, as well as performing arts facilities such as the Arlene Schnitzer Concert Hall and other Portland'5 Centers for the Arts venues. Two City-owned parking facilities at the Rose Quarter are also included in the civic facilities and assets grouping. Please refer to Table 10.2 for more information about principal City-owned office buildings, Table 10.3 for asset groupings and replacement values, and Table 10.4 for the current condition of these assets.

Table 10.2 Principal City-owned Office Buildings

Building name	Address	Square Footage	Replacement value
Portland Building	1120 SW 5th Avenue	406,075	$106,392,000
			
1900 Building	1900 SW 4th Avenue	161,185	$41,747,000

City Hall	1221 SW 4th Avenue	87,500	$24,150,000

Table 10.3 Civic Facilities & Assets Groups and Replacement Values, 2013

Capital Asset class	Value (in millions)
Office buildings	$172.3
Other buildings	$69.3
PDC facilities	$48.7
Spectator facilities	$529.6
Performing arts facilities	$111.2
Total Civic Facilities & Assets	**$882.4**

Table 10.4 Current Condition: Civic Facilities & Assets System, 2013

	Current Condition (in %)						
Capital asset type	Very Good	Good	Fair	Poor	Very Poor	TBD	Confidence Level
Office buildings	0	38.2	61.8	0	0	0	4 - High
Other buildings	0	67.7	32.3	0	0	0	4 - High
PDC facilities	0	0	80	20	0	0	4 – High
Spectator facilities	0	36.7	0	63.3	0	0	3 - Moderate
Performing arts facilities	TBD	TBD	TBD	TBD	TBD	0	TBD*

* OMF is beginning to work with Metro/MERC on the status of performing arts facilities.

There are over 2,950 vehicles and pieces of equipment that also fall within to the category of civic facilities and assets through CityFleet, including motorcycles, passenger vehicles, vans, SUVs, pickups in various weights, police cars, dump trucks, loaders, trailers, vactors, and many other pieces of specialized equipment. Because vehicles are not considered “public facility assets” for the purposes of this plan, they are not included in the any of the asset groups described in the tables above.

Key Issues, Trends, Opportunities

De-centralized Property Management

At the current time, the City does not have a centralized property management function. This means that the maintenance and repair needs of City-owned buildings are sometimes assessed using different criteria and decision-making processes. Different bureaus have different levels of success in financing repairs or capital improvements, and the current process can force bureaus to compete with one another for the funding necessary to keep buildings well maintained and operating properly. This lack of integration also makes it more challenging to perform the citywide facilities assessments necessary for emergency response and disaster planning. A more integrated approach is needed in order to perform analysis and make investment decisions that result in cost savings, capitalize upon operational efficiencies, and maximize shared benefits across City agencies.

Investing in a Building's Life Cycle

Investments in public buildings need to account for maintenance and repair needs that accrue as time goes on. Investing in the full life cycle of a building maximizes the utility and cost-effectiveness of the public expenditure, while at the same time ensuring that City-owned buildings are safe and reliable.

Upfront investments in resilient, high-quality materials and systems can minimize repair costs and significantly extend a building's lifespan. Regularly allocating sufficient amounts of money for major maintenance and replacement reserves can fund repairs as needed, which also minimizes costs over time. These practices help to avoid unexpected expenses to replace major structural components – like roofs and support beams - and other building systems that impact the safety of Portland residents and City employees. Additionally, utilizing funds for ongoing preventative maintenance can help keep a wide range of building components in good condition for longer periods of time.

Diverse Funding Sources

While the majority of BIBS Facilities services are financed through IAs with City bureaus, other funding allocated for civic facilities and assets comes from different sources within Portland's public finance system. These different sources complicate the management and maintenance of civic facilities and assets because each source comes with different provisions about how funds can be spent. Revenue received for the use of one facility or asset category cannot be used for another facility or asset category. Similarly, debt financing for projects in one facility or asset category cannot be used for projects in another facility or asset category.

Changing Codes, Regulations, and Policies

City-owned facilities are constructed and maintained to meet a wide range of codes, policies, standards, and regulations. While codes and regulations stemming from the federal or state level take the form of mandates with specified consequences, other standards and policies serve as more general guidelines that demonstrate the City's commitment to issues like public art, sustainability, and equity. When any of these standards are changed or updated, it can require unanticipated expenditures to bring facilities up-to-date.

The changing regulatory and policy environment can make it difficult to plan for investments in civic facilities and assets, particularly at a time when innovations in building materials and technology continue to develop at a rapid pace. While new codes, regulations, and policies generally produce effective results and operational improvements, the financing necessary for these changes is often placed in direct competition with the funds available for other basic programmatic needs.

Innovations in Sustainability

Municipal services in Portland have become increasingly sophisticated, regularly changing to accommodate new technologies and evolving policy priorities.

For example, several innovative Green Fleet initiatives have been implemented in recent years to help the City meet current sustainability goals. These initiatives analyze City vehicles and pieces of equipment

to determine the optimal balance between functionality, fuel type, fuel consumption, and cost. CityFleet utilizes various strategies to realize this balance, offering a broad array of clean fuel technologies and low-emission vehicles to their customers.

Similar technological innovations for buildings, facilities, vehicles, and equipment will no doubt continue to develop in the coming years. The City will likely have several opportunities to capitalize upon these innovations to strengthen energy independence, decrease operating costs, and increase Portland's resilience to changes in the environment.

Regulatory Compliance

Though public facilities planning for civic facilities and assets is not mandated by the State of Oregon, other regulations, standards, and guidelines apply to the City's development, management, and maintenance of these assets. The following list highlights the most relevant of these regulations, standards, and guidelines, but is not intended to be a complete list:

- City of Portland's planning and zoning policies, plans, and regulations, including the **Comprehensive Plan, Zoning Code, and Zoning Map**, provide both guidelines and regulations related to wide array of topic such as land use, building mass and placement, parking and loading, and where applicable, required land use reviews. Portland's plans, policies, and regulations incorporate and are consistent with **regional, state, and federal planning requirements** such as Metro's Regional Framework Plan, Oregon's Statewide Planning Goals, and where applicable, the National Historic Preservation Act.
- A wide range of **building and development codes and regulations** are applied through the City of Portland's building permit and inspection processes, including requirements related to structural components, fire and life safety, accessibility, plumbing, electricity, heating and ventilation, and other issues related to development.
- The **Environmental Protection Agency (EPA)** implements several national regulations related to environmental health and greenhouse gas emissions that impact CityFleet.
- The **Americans with Disabilities Act (ADA)** addresses accessibility of public facilities and programs.
- The **Elevators division** of the Department of Administrative Services (DAS) is responsible for statewide elevator code development, interpretation, and enforcement.
- The **2007 Portland Fire Code**, which is based on the **2007 Oregon Fire Code** and the **International Fire Code (IFC)**, is implemented by the City of Portland Fire Marshall and provides

development and design guidelines to reduce loss of life and property due to fire.

- The **Oregon Department of Environmental Quality (DEQ)** is the State agency tasked with protecting the health and quality of Oregon's natural environment. Oregon DEQ implements a variety of regulations, including the discharge of pollutants and other hazardous materials, which impact vehicles, apparatus, and facilities used for fueling or de-icing.
- The **Oregon Occupational Health and Safety Division (OR-OSHA)** requires that buildings and facilities comply with statewide environmental controls related to safety, sanitation, and public health.
- The **Oregon Department of Public Safety Standards and Training** is responsible for security-related regulations when required for a project.
- **Leadership in Energy & Environmental Design (LEED)** certification standards are related to existing buildings and new construction.
- The **Department of Justice (DOJ) Community Policing Standards** and **Commission on Accreditation for Law Enforcement Agencies (CALEA)** provide standards for police facilities.

Investment Strategy

Unlike other City-owned infrastructure assets, civic facilities and assets are not related to the provision of a State-mandated public service – like water or sewer. Investment strategies in the Citywide Systems Plan are generally intended to eliminate service gaps and ensure service provision inside of city boundaries. However, an investment strategy for civic facilities and assets is not a required public facilities plan component.

At the current time, the City lacks a systematic method to quantify these needs for civic facilities and assets. As a result, the needs and improvements identified in this section were not informed by a detailed assessment of how to bring the system's current capacity to a level that can support future development patterns. Instead, this strategy is primarily oriented around improving the current investment process, highlighting some planned and recently completed projects.

Process

Investments in capital improvements for civic facilities and assets seldom result from a linear decision-making process. While there are annual inspections and reviews that provide a foundation for these investment decisions, they are usually made in a less predictable, more opportunistic manner based on funding availability or shared interests among bureaus and other agencies.

The need for a capital investment can be determined based on a comparison between the current operational needs of the primary user and the capacity of the facility or asset. For example, the Kerby Garage facility, originally built as a stable for the City's equestrian division, does not have sufficient capacity to accommodate CityFleet's current facility needs.

Once an individual agency need is recognized, common needs can be identified between City agencies. For example, if one bureau is looking to expand, and another bureau is holding surplus property nearby,

partnerships can be formed to move forward with the expansion in a way that maximizes benefits for each party.

In other instances, City agencies find opportunities to meet their needs by joining with other agencies on previously planned projects. These resourceful partnerships have become an important tool for City agencies seeking funding when available resources are limited. Not only can partnerships allow more parties to benefit from a public expenditure, but they can also help avoid situations where one bureau is competing with another for funding. This approach also allows bureaus to work together to identify applicable goals and policies, consider current City Council priorities, and ultimately present an actionable proposal for Council approval.

Planned Projects and Improvements

BIBS Facilities and OMF are continually pursuing new projects and improvements to increase their capacity to address facility needs and facilitate the delivery of public services. Notable amongst these planned projects is a scheduled renovation of the 9-1-1 Center – sometimes referred to as the Portland Communications Center.

9-1-1 Center

BIBS Facilities is currently working with BOEC to upgrade the existing 9-1-1 Center. While renovation planning is still underway, the project is intended to address current facility needs that include leaks in the roof structure and an ineffective HVAC system.

This renovation will likely face significant logistical challenges due to the fact that the City's emergency response operations and equipment will need to remain functional on a 24-7 basis throughout the duration of construction. It could be costly, time-intensive, and inefficient to temporarily relocate these operations and equipment while the facility is being upgraded. However, it will be critical to retain emergency communications services at all times to ensure public safety and citywide emergency preparedness. The Emergency Response section includes more information about planned projects and recommended improvements related to other emergency response infrastructure.

Recent Projects

BIBS Facilities seeks to maintain and improve civic facilities and assets through their property management and facility planning services. These efforts vary in complexity from the construction of entirely new, state-of-the-art facilities to everyday maintenance and repair for existing facilities. A notable recent project is the construction of the Emergency Coordination Center (ECC), which was completed in January 2014.

Emergency Coordination Center (ECC)

The ECC project arose in order to address needs within the City's provision of emergency response services. The facility was designed to equip tenants with more space to provide emergency coordination services, a larger parking lot to accommodate standby emergency vehicles, and a 150-foot telecommunications tower. The $19.8 million facility was financed through a multi-agency partnership,

and is now occupied by the Portland Bureau of Emergency Management and the Portland Water Bureau's Emergency Management and Security offices.

The facility, located on SE Bush Street and SE 99th Avenue, is connected to the existing building for the 9-1-1 Center to facilitate co-location with BOEC. The ECC acts as a nexus for citywide coordination in the event of an emergency, with several design features and building systems included to ensure continuity of operations with or without access to primary sources of energy or communications technology. The Emergency Response section includes additional information about the Portland Bureau of Emergency Management, the Bureau of Emergency Communications, and the City's emergency response infrastructure.

Major Needs & Recommended Improvements

The following sections highlight a few significant projects and procedural changes that will impact the investment strategy for civic facilities and assets. The Buildings and Assets section describes buildings that have received a great deal of public attention due to pressing maintenance and repair needs, and explains the current status of efforts to improve these facilities. The Process and Management section describes other important needs that are not necessarily tied to an individual building or project, and identifies ways to improve decision-making processes for investments in this set of assets.

Buildings & Assets

Many of Portland's most prominent buildings and facilities are showing the impact of deferred maintenance. The following buildings and assets are in need of significant attention to maintain their viability for the coming twenty-year planning horizon.

The Portland Building

The Portland Building is a fifteen-story office building that houses several municipal agencies and departments, including the Bureau of Environmental Services, the Portland Bureau of Transportation, Portland Parks and Recreation, the Portland Water Bureau, and OMF.

The building, opened in 1982, is renowned for its status as the world's first major postmodern work of architecture, and was placed on the National Register of Historic Places in 2011. Many structural components and operating systems are in need of repair. A recent assessment by BIBS Facilities included an initial estimate of $95 million for one potential renovation option for the Portland Building. Though demolition and redevelopment scenarios are being considered, the future of the building remains uncertain.

Veterans Memorial Coliseum

The Veterans Memorial Coliseum (VMC) has a capacity of almost 10,000 seats and currently hosts over 100 events per year. The facility opened in 1960 and many building components are now in need of repair due to years of underfunded major maintenance and inadequate replacement reserves. Needs include the repair or replacement of structural components of the building's rectangular shell and roof, inefficient heating systems, and a lack of ventilation to accommodate cooking at concession stands.

The VMC has a celebrated history; it was dedicated to veterans of all wars when it opened, and was placed on the National Register of Historic Places in September 2009. Several alternate uses and renovation ideas have been proposed for the facility in recent years. An extensive community engagement process and years of planning for a catalytic investment project were placed on hiatus in 2012 when plans did not move forward. The City is currently planning for the future of the facility.

Performing Arts Facilities

The Portland'5 Centers for the Arts offers five venues in three City-owned facilities[3], providing arts and entertainment to the entire region. The collection of facilities comprises the 5th largest performing arts

[3] The Portland'5 Centers for the Arts includes the Arlene Schnitzer Concert Hall, the Keller Auditorium, and the Antoinette Hatfield Hall which is home to the Brunish, Newmark, and Winningstad Theaters.

center in the country. These facilities bring over 1,000 music, theater, dance, and lecture performances to Portland every year, generating an annual average of $60 million dollars[4] in regional spending.

These buildings are owned by the City, with Metro handling operational oversight and management responsibilities. At the current time, many unknowns remain regarding the facilities' needs and funding sources for major systems replacements and building upgrades.

Westside Emergency Response Center

The former SFC. Jerome F. Sears U.S. Army Reserve Center was acquired by the City through the Federal Base Realignment and Closure process. The location and size of the property make it suitable as an emergency response staging facility on the west side of the Willamette River, particularly because most of the City's emergency response equipment and offices are currently located on the east side. A facility at this site could serve the operational needs of Portland Fire and Rescue and the Portland Police Bureau, and play an integral role in any coordinated citywide emergency response strategy.

The building, originally built in the 1950s, would need to be brought up to current building standards in order to properly function as a backup staging center, de-icing facility and fueling station. The future use of the facility is uncertain. Efforts to complete necessary zoning changes are moving forward, as is the identification of funding for the full range of improvements required for City occupation. In total this work is estimated to cost approximately $11 to $12 million.

Process and Management

There are other pressing needs that extend beyond an individual building or facility. The following topics reflect needs regarding the process of planning, managing, maintaining, and repairing civic facilities and assets.

Major Maintenance and Replacements

BIBS Facilities collects a major maintenance and replacements reserve fund through its rental rates on all managed properties. The acknowledged industry standard is to build 3% of a building's replacement value into the rental rates to fund these reserves on an annual basis. Currently, the City has built in approximately 1.2% of replacement value into rental rates for facilities owned by OMF.

Collecting less than the industry standard for reserve funding has led to a significant cumulative funding gap for major maintenance and replacements. Similar challenges are shared by other property-owning bureaus, many of which lack funding strategies. A system-wide review could better assess current funding strategies and prioritize investments to provide more reliable sources of funding for major maintenance reserves.

[4] Portland Center for the Performing Arts (now called Portland'5 Centers for the Arts), 2011-2012 Annual Report.

Holistic Facilities Planning

There is no existing, coordinated plan to prioritize and evaluate investments in civic facilities and assets. Major facility projects and capital improvements are typically implemented on an ad-hoc basis, with annual investment decisions often tied to a bureau's budget proposal. The result is a segregated approach that does not maximize the efficiencies of making investments that provide mutual benefits to multiple City agencies. This approach also does not capitalize on the capacity for coordination that already exists between bureaus to develop opportunistic partnerships for underfunded projects.

A more comprehensive, integrated facilities planning approach for all City-owned or City-managed facilities could be beneficial. While individual agencies currently do their own internal strategic planning, these approaches could be analyzed across bureaus in order to assess facilities needs more thoroughly on a City-wide scale. With participation from agency representatives, facilities needs could be more effectively and efficiently addressed across the board.

Improving Asset Management

The City's existing asset management process provides a methodology for assessing the condition of assets in relatively broad terms – "very good", "good", "fair", "poor", and "very poor". While it is helpful to understand the condition of assets using these categories, a greater level of detail is needed to more substantially inform decision making.

In collaboration with the City Asset Managers Group, BIBS Facilities has been working to update and improve the Facilities Condition Assessment used for civic assets and facilities. This more detailed approach to facility assessment will be available to all City infrastructure bureaus. This effort may strengthen the asset management foundation, better facilitate inter-bureau coordination for projects and improvements, and enhance the information available about facility needs throughout the city.

Financial Strategy

Financial strategies in the Citywide Systems Plan are normally intended to address the needs and recommendations identified in the investment strategy. For instance, if the investment strategy points out the need for a new road, the financial strategy is supposed to define ways to finance it. There is no State requirement to provide a financial strategy for civic facilities and assets. In addition, because needs and recommendations for civic facilities and assets aren't currently able to be analyzed at this level of detail, it is difficult to present a corresponding financial strategy. Without the capacity to evaluate required levels of service and develop a project list that will help accommodate those levels of service, financial planning for civic facilities and assets is primarily responsive and opportunistic.

The Sources of Revenue section describes significant sources of funding for each type of asset. The Financial Challenges section identifies funding gaps and other financial issues that affect these assets. Future efforts to develop a financial strategy could use this information as a starting point, as these challenges will need to be addressed in order for any strategy to be successfully implemented.

Sources of Revenue

The operations of BIBS Facilities depend largely upon revenue collected through rental rates. Historically, the City has tried to limit rental rate increases to prevent potential cuts to services.

Major maintenance money for most City-owned office buildings, maintenance facilities, the 9-1-1 Center, and the Archives and Records Center comes out of rental rate revenue. Rental rates account for the full spectrum of services offered by BIBS Facilities, including overhead costs and other non-billable time. Major maintenance money is also gathered through net income from Union Station, a Portland Development Commission facility managed by the City, a portion of which is used to fund improvements at that facility. Most of these agreements are negotiated through either IAs between City agencies or IGAs between a City agency and another public agency.

CityFleet operates similarly to a private business, billing their customers for services rendered using burdened labor rates, parts, and fuel charges – all charges that include overhead costs.

Major projects and capital improvements for civic facilities and assets are sometimes financed through long-term financing. Bonds, loans or lines of credit can be used to provide funds for a project that cannot otherwise be paid for through the existing resources of the City's General Fund or- rates paid to bureaus for services. General obligation bond measures can be placed on voter ballots, and if approved create a new property tax that supports a reliable, low-interest form of financing for public projects. Taxpayers then fund the resulting annual debt service. Capital improvements and major projects can also be funded through other forms of debt financing supported by resources other than voter-approved property taxes.

