City of Bellevue

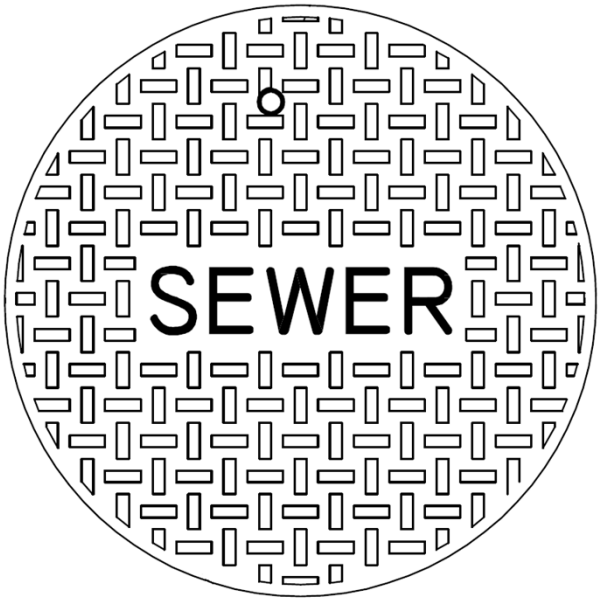
2013 Wastewater System Plan

Volume 1

Chapters 1-10

City of Bellevue

2013 Wastewater System Plan



Executive Summary

The City of Bellevue (the City) wastewater utility service area includes the entire City of Bellevue, the Cities of Clyde Hill and Medina, the Towns of Hunts Point and Yarrow Point, the Village of Beaux Arts, and small adjacent portions of the City of Issaquah (South Cove area) and unincorporated King County. Since the founding of the original Bellevue Sewer District on Meydenbauer Bay in 1952, the utility has protected water quality and public health, while facilitating economic vitality, desirable neighborhoods and significant growth.

The 2013 Wastewater System Plan (the Plan) reflects back on more than a decade of change since Bellevue's 2002 Wastewater Comprehensive Plan, while charting a course to navigate the challenges ahead. The Plan addresses aging of infrastructure, system expansion to accommodate development, revised polices and practices, newly available analytical data, finances, revised forecasting of growth, and recommended improvements.

The Plan has been prepared as a General Sewer Plan in conformance with Washington Department of Ecology criteria, as defined in WAC 173-240-050.

Recreation in Mercer Slough, with Construction Crane in Background

The Plan provides a basis for capital improvement planning for the next 6 years. The Plan also forecasts anticipated needs within the next 20 years and for ultimate system build-out based on land use zoning.

The City has consulted with Bellevue's Environmental Services Commission (ESC) in public meetings for review and direction of the Plan at key points of Plan development, including policy clarifications, evaluation criteria, results analysis and recommendations. The ESC advises Bellevue City Council on utilities planning and related topics, and is comprised of seven residents from within the city's service area.

Policies

The City prepared and adopted Bellevue's Comprehensive Plan (City Ordinance No. 5570, November 29, 2004) as required by the Washington State Growth Management Act (GMA). Consistent with the GMA, Bellevue's Comprehensive Plan policies require the Utilities Department to anticipate and facilitate growth. Specifically:

> POLICY UT-4. Base the extension and sizing of [Utilities] system components on the land use plan of the area. System capacity will not determine land use.
>
> POLICY ED-21. Continue to identify, construct and maintain infrastructure systems and facilities required to promote and sustain a positive economic climate. Anticipate needs and coordinate city infrastructure investments with economic development opportunities.

The Utility's performance is measured in part on its responsiveness to zoning and development activity.

This Wastewater System Plan is consistent with Bellevue's Comprehensive Plan policies, and serves as the functional plan to implement those policies. Furthermore, the Wastewater System Plan itself defines Utilities-specific policies. These Utilities-specific policies, found in Chapter 2, focus on:

- Customer Service
- Service Area
- Water Quality
- Regional Policy Interface
- Financial Policies

Minor changes have been made to several policies since the 2002 Plan. Significant policy changes since the 2002 Plan include:

- Inflow & Infiltration (I&I) policy language has been made clearer and more concise.
- A new policy regarding City participation in regional policy development has been added. This new policy was added to guide Bellevue's role in influencing regional decision-making in the interests of the City and Bellevue's rate payers.

System Infrastructure

Bellevue's sewer system includes approximately 525 miles of sewer mains, 130 miles of service stubs (within public rights of way), 18.7 miles of "lake line" sewer pipe, 10 flush stations, 36 pump stations, and 14,360 manholes.

Since the 2002 Plan, the City has continued to improve its system assessment and understanding, through systematic video inspection, flow monitoring, and other investigative techniques that are best practices for utility asset management. System infrastructure is also observed during regular cleaning and flushing, and in response to customer complaints. While the system overall is well-maintained and functional, recent information has indicated several emerging challenges for the wastewater system:

- **Lake Line Condition**. The City's lake lines are sewer pipes that follow the shorelines of Lake Washington and Lake Sammamish, underwater and in some cases on land adjacent to the lakes. Two issues have emerged that indicate a need to replace the oldest sections of this piping soon:

    - Assessment of asbestos cement lake line pipes in Meydenbauer Bay revealed significant deterioration of this piping in some locations. These are some of the first pipes installed in the original Bellevue Sewer District, circa 1952. It is anticipated that unacceptable structural failures of these pipes could occur within about 10-15 years if they are not replaced or rehabilitated.
    - Overflows have occurred upstream of lake line piping, due to reduced lake line capacity from sedimentation. Due to relatively flat installation, these pipes are particularly susceptible to sedimentation and require daily flushing.

    Replacement of the lake lines is expected to be technically challenging, environmentally sensitive, and relatively very expensive compared to other sewer projects. It is anticipated that no single solution will work at all locations, such that a variety of options may be needed based on site-specific factors. Stakeholder input will be critical to making final decisions. Any option selected will impact entire neighborhoods and require consensus among diverse interest groups.

    CIP Plan No. S-58 – Sewer Lake Line Replacement Program has been created to evaluate lake line replacement options, and is recommended to continue.

- **Inflow and Infiltration (I&I)**. Flow monitoring data from King County's 2002 I&I study and subsequent investigations revealed that stormwater and groundwater flows into Bellevue's wastewater system are significantly higher than previously assumed. If not mitigated, these I&I flows could cause downstream capacity problems, increase the potential risk of overflows, and necessitate additional capital investments. The Plan recommends targeted investigation and reduction of I&I.

- **Storm Frequency and Vulnerabilities**. The City's experiences in wind storms, ice storms, prolonged power outages and other extreme weather events in 2006, 2007 and 2010 provided valuable experience to guide the Plan.

    - **Storm Frequency**. The frequency and severity of extreme weather events that resulted in one or more sewer overflows in the system have increased since the 2002 Plan. Subsequently, some locations that were perceived to have an acceptable risk of overflow only during extreme (greater than 20-year frequency) events could be more susceptible, given changing event-frequencies. The City has always investigated known overflows, but now recognizes that the frequency of overflows could increase if nothing is done. The Plan recommends I&I investigation and reduction (where feasible), and capacity improvements where necessary to manage the risk of overflows.

    - **Storm Vulnerabilities**. Recent storms have validated the City's utility emergency management procedures, but also revealed some vulnerabilities in the wastewater system. The City's strategy to equip critical pump stations with permanent on-site backup power has worked well. However, utility staff found it difficult to access less critical pump stations with portable generators when roads were blocked by downed trees, ice and other obstacles. Difficulty accessing these pump stations subsequently increased overall response times. The Plan recommends more pump stations be equipped with permanent on-site backup power.

- **Asbestos Cement Pipe Failures**. The City's potable water distribution system has experienced a high rate of asbestos cement (AC) pipe failures, relative to other pipe materials. Subsequently, an AC water main replacement program has been implemented by the water utility. Bellevue's wastewater system also has some AC piping. AC gravity sewer piping has a lower criticality and consequence of failure, because they are not pressurized. However, there are some AC force mains (pressurized pipes) in the City's wastewater system that are now perceived by the City to have a high consequence of failure. The Plan recommends establishing a program to inspect and prioritize replacement of AC force mains.

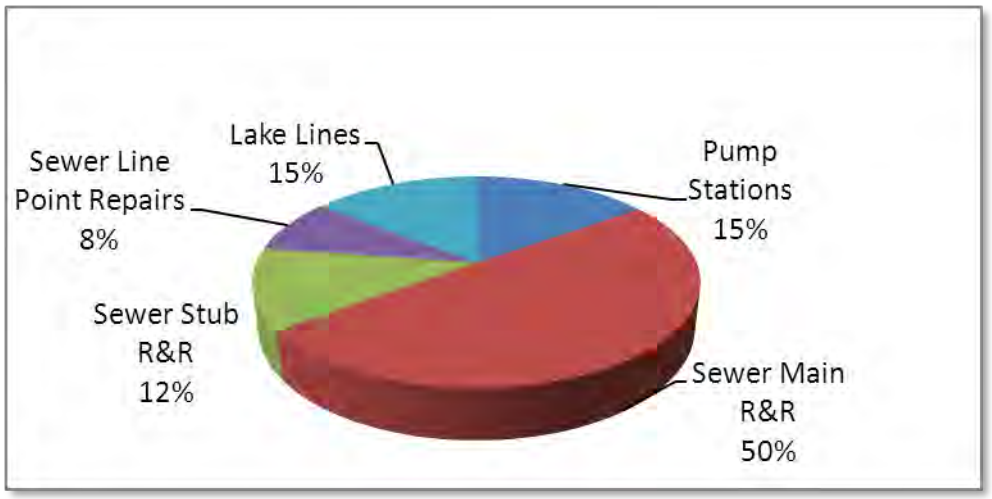
Asset Management

Bellevue's wastewater infrastructure is aging. Planning for system renewal and replacement (R&R) is necessary to ensure adequate long-term financing and to manage the risk of system failures.

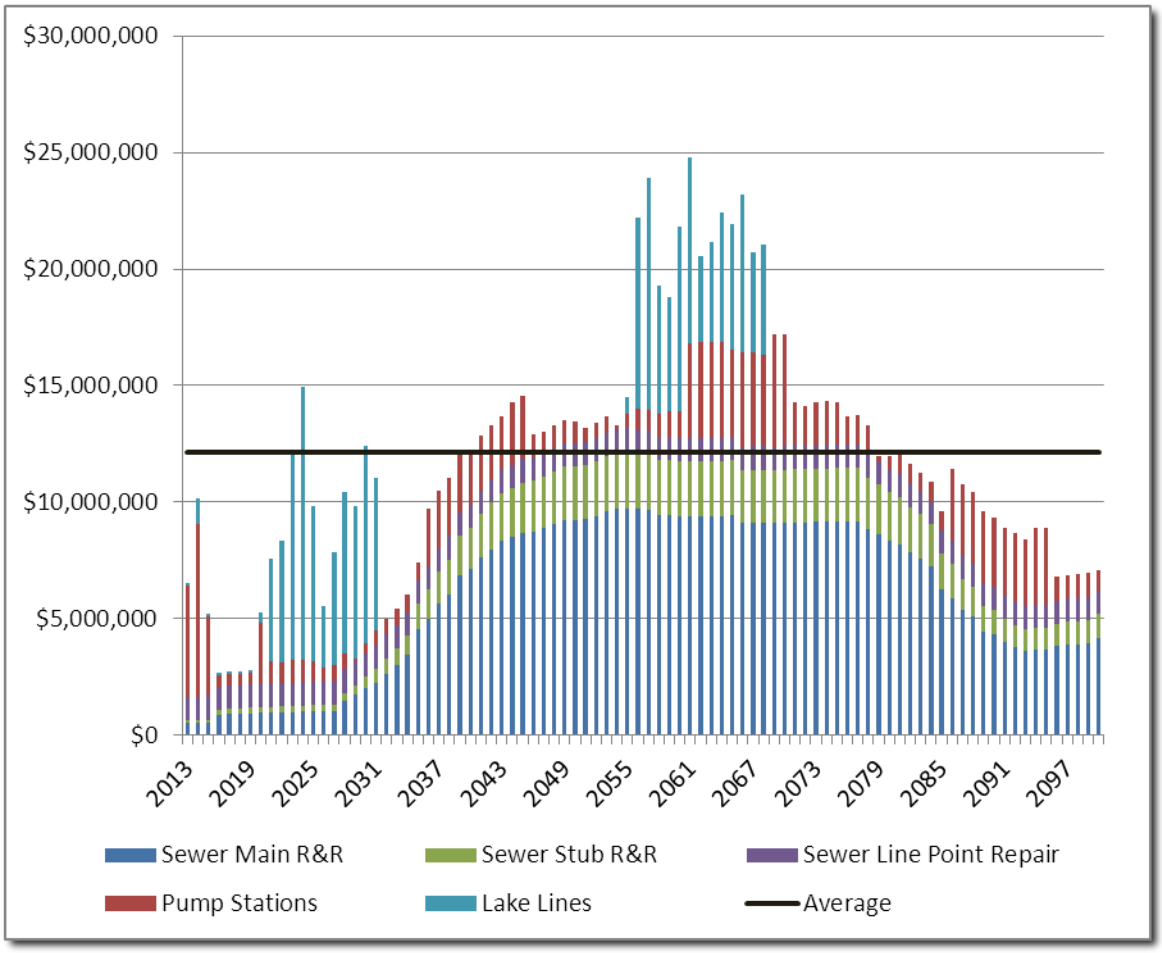
Bellevue's Utilities Department has established a strong long-term financial position, by incorporating the five core components of the EPA asset management framework:

1. Determine The Current State of the Assets
2. Define Service Levels
3. Determine Asset Criticality and Risk
4. Determine Best Operating and Maintenance (O&M) and Capital Improvement Program (CIP) Strategies to Minimize Life Cycle Costs
5. Determine Funding Strategy

Based on industry standards for asset life expectancy, as well as local factors specific to the City's wastewater system, Bellevue has developed a schedule of annual costs for funding anticipated R&R projects through the year 2100.



Projected 75-Year Wastewater System R&R through 2087



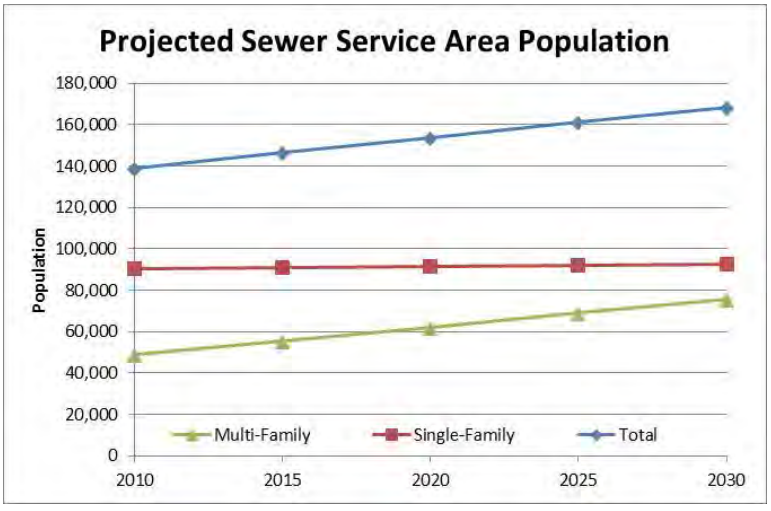
Projected R&R Needs through 2100

Growth and Development

Bellevue's sewer service area experienced significant population growth throughout the 2000's, particularly in downtown Bellevue. Although the recession slowed growth in 2008-2009, Bellevue's service area population continues to expand and is projected to surpass 168,000 by 2030. Most of this growth will occur Downtown and in the Bel-Red Corridor.

Recent Downtown Development

To estimate future wastewater flows, the Wastewater System Plan uses population and land use projections developed by the Bellevue Planning and Community Development Department. The projections consider the Bellevue Comprehensive Land Use Plan, and are consistent with Puget Sound Regional Council data and forecasts, and U.S. census data. Population and sewage flow projections consider ultimate growth within the City's urban growth boundary limits, in accordance with GMA requirements.



In addition to population growth from within, Bellevue's sewer utility service system has grown since 2002 through expansion of the service area boundaries. In 2003, Bellevue assumed Coal Creek Utility District's water and sewer infrastructure located inside Bellevue City limits. The service area was also extended in the Cougar Mountain area to the Urban Growth Boundary. The Plan reflects these changes, as shown in Figure 1.

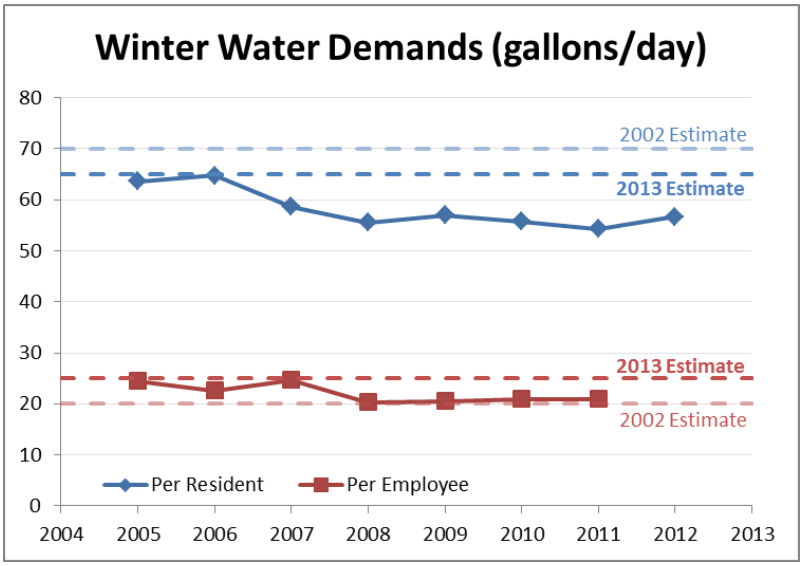
Population and employment projections are used to evaluate the system's ability to meet future needs, and form the basis of recommendations for capacity expansion projects.

System Hydraulic Analysis

Computer modeling is used to evaluate the system's current hydraulic capacity and its ability to meet projected capacity requirements. The criteria used to determine future flows were reviewed as part of this plan update.

The City's criteria for projecting sanitary wastewater flows and analyzing system hydraulics are generally conservative, and have not been significantly modified. However, some changes have been made to reflect new data or avoid excessively conservative results:

- **Water Usage Changes**. Winter drinking water billing records are used to estimate sanitary wastewater flows. Since the 2002 Plan, Bellevue's peak year winter residential demands have decreased from 70 gallons/day/capita (gpdc) to 65 gpdc, while commercial demands per employee have increased from 20 gpd to 25 gpd.



- **Mixed-Use Zoning**. Special criteria are used to estimate future wastewater flows in areas zoned for mixed-use properties. This is necessary to develop realistic flow estimates, because the City's normal criteria (assume maximum potential buildout allowed) would result in overly-conservative estimates that indicate excessive future capital facility sizing needs. Mixed-use properties are unique in that future developers dictate the ratio of residential/commercial floor space, which cannot be predicted by the City. This affects re-zoned areas in Downtown and the Bel-Red Corridor in particular.
- **Peaking Factors**. The peaking factor used for sanitary flows was reduced from 4.0 to 2.0, reflecting the peak observed in actual diurnal water usage.
- **Inflow and Infiltration (I&I)**. Modeled I&I flows have been increased to reflect flow monitoring data, which indicated higher I&I than previously assumed.
- **Modeling Software**. The City switched hydraulic modeling programs from HYDRA to SWMM, to reduce cost and convert to a more standardized platform.

Recommended System Improvements

Recommended sewer system improvements fall into three general categories:

- **Existing System Capacity Improvements**. These projects address known or potential system capacity or reliability problems in the existing system.
- **System Capacity Expansion to meet Planned Growth**. These projects and programs address projected system capacity problems due to forecasted future development.
- **Infrastructure Renewal and Replacement**: These projects and programs are intended to reduce the number and severity of system failures due to age.

Ongoing annual improvement programs and one time projects recommended to maintain, rehabilitate, and upgrade the City's existing infrastructure over the next 6 years are summarized in the tables below.

Recommended Ongoing Capital Improvement Programs

CIP Plan Number	Program Description	Approximate Annual Budget (2013 dollars)*
S-16	Sewage Pump Station Improvements	$480,000
S-24	Sewer System Pipeline Rehabilitation*	$1,687,000
S-30	Sewer Service Extensions	$399,000
S-32	Minor Capital Improvement Projects	$148,000
S-58	Sewer Lake Line Replacement Program*	$113,000
S-66	Sewer System Pipeline Replacement	$1,040,000
	TOTAL ANNUAL COSTS	$3,867,000

* See Table 9-1 for footnotes

Recommended and Currently Funded Capital Improvement Projects

CIP Plan Number	Project Description	Approx. Total Budget*	Approx. Schedule for Completion
S-52	East CBD Trunk Capacity Improvements	$2,894,000	2015
S-53	Bellefield Pump Station Capacity Improvement	$9,984,000	2016
S-59	Add On-site Power at Sewer Pump Stations	$1,228,000	2020
S-60	Wilburton Sewer Capacity Upgrade	$5,322,000	2016
S-61	Midlakes Pump Station Capacity Improvements*	$4,001,000	TBD[2]
S-63	Utility Facilities for 120th Ave NE Segment II	$1,170,000	2016
	TOTAL	$24,600,000	

* See Table 9-3 for footnotes

Proposed projects and programs (not currently funded) to address emerging issues are shown below. These projects are identified in Chapter 7, System Hydraulic Analysis, and are summarized later in Chapter 9.

Proposed Proposed Projects and Investigational Activities

Program Description	Estimated Total Funding Required (2013 dollars)
Flow Monitoring to Corroborate Computer Model Results*	$120,000
I&I Investigations *	$855,000
Asbestos Cement Force Main Replacement at Lake Hills #6 and Lake Hills #12 Pump Stations*	$1,500,000
TOTAL ANNUAL COSTS	$2,475,000

* See Table 9-3 for footnotes

Finances

The City has a sound financial base that can finance the recommended capital improvements. Bond ratings from Moody's Investors Service and Standard and Poor's indicate a high level of confidence in the ability of the City's utilities to repay debt obligations, if needed. The sewer utility currently has no outstanding debt.

Conclusion

The 2013 Wastewater System Plan identifies the risks and opportunities of the City's wastewater system, and lays the groundwork for continued economic expansion, excellent quality of life, and sustained growth and development over a 20-year planning horizon.

This Page is Intentionally Blank

Contents Page

Contents Page

Tables

Figures

CHAPTER 1
Introduction

This 2013 Wastewater System Plan (the Plan) updates the City of Bellevue (the City) 2002 Comprehensive Wastewater Plan, which was adopted in September 2002. The Plan pertains to the City of Bellevue Utilities Department's wastewater utility (the Utility). The Utility owns and operates public wastewater facilities in the Cities of Bellevue, Issaquah, Medina and Clyde Hill, the Towns of Yarrow Point and Hunts Point, the Village of Beaux Arts, and a small portion of unincorporated King County.

The plan addresses the following changes which have occurred since the City's 2002 Comprehensive Wastewater Plan was adopted:

- Updates and changes to wastewater utility policies
- Revised ultimate buildout conditions due to zoning and land use changes.
- Revised service area population projections and flow forecasts
- Revised infiltration and inflow flow projections
- Re-evaluation of infrastructure renewal and replacement needs
- Updated recommendations

1.1 Purpose

The general purpose of this plan is to evaluate the existing wastewater system, identify current and future needs, and develop a plan to meet those needs. Additionally, this plan is intended to:

- Disseminate information and develop consensus among stakeholders
- Document wastewater utility-specific policies
- Serve as a reference document for Utility staff and for partner utilities
- Comply with, and demonstrate conformance with applicable regulations

1.2 Regulatory Compliance

The Plan complies with General Sewer Plan requirements of the Washington State Department of Ecology (WAC 173-240-050) and King County (KCC 28.84.050 and 13.24), and where applicable complies with the Puget Sound Water Quality Management Plan.

The City prepared and adopted Bellevue's Comprehensive Plan (City Ordinance No. 5570) as required by the Washington State Growth Management Act (GMA). This Wastewater System Plan is consistent with the City's Comprehensive Plan.

The City follows the State Environmental Policy Act (SEPA) requirements for capital projects, where applicable. Appendix A provides documentation of SEPA compliance for this Plan.

The City complies with the National Environmental Policy Act (NEPA) where applicable. NEPA typically does not apply to the City's wastewater projects, since none of the City's wastewater funding comes from federal sources. Since the 2002 Plan, the City's interaction with NEPA for wastewater projects has been limited to U.S. Army Corps of Engineers permits for work related to lake line inspection and construction below ordinary high water in Lake Washington.

1.3 Wastewater System History

Since World War II, Bellevue's wastewater system has grown along with the residential areas on the east side of Lake Washington. Originally the area was served by the Bellevue Sewer District, the Lake Hills Sewer District, the Eastgate Sewer District, and Coal Creek Utility District, as shown in Figure 1-1. The wastewater service area is bounded by Kirkland and Redmond to the north, Newcastle and Cougar Mountain Regional Wildland Park to the south, Lake Washington to the west, and Lake Sammamish and Issaquah to the east.

***Figure 1-2**: 1948 Map Showing Original Bellevue Sewer District (Puget Sound Regional Archives)*

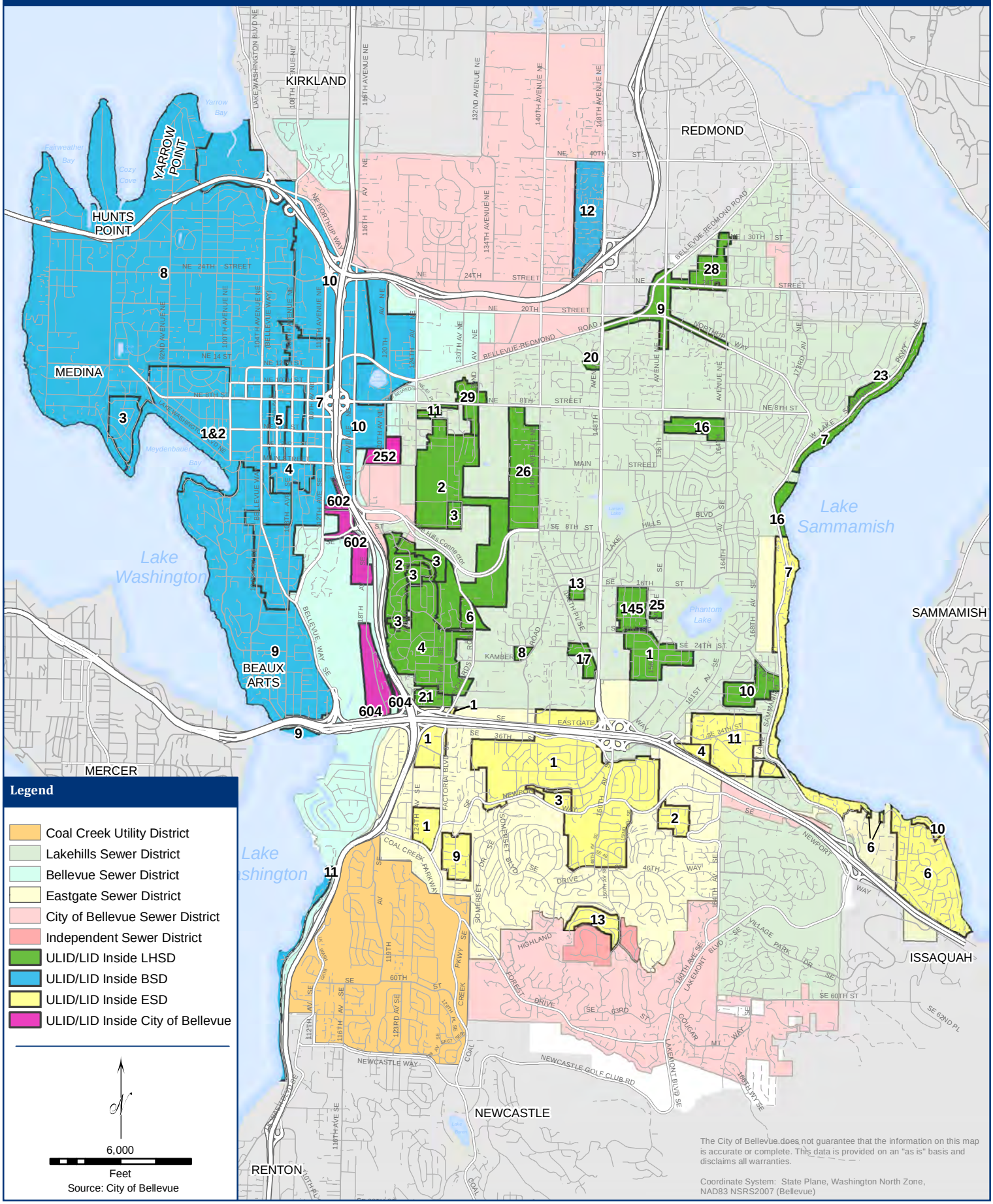
The Bellevue Sewer District was formed in 1948, and served the vicinity of Meydenbauer Bay (See Figure 1-2). It was a separate entity that actually pre-dates the City of Bellevue. The Bellevue Sewer District service area grew to include western portions of what is now the City of Bellevue, as well as what is now the cities of Clyde Hill, Medina, Hunts Point and Yarrow Point (See Figure 1-3). Originally, flows from Bellevue Sewer District were discharged to Lake Washington. Following the formation of King County Wastewater Treatment Division (KCWTD), flows were diverted to KCWTD's Renton treatment plant.

The City of Bellevue incorporated in 1953. Prior to this, the area was unincorporated King County. In response to deteriorating water quality in Lake Washington, the Municipality of

Historical Sewer Districts

Figure 1-1

City of Bellevue
GIS Services



Legend

- Coal Creek Utility District
- Lakehills Sewer District
- Bellevue Sewer District
- Eastgate Sewer District
- City of Bellevue Sewer District
- Independent Sewer District
- ULID/LID Inside LHSD
- ULID/LID Inside BSD
- ULID/LID Inside ESD
- ULID/LID Inside City of Bellevue

N

6,000
Feet

Source: City of Bellevue

Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

Date: 7/8/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_1-1_Historical_Sewer_Districts_8x11.mxd IT Department

Metropolitan Seattle ("Metro", now the King County Wastewater Treatment Division, KCWTD) was formed in 1958 to address certain regional planning concerns, including sewage conveyance and treatment. KCWTD built two treatment plants (Renton and West Point), and acquired some existing assets from utility districts.

Lake Hills Sewer District served eastern portions of what is now the City of Bellevue, and operated its own wastewater treatment plant near the north end of Lake Sammamish. In 1964, KCWTD acquired the Lake Hills wastewater treatment plant. Following construction of KCWTD's Hollywood Pump Station (in Redmond) and new conveyance facilities, KCWTD abandoned the Lake Hills plant in the 1970's and routed wastewater from the Lake Hills area to KCWTD's West Point Treatment Plant.[1] Figure 1-4 shows KCWTD's conveyance and treatment facilities in relation to Bellevue.

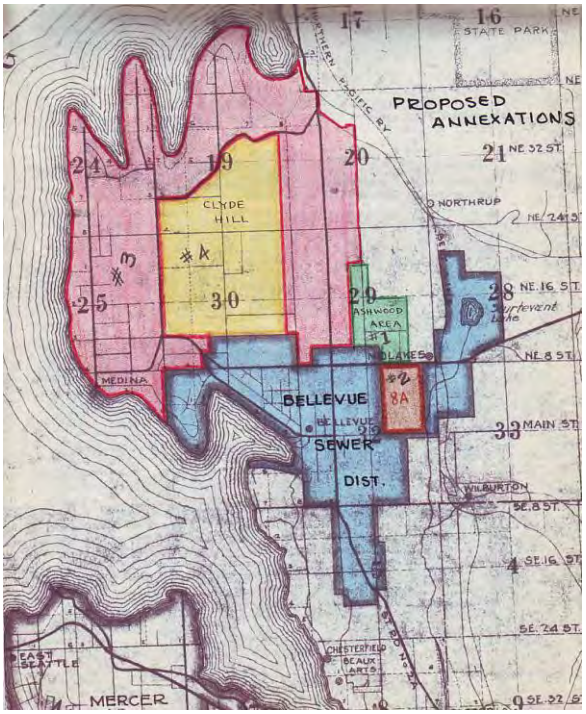


***Figure 1-3**: 1956 Map Showing Annexation of Clyde Hill, Medina, Hunt's Point and Yarrow Point into Bellevue Sewer District (Puget Sound Regional Archives)*

In the early 1970's, the City of Bellevue assumed the Bellevue Sewer District and the Lake Hills Sewer District, and incorporated them into the City government. The objective of these acquisitions was to provide uniform wastewater service throughout the City. The Bellevue Sewer District also included areas outside of the City of Bellevue that remain part of the City of Bellevue's wastewater system service area (Clyde Hill, Medina, Hunts Point and Yarrow Point). An agreement between the City of Bellevue and Bellevue Sewer District stipulated that the City provide equitable services to the District customers whether they were inside or outside of Bellevue's city limits.[2]

More recently, Bellevue's city limits grew to include most of the area served by the Eastgate Sewer District, and in January of 1995 the City assumed all assets and operation of the Eastgate Sewer District. This area includes portions of southeastern Bellevue near the southern end of Lake Sammamish and Interstate 90.

[1] HDR/Brown and Caldwell. King County Conveyance System Improvement Project, North Sammamish Subregional Planning Area, Final Task 210/220/230 Report. October 2003. http://your.kingcounty.gov/dnrp/library/wastewater/csi/1999-2003/LkSamm_N/210-220-230_report.pdf

[2] City of Clyde Hill. http://www.clydehill.org/community-resources/emergency-services/

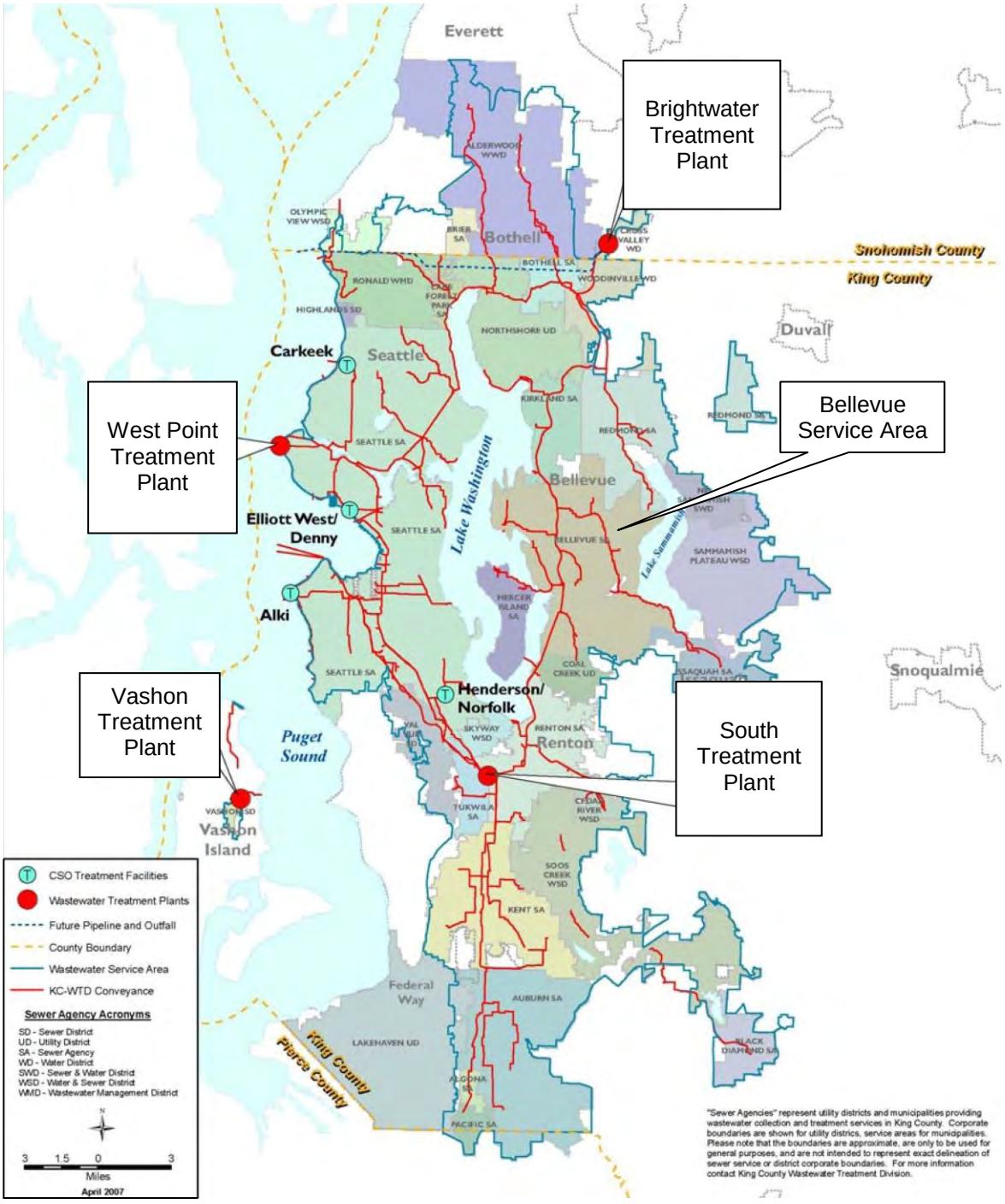


Figure 1-4: KCWTD Conveyance and Treatment Facilities (Courtesy of KCWTD)

In 2003, the City assumed the portion of Coal Creek Utility District within Bellevue city limits, as shown in Figure 1-5. This extension of the City's wastewater service area was consistent with Bellevue's Comprehensive Plan policy that all publicly owned utility systems within the city limits should be owned and operated by the City, unless circumstances dictate otherwise.

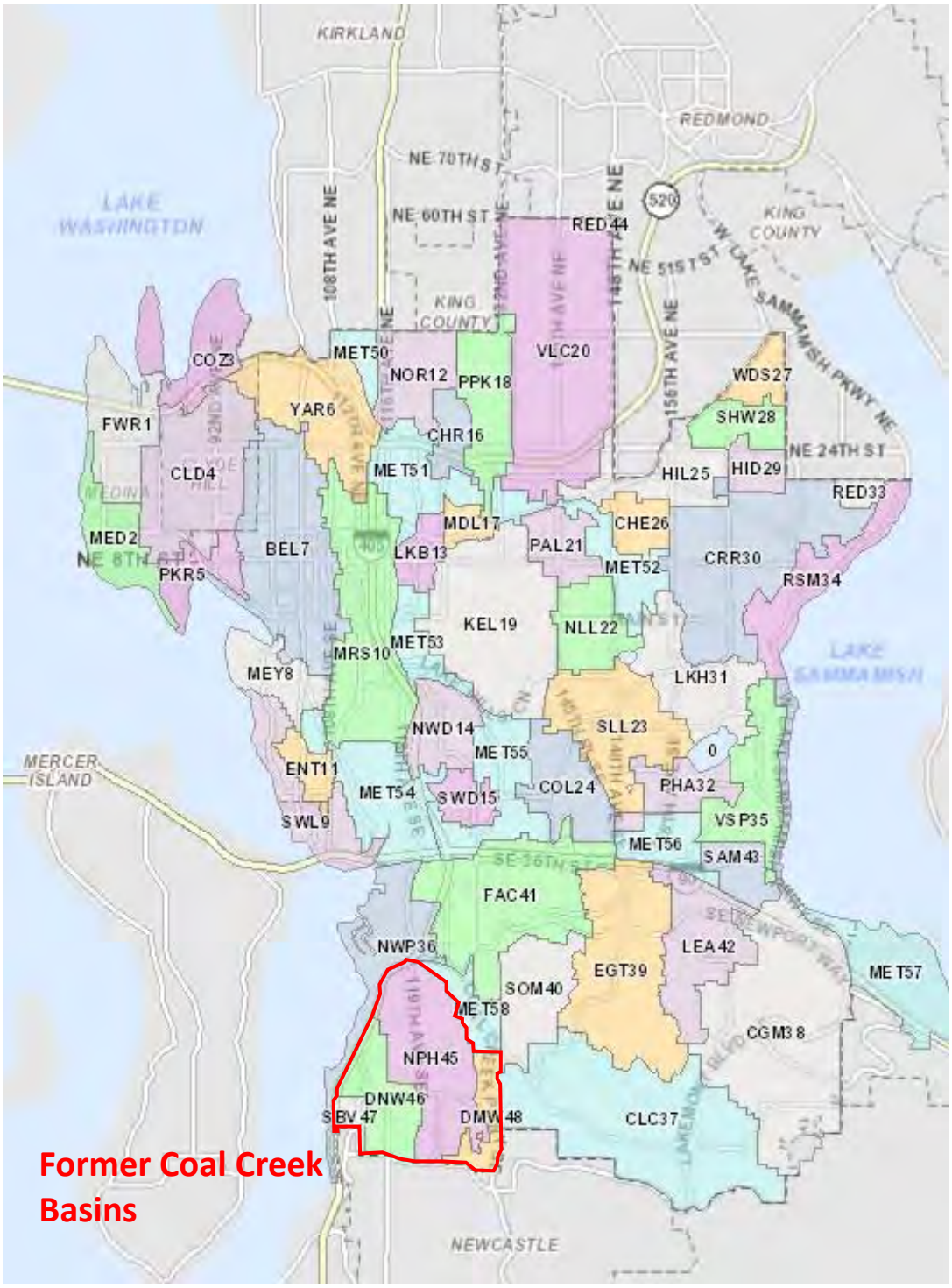


Figure 1-5: Current Bellevue Sewer Basins, with Former Coal Creek Basins

1.4 Organizational Structure

The Utility is administered by the City of Bellevue Utilities Department, whose overall management is provided by the Director and Deputy Director. The Director's office is the Utility's primary point of contact for the City Manager, City Council and the Environmental Services Commission. In addition to general management duties, the Director is responsible for reviewing regional and state legislative issues and for implementing policy.

The Utilities Department is separated into three divisions, as listed below. Each Division is led by an Assistant Director, who reports to the Director:

- Resource Management and Customer Service
- Engineering
- Operations and Maintenance

An organization chart for the Utilities Department is shown in Figure 1-6.

1.4.1. Resource Management and Customer Service Division

The Assistant Director for Resource Management and Customer Service manages the sections responsible for the Department's financial management, public outreach, solid waste management, and customer service. These functions include all utility billings, customer information system management, customer accounts and services. In addition, this division provides payroll and personnel management for the Utilities Department, coordinates bi-annual budget development and monitoring, performs rate forecasting, and manages accounts payable and receivable.

1.4.2. Engineering Division

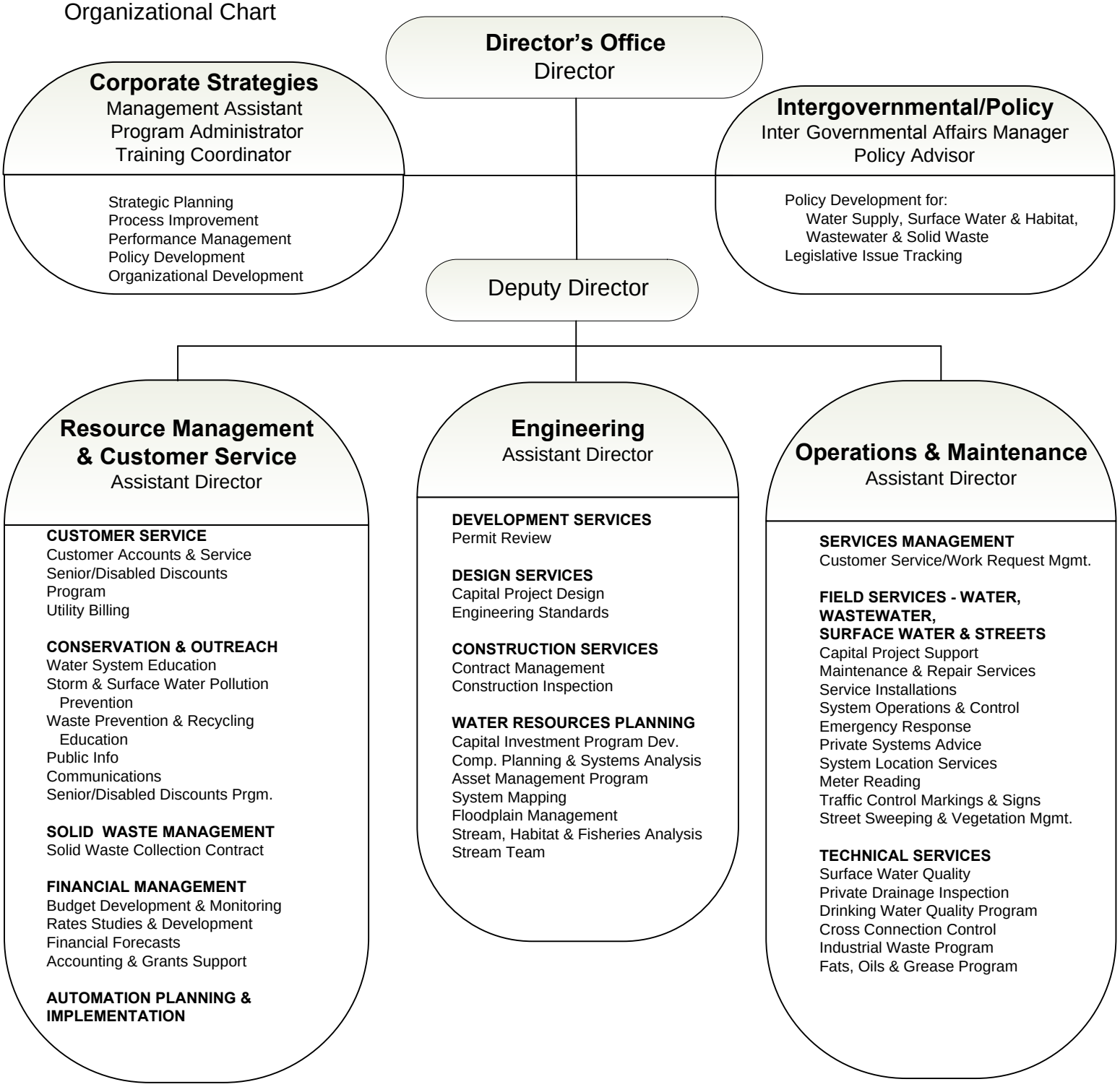
The Assistant Director for Engineering is responsible for management of the water, wastewater, and storm drainage system planning, mapping, design, construction, and development review functions. This division is divided into four sections :

- The Water Resources Planning Section is responsible for watershed planning, utility system planning, asset management programs, hydraulic modeling, mapping and data management. This section develops the Utility's Capital Investment Program (CIP) and system functional plans. This section also reviews and evaluates developer requests to determine their effect on system operation.

Figure 1-6: City Of Bellevue Utilities Organizational Chart

CITY OF BELLEVUE UTILITIES

Sewer Utility Fund, Storm & Surface Water Utility Fund
Water Utility Fund, Solid Waste Fund



- The Design Section is responsible for capital project design and management. Design of projects is performed primarily by consultants, in order to effectively manage the City's internal CIP work program workload. Some minor work requiring rapid response is done by in-house design staff. The design section maintains and updates the Utilities Engineering Design Standards.

- The Construction Inspection Section manages construction work for the department to assure timely and efficient completion of projects. This section also provides inspection services to ensure City and developer built utility projects are installed and constructed according to approved design plans and specifications.

- The Development Review Section conducts permit reviews and administers other development processes, requiring coordination within Utilities and other City departments. The section also manages and staffs the utility desk at the Permit Center, which is the first contact for customer service and information on development requests. The Development Section is responsible for approving developer extension designs for construction.

1.4.3. Operations and Maintenance Division

The Assistant Director of Operations and Maintenance manages the maintenance and operations of all public utilities, including water, wastewater, and storm drainage. The Water, Wastewater, Storm Drainage Operations Manager oversees the day-to-day operations of the water and wastewater utilities, and the Wastewater Operations Superintendent supervises all crews assigned to maintenance and operation of the wastewater system. Maintenance staff members are encouraged to pursue training to expand their job skills. Washington Wastewater Collection Personnel Association certification is required for all skilled worker job classifications. A list of certified wastewater maintenance personnel positions is provided in Chapter 8.

The Operations and Maintenance (O&M) Division is charged with operating the system and providing preventive maintenance. The O&M Division monitors and assesses the condition of infrastructure to minimize failures and extend the life of wastewater system components. It also provides water quality regulatory compliance and code enforcement, and works to ensure the integrity of the existing infrastructure during development and redevelopment. The division investigates and corrects any actual failures, provides emergency response, responds to illegal discharges, and responds to customers who report system problems. Typical system problems include pipeline blockage or collapse and power outage. Regular operations and maintenance procedures are outlined in Chapter 8.

1.5 Definitions

The following section contains a glossary of some of the terms used in this document:

Average dry weather flow. The average rate of flow during a dry weather flow day.

Basin. Sub-division of the city wastewater network draining to a discrete point such as a KCWTD interceptor, major city trunk, pump station, or neighboring jurisdiction.

CBD. Bellevue's Central Business District, now referred to as Downtown.

Debt Service Coverage. The ratio of total revenue for water, wastewater and storm drainage services after deducting operating and maintenance expenses to the average annual payment required to service all outstanding Utility Department debt.

Domestic Waste. Sanitary wastewater produced by normal residential activities.

Drain Fields. An underground region, downstream of a septic tank, that allows for the microbial breakdown of wastewater contaminants.

Dry weather flow. Wastewater flow during periods of little or no rainfall. Rates of flow exhibit hourly, daily, and seasonal variations. A certain amount of infiltration may also be present. See also "Average Dry Weather Flow" and "Peak Dry Weather Flow."

Easement. A grant or authorization by a property owner of the use of any designated portion of land by the public generally or by a corporation, or persons for specified purposes.

Effluent. Wastewater that leaves residential, commercial, and industrial properties and enters the wastewater system.

HYDRA. Sanitary sewer hydraulic modeling and flow routing software, produced by Pizer, Inc.

Hydrogen sulfide. A potentially toxic and lethal gas (chemical symbol H_2S) produced in sewers by anaerobic decomposition. Detectable in low (less than 0.01 percent) concentrations by its characteristic "rotten egg" odor, it deadens the sense of smell in higher concentrations or after prolonged exposure. Respiratory paralysis and death may occur quickly at concentrations as low as 0.07 percent by volume in air. Hydrogen sulfide is a hazard for collection system maintenance staff and can lead to deterioration of concrete and other pipe materials through corrosion.

Industrial Waste. Wastewater generated by commercial and industrial customers. Customers include restaurants, Laundromats, service stations, and manufacturing facilities.

Infiltration. The quantity of ground water that leaks into the wastewater collection system from the surrounding soil. Common points of entry include broken pipes and defective joints in the pipe or in walls of manholes. Infiltration may result from sewers being laid below the ground water table or from saturation of the soil by rain or irrigation water.

Inflow. Rainwater which enters the collection system through roof drain connections, catch basin connections, and holes in the tops of manhole covers in flooded streets. Inflow is generally distinguished from infiltration by the rapidity with which inflow begins and ends after a period of rainfall. Infiltration, on the other hand, may persist for an extended period after a rainfall.

Interceptor. A sewer that receives flow from a number of main or trunk sewers, force mains, etc. WDOE requires that the minimum peak design flow for interceptor sewers should be not less than 250 percent of the average day wet weather design flow.

Intertie. A connection point between two wastewater systems that allows for the movement of wastewater from one municipality to another.

Latecomer Agreement. A contract that provides for the reimbursement of costs to developers who construct facilities that directly benefit other properties.

Level of Service. Qualitative measure of the operational conditions of a wastewater system.

Main. A sewer that receives flow from one or more submains. Also referred to as "trunk." WDOE requires that the minimum peak design flow should be not less than 250 percent of the average day wet weather design flow.

Maximo. Software used for municipal maintenance management.

Metro. Former name of King County Wastewater Treatment Division (KCWTD)

Multi Family Unit. A building designed to house two or more families living independently of each other.

O&M. Operations and Maintenance.

PCD. City of Bellevue Department of Planning and Community Development.

Points Communities. Incorporated communities west and northwest of Bellevue including Medina, Hunts Point, Yarrow Point, and Clyde Hill.

Peaking-factor. Ratio of peak sanitary flow to the average sanitary flow over a 24 hour period, used in hydraulic modeling.

Pipe Bursting. Trenchless pipe replacement where a new pipe is pulled through an existing pipe. The existing pipe bursts and the new pipe is then connected to the system and made available for service.

PSRC. Puget Sound Regional Council.

Revised Code of Washington (RCW). Document which consists of statutes passed by the state legislature.

Right of Way (ROW). All public streets and property dedicated to public use for streets together with public property reserved for public utilities, transmission lines and extensions, walkways, sidewalks, bikeways or equestrian trails.

Saturation density. Population densities at ultimate buildout used throughout this document. This condition was assumed to occur in the year 2020, except for DNTN where the ultimate buildout condition is more long term.

Septic systems. On site treatment system for domestic sewage, utilized for individual residences not connected to the city's sanitary sewer system, consisting of a septic tank and drainfield.

Sewer Stub. That portion of the side sewer in the right-of-way or easement dedicated to the utility.

Sewerage. A complete system of piping, pumps, basins, tanks, unit processes, and appurtenances for the collection, transporting, treating, and discharging of wastewater. Term is declining in use, generally being replaced by "sewer system" or "wastewater facility".

Side Sewer. A conduit extending from the public sewer main to the connection with a building's plumbing system..

Single Family Unit. A building occupied exclusively by one family, except where a valid accessory dwelling unit registration has been approved.

Slip Lining. Trenchless pipe rehabilitation where a new smaller pipe is inserted into an existing failing pipe. The new pipe is connected to the existing system and made available for service.

Sub-basin. Sub-division of sewer network basin to cover the area connected to a specific reach of modeled trunk sewer generally associated with an area of consistent land use zoning.

Surcharging. Gravity pipe flow condition where the hydraulic gradeline is above the crown of the pipe, causing flow volumes based on pressure differential rather than gravity.

SWMM. Hydraulic modeling software developed and maintained by the United States Environmental Protection Agency.

Trunk. A sewer that receives flow from one or more submains. Also referred to as "main."

Washington Administrative Code (WAC). Document which consists of regulations adopted by the state to carry out the RCW.

Wastewater. Water-carried wastes from residences, businesses, institutions, and industrial establishments, together with such ground and storm waters have entered the system unintentially through infiltration or inflow.

Wet weather flow. Wastewater flow during or following periods of moderate to heavy rainfall. Inflow may increase the wet weather flow to a rate many times greater than the dry weather flow, and unless provided for in sewerage design, can produce hydraulic overloads resulting in wastewater overflows to streets or water courses.

1.6 Abbreviations

BMP	Best Management Practices
BSMS	Bellevue Sewer Maintenance System (city's planning department sewer data management software)
CB	Community Business
CCTV	Closed Circuit Television Zoning Designations
CCUD	Coal Creek Utility District
cfs	Cubic feet per second
CIP	Capital Investment Program
CIPP	Cured In Place Pipe
DNTN	Downtown
DNTN-O-1	Downtown Office - District 1
DNTN-O-2	Downtown Office - District 2
DNTN-R	Downtown Residential
DNTN-MU	Downtown Multiple Use District
DNTN-OLB	Downtown Office and Limited Business
DNTN-OB	Downtown Old Bellevue
EmpPSF	Employees per square foot
ENR-CCI	*Engineering News Record* - Construction Cost Index
EPA	United States Environmental Protection Agency
FOG	Fats, oils and grease
GC	General Commercial
GIS	Geographical Information System
GMA	Growth Management Act
gpad	Gallons per acre per day
gpcd	Gallons per capita per day
gpm	Gallons per minute
I/I	Infiltration/Inflow
KCWTD	King County Wastewater Treatment Division
LI	Light Industrial
LID	Local Improvement District
MF-L	Multiple Family - Low
MF-M	Multiple Family - Medium
MF-H	Multiple Family - High
mgd	Million gallons per day
NB	Neighborhood Business
O	Office
OLB	Office and Ltd. Business
OR	Occupancy Rate
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
PDWF	Peak Dry Weather Flow

PEqPA	Population Equivalent Per Acre
PO	Professional Office
PWWF	Peak Wet Weather Flow
R&R	Renewal and Replacement
RCP	Reinforced concrete pipe
RCW	Revised Code of Washington
ROW	Right of Way
SF-L	Single Family - Low
SF-M	Single Family - Medium
SF-H	Single Family - High
SWMM	Hydraulic modeling software developed and maintained by the United States Environmental Protection Agency
TAZ	Transportation Analysis Zone
TDH	Total Dynamic Head
ULID	Utility Local Improvement District
WAC	Washington Administrative Code
WDOE	Washington State Department of Ecology
WO	Work Orders
WWSP	City of Bellevue Wastewater System Plan

CHAPTER 2
Wastewater Utility Policies

The City's wastewater system is administered according to Bellevue City Code Chapter 24.04, the wastewater utility code. The Code establishes responsibility and legal authority for the City's rates, permit fees and connection fees, charges to outside users, connection charges, developer extensions, interlocal agreements, programs and enforcement.

Bellevue's City Comprehensive Plan, last amended and adopted in February 2009, establishes a broad framework of goals to guide subsequent policy decision making. The Utilities Element of the Comprehensive Plan is consistent with that framework, and highlights in particular the city's goals of protecting the natural environment, pursuing a strong and diverse local economy, and providing needed community services and facilities. To that end, the major goals of the Utilities Element are:

1. To promote and encourage the development and maintenance of all utilities at the appropriate levels of service to accommodate the City of Bellevue's projected growth.

2. To promote and encourage the provision of reliable utility service in a way that balances the public's concern about safety and health impacts of utility infrastructures, consumers' interest in paying no more than a fair and reasonable price for the utility's product, Bellevue's natural environment and the impacts that utility infrastructures may have on it, and the community's desire that utility projects be aesthetically compatible with surrounding land uses.

3. To process permits and approvals for utility facilities in a fair and timely manner and in accord with development regulations which encourage predictability.

4. To encourage new technology that improves utility services and reliability while balancing health and safety, economic, aesthetics, and environmental factors.

Policies specific to all city-managed utilities, including wastewater, water, storm drainage, and solid waste management, are also defined within the Utilities Element, and are not restated here. Those specific policies led to development of wastewater system policies that govern various facets of wastewater utility operations that comprise this chapter. A brief description of the five broad Utility System Plan policy categories is provided below. The first four policy categories are grouped together and identified in this chapter as General Policies. These policies are specific to Bellevue’s Wastewater Utility. The Financial

Policies category comprises the fifth major policy group. The financial policies apply to all three Bellevue waterworks utilities (water, wastewater and storm drainage), and are reviewed and revised biannually as part of the City's budget process.

Customer Service. These policies define the level of service provided to utility customers, public and private ownership, and responsibility for wastewater system components.

Service Area. Service area policies concern Bellevue's existing and ultimate service area boundaries and conditions for service extension within those boundaries.

Water Quality. These policies explain the obligations of King County, the Bellevue Wastewater Utility and the customer regarding water quality issues related to the wastewater system.

Regional. This policy defines Bellevue's role concerning regional, state and federal wastewater policies and requirements that impact Bellevue.

Financial. This category summarizes the Utility Department's general financial policies including those governing rate setting, development charges, capital improvement financing, and reserves.

2.1 Wastewater Utility Policies Background

These wastewater utility policies were initially developed in 1993 by a committee comprised of department management, staff, and a representative of the former Eastgate Sewer District. The committee investigated current city and industry practice, financial impacts and liability, and utility customer expectations. Other long-standing operational policies and financial policies were reviewed by utility management. A discussion of pertinent policy issues was then included in the 1994 Bellevue Comprehensive Sewer Plan, and each subsequent update.

The general policies have been reviewed and updated by Utilities Department management and the Environmental Services Commission as part of each subsequent wastewater system plan update. The policies in this document (excluding the financial policies) were reviewed by the Environmental Services Commission on October 4, 2012. Financial policies are reviewed, updated and adopted by Council as part of each bi-annual budget. The financial policies were last reviewed by the Environmental Services Commission as part of the 2013-14 budget update, on May 3, 2012 and adopted by City Council on December 3, 2012. This chapter contains the current wastewater utility policies.

2.2 General Policies

2.2.1 Customer Service Policies

2.2.1.1 Emergency Preparedness

The utility will prepare and update an emergency plan as a part of its operations program. The plan will ensure that adequate emergency provisions are in place to provide for an organized response to the most likely kinds of emergencies that may endanger the health and safety of the general public, the environment, or the operation of the Wastewater Utility system. The plan will also address issues related to preparation, mitigation and long term system recovery to ensure the orderly and full restoration of the wastewater system after an emergency.

Discussion:

A key Utility responsibility is to respond to the needs of all wastewater utility customers and the general public during times of crisis. The continued functioning of the wastewater system during a disaster and restoration of service following a disaster are essential.

The emergency response plan focuses on preparedness for major disasters, such as an earthquake or flood, and on system response and recovery. It is not intended to address minor isolated system interruptions such as those caused by isolated main failures, blockages, and power outages. Standard operating procedures have been established to address these minor interruptions.

The emergency response plan complies with applicable RCW and WAC requirements. There are no King County contractual requirements for an emergency preparedness plan. The plan defines the Utility's role in Bellevue's city-wide Emergency Operations Plan.

Reconstruction of damaged infrastructure should be to current codes and standards, and should be consistent with current Wastewater System Plan Policies, to protect current and future customers, assure consistency with the City's long range plans, and ensure access to federal funds for reconstruction, where available.

2.2.1.2 Sewer System Ownership and Maintenance

The utility assumes ownership and responsibility for the structural integrity of all sewers, mainlines, and side sewers within public rights-of-way and easements dedicated to the utility, except to the extent that private ownership is otherwise indicated as a matter of record. Private property owners continue to own and be responsible for the construction, maintenance, protection and repair of that portion of the side sewer located on private property and any side sewer appurtenances, such as check valves (Sewer Utility Code 24.04.115). Private property owners also are responsible for any maintenance or repair associated with the misuse of utility-owned side sewers and mains.

Discussion:

The policy is consistent with the common customer perception that they own only that portion of the side sewer on their property, and it clarifies the customer responsibility for maintenance associated with system misuse (i.e. blockages).

The policy is consistent with the city's right-of-way use ordinance, which effectively prohibits privately owned facilities within public rights-of-way. It is also consistent with the franchise agreements the city has for areas within the service area that are outside Bellevue's corporate limits, in unincorporated King County, and the Points communities. The policy helps to assure that any work done in the right-of-way conforms to the standards of the local jurisdictions (for example, all work done within King County road right-of-way must be performed in accordance with the current King County Road Standards).

Initial attempts to clear side sewer blockages remain the property owner's responsibility. The utility will become involved only if cleaning/clearing attempts by the property owner's contractor fail, suggesting that the problem may be located within the utility-owned sewer system. If the required repair is the result of a blockage, damage from vegetation on private property (including easements), damage from property owner-installed vegetation (private landscaping) in the right-of-way, or any other problem associated with private misuse of the line, then the responsible property owner will be liable for damages and for costs associated with repair and maintenance.

For utility-owned pipes, costs for repairs associated with structural integrity, such as cracking or collapse, poor original construction, impacts from construction within the right-of-way, or root intrusion from City-maintained landscaping in the right-of-way are the responsibility of the utility. Costs to repair or maintain utility-owned pipes as a result of private misuse are the responsibility of the pertinent property owner.

Utility ownership of side sewers within rights-of-way increases utility control over the integrity of the collection system. This is beneficial for regional infiltration and inflow

reduction programs, since a significant proportion of infiltration has been shown to occur in side sewers.

2.2.1.3 Service Reliability and Infrastructure Investment

The Utility shall invest resources as necessary to construct, maintain and renew sewer system infrastructure and equipment such that Utility customers are provided consistent, reliable service.

Discussion:

The utility shall provide sufficient maintenance and use appropriate operation practices to maintain or enhance the existing level of wastewater service. Where operation and maintenance procedures are not sufficient or cost effective, capital projects shall be scheduled and funded to replace or rehabilitate wastewater facilities.

The utility recognizes that over the long-term system renewal and replacement rather than increased maintenance response provides:

- More reliable customer service.
- Increased protection of the environment.
- Reduced likelihood of property damage and disruption to the community.

Consequently, the utility is committed to maintaining a strong capital investment plan that stresses continued high quality system performance. An example is the on-going sewer rehabilitation program. The utility attempts to maximize the useful life of facilities and infrastructure by actively monitoring for problems, staying up-to-date on industry studies and research in this area, and by developing criteria for system replacement and renewal.

Wherever possible, the utility shall anticipate system interruptions and shall design and operate the system to minimize the impact of such interruptions to individual customers, the community, and the environment. For that reason:

- Emergency power capability is provided at all pump stations.
- To the extent practicable, equipment redundancy is provided (i.e., provide facilities to pump maximum flow rates, even with one pump out of service).

2.2.1.4 Inflow and Infiltration Monitoring and Reduction

The Utility should reduce or eliminate Inflow and Infiltration (I & I) where it is a cost effective means of resolving a capacity problem within the City's wastewater system.

Discussion:

The Wastewater Utility will investigate areas where it suspects that I & I may be contributing to a capacity problem within Bellevue's wastewater system. It will monitor these areas to quantify I & I. Where high I & I is confirmed, the Utility will attempt to identify the sources so that removal or reduction of I & I can be evaluated as a cost effective means of addressing the capacity problem. The Utility will also work in cooperation with regional efforts to quantify and reduce I & I, if cost effective, with the goal of reducing demand on regional transmission and treatment facilities.

In most cases where I & I is a significant problem, the primary contributor is infiltration sources such as ground water entering through leaky pipes and manholes. Infiltration sources are typically very difficult to identify and eliminate. However, inflow sources such as direct connections of storm or surface water drainage systems to the City's wastewater system are generally easy to identify and are strictly prohibited by City Code. Therefore Inflow sources must be eliminated whenever these connections are identified. The owner of a storm or surface water drainage system illegally connected to the City's wastewater system is responsible for the elimination of that connection.

The city's primary concern with I & I is related to the ability of Bellevue's wastewater system to convey those flows; a secondary concern is wasted energy and resources to pump the flows prior to discharge. If sufficient system capacity is available, the cost of I & I reduction is generally difficult to justify at the local level. The Utility also recognizes that regional transmission and treatment facilities as well as energy costs are impacted by local system I & I flows. The Utility will therefore cooperate with regional efforts to determine if I & I reduction is a cost effective means of reducing the increasing demand on regional facilities.

2.2.2 Service Area Policies

2.2.2.1 Redevelopment Thresholds for Payment of Connection Charges

The Utility shall collect allocated costs for system improvements from benefited properties if such property undergoes a substantial remodel or more significant improvement, or if an improvement creates a significant impact to downstream system capacity. For this policy, properties which undergo cumulative improvements from the time the charge is established which meet either condition are included. Authority to require payment, even in the case where no sewer permit or developer extension is required, is included in the sewer code.

Discussion:

The costs of system improvements constructed or planned by the city are allocated to benefited properties proportionately, to recoup all engineering and construction costs. "Fair share" fees are determined based on area and permitted density of development (zoning), since these parameters determine the sewer capacity that could be required by any property. The assessment is therefore based on the **capacity available** to a property, rather than the **actual capacity used** or required by development on the property.

Minor tenant improvements generally do not require substantial additional wastewater capacity, and so do not trigger payment of the fees. However, development or substantial remodel at a site implies some use of the additional wastewater capacity available to a site, and shall require full payment. Collection of a partial fee based on the proportion of available capacity actually used generally would not be appropriate since the utility would likely never recoup full cost, and the balance would be supported by the general rate base.

Land Use Code (LUC) 20.50.044 defines "Remodeling, Substantial" as construction which increases the floor area of an existing building or structure by at least 20 percent. It is a threshold that triggers many significant land use, street, and other utility requirements. Small improvements taken together can create a significant impact on capacity, hence the cumulative recommendation of the policy.

Properties are liable for full payment of all connection fees, regardless of whether they were initially developed, under-developed, or subsequently rezoned, since the charges are based on the sewer capacity that is or will be available to the property. Fees for any specific system improvement will only be collected once, regardless of the number of times the property redevelops. Direct facility charges are separate from, and in addition to capital recovery charges, latecomer agreements and other charges defined in the sewer code.

2.2.2.2 Septic Systems

***New Septic Systems* - In addition to King County requirements, the Utility should require connection to the City wastewater system where practical. Where it is not practical, septic systems should be allowed provided there are no negative health or environmental impacts and if the owner agrees to connect to the City system when it becomes available.**

***Existing Septic Systems* - Existing septic systems should be allowed to remain in service, provided that there are no health or environmental impacts.**

Discussion:

The King County Health Department regulates the use of septic systems in King County, including Bellevue. Minimum design standards for septic systems are established by the state. The county may impose more stringent requirements at its discretion. The county requires new development to connect to public sewers if the development is within the

urban growth area. The county also requires existing development that is within 200 feet of a public sewer to connect when repair or modification to the on-site septic system becomes necessary.

The county interest in regulating systems is to protect human health. In addition to health risks, failing septic systems can have an adverse effect on ground water quality in the form of phosphorus and nitrogen build-up.

Both state and county regulations imply the preference of a municipally owned collection system over privately owned septic systems in urban growth areas. However, the regulations make no attempt, other than the 200-foot requirement, to establish economic parity between the two options. Further, the regulations do not consider the likelihood of a municipally-owned collection system being installed at some future date. This policy addresses these issues and allows homeowners and the city to work cooperatively to determine which system can best serve the homeowner and/or the surrounding neighborhood, as well as the timing of proposed system extensions.

The county regulates existing systems by responding to known or reported cases of improperly functioning or failing systems. Generally these systems are only identified by odor or visual evidence of surface sewage. Failing systems must connect to a collection system when practical, install a new system or rehabilitate the existing system to county standards. The two most likely causes of failing septic systems are improper use and failure to pump out sludge build-up at regular intervals. Proper use and regular pumping of septic systems are the most cost effective ways of protecting the ground water resource. This maintenance also prevents costly repairs or replacement of the septic systems by homeowners.

2.2.2.3 Service Extension

Wastewater system service extension by Bellevue will be considered, provided the area to be served is within the City's existing wastewater service area and the extension of service is consistent with adopted annexation policies. Service extension by Bellevue may be considered under such conditions only if the City's costs are recovered and sufficient financial resource is available.

Discussion:

In 1979, Bellevue reached agreement with Renton and Issaquah, identifying sphere of influence limits. These limits established ultimate annexation boundaries. Since that time, a portion of this sphere of influence line has been eliminated by the incorporation of the City of Newcastle. Because it is most efficient and economical for the City to provide services to city residents, the ultimate wastewater service area coincides with the sphere of influence boundary.

This policy is consistent with the Utilities Element of the City Comprehensive Plan, which states that service should be extended provided land use considerations are met and all costs are recovered. (Policy UT-7 and UT-8).

Property owners are responsible for extending wastewater service to their property. The city may extend the system to assure orderly system development, in which case, benefited property owners would be responsible for an equitable share of extension costs. Wastewater system extensions must be constructed to current city standards.

2.2.2.4 Bellevue Initiated Assumption of Sewer Districts

Bellevue will seek to assume the operation of a sewer district when the City Council determines that the assumption is in the best interest of the City and the assumption is consistent with the City's Comprehensive Plan, and will do so as permitted by state law.

Discussion:

It is Bellevue's policy, as stated in the City's Comprehensive Plan, to own and operate all publicly owned utility systems within the city limits unless circumstances otherwise dictate.

2.2.3 Water Quality Policies

2.2.3.1 Effluent Pretreatment Requirements

All non-domestic utility customers should be required to implement Best Management Practices (BMPs) to ensure effluent meets established standards.

Discussion:

Requirements for biological, chemical or mechanical pretreatment devices or other on-site system improvements are related to the quality and quantity of the effluent produced rather than some threshold amount of redevelopment occurring on a site. Any proposed tenant or site improvement creates an opportunity for review of potential effluent quality impacts. Where detrimental impacts exist, the utility should impose requirements which will result in effluent quality that meets established local, county, state, and federal standards. The utility recognizes that BMPs mean requiring implementation of the Most Practical Technology; that is, the most appropriate technology for any given circumstance.

Existing customers who are not proposing system improvements are still obliged to practice BMPs. A proactive approach involving education and training in the use of biotechnology or other technologies should be used wherever such technology is likely to preclude damage to Bellevue's collection and pumping systems. Enforcement actions by the utility should be

authorized by the city sewer code and taken whenever a violation is discovered if compliance is not otherwise obtained.

To date the program has focused on non-domestic users, since KCWTD standards don't apply to residential customers. Generally, for fats oils and grease (FOG) problems, this has meant food handling and automotive types of businesses. If there is potential for a significant benefit to be realized by implementing pretreatment in high density residential locations, a pilot program could be developed to measure the effectiveness of such measures.

2.2.3.2 Industrial Discharge Monitoring

Bellevue will continue to rely on King County to regulate and enforce industrial discharges. Bellevue's focus will be to protect the local system components. Consequently, Bellevue should retain Code authority as necessary to protect the integrity of the local sewer system.

Discussion:

The City is responsible for the construction, maintenance and operation of all local sewerage facilities and for all costs incident to the collection and delivery of sewage to King County. Bellevue is obligated by contract with King County to deliver all sewage and industrial waste collected by the City, and King County is obligated to accept the sewage delivered for treatment and disposal subject to such reasonable rules and regulations as may be adopted by the King County Council. Those rules are contained in King County Code Title 28. Because King County is the permitted discharger of treated wastewater into state and federal waters, it is the only agency authorized to enforce federal and state standards for industrial users (all non-domestic). Ordinance 11034 specifically excludes participant local agencies who collect domestic and industrial waste and convey such waste to King County, from the discharge requirements, thus limiting the City's liability for discharge in violation of regulations.

As owner of the collection system which delivers waste to King County, Bellevue should actively monitor the impact of regulated sewage on the local system and should be authorized to take enforcement action when necessary. Program activities currently include continuing the polar/non-polar FOG monitoring program, reviewing summary reports of King County monitored discharge, and periodically inspecting sewer mains which receive industrial effluent.

Bellevue should continue to rely on King County as principal enforcer of state and federal standards. King County is made aware of any suspected discharge violations. Where violations have occurred that are detrimental to the local system, Bellevue notifies King County to take appropriate enforcement action. Bellevue should take any necessary steps to protect the integrity of the local system and must have the code authority to do so.

2.2.4 Regional Policy

The Utilities Department shall seek to:

- **Accomplish the City's environmental goals to promote a healthy environment, public safety and a strong economy, essential to maintaining the city's and region's quality of life;**
- **Ensure reasonable and prudent fiscal policies on behalf of ratepayers;**
- **Ensure regional, state and federal requirements are fiscally prudent and achievable; and**
- **Maintain local control and flexibility in policy/program implementation.**

The Utilities Department's role is to develop proposed guiding principles/interests for Council approval. Pursuant to Council direction, the Utilities Department role in monitoring, influencing, developing and implementing regional, state, and federal wastewater requirements, policies and programs may include:

- **Influencing legislation through lobbying and written/verbal testimony;**
- **Participating in rule-making;**
- **Reviewing technical documents;**
- **Serving on regional forums and coalitions, advisory committees and work groups; and**
- **Providing technical and staff support for Council members serving on regional, state, or federal wastewater committees.**

Discussion:

The Utilities Department has participated in the development and implementation of regional, state, and federal wastewater requirements, policies and programs for a number of reasons:

- The City has a direct interest in helping shape regional, state and federal wastewater mandates because they affect utility costs, can result in rigid programs that preclude more creative or effective local ones, or can result in requirements that are impossible to meet.
- The City has been looked to as a significant stakeholder with regard to the updating and revision of regional and state wastewater requirements and therefore has had an opportunity to serve as a technical resource and participant in shaping requirements, policy and programs to benefit the City.
- The City benefits from learning about the experiences and technical expertise of others.

The Utilities Department's role in developing regional, state, and federal requirements, policies and programs varies from influencing legislation, rules, and policy to sharing technical information and participating in technical peer review groups, advisory panels, and joint studies. Through its involvement, the Utilities Department seeks to achieve the City's goals while keeping down costs to utility rate payers and maintaining local control and flexibility.

2.2.5 Financial Policies

Combined Waterworks Utility Financial Policies are provided on the following pages, as adopted by Bellevue City Council on December 3, 2012 (Ordinance No. 6086).

Waterworks Utility

Financial Policies

December, 2012

TABLE OF CONTENTS

INTRODUCTION

The Waterworks Utility is the financial consolidation of the Sewer, Storm & Surface Water and Water Utilities of the City of Bellevue for debt rating and coverage purposes as established in Ordinance No.'s 2169, 2845, 3158 and 4568. It pledges the strengths and revenues of the three separate Utilities for the common financial good while keeping each Utility financially separate for budgeting, rate-setting, revenues, expenditures, debt and accounting.

These "Financial Policies" apply uniformly to the Sewer, Storm & Surface Water and Water Utilities with few, unique exceptions which are identified separately. This update reflects changes consistent with current long-range financial planning, particularly with regard to renewal and replacement funding, the use of debt and rate policies. They supersede the Financial Policies, which were adopted under Resolution No. 5967 in 1995.

These policies do not stand-alone. They must be taken in context with the other major City and Utilities documents and processes. For instance, each Utility has its own System Plan, which documents its unique objectives, planning, operations and capital needs. These Utility System Plans have historically had a 20-year planning horizon. Future Utility System Plans will need to evaluate long term renewal and replacement of aging facilities, much of which were constructed in the 1950's and 1960's during periods of high growth rates and are approaching the end of their useful life. Life cycle costs should be considered in planning the future capital facilities and infrastructure needs.