Financial Challenges

The City uses an asset management approach to document the condition of its property and make informed investment decisions. The financial condition of these assets is primarily indicated by their annual funding gaps; where noted, a one-time funding gap is used (see Table 10.5).

Table 10.5 Civic Facilities & Assets annual funding gaps, 2013

	Value (in millions)				
Capital asset type	**R/R/R**	**Mandate**	**Capacity**	**Total**	**Confidence level**
Office buildings	$2.2	$0.0	$0.0	$2.2	4 – High
Other buildings	$1.3	$0.0	$0.0	$1.3	4 – High
PDC facilities	NA	NA	NA	NA	4 – High
Spectator facilities *	NA	NA	NA	NA	4 – High
Performing arts facilities **	TBD	TBD	TBD	TBD	TBD
Total for Civic Facilities & Assets	$3.5	$0.0	$0.0	**$3.5**	

R/R/R (Repair, Rehabilitation, Replacement): Additional funding necessary to repair, rehabilitate and replace existing assets to bring them up to established service levels, or replace assets considered functionally obsolete (not meeting those service levels).

Mandate: Additional funding necessary to improve existing assets to meet regulatory requirements, exclusive of improvements that fall under R/R/R or capacity.

Capacity: Additional funding necessary to address existing inequities and deficiencies in levels of service for current customers and citizens.

* Spectator facilities fund gaps are of a one-time nature: $35M for reserves funding.

** OMF is beginning to work with Metro/MERC on the status of performing arts facilities.

For assets in the "office buildings" and "other buildings" groups, this funding gap is calculated by determining the annual difference between what is collected in rental rates[5] or set aside from net income for major maintenance and the industry standard of 3 percent of replacement value. The Office of Management and Finance is currently only able to reinvest about 1.2 percent of the replacement value of these civic facilities and assets on an annual basis. The level of reinvestment in major maintenance has declined in recent years, due to rapidly escalating costs to replace buildings (above regular inflation), the increase in the number of new facilities, and rate reductions to meet the declining resources of users of civic facilities and assets.

The funding gap created by this 1.2 percent of replacement value reinvestment will not allow OMF to cover major maintenance and replacement needs for civic facilities and assets for the next five years, with many projects being pushed back beyond this timeframe. Regardless, this is not a severe enough funding gap to force a decrease in the overall condition of individual assets from their current broad designations as either "good", "fair" or "poor" within a 10-year planning horizon. Since the likelihood of rental rate increases is low, funding for major maintenance should be increased. One way to reduce the funding gap is to direct savings from efficiency improvements to major maintenance reserves.

For spectator facilities and Union Station, the funding gap is noted as the one-time difference between actual fund reserves for capital maintenance and estimated costs to address the deferred maintenance at Veterans Memorial Coliseum and Union Station. For Union Station, the best resource for addressing maintenance needs are grant funds. Recently grant funds have been used mainly for the roof structure, which is the facility's most pressing need.

[5] Rental rate increases for City facilities are limited to CPI, though there may be cost element factors that are in excess of CPI.

TECHNOLOGY SYSTEMS

Introduction

Technology systems come in a multitude of forms, with a range encompassing computer hardware and software, voicemail systems, video systems, microwave radio systems and other radio equipment, and transmission towers.

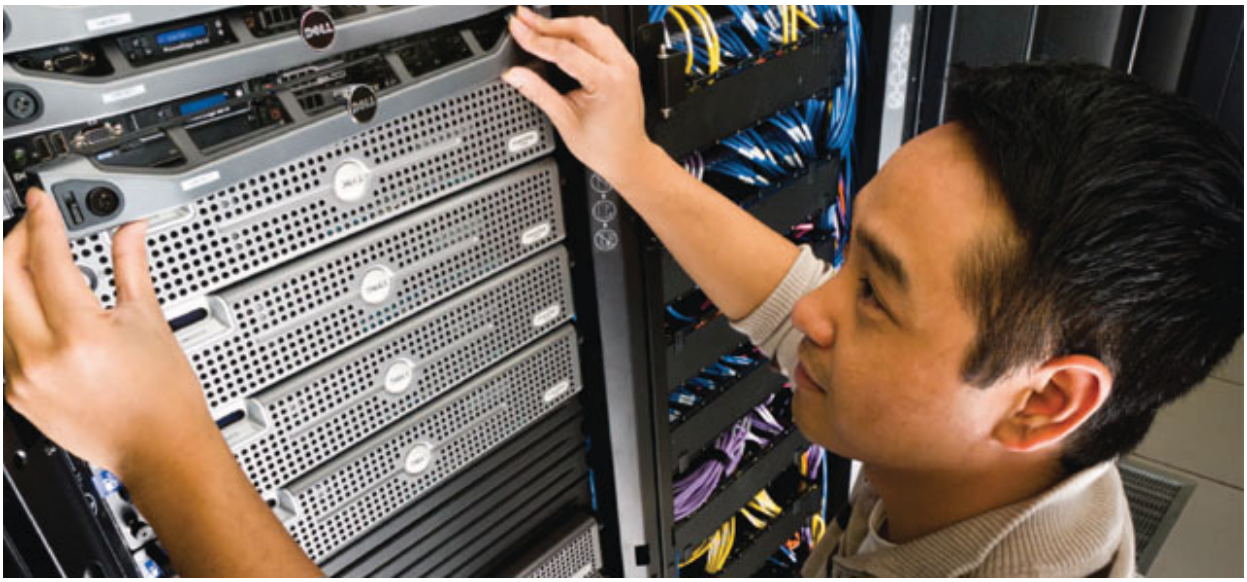
These systems have a direct impact upon nearly every City agency's ability to provide services ranging from routine correspondence to emergency response. They enable City agencies to operate more efficiently, with many bureaus relying on sophisticated modeling software, monitoring systems, and databases for construction permitting, land use planning, spatial analysis, and a variety of administrative processes. Reliable, innovative technology systems play a critical role in Portland's status as a resilient, prosperous, modern city, with many predicting that the importance of these systems will only continue to increase throughout the Comprehensive Plan's twenty-year planning horizon.

It can be challenging to analyze these systems using language and concepts associated with more traditional infrastructure systems. The operational capacity of technology and its potential to impact services is constantly in flux, which makes it difficult to measure performance and conduct meaningful long-range planning. When the original Comprehensive Plan was drafted in the late 1980s it would have been impossible to predict the form and magnitude of change that the internet and other corporate software applications would affect. Because the pace of technological innovation is continuing to accelerate, the future is likely to bring several opportunities for the City to consider new and potentially groundbreaking technologies.

Many City bureaus are capitalizing on opportunities to invest in and utilize innovative technology systems, including cloud computing, interactive mapping applications, and mobile payment systems to streamline operations. Though these technologies may become outdated in the coming years, there will be emerging opportunities for the City to benefit from the evolving technological landscape within the twenty-year planning horizon.

Technology systems within the City of Portland are primarily handled by the Bureau of Technology Services (BTS). The Bureau of Technology Services is tasked with providing management, policy setting, strategic planning, and leadership in the use of computer, radio, and telecommunications technologies for the City. Other City bureaus own or manage specialized technology based assets, particularly computer software. While not the focus of this section, these non-BTS technologies are critical to the City's ability to deliver services. For example, SAP, the City's centralized financial and administrative business software, is integral many City functions.

This section begins with mission and vision statements from BTS, then discusses how technology systems impact an array of City services and programs. The section identifies some trends, issues, opportunities, major needs and associated recommendations for technology systems. It concludes with a brief discussion of the investment process and financial strategy currently utilized by BTS and the Office of Management and Finance (OMF) for City-owned technology assets.



Vision

There is no consolidated vision for technology systems at this point in time, though BTS has developed their own bureau-specific vision statements. Based on these statements, the following vision statement has been developed for technology systems for the purposes of this document:

The City of Portland's technology systems provide forward-thinking solutions for local government. They enable members of the public to engage with City agencies and programs, and help to facilitate a two-way dialogue between residents and government officials. The Bureau of Technology Services aims to be a recognized leader in municipal technology systems, and a valued strategic partner to public- and private-sector efforts that support innovative and resilient technology investments across the city.

In addition, the Corporate Geographic Information Systems program at BTS has a stated vision to "enable superior decision making by providing the highest quality geospatial information to all, anytime, anyplace, and on any platform, in order to provide the highest level of City services".

Mission

Technology systems also lack a consolidated mission statement relevant to this document. Similar to the vision statements, there are a few bureau-specific mission statements that apply to the assets in this section. The following mission statement was developed for the purposes of this document, and is intended to incorporate bureau-specific language through the lens of technology systems:

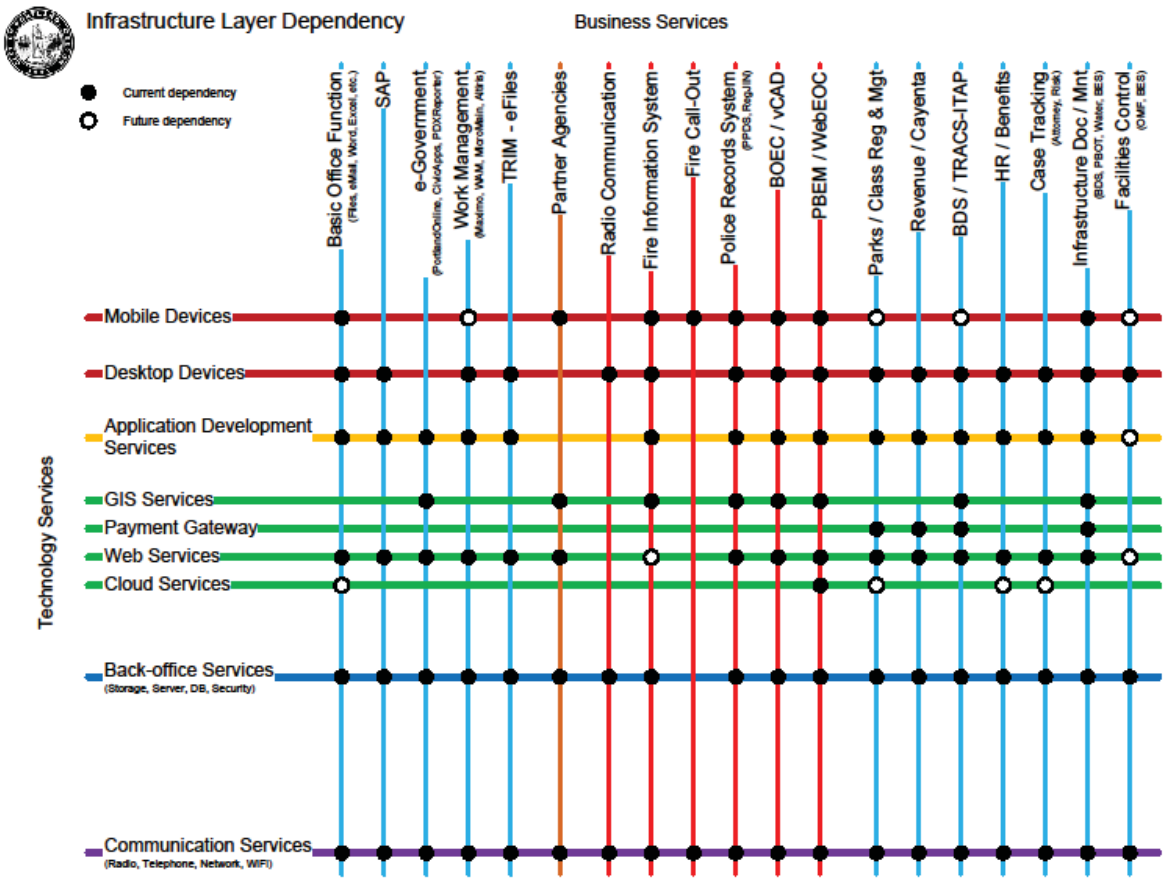
The Bureau of Technology Services provides innovative, reliable, and secure technology services and strategic leadership in alignment with the needs of the City of Portland, the public, and regional partners. Individual services provided by BTS support the City's goal to deliver efficient, effective, and accountable municipal services, as well as OMF's goal to maximize the cost effective use of technology. These services maintain a world class production technology environment, support mission critical voice and data communications needs, and employ appropriate safeguards required in order to protect the City's information assets.

The Corporate Geographic Information Systems program at BTS also has a mission to "improve the delivery of City services to the public by providing strategic geospatial technology and services that promote informed decision making, foster collaborative partnerships, and enable access to data wherever it is needed".

Services Provided

The City's major technology systems are all integrated to a significant extent (see Figure 10.2). This means that operations for most BTS technology systems are dependent upon access to other BTS systems, and all systems within this matrix are important for everyday service provision. This matrix of systems has a very broad influence on public service provision, and this influence will continue to expand during the next twenty years.

Figure 10.2 Technology Systems Service Dependency Grid



Technology systems allow City bureaus to perform the wide array of services that rely upon the use of technology. Services provided and impacted by technology systems include:

- Communications services, including telephony;
- Life safety and emergency communications, coordination, prevention, and response services;
- Water provision, transportation services, and nearly every other public service described elsewhere in the Citywide Systems Plan;
- Public access to City websites and internet databases;
- Internal business services;
- Digital archives and data storage services; and
- The ability to take payment for services using credit or debit cards.

Levels of Service

The Bureau of Technology Services uses a long list of performance metrics to assess service provision. The Bureau of Technology Services is not subject to State comprehensive planning requirements to meet any specific service levels. A few key metrics related to public services include.

- The percentage of time Radio Systems operated without failure;
- The average number of unique visitors per day to PortlandOnline;
- The average number of maps per day viewed through PortlandMaps;
- Customer service satisfaction ratings;
- Payment gateway availability; and
- Mission critical communications and production systems availability.

In addition, BTS has several performance metrics for services provided internally to other City bureaus or employees. These include metrics related to support call response times, information security, time spent deploying new software or hardware, and the percentage of time that internet service is available to City staff members.

Service Area

Physical boundaries are less relevant to technology systems than other citywide systems, because much of this technology is either mobile or accessible from remote locations. Most of the technology systems supported by BTS are primarily for the use of the City of Portland and are primarily used within the municipal boundaries as defined by the City's urban growth boundary. However, some of them, including some public safety systems such as Computer-Aided Dispatch and the radio system, are also used by agencies outside of City boundaries.

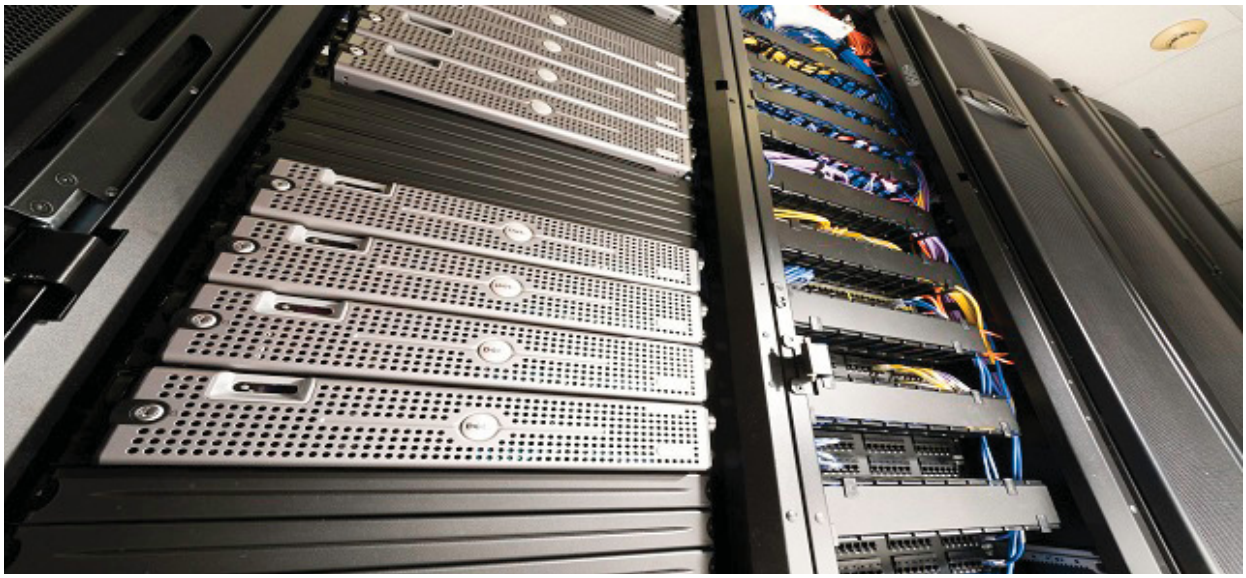
Other technology systems are used by City agencies outside of city boundaries to support City needs. For instance, the Portland Water Bureau utilizes BTS hardware and software at the Bull Run Reservoir site to support watershed operations. Future years may also bring about other reasons to maintain facilities

outside of city boundaries to serve needs in Portland – including redundant data centers located remotely to ensure access to important private data servers in the event of an emergency.

Service Agreements

The Bureau of Technology Services has interagency agreements (IAs) with nearly every City bureau. Funds received through IAs are deposited into the Technology Services Fund, an internal service fund that can only be funded through this source. Interagency charges are designed to approximate the cost of the services consumed by the service receivers. These IAs comprise the bulk of the funding for the services BTS provides, and as such most BTS services are provided internally to other City bureaus.

The Bureau of Technology Services also provides services to other agencies and jurisdictions through intergovernmental agreements (IGAs). Intergovernmental services range from 800 MHz simulcast and trucking radio services, to use of the City's Integrated Regional Networking Enterprise system, to site usage at communications tower locations. The Bureau of Technology Services has negotiated IGAs with organizations including Metro, Tri-Met, Oregon Health and Sciences University, David Douglas School District, and the City of Lake Oswego – among others.



Inventory Summary

Components of technology systems include many different types of assets, ranging from obsolete to newer and more cutting edge equipment. This technology comes in a multitude of forms, with a range encompassing computer hardware and software, voicemail systems, video systems, microwave radio systems and other radio equipment, and transmission towers. See Table 10.6 for more information about technology system groups and replacement values.

Table 10.6 Technology Systems Groups and Replacement Values, 2013

Capital Asset class		Value (in millions)
BTS:	Communications	$70.8
	Production services	$2.8
	Strategic technology	$6.2
Other bureaus:	Equipment and software	$8.2
	Strategic technology	$93.8
Total Technology Systems		**$181.8**

Table 10.7 provides information about the current condition of technology systems. The condition ratings for these asset groups are based on current age and expected useful life cycle. Condition here is expressed as a percentage of assets, with systems that are considered to be obsolete included in the "poor" condition rating.

Table 10.7 Current Condition of Technology Systems

		Current Condition (in %)						
Technology systems by capital asset type		Very Good	Good	Fair	Poor	Very Poor	TBD	Confidence Level
BTS:	Communications	0	97	3	0	0	0	4 - High
	Production services	0	77	23	0	0	0	4 - High
	Strategic technology	0	84	16	0	0	0	4 - High
Other bureaus:	Equipment and software	0	100	0	0	0	0	4 - High
	Strategic technology	0	88	12	0	0	0	4 - High

The following paragraphs describe and provide examples to clarify each major grouping of technology systems assets.