The City has a seven-year City-wide Capital Investment Program (CIP) Plan which is updated with each biennial budget cycle. All major City capital projects are included. Generally, they are described as over $25,000; involving new physical construction, reconstruction or replacement; and involving City funding. The CIP identifies the level and source of funding for each project. The CIP includes specific sections for each Utility which identify near-term capital projects consistent with each current Utility System Plan and several projects of general scope including renewal and rehabilitation, capital upgrades, response to growth and other system needs.

I. GENERAL POLICIES

A. *Fiscal Stewardship*

The Waterworks Utility funds and resources shall be managed in a professional manner in accordance with applicable laws, standards, City financial practices and these Financial Policies.

Discussion:

It is incumbent on Utility management to provide professional fiscal management of utility funds and resources. This requires thorough knowledge of and conformance with the City financial management processes and systems as well as applicable laws and standards. It also requires on-going monitoring of revenues and expenses in order to make decisions and report to City officials, as needed, regarding the status of Utilities financing. Independent financial review, analysis and recommendations should be undertaken as needed.

B. *Self-sufficient Funding*

Each Utility shall remain a self-supporting enterprise fund.

Discussion:

The revenues to each Utility primarily come from customer charges dependent on established rates. State law requires that utility funds be used only for utility purposes. Since each Utility has somewhat differing service areas, it is essential for ratepayer equity that they be kept financially separate and accountable. The City's General Fund can legally contribute to the Utility funds but does not. The City budgeting process includes a balanced and controlled biennial Utility budget. This requires careful preparation of expense and revenue projections that will be reviewed by City management, the Environmental Services Commission, the general public and the City Council prior to approval of any change in Utility rates.

C. *Utility System Planning Policies*

The Water Utility System Plan shall be updated every six years as required by state statute; the Wastewater and Storm & Surface Water System Plans shall be updated as required by changed conditions or state statute, generally every six to ten years. All Utility system plans shall use a 20-year planning horizon or greater, and shall consider life cycle costs to identify funding needs. Studies to analyze specific geographic areas or issues, such as Storm & Surface Water basin plans, Wastewater capacity and flow studies, or Water pressure zone studies will be completed as required using similar criteria for planning infrastructure needs.

Substantial portions of the City utility systems were constructed in the 1950's and 1960's. These systems are approaching the end of their useful life as illustrated on the following Exhibit 1 - Watermain Replacement Spending and Exhibit 2 - Sewermain Replacement Spending. The storm & surface water infrastructure is of similar age but has not been graphed. It most likely has a relatively shorter expected life span. The object is to determine and follow a survivor curve replacement schedule rather than the replacement schedule based on age alone. Assumptions for survivor curves and useful lives are revisited periodically. These were assessed in 2004 and updated for the most recent engineering and financial findings. Significant changes include the adjustment of replacement costs to current price levels, categorization of pipe assets based on expected useful lives, and replacement of major non-pipe Utility assets such as pump stations and reservoirs. The Exhibits illustrate an example survival replacement curve based on preliminary estimates only. As real needs are determined, they will replace the estimated curves. Renewal and/or replacement will require substantial reinvestment in the future and have major rate impacts if large portions of the systems have to be replaced in relatively short periods of time. The actual useful life of underground utilities is difficult to determine and the best available data is needed to be able to plan for the orderly and timely renewal and/or replacement. For this purpose, the utility system plans need to have at least 20 year planning horizons and must address the aging of the Utility systems.

Long term system planning for the Utility systems is required in order to assure that the future financial needs are anticipated and equitable funding plans can be developed. In order to keep funding plans current, utility system plans need to be updated approximately every six years (as required by State law for water and sewer system plans). These Financial Policies will then be reviewed and updated as needed.

Exhibit 1
Watermain Replacement Spending
(Based on 75-Year Expected Asset Life)

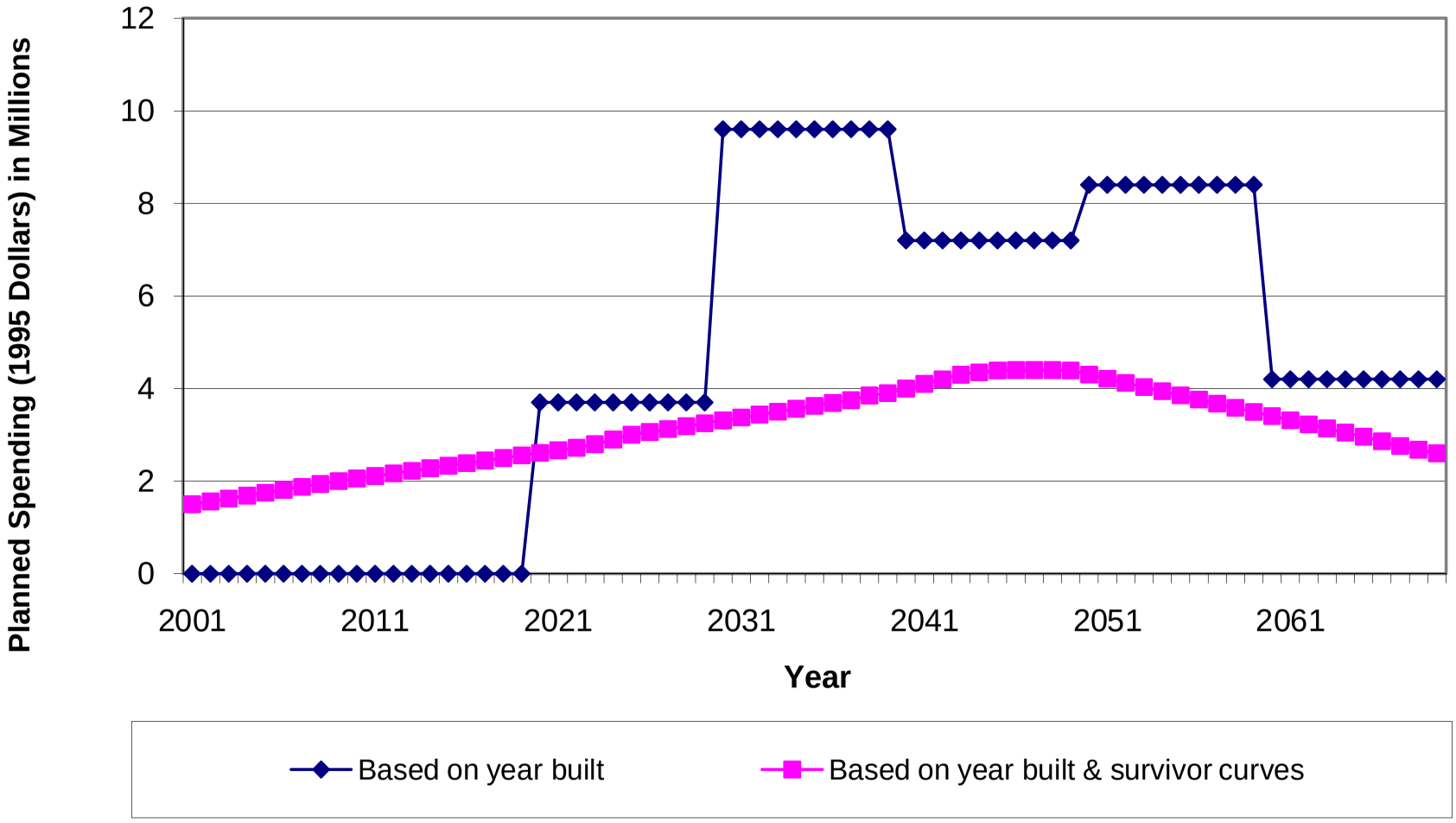
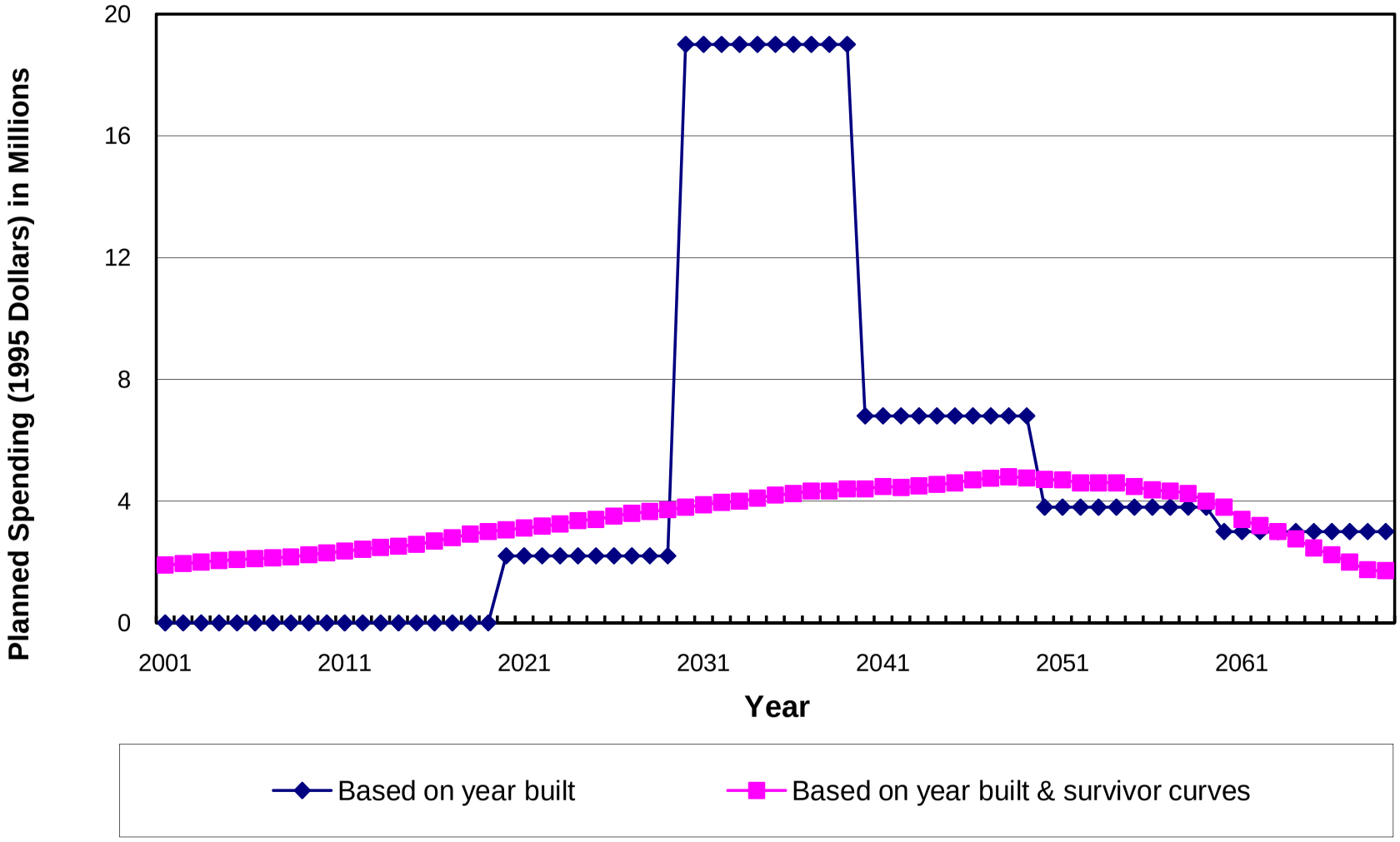


Exhibit 2
Sewermain Replacement Spending
(Based on 75-Year Expected Asset Life)



II. CAPITAL INVESTMENT PROGRAM POLICIES

A. *General Scope*

The Utilities Capital Investment Program (CIP) will provide sufficient funds from a variety of sources for implementation of both short- and long-term capital projects identified in each Utility System Plan and the City-wide Capital Investment Program as approved by the City Council.

Financial planning for long-term capital investment shall be based on principles that result in smooth rate transitions, maintain high credit ratings, provide for financial flexibility and achieve inter-generational equity.

Discussion:

These near-term capital projects are usually identified in each Utility system plan which also provides the criteria and prioritization for determining which projects will be constructed. Several projects of general scope are also included to allow for on-going projects that are less specifically identified due to their more inclusive nature.

In addition to these near-term projects, funding should be provided for long-term capital reinvestment in the system to help minimize large rate impacts as the systems near the end of their useful life and have to be renewed or replaced. Ordinance No. 4783 established a Capital Facilities Renewal & Replacement (R&R) Account for each Utility to provide a funding source for this purpose. Other policies describe how this Account is to be funded and expended.

A reinvestment policy by itself, without some form of planned and needed expenditure, could lead to excessive or unneeded expenditures, or conversely unnecessary accumulations of cash reserves. The reinvestment policy needs to tie the planned expenditures over time with a solid, long-term financial plan that is consistent with these policies.

The actual needs for the renewal/replacement expenditures should relate to the on-going need to minimize system maintenance and operating costs consistent with providing safe and reliable service, the age and condition of the system components, and any regulatory or technical obsolescence. In essence, plant should be replaced when it is needed and before it fails. As such, the goal setting measure of how much is an appropriate annual or periodic reinvestment in renewals and replacement of existing assets should be compatible with the age and condition of the infrastructure and its particular circumstances.

WP0459C-ORD
06/27/95

ORIGINAL

CITY OF BELLEVUE, WASHINGTON

ORDINANCE NO. 4783

AN ORDINANCE creating utility capital replacement accounts for the Water, Sewer and Storm and Surface Water Utilities within the Utility Capital Investment Fund for the purpose of accumulating funding for long term replacement of utility facilities.

WHEREAS, the Utilities 1995 Cost Containment Study prepared by Financial Consulting Solutions Group, Inc. (FCSG) recommends that current utility rates recover from the ratepayers amounts which at a minimum are equal to the depreciated value of the original cost of utility facilities and at a maximum are amounts equal to the replacement value of utility infrastructure; and

WHEREAS, FCSG recommends that utility funds not needed for current expenditure be placed in a replacement account to be used in the future in combination with current revenues and/or debt financing to replace capital facilities nearing the end of their useful life; and

WHEREAS, implementation of FCSG's recommendations would promote intergenerational rate equity and provide more stable rates to customers over the long term; and

WHEREAS, the Council desires to make an initial, 1995 deposit of $600,000 in savings from the Water Fund into the new capital replacement account for the Water Utility; now, therefore,

THE CITY COUNCIL OF THE CITY OF BELLEVUE, WASHINGTON, DOES ORDAIN AS FOLLOWS:

Section 1. The purpose of this ordinance is to establish capital facilities replacement accounts within the Utility Capital Investment Fund in order to assure a future funding source for replacement of utility facilities nearing the end of their useful life. The City Council will determine each year, as part of the adoption of the utilities operating budgets, how much, if any, utility revenue during the upcoming year shall be designated for transfer to a replacement account. The City Council may also authorize the receipt of other funds directly into these capital facility replacement accounts. Once deposited the funds will accumulate with interest. The decision regarding when and how to utilize such accumulated funds for the replacement of utility facilities will be made as part of the Utility Comprehensive Plans and Utility Capital Investment Program approval process.

ORIGINAL

WP0459C-ORD
06/27/95

Section 2. The following new accounts are established in the Utility Capital Investment Fund:

Capital Facilities Replacement Account - Sewer
Capital Facilities Replacement Account - Water
Capital Facilities Replacement Account - Storm and Surface Water

Section 3. There is hereby authorized the 1995 transfer from the Water Utility Operating Fund to the Capital Facilities Replacement Account - Water the amount of $600,000.

Section 4. This ordinance shall take effect and be in force five days after its passage and legal publication.

PASSED by the City Council this 24th day of July, 1995, and signed in authentication of its passage this 24th day of July, 1995.

(SEAL)

Donald S. Davidson, DDS, Mayor

Approved as to form:

Richard L. Andrews, City Attorney

Richard L. Kirkby, Assistant City Attorney

Attest:

Myrna L. Basich, City Clerk

Published July 28, 1995

B. *Funding Levels*

Funding for capital investments shall be sustained at a level sufficient to meet the projected 20 year (or longer) capital program costs.

Funding from rate revenues shall fund current construction and engineering costs, contributions to the Capital Facilities Renewal and Replacement (R&R) Account, and debt service, if any.

Inter-generational equity will be assured by making contributions to and withdrawals from the R&R Account in a manner which produces smooth rate transitions over a 20 year (or longer) planning period.

On an annual basis, funding should not fall below the current depreciation of assets expressed in terms of historical costs less any debt principal payments.

Discussion:

These policies are based on the experience gained by developing a long-term Capital Replacement Funding Plan. In absence of such a plan, the range of capital investment funding should fall between the following minimum and maximum levels:

The minimum annual rate funding level would be based on the current depreciation of assets expressed in terms of historical costs, less any debt principal payments.

The maximum annual rate funding level would be based on the current depreciation of assets expressed in terms of today's replacement costs, less any debt principal payments.

The minimum level based on historical cost depreciation approximates the depletion of asset value. Some of the cost may already be in the rates in the form of debt service. Depreciation less debt principal repayment provides a minimum estimate of the cost of assets used. Any funding level below this amount defers costs to future rate payers and erodes the tility s equity position, which puts the tility s financial strength and viability at risk.

The maximum level based on replacement cost depreciation represents full compensation to the utility, in terms of today's value, for the depletion of assets. The replacement cost depreciation, again less debt principal repayment, provides a ceiling to an equitable definition of "cost of service".

The purpose of long-term capital reinvestment planning is to establish a target funding level which is based on need and to assure that funds will be available for projected capital costs in an equitable manner. The best projection of the needed capital reinvestment is based on a "survival curve" approach, approximating the timing and cost of replacing the entire system. This defines the projected financial needs and allows determination of equitable rate levels, funding levels for current capital construction and engineering, contributions to and withdrawals from the R&R Account, and the use of debt, if any. It also provides a means to project depreciation on both historical cost and replacement cost basis which are used to calculate minimum and maximum funding levels, debt to fixed asset ratios, and debt coverage levels, if debt is used. These later measures can be used to assure that the financial plan meets conventional standards.

C. *Use of Debt*

The Utilities should fund capital investment from rates and other revenue sources and should not plan to use debt except to provide rate stability in the event of significantly changed circumstances, such as disasters or external mandates.

Resolution No. 5759 states that the City Council will establish utility rates/charges and appropriations in a manner intended to achieve a debt service coverage ratio (adjusted by including City taxes as an expense item) of approximately 2.00". Please note that the Moody's Investor Services rating should be Aa2 (not Aa as stated in Resolution No. 5759).

Discussion:

The Utilities are in a strong financial position and have been funding the Utility Capital Investment Program from current revenues for a number of years. The current 20 year and 75 year capital funding plans conclude that the entire long-term renewal and replacement program can be funded without the use of debt if rates are planned and implemented uniformly over a sufficient period. Customers will pay less over the long-term if debt is avoided, unless it becomes truly necessary due to unforeseen circumstances such as a disaster or due to changes in external mandates. Having long-term rate stability also assures inter-generational equity without the use of debt because the rate pattern is similar to that achieved by debt service.

Use of low interest rate debt such as the Public Works Trust Fund loans, by offering repayment terms below market rates, investment earnings or even inflation, should be viewed as a form of grant funding. When available or approved, such sources should be preferred over other forms of rate or debt funding, including use of available resources. Since such reserves would generate more interest earnings than the cost of the loan, the City's customers would be assured to benefit from incurring such debt.

WP0254C-RES
03/03/94

CITY OF BELLEVUE, WASHINGTON

RESOLUTION NO. 5759

A RESOLUTION relating to financial policy for the Waterworks Utility and adopting a debt service coverage policy for the Waterworks Utility

WHEREAS, the City of Bellevue is consistently recognized for its prudent financial management; and

WHEREAS, the City of Bellevue's Water and Sewer Bonds are currently rated Aa by Moody's Investor Services and AA- by Standard & Poor's Corporation, which are considered to be excellent ratings; and

WHEREAS, these excellent ratings result in lower interest costs on the City's Water and Sewer bonds, which, in turn, may result in lower water, sewer and storm drainage costs; and

WHEREAS, it is important to the rating agencies and to the financial community that the City articulate its financial goals for its Waterworks Utility; and

WHEREAS, a desirable debt service coverage ratio, the ratio of revenues available for debt service to the annual debt service requirement, positively affects the Utility's bond ratings; and

WHEREAS, the City Council deems it in the City's best interest to establish a debt service coverage policy target for the purpose of protecting its current bond rating and to allow for the development of financial projections, NOW, THEREFORE,

THE CITY COUNCIL OF THE CITY OF BELLEVUE, WASHINGTON, DOES RESOLVE AS FOLLOWS:

Section 1. The City Council hereby adopts the following debt service coverage policy for the bonds issued by the City's Waterworks Utility.

The City Council will establish utility rates/charges and appropriations in a manner intended to achieve a debt service coverage ratio (adjusted by including City taxes as an expense item) of approximately 2.00. The City Council authorizes the Waterworks Utility to utilize this policy in development of pro

WP0254C-RES
03/03/94

forma projections which will be disseminated to the bond rating agencies and to the financial community generally.

PASSED by the City Council this 7th day of March, 1994, and signed in authentication of its passage this 8th day of March, 1994.

(SEAL)

Donald S. Davidson, DDS, Mayor

Attest:

Myrna L. Basich, City Clerk

D. *Capital Facilities Renewal & Replacement (R&R) Account*

1. Sources of Funds

Revenues to the R&R Account may include planned and one-time transfers from the operating funds, transfers from the CIP Funds above current capital needs, unplanned revenues from other sources, Capital Recovery Charges, Direct Facility Connection Charges and interest earned on the R&R Account.

2. Use of Funds

Funds from the R&R Account shall be used for system renewal and replacement as identified in the CIP. Because these funds are invested, they may be loaned for other purposes provided repayment is made consistent with the need for these funds and at appropriate interest rates. Under favorable conditions, these funds may be loaned to call or decrease outstanding debt.

3. Accumulation of Funds

The R&R Account will accumulate high levels of funds in advance of major expenses. These funds will provide rate stability over the long-term when used for this purpose and *should not be used for rate relief.*

Discussion:

Revenues from Capital Recovery Charges, Direct Facility Connection Charges and interest earned on the R&R Account are deposited directly into the R&R Account. Other transfers are dependent on the long-term financial forecast, current revenues and expenses, and CIP cash flows. The long-term financial forecast projects a certain funding level for the transfers to the CIP and the R&R Accounts. Rates should be established consistent with this long-term financial plan and will generate the funds for such transfers. Setting rates at lower levels may result in current rate payers contributing less than their fair share for long-term equity.

R&R Account funds must only be used for the purpose intended; that is, the long-term renewal and replacement of the utility systems. They may be used for other purposes if it is treated as a loan, which is repaid with appropriate interest in time for actual R&R needs for those funds.

These accounts are each projected to accumulate tens of millions of dollars in order to meet the anticipated costs for the actual projects at the time of construction. It is the intent of these policies that these reserve funds will not be used for other purposes or to provide rate relief because that would defeat the long-term equity and could lead to the need for the use of debt to fund the actual needs when they occur.

III. SYSTEM EXPANSION AND CONNECTION POLICIES

A. *Responsibilities*

Those seeking or who are required to have Utility service are responsible for extending and/or upgrading the existing Utility systems prior to connecting.

Discussion:

It is the responsibility of the party seeking Utility service to make and pay for any extensions and/or upgrades to the Utility systems that are needed to provide service to their property. The extensions or upgrades must be constructed to City standards and requirements. This is typically accomplished through a Developer Extension Agreement with the City wherein requirements are documented, standards are established, plans are reviewed and construction is inspected and approved. Service will not be provided until these requirements are met.

The philosophical underpinning of this policy is that growth pays for growth . istorically, developers constructed much of the City s utility infrastructure. f the infrastructure eventually would benefit more than the initial developer, the Utility signed a Latecomer Agreement to reimburse the original financier from charges to those connecting and receiving benefit at a later point in time. When the cost to extend and/or upgrade the system to accommodate development or redevelopment is beyond the means of a single developer, the Utility has employed a variety of methods to assist in the construction of the necessary infrastructure. Local Improvement Districts (L s) historically have been used to provide financing for infrastructure for new development, with the debt paid over time by the property owners. Most of the older Utilities infrastructure was financed by this method.

The Utility has in some cases up-fronted the infrastructure construction for new development or redevelopment from rate revenues which are later reimbursed with interest, in whole or in part, by subsequent development through direct facility connection charges (see Cost Recovery Policy). Examples are the water and sewer infrastructure for Cougar Mountain housing development and Central Business istrict (CB) redevelopment. Another example is the use of the tility s debt capacity to provide for development infrastructure whereby the City sells bonds at lower interest rates than can private development, constructs the infrastructure, and collects a rate surcharge from the benefited area to pay off the bonds. Examples of this type of financing include the Lakemont development drainage infrastructure and the Meydenbauer Drainage Pipeline in the CBD.

B. *Cost Recovery*

The Utility shall establish fees and charges to recover Utility costs related to: (1) development services, and (2) capital facilities that provide services to the property.

The Utility may enter into Latecomer Agreements with developers for recovery of their costs for capital improvements, which benefit other properties in accordance with State law. The Utility will add an administrative charge for this service.

Discussion:

In general, Utility costs related to development services are recovered through a variety of fees and charges. There are fixed rates for some routine services based on historical costs and inflation. There are fixed plus direct cost charges and applicable overhead for developer extension projects to cover the lengthy but variable level of development review and inspection

typically required to implement these projects. These rates are reviewed periodically to ensure that the cost recovery is appropriate.

When the means of providing the infrastructure to serve a new development or redevelopment are beyond the means of a single developer, the Utility may elect to assist the developer by using: L s, Latecomer Agreements, special debt (to be paid by special rate surcharges), up-fronting the costs from Utility rate revenues (to be reimbursed by future developers with interest through direct facility connection charges), or other lawful means. It is the intent of this policy to fully recover these costs, including interest, so as to reimburse the general rate payer.

Latecomer charges allow cost recovery for developers and private parties, for facilities constructed at their own expense and transferred to the Utility for general operation. Properties subsequently connecting to those systems will pay a connection charge that will be forwarded to the original individual or developer or the current owner depending on the terms of the Latecomer Agreement. The Utility collects an overhead fee on this charge for processing the agreements and repayments.

C. ***Use of Revenues***

All capital-related revenues such as Capital Recovery Charges and Direct Facility Connection Charges should be deposited in the Capital Facilities Renewal & Replacement Accounts.

Discussion:

Capital Recovery Charges are collected from all newly developed properties in the form of monthly rate surcharges over a ten year period to reimburse the Utility for historical costs that have been incurred by the general rate base to provide the necessary facilities throughout the service area. These Capital Recovery Charges should be deposited in the Capital Facilities Renewal & Replacement Accounts.

Direct Facility Connection Charges are collected for capital improvements funded by the City as described above in Section 2 under Cost Recovery. The total cost of the improvement is allocated to the area of benefit and distributed on an equitable basis such as per residential equivalent unit. Interest is collected in accordance with State law.

D. ***Affordable Housing Consideration***

The Utility shall base connection charges on the number of units allowed under the basic zoning. Only incremental cost increases will be charged to affordable housing units.

Discussion:

The City has adopted bonus density incentives for developers to build units specifically for affordable housing. Under historical practices these additional units would have been charged the same connection fee as all other units, resulting in a lower cost per unit for all units. While this is fair, it does not create any incentive to develop affordable housing. By charging only the incremental increased facility cost to the affordable housing units, all developers who include an affordable housing component will experience no increase in cost because of the affordable bonus density units. The cost per unit for affordable units is thereby reduced. The cost per unit for all other units, based on underlying land use zoning, remains unchanged.

IV. RATE POLICIES

A. *Rate Levels*

Rates shall be set at a level sufficient to cover current and future expenses and maintain reserves consistent with these policies and long-term financial forecasts.

Changes in rate levels should be gradual and uniform to the extent that costs (including CIP and R&R transfers) can be forecast.

Cost increases or decreases for wholesale services shall be passed directly through to Bellevue customers.

Local and/or national inflation indices such as the Consumer Price Index (CPI) shall be used as a basis for evaluating rate increases.

At the end of the budget cycle, fund balances that are greater than anticipated and other one-time revenues should be transferred to the R&R account until it is shown that projected R&R account funds will be adequate to meet long-term needs, and only then used for rate relief.

Discussion:

A variety of factors including rate stability, revenue stability, the encouragement of practices consistent with Utility objectives and these Waterworks Utility Financial Policies are considered in developing Utility rates. The general goal is to set rates as low as possible to accomplish the on-going operations, maintenance, repair, long-term renewal and replacement, capital improvements, debt obligations, reserves and the general business of the Utility.

Long-range financial forecast models have been developed for each of the Utilities, which include estimated operating, capital and renewal/replacement costs for a 75 year period in order to plan for funding long-term costs. Operating costs are assumed to remain at the same level of service and don t include impacts of potential changes due to internal, regional or federal requirements. Capital costs, including renewal/replacement, are projected based on existing CIP costs and approximated survival curves for the infrastructure. The models are used to project rate levels that will support the long-term costs and to spread rate increases uniformly over the period. This is consistent with the above policy that changes in rate levels should be gradual and uniform. Uniform rate increases help ensure that each generation of customers bears their fair share of costs for the long-term use and renewal/replacement of the systems.

The biennial budget process provides an opportunity to add to or cut current service levels and programs. The final budget, with the total authorized expenses including transfers to the CIP Fund and the R&R Account, establishes the amount of revenue required to balance the expenses. A balanced budget is required. The budgeted customer service revenue determines the level of new rates. For example, if the current rates do not provide sufficient revenues to meet the projected expenses, the costs have to be reduced or the rates are increased to make up the shortfall.

For purposes of these policies, wholesale costs are defined as costs to the Utilities from other regional agencies such as the Seattle Public Utilities and/or the Cascade Water Alliance (CWA), and King County Department of Natural Resources for sewer treatment and any agreed upon Storm & Surface Water programs. Costs which are directly based on the Utilities' revenues or budgets such as taxes, franchise fees and reserve levels that increase proportionally to the wholesale increases are included within the definition of wholesale costs.

B. ***Debt Coverage Requirements***

Utility rates shall be maintained at a level necessary to meet minimum debt coverage levels established in the bond covenants and to comply with Resolution No. 5759 which establishes a target coverage ratio of 2.00.

Discussion:

Existing revenue bond covenants legally require the City's combined Waterworks Utility, which includes the Water, Sewer and Storm & Surface Water Utilities, to maintain a minimum debt coverage ratio of 1.25 on a combined basis. In 1994, Council also adopted Resolution No. 5759 that established a policy, which mandates the Utilities to maintain a target combined debt coverage ratio of approximately 2.00, to further protect the City's historically favorable Utility revenue bond ratings. Water and Sewer Utility resources are counted in the official coverage calculation though Storm & Surface Water is responsible for the major portion of current outstanding Utility debt. Requiring Storm & Surface Water to separately maintain the minimum 1.25 legal debt coverage level and to move toward the 2.00 level will help ensure that necessary coverage requirements are met, and that customers of the other Utilities will not be unfairly burdened with the cost of meeting this obligation. It also ensures that sufficient coverage is available to the Water and Sewer Utilities if they need to incur debt.

C. ***Frequency of Rate Increases***

Utility rates shall be evaluated annually and adjusted as necessary to meet budgeted expenses including wholesale cost increases and to achieve financial policy objectives.

Discussion:

In 1996, the City changed to a biennial budget process and adopted a two-year Utilities budget including separate rates for 1997 and 1998. This practice will continue on a biennial basis. However, Utility rates will be evaluated on an annual basis and adjusted as necessary to ensure that they are effectively managed to achieve current and future financial policy objectives. Annual rate reviews will include preparation of forecasts covering a twenty-year period for Utility revenues, expenditures, reserve balances and analysis of the impact of various budgetary elements (i.e. CIP transfers, R&R Account transfers, debt service costs, debt coverage levels, operating expenses, and reserves) on both current and future rate requirements.

D. ***Rate Structure - Sewer***

The Sewer Utility rate structure will be based on a financial analysis considering cost-of-service and other policy objectives, and will provide for equity between customers based on use of the system and services provided.

Discussion:

In 1993, a Sewer Rate Study was performed that resulted in Council approval of a two-step, volume-based rate structure for single-family customers based on winter average metered water volumes instead of the traditional flat rate structure. Flat rate structures were seen as inequitable to low-volume customers who paid the same amount as high volume customers. Rates are based on the level of service used, rather than the availability of service.

The revenue requirements are based on the "average" single-family winter average volume calculated annually from the billing database. The charge for an individual customer is based on their winter average and then charged at that level each bill for the entire year to avoid charging for irrigation use. The customer's winter average is based upon the prior year's three winter bills because the current year's bills include winter months, which would result in the average constantly changing. Customers without prior winter averages to use for a basis are charged at the "average" volume until they establish a winter-average or sufficient evidence that their use is significantly different than the "average".

E. ***Rate Structure - Storm & Surface Water***

The Storm & Surface Water Utility rate structure will be based on a financial analysis considering cost-of-service and other policy objectives, and will provide adjustments for actions taken under approved City standards to reduce related service impacts.

Discussion:

In the existing Storm & Surface Water rate structure, customer classes are defined by categories of development intensity, i.e., *undeveloped, lightly developed, moderately developed, heavily developed* and *very heavily developed*. Based on theoretical run-off coefficients for each of these categories, higher rates are charged for increasing degrees of development to reflect higher run-off resulting from that development. Under this structure, billings for both residential and non-residential customers are determined by total property area and rates assigned to applicable categories of development intensity. Customers providing on-site detention to mitigate the quantity of run-off from their property receive a credit equal to a reduction of one rate level from their actual development intensity. Property classified as "wetlands" is exempt from Storm & Surface Water service charges.

Large properties, over 35,000 square feet, with significantly different levels of intensity of development may be subdivided for rate purposes in accordance with Ordinance No. 4947. In addition, properties with no more than 35,000 square feet of developed area in the light and moderate intensity categories may, at the option of the owner, defer charges for that portion of the property in excess of 66,000 square feet. The property owner may apply for a credit against the Storm & Surface Water charge when they can demonstrate that the hydrologic response of the property is further mitigated through natural conditions, on-site facilities, or actions of the property owner that reduce the City s costs in providing Storm & Surface Water quantity or quality services.

Future design of a water quality rate component will also use cost-of-service principles to assign defined water quality costs to customer classes, according to their proportionate contribution to Utility service demand. It is anticipated that these rate structure revisions will also provide financial incentives to customers taking approved actions to mitigate related water quality impacts.

F. ***Rate Structures - Water***

The water rate structure will be based on a financial analysis considering cost-of service and other policy objectives, and shall support water conservation and wise use of water resources.

Discussion:

The water rate structure consists of fixed monthly charges based on the si e of the customer s water meter and volume charges, which vary according to customer class and the actual amount

of water that the customer uses. There are three different meter rate classifications: domestic, irrigation and fire standby. The different charges are based on a cost-of-service study.

State law and the wholesale water supply contract require the Utility to encourage water conservation and wise use of water resources. Seattle first established a seasonal water volume rate structure for this purpose in 1989 with higher rates in the summer than in the winter. In 1990, based on a water rate study and the desire to provide a conservation-pricing signal to our customers, the City adopted an increasing block rate structure for local volume rates. The rate structure was revised in 1991 to pass through an increase in wholesale water costs, which also included a higher seasonal water rate for summer periods. The block water rate structure was revised again in 1997, to incorporate new cost-of-service results from a 1996 water rate study.

An increasing block rate structure, charges higher unit rates for successively higher water volumes used by the customer. The current rate structure has four rate steps for single-family and three rate steps for multi-family customers, based on metered water volumes. All irrigation-metered water is charged at a separate, higher rate. Because non-residential classes do not fit well in an increasing block rate approach due to wide variations in their size and typical water use requirements, seasonal rates, with and without irrigation, were established for these customers. This rate structure will be thoroughly reviewed, as more historical information is available on the effect of the increasing block and seasonal rate structure.

In 1997, an additional category of fire protection charges was added for structures and facilities that benefit from the City water system but are not otherwise being charged for water service. For example, a number of homes are on private wells but are near a City-provided fire hydrant and enjoy the additional benefit of fire protection yet didn t pay for the benefit on a water bill. The charge is based on an equivalent meter size that would normally serve the facility. It also applies to facilities that have terminated water service but still stand and require fire protection, such as homes or buildings that are not occupied.

G. *Rate Equity*

The rate structure shall fairly allocate costs between the different customer classes. Funding of the long-term Capital Investment Program also provides for rates that fairly spread costs over current and future customers.

Discussion:

As required under State law, Utility rates will provide equity in the rates charged to different customer classes. In general, rates by customer class are designed to reflect the contribution by a customer group to system-wide service demand, as determined by cost-of-service analysis. The RCW also authorizes utility rates to be designed to accomplish "any other matters, which present a reasonable difference as a ground for distinction". For example, increasing water rates for irrigation and higher levels of use is allowed to encourage the wise use and conservation of a valuable resource. Formal rate studies are periodically conducted to assure ongoing rate equity between customer classes and guide any future rate modifications necessary to support changing Utility program or policy objectives.

Contributions from current rates to the R&R Account also provide equity between generations of rate payers by assuring that each user pays their fair share of capital improvements, including renewal and replacement, over the long-term. (See sections B and D under the Capital Investment Program Policies).

H. *Rate Uniformity*

Rates shall be uniform for all utility customers of the same class and level of service throughout the service area. However, special rates or surcharges may be established for specific areas, which require extraordinary capital investments and/or maintenance costs. Revenues from such special rates or surcharges and expenses from capital investments and/or extraordinary maintenance shall be accounted for in a manner to assure that they are used for the intended purposes.

Discussion:

The City Water and Sewer Utilities originally formed by assuming ownership of three separate operating water districts and two sewer districts. In the assumption agreements, each included a provision that requires the Utility to uniformly charge all customers of the same class throughout the entire service area. The basic rates are set for all customers, inside and outside of the City, except for local utility taxes in Bellevue, and franchise fees in Clyde Hill, Hunts Point, Medina, and Yarrow Point. Unlike the Water and Sewer Utilities, the Storm & Surface Water Utility only serves areas within the City limits.

Under state law, Utilities are required to charge uniform rates to all customers in a given customer class, regardless of property location within the service area. The only exception permitted is for certain low-income customers (see below).

However, when conditions in particular service areas require extraordinary capital improvement or maintenance costs to be incurred, special rates or surcharges may be adopted to recover those costs directly from properties contributing to the specific service demand, instead of assigning that cost burden to the general Utility rate base. This will only apply for costs above and beyond normal operations, maintenance and capital improvements. For example, rate surcharges are being used to recover debt service costs for capital facilities in Lakemont and the CBD. An additional rate surcharge for Lakemont properties is being collected for extraordinary maintenance costs of the storm water treatment facility.

I. *Rate Assistance*

Rate assistance programs shall be provided for specific low-income customers as permitted by State law.