Communications assets owned by BTS include data networks, the Integrated Regional Networking Enterprise telecommunications system, certain transmission towers, and the City's 800 MHz radio system. These assets facilitate effective and reliable communication between City employees and agencies. For example, the City's 800 MHz Radio System is used by a number of public safety agencies to coordinate emergency response and other critical communications.

Production services technology owned by BTS includes both virtual and physical servers, the City's email system and storage area networks, application servers, and backup system hardware and software. These assets store data and facilitate internal communications within the City of Portland. For example, the City's collection of servers houses software that provides database services to a large number of computers and other computer programs. These servers help display requested data for users within the City network, and perform data analysis and storage tasks necessary for managing large amounts of digital information.

Strategic technology owned by BTS includes both hardware and software for corporate applications such as E-Gov, E-Commerce, and Geographic Information Systems. This asset group also includes information security technology in the form of both hardware and software. Information security

technology is used to ensure continued functionality of the City's technology systems and to keep sensitive information or private data safe from viruses and other internet security threats. A good example of this would be the virus scan software installed on City-owned computers, which ensures that data or programs downloaded from the internet are safe and free of viruses.

Equipment and software owned by other bureaus, such as video systems, certain radio equipment, bureau PCs, and bureau laptops, facilitates access to technology services within individual City agencies, connecting City employees with the array of technology systems listed above. For example, email systems and strategic corporate applications can only be used by City agencies if they have PCs and

laptops equipped to handle those functions.

Strategic technology owned by other bureaus includes corporate applications such as Computer-Aided Dispatch; the Portland Police Data System; the Customer Information System; and the Tracking, Review, Application and Construction System (TRACS). These applications help City agencies provide services by making information more accessible and streamlining administrative processes. For instance, TRACS helps the Bureau of Development Services assess permit requests and review construction plans for proposed projects. This also benefits builders and developers by tracking information on projects, reducing the amount of time spent on permitting processes, and reducing the number of trips to the Permit Center.

Key Issues, Trends, Opportunities

Constantly Evolving Technologies with Limited Lifespans

Technology of all types has a limited life span. At present, the increasing availability of high speed internet connections, open source code, "app stores", cloud computing resources, and the increasing availability of good quality mobile devices with internet access are major influencers of technology. These

drivers and influencers of technology will continue to evolve rapidly and can be expected to change significantly in short periods of time.

When technology exceeds its lifespan a variety of problems can occur, including failures, inability to maintain, inability to upgrade, and other problems. The City currently has a material investment in older technology that must continue to be maintained while other technology is evolving rapidly. It will continue to be a challenge to maintain important legacy systems while at the same time researching, adopting and implementing new technologies needed by the City in order to keep pace with the needs of Portlanders over the next twenty years.

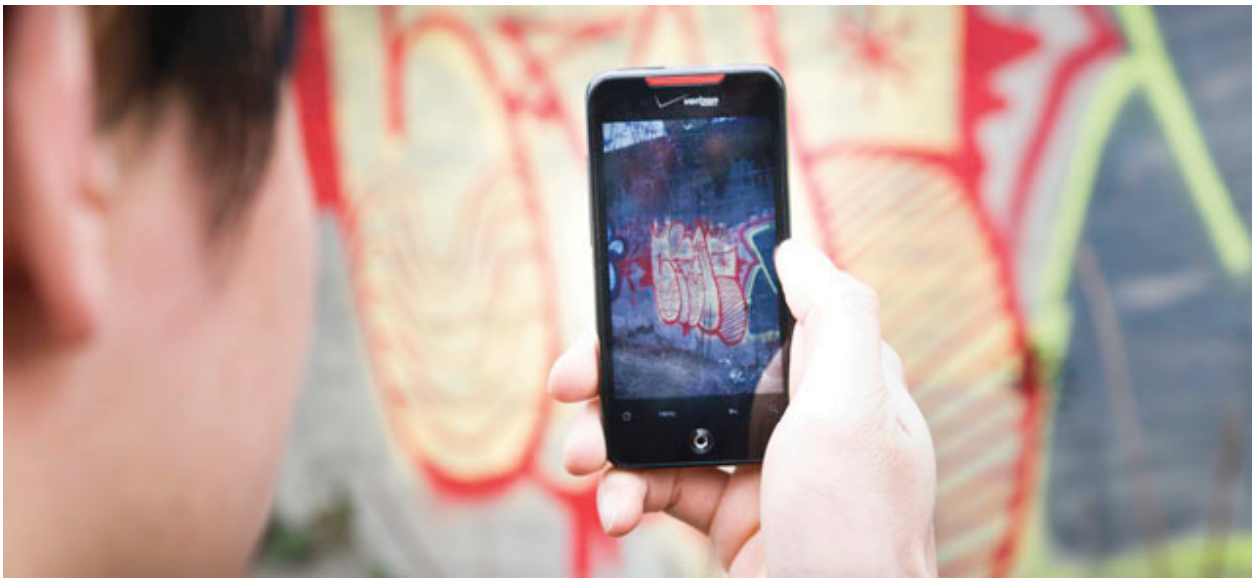
Cloud Computing

Recent years have seen a rise in the popularity of services such as servers, storage, and applications being delivered through the Internet. Commonly referred to as cloud computing, this development presents an opportunity to use resources more efficiently and reduce costs for City bureaus. The City has already started utilizing cloud technologies to a limited extent, with a future deployment of the cloud-based Office 365 software planned for all City bureaus.

If implemented properly, cloud computing has the potential to improve and streamline City operations. However, there are potential pitfalls that come along with storing private or sensitive government information on the internet. As with many technologies, the City has to balance the potential for operational efficiency with a need for the highest level of information security for private data.

Mobile Computing and a Mobile Workforce

Mobile computing has allowed citizens and employees to use technology tools virtually anytime and anywhere without the need to be in a certain location – such as an office. This technology is already making it possible for City employees who work in the field to use mobile tools to allow them to work more efficiently. It also presents opportunities to explore different office space arrangements that would allow City employees to work remotely on a more regular basis, as appropriate.



Consumerization of Technology

Employees and citizens own a variety of technology tools, such as smartphones and tablets, and many people expect to be able to use them when interacting with the City to obtain information or pay for services. This consumerization of technology presents an opportunity to allow the use of personal technology where it supports the City's mission, while making certain that City systems are protected from viruses and malware.

"The Internet of Things"

Another emerging technology trend is "the internet of things" where devices and machines communicate via the internet without the intervention of humans. These devices can sense aspects of the real world, like temperature, location, pressure, fluid levels, and other key indicators, assess that data, and act according to program needs. One example is the driverless car technology being developed by Google and other companies. This technology could be used by a pump programed to assess water levels and turn on when reach a certain height was reached to activate drainage at that location

These capabilities are an emerging driver in the technology field, and it is likely that vendors will start to provide the City with solutions informed by this concept in the near future. Though this technology might seem outdated by the end of the twenty-year planning horizon for the Citywide Systems Plan, it could have a large influence on future technology decisions within the City.

Regulatory Compliance

Though technology systems do not have to comply with quite as many regulations and restrictions as other infrastructure systems, there are still a few relevant standards and guidelines that impact BTS services:

- The use of payment cards (debit and credit cards) is overseen by the Payment Card Industry (PCI) group. This results in periodic audits to evaluate the safeguards applied to the handling of this data in order to prevent identity theft and other misuse. The City processes over 130 million payment card transactions annually.
- The City adheres to the guidelines of the Health Insurance Portability and Accountability Act (HIPAA) which outlines privacy rules for information about an individual's health.
- Certain data, such as law enforcement data, medical data and personally identifiable information (e.g. Social Security numbers) requires a high level of confidentiality. Steps are taken to ensure the proper access to these data.

Investment Strategy

Technology systems require strategic investments in order to stay current with a constantly progressing technological landscape. The City's asset management practices, as well as other internal working groups, have developed a few guidelines and recommendations to inform these investments. These longer-term strategies are often supplemented by flexibility in the short-term, with other more incremental

decisions being made along the way to capitalize on strategic opportunities or recent technological advancements.

Process

Five-year maintenance and replacement plans for technology systems are prepared through OMF's Asset Management program. These plans are produced by BTS staff responsible for asset management, and are refined by a management review group. Priority is given to items that support public safety, improve reliability and availability of critical data systems, and improve efficiency and reduce costs through the consolidation of infrastructure. The Bureau of Technology Services also recently embarked upon a Citywide Technology Assessment, which has resulted in additional recommendations to strengthen the City's technology investment and decision-making processes.

The Bureau of Technology Services currently employs a formal intake process when new work is identified. This practice is supplemented by the use of portfolio management software, which provides a comprehensive picture of the entire BTS work queue as well as the demands the project is anticipated to have on City resources. Major influencers for short-term decisions include the urgency of the need, the availability of funding, the presence of executive support, and the capacity for revenue generation. Certain large technology projects are overseen by the Technology Oversight Committee (TOC), where citizen members review the projects, ask questions, and provide suggestions. TOC reports are also shared periodically by the Chief Administrative Officer with City Council.

Recent and Ongoing Projects

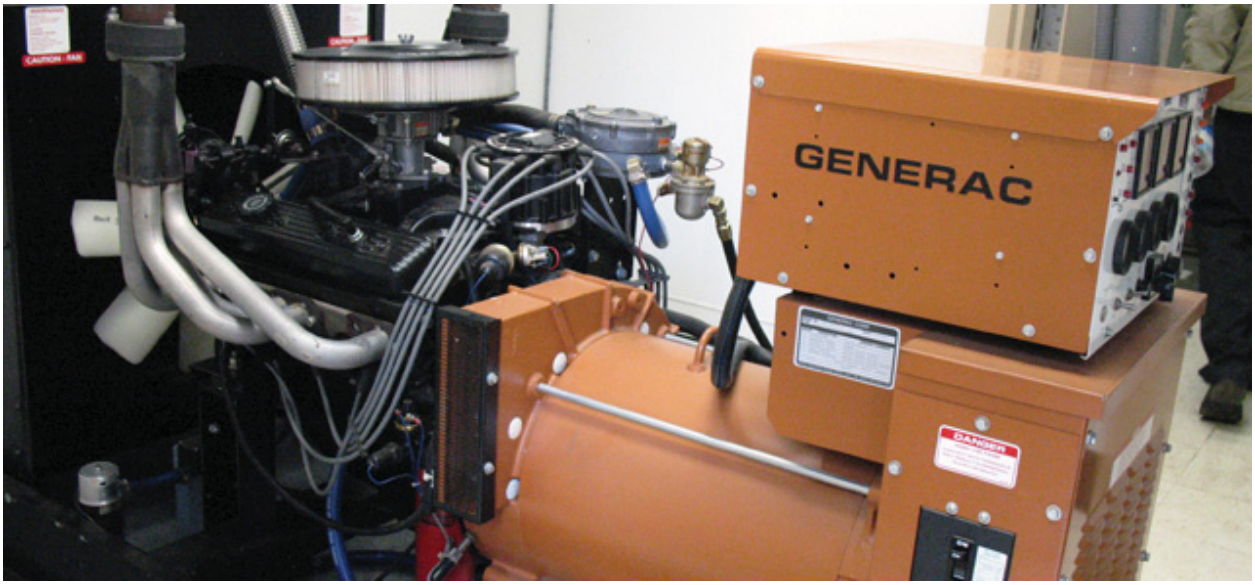
The Bureau of Technology Services is continually implementing any number of projects that aim to provide solutions through technology systems for both City staff and the general public. Recently completed projects include the deployment of Windows 7. Current projects include the deployment of Office 365 and the implementation of the Public Safety Systems Revitalization Project.

Windows 7 & Office 365

The Bureau of Technology Services is currently finishing the deployment of the Windows 7 operating system for all City bureaus. In addition, Office 365, the online version of Microsoft's office suite, is in the process of being deployed citywide.

Public Safety Systems Revitalization Project (PSSRP)

The Office of Management and Finance has established a multi-bureau committee to address the replacement of major public safety technology systems including the 800 MHz radio system, Computer-Aided Dispatch for the Bureau of Emergency Communications, and Portland Police Data System. This work, called the Public Safety Systems Revitalization Project (PSSRP), is addressing funding, governance, coordination, timing, and other issues related to the replacement of these major technology systems.



Planned Projects and Improvements

There are several other projects that are expected to be completed in the next five to ten years. Some of these anticipated projects include replacements of portions of the City's Integrated Regional Networking Enterprise system, production services assets such as storage area networks and servers, and various strategic corporate applications. For instance, the Portland Police Data System is planned to be replaced by a new system called RegJIN by Spring 2015. Additionally, if the 311 Call Center (see p. 347) moves forward it is likely to include a significant technology component.

Major Needs & Recommended Improvements

The following section highlights some projects and procedural changes that would be in alignment with the investment strategy for technology systems. These include expanded system performance metrics; the adoption of an integrated, inclusive decision-making process; and improved disaster recovery planning for technology.

Expanded System Performance Metrics

The Bureau of Technology Services measures both the performance of selected systems and customer experience. There is a need to measure additional characteristics of system performance, such as energy use, in order to find opportunities for additional efficiencies, Measuring system performance can also help to inform strategic planning and decisions about the purchase of new or replacement technology.

In addition, metrics can provide guidance about system and network load and sizing, thus helping to determine whether the components are the right fit for the work load. This information is useful when expanding or replacing the system. Data centers are notoriously heavy consumers of electricity, which is needed to run technology equipment and to manage temperature and humidity. Expanded system monitoring and performance metrics could provide more precise information about energy consumption and energy savings as changes are made to improve efficiency.

Integrated, Inclusive Decision-Making Process

The City could benefit from a more robust methodology to evaluate the costs and benefits of proposed technology investments before they are approved. This could lead to better assessments of each requested technology systems project by considering factors such as life-cycle cost, which identifies not only purchase and implementation costs but also the cost of maintenance and upgrades. This would allow the City as a whole to make more informed investment decisions and reject projects that do not demonstrate adequate value.

The recent Citywide Technology Assessment conducted by BTS has brought forth some recommendations about best practices and governance. Among these is the recommendation to create Communities of Interest, a collaborative venue for bureaus with similar technology needs to consider solutions that span multiple bureaus. This would increase efficiency and cost savings, and could provide a more complete view of technology needs across the City.

Disaster Recovery Planning for Technology

The City needs a robust disaster recovery plan that includes technology systems in order to prepare for City services to continue during and after a disaster. The implementation of such a plan is critical to Portland's emergency response capacity, and could contribute to the resiliency of many essential City services and programs. The Bureau of Technology Services is working on a plan for technology systems disaster recovery.

Financial Strategy

As mentioned elsewhere in this chapter, financial strategies in the Citywide Systems Plan usually address the needs and recommendations identified in the investment strategy. There is no state requirement to develop a financial strategy for technology systems, and needs and recommendations for technology systems are not able to be analyzed at this level of detail. Without the capacity to develop a project list or detailed investment strategy, financial planning for technology systems will necessarily remain responsive and opportunistic.

The following is a description of the significant sources of funding for capital asset groups included in the Technology Systems section, and a discussion of funding gaps and other financial issues that affect these assets. Future efforts to develop a financial strategy should use this information as a starting point, as these challenges will need to be addressed in order for any strategy to be successfully implemented.

Sources of Revenue

At this time, the sole sources of revenue for BTS are IGAs and IAs related to service provision. Revenue received from these agreements flows through the Technology Services Fund, an internal services fund requiring that revenue received be used to fund BTS operations. Bureau of Technology Services IA charges are designed to cover the cost of the services consumed by the service receivers.

Other critical projects are usually funded using one-time fund balances or other one-time allocations included in annual bureau-specific budget proposals. Additionally, replacements are sometimes funded through reserve funds.

Due to the fact that technology systems projects benefit different bureaus in different ways, their associated funding sources can vary depending upon the project and its intended scope. For instance, the PSSRP was financed partially through General Obligation bonds approved by voters. This funding source was used to complement a mix of debt and cash financing for the project that was approved by Council as part of prior budget processes.

Financial Challenges

Establishing replacement values, current conditions, and funding gaps for technology systems requires a different approach than for other City assets. This is primarily due to the short lives and quick obsolescence of technology assets. Another important factor is the critical need to stay current with technologies that may not be supported by vendors in the future, which can render the technology unusable. For example, Microsoft recently stopped providing customer support for the Windows XP operating system, which prompted most users to upgrade to the newer Windows 7.

Bureau of Technology Services rates currently only include partial funding for major maintenance and replacement systems. This significant long-term financial challenge is compounded by the fact that replacement values for technology assets are difficult to assess with any certainty, even on a short-term basis. Currently BTS estimates the replacement value of technology assets based on recently completed projects and a rough assessment of the experiences of other governments. The Bureau of Technology Services includes the indirect costs for engineering and other professional services in these replacement values

Another pertinent issue is the value of the revenue lost when technology systems malfunction or become inaccessible. Glitches or other technology failures can result in electronic payments being dropped, valuable data disappearing, and a variety of other negative consequences. Though lost revenue is not incorporated into calculations of the value of technology assets, it has a direct impact on the value of these systems to both City staff and the members of the public that utilize technology systems.

Annual funding gaps and other relevant financial information has been compiled in Table 10.8. Annual funding gap calculations include annual funding necessary to meet industry standards for major maintenance, and annual needs to ensure replacement and upgrades of technology on accepted schedules.

Table 10.8 Technology Systems Annual Funding Gaps, 2013

Capital asset type		Value* (in millions) R/R/R	Mandate	Capacity	Total	Confidence level
BTS:	Communications	$5.4	$0.0	$0.0	$5.4	4 – High
	Production services	$0.4	$0.0	$0.0	$0.4	4 – High
	Strategic technology	$0.7	$0.0	$0.0	$0.7	4 – High
Other bureaus:	Electronic equipment and software	$0.7	$0.0	$0.0	$0.7	4 – High
	Strategic technology	$4.9	$0.0	$0.0	$4.9	4 – High
Total for Technology Systems		$12.1	$0.0	$0.0	**$12.1**	

R/R/R (Repair, Rehabilitation, Replacement): Additional funding necessary to repair, rehabilitate and replace existing assets to bring them up to established service levels, or replace assets considered functionally obsolete (not meeting those service levels).

Mandate: Additional funding necessary to improve existing assets to meet regulatory requirements, exclusive of improvements that fall under R/R/R or capacity.

Capacity: Additional funding necessary to address existing inequities and deficiencies in levels of service for current customers and citizens.

EMERGENCY RESPONSE

Introduction

Emergency response infrastructure includes City-owned buildings, facilities, apparatus, vehicles, and equipment primarily owned or managed by the Office of Management and Finance (OMF) or Portland Fire and Rescue (PF&R). Emergency response infrastructure plays a central role in the City's full emergency response system, which delivers life safety and emergency response services for occurrences ranging from vandalism to inclement weather to a major natural disaster.