Discussion:

Continual increases in all utility rates have had a significant impact on low-income customers. The City has adopted a rate discount or rebate program for disabled customers and senior citizens over 62 years old and with income below certain levels as permitted under State law and defined in Ordinance No. 4458. It has two levels, one discounting Utility rates by 40 percent and the other level by 75 percent, based on the customer's income level. Customers that indirectly pay for Utility charges through their rent can obtain a rebate for the prior year's Utility charges on the same criteria. The City also rebates 100 percent of the Utility Tax for these customers. The cost of this program is absorbed in the overall Utility expenses and is recovered through the rate base. The General Fund provides for the Utility tax relief.

There are other low-income customers who are less than 62 years old and currently receive no Utility rate relief. However, the City has instituted a separate rebate of Utility taxes for qualified low-income citizens.

V. OPERATING RESERVE POLICIES

A. *Operating Reserve Levels*

The Utilities' biennial budget and rate recommendations shall provide funding for working capital, operating contingency, and plant emergency reserve components on a consolidated basis in accordance with the attached Summary of Recommended Consolidated Reserve Levels table and as subsequently updated.

Discussion:

Utility resources not spent for operations remain in the fund and are referred to as reserves. At the end of each year, these funds are carried forward to the next year's budget and become a revenue source for funding future programs and operations. Under the terms of this policy, the Utility budget is targeted to include a balance of funds for the specific purposes stated above. While included in the total operating budget, these reserves will only be available for use pursuant to these reserve policies. Setting aside these budget resources in the reserve balance will help to ensure continued financial rate stability in future Utility operations and protect Utility customers from service disruptions that might otherwise result from unforeseen economic or emergency events.

The working capital reserve is maintained to accommodate normal cyclical fluctuations within the two month billing cycle and during the budget year. These are higher for Water than for Sewer and Storm & Surface Water due to more variable revenues and expenditures. They are described in terms of a number of days of working capital as a percentage of a full-year s budget.

The operating contingency reserve protects against adverse financial performance or budget performance due to variations in revenues or expenses. Again, the Water Utility is most susceptible to year-to-year variations in water demand. They are described in terms of percentages of budgeted wholesale costs and operations and maintenance (O&M) costs.

The plant emergency contingency reserve provides protection against a system failure at some reasonable level. The Storm & Surface Water Utility requires the largest reserve due to the risk of major flood damage to Utility facilities. Water and Sewer Utilities protect against the cost of a major main break or failure. These do not protect against the loss of facilities that are covered by the City's Self-Insurance to which the Utilities pay annual premiums nor are they sufficient to respond to a major disaster, such as a major earthquake.

The reserves of the three utilities have historically been treated separately. This protects against cross-subsidy, thereby retaining rate equity for each utility, each of which has different customers. However, it results in higher reserve targets, with more funds retained than otherwise may be needed. Sharing risks among utilities can reduce reserves. This does not require that reserves actually be consolidated into a single fund, but simply that individual reserve targets reflect the strength provided by the availability of cross-utility support. Under the "consolidated" scenario, cash shortfalls in one reserve could be funded through inter-utility loans, to be repaid from future rates. The likelihood that a serious shortfall would occur in more than one fund at the same time is slight and the benefits of lower overall reserve levels will benefit rate payers. Also, the rate policies and the debt coverage policy will ensure that there will be a strong financial response to any significant shortfall. The risk is considered a prudent financial policy.

City of Bellevue

Summary of Recommended Consolidated Reserve Levels

	Water		Wastewater		Storm Drainage	
Type of Reserve	Basis	Level	Basis	Level	Basis	Level
Working Capital – Reserves against revenue and expense fluctuations within the 2 month billing cycle and during the budget year.	48 days of budgeted O&M costs (excludes debt service, capital funding).	$4,609,100	30 days of Metro costs and 20 days of City O&M costs (excludes debt service, capital funding).	$2,877,800	29 days of budgeted O&M costs (excludes debt service, capital funding).	$841,800
Operating Contingency – Reserves against annual budget shortfalls due to poor financial performance.	7.5% of water purchase costs and 11% of other water O&M costs.	$3,252,200	2% of Metro costs and 5% of other wastewater O&M costs.	$1,113,200	2.5% of O&M costs.	$264,900
Plant Emergency Contingency – Reserves against failure of a major facility or piece of equipment.	Cost for repair of water main break.	$100,000	Cost of repair for wastewater main break.	$100,000	$500,000 based on potential net cost of flood damage.	$500,000
Less: Allowance for duplicating or offsetting reserves	None.	$0	Working Capital and Operating Contingency include offsetting reserves equal to 2% of all O&M.	$(775,300)	None.	$0
Less: Allowance for consolidating reserves	2.5% of City O&M for interfund charges between utilities.	$(445,400)	1% City O&M for interfund charges between utilities.	$(112,600)	1% of City O&M for interfund charges between utilities.	$(105,900)
	Share of reduced plant emergency reserve.	$(15,000)	Share of reduced plant emergency reserve.	$(15,000)	Share of reduced plant emergency reserve.	$(70,000)
	Lesser of min. working capital or plant emergency reserves.	$(85,000)	Lesser of min. working capital or plant emergency reserves.	$(85,000)	Lesser of min. working capital or plant emergency reserves.	$(220,000)
Total		$7,415,900		$3,103,100		$1,210,800

Note: Reserve levels based on amended 2012 utility budgets.

For this purpose, O&M costs are the entire annual operating budget of the Utility less the annual debt service, Capital Investment Program transfers and R&R Account transfers. Independent reserve levels are the levels that would be required by an individual Utility Fund (Water, Sewer and Storm & Surface Water) at any point in time to cover financial obligations if any one of the three reserve components where called for; i.e., working capital, operating contingency or plant emergency. At any single time, the full independent reserve levels should be available for the individual stated purpose, again because it is unlikely that all three components would be called for at once. For example, the Water Utility needs $100,000 available for an emergency repair but it is not likely that the Sewer Utility will need $100,000 and the Storm & Surface Water Utility will need $500,000 all at the same point in time.

The consolidated basis is for budget and rate setting purposes only, to reduce the total revenue requirement by considering the reserve risk shared between the three utilities. The dual reserve levels should be considered as circumstances evolve.

In 2004, the Financial Consulting Solution Group (FCSG) performed an analysis of recommended changes to the Water tility s working capital and operating contingency reserves to reflect the new wholesale water contract with CWA and to update reserve levels for current conditions. Under the new contract, billing practices for wholesale costs have changed as follows:

1. CWA payment occurs before the associated revenues are collected, resulting in a greater lag between wholesale expense and when revenues are collected.

2. CWA payments are distributed over the whole year based on predetermined percentages and not based on actual consumption during the year. Due to seasonal revenue variation, there is an accumulative deficit in revenues prior to the peak revenue period.

In addition, the total costs to Bellevue are now largely fixed for the year due to the take or pay nature of the contract between CWA and Seattle Public Utilities. This shifts the risk during a poor water sales year to the City since there will not be a corresponding reduction in water purchase costs when water sales are down.

Changes in both billing practices as well as the fixed nature of the wholesale costs will result in an increase in required reserves for working capital and operating contingency for the Water Fund.

As part of their 2004 analysis, FCSG recommended increasing working capital operating reserve requirements for the Water fund from 48 days of budgeted O&M costs (excluding debt service and capital funding) to 70 days. The change was primarily related to an expected increase in seasonal revenue variation resulting from Cascade s fixed monthly billing percentages. However, our experience has been that since implementing the change in 2005 there has been essentially no increase in seasonal revenue variation. As a result, beginning in 2011, working capital operating reserve requirements for the Water fund will be reduced from 70 days of budgeted O&M costs (excluding debt service and capital funding) to the original level of 48 days.

B. *Management of Operating Reserves*

Related to the recommended target reserve levels, a working range of reserves is established with minimum and target levels. Management of reserves will be based on the level of reserves with respect to these thresholds, as follows:

Above target - Reserve levels will be reduced back to the target level by transferring excess funds to the R&R Accounts in a manner consistent with the long-range financial plan.

Between Minimum and Target - Rate increases would be imposed sufficient to ensure that: 1) reserves would not fall below the minimum in an adverse year; and 2) reserves would recover 50% of the shortfall from target levels in a normal year. Depending on the specific circumstances, either of these may be the constraint, which defines the rate increase needed.

Below Minimum - Rate increases would be imposed sufficient to ensure that even with adverse financial performance, reserves would return at least to the minimum at the end of the following year. To meet this "worst case" standard, a year of normal performance would be likely to recover reserve levels rapidly toward target levels.

Negative Balance - Reserves would be borrowed from another utility to meet working capital needs. Similar to the "below minimum" scenario, rate increases would be imposed sufficient to ensure that even with adverse financial performance, reserves would return from the negative balance to at least the minimum target at the end of the following year, which would allow for loan repayment within that time frame.

Discussion:

"Adverse financial performance" or "worst case" are defined by the 95% confidence interval based on historical patterns. The worst case year is currently defined as a year with sales volumes 15% below the sales volume for a normal year. This was determined by using statistical measurements of sales volumes for 18 years with a 95% confidence interval. That is, in any given year there is only a 5% chance that the worst case year would be more than 15% below the normal year. Another way to say the same thing is that in 19 out of 20 years the worst case year would not be more than 15% below the normal year.

Maintaining the 95% confidence interval, as more and more data becomes available, a worst case year could change upward or downward from the 15% variation from a normal year.

The recommended reserve policies are premised on the vital expectation that reserves are to be used and reserve-levels will fluctuate. Although budget and rate planning are expected to use the target reserve number, reserve levels planned to remain static are by definition unnecessary. It is therefore important to plan for managing the reserves within a working range between the minimum and target levels as stated in the above policies. There may be situations in short-range financial planning where reserves are maintained above target levels to overcome peaks in actual expenses.

In the event of an inter-utility loan, the balance for the borrowing utility would essentially be any cash balance less the amount owed. The lending utility would count the note as a part of its reserves, so that it does not unnecessarily increase rates to replenish reserves that are loaned.

In this management approach, there is still a risk that a major plant emergency could exceed the amount reserved. Such a major shortfall would require rate action to assure a certain level of replenishment in one year. To avoid rate spikes due to this type of action, they should be considered on a case-by-case basis. This will provide the flexibility to use debt or capital reserves in lieu of operating reserves to cover the cost and allow a moderated approach to replenishing reserves out of rates.

C. *Asset Replacement Reserves*

Utility funds will maintain separate Asset Replacement Accounts to provide a source of funding for future replacement of operating equipment and systems.

Anticipated replacement costs by year for the upcoming 20-year period, for all Utility asset and equipment items, will be developed as a part of each biennial budget preparation process. Budgeted contribution to the Asset Replacement Account will be based on the annual amount needed to maintain a positive cash flow balance in the Asset Replacement Account over the 20-year forecast period. At a minimum, the ending Asset Replacement Account balance in each Utility will equal, on average, the next year's projected replacement costs for that fund.

The Utilities Department will observe adopted Equipment Rental Fund (ERF) and Information Services budget policies and procedures in formulating recommendations regarding specific equipment items to be replaced.

Discussion:

Providing reserves for equipment and information technology systems replacement allows monies to be set aside over the service life of these items to pay for their eventual replacement and alleviate one-time rate impacts that these purchases might otherwise require. Annual revenues set aside for this purpose will be based on aggregate Utility asset replacement cash flow needs over the long-term forecast period, instead of individual asset replacement amounts. This strategy will allow Utilities to minimize the progressive build-up of excess Asset Replacement Account balances that would result from creating and funding separate reserve accounts for individual Utility asset and equipment items.

CHAPTER 3
System Planning Considerations

3.1 Introduction

Information relevant to wastewater planning includes service area boundaries, density of existing developments, agreements with neighboring sewer districts, and expectations for future development. This chapter describes system planning considerations as they relate to identifying sewer infrastructure needs for the City of Bellevue.

The City's Comprehensive Plan complies with the requirements of the Growth Management Act (GMA). This Wastewater System Plan (a General Sewer Plan per WAC 173-240-050) allows for wastewater system growth consistent with the City's Comprehensive Plan, and therefore the GMA.

3.2 Geographical Description

Bellevue's wastewater system is bounded on the north by Redmond and Kirkland, by Lake Washington to the west, by Lake Sammamish to the East, and by Coal Creek Utility District and Issaquah to the south. The service area includes the entire City of Bellevue, the Cities of Clyde Hill and Medina, the Towns of Hunts Point and Yarrow Point, and small adjacent portions of the City of Issaquah (South Cove area) and unincorporated King County.

In most areas, Bellevue is developed and not expected to experience significant new development on vacant land. Some limited vacant and/or undeveloped land exists at the base of Cougar Mountain in southeastern Bellevue, with some other vacant parcels distributed throughout the City. However, there are areas in Bellevue with potential for redevelopment. The Downtown district (DNTN) was rezoned in 1981 which significantly increased allowable population and employment densities. The Bel-Red Corridor was rezoned in 2009 to allow higher density residential and commercial development. There are also smaller scale zoning changes which periodically occur and can effect wastewater planning.

The Eastgate/I-90 Corridor and Wilburton areas are two other areas with significant redevelopment potential and possible rezoning. Should rezones occur, there would likely be development potential in these areas as well.

Significant sections of the City currently use septic systems. These areas include portions of the Bridle Trails neighborhood in northern Bellevue, areas near Cougar Mountain (southeastern Bellevue), and the Coal Creek area.

The ultimate collection system will therefore consist primarily of the existing system, plus any extensions to currently vacant land or areas served by septic systems in Bridle Trails, near Coal Creek, and on or near Cougar Mountain.

3.2.1 Septic Systems

Septic systems within the service area are under the purview of King County Public Health Department. However, Bellevue Utilities attempts to monitor the location of septic systems in order to understand the potential future wastewater service extension needs.

Figure 3-1 shows an approximation of septic sites. The locations of septic sites were estimated by mapping the parcels that house water customers but do not have a wastewater billing account, resulting in a total of approximately 1,500 sites. Estimated vacant parcels are also shown, to identify other parcels that may require wastewater service in the future.

The City has not performed any recent studies to determine the effect of septic areas on potential surface or ground water quality in Bellevue. If an area is believed to have a failing septic site, Bellevue investigates to determine if there is an illicit discharge to surface waters. If so repairs or maintenance are required by the septic system's owner. Typically one or two systems are investigated each year.

Bellevue Ordinance No. 4232, adopted February 22, 1991, prohibits any new buildings from connecting to septic systems except by variance. Since that time, only 16 variances have been approved to allow septic systems. Variance applications require a King County approved septic system design; a map identifying any potable water sources, surface water, and known ground water on the site; an appraisal of the fair market value of the property; and a temporary service agreement requiring connection to sanitary sewer when service becomes available. The Utilities Department Director or her designee approves or denies variance applications. An appeals process with a Hearing Examiner is available.

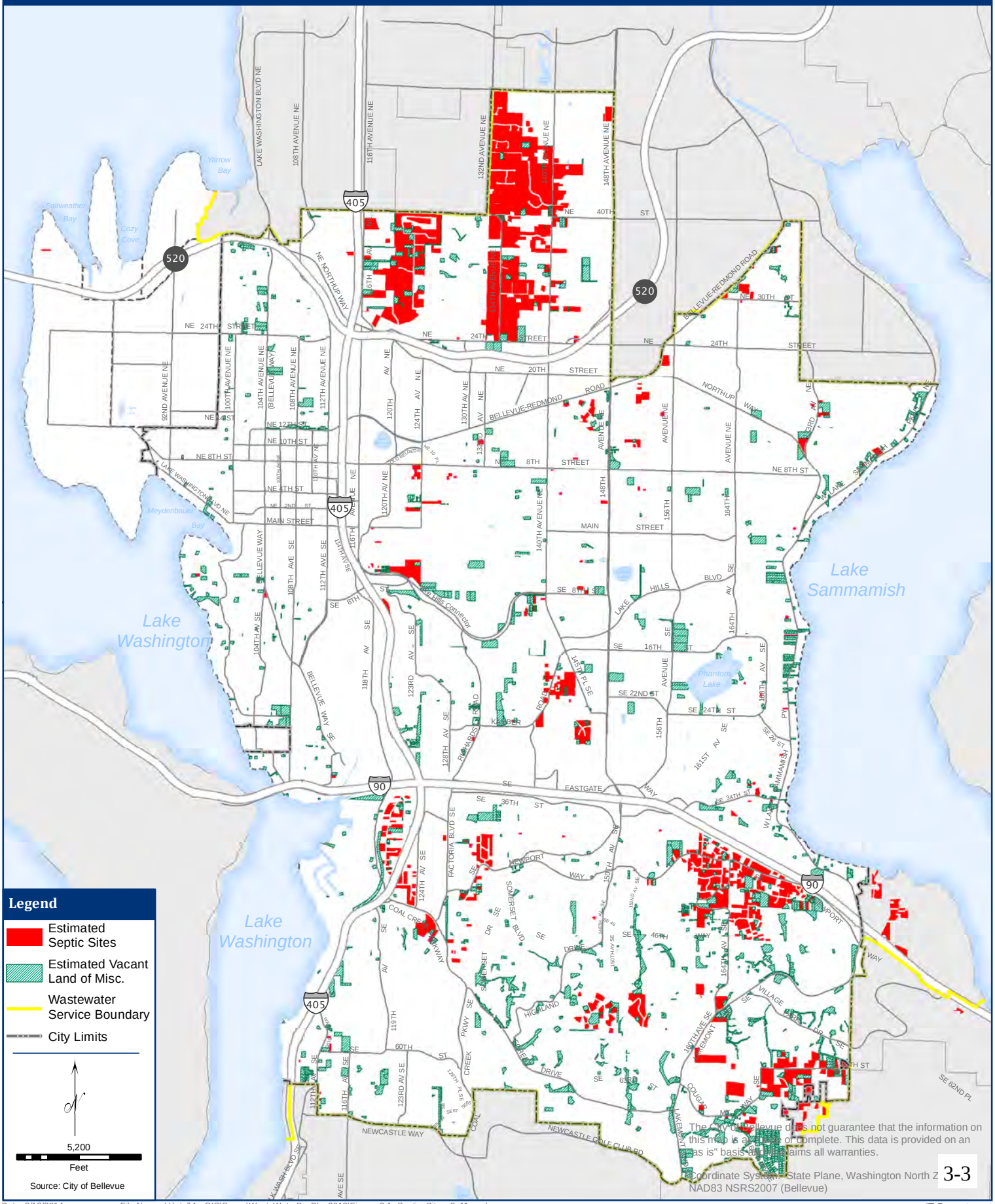
The exception to Bellevue's septic system policies is the Bridle Trails neighborhood, which has a wastewater policy (S-BT-33) specific to that geographic subarea that allows but does not require connection to or extension of the sanitary sewer until otherwise necessary for public health reasons. This neighborhood is located north of NE 24th Street and east of 116th Avenue NE, near the border with Kirkland and is distinguished on figure 3-1 by its high density of septic systems.

The wastewater Capital Investment Program (CIP) allocates funds annually to extend sewer service to areas where septic systems are failing or new service is needed. The cost of system

Non-Sewered Parcels

Figure 3-1

City of Bellevue
GIS Services



Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_3-1_Septic_Sites_8x11.mxd IT Department

extension is repaid by benefited properties through proportionate connection charges. The system capacity analysis of each sewer basin assumes eventual connection of all septic and currently unsewered properties to the sewer system. Specific locations of sewer extensions will be determined during the design phase of each project.

The Utility performs education as needed to encourage proper management of existing septic systems. The focus is on educating septic system owners on appropriate care and maintenance to maximize the performance and life of existing drain fields. The city participates in County workshops on this subject as they arise. Owners of septic systems within Bellevue are notified of the workshops by mail.

3.2.2 Topography and Streams

The City of Bellevue is part of the larger Puget Sound drainage basin. Located in the Washington State Cedar/Sammamish Water Resource Inventory Area, stormwater originating in Bellevue either drains to Lake Sammamish east of the city or Lake Washington to the west. Lake Sammamish itself is a tributary to Lake Washington via the Sammamish River. Lake Washington drains to the Puget Sound via the Lake Washington Ship Canal (Ship Canal) at Montlake, then to Lake Union, and eventually through the Hiram M. Chittenden Locks (Ballard Locks) in Seattle to the Puget Sound.

The storm and surface water system in Bellevue is totally separated from the sanitary sewer system. The storm and surface water system consists of a series of open streams, a network of pipes, storage facilities, lakes, ponds, wetlands, collection, and treatment facilities all in a mix of public and private ownership. As described in the City's original Drainage Master Plan (KCM-WRE/YTO 1976), the mosaic of public and private drainage system components work together to perform the system's critical functions of stormwater conveyance, flood protection, and environmental protection.

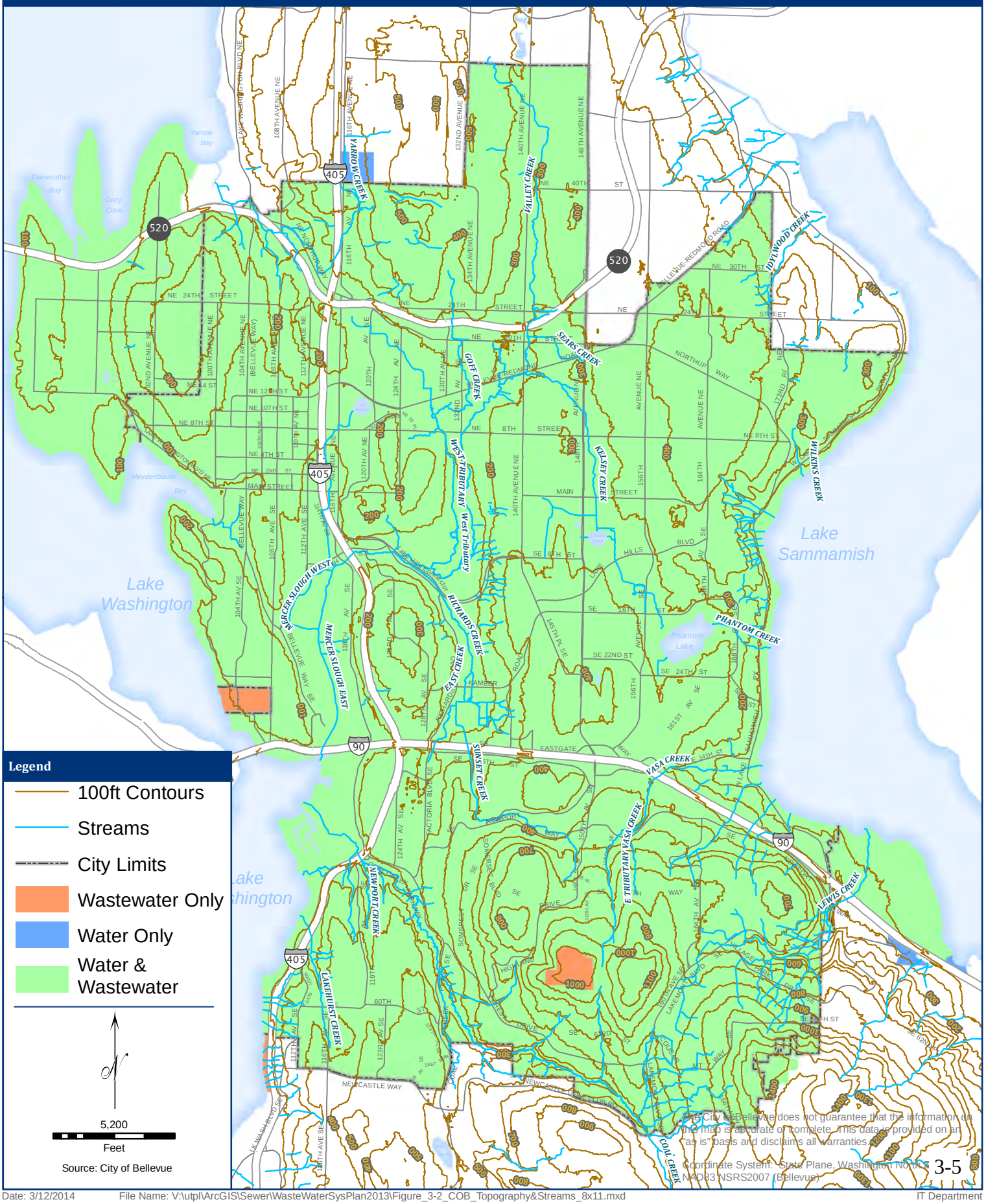
Historic logging in western Washington created long-term impacts to streams and watersheds.

Bellevue's storm and surface water system is a result of the topography, current and historic land uses, regulations, and geology of the area. The city covers approximately 32 square miles. There are about 82 miles of streams within the Bellevue city limits alone (not including neighboring cities in Bellevue's wastewater service area); and 3 small lakes (Larsen Lake, Lake Bellevue, and Phantom Lake). Figure 3-2 shows the topography and open channel stream system in Bellevue's wastewater service area.

City of Bellevue Topography and Streams

Figure 3-2

City of Bellevue
GIS Services



Coordinate System: State Plane, Washington North FIPS 4601 NAD83 NSRS2007 (Bellevue)

Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_3-2_COB_Topography&Streams_8x11.mxd IT Department

3.2.3 Geology and Soils

The geology of the study area is an important factor to be considered in the development of a comprehensive wastewater plan. The soils and geologic formations encountered may affect the selection of pipeline routes, the design, and the methods of construction. These considerations directly influence project costs.

The Puget Sound region's geology and soils are derived from periods of glaciation that have occurred over the past thousands of years, the most recent being the Vashon Ice Age. The topography of the study area is typical of the central Puget Sound region, characterized by the moderately rolling terrain. The Frasier Glacier's advance and retreat defined the basic land forms and deposited the area's basic soils. As the glacier advanced, new hills and valleys were carved out of the previous landscape. The glaciers carried with them material that they removed. As the glaciers moved forward and then receded, these new materials were deposited as glacial till and outwash. Subsequent weathering, organic deposition, and stream action produced the soils that now overlie the older glacial soils.

The area north of Interstate 90 (I-90) is generally composed of soils of the Alderwood association. These soils are moderately well drained gravelly, sandy loams that range from 24 to 40 inches deep. Beneath the topsoil is consolidated glacial till. The area south of I-90 is generally soil of the Beausite-Alderwood association. This association is composed of about 55 percent Beausite soils and 30 percent Alderwood soils. Beausite soils are gravelly sandy loams that have sandstone at a depth of 25 to 40 inches.

The Alderwood association soils are generally suitable for development and sewer construction. They tend to have a seasonally high water table, which influences pipe material selection to reduce infiltration. Although Beausite-Alderwood association soils are suitable for development and sewer construction, potential sewer routes may have to be investigated for the presence of bedrock.

Several areas of the study area, mainly near Mercer Slough and around Larsen and Phantom Lakes, are classified as Seattle association. This soil is mucky peat and provides no structural support for pipelines. Mercer Slough is the largest peat deposit in King County, covering more than 500 acres. Any sewers constructed in this type of soil would need to be placed on piling, and may require additional measures to counteract buoyant forces.

Coal mining in King County dates from the 1860's. The Coal Creek and Newcastle areas were actively mined for coal as recently as 1963. Currently, abandoned coal mines exist throughout the area. Many but not all of the mine locations and mine conditions are publicly recorded or documented. In areas where mining has occurred there is potential for trough subsidence, which can lead to property damage. In addition, where the mine workings were relatively close to the surface, there is also a risk of sink hole development. Bellevue has land use regulations designed to mitigate potential safety hazards on property in affected areas.

3.2.4 Service Area

The Utility's wastewater service area contains approximately 37 square miles of land between Lake Washington and Lake Sammamish. In addition to the City of Bellevue, the service area includes the Cities of Medina and Clyde Hill, the Towns of Yarrow Point and Hunt's Point, the Village of Beaux Arts, a small portion of the City of Issaquah (South Cove area), and two small portions of unincorporated King County. The Utility also serves small portions of Kirkland, Redmond, and Newcastle through interlocal service agreements. City limits and surrounding communities are shown in Figure 3-3.

Except for a few joint-use and KCWTD-owned facilities, Bellevue owns, operates, and maintains the entire public wastewater system within the service area, both inside and outside the Bellevue city limits. The southwestern section of Bellevue's city limits, which used to be serviced by the Coal Creek Utility District, was assumed by the City in 2003.

Figure 1 of the Executive Summary shows the significant changes in the service area since the 2002 Comprehensive Wastewater Plan. With the adoption of this 2013 Plan update, the sewer service area will include these changes, and the wastewater service area boundaries will be as shown in Figure 3-3. Changes include:

- Areas of the Coal Creek Utility District within the City of Bellevue were assumed by Bellevue Utilities in 2003. These areas have been added to the wastewater service area.
- The southern extent of the service area was expanded in the Newcastle area to match Bellevue City Limits in Coal Creek Park.
- A southeastern portion of the service area on Cougar Mountain was removed, to stay within the urban growth boundary, consistent with the Growth Management Act.
- Two small, currently unsewered areas were incorporated in the City of Bellevue in 2012. These are the Hilltop Community (along SE 55th St) and a nearby area along 153rd Ave SE in the southern portion of Bellevue, both of which are served by septic systems. Due to their isolated location, at the top of a hill, surrounded by Bellevue's wastewater service area, they cannot add sanitary sewer service without connecting to Bellevue's wastewater system.

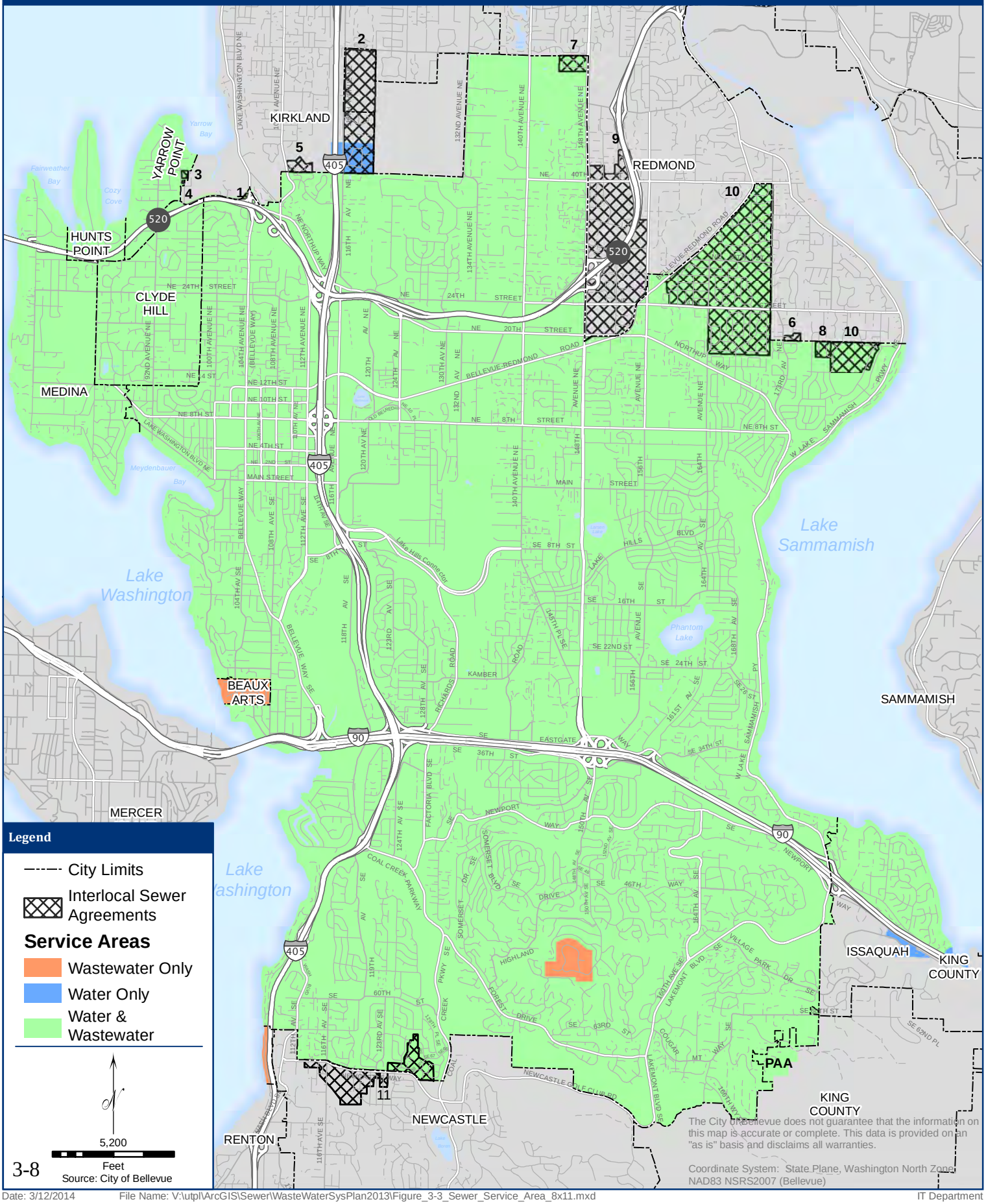
Bellevue's service area includes the South Cove neighborhood in the City of Issaquah. This area encompasses less than 400 acres at the southern end of Lake Sammamish, west of Lake Sammamish State Park and north of I-90. Other areas of Issaquah area served by the City of Issaquah.

There are two areas of unincorporated King County within the City's wastewater service area. The first area includes customers on Ripley Lane, along the Lake Washington shore at the southwest corner of the service area. The second area is on Cougar Mountain, outside Bellevue city limits, but within the urban growth boundary.

Sewer Service Area

Figure 3-3

City of Bellevue
GIS Services



Legend

- City Limits
- Interlocal Sewer Agreements

Service Areas

- Wastewater Only
- Water Only
- Water & Wastewater

5,200 Feet

Source: City of Bellevue

Coordinate System: State Plane, Washington North Zone NAD83 NSRS2007 (Bellevue)

Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_3-3_Sewer_Service_Area_8x11.mxd IT Department

When an unsewered part of the Utility's service area requests an extension of wastewater system, there are several factors which will impact the extension. The location of nearby features such as streams or lakes, and existing streets are all taken into account during planning. The City considers geographic data for these features, as well as the local topography and water supply and distribution facilities, to determine how best to provide service.

3.3 Neighboring Jurisdictions

The Utility's wastewater service area is adjacent to several agencies which provide wastewater service. These include the Cities of Kirkland and Redmond to the north, and Coal Creek Utility District, the City of Renton, and the City of Issaquah to the south. In some instances interlocal agreements have been made with these agencies to share facilities to better serve customers.

Franchise agreements are entered for areas where the City of Bellevue provides wastewater service outside Bellevue city limits but within the Utility's service area. The City has such agreements with the towns of Clyde Hill, Hunt's Point, Yarrow Point, Beaux Arts Village, and the City of Medina. A similar agreement with King County (November 1995) covers several areas in the southeast portion of the service area. That agreement expires in 2020.

Neighboring jurisdictions, and areas covered under interlocal agreements, are illustrated on Figure 3-3. A brief discussion of each interlocal agreement is included below. The agreements are included in appendix B.

3.3.1 Agreements with Kirkland

#1 Kirkland and Bellevue jointly use the sanitary sewer main within the Points Drive right-of-way and beneath SR520. The understanding between the cities was signed May 24, 1989. Kirkland owns and maintains the portion of the line north of SR 520 and Bellevue owns and maintains the portion of the line under and south of SR 520.

#2 An interlocal agreement was signed September 19, 1984, for Bellevue to accept sewage flow from approximately 220 acres of Kirkland west of I-405 and east of Bridle Trails State Park between NE 60th Street and NE 40th Street (Bellevue corporate limit). Kirkland owns the sanitary sewer facilities within this area for all purposes, including customer service charges and maintenance.

#3 & #4 Bellevue signed temporary agreements on July 28, 1980, to serve two properties in Kirkland located on the corporate limit line between Kirkland and Yarrow Point (served by Bellevue). The agreements will remain in force until Kirkland extends facilities to the area. As long as the affected customers are connected to the city's wastewater system, they are treated as Bellevue customers for all purposes,

including the billing and collection of service charges. Both properties are connected directly to the existing Bellevue sewer line. One property is approximately two acres located south of NE 40th Street and east of 95th Avenue NE. The other property is an area of approximately one quarter-acre located east of 95th Avenue NE about 130 feet north of NE 38th Street.

#5 Thirteen acres in the Watershed Park area of Kirkland, just east of 108th Avenue NE adjacent to the city, drain to the Bellevue sewer system under an interlocal agreement signed January 28, 1979. The sanitary sewer facilities in this area are the property of the City of Kirkland for all purposes, including customer service charges and maintenance.

3.3.2 Agreements with Redmond

#6 On June 6, 1990, the city signed a letter of understanding and approval to accept sewage flows from approximately four and one-half acres in Redmond. This area is located at NE 20th Street, east of 173rd Avenue NE. The sanitary sewer facilities are the property of the City of Redmond for all purposes, including customer service charges and maintenance.

#7 An interlocal agreement was signed April 28, 1986, for Redmond to accept sewage flow from approximately thirteen acres of Bellevue west of 148th Avenue NE and south of NE 60th Street (Bellevue corporate limit). Bellevue owns the sanitary sewer facilities within this area for all purposes, including customer service charges and maintenance.

#8 The City of Redmond agreed to allow and accept the necessary connections to provide service for approximately ten acres of property located in Bellevue. The property is located between NE 18th Street and NE 20th Street (Bellevue corporate limit). It includes the adjacent lots on both sides of 178th Avenue NE and 179th Avenue NE. Bellevue owns the sanitary sewer facilities within this area for all purposes, including customer service charges and maintenance. The agreement was signed by Bellevue November 15, 1981.

#9 A joint-use agreement was signed, effective May 13, 1971, for the sanitary sewer trunk on Bellevue-Redmond Road from about 315 feet upstream of Bellevue manhole 25-113 to the KCWTD manhole number RO3-22 at 143rd Avenue NE. This trunk serves about 293 acres of Redmond northeast of Bel-Red Road and 148th Avenue NE and Bellevue's Highland (25) basin. The city owns this joint-use facility and is responsible for operation and maintenance.

#10 An agreement, dated February 23, 1968, established four joint-use facilities in Redmond which convey sewage flows from Bellevue to the KCWTD Lake Hills

Trunk through Redmond. The Agreement is significant in scope, and should be updated to reflect current operation.

The City of Redmond owns the joint-use facilities named in this agreement, and is responsible for their operation and maintenance. Each city bills the customers within its jurisdiction. The following joint-use lines are covered by this agreement:

- The North area (Ardmore) trunk facility drains Bellevue's Sherwood Forest (28) basin and flows east into Redmond at NE 29th Place on 172nd Avenue NE.
- The Braeburn general facility in Redmond conveys flow from 10th Ave. NE and 184th Ave. NE adjacent to Tam-O-Shanter golf course in basin 33. Flow leaves Bellevue in a northerly direction across NE 20th Street at 182nd Avenue NE and 183rd Avenue NE.
- The Sherwood Elementary trunk line serves Bellevue's Hidden Hills (29) basin. Flow travels east out of Bellevue across 172nd Avenue NE at NE 24th Street.
- The 172nd Avenue NE trunk sewer conveys flow north from the centerline of NE 40th Street out of Bellevue's Woodside (27) basin.

In addition, Redmond customers can be served by existing boundary facilities owned by the city. Redmond will pay a proportionate charge of the cost of the facility providing sewer service. This agreement also provides that future joint-use facilities can be planned, constructed, and connected as appropriate under the terms and provisions of this agreement.

3.3.3 Agreements with Coal Creek Utility District

#11 The portion of the Coal Creek Utility District (CCUD) within Bellevue city limits was assumed on December 31st, 2003. Both Bellevue and CCUD agreed to accept wastewater flows from the other party in specified areas on the border between Bellevue and CCUD. Any future land use zoning changes which would require additional capacity would be paid for by the party proposing the change.

3.3.4 Agreements with Issaquah

An agreement, dated April 17th, 1990, established a joint-use facility (in Bellevue) to convey sewage flows from the Lakemont Triangle area through Bellevue to the King County Issaquah Interceptor. Issaquah has since annexed the Lakemont Triangle and built facilities to convey Lakemont Triangle flows through Issaquah's system and directly to King County's interceptor. Bellevue no longer receives flows from Issaquah relating to this agreement.

The City has a sphere of influence agreement with the City of Issaquah. This agreement was approved jointly by both city councils in July 1979 and reaffirmed in August 1987. It identifies a line to which these cities will eventually expand. For each city, the area between the sphere of influence line and the City's current boundary is known as the potential annexation area (PAA). Bellevue's remaining PAA (Cougar Mountain PAA) corresponds to the City's service area in unincorporated King County on Cougar Mountain, shown on Figure 3-3.

3.4 Regional System and Sewage Treatment

The City has contracted with King County Wastewater Treatment Division (KCWTD) for treatment and disposal of all sewage flows generated within the Utility's wastewater service area through the year 2036. KCWTD operates and maintains the regional sewage collection system, and is responsible for the adequacy of treatment. All of the Utility's wastewater flows eventually discharge to KCWTD regional trunks and interceptors within or adjacent to Bellevue's wastewater service area. Most of Bellevue's sewage leaves the City via the East Side Interceptor, with a portion leaving via the Lake Hills Trunk, and a small portion leaving via the Lake Sammamish Interceptor. Wastewater discharged into the Lake Hills Trunk is eventually treated at King County's Brightwater Treatment plant in Woodinville. All other wastewater from the City is treated at King County's South Treatment plant in Renton. King County facilities to which Bellevue sewers discharge are shown in Figures 1-3 and 5-1.

3.5 Land Use

Projected land use for future development in the Utility's service area, as provided by the appropriate local planning authorities, was used in preparation of the Plan. The Plan addresses current land use and future land use direction.

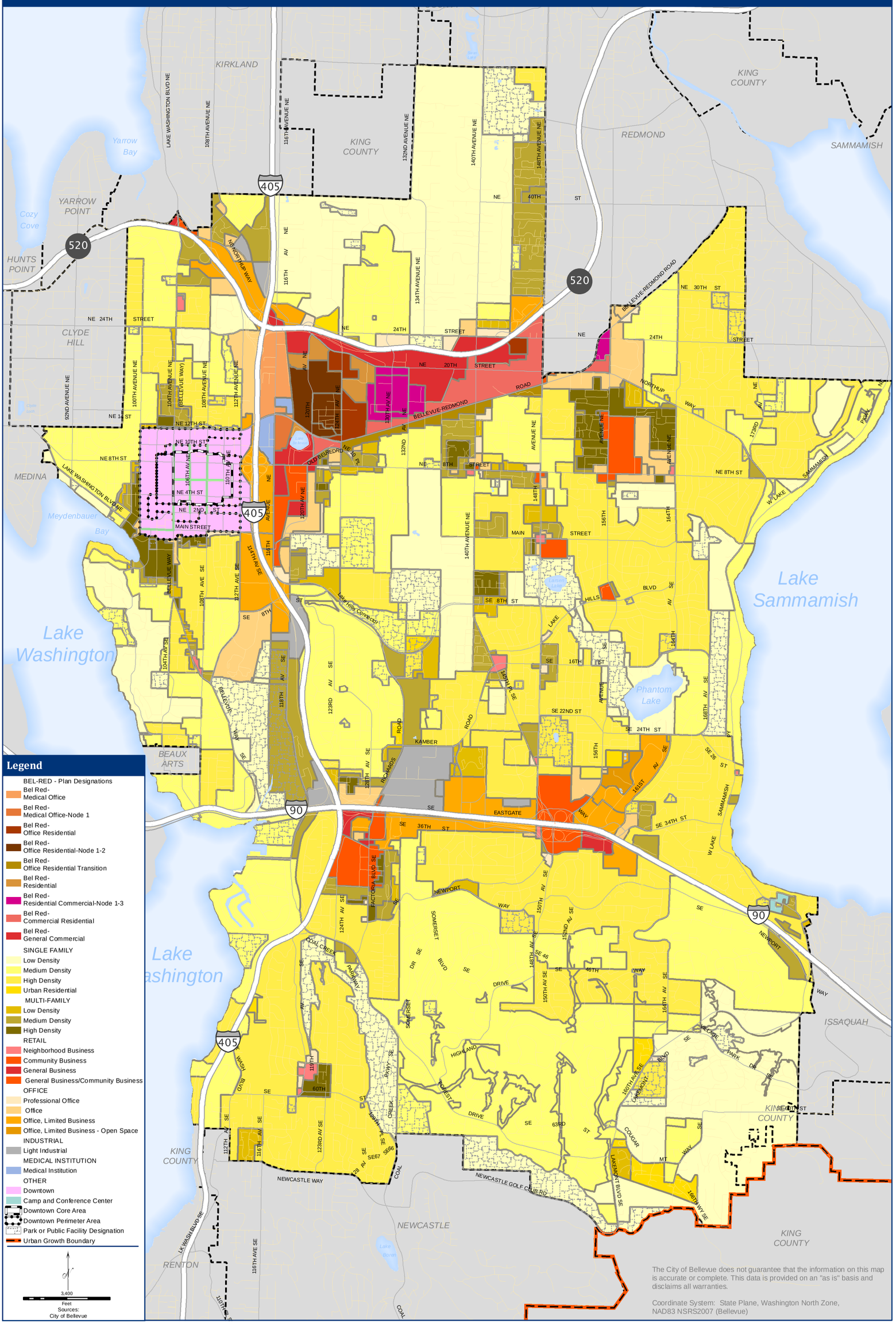
Land use within the City of Bellevue is governed by the City of Bellevue Comprehensive Plan. Figure 3-4 illustrates the City of Bellevue's comprehensive land use plan for future development. The density of development permitted in each land use designation throughout the entire sewer service area is specified in the zoning ordinances of the City and of other municipalities in the service area (not shown) and King County. The Plan assumes that land use in Medina, Clyde Hill, Yarrow Point, and Hunt's Point will continue to be single-family residential.

Figure 3-5 illustrates the City of Bellevue's existing zoning. Over the past several years, all zoning within the Bellevue city limits has been brought into conformance with the City's Comprehensive Land Use Plan, as required by the Growth Management Act. For other municipalities (not shown), including Medina, Clyde Hill, Yarrow Point, and Hunt's Point, zoning is predominantly single-family residential.

Comprehensive Plan for Ultimate Development

Figure 3-4

City of Bellevue
GIS Services



Legend

- BEL-RED - Plan Designations
- Bel Red- Medical Office
- Bel Red- Medical Office-Node 1
- Bel Red- Office Residential
- Bel Red- Office Residential-Node 1-2
- Bel Red- Office Residential Transition
- Bel Red- Residential
- Bel Red- Residential Commercial-Node 1-3
- Bel Red- Commercial Residential
- Bel Red- General Commercial
- SINGLE FAMILY
- Low Density
- Medium Density
- High Density
- Urban Residential
- MULTI-FAMILY
- Low Density
- Medium Density
- High Density
- RETAIL
- Neighborhood Business
- Community Business
- General Business
- General Business/Community Business
- OFFICE
- Professional Office
- Office
- Office, Limited Business
- Office, Limited Business - Open Space
- INDUSTRIAL
- Light Industrial
- MEDICAL INSTITUTION
- Medical Institution
- OTHER
- Downtown
- Camp and Conference Center
- Downtown Core Area
- Downtown Perimeter Area
- Park or Public Facility Designation
- Urban Growth Boundary

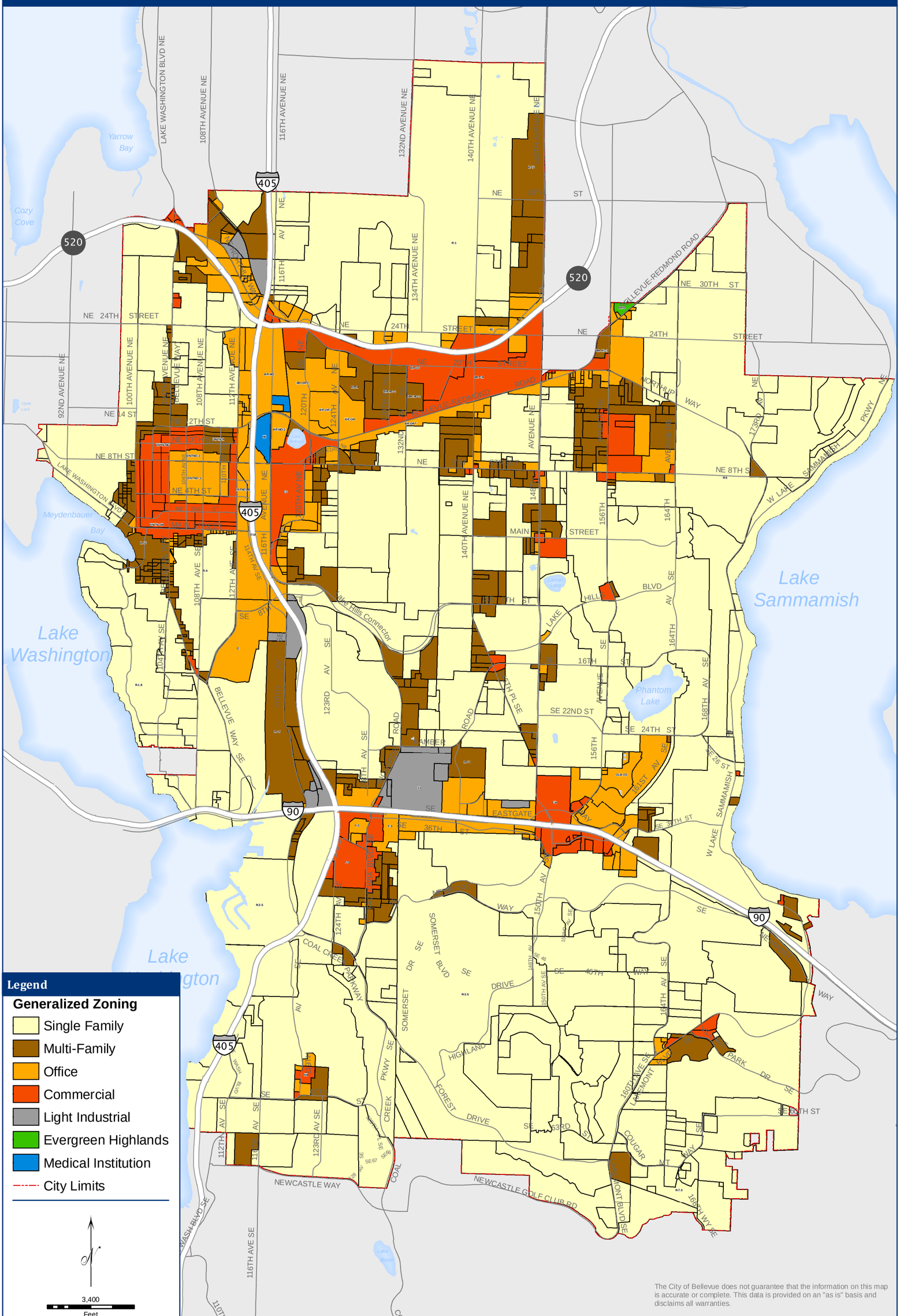
3,400 Feet
Sources: City of Bellevue

Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

Current Generalized Zoning

Figure 3-5

City of Bellevue
GIS Services



Legend

Generalized Zoning

- Single Family
- Multi-Family
- Office
- Commercial
- Light Industrial
- Evergreen Highlands
- Medical Institution
- City Limits

3,400
Feet

Sources:
City of Bellevue

The City of Bellevue does not guarantee that the information on this map is accurate or complete. This data is provided on an "as is" basis and disclaims all warranties.

Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_3-5_Current_Generalized_Zoning_11x17.mxd IT Department

It should be noted that for unincorporated areas of King County, there may be minor discrepancies between the City's Comprehensive Land Use Plan, and King County's Comprehensive Plan. These discrepancies are not significant for the purpose of projecting sewage flows and forecasting system capacity needs. The two unincorporated areas are on Ripley lane in northwest Renton (along the shore of Lake Washington), and on Cougar Mountain. King County planning takes precedence in these areas, and should be referred to for specific zoning and planning information, until and unless the area in question is annexed to the City of Bellevue.

There has been one major land use zoning change since 2002, which was the result of a plan for redevelopment of the Bel-Red area. This area is in central Bellevue, just north of Bel-Red Road and south of SR-520. The area previously only allowed commercial and industrial uses, but now allows mixed use commercial and residential development. This rezone will result in much higher employment and population densities within the area.

3.6 Water Systems

The City's water utility service area and major drinking water facilities are shown in Figure 3-7.

The City of Bellevue has no drinking water treatment plants, and purchases its drinking water from Seattle Public Utilities through Cascade Water Alliance. However, the City currently maintains four of its own wells for emergency water supply.

Three other public water utilities own infrastructure within the City's wastewater service area. Seattle Public Utilities owns regional water transmission pipelines in Bellevue, as well as Eastside Reservoir. King County Water District #117 serves customers in the Hilltop Community in south Bellevue, and operates its own drinking water well, with an emergency intertie to Bellevue's water system. The Town of Beaux Arts Village operates its own drinking water system, consisting of one normal operating well, a second well for emergency supply, and an emergency intertie to Bellevue's water system.

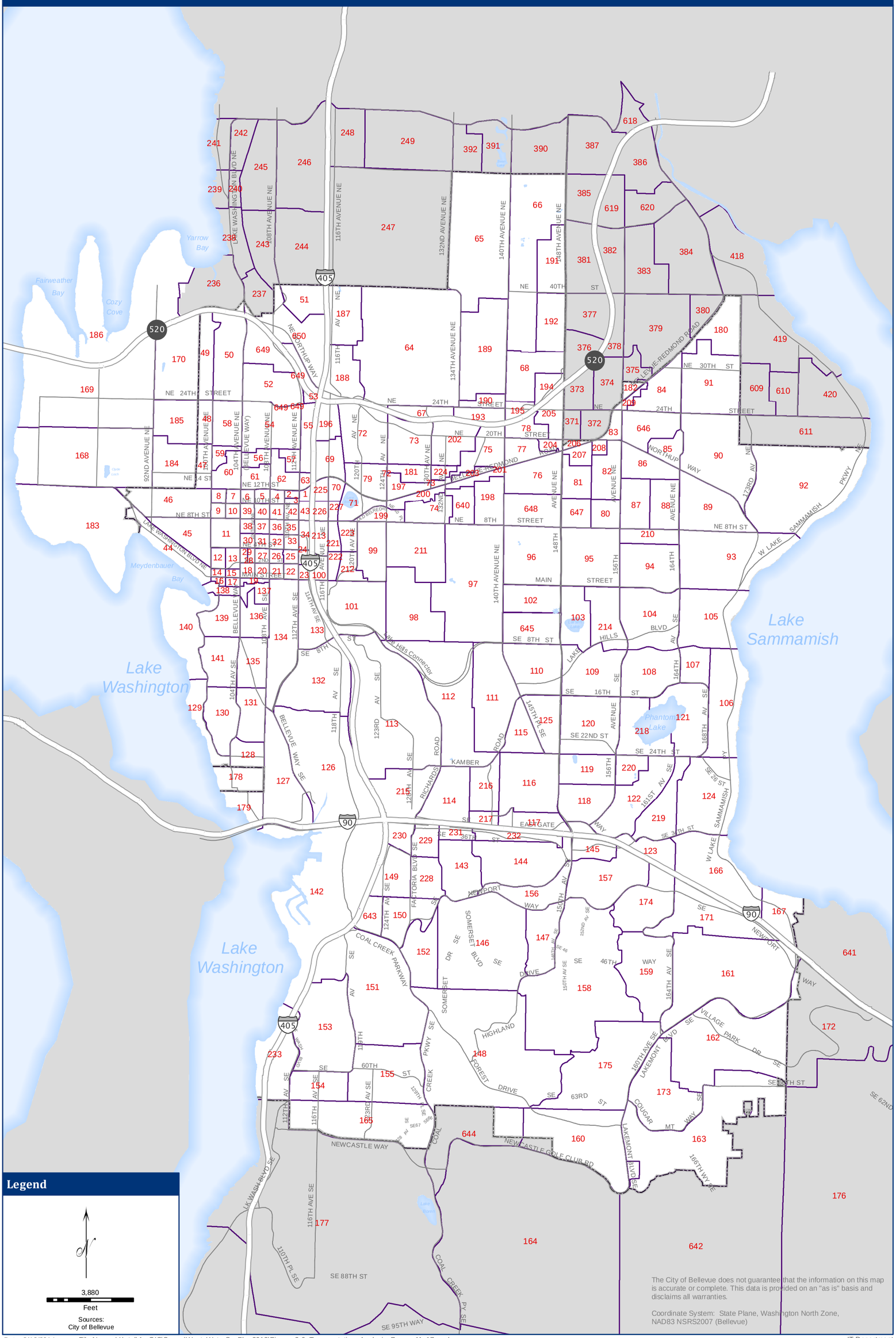
All of the City of Bellevue's drinking water reservoirs are above-grade, however Seattle Public Utilities owns and operates a buried reservoir (Eastside Reservoir) within the City of Bellevue for regional water supply. Eastside Reservoir is located on a hill and meets Washington State Department of Health regulations for grading, stormwater runoff and wastewater separation.

This Page is Intentionally Blank

Transportation Analysis Zones

Figure 3-6

City of Bellevue
GIS Services



Legend

3,880
Feet

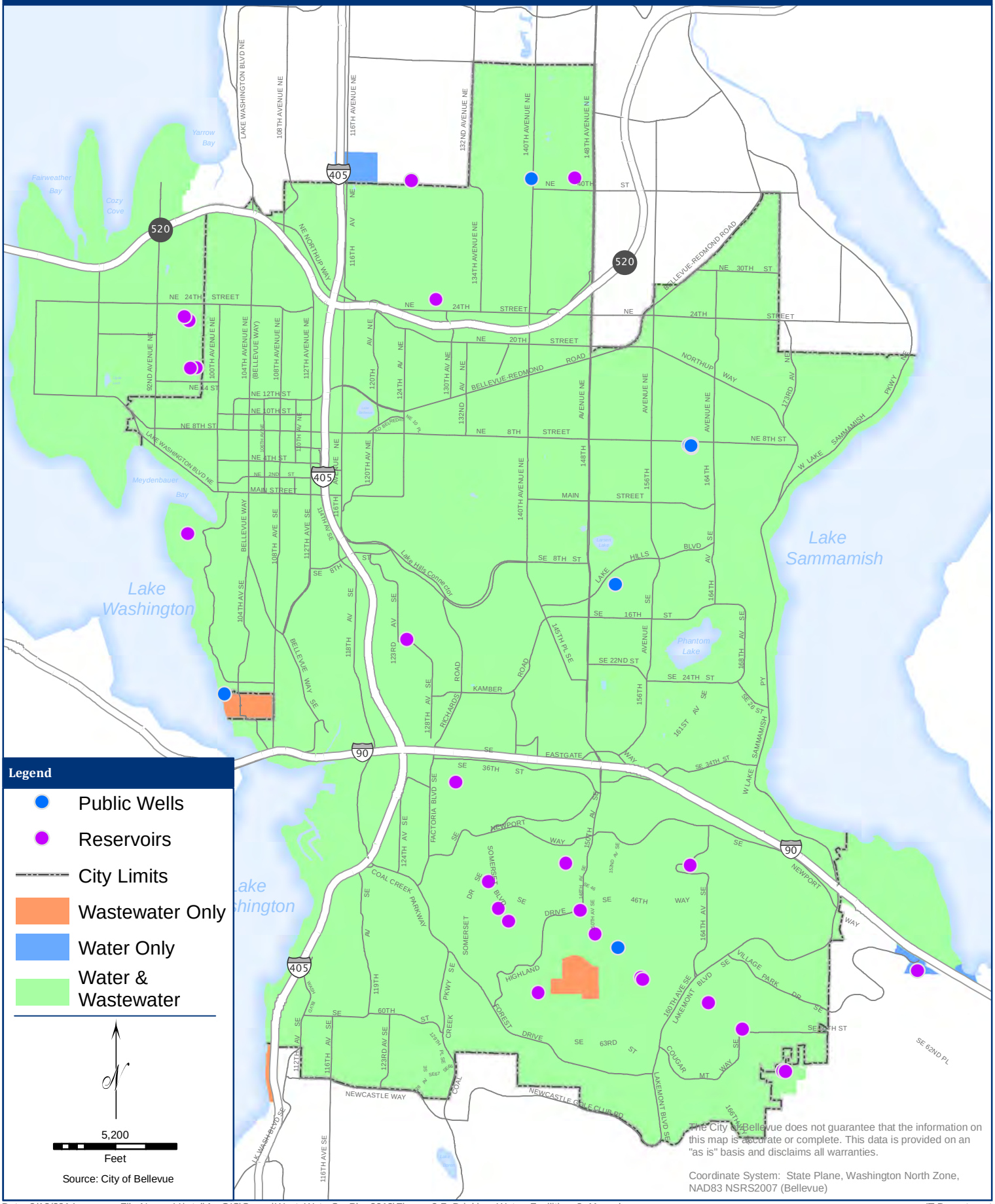
Sources:
City of Bellevue

Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

Drinking Water Facilities

Figure 3-7

City of Bellevue
GIS Services



Legend

- Public Wells
- Reservoirs
- City Limits
- Wastewater Only
- Water Only
- Water & Wastewater

5,200
Feet

Source: City of Bellevue

Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

3.7 Population and Employment Projections

Population and employment projections within the City's wastewater service area were provided by the City of Bellevue's Department of Planning and Community Development (PCD). PCD's projections are based on the Puget Sound Regional Council's 2006 Small Area Forecast for population, households, and employment The Puget Sound Regional Council's (PSRC)2013 forecast products were not available in time to be incorporated into this Plan, but the new forecast is not anticipated to significantly change sewer planning analyses.

PSRC allocates projected growth in Forecast Analysis Zones (FAZs) throughout the region. Thirteen of PSRC's FAZs intersect the City's wastewater service area.

PCD allocates projected growth within each FAZ to the City's smaller Transportation Analysis Zones (TAZs), based on where capacity and demand exist on a local level. About 243 of PCD's TAZs intersect the City's wastewater service area. Each TAZ is a geographic area containing essentially homogenous land use, with roadways as boundaries in most cases. Figure 3-6 illustrates the TAZs within the wastewater service area.

To estimate population within each TAZ, the Planning Department applied household size estimates for single-family and multi-family households in different areas of the City drawn from the U.S. Census Bureau's 2006-2010 American Community Survey. to known quantities of single- and multi-family units. Building square footage for different types of commercial development was used as the basis for estimating current and future employment within commercial areas. Average household sizes and employees per square foot are summarized in Table 3-1.

Table 3 - 1: Population and Employee Density

Land Use Category	Employee per Ksqft[a]		Persons per Household	Percent Vacancy	
	DNTN[b]	Non-DNTN		DNTN	Non-DNTN
Existing (2012):					
Office	3.7	3.1	—	10.0	10.0
Retail	3.7	2.6	—	10.0	10.0
Industrial	1.6	1.6	—	10.0	10.0
Residential					
Single-Family	—	—	2.7	—	4.0
Multi-Family	—	—	2.0	—	9.0

[a]Ksqft = one thousand square feet.
[b]DNTN = Downtown District

Based on existing zoning PCD estimates that saturation densities will be realized within the City by the year 2030 for all areas except the Downtown District (DNTN and the Bel-Red

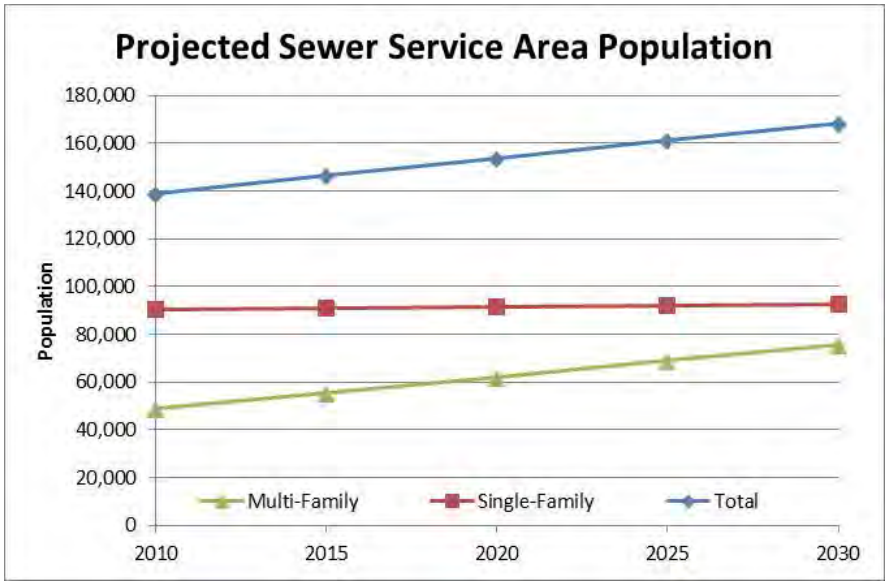
subarea As zoning updates are made consistent with the Eastgate/Factoria subarea additional development capacity may be available in that area as well. Saturation densities for the DNTN are assumed to occur by the year 2050.

The Growth Management Act requires the city to plan for growth and therefore has several impacts on the city's utility system, including requiring an inventory of existing facilities and determining their capacity to accommodate growth. All of Bellevue's service area and the area within Bellevue's sphere of influence are within designated urban areas. The rural/urban growth boundary is generally to the east. Population and employment figures for each TAZ were the best available information when this portion of this comprehensive plan was prepared.

Projections indicate a total residential population increase from 2012 to 2030 of approximately 23,000 for the wastewater system service area, which translates into an annual increase of approximately 0.87%. Projected total service area populations are shown in Table 3-2.

Table 3 - 2: Residential Population Projections for the City of Bellevue Wastewater System Service Area

Year	2010	2015	2020	2025	2030
Multi Family Population	48,618	55,418	62,218	69,017	75,817
Single Family Population	90,290	90,874	91,457	92,041	92,624
Total	138,908	146,291	153,675	161,058	168,441



Current estimates and 2030 projections of population and employment are shown by sewer basin in Table 3-3. PCD developed the basin-specific forecasts by overlaying the separate TAZ and basin geometry in ArcGIS software, and using appropriate software tools to allocate the data.

The current level of development as a percentage of projected 2030 development is shown in Table 3-4. Bellevue's sewer basins are shown in Figure 1-3 and Figure 5-1.

Table 3-3: Residential Population and Employment by Basin

ID	Basin Name	Code	Residential Population				Employment		
			SF 2012	SF 2030	MF 2012	MF 2030	2010	2030	Change
1	Fairweather	FWR1	1471	1483	0	0	53	57	4
2	Medina	MED2	1004	1019	0	0	174	176	2
3	Cozy Cove	COZ3	1408	1409	10	10	7	7	0
4	Clyde Hill	CLD4	3093	3126	0	0	228	228	0
5	Parker	PKR5	1072	1084	0	0	21	21	0
6	Yarrow Bay	YAR6	1664	1709	906	1075	3,744	4,048	304
7	Bellevue	BEL7	3151	3185	11329	22971	30,224	52,667	22,443
8	Meydenbauer	MEY8	1183	1188	476	474	148	181	33
9	Sweyolocken	SWL9	1912	1950	0	0	36	36	0
10	Mercer Slough	MRS10	1439	1423	5828	7903	27,218	33,783	6,565
11	Enatai	ENT11	631	644	0	0	102	228	125
12	Northup	NOR12	486	503	0	0	180	187	7
13	Lake Bellevue	LKB13	3	3	619	1844	3,007	8,247	5,240
14	North Woodridge	NWD14	1199	1203	0	0	147	147	0
15	South Woodridge	SWD15	911	913	374	374	90	195	105
16	Cherry Crest	CHR16	557	566	59	261	631	661	30
17	Midlakes	MDL17	3	3	0	843	1,898	2,070	173
18	Pikes Peak	PPK18	1310	1328	0	325	1,659	2,295	271
19	Kelsey Creek	KEL19	2530	2635	906	942	533	596	63
20	Valley Creek	VLC20	1862	1875	5546	5858	5,836	6,832	996
21	Palisades	PAL21	391	397	2775	2854	843	948	106
22	N Larsen Lake	NLL22	877	888	1654	1654	1,235	1,449	214
23	S Larsen Lake	SLL23	2810	2807	1743	1936	710	732	23
24	College Hill	COL24	1210	1284	316	351	2,822	4,142	1,321
25	Highland	HIL25	214	215	1764	3354	4,288	5,755	1,467
26	Chevy Chase	CHE26	742	684	2379	2625	138	190	51
27	Woodside	WDS27	1173	1188	0	0	0	0	0
28	Sherwood Forest	SHW28	1447	1458	0	0	22	24	2
29	Hidden Hills	HID29	1270	1288	0	0	137	137	0
30	Crossroads	CRR30	6611	6636	2115	2480	2,873	3,472	599
31	Lake Hills	LKH31	3204	3216	58	58	817	839	22
32	Phantom Lake	PHA32	1072	1078	9	9	1,129	1,253	124
33	Redmond	RED33	238	239	0	52	0	0	0
34	Rosemont	RSM34	2028	2037	154	154	0	0	0
35	Vasa Park	VSP35	2301	2365	0	0	1,212	1,215	3
36	Newport	NWP36	1653	1675	136	855	27	30	4
37	Coal Creek	CLC37	5182	5335	406	406	0	0	0
38	Cougar Mountain	CGM38	4667	4844	1096	1096	689	786	98
39	Eastgate	EGT39	5222	5351	213	421	814	964	150
40	Somerset	SOM40	2570	2581	0	0	406	406	0
41	Factoria	FAC41	2417	2464	2266	4492	10,635	14,140	3,505
42	Leawood	LEA42	2411	2474	37	0	603	686	83
43	Sammamish	SAM43	1244	1432	316	316	22	22	0
44	Redmond	RED44	166	166	0	0	0	0	0
45	Newport Hills	NPH45	4305	4398	731	1144	496	685	189
46	DNW	DNW46	1672	1734	42	66	120	125	5
47	South Bellevue	SBV47	243	253	0	0	0	0	0
48	DMW	DMW48	523	539	0	0	15	15	0
50	Metro 50	MET50	291	291	670	670	315	315	0
51	Metro 51	MET51	42	131	278	2178	5,103	6,723	1,620
52	Metro 52	MET52	1025	1048	710	2002	2,426	2,831	405
53	Metro 53	MET53	16	45	586	653	1,869	1,988	119
54	Metro 54	MET54	877	887	622	706	235	347	112
55	Metro 55	MET55	713	716	1607	1607	1,742	2,758	1,016
56	Metro 56	MET56	0	0	267	267	7,486	7,643	156
57	Metro 57	MET57	2845	2891	479	479	34	35	1
58	Metro 58	MET58	335	346	52	52	96	96	0
	Total		**90,899**	**92,624**	**49,534**	**75,817**	**125,296**	**173,414**	**47,754**

Table 3-4: Current Development as % of 2030 Projected Development

ID	Basin Name	Total Area	Residential		Commercial		Other
			Approx Area (acres)	% of 2030 population	Approx Area (acres)	% of 2030 employment	Area* (acres)
1	Fairweather	407	232	99%	4	94%	170
2	Medina	295	213	98%	2	99%	81
3	Cozy Cove	371	272	100%	0	100%	99
4	Clyde Hill	747	504	99%	72	100%	171
5	Parker	189	140	99%	0	100%	49
6	Yarrow Bay	586	236	92%	86	92%	263
7	Bellevue	943	424	55%	160	57%	359
8	Meydenbauer	255	179	100%	2	82%	73
9	Sweyolocken	364	222	98%	1	100%	140
10	Mercer Slough	850	180	78%	288	81%	382
11	Enatai	125	82	98%	1	45%	43
12	Northup	335	194	97%	0	96%	141
13	Lake Bellevue	134	11	34%	44	36%	80
14	North Woodridge	273	124	100%	0	100%	150
15	South Woodridge	140	82	100%	2	46%	55
16	Cherry Crest	142	66	75%	8	95%	68
17	Midlakes	86	1	0%	22	92%	63
18	Pikes Peak	376	255	79%	23	86%	97
19	Kelsey Creek	943	366	96%	260	89%	317
20	Valley Creek	1363	789	96%	271	85%	302
21	Palisades	211	124	97%	16	89%	71
22	N Larsen Lake	286	120	100%	5	85%	162
23	S Larsen Lake	608	292	96%	13	97%	302
24	College Hill	354	140	93%	23	68%	192
25	Highland	333	41	55%	140	75%	151
26	Chevy Chase	166	120	94%	6	73%	41
27	Woodside	140	89	99%	0	-	51
28	Sherwood Forest	194	120	99%	2	94%	71
29	Hidden Hills	133	92	99%	0	100%	41
30	Crossroads	1018	617	96%	87	83%	314
31	Lake Hills	465	271	100%	10	97%	184
32	Phantom Lake	237	139	100%	62	90%	36
33	Redmond	57	21	81%	0	-	37
34	Rosemont	375	254	100%	0	-	121
35	Vasa Park	412	224	97%	12	100%	177
36	Newport	459	262	71%	15	88%	182
37	Coal Creek	1196	664	97%	0	-	532
38	Cougar Mountain	1414	662	97%	28	88%	724
39	Eastgate	832	518	94%	7	84%	307
40	Somerset	387	248	100%	2	100%	137
41	Factoria	906	339	67%	201	75%	366
42	Leawood	484	314	99%	22	88%	148
43	Sammamish	260	177	89%	1	100%	83
44	Redmond	19	13	100%	0	-	6
45	NewportHills	660	408	91%	10	72%	242
46	DNW	306	137	95%	1	96%	168
47	South Bellevue	56	34	96%	0	-	22
48	DMW	151	59	97%	56	100%	36
50	Metro 50	99	71	100%	17	100%	11
51	Metro 51	339	27	14%	268	76%	44
52	Metro 52	569	149	57%	126	86%	294
53	Metro 53	178	35	86%	88	94%	55
54	Metro 54	508	139	94%	80	68%	290
55	Metro 55	389	133	100%	100	63%	156
56	Metro 56	207	24	100%	144	98%	39
57	Metro 57	456	276	99%	1	97%	178
58	Metro 58	152	60	97%	0	100%	92

* Other area includes right-of-way, parks, schools, and other parcels

3.8 Water Reclamation

The City recognizes the importance of developing alternative resources for certain types of water use, where appropriate. City Comprehensive Plan policy UD-13 requires the use of recirculating or recycled water for decorative fountains, and some commercial car-washes in the city are known to employ "gray water" recycling systems.

The City has completed a draft of King County's Water Reclamation Checklist, which will be required for the City of Bellevue 2015 Water System Plan. The draft Checklist is shown in Figure 3-8. The City's largest water customers are not potential reclaimed water users, because they require potable water for human consumption (beverage and food production) or for sanitary purposes (hospital facilities, swimming pools, etc).

The City is aware of emerging trends in urban design, such as on-site domestic water recycling. Bellevue has not yet been approached with proposals to build and operate these systems, but the City anticipates that developers will express interest in these systems as part of Bel-Red and Downtown re-development. The City's Comprehensive Plan explicitly promotes and encourages green infrastructure, but no policies relating specifically to on-site water recycling have been developed. The City will consider this topic as part of its 2015 Water System Plan.

For questions, call Kristina Westbrook,
King County Reclaimed Water Program Manager at (206) 296-5279
www.kingcounty.gov/reclaimedwater

King County

Water Reclamation Evaluation Checklist
For Systems with 1,000 or more Connections

The County and State recognize that changing conditions could initiate a need to respond in new ways to future water quality standards, wastewater discharge requirements, take advantage of advances in treatment technologies and/or allow our region to be positioned to respond to changes associated with climate change and population growth.

In 2003, Chapter 90.46 of the Revised Code of Washington (RCW) was amended to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing their water system plans. Please use this checklist to meet King County consistency requirements in responding to this legislation.

Please use this checklist, including the inventory template, to ensure that your water system plan includes sufficient information about opportunities for reclaimed water and your system's efforts to develop those opportunities. If a question is not applicable or the information is unavailable, then answer, "unknown" or "n/a." King County will consider the checklist completed if each answer is filled in with the best available information, even if the utility states that it is not aware of any reclaimed water opportunities within its service area.

Water System Name: BELLEVUE, CITY OF
Date: July 24, 2014
PWS ID# 05575
Contact: D. LANE (425) 452-6865

1. **Identifying Potential Future Demand for Reclaimed Water:** King County maintains a database and map of potential reclaimed water users for evaluating future projects. Please use the template below, or similar table, to provide information to assist King County in further researching these potential uses.
   - **Large Utility Water Users** (choose one):
     - ☐ Attached is an inventory of twenty large (above 20,000 gallons/month on average), non single-family residential, water users served by our utility that have a potential for reclaimed water use, or
     - ☑ Attached is an inventory of our utility's top twenty water users, or
     - ☐ The information requested is unknown or not available.
       Additional Comments: _____
   - **Large Self Suppliers** (choose one):
     - ☑ Attached is an inventory of large, self-supplied water users within our water utility's service boundaries - especially those near wastewater treatment plants, mainlines, outfalls, and pump stations or similar reclaimed water facilities), or
     - ☐ The information requested is unknown or not available.
       Additional Comments: _____
   - **Other** (choose one):
     - ☐ Attached is an inventory of other water users (such as those that are clustered near one another and could be served by a single system) that may be likely candidates for reclaimed water use, or
     - ☑ The information requested is unknown or not available.
       Additional Comments: Potential reclaimed water users are few and are identified on Page 3.

2. **Environmental Commitment**: Are you a city/town, or providing water service to a city/town, that has made commitments within resource management plans, salmon recovery plans, or other environmental initiatives for which there is a potential opportunity for using reclaimed water to assist in meeting commitments? (choose one)

   ☑ Yes, here are plans that have potential for reclaimed water use in our service area to meet the above commitments:
   The City of Bellevue Comprehensive Plan has generalized language that promotes and encourages green infrastructure and resource conservation where appropriate.

   ☐ The information requested is unknown, not available.
   Additional Comments: _____

3. **Identifying Areas of Potential Use of Reclaimed Water for Environmental Benefit:**
   Below are ***examples*** of uses of reclaimed water ***that comply with State, Federal and other reclaimed water environmental, health and safety standards***. All of these uses are currently in effect somewhere in Washington State. To the best of your knowledge, are any of these potential uses for reclaimed water applicable to your area?