Under day-to-day circumstances, emergency response infrastructure is utilized by bureaus in the City's four-legged stool of emergency response – the Portland Police Bureau (PPB), Portland Fire and Rescue (PF&R), the Bureau of Emergency Communications (BOEC), and the Portland Bureau of Emergency Management (PBEM) – to respond to calls when Portlanders are in need. This emergency response system places BOEC as the first point of contact for emergency calls, with dispatchers then directing incidents to PPB or PF&R depending on the situation. When incidents or events require the involvement of additional City bureaus, PBEM steps in to coordinate emergency response on a broader scale

The City's emergency response system is vital to Portland's emergency preparedness and continuation of operations strategies, with many components of this section listed as "essential facilities" in the City's Natural Hazard Mitigation Plan (see p. 38). In the event of a large-scale climate event or disaster, the City's emergency response system expands to include the Disaster Policy Council and other City bureaus like the Portland Bureau of Transportation, the Portland Water Bureau, or the Bureau of Environmental Services for additional services as needed. Regardless of the scale or intensity of the emergency, Portland's emergency response system plays a foundational role in increasing citywide resiliency and facilitating an appropriate recovery.

Infrastructure covered in this section includes ~~fire station~~fire & rescue stations, specialized mobile response units, fire trucks, fireboats, police stations, and other buildings occupied by BOEC, PBEM,

PF&R, and PPB. Due to existing accounting and asset management practices, this collection does not comprise the entirety of the City's emergency response system. Many assets equally critical to emergency response are covered in other sections of this chapter, including the computer-aided dispatch system, the Emergency Coordination Center, the 9-1-1 Center, police vehicles, and emergency communications technology[6].

Emergency response infrastructure is often utilized by multiple bureaus simultaneously, with many intergovernmental and mutual-aid agreements that extend related services into every jurisdiction that borders the City of Portland. These assets are also subject to different ownership and management structures, and are dispersed throughout different capital asset groups used in City asset management practices. This complexity makes it difficult to perform comprehensive assessments, prioritize investments, and conduct financial planning for emergency response infrastructure. Because the Citywide Systems Plan represents the first effort to plan at this level of detail for emergency response assets, there is more work that needs to be done before long-term strategies can be implemented for the system as a whole.

This section describes how, where, and to what degree emergency response assets impact the provision of life safety services. It also includes a summary inventory for emergency response infrastructure, a discussion of their current condition and capacity, and a compilation of relevant issues, trends, and opportunities likely to arise over a twenty-year timeframe. This section then assesses some needs and recommendations for these assets, and concludes with a consideration of investment priorities and financial strategies to address those needs and recommendations in coming years.

Agency Organizational Structure

The Office of Management and Finance and PF&R manage the buildings, facilities and apparatus included in the Emergency Response section. The Office of Management and Finance is responsible for all police facilities, which are managed through BIBS Facilities much like other City-owned or occupied office buildings. The Portland Police Bureau is the primary user of police facilities, with police vehicles provided through an interagency agreement with CityFleet. Portland Fire and Rescue is the primary user and manager for all fire facilities, as well as a collection of specialized firefighting vehicles, apparatus, and equipment. Portland Fire and Rescue handles ownership and management of these assets in part because their services are heavily integrated with the use of these assets. For instance, extinguishing a fire is nearly impossible without the use of specialized fire-fighting equipment such as hoses, ladders, and the fire apparatus itself. Though PPB depends upon precincts and vehicles to fulfill their bureau's mission, police facilities are less specialized and more flexible in nature.

Other bureaus are directly involved in the provision of emergency response services, particularly BOEC and PBEM. Depending on the circumstance, many other agencies can play support roles in Portland's emergency response system, including the Portland Bureau of Transportation, the Portland Water

[6] The value of the Emergency Coordination Center and the 9-1-1 Center is included in the "other buildings" asset group in the Civic Facilities & Assets section. The value of police vehicles has not been included in any asset groups within the Citywide Systems Plan. The value of communications technology has been included in the "communications" asset group in the Technology Systems section.

Bureau, and the Bureau of Environmental Services. The Bureau of Technology Services is also involved in emergency communications services and systems.

Vision

Similar to civic facilities and assets, there is no consolidated vision for Portland's emergency response assets. All four emergency response bureaus (BOEC, PBEM, PF&R, and PPB) have their own bureau-specific vision statements, but this language is only partly applicable to the assets covered in this chapter. Based on existing language, the following vision statement has been created for the purposes of this document:

Emergency response buildings, facilities apparatus, vehicles and equipment allow City agencies to provide coordinated, efficient and effective emergency response and life safety services to Portland residents and visitors.

Mission

Emergency response infrastructure also lacks a consolidated mission statement. Based on the mission statements from BOEC, PBEM, PF&R, and PPB, the following mission statement has been developed for Portland's emergency response infrastructure:

Emergency response buildings, facilities and apparatus provide the infrastructure necessary to effectively support services that protect life, property, and the environment, reduce crime and the fear of crime, maintain human rights, contribute to disaster risk reduction, and support the connection between the community and emergency responders.

Services Provided

Emergency response facilities and apparatus are utilized by PPB and PF&R, in coordination with PBEM, BOEC, and other City bureaus as necessary. Emergency response infrastructure enables these bureaus to provide life safety and emergency response services, which include:

- Fire and rescue services;
- Police services;
- Fire prevention services, such as plan review, code enforcement, and Harbor Master services;
- Emergency communications services;
- Emergency coordination and incident management; and
- Emergency prevention education and outreach.

Additionally, emergency response facilities often include conference rooms and gathering spaces used by neighborhood groups and various City bureaus. For instance, the North and East Precinct facilities each have community rooms available to the public, and all three major Precincts (Central, East, and North) also serve Portland citizens by providing a physical point of contact for police-related issues and concerns.

Service Area

Emergency response services are provided within the boundaries shown in Figure 10.3 and Figure 10.4. These services are provided to Portland residents within the City's urban growth boundary.

Additionally, emergency response services are available in areas outside of these boundaries based on a number of intergovernmental agreements entered into by the bureaus responsible for emergency response and life safety service provision. This results in an effective service area that is larger than the urban services area, extending into the areas under the jurisdiction of the Port of Portland as well as those governed by Multnomah County, the City of Gresham, and other municipalities in the region.

Figure 10.3 Portland Fire & Rescue Stations, 2014

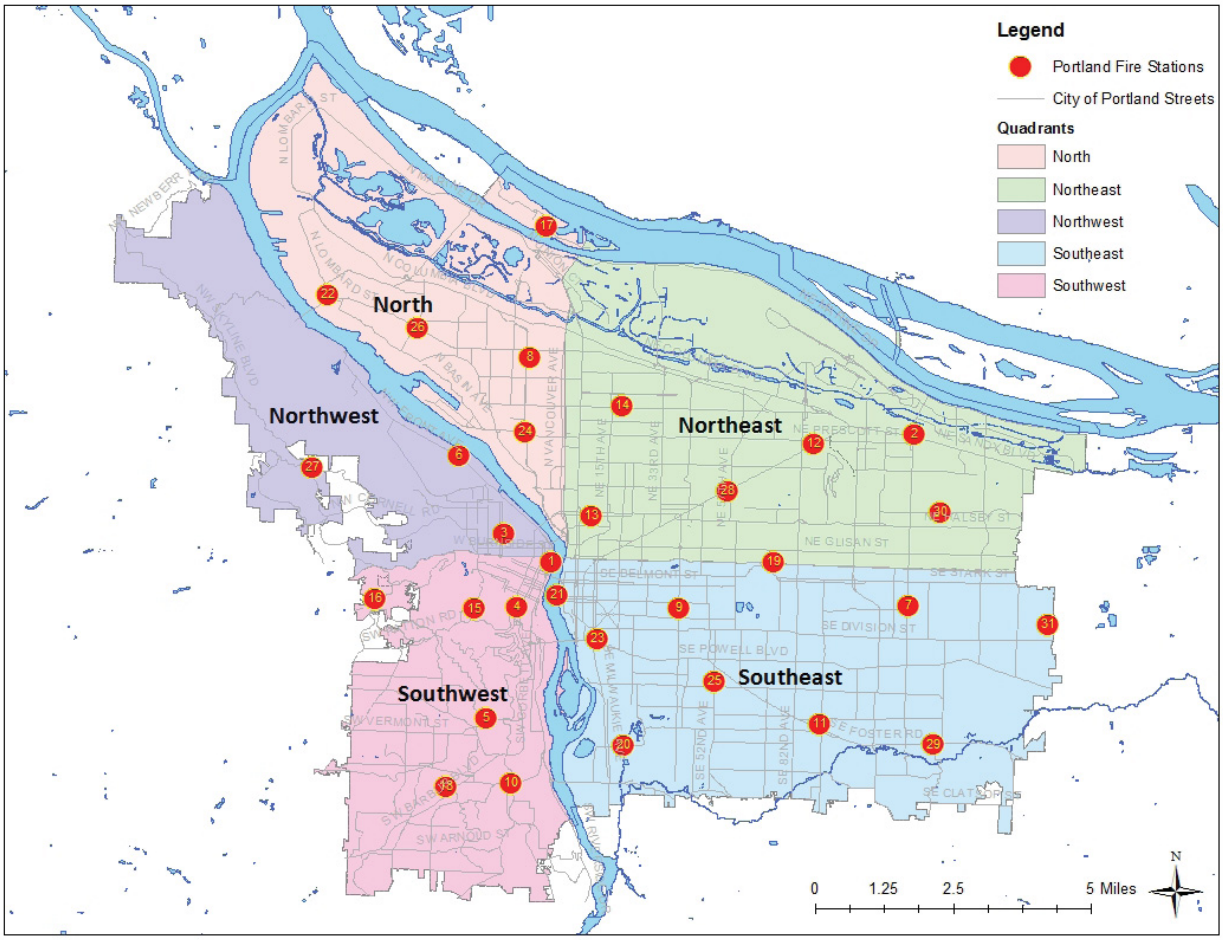
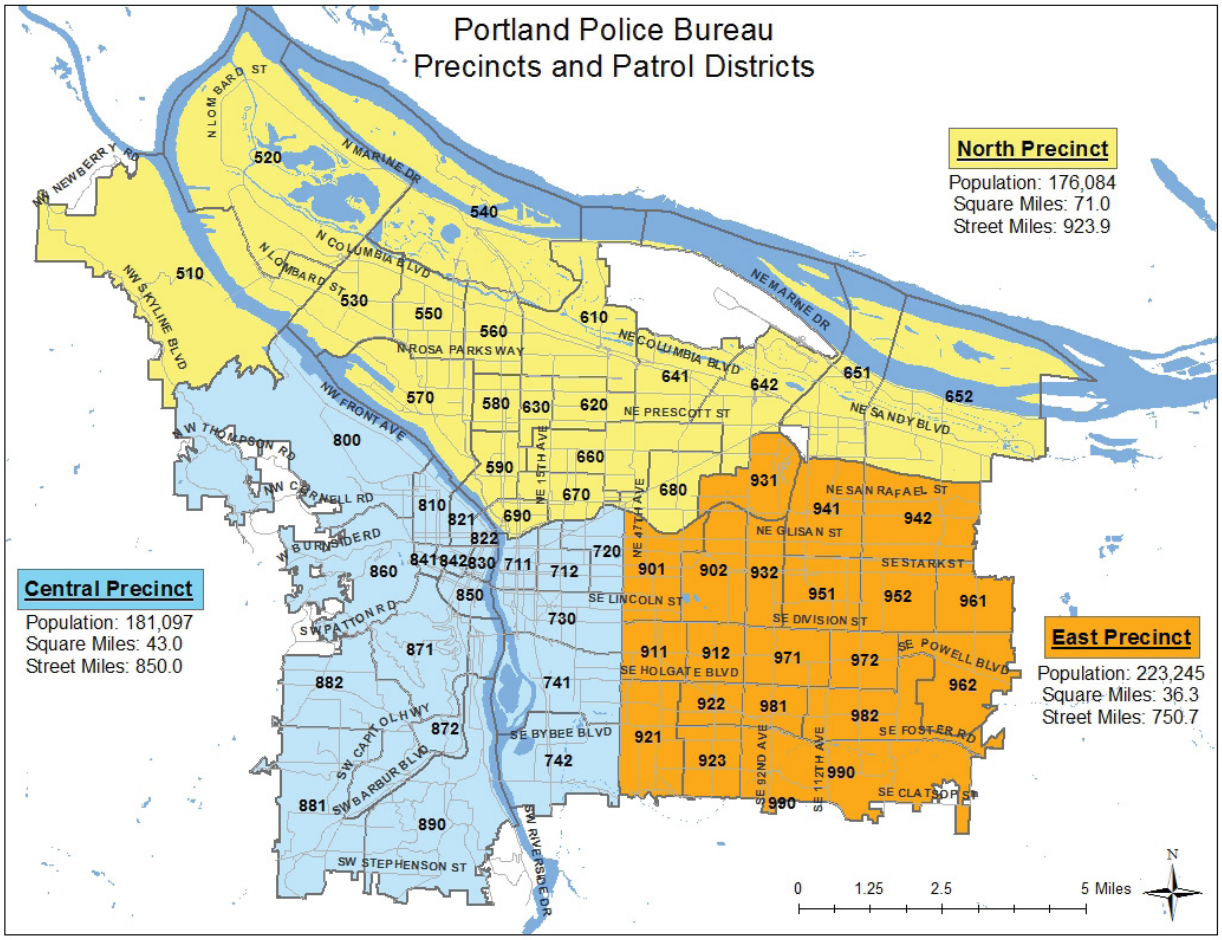


Figure 10.4 Portland Police Precincts and Patrol Districts, 2014



Service Agreements

Service agreements for emergency response infrastructure take similar forms to the agreements for civic facilities and assets discussed earlier in the chapter. These agreements range from interagency agreements (IAs) amongst City bureaus, intergovernmental agreements (IGAs) between city bureaus and outside agencies, and condominium lease agreements, or other partnerships oriented around City-owned assets.

Portland Fire and Rescue has mutual-aid agreements with all jurisdictions surrounding City of Portland boundaries, including waterways and forest areas. For instance, PF&R is a member of the Marine Fire Safety Association (MFSA) serving the Lower Columbia and Lower Willamette River areas along with other emergency response agencies from Vancouver to Clackamas County (for more information on mutual-aid agreements see p.41).

The Portland Police Bureau is involved in over 200 agreements with over 50 different agencies, including the State of Oregon, the State of Washington, and several federal agencies. Many of these are IGAs related to mutual aid in the event of a major emergency, including agreements with Sherriff's offices in

Multnomah and Clackamas County. Other agreements include IAs related to police vehicles leased through CityFleet and technology services provided by the Bureau of Technology Services.

The Bureau of Emergency Communications provides 9-1-1 and responder dispatch services through IGAs with partner jurisdictions ranging from the City of Troutdale to Fire District 30 on Sauvie Island. The Bureau of Emergency Communications provides computer-aided dispatch connectivity services to the Port of Portland through an IGA, in addition to sharing live dispatch data with regional communications partners in Clackamas, Washington, Columbia, and Clark counties, as well as Lake Oswego.

The Portland Bureau of Emergency Management also has interstate mutual aid agreements for services through the nationally-adopted Emergency Management Assistance Compact (EMAC) and the Pacific Northwest Emergency Management Arrangement (PNEMA), which includes the states of Oregon, Washington, Idaho, and Alaska, along with the Canadian provinces of British Columbia and the Yukon Territory.

All primary emergency response bureaus (BOEC, PBEM, PPB, and PF&R) are involved in agreements or other partnerships related to the buildings, facilities, technology, vehicles, and apparatus covered in this chapter. For instance, the portion of the newly constructed Emergency Coordination Center occupied by PBEM is leased through BIBS Facilities, who was able to construct the facility through a joint-partnership with the Portland Water Bureau. Other examples include the Justice Center, which is occupied by PPB through a condominium lease agreement with Multnomah County.

Levels of Service

Emergency response facilities and vehicles are not required to meet any specific or quantifiable levels of service by the State or any other regulatory body. These facilities and vehicles are expected to perform in a cost-effective and efficient manner to support City bureaus in the direct provision of public services, which are listed in the Services Provided section.

Emergency response bureaus utilize a variety of performance measures to assess their provision of emergency response and life safety services to the public. The Portland Police Bureau has a performance measure to respond to 9-1-1 emergency calls in less than five minutes, an industry standard that PPB has been surpassing in recent years. The Portland Police Bureau also measures their success by the percentage of citizens who rate their services as ‘good’ or better, the percentage of residents who feel safe walking alone in their neighborhood at night, and the percentage of crimes cleared. Police services are also assessed through a measure of “part 1” or major crimes per 1,000 residents, and other similar metrics.

Portland Fire and Rescue uses similar measures to quantify the speed and overall impact of their services. The bureau’s performance measure related to response times seeks to respond to medical and fire emergency calls in five minutes or less 90% of the time, from the time of the call to time of arrival on-site. There are many other performance measures being utilized by PF&R to increase proactive health and wellness practices for their employees and enhance existing code enforcement inspection practices.

Inventory Summary

The emergency response asset inventory includes buildings, facilities, apparatus, vehicles, and equipment. These assets fall into the groupings of "police facilities" and "fire facilities", though it should be noted that "fire facilities" as a grouping includes several mobile fire apparatus units, specialized vehicles, and fire equipment that are not included in the data for either asset group. See Table 10.9 for information about the replacement values of emergency response asset groups, and Table 10.10 for an assessment of their current condition.

Table 10.9 Emergency Response Groups and Replacement Values, 2013

Capital Asset class	Value (in millions)
Police facilities	$108.8
Fire facilities	$96.8
Total Emergency Response	**$205.6**

Table 10.10 Current Condition: Emergency Response System, 2013

	Current Condition (in %)						
Capital asset type	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**	**TBD**	**Confidence Level**
Police facilities	0	100	0	0	0	0	4 - High
Fire facilities	0	98	0	2	0	0	4 - High

The "police facilities" grouping includes PPB precinct facilities for each of the City's three patrol divisions, East, North, and Central. The Central Precinct is located in the Justice Center downtown, a facility that is shared with Multnomah County and also utilized as PPB Headquarters. The City also operates the Southeast Precinct as a sub-station of the East Precinct, at a facility that also houses the Property Crimes unit and the Portland Office of Neighborhood Involvement. Other facilities included in the inventory and utilized by PPB include the Rivergate Vehicle Storage facility, the Property Evidence Division warehouse, the Traffic Division in St. Johns, and a training facility on NE Airport Way that is scheduled to open in August 2014.

The "fire facilities" grouping includes all 30 stations for PF&R, as well as dozens of large mobile fire

apparatus not provided through CityFleet. Other facilities included in the inventory and utilized by PF&R include a facility on NE 122nd Avenue that houses a Training Center and Emergency Medical Services

(EMS) facility, the Public Education Office and Belmont Learning Center, the Fire Code Enforcement and Permit Office in the Gideon Building, the Main Administrative Office on SW Ash Street, and the Logistics Building on SE Powell and 12th Avenue.

Other facilities relevant to emergency response are included in the Civic Facilities & Assets section, such as the newly completed Emergency Coordination Center, the 9-1-1 Center, and police vehicles – which are utilized by PPB through operating agreements with CityFleet. Additionally, communications technology such as Computer-Aided Dispatch (CAD) and 800 MHz radio systems are covered in the Technology Systems section.