   River Augmentation (choose one):

   ☐ Yes, our water rights are limited by instream flows. For more information, King County may contact:
   _____
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: Bellevue purchases regional water supplied by the Cedar and Tolt riversheds.

   Groundwater Recharge (choose one):

   ☐ Yes, we withdraw water from an aquifer that is in a groundwater management area, or from a declining aquifer, where water levels may need to be replenished or to maintain aquifer storage. For more information, King County may contact:
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: Bellevue currently maintains wells only for emergency water supply.

   Water Rights Mitigation (choose one):

   ☐ Yes, our area is pursuing, or planning to pursue, new or additional water rights, and there may be an opportunity to use reclaimed water for mitigation of those new water rights. For more information, King County may contact:
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: _____

   Potential Areas of Environmental Need (choose one):

   ☐ Yes, parts of our service area include potential environmental enhancement locations, such as wetlands enhancement, aquifer recharge, stream flow augmentation, that might be candidates for reclaimed water use. For more information, King County may contact:
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: _____

4. **Local Reclaimed Water Legislation**: If water reclamation is mandated for this water system through local government agreement, contract, local regulations, ordinances, or other mechanisms, please provide a copy of the governing mechanism (choose one).

   ☐ Yes, local legislation exists in our area in support of reclaimed water use. The following relevant legislation is attached (please list titles of documents):

   _____

   _____

   ☑ No water reclamation legislation exists, or is known to exist, at a local level in our service area.

5. **Coordination with Local Wastewater Utility:** Include a brief description of your interactions with any wastewater or reclaimed water utility (King County or other) adjacent to your service area to evaluate any potential opportunities to develop reclaimed water (choose one).

   ☑ Describe if applicable:
   The City participates in the regional Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) and has advised on King County's Reclaimed Water Comprehensive Plan.

   ☐ None. Additional Comments: _____

Template for
Inventory of Water Users and Identification of Potential Reclaimed Water Users

Site Owner or Site Name	Site Address (for general mapping purposes)	Estimated Annual Water Use	Water uses not requiring potable water[1]	Is this a Potential Reclaimed Water Customer?
FOOD & BEVERAGE PRODUCTION	BEL-RED NEIGHBORHOOD	122298 (CCF)	Toilets	No
FOOD & BEVERAGE PRODUCTION	BEL-RED NEIGHBORHOOD	105914 (CCF)	Toilets	No
FOOD & BEVERAGE PRODUCTION	BEL-RED NEIGHBORHOOD	45771 (CCF)	Toilets	No
RETAIL	DOWNTOWN	42506 (CCF)	Toilets, Decorative Fountains	No
HEALTH & FITNESS CLUB	BRIDLE TRAILS NEIGHBORHOOD	37643 (CCF)	Toilets, Irrigation	Yes
OFFICES	EASTGATE NEIGHBORHOOD	35035 (CCF)	Toilets, Irrigation	Yes
HOSPITAL FACILITIES	BEL-RED NEIGHBORHOOD	31716 (CCF)	Toilets, Irrigation	Yes
APARTMENTS	CROSSROADS NEIGHBORHOOD	30637 (CCF)	Toilets	No
APARTMENTS	CROSSROADS NEIGHBORHOOD	27811 (CCF)	Toilets	No
HOTEL	WEST BELLEVUE NEIGHBORHOOD	25057 (CCF)	Toilets	No
APARTMENTS	CROSSROADS NEIGHBORHOOD	24805 (CCF)	Toilets	No
APARTMENTS	COUGAR MTN / LAKEMONT NEIGHBORHOOD	23713 (CCF)	Toilets, Irrigation	Yes
HOTEL	DOWNTOWN	21909 (CCF)	Toilets	No
HEALTH & FITNESS CLUB	WEST BELLEVUE NEIGHBORHOOD	21740 (CCF)	Toilets, Irrigation	Yes
HOTEL	DOWNTOWN	21399 (CCF)	Toilets	No
APARTMENTS	BRIDLE TRAILS NEIGHBORHOOD	17594 (CCF)	Toilets, Irrigation	Yes
CONDOMINIUMS	DOWNTOWN	17496 (CCF)	Toilets, Irrigation	Yes
CONDOMINIUMS	DOWNTOWN	17125 (CCF)	Toilets, Irrigation	Yes
RETAIL	DOWNTOWN	16265 (CCF)	Toilets	No
APARTMENTS	CROSSROADS NEIGHBORHOOD	16181 (CCF)	Toilets, Irrigation	Yes

[1] See Washington State Reclamation and Reuse Standards, September 1997, Section 1, Articles 1-5 for allowable uses of reclaimed water. http://www.ecy.wa.gov/PROGRAMS/WQ/reclaim/standards.html

CHAPTER 4
Flow Projections

4.1 Introduction

Flow projections are used to identify sewers that may have insufficient capacity at ultimate flow conditions. The information used as the basis for developing these flow projections is presented in this chapter. The City's hydraulic model of the wastewater system uses this information to calculate anticipated peak flows in each pipe when the tributary area reaches ultimate development.

There are two primary flow components in the wastewater system. The first component is wastewater (sanitary and industrial) flow, which is made up of all flows generated by domestic, commercial and industrial activities. The second component is infiltration and inflow (I&I), which consists of groundwater (infiltration) and surface water (inflow) that finds its way into the wastewater system. Each of these components is discussed in more detail below (Section 4.2 – Wastewater Flow, Section 4.3 – I&I).

4.2 Wastewater Flow

Population and employment projections and land use data provide the basis for estimating future sanitary and industrial flows within the service area. The method used to project future populations is described in Chapter 3. All modeling flow projections are based on the Bellevue Comprehensive Land Use plan, except for rare cases involving large parks and golf courses that are zoned residential. These areas are modeled assuming zero flow, since redevelopment is considered extremely unlikely.

To develop sanitary flow projections, the volume of wastewater generated per person must be estimated. Flow projections are then established for each land use category based on the type and density of development.

Figure 4-1 shows actual recent wet season per capita water consumption in Bellevue's water service area, and related demand projections from the 2002 Wastewater Comprehensive Plan. Wet season water use provides a good estimate of wastewater flows under existing development conditions, since it can be generally assumed that nearly all of the water used is discharged into the wastewater system.

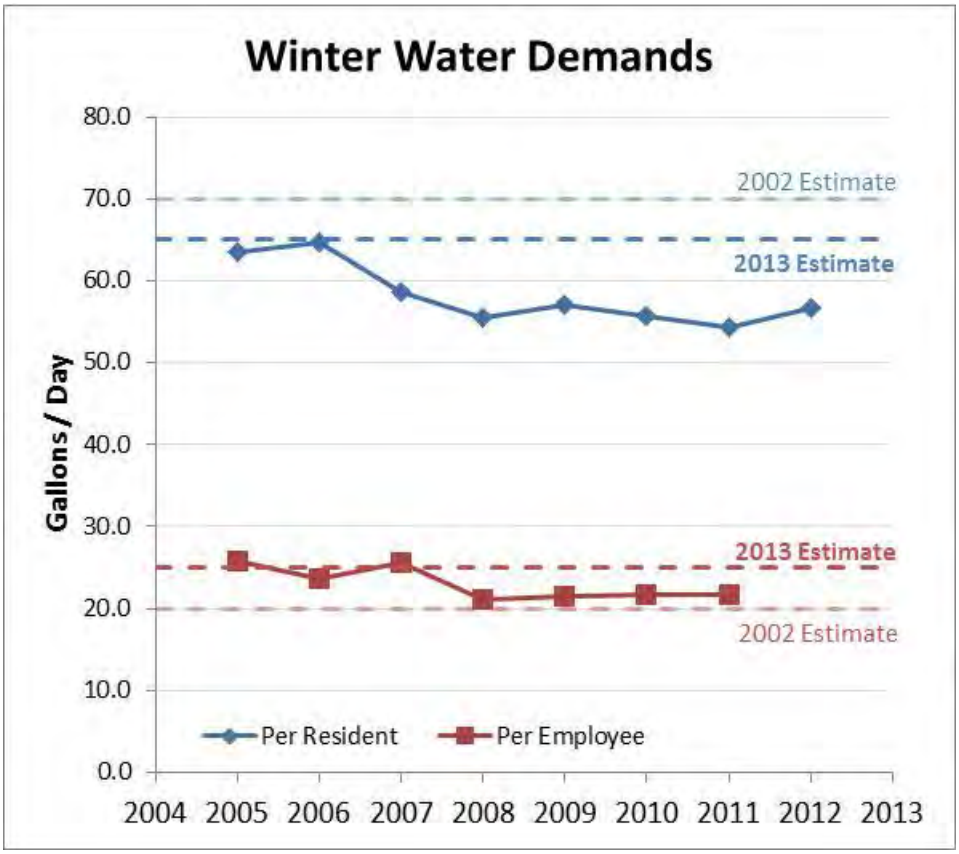


Figure 4-1: Estimated Per Capita Sanitary Wastewater Flow

The general trend since the 2002 Comprehensive Wastewater Plan has been significantly lower residential per capita consumption, but higher consumption per employee. However, based on the general stabilization of demands between 2008-2012 (evident in Figure 4-1), future sanitary wastewater flows and concentrations are projected to be stable for the purpose of sewer planning (no additional conservation).

4.2.1 Residential Area Flow Projections

A per-capita flow of 65 gallons per capita per day (gpcd) is assumed for the purpose of this WWSP. This reflects a reduction from the unit flow factor of 70 gpcd used in the 2002 Bellevue Comprehensive Wastewater Plan. The reason for this reduction is explained below.

To update the unit flow factor, wet season residential water use data obtained from the City's potable water billing system for the months of December through May, 2005-2012 were divided by the residential population served. These billing records reflect actual usage over the period (roughly) from October through March, given the lag from usage to billing with a bi-monthly billing schedule. The lowest-demand billing months are consistently March-May (reflecting actual water usage in January-March), but averaged billing records

over the larger six month wet season are used to smooth out discrepancies between the number of days in billing periods and actual calendar days per month.

Updated wet season water usage data indicated a wet season unit flow factor of slightly less than 65 gpcd. This reduced volume (compared to the 2002 Plan) may be partially a result of improved conservation efficiencies, effects of the recent economic recession, and an increase in the percentage of overall residential population residing in multi-family housing. The 2006 Bellevue Water Comprehensive Plan established that per-capita water use for multi-family residences is significantly lower than for single-family.

Table 4-1 shows the population density for each residential land use within the City of Bellevue, based on information provided by the City's Department of Planning and Community Development (PCD). The land use designations shown in this table are taken from Bellevue's Comprehensive Plan. For each land use (SF & MF), there are multiple zoning designations (L, M & H). The highest zoning density allowed under each land use designation was used to determine ultimate population density, and then to project ultimate flows.

Table 4 - 1: Population Densities for Residential Development

Land Use Category	People Per Unit	Units Per Acre	Population Equivalent Per Acre	Description
SF-L	2.7	1.8	4.86	Single Family - Low
SF-M	2.7	3.5	9.45	Single Family - Medium
SF-H	2.7	5.0	13.50	Single Family - High
MF-L	2.0	15.0	30.00	Multi-family – Low
MF-M	2.0	20.0	40.00	Multi-family – Medium
MF-H	2.0	30.0	60.00	Multi-family – High

Residential Flows generated in Bellevue's Downtown District (DNTN), Bel-Red Corridor and other parts of city planned for redevelopment are uniquely different from other areas and are discussed separately in Sections 4.2.3 and 4.2.4.

Bellevue's wastewater model uses the population equivalent per acre from Table 4-1 and the unit flow volume of 65 gpcd to calculate sanitary flow projections. The persons per unit for single family and multi-family land use categories have changed slightly since the 2002 plan. Single family density has slightly decreased while multi-family density has slightly increased.

4.2.2 Commercial Area Flow Projections

Current winter commercial water use data obtained from the City's utility billing was divided by the number of employees served, resulting in a unit flow factor of 25 gallons per capita per day (gpcd). A unit flow factor of 20 gpcd was used in the 2002 Bellevue

Comprehensive Wastewater Plan. This change could be a result of a change in employee behavior or hours, or a result of changing business types within Bellevue. Commercial flows for most commercial zonings in the City will therefore be based on an average discharge of 25 gpcd.

Commercial flows generated in Bellevue's Downtown District (DNTN), Bel-Red Corridor and other parts of city planned for redevelopment are uniquely different from other areas and are discussed separately in Sections 4.2.3 and 4.2.4.

Most commercial zoning categories allow for the construction of hotels and motels, which produce much higher wastewater flow rates than other commercial land uses. Since commercial areas generally contain relatively few hotels/motels, and all other development density assumptions are conservative, the flow projections developed as part of this Plan do not attempt to account specifically for the high wastewater flows generated by hotels/motels. It is impossible to anticipate specifically where these types of developments will occur. To assume they could occur at every commercially zoned location would be overly conservative and result in numerous unnecessary system capacity upgrades. It is therefore possible that future hotel/motel types of development may create capacity problems within the wastewater system. The capacity impacts of these developments should be individually evaluated each time a proposal of this type comes into the City for review.

Table 4-2 shows the employee and the equivalent population density for each commercial land use category within the City of Bellevue, excluding DNTN, based on information provided by the City's Planning Department. The land use categories shown in this table are taken from Bellevue's zoning designation map, which is consistent with Bellevue's Comprehensive Plan.

The calculations for commercial area equivalent population densities involve the Floor Area Ratio (FAR). FAR is a ratio of the gross floor area of a building and net site area for a parcel within a given zoning category. For example, if a parcel is 10,000 square feet, and the allowed FAR is .35, then the maximum allowed floor area of the building would be 3,500. This ratio combined with the previously discussed employee per square foot data and the flow rates for residents and employees allows us to determine the population equivalent per acre for commercial development in the city. FAR used in the 2002 Comprehensive Wastewater Plan was compared to actual development from 2002-2012. For all zoning categories except one, actual development was either fairly close to the previous prediction, or there was too small of a sample to make a conclusion. For the OLB zoning category, nine recent developments had an average FAR of about 1.1, which is significantly higher than the previous prediction, and suggests a fundamental change in the types of development being built in OLB zones. Therefore, for modeling purposes the OLB zone FAR was increased to 1.1 for this plan update.

Table 4 - 2: Equivalent Population Densities for Commercial Development

Land Use Category	Floor Area Ratio	Employees Per Square Foot	PEqPA[1]	Description
F-1	0.5	0.0031	25.96	Community Business Zoning Designation
F-2	0.6	0.0031	31.16	Office & Ltd. Business Zoning Designation
F-3	1.26	0.0031	65.44	Office & Ltd. Business Zoning Designation
PO	0.35	0.0031	18.17	Professional Office Zoning Designation
O	0.35	0.0031	18.17	Office Zoning Designation
OLB	1.1	0.0031	57.13	Office and Ltd. Business Zoning Designation
NB	0.35	0.0031	18.17	Neighborhood Business Zoning Designation
CB	0.35	0.0031	18.17	Community Business Zoning Designation
GC	0.35	0.00285	16.71	General Commercial Zoning Designation
LI	0.35	0.0016	9.382	Light Industrial Zoning Designation

Note: 1. Formulation used is [FAR*EmpPSF*43560sq.ft./acre*(25/65)]. The ratio 25:65 is applied to calculate the residential population equivalent for commercial data.

The City's hydraulic model uses the population equivalents per acre from Table 4-2 for non-residential zoning categories, excluding the DNTN. The population equivalents per acre have increased from those used in the 2002 Bellevue Comprehensive Wastewater Plan in all cases, and will therefore result in higher hydraulic model flow projections for all non-residential zoning categories. This increase is due to the commercial unit flow factor increasing.

4.2.3 Downtown District Flow Projections

The Downtown District (DNTN), formerly referred to as the Central Business District (CBD), is roughly defined as the area bordered by NE 12th Street to the north, Main Street to the south, Interstate 405 to the east, and 100th Avenue NE to the west.

From 2000 to 2010 the number of housing units within the Downtown increased from 2,230 in 2000 to 7,151 in 2010, an increase of 4,921 units or 220 percent. Continued residential development is projected to occur with the number of units doubling again by 2030. Certain zones within the Downtown (DNTN-R and DNTN-MU) are projected to experience higher concentrations of residential development than other zones (DTN-O1 and DNTN-O2), which are projected to have higher concentrations of commercial development. In DNTN-R zones development is generally envisioned as residential units above retail, whereas within the DNTN-MU zone development is envisioned to include more of a mix of office and residential uses with residential and office towers adjacent to one another. Within multiple use zones, there is inherent uncertainty about the relative proportion of commercial and residential uses. City planners project a range between 20 to 40 percent commercial development in mixed-use zones, which yields an equivalent population of approximately

300 to 330 persons per acre. Within DNTN-O1 and DNTN-O2 planners project about 80 percent of the area will be developed in commercial uses. In contrast, if the area developed as fully residential, the equivalent population would be 365 persons per acre, which would generate significantly higher wastewater flows. Analysis done for the 2002 Wastewater System plan determined that recent development in the DNTN has an average projected population equivalent density that is 82% of the potential maximum.

In order to assess the appropriateness of the 2002 flow projections, forty-two recent DNTN proposed and constructed developments were analyzed. The projects were well distributed among DNTN zoning categories, except for DNTN-OB and DNTN-OLB. A total population equivalent for each proposal was calculated based on:

- Total number of residential living units and the total number of square feet planned for office, retail and other uses.
- Residential population and employee density numbers (shown in Table 3-1.)
- Projected wastewater flows of 25 gpcd for employees and 65 gpcd for the residential population as identified earlier in this chapter.

The resulting population equivalents were then compared to the population equivalents used in the 2002 Plan for each zoning category. The analysis indicated that some categories should have an increased population equivalent. The categories DNTN-O-2 and DNTN-Perimeter A had an increased population equivalent. Zoning category DNTN-OB had too small of a sample size to make conclusions, so the population equivalent density is based on the similarly zoned DNTN-MU.

One development along Bellevue Way south of NE 8th Street was not included in calculating the average zone wide population equivalents, because of its disproportionately large scale. This project had almost double the projected population equivalent density for its zoning. A condition of such large developments is that any wastewater capacity issues must be addressed by the developer in the project planning phase, and any necessary local sewer upgrades are paid by the developer, which was done in this case. Anticipated flow from this project is represented in the system model as a point load.

High rise residential developments create significantly higher wastewater flows than office space and create major point loads on the wastewater collector system. Because we cannot predict the precise location and size of these high rise residential developments, it is possible that such projects will create local capacity problems within the wastewater system. The capacity impacts of such developments should be individually evaluated each time such a proposal is made. Any necessary local system improvements are required as condition of approval for such developments.

While there has been an increase in high rise residential development in the DNTN since the 2002 Comprehensive Wastewater Plan, there are still relatively few compared to other development uses. Therefore, DNTN developments will be monitored, and if necessary,

the DNTN PEqPA will be updated accordingly in the future updates as more development data become available.

Figure 4-2 illustrates DNTN zoning districts. Table 4-3 identifies corresponding residential equivalents used for each zone.

Table 4 - 3: DNTN Land Use

Land Use	PEqPA[1]	Description
DNTN-O-1[3]	400	DNTN Office - District 1 Zoning Designation
DNTN-O-2[3]	280	DNTN Office - District 2 Zoning Designation
DNTN-R	365	DNTN Residential Zoning Designation
DNTN-MU	365	DNTN Multiple Use District Zoning Designation
DNTN-OLB	200	DNTN Office and Limited Business Zoning Designation
DNTN-OB	365[2]	DNTN Old Bellevue Zoning Designation
DNTN Perimeter A (regardless of zoning)	280	

Notes:
1. PEqPA (Population Equivalent Per Acre) formulation used is [FAR*EmpPSF*43560 SF/acre *OR*(25/65)]. The ratio 25:65 is applied to calculate the residential population equivalent for commercial data.
2. Due to small sampling number, the recommended PEqPA is based on similarly zoned DNTN-MU.
3. PEqPA numbers shown do not include any residential towers. Residential towers are included as a point load in the system model to the degree that the tower exceeds the local PEqPA.

4.2.4 Bel-Red and Other Re-developing Areas

As a result of the significant rezoning in 2009, the Bel-Red Corridor has zoning categories unique from the rest of the City. Figure 4-3 shows the new zoning in the Bel-Red Corridor.

The effect of the Bel-Red rezone is that an area which was historically commercial and light industrial now allows high density residential development. This change increases the potential wastewater flows, but also adds uncertainty for projecting future population density and flow distribution, since population growth will be primarily determined by economic conditions, rather than by caps on density (as in a commercial or industrial zone). Projects in basins affected by the rezone have been evaluated for wastewater system capacity on a case-by-case basis as developments are proposed. This process works currently because much of the Bel-Red area has small sewer basins (shown in Figure 4-4) with only one or two, relatively short trunk lines that flow directly into nearby King County mains or interceptors. As more developments are proposed, it will be possible to determine the approximate amount and distribution of future flows, and the basin models will be adjusted to account for the flow expected from each new development.

The Eastgate/I-90 Corridor and Wilburton area are two other areas with significant redevelopment potential and possible rezoning. Should rezones occur, there would likely be a change in the population equivalent density in these areas. The City's planning department provided information regarding expected additional development for this analysis. Wherever flow demand may be higher than expected, the system was modeled assuming an additional point load, to identify potential capacity constraints that could occur with future demand.

4.2.5 Peak Flow Determination

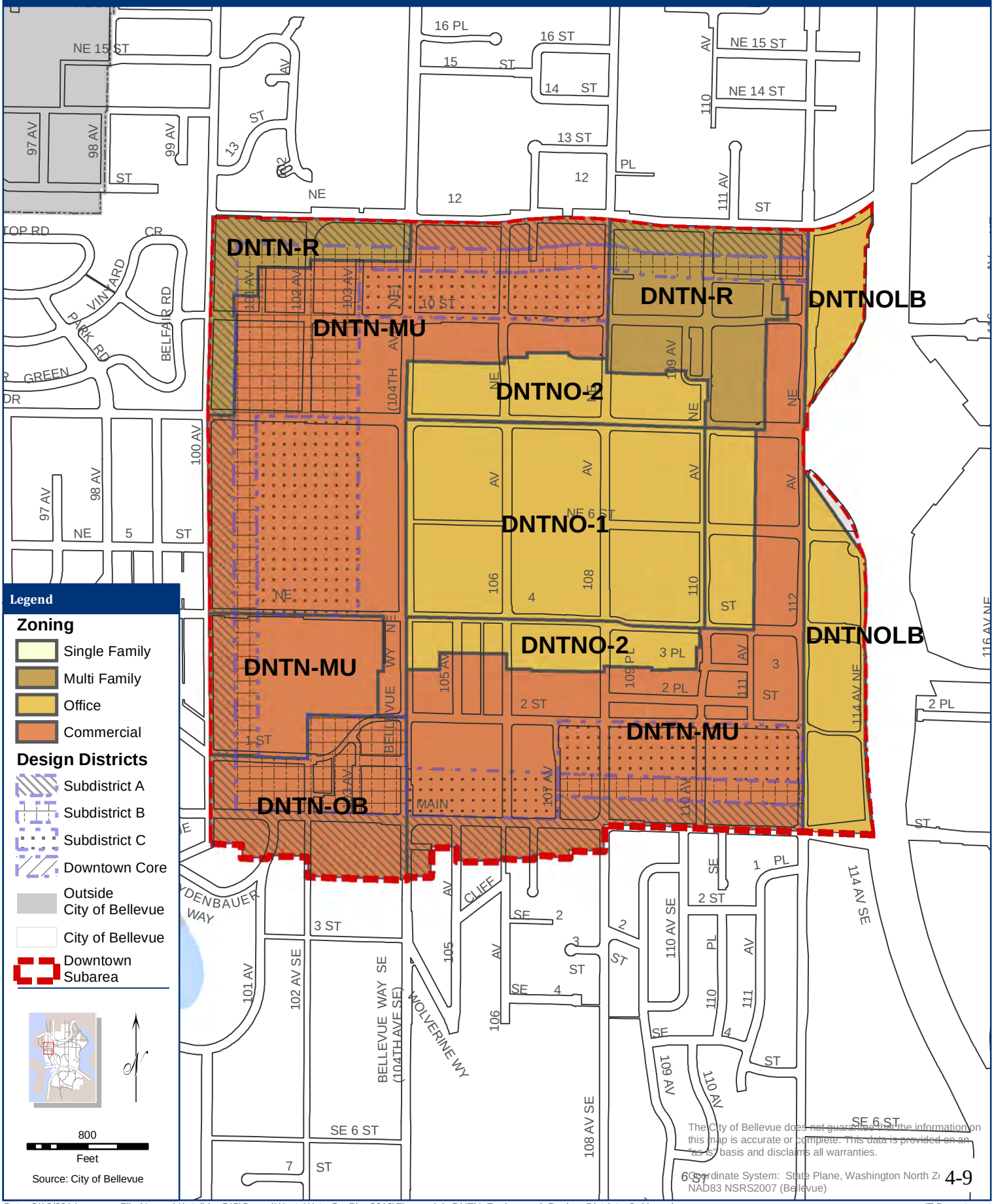
The 2002 Comprehensive Wastewater Plan used a peaking factor method to estimate peak flows over a 24 hour period. That method involves multiplying average flow by a factor of 2.5 to 4.0, depending on the size of the upstream tributary area, to estimate peak flow. The peaking factor method is generally conservative, but there was insufficient flow data to justify a less conservative method. For this plan update, additional flow data is available as a result of extensive flow monitoring by King County. Therefore, a more accurate diurnal curve was used to predict peak flows.

A diurnal curve applies different multipliers to average daily flow throughout a 24 hour period, based on actual observed flow. For residential areas, the curve has two peaks, one in the morning and one in the afternoon. Commercial areas have one peak with a longer plateau in the middle of the day, and much lower flow during non-working hours. The use of a diurnal curve is consistent with the Washington State Department of Ecology (WDOE) sewer design guidelines. The curves were designed using dry day flow measurements from the King County I&I study. WDOE allows using peak flow derived from a diurnal curve if it is calculated using observed flow.

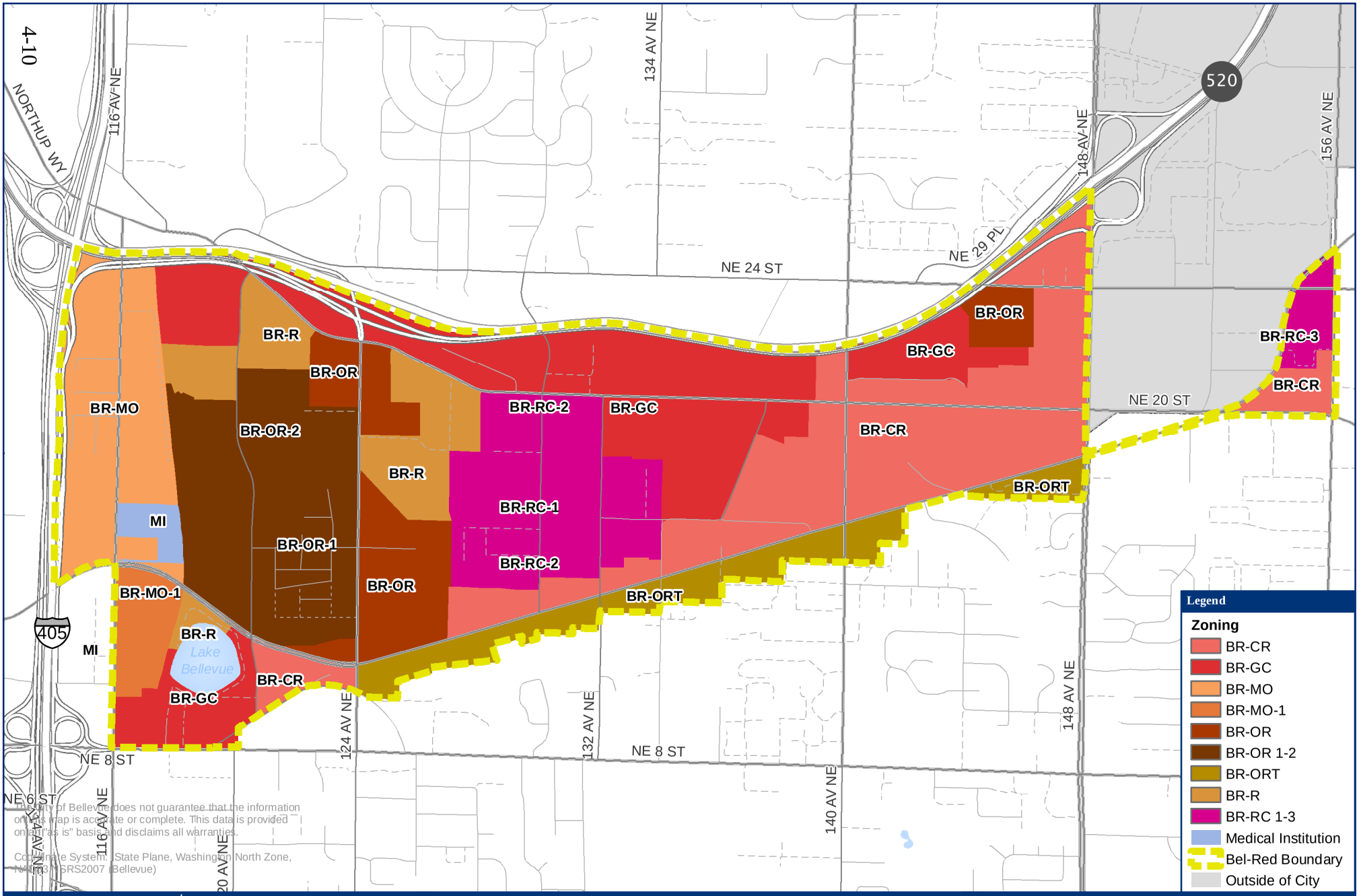
DNTN Zoning and Design Districts

Figure 4-1

City of Bellevue
GIS Services



Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_4-1_DNTN_Zoning_and_Design_Districts_8x11.mxd IT Department



City of Bellevue
GIS Services

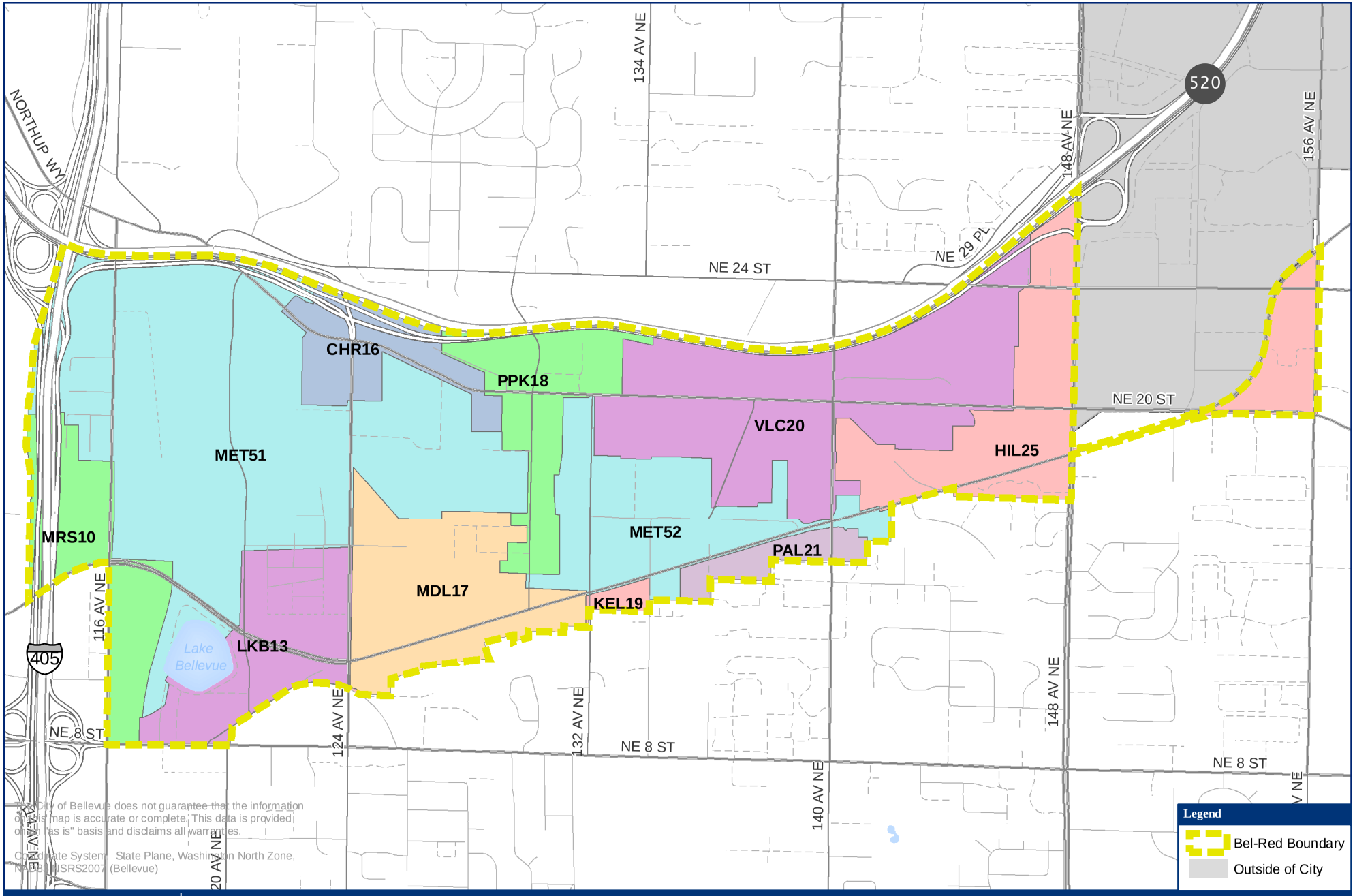
Bellevue-Redmond Corridor Zoning

Figure 4-2

1,400
Feet

Sources:
City of Bellevue

Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_4-2_Bel-Red_Corridor_Zoning_11x8.mxd IT Department



City of Bellevue
GIS Services

Bellevue - Redmond Sewer Basins

Figure 4-3

Date: 3/12/2014 File Name: V:\utpl\ArcGIS\Sewer\WasteWaterSysPlan2013\Figure_4-3_Bel-Red_Sewer_Basins_11x8.mxd IT Department

4.3 Infiltration and Inflow

Ideally, all surface water and groundwater is kept out of the wastewater system. Depending on the quality of construction, the age and condition of the pipe, and the presence of unauthorized surface water connections, surface and ground water enters the system. This water is known as inflow and infiltration (I&I). I&I is measured and described in this plan in units of gallons per acre per day (gpad).

I&I is highly variable, and depends not only on the factors related to the sewer physical condition as noted above, but also on the depth of groundwater, storm intensity and duration, and other parameters. Figure 6-1b shows an extreme example of infiltration at a failed joint in high groundwater conditions.

4.3.1 2002 King County Flow Monitoring Study

King County Wastewater Treatment Division (KCWTD) conducted a flow monitoring study throughout their service area in 2002 to quantify the volume of I&I entering the regional collection and treatment system. Of the approximately 800 flow monitors deployed throughout the region, about 100 were located within the City of Bellevue, in the City's sewer mains. These meters tracked the flow through 'mini basins', sections of the wastewater system that contained approximately 20,000 linear feet of pipe, each draining through one manhole. Data from that study provided much more accurate estimates for I&I peak and base flows than was available historically.

The KCWTD data was not available for the 2002 Wastewater Plan update. For that study, flow measurements from 1994 were used. Basin-specific I&I were estimated between 0 and 5,700 gpad. The King County flow measurements data indicates basin-specific thirty-minute peak I&I rates of between 900 and 12,000 gpad. The city- wide average 30 min peak I&I rate is 3,800 gpad. Basin by basin I&I rates can be seen on table 4-4. The data in table 4-4 is what was used to estimate I&I in the hydraulic model. I&I city wide is now known to be higher than was previously assumed, which will lead to higher flow projections, and some pipes that were previously thought to be sufficiently designed may not have sufficient capacity.

4.3.2 2010 King County Flow Monitoring Study

The 2010 KCWTD flow monitoring study deployed approximately 50 meters located along KCWTD interceptors within the City of Bellevue. The data indicates basin-specific thirty-minute peak I&I rates of between 600 and 7,000 gpad. The city-wide average 30 min peak I&I rate estimated by the study is 3,300 gpad. Basin by basin I&I rates can be seen on Table 4-4.

However, data from the 2010 King County study is inconclusive for 20 City of Bellevue basins due to missing data or other complicating factors, as noted in table 4-4. Therefore, for the purpose of hydraulic analysis, the City is currently using the 2002 I&I data and not the 2010 data.

Some of the complicating factors include methodology changes that designated parcels with large sewer mains as unsewered solely based on land use, and significant discrepancies between basin boundary delineation.

4.3.3 I&I Investigation and Reduction

Bellevue's contract with KCWTD establishes a standard I&I rate: I&I should not exceed 1,100 gpad for any wastewater system constructed after 1961. This standard has not been enforced in practice, because measured flow comes from systems that include both new and old pipes, and because every jurisdiction that has a similar agreement with King County currently exceeds this standard. The vast majority of basins in Bellevue exceed this standard; most have more than double the 1,100 gpad target rate.

The City has performed only limited flow monitoring in several basins since the completion of the 2002 Comprehensive Wastewater Plan, primarily to investigate areas of Bellevue's Downtown District during dry weather flows, or in support of capital projects to verify design criteria. The King County study data provided significantly more data for current and projected flows throughout much of the system, and indicated that I&I is a more significant problem in Bellevue than had previously been recognized.

King County's flow monitoring data, as well as localized data obtained by the City have been incorporated into Bellevue's basin hydraulic models for improved model accuracy. The improved modeling has helped pinpoint areas which might be at risk of overflows as population increases and pipes age and deteriorate.

The city currently does not have a plan to systematically reduce I&I, however where specific problems related to high I&I are observed, those are addressed through targeted I&I investigation. Basins that have significant risk of capacity problems or overflows due to I&I are identified in Chapter 7. The Plan recommends significant, targeted I&I investigation and reduction, along with additional flow monitoring in Chapter 9. These recommended programs will address the highest priority areas of I&I.

Other programs in place also reduce I&I as a matter of course, through pipeline renewal and replacement, and repair of localized defects. Pipeline rehabilitation and replacement programs are discussed in Chapter 9. The City's sewer video inspection program (described in Chapter 8) inspects approximately 10% of the City's sewer mains each year, prioritizing high risk pipes. The sewer inspection program identifies structural defects to be repaired, and is directly responsible for repairing about 120 pipe defects per year. These programs should reduce I&I, although the degree that I&I is reduced is unknown.