Key Issues, Trends, Opportunities

Budgeting For Maintenance

Similar to civic facilities and assets, annual City budgeting processes do not set aside an adequate amount of money for major maintenance of emergency response facilities. Each year, bureaus must evaluate maintenance needs for their facilities in order to prioritize projects that must be dealt with immediately, and defer projects that address less pressing needs. This generally leads to a backlog of projects that tend to become more immediate priorities as budget constraints become tighter. Over time, these delays in repairs and maintenance can cause all projects to become priorities that need addressing.

Currently, PF&R is identifying long-term, ongoing maintenance needs for their existing facilities. For example, a comprehensive roof evaluation for all fire facilities has been completed recently. This will aid in planning for long-term repair or replacement of roofs to last for the next ten to twenty years, and will help to avoid the unnecessary costs of replacing roofs due to deferred maintenance. BIBS Facilities and the OMF perform similar assessments as part of citywide asset management practices, including the Facilities Condition Assessment updates mentioned earlier in the chapter.

Future budgeting processes could benefit from more comprehensive evaluations of emergency response facilities, so that bureaus can better plan for costly repairs and replacements of components such as emergency generators, HVAC systems, and other key building components.

Intensification of Development ~~along Major Corridors~~

~~As~~ Portland's population continues to grow and development is intensifying, particularly ~~along a number of~~in Centers and along Corridors. This intensification of infill development in neighborhoods and business districts may have both positive and negative impacts on emergency response services. A larger population is expected to increase the total number of incidents requiring emergency response. Increased traffic congestion associated with more intense development along emergency response routes may result in an incremental increase in emergency response times. At the same time, complete neighborhoods promote non-auto modes of transportation for many trips, which may reduce congestion. Reducing the number of trips made by automobile may also lead to a reduction in automobile collisions, thus avoiding the emergency response generated by those incidents.

The need for additional emergency response facilities/equipment will be affected by the impacts of growth on emergency response time and reliability. Growth and development patterns can affect the geography and intensity of response needs. To address some the effects of growth, the City has designated a number of emergency response routes that avoid streets with traffic-calming devices or other pedestrian-oriented street improvements. Additionally, future siting of fire & rescue or police facilities could mitigate this effect by locating closer to intensified development or otherwise expanding the coverage of mobile response units. Facility and equipment needs may also be influenced by changes in fire and rescue service models or best practices.

Climate Change

Climate change may cause an increase in weather-related emergency events, like extreme heat, wildfires, flooding and landslides. All of these events have the potential to cause medical emergencies, including illness and injury, or require emergency response to protect the public, environment or infrastructure assets. For example, these events may increase demand for law enforcement to respond to increased emergency-related calls, establish roadblocks, reroute traffic, respond to accidents, or facilitate evacuations.[7]

As climate change occurs, the City's public safety and emergency response bureaus, including PF&R, PPB, PBEM and BOEC, will need sufficient emergency management capacity to prepare for, respond to, and recover from weather-related emergencies. The City's Climate Change Preparation Strategy includes number of emergency management objectives to improve this capacity, such as:

- Developing, testing, training and updating emergency response plans that address weather-related hazards that are likely to become more frequent or intense as the climate changes.
- Ensuring service providers have the education, training and tools to succeed in disaster planning, preparedness, response and recovery efforts.
- Planning and staffing for potential increases in weather-related displacement – people may be in need of emergency housing, food or other supplies – and the resulting potential increases in violence, mental illness, chemical dependency and addiction.[8]

Certain populations – including people who are homeless, lack transportation options, live in poverty, or have physical or mental illnesses or disabilities - may be at greater risk during weather-related emergencies, as they may not have the physical, mental or economic ability to prepare for or respond to hazards. Public safety and emergency response bureaus will need to be prepared for potential shifts in the service needs of these populations.

Emergency response activities occur through multi-agency partnerships. Preparing for and responding to climate change will require continued partnerships between City emergency response bureaus; other City bureaus, like the Portland Housing Bureau and Portland Bureau of Transportation; as well as Multnomah County agencies, including the Departments of Human

[7] City of Portland and Multnomah County, "Climate Change Preparation Strategy: Risk and Vulnerabilities Assessment," 2014.
[8] City of Portland and Multnomah County, "Climate Change Preparation Strategy: Public Comment Draft," 2014.

Services, Emergency Management, Health, Community Services, Community Justice, and the Sheriff's Office.

Increasing Role of Social Media

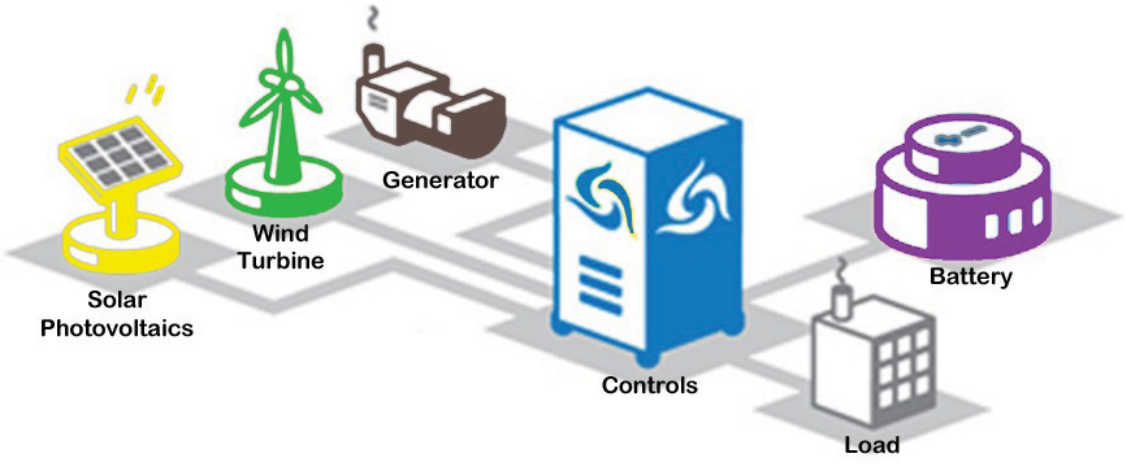
The role of social media continues to evolve during emergencies. The Great Tōhoku Earthquake, Hurricane Sandy and the Boston Marathon bombing tragedies are recent examples where disaster-affected communities and their first responders immediately relied on social media to share and access up-to-date news and information. When an emergency results in degraded telecommunications capabilities and limited bandwidth on cellular networks, texts, tweets, and posts to Facebook are replacing traditional forms of communication. Social media provides a real-time interactive platform for information sharing and first-person accounts of the impacts of the emergency.

However, there are also challenges to the use of social media. Crowd-sourced information is not always accurate, and misinformation spreads as virally as verified information. Additionally, the volume of posts on Twitter, Facebook, Instagram, and other social media platforms can easily overwhelm response agencies trying to monitor and respond to this information. Emerging technology such as Next-Generation 9-1-1 has been designed to better incorporate social media with emergency response systems, allowing people to tweet their 9-1-1 or emergency calls through a system designed to handle this activity. This technology presents opportunities to connect residents with City programs and services, but has yet to be adopted locally due to the large number of regional agencies affected

Microgrids

Redundant technology and equipment is a major part of any emergency response or continuity of operations strategy. When major communications or energy infrastructure is unreliable or not functional, the City can utilize a wide range of redundant systems and equipment, including satellite communications, backup generators, fuel reserves, and a variety of other equipment. Though these systems are dependable and are situated to play a major role in the event of an emergency, these redundant power sources can only supply a finite amount of energy.

In order to secure the City's energy resiliency for longer-term disasters or emergency events, non-



exhaustible backup energy systems could be considered. A microgrid can achieve this by providing a localized system for electricity generation and energy storage that can be operated independently from other energy infrastructure systems. Microgrids could be used to strengthen emergency response and continuity of operations strategies by providing an additional backup power source based on renewable energies, such as wind or solar, that would be more resilient to disruptions to the City's existing energy infrastructure.

Regulatory Compliance

The agencies responsible for the provision, maintenance, and management of emergency response infrastructure are expected to meet a number of regulatory requirements. These codes and regulations have a direct impact on every detailed design component, management technique, maintenance system, and new construction practice utilized for City-owned buildings, facilities, and apparatus. Relevant legislation, regulations, and regulatory agencies are listed in the Regulatory Compliance section for Civic Facilities & Assets.

Investment Strategy

Process

As with the other sections in the Other Essential Facilities & Assets chapter, investments in emergency response infrastructure are not typically the result of linear decision-making or long-range planning efforts. Emergency response and life safety are undoubtedly essential public services, but land-use and infrastructure planning for these services is not mandated by the State like it is for water, sewer, or transportation services. The result is that the Citywide Systems Plan does not include a detailed 20-year project list for public safety and other emergency response facilities and services because comprehensive system plans, including lists of needed investments, costs, and funding sources, are not available at this time. Therefore, the recommendations within this section are primarily oriented towards improving upon current investment practices and preparing for foreseeable major expenditures in the future.

Investments in police facilities are managed by OMF, which performs asset management for police buildings using the same processes and principles employed for other City-owned buildings managed through BIBS Facilities. Fire facilities and apparatus are managed separately, with PF&R taking on management responsibilities instead of BIBS Facilities. Though emergency response infrastructure is managed by multiple bureaus, the processes used to make investment decisions for police and fire assets are similar. Both PF&R and BIBS Facilities take efforts to assess the condition of emergency response assets, including annual inspections, reviews, and other periodic inventory assessments. This information can be utilized to inform annual budget discussions, or it can be used by individual bureaus to justify more opportunistic and less predictable investments based on funding availability or shared interests with other bureaus.

Similar to civic facilities and assets, investments in emergency response infrastructure often benefit from agency partnerships and resourceful financial strategies. For example, the new Police Training Center was able to be constructed after the property was purchased by the City in early 2012. This opportunistic

investment allowed PPB to respond to market availability in a cost-effective manner in order to address previously identified training needs.

The following projects and recommendations provide a snapshot of the City's emergency response infrastructure needs. It should be noted, however, that more holistic and detailed assessment efforts are necessary in order to effectively consider facility needs across all City bureaus.

Recent and Ongoing Projects

Emergency response bureaus regularly seek new projects and improvements to increase their capacity to provide public services and address facility needs. At the current time, projects in the construction phase include a new ~~fire station~~fire & rescue station on the east side of the Willamette River and an expanded PPB training facility on Airport Way. The Civic Facilities & Assets section includes more information about other planned projects relevant to emergency response, including a planned renovation of the 9-1-1

Center.

Inner SE Fire & Rescue Station

In 2010, Portland voters approved a general obligation bond measure that included funding for the replacement of a ~~fire station~~fire & rescue station in Inner Southeast. The new PF&R ~~fire station~~fire & rescue station will sit along the Willamette River near the Oregon Museum of Science and Industry. Construction is currently underway, and the facility is scheduled to be completed by November 2014. This station was staffed by closing nearby fire & rescue station 23.

Police Training Center

A new training complex for PPB is slated to open in 2014 at a location on NE Airport Way. The complex will include a shooting range, a practice driving track, a tactical scenario village, and several other training-related facilities. This expands the training capacity of PPB, making it easier to respond to evolving policies and regulations related to the provision of police services in Portland. This will allow PPB to relocate from current training facilities in order to centralize these operations at the new training center.

Major Needs & Recommended Improvements

The following list of major needs and recommended improvements could serve as a starting point for emergency response investment decisions in future years. The Major Needs and Recommended Improvements section for Civic Facilities & Assets includes for other recommendations related to emergency response, including a discussion of a potential Westside emergency operations facility at the current site of the SFC Jerome F. Sears U.S. Army Reserve Center. This list is not complete, and there are a number of other notable facility needs relevant to emergency response that are not addressed in this section.

24-7 Repair and Maintenance

Emergency response facilities and vehicles are utilized on a constant, 24-7 basis in order to ensure life safety services are available at all times. This results in disproportionate wear and tear on these highly-used assets, and also impacts the amount of time that emergency response facilities and vehicles can be out of commission for repair or maintenance purposes. BIBS Facilities and PF&R use a number of employees and programs in order to stay aware of repair needs and maintenance priorities, but a more around-the-clock approach could prove to be useful for unanticipated facility or vehicle failures.

Major maintenance needs for emergency response assets can include roof replacements, emergency generator repair, vehicle maintenance and repair, and other projects that impact critical pieces of the City's emergency response capacity. Because these assets are essential to the continuity of operations of the City as a whole, they deserve special consideration when prioritizing investments.

Gideon Facility Replacement

It is likely that PF&R will need to vacate their Gideon facility located near the new Orange Line MAX station at SE Clinton Street in the near future. Before that can occur, a new site will be needed to accommodate the functions currently served at that site. These functions include: emergency apparatus maintenance, logistics, prevention and training annex. The replacement training annex should be centrally located to reduce time lost to travel.

311 Call Center

City Council passed a resolution in 2012 that established intent to create a 311 Non-emergency Call Center. The project would enable BOEC to run an operation parallel to the 9-1-1 Center that would provide a single point of contact for community requests for information or services in non-emergency situations. Similar 311 systems have been successfully initiated in 80 cities across the country, including Minneapolis, San Francisco, and Los Angeles. These cities have found that using one easy-to-remember number to access all non-emergency City services has had positive impacts on their 9-1-1 systems, including reduced call wait times and more efficient and effective responses.

The City has established an exploratory committee for a 311 Call Center, and a project assessment has already been funded. While nothing decisive has yet come from these efforts, there is a high likelihood that a decision will be made within the next couple of years. A 311 system would establish a communications infrastructure in Portland for non-emergency situations, when residents don't need immediate assistance but still want to contact authorities about a particular issue. This could have a wide range of positive effects on the City's emergency response capacity, and could also improve communications between residents and City agencies in a more general sense. If the City proceeds with a 311 project, facility needs such as office space and communications infrastructure will need to be defined and addressed before implementing the system.

Mounted Patrol Unit

As recently as early 2014, PPB's Mounted Patrol Unit (MPU) – or equestrian division – was located in a former horse barn in the Centennial Mills building. The building began to cause some concern when engineers uncovered structural issues with support beams for the roof of the facility, at which point PPB was forced to relocate their horses to a barn in Aurora. The unit has continued to operate since the move, with horses being driven by trailer to Portland every day from the Aurora facility to maintain normal MPU operations.

This development has reignited questions about the cost and necessity of the MPU, issues which are currently being explored by the City. The Mounted Patrol Unit currently consists of eight horses, one sergeant, four officers, and three non-sworn staff members. Centennial Mills is owned by the Portland Development Commission[9], and re-development proposals for the site have been under consideration for years. A permanent and easily accessible location for the horse-barn could be necessary once an

agreement is reached regarding the future of the MPU.

Financial Strategy

Financial planning for emergency response infrastructure takes a more flexible, resourceful, and reactive approach than other components of the Citywide Systems Plan. Given the significant challenges to performing long-range planning for the assets covered in this chapter, it is difficult to develop a meaningful list of future projects or talk about how those projects could be financed. Instead of identifying revenue streams and funding mechanisms to support recommendations in the investment strategy – like it does in other chapters – the financial strategy for emergency response infrastructure is more of a description of current practices and existing financial issues.

The following sections discuss funding sources and financial challenges that impact emergency response buildings, facilities, apparatus, vehicles, and equipment. This information can serve as a starting point for future financial planning discussions once a more comprehensive investment strategy has been developed.

[9] Centennial Mills is included in the "PDC facilities" asset group, covered in the Civic Facilities & Assets section.

Sources of Revenue

Emergency response infrastructure is funded by many of the same sources as other components of the Other Essential Facilities & Assets chapter.

Because OMF and BIBS Facilities handle financial management for police facilities, sources of revenue for these facilities are identical to those identified in the Civic Facilities & Assets section. Money from the City's General Fund, general obligation bond measures, and debt financing is sometimes used to fund investments in police facilities.

Portland Fire and Rescue's management and maintenance of fire facilities has led to the use of other sources of revenue for these assets. A recent program to rehabilitate, relocate, and construct new City ~~fire station~~fire & rescue stations was financed through a general obligation bond measure approved by voters in 1998. This program, which ended in FY 2012-13, was also designed to address deferred maintenance, seismic requirements, and other program changes at PF&R. A new general obligation bond was passed in 2010 that included funding for the construction of a new ~~fire station~~fire & rescue station in inner Southeast, a project discussed earlier in this chapter. Portland Fire and Rescue also has annual operations and maintenance budgets for these facilities and vehicles, though the bureau does not have any ongoing budget authority for major maintenance projects at their facilities.

Financial Challenges

Asset management practices are used by OMF to assess the condition of emergency response facilities and vehicles, and inform investment decisions according to identified needs. Within this asset management framework, the financial condition of assets is indicated by their annual or one-time funding gaps. For emergency response infrastructure, funding gaps are calculated by determining the annual difference between what was collected in rental rates or set aside from net income for major maintenance, and the industry standard of 3 percent of replacement value. See Table 10.11 for annual funding gaps in 2013 for police and fire facilities.

Table 10.11 Emergency Response Annual Funding Gaps, 2013

	Value* (in millions)				
Capital asset type	**R/R/R**	**Mandate**	**Capacity**	**Total**	**Confidence level**
Police facilities	$2.8	$0.0	$0.0	$2.8	4 – High
Fire facilities	$2.9	$0.0	$0.0	$2.9	4 – High
Total for Emergency Response	$5.7	$0.0	$0.0	**$5.7**	

R/R/R (Repair, Rehabilitation, Replacement): Additional funding necessary to repair, rehabilitate and replace existing assets to bring them up to established service levels, or replace assets considered functionally obsolete (not meeting those service levels).

Mandate: Additional funding necessary to improve existing assets to meet regulatory requirements, exclusive of improvements that fall under R/R/R or capacity.

Capacity: Additional funding necessary to address existing inequities and deficiencies in levels of service for current customers and citizens.

Currently, OMF is only able to reinvest about 1.2 percent of the replacement value of the assets managed by the bureau, which includes police facilities. This amount has declined from the 3 percent industry standard in recent years due to several factors, including a rise in the cost of building replacements above the level of regular inflation, an increase in the total number of new facilities, and a limit on rental rate increases to the level of regular as opposed to actual inflation. This funding gap will prevent OMF from being able to cover needs for police facilities for the next five years or more, though it is not significant enough to force a decrease in the overall condition of individual assets from their current designations as either “good”, “fair”, or “poor” within the next ten years (See Table 10.10). One way to reduce the funding gap is to direct savings from efficiency improvements to major maintenance reserves. Please see Financial Challenges in the Civic Facilities & Assets section for information about other OMF-managed facilities and assets relevant to emergency response.

For fire facilities and apparatus, PF&R has utilized funds from general obligation (GO) bonds to finance major building seismic upgrades and station remodel projects in recent years. However, aforementioned funding from the GO bond passed in 1998 will shortly be exhausted, and no other ongoing source of major maintenance funding has been identified for future major maintenance expenditures. While this will not cause fire facilities and apparatus to decline in condition from general categories of “good”, “fair”, or “poor” within a ten-year horizon, this strategy could prove problematic in 20 or 30 years when facilities needs become larger and more pressing. The City and PF&R could benefit from identifying future funding sources for fire facilities and apparatus to be set aside each budget year, similar to the process outlined above for police facilities. This could also result in less reliance upon voter-approved GO bonds to fund critical major maintenance projects, in addition to preventing deferred maintenance from accruing to the point where it becomes too expensive to fund using existing resources. Preparing for these future expenditures will allow City bureaus to proactively manage their assets, and give bureaus more freedom to modify and improve buildings according to changing needs.

SUMMARY

The issues, needs, trends, and opportunities described in this chapter provide a baseline level of information to inform public investments in other essential facilities and systems. Though there is still work that needs to be done before these assets are formally incorporated into infrastructure planning discussions, the chapter functions as a starting point for future efforts.

The next twenty years will require a number of investments in order to keep these assets functioning at the levels necessary to maintain State-mandated forms of public facility service provision. Acknowledging the important connections between required service provision and other essential facilities and systems will result in more effective, more efficient public investments and a more resilient financial future.

Appendix A
Investment Strategy

This appendix contains a capital Investment Strategy for the Bureau of Environmental Services, Portland Water Bureau, and Bureau of Transportation. The projects and programs included in the Investment Strategy are intended to maintain existing assets, comply with regulatory mandates, and provide key levels of service to existing and future residents and businesses. More information on how each Bureau's draft Investment Strategy was developed can be found in the relevant chapter of this Plan.

As part of the update to the Comprehensive Plan and to meet public facility planning requirements, the City must also adopt a List of Significant Projects. The List of Significant Projects is intended as a long-term plan for meeting the infrastructure needs of residential and employment growth allowed and planned for by a city's land use designations. The List of Significant Projects includes a subset of projects included in the Citywide System Plan's Investment Strategy. The List of Significant Projects for transportation, water, sewer and stormwater is included as a separate component of the Comprehensive Plan.

Project Maps

Explore interactive maps of the infrastructure projects included in Appendix A through the online **Comprehensive Plan Map App** at http://www.portlandoregon.gov/bps/mapapp/

Bureau of Environmental Services

The Bureau of Environmental Services (BES) project list is based on existing system plans and includes programs for treatment plant upgrades for capacity and regulatory compliance; programs for maintenance of the treatment plants, pump stations, collection system pipes; pipe capacity projects by sanitary and combined sewer basins; watershed programs for each of the major watersheds; a stormwater program area to address system connectivity and water quality; and a sanitary sewer extension program.

The Bureau focuses efforts on comprehensive, multi-purpose solutions in the highest priority areas for work in all four program areas of the Investment Strategy. The Bureau anticipates approximately $2 billion in investment in these programs over the next twenty years. The list assumes that rates are set at a level that is sufficient to meet agreed upon levels of service.

For more information on how this Investment Strategy was developed, please see Chapter 6. Bureau of Environmental Services.

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider (Partner)
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Sewage Treatment																	
Map SS-1 E10245	CBWTP Improvements	This program includes a number of mid-size improvements at the Columbia Boulevard Wastewater Treatment Plant. CBWTP such as: Seismic Improvements, Outfall Diffuser Extension, Access / Egress Improvements, Bio-Solids Dryer, Dewatered Sludge Hopper, TWAS Piping Upgrade, Centrifuge. Also includes expansion to Secondary Treatment, if required. All are consistent with the Facilities Plan and the Conditional Use Master Plan.	Columbia Blvd Wastewater Treatment Plant	All	Efficiency & Expansion	Population growth/ regulations	10,950,000	4,325,000	11,513,000	10,540,000	8,516,000	45,844,000	45,964,000	80,000,000	171,808,000	Bonds	BES
Map SS-2 E10234	TCWTP Improvements	Improvements, as identified in the updated facilities plan. Anticipated projects include property acquisition, new headworks/screenhouse, upgrades to the primary clarifier, and construction of an additional secondary clarifier.	Tryon Creek Wastewater Treatment Plant	SW	Efficiency & Expansion	Population growth/ regulations	216,000	210,000	3,000,000	3,500,000	9,000,000	15,926,000	30,000,000	10,000,000	55,926,000	Bonds	BES
Map SS-3 E04661	Pump Station Improvement Program	Program to refurbish or upgrade pump stations not in compliance with current codes, not operating reliably, need improvements because of growth in the receiving sewage basin, and/or are over 20 years old with out-of-date equipment. The Pump Station Improvement Plan guides the selection of projects. This program was developed to ensure the 97 pump stations are maintained in accordance with a scheduled plan to increase pump station reliability. Program will also address the 57 miles of force mains.	Citywide	All	Maintenance & Efficiency	Level of Service	13,810,000	12,091,000	4,000,000	4,000,000	4,000,000	37,901,000	30,000,000	65,000,000	132,901,000	Bonds	BES
Map n/a E04891	Rehab, Repair, and Modifications	This project provides for annual reinvestment in the treatment facilities to protect capital investment and enhance system reliability. It provides best management practice to prevent probable violations of NPDES permit. The aging Columbia and Tryon Creek plants require regular investment. Projects include equipment replacement, capacity upgrades, and restoration of a facility to its original condition and renewal of useful life for more than 10 years, and regulatory mandates.	Columbia Blvd and Tryon Creek Wastewater Treatment Plants	All	Maintenance & Efficiency	Level of Service	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	10,000,000	15,000,000	30,000,000	55,000,000	Bonds	BES
Maintenance & Reliability																	
n/a	Sewage Pipe Rehabilitation	Based on regular inspection, this program rehabilitates the highest risk pipes.	Citywide	All	Maintenance	Level of Service	49,895,000	51,869,000	42,924,000	31,285,000	19,583,000	195,556,000	160,000,000	300,000,000	655,556,000	Bonds	BES
n/a	Sewer Capacity Upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized based on risk and benefit/cost. Work may also include high priority pipe rehabilitation. Work will occur is small areas within the combined sewer system that are not addressed by basin specific projects.	Citywide	All	Maintenance	Level of Service	0	0	0	0	0	0	0	50,000,000	50,000,000	Bonds	BES
Map SS-4	Holladay/Stark/ Sullivan - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Between Fremont & Stark to NE 24th. South of I-84 to I-205	NE/SE	Capacity	Level of Service	500,000	1,000,000	3,000,000	3,000,000	3,200,000	10,700,000	12,000,000	12,000,000	34,700,000	Bonds	BES
Map SS-5	Beech/Essex - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Willamette River east to Grand b/w Knott and Alberta.	NE	Capacity	Level of Service	0	100,000	900,000	4,500,000	4,000,000	9,500,000	9,000,000	0	18,500,000	Bonds	BES
Map SS-6	Oak - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Willamette River to NE 24th, b/w Irving and Stark.	NE/SE	Capacity	Level of Service	2,000,000	100,000	0	0	500,000	2,600,000	20,000,000	0	22,600,000	Bonds	BES
Map SS-7	Taggart/Insley - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Willamette River to NE 60th; Stark to south city limit	SE	Capacity	Level of Service	7,700,000	6,200,000	2,200,000	900,000	3,800,000	20,800,000	30,000,000	10,000,000	60,800,000	Bonds	BES

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider (Partner)
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Map SS-8	Wheeler - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Willamette River, Grand, Prescott, 24th, Hancock	NE	Capacity	Level of Service	400,000	1,300,000	4,300,000	4,300,000	0	10,300,000	0	0	10,300,000	Bonds	BES
Map SS-9	Lloyd District - capacity upgrades	Based on the Systems Plan and extensive redevelopment activity, program adds capacity by creating a separated stormwater system and/or upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Lloyd District	NE	Capacity	Level of Service	0	500,000	1,500,000	1,500,000	5,000,000	8,500,000	10,000,000	0	18,500,000	Bonds	BES
Map: SS-10	Alder - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Willamette River to SE 42nd bw Stark & Hawthorne; inc. Ladds Addition	SE	Capacity	Level of Service	0	100,000	1,600,000	5,200,000	11,600,000	18,500,000	22,500,000	0	41,000,000	Bonds	BES
Map: SS-11	NE 13th Ave Basin - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	Vancouver, Columbia Blvd, NE 42nd, Prescott	NE	Capacity	Level of Service	500,000	1,300,000	1,400,000	5,000,000	8,000,000	16,200,000	1,200,000	0	17,400,000	Bonds	BES
Map: SS-12	Northwest Neighborhoods - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	NW inc. hills to ridgeline, excluding downtown	NW	Capacity	Level of Service	2,700,000	2,100,000	1,300,000	3,400,000	3,500,000	13,000,000	23,000,000	5,000,000	41,000,000	Bonds	BES
Map: SS-13	North Portland - capacity upgrades	Based on the Systems Plan, program adds capacity by upsizing pipes and/or adding surface infiltration facilities. Projects are prioritized base on risk and benefit/cost. Work also includes high priority pipe rehabilitation, if located within the project area.	West of Peninsular Ave.	N	Capacity	Level of Service	0	0	0	0	0	0	0	5,000,000	5,000,000	Bonds	BES
Map: SS-14 E10034 E10035 E10474	Sanitary Sewer Collection system capacity (Infiltration & Inflow)	A series of projects are proposed to address infiltration and inflow in the sanitary sewer system in SW Portland. Projects typically involve rehabilitation of main lines and laterals and disconnecting storm inlets from the sanitary sewer.	SW	SW	Capacity	Level of Service / Regulatory mandate	2,425,000	1,955,000	4,695,000	7,015,000	7,150,000	23,240,000	18,100,000	15,000,000	56,340,000	Bonds	BES
Surface Water Management																	
Map SM-1 E10040	Johnson Creek Willing Seller Ph. 2	Based on the Johnson Creek Restoration Plan, acquisition of land in four target areas for floodplain restoration. Properties are purchased at fair market value and used to implement restoration projects detailed in other capital projects on list.	Johnson Creek Target Areas	SE	Flood management, water quality, habitat	Level of Service	500,000	500,000	500,000	500,000	500,000	2,500,000	2,500,000	5,000,000	10,000,000	Bonds	BES
Map SM-2 E06941	West Lents Flood Mitigation	Based on the Johnson Creek Restoration Plan, restore floodplain and wetland function in the West Lents target area for flood storage and water quality, stabilize stream banks to protect nearby homes, businesses and downstream sewer infrastructure, and restore habitat. Projects address TMDL requirements, ESA plans and other regulations.	West Lents target area	SE	Flood management, water quality, habitat	Level of Service, regulatory	0	0	300,000	545,000	2,757,000	3,602,000	2,815,000	0	6,417,000	Bonds	BES
Map SM-3 E07383 E08382	East Lents Area Flood projects	Based on the Johnson Creek Restoration Plan, restore floodplain and wetland function in the East Lents target area for flood storage and water quality, stabilize stream banks to protect nearby homes, businesses and downstream sewer infrastructure, and restore habitat. Projects address TMDL requirements, ESA plans and other regulations.	East Lents target area	SE	Flood management, water quality, habitat	Level of Service, regulatory	70,000	70,000	1,800,000	2,300,000	1,000,000	5,240,000	3,000,000	0	8,240,000	Bonds	BES

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider (Partner)
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Map SM-4 E08406 E08247 E07158	Other Johnson Creek Target Area Floodplain Projects	Based on the Johnson Creek Restoration Plan, restore floodplain and wetland function in the Tideman Johnson and Powell Butte target areas, and smaller target areas, in partnership with creek-side property owners for flood storage and water quality. Stabilize stream banks to protect nearby homes, businesses and downstream sewer infrastructure, and restore habitat. Projects address TMDL requirements, ESA plans and other regulations.	Tideman and Powell Butte Target areas plus CRP	SE	Flood management, water quality, habitat	Level of Service, regulatory	806,000	1,506,000	1,306,000	1,427,000	0	5,045,000	0	0	5,045,000	Bonds	BES
Map SM-5 E07466 E06947	Johnson Creek Restoration Program Projects	Priority projects along the main stem and tributaries of Johnson Creek to mitigate flooding, improve water quality and wildlife habitat, address stormwater outfalls and culverts, and sanitary sewer protection. Includes restoration of floodplain and wetlands, construction of stream enhancements, and partnership projects with other agencies to meet the objectives of the 2001 Johnson Creek Restoration Plan. Projects address TMDL requirements, ESA plans and other regulations.	Johnson Creek Watershed, various	SE	Flood management, maintenance, water quality, habitat	Level of Service, regulatory	500,000	3,000,000	650,000	875,000	0	5,025,000	2,000,000	2,000,000	9,025,000	Bonds	BES
Map SM-6 E10563 E05564	Columbia Slough Outfalls	Design and construction of pollution control facilities for separated stormwater areas flowing through 220-city owned outfalls to the Columbia Slough to address DEQ Sediment Order. Program prioritizes outfalls draining Columbia Boulevard and other high traffic City roadways.	Columbia Boulevard area	N/NE	Water quality	Regulatory	150,000	100,000	1,000,000	1,000,000	2,000,000	4,250,000	10,000,000	0	14,250,000	Bonds	BES
Map SM-7 E10377 E07177 E10176	Columbia Slough Restoration Projects	Culvert replacement, water quality facilities and wetland and habitat restoration and enhancement to improve water quality, habitat and hydrology. Projects address TMDL requirements, infrastructure deficiencies, ESA plans and other regulations and may include partnership with other agencies. Includes in-stream restoration as well as stormwater system improvements.	Columbia Slough Watershed, various	N/NE	Water quality, hydrology, maintenance, habitat	Level of Service, Regulatory	5,152,000	1,144,000	0	500,000	325,000	7,121,000	2,000,000	2,000,000	11,121,000	Bonds	BES
Map SM-8 E08676 E08675 E08677	Fanno Creek Stormwater System Improvements	Projects to address TMDLs, recommended by the Fanno/Tryon TMDL predesign. 1-5 year projects include stormwater retrofits along the Beaverton-Hillsdale Highway, addressing deficient stormwater outfalls, and other stormwater system improvements.	Fanno Watershed: Beaverton-Hillsdale corridor and various	SW	Water quality, capacity, conveyance	Level of Service, Regulatory	551,000	1,616,000	533,000	0	0	2,700,000	0	0	2,700,000	Bonds	
Map SM-9 E08679 E08687	Tryon Creek Stormwater System Improvements	Projects to address TMDLs, recommended by the Fanno/Tryon TMDL predesign. 1-5 year projects include stormwater retrofits along the I-5 and Barbur Blvd. corridors, addressing deficient stormwater outfalls, and other stormwater system improvements.	Tryon Watershed: I-5/Barbur area, and various	SW	Water quality, capacity, conveyance	Level of Service, Regulatory	2,000,000	100,000	35,000	270,000	270,000	2,675,000	0	0	2,675,000	Bonds	
Map SM-10 E10373 E10131	Fanno/Tryon Drainage Shoulder Improvements	Drainage improvements for high priority City maintained roadside ditches along arterials in the Fanno and Tryon watersheds. Projects address water quality, as recommended by Fanno/Tryon TMDL predesign. Includes SW Hamilton and SW Stephenson and future projects.	Fanno and Tryon Creeks watersheds (various)	SW	Water quality, capacity, conveyance	Level of Service, Regulatory	100,000	463,000	1,448,000	1,195,000	1,195,000	4,401,000	1,000,000	0	5,401,000	Bonds	
Map SM-11 E08682 E08680 E09105	Fanno/Tryon Restoration Projects	In-stream restoration and improvements to address water quality, hydrology and habitat, including TMDL requirements, ESA plans and other regulations. Includes culvert replacement, stream daylighting, sanitary sewer protection and other restoration in both the Fanno and Tryon creek watersheds. Projects recommended by the Fanno/Tryon TMDL predesign and watershed plans.	Fanno and Tryon Creeks watersheds, various	SW	Water quality, hydrology, maintenance, habitat	Level of Service, Regulatory	231,000	250,000	1,602,000	1,179,000	295,000	3,557,000	2,000,000	2,000,000	7,557,000	Bonds	
Map SM-12 E10498	Willamette River Restoration Projects	Projects to improve water quality, habitat and hydrology along the main stem river and tributaries (subwatersheds) to address TMDL requirements, ESA plans and other regulations. Includes in-stream and floodplain restoration and enhancement.	Willamette River Watershed	All	Water quality, hydrology, habitat	Level of Service, regulatory	0	0	800,000	3,400,000	3,400,000	7,600,000	5,000,000	5,000,000	17,600,000	Bonds	
Map SM-13 E10488	Stephens Creek Stormwater System Improvements	Address stormwater issues in the Stephens Creek subwatershed, including unmanaged stormwater discharge, pollution reduction and detention facilities, restoration of riparian and wetland functions, erosion and sediment loading at outfalls.	Stephens Creek Subwater-shed	SW	Capacity, conveyance, water quality, habitat	Level of Service, regulatory	965,000	1,162,000	996,000	800,000	200,000	4,123,000	10,200,000	0	14,323,000	Bonds	BES

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider (Partner)
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
n/a	Stormwater Management Program Implementation	Improvements to the stormwater management system resulting from Stormwater System Planning. Areas of particular concern include parts of SW (in addition to Stephens Creek), outer east, and the Columbia Slough. Specific improvements have not been identified as of FY14.	Various/ Citywide	City	Capacity, conveyance, water quality, habitat	Level of Service, regulatory	0	0	0	300,000	1,000,000	1,300,000	15,000,000	40,000,000	56,300,000	Bonds	BES
Map n/a E08967 E10372	Culvert Replacement Program	Replace or improve stream culverts citywide to improve fish passage and water quality, and address flooding and maintenance needs. Includes completion of culvert replacements on Crystal Springs Creek and other priority projects to address ESA plans and other system needs.	Various/ Citywide	City	Habitat, flooding, water quality, maintenance	Level of Service, regulatory	1,364,000	1,507,000	1,431,000	0	0	4,302,000	5,000,000	5,000,000	14,302,000	Bonds	BES
Map: n/a E08905 E10486	Watershed Land Acquisition Ph. 1 & 2	Program targets acquisition of medium to high functioning natural resource lands in support of watershed health and stormwater management.	Various/ Citywide	City	Water quality, habitat, hydrology	Level of Service, regulatory	2,000,000	2,000,000	2,500,000	1,500,000	2,000,000	10,000,000	6,000,000	0	16,000,000	Bonds	BES
Systems Development																	
Map: n/a	Sewer Extensions	Sewer extensions are proposed to relieve septic systems at risk of failure, to correct party sewer situations, and to provide service where development will be occurring soon and service is currently not available.	Various	City	Replacement; Efficiency	Level of Service	6,776,000	3,594,000	4,017,000	4,725,000	4,350,000	23,462,000	20,000,000	40,000,000	83,462,000	Bonds	BES
						Total All Projects	114,261,000	102,162,000	103,250,000	106,656,000	109,141,000	535,470,000	513,279,000	683,000,000	**1,731,749,000**		

Flood Management																	
Map: FM-1	Columbia River Levee Improvement Project	Identify and implement necessary improvements to the levees within the Multnomah County No 1, Peninsula No 1 and Peninsula No 2 Drainage Districts, so that they are certified as being protective of a 1% chance flood.	MCDD No. 1, Peninsula No. 1 and No. 2 drainage districts	N, NE	Repair/ Rehabilitation/ Replacement	Level of service, Regulatory	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	$100 - $200 million	District rates and bonds; Local, State, and Federal funds	MCDD 1, PEN 1, PEN 2

Portland Water Bureau

The Portland Water Bureau (PWB) project list is based on existing system plans and includes projects and programs to address longer term infrastructure replacement and maintenance needs, while addressing short-term water system infrastructure needs to ensure compliance with drinking water regulations. The project list focuses on regulatory compliance, improving the condition of aging infrastructure, and addressing operations and maintenance needs.