Table 4 - 4: Observed I&I by Basin

		2002 KC Study		2010 KC Study	
Basin	Basin Name	I&I in GPAD	I&I in GPM	I&I in GPAD	I&I in GPM
1	Fairweather	5,506	1,050	2,851	805
2	Medina	3,247	495	2,851	585
3	Cozy Cove	1,867	400	2,851	734
4	Clyde Hill	2,532	1,035	2,851	1,479
5	Parker	6,157	870	3,959	550
6	Yarrow Bay	3,404	973	***	***
7	Bellevue	4,638	2,676	***	***
8	Meydenbauer	3,275	464	***	***
9	Sweyolocken	2,455	483	*	*
10	Mercer Slough	6,820	2,379	4,157	1,667
11	Enatai	***	***	***	***
12	Northup	2,223	120	*	*
13	Lake Bellevue	11,945	828	*	*
14	North Woodridge	3,410	419	4,121	783
15	South Woodridge	3,880	458	4,121	400
16	Cherry Crest	1,040	72	1,083	72
17	Midlakes	1,087	53	*	*
18	Pikes Peak	2,114	382	753	138
19	Kelsey Creek	4,827	1,404	*	*
20	Valley Creek	2,099	1,047	*	*
21	Palisades	3,683	450	3,335	425
22	N Larsen Lake	4,617	527	3,174	426
23	S Larsen Lake	2,862	833	2,899	782
24	College Hill	1,405	159	*	*
25	Highland	2,007	369	1,933	385
26	Chevy Chase	4,513	387	4,693	384
27	Woodside	2,297	170	3,601	349
28	Sherwood Forest	1,527	161	3,601	486
29	Hidden Hills	4,193	417	3,601	332
30	Crossroads	4,806	2,977	*	*
31	Lake Hills	4,597	1,137	4,579	987
32	Phantom Lake	1,696	148	579	27
33	Redmond	***	***	3,601	143
34	Rosemont	3,681	681	3,737	974
35	Vasa Park	4,223	902	3,951	867
36	Newport	4,491	729	*	*
37	Coal Creek	3,545	1,689	*	*
38	Cougar Mountain	3,324	1,401	*	*
39	Eastgate	4,771	2,286	3,919	2,410
40	Somerset	10,202	2,376	2,808	755
41	Factoria	3,971	1,834	3,012	1,546
42	LEA	***	***	3,919	1,318
43	Sammamish	3,728	537	2,341	424
44	Redmond	1,821	19	***	***
45	Newport Hills	1,837	734	1,743	799
46	DNW	2,233	240	1,430	304
47	South Bellevue	***	***	***	***
48	DMW	***	***	6,973	732
50	MET+	***	***	***	***
51	MET+	***	***	***	***
52	MET+	***	***	***	***
53	MET+	***	***	***	***
54	MET+	***	***	***	***
55	MET+	***	***	***	***
56	MET+	***	***	***	***
57	MET+	***	***	***	***
58	MET+	***	***	***	***

* Inconclusive Data, ***Data incomplete or unavailable

+ Flow monitoring in MET basins is insufficient to estimate basin-wide I&I due to numerous independent connections to KCWTD interceptors

4.4 Flow Projection Summary

Future population, employment and sewage flow projections were developed based on Bellevue's most recently adopted Comprehensive Plan and zoning regulations with regards to allowable residential units per acre and commercial FAR. Average household sizes, employees per square foot, and commercial/residential ratio assumptions were taken from most recent available data sources. Similar information from the cities of Medina, Hunt's Point, and Clyde Hill was incorporated for areas Bellevue serves outside the City's planning area.

Table 4-5 summarizes the numbers that form the basis for projected ultimate flows. Table 4-5 also provides a comparison of these numbers with those used by neighboring jurisdictions as identified in their most recent comprehensive wastewater plans.

Table 4 - 5: Comparison of Eastside Communities

Planning Criteria	Bellevue	Bellevue 2002	Kirkland	Redmond	Issaquah	Coal Creek U.D.
Residential Flow (gpcd)	65	70	103	58&69	47&68	61
Persons/SF Unit	2.7	2.8	2.3	2.53	2.66	2.6
Flow/SF Unit (gpd)	176	196	237	175	204	159
Persons/MF Unit	2.0	1.8	1.94	2.07	1.85	1.8
Flow/MF unit (gpd)	130	126	200	120	135	110
Sq.Ft./Employee	285&375	250	---	---	520	---
Flow/Employee (gpcd)	25	20	8-20	---	83	---
Peaking Factor	2.0	2.5 - 4.0	2.0	---	---	2.5 - 4.0
Inflow/Infiltration (gpad)	Estimated based on nearby flow monitoring	1,100	1,100, observed	1,100, observed	1,100, 2,000	1,100

Tables 4-6 and 4-7 summarize the estimated and projected flows per basin in 2012 and 2030, based on the planning data presented in Chapter 3 and the I&I and per capita flow criteria described in Chapter 4. Flows shown in these tables reflect reasonably expected sanitary wastewater flows based on official population projections. These tables are not intended for the purpose of sizing or designing wastewater facilities; more conservative peaking factors and localized flow monitoring should be used for those purposes.

Table 4 - 6: 2012 Average and Peak Flows Per Basin+

Basin	Average Daily Sanitary Flow (gpm)	Peak Sanitary Flow (gpm)^	Peak I&I (gpm)	Total Peak Flow (gpm)
1	67	135	1,050	1,185
2	48	97	495	592
3	64	128	400	528
4	144	287	1,035	1,322
5	49	98	870	968
6	182	364	973	1,337
7	1,188	2,375	2,676	5,051
8	77	155	464	619
9	87	174	483	657
10	809	1,618	2,379	3,997
11	30	61	77*	138
12	25	50	120	170
13	81	162	828	990
14	57	113	419	532
15	60	119	458	577
16	39	78	72	150
17	34	67	53	120
18	88	177	382	559
19	165	329	1,404	1,733
20	438	875	1,047	1,922
21	158	316	450	766
22	136	272	527	799
23	218	436	833	1,269
24	119	237	159	396
25	165	330	369	699
26	143	287	387	674
27	53	106	170	276
28	66	131	161	292
29	60	120	417	537
30	445	889	2,977	3,866
31	162	323	1,137	1,460
32	69	138	148	286
33	11	21	35*	56
34	99	197	681	878
35	125	251	902	1,153
36	81	163	729	892
37	252	504	1,689	2,193
38	272	545	1,401	1,946
39	260	519	2,286	2,805
40	123	246	2,376	2,622
41	399	799	1,834	2,633
42	121	242	296*	538
43	71	142	537	679
44	8	15	19	34
45	236	472	734	1,206
46	79	159	240	399
47	11	22	34*	56
48	24	48	92*	140
50	49	98	60*	158
51	105	209	207*	416
52	121	242	152*	394
53	60	120	109*	229
54	72	144	311*	455
55	136	271	238*	509
56	144	289	126*	415
57	151	301	279*	580
58	19	38	93*	131
Total (gpm)	8,553	17,106	38,880	55,986
Total (mgd)	12	25	56	81

+ Tributary flows from neighboring jurisdictions and sewer districts are not included
* Due to lack of 2002 I&I study data, the I&I for these basins was assumed based on 1,100 gpad and 80% sewered area.
^ 2010 employment data was extrapolated to 2012 based on 1.77% overall employment increase in Puget Sound region.

Table 4 - 7: 2030 Projected Flows Per Basin[+Δ]

Basin	Average Daily Sanitary Flow (gpm)	Peak Sanitary Flow (gpm)	Peak I&I (gpm)	Total Peak Flow (gpm)
1	68	136	1,050	1,186
2	49	98	495	593
3	64	128	400	528
4	145	290	1,035	1,325
5	49	99	870	969
6	196	392	973	1,365
7	2,095	4,190	2,676	6,866
8	78	156	464	620
9	89	177	483	660
10	1,007	2,015	2,379	4,394
11	33	66	77*	143
12	26	52	120	172
13	227	453	828	1,281
14	57	114	419	533
15	61	123	458	581
16	49	98	72	170
17	74	148	53	201
18	114	229	382	611
19	172	344	1,404	1,748
20	468	935	1,047	1,982
21	163	326	450	776
22	140	280	527	807
23	227	454	833	1,287
24	146	291	159	450
25	261	522	369	891
26	153	305	387	692
27	54	107	170	277
28	66	132	161	293
29	61	121	417	538
30	472	943	2,977	3,920
31	162	325	1,137	1,462
32	71	142	148	290
33	13	26	35*	61
34	99	198	681	879
35	128	256	902	1,158
36	115	229	729	958
37	259	518	1,689	2,207
38	282	564	1,401	1,965
39	277	555	2,286	2,841
40	124	247	2,376	2,623
41	559	1,119	1,834	2,953
42	124	247	296*	543
43	79	159	537	696
44	8	15	19	34
45	262	524	734	1,258
46	83	167	240	407
47	11	23	34*	57
48	25	49	92*	141
50	49	98	60*	158
51	221	442	207*	649
52	187	374	152*	526
53	66	132	109*	241
54	78	156	311*	467
55	153	305	238*	543
56	145	290	126*	416
57	153	305	279*	584
58	20	39	93*	132
Total (gpm)	10,614	21,228	38,880	60,108
Total (mgd)	15	31	56	87

+ Tributary flows from neighboring jurisdictions and sewer districts are not included.
Δ Flows are for current zoning, and do not account for proposed zoning changes that are not yet adopted (e.g. Wilburton re-zones)
* Due to lack of 2002 I&I study data, the I&I for these basins was assumed based on 1,100 gpad and 80% sewered area.

This Page is Intentionally Blank

CHAPTER 5
Existing System

5.1 Introduction

This chapter identifies physical facilities within the Bellevue wastewater system and discusses their operation. Bellevue's wastewater system is entirely separate from the storm and surface water collection system.

The wastewater system is well mapped, inspected, and maintained. There are no known connections between or conflicts with sources of water supply or storm water conveyance.

5.2 Wastewater Drainage Basins

Bellevue's wastewater service area is divided into basins for the purpose of system study and analysis. Basin boundaries take into account logical system extensions into currently unsewered areas. Bellevue's basins and KCWTD's interceptors are shown in Figure 5-1. Each basin has an assigned name and number. The basin names, ID numbers and name abbreviations are shown in Table 5-1. Since adoption of the 2002 Comprehensive Wastewater Plan, the City has assumed the portion of the Coal Creek Utility District within Bellevue City limits. As a result there are four new basins in the wastewater system.

The collection system is divided into 43 major drainage basins and 14 minor basins. The major basins are all hydraulically modeled to evaluate capacity issues. They generally drain to either a single connection point along KCWTD's regional collection system or to a major Bellevue pump station.

The minor basins consist of relatively short sewer mains with numerous connections to regional interceptors. These "basins" actually function as a group of localized sub-basins that are considered as one basin for simplicity. These short mains either discharge to the City of Redmond's system (Basins 33 and 44), Coal Creek Utility District's system (Basin 47 and 48) or to numerous locations along KCWTD's regional trunks and interceptors (Basins 46 and 50 through 58).

5.3 Physical Facilities

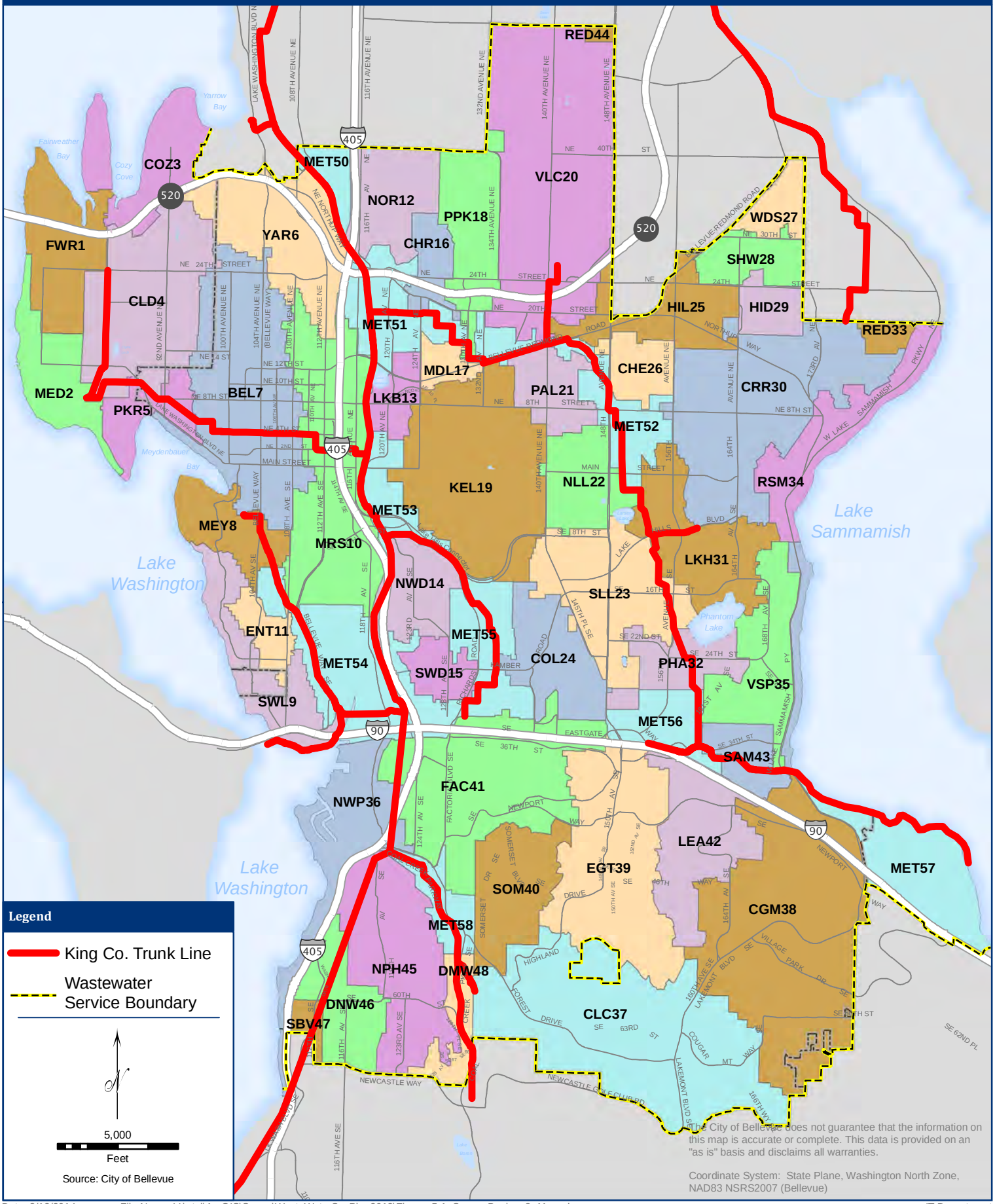
The collection system consists of approximately 525 miles of sewer mains, ten flush stations, and thirty six pump stations. In addition, the City takes responsibility for the portions of the sewer service lines that lie within the public right-of-way. These sewer service "stubs" are estimated to total approximately 130 miles. Length of sewers and number of manholes in each basin are listed in Table 5-1.

Table 5-2 indicates the location of each pump station, the basin it serves, whether it has on-site power generation capability, the number of pumps within each pump station, and some pump characteristics. Table 5-3 indicates the location of each flush station.

Sewer Basins

Figure 5-1

City of Bellevue
GIS Services



Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

Table 5 - 1: Sewer Basin Pipe Inventory

Basin Name	ID	Basin Code	Total No. of manholes	Total (ft)	Unknown Diameter (ft)	Length of Gravity Sewer (ft)											
						<8"	8"	10"	12"	14"	15"	16"	18"	20"	21"	24"	27"
Fairweather	1	FWR	195	46524	597	5050	34504	5438	935	0	0	0	0	0	0	0	0
Medina	2	MED	137	35962	462	2517	29713	666	2604	0	0	0	0	0	0	0	0
Cozy Cove	3	COZ	179	46769	694	4117	41958	0	0	0	0	0	0	0	0	0	0
Clyde Hill	4	CLD	503	102276	76	8510	80551	3434	3061	117	0	0	0	0	4780	1747	0
Parker	5	PKR	156	32172	240	2070	29862	0	0	0	0	0	0	0	0	0	0
Yarrow Bay	6	YAR	324	63739	0	4564	49895	4896	3949	0	435	0	0	0	0	0	0
Bellevue	7	BEL	680	139483	331	2915	100755	6453	9588	845	4151	100	10812	0	415	3118	0
Meydenbauer	8	MEY	177	39798	8	5292	30549	150	888	336	2575	0	0	0	0	0	0
Sweyolocken	9	SWL	230	57714	456	5611	44119	5306	0	0	0	0	0	0	0	0	2222
Mercer Slough	10	MRS	440	84681	395	9778	51306	5214	5157	0	2706	1182	3676	1303	395	3569	0
Enatai	11	ENT	91	19437	142	2645	13717	2933	0	0	0	0	0	0	0	0	0
Northup	12	NOR	48	10846	0	520	7759	0	2377	0	190	0	0	0	0	0	0
Lake Bellevue	13	LKB	73	11971	30	496	8941	0	0	0	2442	0	62	0	0	0	0
Woodridge	14	WDR	146	29903	0	322	27960	1621	0	0	0	0	0	0	0	0	0
Sewer District	15	SWD	119	24770	0	463	24307	0	0	0	0	0	0	0	0	0	0
Cherry Crest	16	CHR	80	16609	0	249	15635	100	625	0	0	0	0	0	0	0	0
Midlakes	17	MDL	23	6607	0	0	5165	1442	0	0	0	0	0	0	0	0	0
Pikes Peak	18	PPK	207	36766	40	1412	35264	0	50	0	0	0	0	0	0	0	0
Kelsey Creek	19	KEL	384	78774	50	2456	71411	1918	1587	0	1352	0	0	0	0	0	0
Valley Creek	20	VLC	481	91271	0	210	80206	7531	2608	0	270	0	446	0	0	0	0
Palisades	21	PAL	149	26732	361	589	24545	1237	0	0	0	0	0	0	0	0	0
N Larsen Lake	22	NLL	138	28124	0	869	25342	1613	300	0	0	0	0	0	0	0	0
S Larsen Lake	23	SLL	361	72654	0	3792	60112	1912	5175	0	0	0	1663	0	0	0	0
College Hill	24	COL	191	32260	0	1209	30719	264	68	0	0	0	0	0	0	0	0
Highland	25	HIL	172	33206	368	595	30368	0	1875	0	0	0	0	0	0	0	0
Chevy Chase	26	CHE	170	27628	24	523	27081	0	0	0	0	0	0	0	0	0	0
Woodside	27	WDS	134	23278	0	0	23278	0	0	0	0	0	0	0	0	0	0
Sherwood Forest	28	SHW	129	27847	30	411	27406	0	0	0	0	0	0	0	0	0	0
Hidden Hills	29	HID	114	22935	0	0	22935	0	0	0	0	0	0	0	0	0	0
Crossroads	30	CRR	712	150609	266	4774	124439	1299	100	0	5796	0	13935	0	0	0	0
Lake Hills	31	LKH	285	60723	15	8179	47455	1085	3989	0	0	0	0	0	0	0	0
Eastgate	32	PHA	96	21910	0	487	17819	1893	1711	0	0	0	0	0	0	0	0

Basin Name	ID	Basin Code	Total No. of manholes	Total (ft)	Unknown Diameter (ft)	Length of Gravity Sewer (ft)											
						<8"	8"	10"	12"	14"	15"	16"	18"	20"	21"	24"	27"
Redmond	33	RED	19	4350	98	0	4252	0	0	0	0	0	0	0	0	0	0
Rosemont	34	RSM	245	50047	573	2704	46748	0	22	0	0	0	0	0	0	0	0
Vasa Park	35	VSP	293	57500	0	2628	52232	770	1254	0	616	0	0	0	0	0	0
Newport	36	NWP	165	39831	542	1821	37468	0	0	0	0	0	0	0	0	0	0
Coal Creek	37	CLC	992	143887	0	1754	128384	3839	2007	978	6925	0	0	0	0	0	0
Cougar Mtn.	38	CGM	1036	149950	1042	372	129243	4387	7832	0	4353	258	2463	0	0	0	0
Eastgate	39	EGT	754	136705	0	0	124147	6248	4032	0	1786	0	0	0	0	492	0
Somerset	40	SOM	372	68005	0	447	60542	5005	2011	0	0	0	0	0	0	0	0
Factoria	41	FAC	618	108224	584	664	89764	11726	3207	0	473	1781	25	0	0	0	0
Leahwood	42	LEA	336	53174	0	56	45584	0	4393	0	3141	0	0	0	0	0	0
Sammamish	43	SAM	235	40746	103	986	35135	2831	1097	594	0	0	0	0	0	0	0
Redmond	44	RED	19	2615	0	0	2615	0	0	0	0	0	0	0	0	0	0
Newport Hills	45	NPH	391	89833	148	2246	73613	13524	302	0	0	0	0	0	0	0	0
DNW	46	DNW	210	33880	0	521	27934	3446	1930	0	0	49	0	0	0	0	0
South Bellevue	47	SBV	66	7967	0	36	7931	0	0	0	0	0	0	0	0	0	0
DMW	48	DMW	63	15234	4648	0	9864	134	588	0	0	0	0	0	0	0	0
METRO	50	MET	77	12340	93	108	12054	85	0	0	0	0	0	0	0	0	0
METRO	51	MET	102	16858	0	677	14501	951	729	0	0	0	0	0	0	0	0
METRO	52	MET	176	30186	38	744	29404	0	0	0	0	0	0	0	0	0	0
METRO	53	MET	79	9955	0	79	9479	174	223	0	0	0	0	0	0	0	0
METRO	54	MET	159	26604	110	5011	21293	190	0	0	0	0	0	0	0	0	0
METRO	55	MET	175	29413	0	1396	27922	95	0	0	0	0	0	0	0	0	0
METRO	56	MET	64	10279	32	73	10174	0	0	0	0	0	0	0	0	0	0
METRO	57	MET	328	54957	0	406	54132	317	102	0	0	0	0	0	0	0	0
METRO	58	MET	61	8624	0	0	8624	0	0	0	0	0	0	0	0	0	0
TOTAL			14359	2705142	12596	103354	2308115	110127	76376	2870	37211	3370	33082	1303	5590	8926	2222

* The basin name "METRO" is used for basins with numerous unconnected short sewers that each discharge separately to a KCWTD interceptor. This does not imply KCWTD ownership of the sewers, except for the interceptor. Other basins discharge to KCWTD interceptors, but typically only in one location.

5.3.1 Pump Stations

The City's pump stations operate based on local control with remote SCADA montoring at the Bellevue Service Center. Pump Stations are listed in Table 5-2.

Table 5 - 2: Pump Stations

Pump Station Name	Basin	Address	On-site Power[1]	Rating Point[2]		No. of Pumps	Installed Capacity GPM[3]	Volts
				GPM	TDH			
Cedar Terrace	YAR 6	3229 115th Avenue NE	No	200	24'	2	400	240
Yarrow Point	COZ 3	9000 NE 42nd Street	No	323	18'	2	646	208
Cozy Cove	COZ 3	3268 Hunt's Point Rd	Yes	325	18'	3	975	480
Hunt's Point	COZ 3	4344 Hunt's Point Rd	No	300	17'	2	600	208
Fairweather Basin	FWR 1	3003 Fairweather Pl NE	Yes	325	52'	3	975	480
Evergreen East	FWR 1	3448 Lake Ln (NE 78th Pl)	No	300	14'	2	600	208
Evergreen West	FWR 1	3603 Evergreen Point Rd	No	300	16'	2	600	208
Lakecrest	MED 2	1823 73rd Avenue NE	No	300	17'	2	600	208
Medina City Hall	MED 2	501 Evergreen Point Rd	Yes	350	67'	2	700	208
Parkers[4]	PAR 5	9011 Lk Wash Blvd NE	No	425	144'	3	1,275[(4)]	480
Grange	BEL 7	9927 Meydenbauer Wy	Yes	350	84'	2	700	480
Meydenbauer	MEY 8	9931 Shoreland Dr SE	No	285	59'	2	570	240
Killarney	SWL 9	2177 Killarney Wy SE	No	425	11'	2	850	240
Newport Pump	NWP 36	73 Skagit Key	Yes	693	134'	2	1,386	480
Newport Lift	NWP 36	68 Cascade Key	Yes	359	17'	2	718	480
Bagley	NWP 36	4400 Lk Wash Blvd SE	No	229	40'	2	458	240
Pleasure Point	NWP 36	5600 Pleasure Pt Rd SE	No	125	11'	2	250	240
South Ridge	SBV 47	6216 108th Ave SE	No	85	125	2	170	480
Kimberlee Park	DNW 46	11001 SE 56th SE	No	350	175'	2	700	480
Lake Heights	NPH 45	4425 Lk Wash Blvd SE	No	120	63'	2	240	480
Bellefield[5]	MRS 10	1400 112nd Avenue SE	Yes	950[5]	46'	3	2,850	480
Midlakes[5]	MDL 17	12700 Bel-Red Rd	Yes	800[5]	45'	2	1,600	240
Palisades	PAL 21	13630 NE 13th St	No	165	64'	2	330	480
Wilburton	MRS 10	1331 118th Avenue SE	No	350	42'	2	700	480
Emerald Ridge	MET 50	3080 118th Avenue SE	No	280	90'	2	560	480
Eastgate #1	SAM 43	2442 W Lk Samm Pkwy SE	Yes	424	14'	2	848	240
Eastgate #2	SAM 43	1802 W Lk Samm Pkwy SE	Yes	300	13'	2	600	240
Lake Hills #4	LKH 31	16035 SE 9th St	No	400	65'	2	800	480
Lake Hills #6	LKH 31	16358 SE 16th St	No	145	64'	2	290	480
Lake Hills #7	VSP 35	16280 SE 24th St	No	220	60'	2	440	480
Lake Hills #12	RSM 34	365 W Lk Samm Pkwy SE	Yes	750	251'	4	3,000	480
Lake Hills #16	RSM 34	254 W Lk Samm Pkwy NE	No	400	78'	2	800	480
Lake Hills #17	RSM 34	628 W Lk Samm Pkwy NE	No	245	11'	2	490	240
Lake Hills #18	RSM 34	1082 W Lk Samm Pkwy NE	No	245	11'	2	490	240
Lake Hills #19	RSM 34	1830 W Lk Samm Pkwy NE	No	245	11'	2	490	240
Lakemont	CGM 38	5392-176 Place SE	Yes	200	21'	2	400	480

1. As of 2013. Additional pump stations are scheduled to have on-site power installed as part of CIP No. S-59. Those stations will be identified as part of future preliminary design work.
2. Design rating point per manufacturer's pump curves. Actual performance may differ due to impeller wear.
3. Installed capacity based on rating points for one pump only; not corrected for additional downstream head loss with multiple pumps running (actual installed capacity is less)
4. Parkers, a.k.a. Lake Washington Pump Station has two high-capacity pumps and one 2-speed low/high-capacity pump. The two high-capacity pumps are rated at 425 gpm each while operating in parallel (850 gpm total). The third, 2-speed pump is capable of functioning as a flush station pump (in low speed) or a third redundant high-capacity pump (in high speed).
5. Bellefield and Midlakes Pump Station capacity expansion projects are currently in design. Capacities shown are for existing pump stations.

5.3.2 Lake Lines and Flush Stations

The Lake Washington and Lake Sammamish shorelines and adjacent upland areas are served by lakeshore collector pipes known as "lake lines". By preventing discharge of raw sewage into Bellevue's lakes, the lake lines provide a tangible benefit to all Bellevue citizens, neighboring jurisdictions, and the environment. Beginning from their installation in the 1950s, the lake lines were part of a regional strategy that markedly improved Lake Washington water quality, including reduced odor, enhanced visibility, and reduction of excessive phosphorus and algae growth (http://www.kingcounty.gov/, "The Lake Washington Story").

The lake lines are sewers constructed either in the lake or below the nearby shore. There are approximately 18.7 miles of lake lines, including roughly 14.6 miles along Lake Washington, and 4.1 miles along Lake Sammamish.

Wastewater flows by gravity from the areas served to the lake lines. At the downstream end of the lake lines, pump stations lift flow to the gravity sewer system above the shore.

Figure 5-2: Typical View of Exposed Portion of Lake Line Sewer

The lake lines are susceptible to sedimentation because they generally have only nominal slope, and in some locations are flat or have low spots. Low-pressure pump stations known as "flush stations" are installed at the upstream end of the lake lines to pump lake water

through the piping, to increase flow velocities and provide some scouring to clear sediments. Bellevue's flush stations are listed in Table 5-3.

Table 5 - 3: Flush Stations

Flush Station	Also Known As	Basin	Address	No. of Pumps	Capacity (GPM)	Total Dynamic Head	Voltage
#1	Yarrow Bay F.S.	COZ 3	4620 95th Ave NE	1	240	21'	240
#2	Hunts Point F.S.	COZ 3	3261 Hunts Point Road	1	240	21'	240
#3	Long F.S.	FWR 1 / MED 2	2441 Evergreen Point Rd.	2	240	21'	240
#4	King F.S.	MED 2	8875 Groat Point Drive	1	240	21'	240
#5	Thurston F.S.	PAR 5	8925 Groat Point Drive	1	240	21'	240
#6	Ellis F.S.	MEY 8	903 SE Shoreland Drive	1	240	21'	240
#7	Cragin F.S.	SWL 9	1175 96th Ave Se	1	240	21'	240
#8	Ripley F.S.	NWP 36	70011 Ripley Lane	1	240	21'	240
#9	Sunrise Cove F.S.	RSM 34	546 W. Lk. Sammamish Pkwy SE	1	375	10'	240
#10	Eastgate F.S.	SAM 43	562 W. Lk. Sammamish Pkwy SE	1	300	9'	240

Although the flush stations provide nightly flow to move sediment, accumulation of debris in the lake lines is still a problem. Figure 5-3 shows approximately 100 five-gallon buckets of debris that was removed from a section of approximately 500-feet of lake line pipe along Meydenbauer Bay.

The accumulation of debris has been known to limit the capacity of the pipe and cause overflows. Overflows occur in lake line piping at a frequency out of proportion with lake line length. Lake lines account for approximately 3.5% of the sewer mains length in the system, but approximately 20% of overflows from 2009-2011.

Figure 5-3: Debris Removed from a Portion of Meydenbauer Bay Lake Line Sewer

The oldest Lake Washington lake lines and flush stations were installed in the early 1950s by Bellevue Sewer District (now part of the City), and some pre-date incorporation of the City of Bellevue. These facilities are aging, and do not meet current design standards for gravity pipeline slopes or lake water intake depth (for flush station intakes). However, they have served to convey sewage from the shoreline and adjacent upland properties for decades, and helped to significantly improve lake water quality after their installation.

5.4 System Reliability

Much of the City's wastewater collection system conveys flow downhill by gravity. Continued reliable operation of this gravity system is addressed by various maintenance activities described in Chapter 8.

There are also a number of areas within Bellevue's system that require the use of pump stations and force mains to move wastewater flows from one place to another and ultimately to the KCWTD regional collection system and treatment. The use of pumps and motors provides an increased opportunity for the system operation to break down due to mechanical failure or power loss. The following provisional practices help to ensure the continued reliable operation of Bellevue's pumping facilities:

- Each station is equipped with at least two pumps (installed capacity). Each pump station was originally designed with redundant capacity to convey the peak design flow with one pump out of service (firm capacity). Due to increased I&I over time, the following pump stations now require all pumps to be running (installed capacity) to convey peak flows: Cozy Cove, Fairweather, Newport Lift, Yarrow Point, Hunts Point, Parkers, Bagley, and Pleasure point. Redundancy needs will be weighed as part of pump station prioritization criteria in the pump station evaluation currently underway.
- All stations can be powered by one of the Utilities portable generators in the event of a power outage.
- Critical stations have permanent on-site emergency power generators that automatically provide power in the event of a power outage. These locations are indicated in table 5-2.
- Permanent on-site power is being added at several pump stations on a prioritized, ongoing basis, as described in Chapter 9.
- All pump stations are continually monitored with telemetry for pump failure, power failure, high wet well, and/or overflow alarms.
- Pump stations are regularly operated and maintained as described in Chapter 8.

5.5 Hydraulic Operations

The following section describes in general terms how and at what locations Bellevue's wastewater is delivered to KCWTD's regional collection system.

5.5.1 Basins Served by KCWTD's Medina Trunk and Force Main

Fairweather Pump Station delivers all of the flow from **Basin 1** to **Basin 4**. All of the flows from **Basin 3** are also delivered to **Basin 4** via the Cozy Cove Pump Station. **Basins 1 and 3** flows enter at the top of the Medina trunk via **Basin 4** sewer mains. **Basin 4** flows enter the trunk at numerous locations along its entire length. Immediately prior to the Medina

trunk reaching KCWTD's Medina Pump Station, flows from **Basin 2**, (via Bellevue's Medina City Hall Pump Station) and **Basin 5** (via the Parkers Pump Station) enter the trunk. All flows collected by the Medina Trunk are pumped by KCWTD's Medina Pump Station through the Medina Force Main to the Eastside Interceptor.

5.5.2 Basins Served by KCWTD's Bellevue Trunk

Sewage from **Basin 7** and **Basin 8** flows by gravity to KCWTD's Bellevue Pump Station, which pumps those flows through the Bellevue Force Main into the Bellevue Trunk. All flows from **Basin 10** are pumped into the trunk by Bellevue's Bellefield Pump Station. **Basin 11** sewage flows by gravity into this Trunk. All flows collected by the Bellevue Trunk are pumped by KCWTD's Sweyolocken Pump Station to the Eastside Interceptor. Sewage from **Basin 54** enters the Bellevue Trunk at several locations along its length, as well as directly into the Eastside Interceptor near the Sweyolocken Pump Station discharge point.

5.5.3 Basins Served by KCWTD's Enatai Interceptor

The Enatai Interceptor conveys flows from Mercer Island to KCWTD's Sweyolocken Pump Station, which pumps to the Eastside Interceptor. Sewage from Bellevue's **Basin 9** flows by gravity into the Enatai Interceptor prior to its discharge to the Sweyolocken Pump Station.

5.5.4 Basins Served by KCWTD's Factoria Trunk

All flows into the Factoria Trunk are by gravity. **Basin 41** flows enter at the upstream end of the trunk. **Basin 15** flows are the next to enter, then **Basin 24**, followed by both **Basin 14** and **Basin 19** which enter at the same point approximately halfway down the trunk. Sewage from **Basin 55** also enters this trunk at various locations along its entire length. All flows collected by this trunk are discharged to the Eastside Interceptor.

5.5.5 Basins Served by KCWTD's Issaquah Interceptor

The Issaquah Interceptor conveys sewage from the South Lake Sammamish, Vasa Park, Cougar Mountain, and Issaquah areas to KCWTD's Sunset Pump Station. Sewage from **Basin 38** flows to this interceptor by gravity at two separate points. Sewage from **Basin 57** also flows to this interceptor by gravity and enters at various locations along its length. **Basin 35** and **Basin 43** flow by gravity directly to the Sunset Pump Station, which pumps all the flows collected by the Issaquah Interceptor up to the Heathfield Pump Station, which pumps the flow to the Eastgate Trunk.

Basin 38 is also served by the South Vasa trunk, an 18" trunk sewer that crosses I-90 and connects to the Issaquah interceptor. The city recently transferred ownership of the South Vasa trunk sewer to KCWTD, because the upstream tributary area grew to surpass KCWTD's threshold for ownership.

5.5.6 Basins Served by KCWTD's Eastgate Trunk

All four basins discharging directly into the Eastgate Trunk do so by gravity. Sewage flows from both **Basin 39** and **Basin 42** enter at the upstream end of the Eastgate Trunk. Flows from **Basin 56** enter at various locations along the upper half of this trunk, followed by **Basin 32**. All the sewage collected by this trunk is discharged directly to the Lake Hills Interceptor.

5.5.7 Basins Served by KCWTD's Lake Hills Interceptor

Approximately one-third of **Basin 30** enters at the upstream end of the Lake Hills Interceptor by gravity and via KCWTD's Lake Hills Boulevard Siphon. Sewage from the Eastgate Trunk, **Basin 23** and **Basin 31** also enters at the upstream end of the Lake Hills Interceptor by gravity. Moving downstream along the interceptor, **Basin 22** flows, and then **Basin 26** flows enter the interceptor by gravity. **Basin 25**, which also transports sewage from an area of Redmond under an interlocal agreement, discharge into this interceptor. Farther downstream, **Basin 21** and the joint use Valley Creek Interceptor (shared by KCWTD and Bellevue) both discharge by gravity to the Lake Hills Interceptor at the same location. The Valley Creek Interceptor conveys sewage flows from **Basin 20**. Next, **Basin 17** (via the Midlakes Pump Station) and **Basin 18** (by gravity) connect to the interceptor at the same point. The last basin to flow into this interceptor is **Basin 16** (by gravity). Sewage from **Basin 52** flows by gravity into the interceptor at various locations. All of the sewage collected by the Lake Hills Interceptor is discharged directly to the Eastside Interceptor. Sewage from **Basin 51** discharges at several locations to both the Lake Hills Interceptor and the Eastside Interceptor near the point where the two meet.

5.5.8 Basins Served by KCWTD's Coal Creek Trunk

Sewage from **Basin 37** and **Basin 40** flows by gravity into the upstream end of the Coal Creek Trunk. **Basin 58** enters the trunk at various locations. Sewage from the eastern part of **Basin 48** flows by gravity into the Coal Creek Trunk. The Coal Creek Trunk discharges directly to the Eastside Interceptor.

5.5.9 Basins Served by KCWTD's Eastside Interceptor

Sewage from **Basin 6** flows by gravity into Kirkland and through joint-use sewer mains (shared by Kirkland and Bellevue) to KCWTD's Yarrow Bay Pump Station, which pumps directly to the Eastside Interceptor. Sewage from **Basin 12**, **Basin 13**, **Basin 50**, and **Basin**

53 flows by gravity directly into the Eastside Interceptor at several locations. **Basin 36** flows are pumped via the Newport Pump Station directly into the Eastside Interceptor. Sewage from **Basin 46** flows to the interceptor both by gravity, and from the Kimberlee Park pump station. Sewage from **Basin 45** flows to the interceptor by gravity, near where the interceptor merges with the Coal Creek Trunk. Sewage from **Basin 47** and the western part of **Basin 48** flow by gravity into the Coal Creek Utility District system and ultimately to the Eastside Interceptor.

5.5.10 Basins Served by KCWTD's Lake Hills Trunk

Sewage from **Basin 27**, **Basin 28**, **Basin 29**, and **Basin 33** flows by gravity into Redmond, through joint-use sewer mains (shared by Redmond and Bellevue) to KCWTD's Lake Hills Trunk. All flows from **Basin 34** are pumped, via Pump Station #12, into the west portion of Basin 30. Approximately two-thirds of **Basin 30** flows directly to the upstream end of the Lake Hills Trunk by gravity. All of the sewage collected by the Lake Hills Trunk is discharged to KCWTD's Lake Sammamish Interceptor.

5.5.11 Basins Served by KCWTD's Lake Sammamish Interceptor

Sewage from **Basin 44** flows into the City of Redmond's wastewater system and eventually to KCWTD's Lake Sammamish Interceptor.