The Bureau anticipates approximately $1.6 billion in investment in these projects and programs over the next twenty years. The list assumes that rates are set at a level that is sufficient to meet agreed upon levels of service.

For more information on how this Investment Strategy was developed, please see Chapter 7. Portland Water Bureau.

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Customer Service																	
n/a	Automated Meter Reading (AMR) Implementation	This project provides for the Installation of automatic water meter reading equipment throughout the City.	Various	All	Efficiency	Service Level	0	0	0	0	0	0	45,000,000	0	45,000,000	Bonds	PWB
n/a	Dodge Park	Improvements will continue to address security and visitor amenities at the site, trespass/hazard warning signs, alternative park management arrangements, and visitor management. The bureau is committed to improving the maintenance of the park including preservation of existing infrastructure, repairs, replacements and upgrades. New uses for the park include an amphitheater, camping, training area, facility upgrade to the existing building, and special needs assistance for using the park amenities.	Dodge Park	E	Expansion	Service Level	0	0	0	0	0	0	400,000	800,000	1,200,000	Bonds	PWB
Map W-1 W01401	Emergency Coordination Center	This project designs and constructs the City's Emergency Coordination Center. The bureau will locate its emergency response and security staff at the location. The project location is adjacent to the City's 911 Call Center at SE 99th Ave and Powell Blvd. The total project cost is $19.85M and PWB is a contributing bureau.	Emer. Coord. Center (SE 99th and Powell)	E	Maintenance	Service Level	1,807,000	0	0	0	0	1,807,000	0	0	1,807,000	Bonds	PWB (POEM)
Map: n/a WBCSSE	Security and Emergency Management	The bureau is committed to increasing flexibility and preparedness to meet future security challenges, to enhance security throughout the water system and to modernize security practices and infrastructure. Projects funded by this budget will include physical security improvements to major and smaller facilities as well as improved security in the overall water distribution system and control/communications system.	Various	All	Maintenance	Service Level	0	0	250,000	500,000	500,000	1,250,000	2,500,000	5,000,000	8,750,000	Bonds	PWB (BTS)
Distribution																	
Map W-2 W01632	Bertha Service Area Improvements	This project will connect the Bertha 962 pressure zone with the 937 pressure zone with new 8-inch and 4-inch main and a new regulator. This work will allow for the abandonment of the existing main that passes through steep, unimproved right-of-way while maintaining an adequate level of service to the Bertha Service Area.	Bertha Service Area	SW	Replacement Efficiency	Service Level	430,000	426,000	0	0	0	856,000	0	0	856,000	Bonds	PWB
Map W-3	Burnside Pump Station Replacement	This project will decommission the old undersized pump station and modify the nearby Verde Vista pump station to serve the Burnside pumping needs for the next 50 years. The project will also acquire property for the future Burnside pump station to be built 50 years from now.	Burnside Pump Station	NW	Maintenance	Service Level	0	0	0	0	0	0	2,000,000	0	2,000,000	Bonds	PWB
Map W-4 W01674	Carolina Pump Main Extension, Phase II	This project will connect the existing Carolina Pump Main (Westwood Tanks) and the Fulton Pump Main (Burlingame Tanks) together. This will be a pump main from the intersection of SW Capital Hwy and SW Terwilliger Blvd to the Burlingame Tank site.	SW Capitol Hwy – SW Terwilliger	SW	Expansion	Service Level	690,000	2,494,000	0	0	0	3,184,000	0	0	3,184,000	Bonds	PWB
Map: n/a WBDIDM	Distribution Mains	This program includes rehabilitation and replacement of substandard mains, expansion due to applications from private developers, increasing supply for fire protection, improving water quality and water system upgrades due to local improvement districts (LIDs), and street improvements. Water main replacements also include appurtenances such as fire hydrants, valves, pressure regulators, service branches, and other facilities.	Various	All	Replacement	Service Level	11,717,000	13,911,000	15,875,000	16,775,000	17,460,000	75,738,000	75,000,000	150,000,000	300,738,000	Bonds	PWB
Map W-5 W01652	Division Street Piping	This project will design and construct improvements located in the ROW for the Tabor Reservoir Adjustments project. Improvements will be made to the distribution and transmission systems as well as to Conduits 2 and 3 in SE Division St.	SE Division St	SE	Replacement	Service Level	1,480,000	200,000	0	0	0	1,680,000	0	0	1,680,000	Bonds	PWB

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Map n/a WBDIFS	Field Support	This project funds vehicles and major equipment purchases, including heavy construction equipment such as dump trucks and backhoes, and Bureau owned computer software with a unit cost greater than $5000.	Various	All	Replacement Efficiency	Service Level	3,755,600	3,501,500	3,388,900	3,460,138	3,459,338	17,565,476	17,500,000	35,000,000	70,065,476	Bonds	PWB
Map W-6 W01359	Forest Park Low Tank	This project will plan, design and construct a single 1.3 million gallon AWWA D110 type 1 tank. This storage is to augment regular system capacity and increase fire flow.	Forest Park Low Tank	NW	Growth	Service Level	2,210,000	0	0	0	0	2,210,000	0	0	2,210,000	Bonds	PWB
Map: n/a WBDIFO	Fountains	The bureau has responsibility for 27 decorative fountains, including repairs, replacements and upgrades. Funding includes provisions for repair of drain lines and valves, replacement of liners, repair and replacement of electrical equipment and lighting systems, repair and replacement of pumps, addition of telemetry, and various improvements to exterior surfaces.	Various/ Citywide	All	Maintenance	Service Level	150,000	150,000	150,000	150,000	150,000	750,000	750,000	1,500,000	3,000,000	Bonds	PWB (PP&R, RACC)
Map W-7 W01358	Fulton Pump Station	This project will replace the Fulton Pump Station with a new pump station located in Willamette Park.	Fulton Pump Station	SW	Replacement Efficiency	Service Level	2,220,000	6,740,000	100,000	0	0	9,060,000	0	0	9,060,000	Bonds	PWB (PPR)
Map W-8	Greenleaf Pump Station	This project will plan, design and construct a replacement Greenleaf pump station at the existing site. Flow upgrades will remove the Penridge tank from the system. The new pump station will pump directly to the distribution system.	Greenleaf Pump Station	NW	Replacement Efficiency	Service Level	0	0	0	0	0	0	3,500,000	0	3,500,000	Bonds	PWB (PPR)
Map: n/a WBDIHY	Hydrants	The bureau maintains about 16,000 fire hydrants. These hydrants allow Portland the flexibility and preparedness to meet the challenge of a fire emergency through coordination with the Fire Bureau. This project provides for the replacement of fire hydrants that are no longer repairable. Replacements may also occur as part of the bureau's ongoing efforts to standardize hydrant types for more efficient and effective management of maintenance and repair activities.	Various/ Citywide	All	Replacement Efficiency	Service Level	1,100,000	1,200,000	1,200,000	1,200,000	1,200,000	5,900,000	6,000,000	12,000,000	23,900,000	Bonds	PWB (PFB)
Map W-9 W01400	Interstate Facility Renovation	The bureau's System Control Center and Operations and Maintenance Facility, located on North Interstate Avenue, serves as the hub for maintenance and construction crews, vehicles, equipment and materials, and the emergency operations center. This project consists of a comprehensive plan of reconstruction and improvements that will address seismic and other site vulnerabilities, and bring the facility up to current safety and building codes.	Interstate Facility (NE Interstate)	All	Efficiency; Maintenance	Service Level	12,377,000	16,248,390	6,138,422	560,000	0	35,323,812	0	0	35,323,812	Bonds	PWB (OMF)
Map: W-10 W01348	Portland-Milwaukie Light Rail Project	This project consists of planning, design and construction for relocation of over 5,000 feet of main required for the Portland-Milwaukie Light Rail project. PWB Construction crews and Construction Management Team will assist during the construction phase of the project.	PMLR alignment, SW/SE	SW, SE	Replacement	Service Level	1,100,000	0	0	0	0	1,100,000	0	0	1,100,000	Bonds	PWB (PBOT, TriMet)
Map: n/a WBDIME	Meters	This project funds the purchase and installation of water meters. The Bureau objective is to maintain meter accuracy to within 3% of actual values.	Various/ Citywide	All	Replacement Efficiency	Service Level	1,700,000	1,590,000	1,800,000	1,800,000	1,800,000	8,690,000	9,000,000	18,000,000	35,690,000	Bonds	PWB
Map: n/a WBDIPT	Pump Stations and Tanks	This program maintains a large variety of infrastructure consisting of water storage tanks, pumps, and pump and control facilities. The bureau uses a reliability centered maintenance (RCM) analysis to prioritize projects in these areas. A key focus of the next five years will be to replace the remote telemetry units at over 140 remote sites. The existing units are over 15 years old, and are becoming obsolete. The servers are at the end of their service cycle, and must also be replaced.	Various/ Citywide	All	Replacement Efficiency; Growth	Service Level	500,000	510,000	1,480,000	1,098,000	1,415,000	5,003,000	5,000,000	10,000,000	20,003,000	Bonds	PWB
Map: W-11 W01581	Rose City Sewer Rehabilitation	The project will install 1207 feet of 8 inch DI, 2 new hydrants and 39 new water services 2 inches or smaller.	Rose City area	NE	Replacement	Service Level	2,000	0	0	0	0	2,000	0	0	2,000	Bonds	PWB

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Map: W-12 W01651	Raymond Tank Supply Improvements	This project will design and construct improvements at Raymond Tank Site and at an intersection of SE Holgate Boulevard and SE 136th Avenue.	Raymond Tank, vicinity	SE	Efficiency	Service Level	125,000	410,000	0	0	0	535,000	0	0	535,000	Bonds	PWB
Map:W-13	Sam Jackson Pump Station	This project will add multiple capital improvements including seismic improvements, replacement of RTU and motor controllers, installation of pump control and check valves, extension of the crane rail, a concrete pad, and installation of a security fence and gate.	Sam Jackson Pump Station	SW	Replacement ; Efficiency	Service Level	0	0	0	0	0	0	1,400,000	0	1,400,000	Bonds	PWB
Map n/a WBDISV	Services	This project constructs replacement and customer requested water services. A water service is the connection between the water main and any given customer's service meter. Service connections are always performed by Water Bureau crews directed by a certified Water Service Mechanic. An ongoing budget of approximately $4 million per fiscal year provides for installation of about 1,000 water service connections annually and other upgrades to existing water services.	Various/ Citywide	All	Expansion	Service Level	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	20,000,000	20,000,000	40,000,000	80,000,000	Bonds	PWB
Map: W-14 W01590	Willamette River Pipe Crossings	The project replaces major pipelines to strengthen the transmission link between Powell Butte and the service areas west of the Willamette River, including downtown and the storage reservoirs at Washington Park. It includes construction of a new seismically strengthened river crossing to replace the first one of potentially two Willamette River crossings, and new transmission piping on both sides of the river.	Various, Powell Butte – Wash. Park	CC	Expansion	Service Level	460,000	2,600,000	5,000,000	20,000,000	28,540,000	56,600,000	0	55,000,000	111,600,000	Bonds	PWB
Regulatory Compliance																	
Map: n/a W01355	Bull Run Dam 2 Tower	The Water Bureau plans to install steel multi-level intake structures onto the North Dam 2 Tower located in the Bull Run watershed. Modifications are designed to allow selective water withdrawal, proper operation during flood conditions, and enable the towers to better withstand seismic loadings.	Bull Run	Bull Run	Maintenance	Service Level	5,975,000	475,000	0	0	0	6,450,000	0	0	6,450,000	Bonds	PWB
Map: n/a W01534	HCP Alder Creek Fish Passage	This project will design and install two fish passage facilities as planned in the Habitat Conservation Plan (HCP). The project is in Alder Creek, a tributary to the Sandy River. There will be a fish ladder at the waterfall and a fish ladder at a water diversion.	Bull Run	Bull Run	Maintenance	Service Level	458,000	0	0	0	0	458,000	0	0	458,000	Bonds	PWB
Map: n/a WBRCRC	Water Quality and Regulatory Compliance	The bureau recognizes the Bull Run watershed as a diverse ecosystem. The bureau is committed to preserving this habitat and complying with federal regulations using practical, locally driven solutions. Many of the projects in this subprogram respond to the Endangered Species Act (ESA), including the implementation of the Bull Run Habitat Conservation Plan (HCP) as adopted by City Council and approved by the National Marine Fisheries Service. Consistent with HCP commitments, this program funds easements, purchases land, and also supports projects jointly conducted with other watershed partners.	Bull Run	Bull Run	Efficiency	Service Level	1,304,000	3,642,000	9,300,000	2,350,000	2,000,000	18,596,000	10,000,000	20,000,000	48,596,000	Bonds	PWB (EPA, OHHS)

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Supply																	
Map: n/a WBSUBR	Bull Run Watershed	The bureau is committed to updating the Bull Run watershed protection and maintenance procedures and agreements based on the 2007 Bull Run Agreement with the Mt. Hood National Forest. The function of this program is to allocate funds for the capital projects necessary to maintain, improve, and protect the watershed facilities that are not directly related to the water supply system facilities. This includes Bull Run Watershed road reconstruction to ensure continuous, reliable, and safe access to all facilities, as well as maintenance of other city-owned infrastructure within the watershed.	Bull Run	Bull Run	Maintenance	Service Level	380,000	780,000	2,500,000	2,750,000	2,000,000	8,410,000	10,000,000	20,000,000	38,410,000	Bonds	PWB (USFS)
Map: n/a	Dams and Headworks Repair and Rehabilitation	This program provides for assessment of the condition and rehabilitation of dams and other facilities at Headworks. As many of these facilities are between 50 and 70 years old, their safe and reliable operation requires ongoing investment. The program includes preliminary engineering and design of needed repairs, rehabilitation of these facilities, and actual repair work.	Bull Run	Bull Run	Maintenance	Service Level	0	0	0	0	0	0	1,000,000	2,000,000	3,000,000	Bonds	PWB
Map: n/a WBSUGW	Groundwater Improvements	The Columbia South Shore Wellfield (CSSW) is Portland's alternative supply of water should the Bull Run watershed supply be interrupted for any reason. Projects funded in this program improve the maintenance of this aging infrastructure, including repairs, selective replacements and upgrades.	CSSW	NE	Maintenance	Service Level	300,000	450,000	450,000	500,000	500,000	2,200,000	2,500,000	5,000,000	9,700,000	Bonds	PWB
Map:W-15	Groundwater Collection Main Hardening	Much of the piping connecting the wells to the Groundwater Pump Station is located in liquefiable soils which are vulnerable during a seismic event. This project would design and install measures to "harden" the piping and reduce this vulnerability.	CSSW	NE	Maintenance	Service Level	0	0	0	0	0	0	0	20,000,000	20,000,000	Bonds	PWB
Map: W-16 W01371	Groundwater Electrical Supply Improvements	This project designs and constructs a new 115kV/4160V transformer and other components to complete a double-ended electrical substation at the Groundwater Pump Station. It will also design and construct a 5kV main breaker replacement and purchase selected spare components.	CSSW	NE	Efficiency	Service Level	79,000	1,992,000	0	0	0	2,071,000	0	0	2,071,000	Bonds	PWB
Map: W-17	Groundwater Pump Station Expansion	As water demand increases, the bureau will need to increase the available flows from the groundwater system. The system expansion will include upgrade of the Groundwater Pump Station to provide additional capacity.	CSSW	NE	Expansion	Population	0	0	0	0	0	0	0	10,000,000	10,000,000	Bonds	PWB
Map: W-18	Groundwater Wellfield Expansion	As water demand increases, the bureau will need to increase the available flows from the groundwater system. The system expansion will include additional well development and collection mains in the Columbia South Shore area.	CSSW	NE	Expansion	Growth	0	0	0	0	0	0	2,000,000	10,000,000	12,000,000	Bonds	PWB
Map: W-19	Groundwater Wellfield Reliability Enhancement	The bureau is attempting to increase the flexibility and preparedness to meet the future challenge of an interruption of Bull Run water. The bureau is improving its emergency preparedness by evaluating electrical vulnerability for the pumping system, reviewing the flood inundation vulnerability of the site, and development of a Groundwater Intertie that would reduce transmission system vulnerability. The inundation review may be partially completed through a partnership with Multnomah County Drainage District.	CSSW	NE	Efficiency	Service Level	0	0	0	0	0	0	1,000,000	2,000,000	3,000,000	Bonds	PWB
Map: W-20	Powell Valley Well Improvements	The project includes upgrade of the facilities in the previous Powell Valley Road Water District area and connection and integration of these facilities to the PWB water system.	CSSW	NE	Efficiency	Growth	0	0	0	0	0	0	1,000,000	2,000,000	3,000,000	Bonds	PWB
Map: n/a W01669	Road 1008	This project will design and construct an overlay for the Bull Run 1008 road.	Bull Run	Bull Run	Maintenance	Service Level	60,000	650,000	0	0	0	710,000	0	0	710,000	Bonds	PWB
Map: n/a W01670	Road 10 MP 0.6-1.8	Design and construct walls, widening, culverts and repave this portion of the Bull Run 10 road.	Bull Run	Bull Run	Maintenance	Service Level	60,000	840,000	0	0	0	900,000	0	0	900,000	Bonds	PWB

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Support																	
Map: n/a	Building Maintenance	The bureau maintains hundreds of structures from the Bull Run watershed to Downtown Portland. These structures range in size from small pump houses to the maintenance hub on Interstate Avenue. The necessary work involves structural repairs and maintenance.	Various/ Citywide	All	Maintenance	Service Level	0	0	0	0	0	0	1,000,000	2,000,000	3,000,000	Bonds	PWB (OMF)
Map: n/a WBASPL	Planning	This project funds general planning studies for projects that the Water Bureau encounters during operation of the water system. These include pressure zone adjustments, facility modifications, and system element studies. The bureau attempts to employ efficient and effective management practices when evaluating the need for new facilities.	Various/ Citywide	All	Efficiency; Maintenance	Service Level	1,500,000	1,500,000	2,000,000	2,500,000	2,500,000	10,000,000	12,500,000	25,000,000	47,500,000	Bonds	PWB
Map: n/a	Sandy River Station Upgrade	This project consists of upgrades to the Sandy River Station facilities including an evaluation of a potential move to a different site.	Sandy River station	E	Efficiency Maintenance	Service Level	0	0	0	0	0	0	0	5,000,000	5,000,000	Bonds	PWB (OMF)
Map: n/a	West Side Maintenance Facility	A hub is needed on the west side of the Willamette River for maintenance and construction crews, vehicles, equipment and materials, and emergency operations. This project includes construction of the facility within the next 20 years.	West of Willamette River, tbd	W	Efficiency; Maintenance	Service Level	0	0	0	0	0	0	5,000,000	0	5,000,000	Bonds	PWB (OMF)
Transmission & Terminal Storage																	
Map: n/a	Conduit 5	This project would include installation of sections of a new Conduit 5 as growth occurs and the condition of the existing conduits worsens.	Conduit 5, east of city limits	E	Maintenance Expansion	Service Level; Growth	0	0	0	0	0	0	0	75,000,000	75,000,000	Bonds	PWB
Map: n/a WBTTCT	Conduits and Transmission Mains	The conduits that bring water to Portland from the Bull Run watershed are pipes 56 to 72 inches in diameter. This program funds repairs, replacements and upgrades to these key pipelines. Reliable service to the City and the City's wholesale customers is the key reason for the bureau's commitment to improve maintenance of this aging infrastructure.	Various/ Citywide	E	Maintenance	Service Level	425,000	8,500,000	12,600,000	5,000,000	7,000,000	33,525,000	10,000,000	20,000,000	63,525,000	Bonds	PWB
Map W-22 W01424	Kelly Butte Reservoir	The purpose of this project is to increase storage capacity from 10MG to 25MG by replacing the existing tank with a buried reservoir. This includes site access, construction access and easements, staging areas, and on-site storage areas. This project establishes Kelly Butte as the key facility that will be used for system pressure equalization and in-town terminal storage in lieu of the Mt. Tabor open reservoirs.	Kelly Butte	SE	Replacement	Service Level; Growth	35,000,000	27,000,000	4,970,000	0	0	66,970,000	0	0	66,970,000	Bonds	PWB
Map: n/a	New Conduit Intertie	This project would address concerns about the capability of the conduit system to withstand hazards and deliver an uninterruptible supply to the City. The project will improve reliability of flow during emergency conditions and for maintenance by providing additional isolation and interconnectivity.	Conduit, east of city limits	E	Maintenance Efficiency	Service Level	0	0	0	0	0	0	0	10,000,000	10,000,000	Bonds	PWB
Map W-23 W01343	Powell Butte Reservoir 2	This LT2 project is being constructed in 2 phases -- Phase 1 is complete. The project is currently in Phase 2, the construction of a 50 million gallon buried reservoir at Powell Butte. It includes a short section of Conduit 5, construction of a maintenance and storage facility, replacing the caretaker's house, construction of an interpretive center and restrooms, reservoir overflow, park improvements and mitigation requirements as part of the conditions for approval in the 2003 LUR Type III CUMP.	Powell Butte	SE	Replacement	Service Level; Growth	27,520,000	7,700,000	0	0	0	35,220,000	0	0	35,220,000	Bonds	PWB
Map W-24	Powell Butte Reservoir 3	This project constructs a third reservoir at Powell Butte and possible bypass piping around the Butte.	Powell Butte	SE	Expansion	Growth	0	0	0	0	0	0	0	100,000,000	100,000,000	Bonds	PWB
Map: n/a	Sandy River Conduit Relocation, Phase II	The bureau is committed to increasing the flexibility and preparedness to meet the future challenge of a natural disaster. This project will relocate the Sandy River crossings of Conduit 3. The crossings of Conduit 2 and 4 have already been completed. These conduits were identified in the system vulnerability study as vulnerable to seismic, volcanic, flooding, and other natural and manmade hazards.	Sandy River crossing	E	Replacement	Service Level	0	0	0	0	0	0	5,000,000	0	5,000,000	Bonds	PWB

Project ID	Project Title	Project Description	Location	Area	Project Objective	Driver	Estimated Cost by Time Period								Grand Total	Funding Source	Facility Provider
							FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	Total FY 2013-18	FY 2018-23	FY 2023-33	FY 2013-33		
Map W-25 W01524	Tabor Reservoir Adjustments	This project includes adjustments to piping, structures and other features at Mt. Tabor in order to move storage elsewhere and physically disconnect the open reservoirs from the public water system for compliance with LT2. Project does not include disposition of the reservoirs after they have been disconnected from the public water system.	Mt. Tabor	SE	Replacement	Service Level	225,000	1,140,000	1,990,000	0	0	3,355,000	0	0	3,355,000	Bonds	PWB
Map W-26 W01402	Washington Park Reservoir 3	The project will plan, design and construct a new buried reservoir to replace open reservoir No. 3. This project is one solution toward compliance with LT2 replacement of the open reservoirs. It is assumed that Reservoir # 4 will be used as the overflow detention structure. We envision that the buried reservoir would be topped with a reflecting pond and historical features would be protected to retain its visual appeal.	Washington Park	SW	Replacement	Service Level	3,600,000	2,300,000	2,900,000	19,300,000	24,000,000	52,100,000	0	0	52,100,000	Bonds	PWB
Map W-27	West Side Transmission Main Improvements	These mains include the Sam Jackson to Downtown Pipeline and the Jefferson Street Supply mains. These large transmission mains are needed to strengthen the supply to terminal storage located on the west side of the Willamette River.	Various, SW Portland	E	Maintenance Expansion	Service Level; Growth	0	0	0	0	0	0	10,000,000	10,000,000	20,000,000	Bonds	PWB
Map: n/a	Wholesale Connections	This project provides for facilities servicing wholesale customers including repairs, replacements, and upgrades of pump stations and meters. Additional interties may be needed in the future.	Bull Run	All	Efficiency	Service Level; Growth	0	0	0	0	0	0	0	2,000,000	2,000,000	Bonds	PWB
Treatment																	
Map: n/a W01582	Headworks Flow Meters	This project would install new flow meters on the Primary Intake conduits; install new flow meters and flow control valves on Screen house #3 conduits; and, address the sump pump drainage system in Bailey PRV vault.	Bull Run	Bull Run	Maintenance	Service Level	2,500,000	0	0	0	0	2,500,000	0	0	2,500,000	Bonds	PWB
Map: n/a	Treatment Facilities Improvements	Treatment of Portland's drinking water is the most complex activity the bureau engages in while operating the water system. This project would include several related projects for the Bull Run water supply, at Bull Run Headworks and the Lusted Hill Facility. Projects would likely be driven by State and Federal regulations	Bull Run	Bull Run	Maintenance	Service Level; Growth	0	0	0	0	0	0	50,000,000	100,000,000	150,000,000	Bonds	PWB (EPA, OHHS)
						Total All Projects	**125,209,600**	**110,949,890**	**76,092,322**	**81,943,138**	**96,524,338**	**490,719,288**	**309,050,000**	**767,300,000**	**1,567,069,288**		

Bureau of Transportation

The Portland Bureau of Transportation project list includes planned transportation projects, based on the Portland's Transportation System Plan (TSP) and the Regional Transportation Plan (RTP). These multi-modal projects address the needs of pedestrian, bicyclists, transit users, freight movers, and motorists. Investments in the City's transprotation system are needed to maintain existing facilities and to ensure the system meets the needs of Portlanders for decades to come. Anticipated funding is not adequate to support completion of all projects identified in the Investment Strategy.

The City is updating the Transportation System Plan along with the Comprehensive Plan Update. This update of the Transportation System Plan will include refining the list of projects included here to reflect anticipated funding, project timing; recent plans, new goals and policies, and proposed centers, corridors, and greenways.

For more information on the TSP update project, visit http://www.portlandoregon.gov/transportation/63710.

Planning and Sustainability Commission:

To review the draft Transportation Investment Strategy, please see the project list included in the Transportation System Plan packet. A copy of the final Transportation Investment Strategy will be inserted here and forwarded as part of the PSC Recommended Plan.

Appendix B
Urban Service Agreements

Urban service agreements are being reviewed and updated as part of the Comprehensive Plan Update implementation phase (Task 5). When available, a list of relevant agreements will be added here to comply with Oregon Revised Statutes 195 and 197.

Appendix C
Resources

Document	Date	Source
Airport Futures	2010	BPS/Port
Bicycle Plan for 2030 (Bicycle Master Plan)	2010	PBOT
Bull Run Water Supply Habitat Conservation Plan	2008	PWB
Bureau of Environmental Services Strategic Plan	2011	BES
BES Capital Improvement Plan	Annual	BES
Climate Action Plan	2009	BPS
Columbia Boulevard Wastewater Treatment Plant Conditional Use Master Plan	2010	BES
Columbia Boulevard Wastewater Treatment Plant Facilities Plan	2008	BES
Combined Sewer System Plan		BES
Comprehensive Plan	1980-2010	BPS
CSO Facilities Plan	2011	BES
Distribution System Master Plan	2007	PWB
Fanno and Tryon Creeks Watershed Management Plan	2005	BES
Freight Master Plan	2006	PBOT
Infrastructure Master Plan	2000	PWB
Johnson Creek Restoration Plan	2001	BES
Metro 2040 Growth Concept	1995/2012	Metro
Metro Regional Framework Plan	1997/2005	Metro
Metropolitan Greenspaces Master Plan	1992	Metro
Mt. Hood National Forest Land and Resource Management Plan	1990	USDA Forest

		Service
Natural Area Acquisition Strategy	2006	PP&R
Natural Areas Restoration Plan	2010	PP&R
Northwest Forest Plan	1994	USDA Forest Service
Oregon Highway Plan (OHP)	1999	ODOT
Oregon Transportation Plan (OTP)	2006	ODOT
Parks 2020 Vision	2001	PP&R
Pedestrian Master Plan	1998	PBOT
Portland Parks & Recreation Strategic Plan	2012	PP&R
Portland Plan	2012	BPS
Portland Watershed Management Plan (PWMP)	2006	BES
Powell Valley Road Water District Wellhead Protection Plan	1998	PVRWD
PWMP 5-Year Implementation Strategy 2012-2017	2012	BES
Regional Transportation Plan (RTP)	2013	Metro
Regional Water Supply Plan	1996/2004	RWPC
Seasonal Water Supply Augmentation and Contingency Plan, also referred to as the Summer Supply Plan (SSP)	Annual	PWB
Statewide Comprehensive Outdoor Recreation Plan (SCORP)	2008	OPRD
Stephens Creek Stormwater System Plan	2012	BES
Stormwater Discharge Monitoring Plan	2012	BES
Stormwater Management Manual	2008	BES
Stormwater Management Plan	2011	BES
Streetcar Concept Plan	2009	PBOT
Transportation System Plan	2006	PBOT
Tryon Creek Wastewater Treatment Plant Facilities Plan	1999	BES

UIC Corrective Action Plan	2006	BES
Underground Injection Control (UIC) Management Plan	2012	BES
Urban Forest Action Plan	2007	PP&R
Urban Forestry Management Plan	2004	PP&R
Urban Growth Management Functional Plan	1996/2013	Metro
Water Management and Conservation Plan	2010	PWB

Appendix D
Glossary

Bureau abbreviations

- BES - Bureau of Environmental Services
- BES - Bureau of Environmental Services
- BPS - Bureau of Planning and Sustainability
- PBOT - Portland Bureau of Transportation
- PBEM - Portland Bureau of Emergency Management
- PPB - Portland Police Bureau
- PP&R - Portland Parks & Recreation
- PWB - Portland Water Bureau

Local, State and Federal Agency abbreviations

- DEQ - Oregon Department of Environmental Quality
- EPA - U.S. Environmental Protection Agency
- MCDD - Multnomah County Drainage District
- Metro - Elected regional government for the Portland metropolitan area
- ODOT - Oregon Department of Transportation
- ORPD - Oregon Parks and Recreation Department
- RWPC - Regional Water Providers Consortium
- USDA - U.S. Department of Agriculture

Portlanders: People who live, work, do business, own property, or visit Portland, including people of any race, ethnicity, sex, gender or gender identity, sexual orientation, belief system, political ideology, ability, socioeconomic status, educational status, veteran status, place of origin, language spoken, age or geography.

Active transportation: Transportation that involves physical activity, including walking, biking, and using transit (because usually one must walk or roll to the bus or train).

Adaptive management: A dynamic planning and implementation process that applies scientific principles, methods, and tools to improve management activities incrementally as better information and as analytical tools become available. Involves frequent modification of planning and management strategies, goals, objectives and benchmarks. Requires frequent monitoring and analysis of the results of past actions and application of those results to current decisions.

Asset management: The continuous cycle of asset inventory, condition, and performance assessment that has as its goal the cost-effective provision of a desired level of service for physical assets. Investment decisions consider planning, design, construction, maintenance, operation, rehabilitation, and replacing assets on a sustainable basis that considers social, economic, and environmental impacts.

Best practice: An activity that has proven its effectiveness in multiple situations and may have applicability in other situations.

Center: Places with concentrations of commercial and community services, housing, gathering places, and transit connections. Centers provide services to surrounding neighborhoods and are intended to be places that are a focus of growth, where increasing numbers of people will live, work, and visit. Different types of centers have varying functions, levels of activity, and scale and intensity of development:

Central City: Corresponds to the Central City plan district, which serves as the region's premier center, anchoring an interconnected system of centers.

Centers and corridors: When used together, "centers and corridors" refers generally to places where development is concentrated, including the Central City, Gateway Regional Center, Town Centers, Neighborhood Centers, Transit Station Areas, Civic Corridors, and Neighborhood Corridors.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law, commonly known as Superfund, that was enacted in1980 and established requirements for hazardous waste sites; authorized actions to address releases or threatened releases of hazardous waste; provided for liability for responsible parties; and established a trust fund to provide for cleanup of hazardous waste when no responsible party can be identified.

Civic Corridors: These are a prioritized subset of the city's most prominent transit and transportation streets. They connect centers, provide regional connections, and include segments where commercial development and housing are focused. Civic Corridors are intended to become places that continue their important transportation functions while providing livable environments for people and evolving into distinctive places that are models of ecological design.

Clean Water Act (CWA): A law passed by the U.S. Congress in 1972 that makes the discharge of pollution into surface or ground waters without a permit illegal, and that encourages the use of the best achievable pollution control technology to reduce the impact of discharged effluent.

Combined sewer overflow (CSO): In areas with combined sewers that convey both sewage and stormwater in a single pipe, stormwater runoff during rainstorms can exceed the capacity of pipes, causing overflow of sewage and stormwater into a waterbody.

Corridor: When an area is designated as a corridor (such as a Civic or Neighborhood Corridor), it may be a single major street or a broader mobility corridor for a range of transportation modes (transit, pedestrians, cyclists, freight, motor vehicles, and so forth), although not necessarily on the same street.

Critical infrastructure: Assets and systems that are essential for the functioning of society and the economy, including energy generation, transmission and distribution; telecommunications; water supply and wastewater; transportation systems; public health; and security and emergency response services.

Ecological function: The physical, chemical, and biological functions of a watershed such as flow conveyance and storage, channel dynamics, nutrient cycling, microclimate, filtration, control of pollution and sedimentation, water quality, terrestrial and aquatic habitat, and biodiversity.

Ecosystem services: The contribution of ecosystem conditions and processes to human well-being. Examples include pollination of trees and plants, climate regulation, clean air and water, flood mitigation, stormwater management, recreational opportunities, and satisfaction of aesthetic and spiritual needs.

Endangered Species Act (ESA): A law passed by the U.S. Congress in 1973 that established programs for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The U.S. Fish and Wildlife Service maintains the list of threatened and endangered species.

Green infrastructure: Public or private assets—either natural resources or engineered green facilities—that protect, support, or mimic natural systems to provide stormwater management, water quality, public health and safety, open space, and other complementary ecosystem services. Examples include tress, natural areas, ecoroofs, green street facilities, wetlands, and natural waterways.

Greenways: A system of accessible pedestrian- and bike-friendly green streets and trails that link neighborhood centers, parks, schools, natural areas, and other key community destinations. The Greenways system is a prioritized subset of pedestrian and bicycle connections that use multi-objective, distinctive design approaches that draw on and contribute to Portland's pedestrian, bicycle, green street, and parks and open space systems.

Habitat Corridors: Stream and/or vegetation connections that provide habitat values and allow wildlife to move between habitats.

Habitat-friendly development: Strategies to provide habitat for and prevent harm to native resident and migratory wildlife. Examples include habitat-oriented and wildlife-friendly ecoroofs, bridges, buildings and sites, including features such as nest platforms and bat boxes. Strategies also involve development designs and practices that limit the amount of light, noise, vibration, and other disturbance that affect wildlife and wildlife habitat, especially during vulnerable wildlife life cycles (such as mating/nesting season and migration), improve wildlife access and passage, limit fencing, roads, culverts and other barriers between important habitats (between desirable feeding and watering sites, for example), and limit impacts related to construction in rivers.

Healthy watershed: A healthy urban watershed has the hydrologic, habitat, and water quality conditions suitable to protect human health and maintain viable ecological functions and processes, including self-sustaining populations of native fish and wildlife species whose natural ranges include the Portland area.

High-Capacity Transit Corridors: The system of light rail and other high-capacity transit stations. Some of these stations are located along streets that serve as Civic Corridors (such as Interstate Avenue), but

others are located along freeways or other locations where the primary focus of activity and development is in Transit Station Areas.

High-risk infrastructure: Infrastructure assets that have a high risk of failure, based on the likelihood and consequence of that failure.

Hydrologic cycles: The movement of water on, in, and above the earth, through processes of evaporation, condensation, precipitation, infiltration, runoff, and subsurface flow.

Infrastructure: Generally long-lived capital assets that serve whole communities, are normally stationary, and can be preserved for a significant number of years. Two of the most basic types of infrastructure are transportation and utilities. Examples include streets, bridges, tunnels, drainage systems, water and sewer lines, pump stations and treatment plants, dams, and lighting systems. Beyond transportation and utility networks, Portland includes buildings, green infrastructure, parks and recreation, communications, and information technology as necessary infrastructure investments that serve the community.

Level of service standard: A defined standard against which the quality and quantity of service can be measured. A level of service can take into account reliability, responsiveness, environmental acceptability, customer values, and cost.

Low-impact development: Strategies to reduce the environmental impact of development on natural systems, including hydrology and vegetation. These strategies include using paving and roofing materials to reduce effective impervious area, clustered or small lot development that reduces disturbance area, the use of vegetated stormwater management to mimic pre-development site hydrology, alternative road layout and narrower streets, natural area protection, and landscaping with native plants.

Municipal Separate Storm Sewer System (MS4): A publicly-owned conveyance or system of conveyances that discharges to waters of the U.S. and is designed or used for collecting or conveying stormwater, but is not a combined sewer or part of a publicly-owned treatment system. The MS4 stormwater system is regulated under the Clean Water Act.

National Environmental Protection Act (NEPA): A federal law that promotes protection and enhancement of the environment and established procedural requirements for environmental assessments (EAs) and impact statements (EISs) for proposed federal agency actions.

National Pollutant Discharge Elimination System (NPDES): Wastewater and Surface water quality program authorized by Congress as part of the 1987 Clean Water Act, and administered by the state Department of Environmental Quality. NPDES provides guidance to municipalities and state and federal permitting authorities on how to meet wastewater and stormwater pollution control goals as flexibly and cost-effectively as possible.

Total Maximum Daily Loads (TMDLs): A calculation of the maximum amount of a pollutant a waterbody can receive and still meet water quality standards. The Clean Water Act establishes and regulates TMDLs.

Underground Injection Controls (UIC): An injection system that distributes or injects fluids such as stormwater runoff or wastewater below the surface of the ground.