CHAPTER 6
System Renewal and Replacement

This chapter addresses issues related to the aging and corresponding deterioration of the wastewater system infrastructure. Bellevue Utilities uses industry standard asset management practices to proactively identify system renewal and replacement (R&R) needs and to establish policies and programs to address those needs in a timely and cost effective manner.

6.1 Asset Management Program Framework

System renewal and replacement is predicated on asset management principles. Bellevue Utilities has a formal asset management program that follows the Environmental Protection Agency's asset management framework. The asset management program's purpose is to manage the Utilities infrastructure assets so that service levels required by regulators and expected by customers are met at optimal cost and minimal risk.

Bellevue Utilities has incorporated the five core components of the EPA asset management framework, as explained briefly here, and in more detail later in this chapter:

1. Determine The Current State of the Assets

An inventory of the assets is maintained. The inventories include age, location, condition, estimate of remaining useful life and renewal and/or replacement cost. The inventories are updated when new or missing data becomes available. Maximo is used for the computerized maintenance management system (CMMS) software. Other commercial software such as CUES Granite XP and specially developed data bases are used to augment Maximo with asset condition data.

2. Define Service Levels

Service level goals are defined which are consistent with regulatory requirements and customer expectations. High level service level indicators and more detailed asset performance indicators are monitored and compared to defined targets. The number of overflows per 100 miles of sewer main is the example of a high level service level. Tracking of assets failures by the type of the asset and failure cause is an example of more detailed performance indicators that are tracked.

3. Determine Asset Criticality and Risk

Asset criticality is determined on the basis of the failure consequences. A triple bottom line approach is considered to determine criticality. Economic, environmental and social costs are included. Condition information along with the performance of similar assets is used to estimate failure probability. Risk is the product of the failure consequences and failure probability.

4. Determine Best Operating and Maintenance (O&M) and Capital Improvement Program (CIP) Strategies

Asset condition data and asset criticality/risk are used to help identify and refine O&M and CIP strategies that are consistent with meeting the service level targets. Life cycle cost analyses are used to determine the lowest cost alternatives. Alternatives can include increased or different maintenance, repairing some component of the asset, rehabilitating the asset, asset replacement or some combination of the alternatives.

5. Determine Funding Strategy

Bellevue Utilities strives to maintain rate equity, uniformity and stability for funding of infrastructure renewal and replacement. During years of low renewal and replacement expenditures, contributions are made to the fund. The fund will be drawn down during periods of above average renewal and replacement expenditures to stabilize rate increases. R&R funds should not be used for rate relief. Debt should not be used, except to provide rate stability in the event of significantly changed circumstances, such as disasters or external mandates. New connections are assessed appropriate charges to recover the Utility's costs to provide service to benefitted customers.

6.2 Condition Assessment

Bellevue Utilities has an active condition assessment program. Condition assessment is used to help identify current renewal and replacement needs and to forecast future needs. The purpose of the condition assessment program is to identify assets that must be repaired, renewed, replaced or maintained in a different manner in order to provide the desired function. Condition assessment activities include the closed circuit television inspection of sewer mains and stubs, visual and mechanical inspection of pump station facilities and a lake line condition assessment program. Additionally, maintenance, failure and claims information is used to identify trends and potential issues.

6.2.1 Condition Assessment – Pipelines and Manholes

Bellevue Utilities videos approximately 70 miles of its sewer pipelines, about 10% of the pipeline inventory, each year. Approximately 50% of the video footage is performed to:

- inspect sewer pipelines in streets that will be overlaid or where other street improvements are planned;
- assess preventive maintenance effectiveness and schedules;
- verify that preventive maintenance contractors have performed their contracted work;
- respond to customer requests

The remaining (roughly) 50% of video work is programmatic visual inspection of sewer pipelines (mains and stubs) in the system. Prioritized based on criticality and risk, each sewer main and the stubs off of each main are videoed every 5, 10 or 20 years. The most critical sewer lines (approximately 30 miles of pipe), defined as those lines where failure would not be acceptable due to either system importance or potential effects on other systems such as Olympic Pipeline, are videoed every 5 years. The roughly 100 miles of high risk (probability of failure multiplied by consequence of failure) pipe is videoed every 10 years. The remaining sewer pipelines (roughly 400 miles) are videoed every 20 years.

Figure 6-1a: Typical video inspection

The City began targeted video inspection of sewer pipes in the 1990's. The programmatic approach to ensure that all pipelines are videoed on a regular schedule began in 2012. Through 2012, approximately 77 percent of the gravity sewer mains have been videoed.

Pipeline defects are identified and rated in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) standard. Defects that require repair are prioritized on the basis of risk.

Figure 6-1b: Video showing failed joint with infiltration

Manholes are visually inspected by Operations and Maintenance crews. To date, inspection results and a consultant recommendation have indicated that a separate manhole renewal and

replacement program is not necessary, and that the manholes can be considered part of the piped system for renewal and replacement purposes. O&M crews have an annual goal of inspecting 1/3 of the system's manholes.

6.2.2 Condition Assessment – Lake Lines

Because the lake lines are located along the Lake Washington and Lake Sammamish shorelines, condition assessment is difficult. There are not many manholes that can be used to access the lake lines. The flat slope of the lines is conducive to debris accumulation. The combination of the lack of CCTV camera access points and debris makes closed circuit television and other types of remote inspection impractical for most lake line sections.

There are approximately 14.6 miles of lake line piping in and along Lake Washington, and roughly another 4.1 miles of lake lines in Lake Sammamish. The Lake Washington lake lines were mostly installed in the 1950's, and primarily include AC and cast iron pipe. The Lake Sammamish lake lines were installed in the 1960's, and are primarily cast and ductile iron. Figure 6-2 shows the lake line pipe materials and approximate locations. Table 6-1 shows the total length of each pipe material.

Table 6-1, Lake Line Materials and Lengths

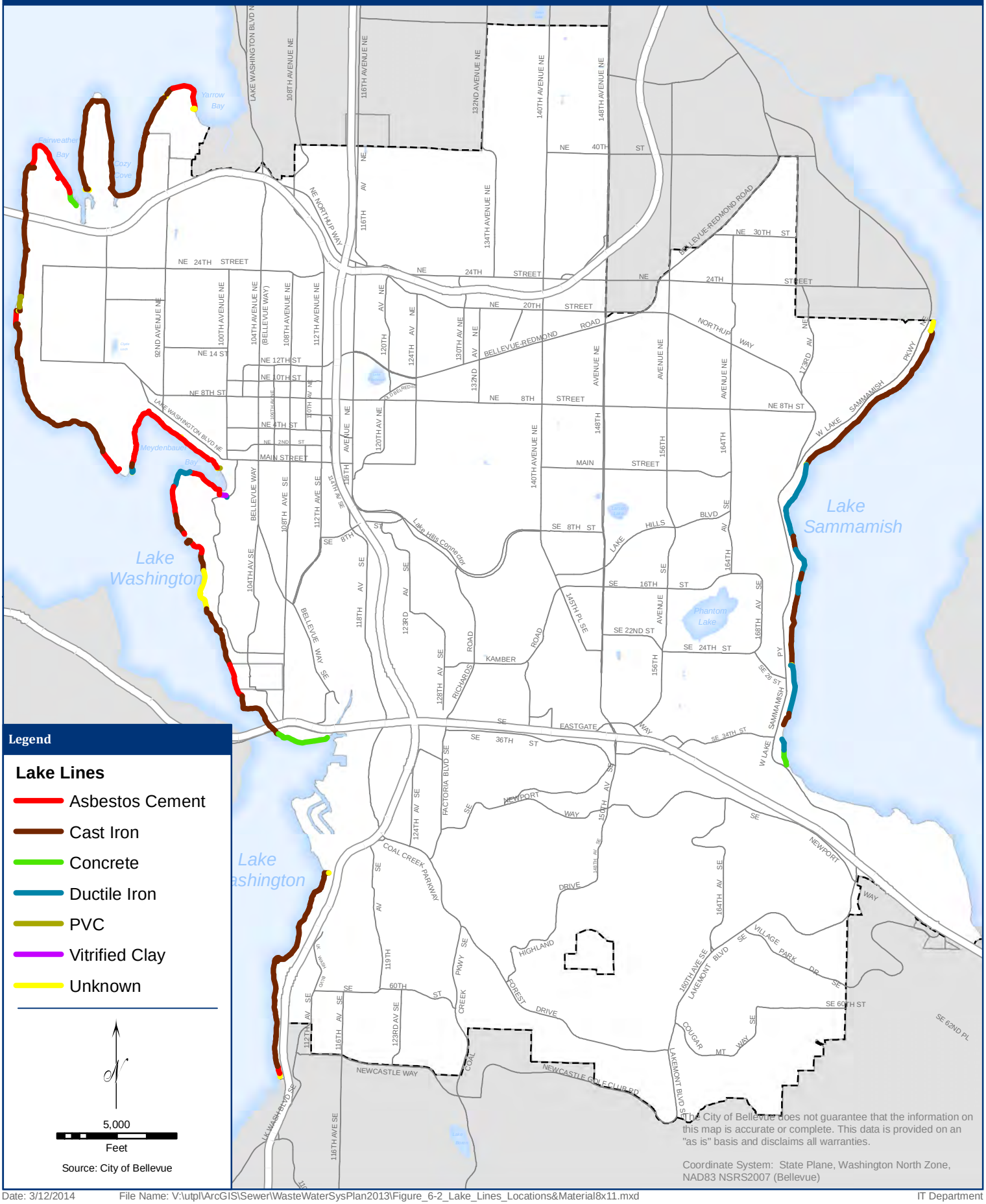
Material	Length (Feet)	Length (Miles)
Asbestos Cement	19,077	3.61
Cast Iron	62,200	11.8
Concrete	3,429	0.65
Ductile Iron	10,027	1.90
PVC	559	0.11
Vitrified Clay	324	0.06
Unknown	3,234	0.61
Total	98,850	18.7

Pipe failures or blockages in the lake lines can cause sewage releases directly into the lakes, threatening sensitive shoreline habitat, closing beaches and interrupting service to homeowners.

Lake Line Locations and Pipe Materials

Figure 6-2

City of Bellevue
GIS Services



Legend

Lake Lines

- Asbestos Cement
- Cast Iron
- Concrete
- Ductile Iron
- PVC
- Vitrified Clay
- Unknown

5,000
Feet

Source: City of Bellevue

Coordinate System: State Plane, Washington North Zone, NAD83 NSRS2007 (Bellevue)

During a 2007 video inspection of lake line pipe near Meydenbauer Bay (in Lake Washington), a segment of pipe was discovered where the crown of the pipe had completely eroded away. Subsequently, the City hired a consultant to evaluate the condition of the lake lines in and near the bay. The piping along Meydenbauer Bay is AC pipe installed in the 1950's, with cast iron fittings, wyes, and cleanouts. Destructive testing revealed that while some portions of the Meydenbauer Bay lake line are in good condition, other sections (particularly sections on land near the Bellevue Marina) had deteriorated to the point of failure. In addition, some sections of lake line piping had reduced capacity due to sediment and debris inside the pipe. Furthermore, due to the apparent fragility of the pipe, O&M staff have been advised not to jet clean the lake

Figure 6-3: Meydenbauer Bay Lake Line Deterioration

lines in Meydenbauer Bay, which could exacerbate sedimentation. In general, the investigation determined that some portions of the AC lake lines may be approaching the end of their useful life, and that a wider evaluation to support appropriate asset management decisions was advised.

Following lake line assessment in Meydenbauer Bay, the City retained another consultant to assess all of the lake lines along Lake Washington. This evaluation started in 2010 and is currently underway. The primary inspection mode is laboratory analysis of pipe coupons to determine how much deterioration has occurred and to forecast when deterioration might

require replacement. An attempt to more accurately map the lines and identify potential high points where hydrogen sulfide may have accumulated has been so far largely unsuccessful.

Elsewhere along Lake Washington (outside of Meydenbauer Bay), the Yarrow Point, Cozy Cove and Evergreen East pump stations (near Kirkland) are believed to have overflowed into Lake Washington during storm events, due to the combination of insufficient capacity in the downstream lake lines and high upstream I&I during storm events. In addition to the ongoing lake line assessment, I&I investigations in these areas is also recommended (see Chapter 9).

The Lake Sammamish lake lines, which are newer than the Lake Washington lake lines and primarily cast and ductile iron, will be assessed after the Lake Washington investigation is complete.

6.2.3 Condition Assessment – Pump and Flush Stations

All pump and flush stations are inspected monthly by O&M crews. Additionally, consultants evaluated the stations and proposed renewal and replacement recommendations in 1986 and 1992. Based on the recommendations developed in these reports, a series of pump station rehabilitation projects were completed. Since 1984, all pump stations except for Lake Heights and Wilburton have been rehabilitated (Lake Heights and Wilburton pump stations are scheduled for upgrade as part of CIP Plan No. S-16, as described in Chapter 9).

It has been almost 25 years since many stations were rehabilitated. Bellevue Utilities is currently beginning a new wastewater pump condition assessment study. The study will take an asset management-focused approach to pump station evaluation, using a more formalized life cycle cost analysis to analyze renewal and replacement alternatives. Both short and long-term renewal and replacement needs will be forecasted as part of the condition assessment process.

6.3 Service Levels

The primary metric used to define wastewater system service level is the number of wastewater overflows. An overflow is defined as whenever wastewater flows out of Bellevue Utilities' collection system to a location other than KCWTD's collection/treatment system. Overflow examples include backups into buildings and residences, overflows through manhole lids, and flows diverted into the environment. From 2000 through 2007, typically 20 to 30 overflows occurred each year. In 2001 and 2007, more than 30 overflows were recorded each year. In 2007, maintenance practices such as jetting and root sawing schedules were adjusted and the number of overflows since 2007 has been reduced to between 10 and 20 per year.

An overflow target has not yet been set. The number of overflows experienced since 2007 is low when compared to similarly sized wastewater utilities, even though few other utilities have

lake lines systems similar to Bellevue's. Also, many other utilities do not take responsibility for side sewer maintenance and replacement like Bellevue does. Although the number of overflows is down, condition assessment findings and recent capacity related overflows (during wet weather events) suggest increased overflows in the future unless infrastructure rehabilitation and replacement keeps up with the deterioration of infrastructure as it ages (recommendations for renewal and replacement are in Chapter 9).

In addition to the total number of overflows, several additional performance indicators are tracked, including:

- The causes of overflows and the type of asset responsible for overflows
- The number and amount of damage claims paid to customers as a result of sewer system failures
- The number and severity of sewer system defects identified by CCTV

Although not all of the performance indicators that are tracked directly measure customer service, they are precursors of conditions that influence customer service. The performance indicators can be used to influence asset management strategies and decisions to prevent drops in customer service levels.

6.4 Renewal and Replacement

The City recognized in the 1990's that asset renewal and replacement would be a significant future cost. Bellevue City Council established capital facilities replacement accounts to address R&R needs by ordinance (#4783) in 1995. Additional information on R&R policies can be found in the Waterworks Utility Financial Policies (Chapter 2) and in Chapter 10.

The City is now focusing on refinement of forecasted R&R needs based on condition assessment, asset criticality, capacity (forecasted growth) and coordination with other projects.

Asset repair, renewal or replacement is needed when the asset can no longer function in the manner needed to meet the Utility's service level targets. The optimal repair, renewal or replacement strategy is determined with life cycle cost analyses that consider the triple bottom line – economic, environmental and social costs and benefits.

The average age of Bellevue's wastewater system infrastructure is over 50 years old. Although some facilities will last more than 100 years, other facilities such as asbestos cement sewer mains and prefabricated metal pump stations will require replacement in as little as 50 to 60 years after installation. Although continuing growth must still be accommodated, the emphasis for Bellevue Utilities capital investment has shifted from growth-related capacity projects toward meeting renewal and replacement needs to maintain customer service levels.

The major wastewater asset classes are wastewater pipelines, lake lines, and pump and flush stations. Wastewater pipelines include on-land sewer collection mains, force mains, sewer stubs (or portion of the sewer service lines that lie within public rights-of-way), and manholes. Lake lines are comprised of approximately 19 miles of sewer mains, located along the shorelines of Lake Washington and Lake Sammamish, which serve lakefront residences and adjacent upland areas. The third asset class consists of pump and flush stations, used to pump wastewater up from low lying areas or to flush the relatively flat, low pressure lake lines.

The cost to replace all wastewater system assets is estimated to approach $1.5 billion. Technologies such as trenchless pipe rehabilitation will lessen the actual cost renewal and replacement cost somewhat. Still, approximately $1 billion is projected to be needed to renew and replace existing wastewater system infrastructure over the 75 period from 2013 through 2087.

A current estimate of the wastewater system renewal and replacement needs based on asset class and forecast replacement timing is presented in Figure 6-4. As Figure 6-5 shows, the majority of the renewal and replacement needs will be related to wastewater mains and service stubs.

Forecasted funding needs and utility rates are periodically refined, and will be adjusted following ongoing studies, including the Lake Washington lake line condition assessment and wastewater pump station evaluation.

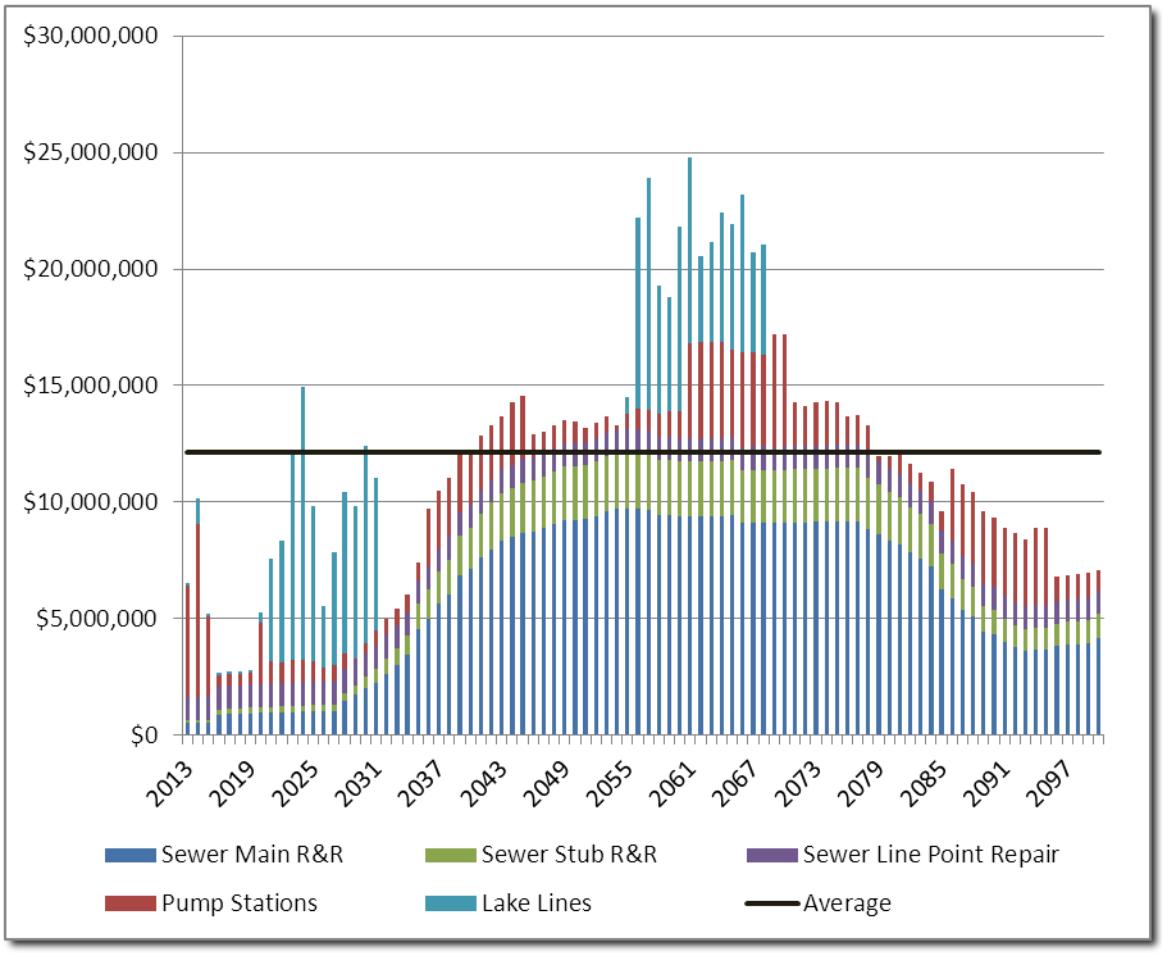


Figure 6-4. Estimated Renewal and Replacement Needs 2013 through 2100

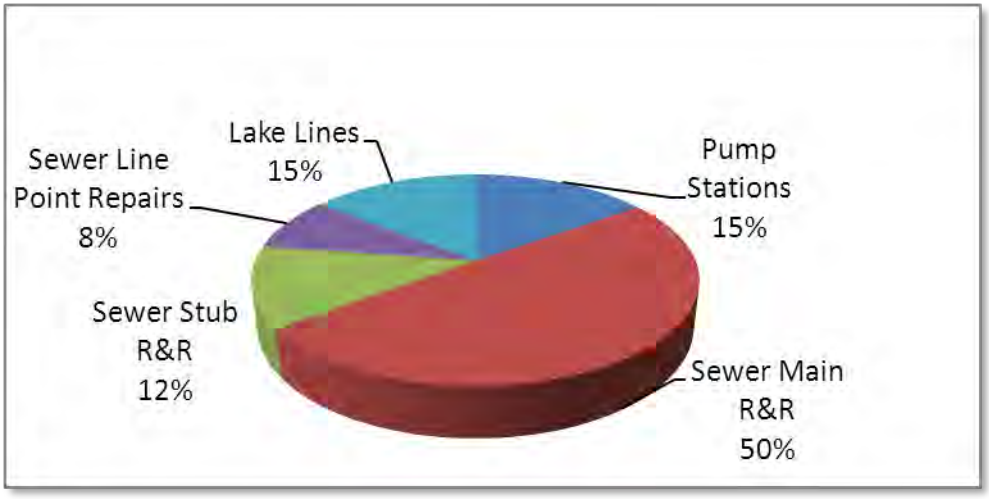


Figure 6-5. Breakdown of Wastewater System Renewal and Replacement Costs From 2013 through 2087

6.4.1 Renewal and Replacement – Wastewater Pipelines and Manholes

For long term planning purposes, sewer pipeline renewal and replacement forecasts are based on pipe material, age and diameter. There is variability and uncertainty in how long the different pipe types will last. Bellevue assumes the following average service lives for sewer pipes, as recommended by engineering consultants and in general accordance with current industry expectations (does not include lake lines):

- 150 year average life
  - PVC pipe
  - Cast iron pipe 12 inches diameter and larger
  - Ductile iron pipe 12 inches diameter and larger
  - Vitrified clay pipe
  - Polyethylene pipe
- 100 year average life
  - Concrete Pipe
  - Cast iron pipe less than 12 inches diameter
  - Ductile iron pipe less than 12 inches diameter
- 75 year average life
  - Cured in place pipe (rehabilitated pipe)
  - Unknown material

It is assumed that pipe renewal and replacement needs will occur uniformly in the period that starts 25 years before the average service life and ends 25 years after the average service life. The wastewater stubs are assumed to be renewed or replaced when the mains are replaced.

Bellevue's forecast estimates that 75% of the sewer mains can be rehabilitated with trenchless cured in place pipe (CIPP). The other 25% is assumed to require open trench replacement. Because CIPP reduces the diameter and capacity of the existing host pipe, CIPP is assumed to be feasible only once for any given pipeline. Pipe replacement is required for CIPP once it reaches the end of its service life.

Other trenchless technologies may also be employed, but would need to be evaluated on a case-by-case basis. Pipe bursting may only be feasible for existing concrete pipe. Slip-lining reduces the pipe diameter substantially, and may only be feasible for rehabilitating pipes that have excessive existing capacity.

The current planning-level estimated unit cost used by the City for replacement of a typical 8-inch main is $480 per foot. For re-lining pipes, the City currently assumes roughly $120/lineal foot for 8"-12" diameter pipe and $150/lf for 15"-18". Site-specific factors such as soil type, groundwater depth, depth of pipe, pipe location (ROW or private land), installation method, etc will cause variation in the installed unit costs for pipe. However, the City uses one average unit cost (including a significant contingency) for simplicity in planning level estimates. More

detailed cost estimates are developed during the preliminary design phase for each project, to account for site-specific factors, with a smaller level of contingency.

Larger diameter pipe replacement costs are assumed to scale in proportion to the pipe diameter. Although this assumption produces reasonable estimates for 12-inch and smaller diameter pipe, it may overstate the costs for larger diameter pipe. Although the cost estimates for larger diameter pipe will be refined, these refinements will have minimal effect on the overall renewal and replacement forecasts since almost 90% of the mains are 8-inches in diameter and more than 95% of the mains are 12-inches in diameter or smaller.

CIPP renewal costs are estimated to be 50% of the open trench replacement costs. CIPP is assumed to have an average life of 50-75 years.

6.4.1.1 Sewer Stubs

By policy, Bellevue Utilities is responsible to maintain, rehabilitate and/or replace that portion of side sewers (sewer stubs) that lie within public rights-of-way or in an easement dedicated to the utility, except in cases of sewer misuse by a customer (discharged grease, debris, etc), or when private ownership is otherwise indicated as a matter of record. Sewer stubs are difficult to maintain because most do not have cleanouts, so the only way to access the stubs is through the sewer main. Bellevue Utilities has been unable to locate side sewer maintenance equipment such as root saws that can be launched from the sewer main. Consequently, maintenance activities such as root sawing that are routine for sewer mains cannot be performed on side sewers and expensive points repairs must be done instead.

6.4.1.2 Manholes

A 2012 consultant review of the wastewater rehabilitation and replacement forecast assumptions and methodology suggested that because Bellevue has a cooler, less humid climate and has not experienced extraordinary issues with manhole deterioration, a separate manhole rehabilitation and replacement program will likely not be needed. Manhole rehabilitation or replacement should be addressed when the connecting sewer mains are rehabilitated or replaced.

6.4.1.3 Wastewater Pipeline Renewal and Replacement Programs

Through 2012, sewer pipeline renewal and replacement was funded entirely through Program S-24, Sewer System Pipeline Rehabilitation. Although the funding was used primarily to make point repairs to mains and stubs, occasionally an entire run of sewer main would need to be relined or replaced. The relining or replacement costs severely impact the resources available for point repairs. Consequently, the backlog of needed point repairs grew. An Operations and Maintenance repair crew was added in 2011, to make most point repairs that are no more than 14 feet deep and that do not require traffic control. The O&M repair crew has stabilized the repair back log. There is variability in the number of defects that is identified each year and the

number of repairs that can be made through S-24. The long term adequacy of the current defect repair resources is being assessed.

The frequency and/or severity of defects on some sewer pipelines makes relining or replacement more cost-effective from a life cycle costs comparison than continuing to make individual point repairs. Consequently, a new program, S-66, Sewer System Pipeline Replacement, began in 2013. Initially, this program will fund rehabilitation or replacement of one-half to one mile of sewer main per year. As the pipeline inventory ages, relining or replacement will become the least life cycle cost alternative for more sewer mains and funding for this program will need to increase.

6.4.2 Renewal and Replacement – Lake Lines

Some background on the lake lines and existing conditions is provided in Chapter 5, but a more detailed assessment of the Lake Washington lake lines is currently underway.

Preliminary condition assessment, failure history and maintenance records suggest that the approximately four miles of asbestos cement lake lines located in Lake Washington may be at or near the end of its service life. Although the inability to effectively remove debris in the lake lines has already caused an elevated frequency of overflows in these pipes, it is anticipated that unacceptable structural failures of these pipes could occur within about 10-15 years if they are not replaced or rehabilitated. Additional asbestos lake line samples will likely need to be analyzed before replacement needs and schedules can be more precisely determined.

A comprehensive replacement strategy that considers the interdependence of adjacent lake line sections needs to be developed for the lake lines in each lake, and for each lake line segment. Each segment of lake line between flush stations will likely need to be replaced all at once, because the flush stations function to flush the entire segment before the wastewater is pumped to the gravity system. The site-specific nature of each lake line segment creates uncertainty about which replacement alternative and which lake line materials would be most appropriate for each segment.

Lake line systems such as Bellevue's are not very common, so estimating renewal and replacement costs is difficult. Based on a project in Mercer Island where the lake lines were replaced with new in-lake pipes, replacement is estimated to be on the order of $1,500 per foot. A replacement cost of $1,500 per foot implies that the total cost to replace the lake lines in both Lake Washington and Lake Sammamish will approach $150 million.

Lake line replacement costs and scheduling will significantly impact wastewater system R&R resource needs. Currently, subject to the results of the Lake Washington lake line condition assessment results, it is anticipated that the asbestos cement and older cast iron lake lines that are primarily located in Lake Washington will be replaced from 2021 through 2031. The newer

ductile iron lake lines which are located in Lake Sammamish would be replaced from 2055 to 2068.

The first Lake line replacement project is funded by Program S-58, Sewer Lake line Replacement Program. Approximately 1100 feet of asbestos cement lake line in Meydenbauer Beach Park will be replaced in approximately 2016, pending re-design of the park by the Parks Department.

6.4.3 Renewal and Replacement – Pump and Flush Stations

For forecasting purposes, pump stations are assumed to require renewal every 25 years. The pump station long term replacement forecast for mechanical and electrical equipment assumes a service life of 100 years for reinforced concrete stations and 50 years for prefabricated stations. The service life estimates and renewal and replacement cost estimates will be modified to reflect the station-specific findings of pump station evaluations now underway. In addition to normal rehabilitation issues such as deterioration, equipment obsolescence and safety, pump station modifications may need to consider hydraulic capacity and emergency power requirements.

Eighteen stations are approaching or have reached the 25 year mark since they were last rehabilitated. These stations will likely require rehabilitation in the near future. Sewer pump station rehabilitation and replacement is funded through Program S-16, Sewer Pump Station Improvements.

Table 6-2, Proposed Pump Station Rehabilitation Schedule[1]

Pump Station	Installed	Most Recent Rehab	Next Rehab[2]
Wilburton	1978	---	2016
Cedar Terrace	1985	---	2017
Lake Hills #17	1966	1987	2017
Lake Hills #18	1966	1987	2018
Lake Hills #19	1966	1987	2018
Parkers	1952	1987	2019
Cozy Cove	1960	1988	2019
Evergreen East Lift	1960	1988	2020
Evergreen West Lift	1960	1988	2020
Fairweather Basin	1960	1988	2021
Hunt's Point Lift	1960	1988	2021
Lake Hills #6	1988	1988	2022
Lake Hills #7	1988	1988	2022
Lake Crest Lift	1960	1988	2023
Medina City Hall	1960	1988	2023
Newport Lift	1964	1988	2024
Newport Pump	1964	1988	2024
Yarrow Point Lift	Unk	1988	2025
Lake Hills #4	1991	1991	2025
Grange	1993	1993	2026
Lake Hills #16	Unk	1994	2026
Lakemont	1994	1994	2027
Palisades	1968	1994	2027
Bagley[3]	1968	1995	2028
Killarney	1966	1995	2028
Meydenbauer	1960	1995	2029
Pleasure Point	1968	1996	2029
Eastgate #1	1968	2000	2030
Eastgate #2	1968	2000	2031
Lake Hills #12	1963	2003	2032
Kimberlee Park	1993	2007	2036
Southridge		2007	2036
Emerald Ridge	1982	2011	2037
Lake Heights	1948	---	2015
Midlakes[3]	2015	N/A	2040
Bellefield[3]	2015	N/A	2041

1. Schedule is based on a recommended increase in rehabilitation frequency to 2 pump stations per year, as part of CIP S-16. Current funding allows for roughly 1 pump station per year.
2. An engineering consultant is currently evaluating all pump stations installed or rehabilitated more than 10 years ago. The results of this evaluation will be used to change pump station priority to account for actual physical conditions, parts obsolescence, failure consequences and capacity problems.
3. Existing pump station will be replaced with a new pump station (in lieu of rehabilitation)

Table 6-2, Proposed Flush Station Rehabilitation Schedule[1]

Pump Station	Installed	Most Recent Rehab	Next Rehab[2]
Flush Station 3	1999	1999	2030
Flush Station 9	1975	2000	2031
Flush Station 10	1968	2000	2032
Flush Station 1	early 1960's	2003	2033
Flush Station 2	early 1960's	2003	2033
Flush Station 4	early 1960's	2003	2034
Flush Station 6	mid 1960's	2003	2034
Flush Station 7	mid 1960's	2003	2035
Flush Station 8		2003	2035
Flush Station 5	approx 1955	2014	2039

1. Schedule is based on a recommended increase in rehabilitation frequency to 2 pump stations per year, as part of CIP S-16. Current funding allows for roughly 1 pump station per year.
2. An engineering consultant is currently evaluating all pump stations installed or rehabilitated more than 10 years ago. The results of this evaluation will be used to change pump station priority to account for actual physical conditions, parts obsolescence, failure consequences and capacity problems.

6.5 Renewal and Replacement Funding Strategy

The City of Bellevue has financial policies in place to fund the planned renewal and replacement (R&R) of its sewage collection system (see Chapter 2). In order to provide as much intergenerational equity as feasible with respect to paying for asset renewal and replacement, Bellevue Utilities maintains a renewal and replacement fund. The objective is to contribute to the renewal and replacement when renewal and replacement needs are below average and to withdraw from the fund when the needs are above average.

A consultant recently reviewed the Bellevue Utilities renewal and replacement funding forecasts and funding adequacy. The consultant concluded that, in general, the renewal and replacement service life expectancies and cost estimates were in line with industry standards. Specific recommendations for improving the forecasts that will be implemented include:

- Use wastewater pipe replacement cost data developed by King County for the larger diameter pipelines when Bellevue does not have significant cost data

- Estimate sewer stub replacement costs on a "per stub" basis instead of using a percentage of the main replacement cost

- Refine pump station costs so they are based on station size and criticality. Base expected pump station service life on station type (e.g., 100 years for reinforced concrete stations, 50 years for prefabricated package stations) until station-specific studies are completed

Because the majority of the renewal and replacement forecast costs are for smaller diameter sewer mains, implementation of these recommendations is not expected to significantly affect the long range forecast. A more significant impact would be any changes to timing of the lake line replacements driven by new information identified by the condition assessments.

The consultant recommended that if the Bellevue Utilities wishes to avoid sharp rate hikes and debt financing, a commitment must be made to continue making contributions to the R&R fund and not to defer contributions. Figure 6-6 shows the projected renewal and replacement fund balance over time, providing that the commitment to maintaining generational equity is maintained.

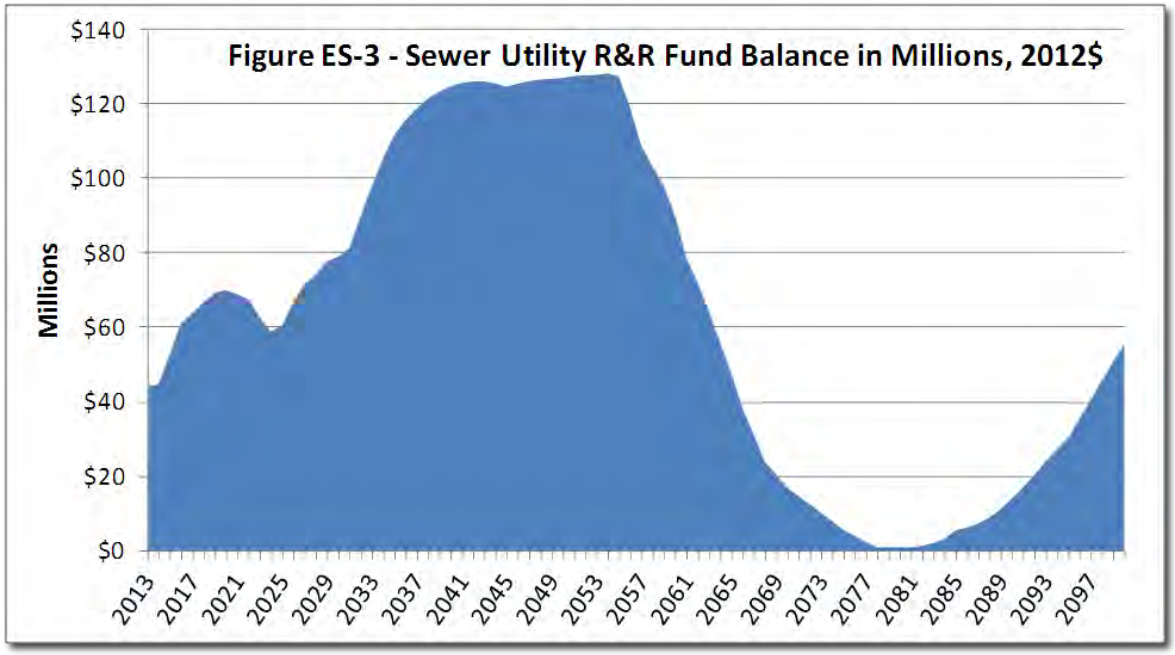


Figure 6-6. Projected Renewal and Replacement Fund Balance

CHAPTER 7
System Hydraulic Analysis

7.1 Introduction

The City of Bellevue uses The United States Environmental Protection Agency's Storm Water Management Model (SWMM) modeling software to hydraulically analyze flow and capacity in the wastewater system. As part of this Wastewater System Plan update, the hydraulic modeling efforts included re-examining the modeling criteria and assumptions, followed by analysis of pertinent sewer basins and recommendations for improvements.

Modeling analysis and results are summarized below. Discussion of flow-related critera and assumptions can be found in Chapters 3 and 4, and recommendations for improvements are listed in Chapter 9.

7.2 Modeling Approach

The City models its sewer system to identify pipes that may have capacity problems as sewage flows increase with population growth and system aging over time. Bellevue uses a conservative approach to forecasting flows, to allow early identification of potential capacity constraints, and to avoid under-sizing new piping for a 100+ year design life. The following is a summary of the most significant modeling criteria used:

- Model for ultimate flows at build-out, meaning all properties are assumed to be developed to their maximum potential density based on zoning.
- Assume an occupancy rate of 100% for both commercial and residential development.
- Undeveloped properties are assumed to develop to the highest density allowed under the Bellevue Comprehensive Land Use Plan.
- Use I&I flow data estimated from King County's 2002 I&I study, plus 28% to account for additional flow as pipes continue to age.
- City of Bellevue Sanitary Sewer Engineering Standard S3-01.4 is used as the criteria for analyzing pipe capacity:
    - For existing piping, potential capacity problems are identified where pipes are at least 75% full at peak flow.
    - New pipes are designed to be 50% full at forecasted peak flows.

If the model predicts pipe capacity problems using these conservative parameters, further investigation is done to confirm or refute the likelihood of future capacity problems. This process allows for identifying and prioritizing areas for further analysis, while helping to avoid unnecessary capital expense. Subsequent investigation consists primarily of:

- Flow monitoring to determine actual current flows and estimate I&I influence, and
- Examining the remaining practical development potential of the tributary area to forecast actual anticipated flows over time.

The remaining practical development potential is based on forecasting by PCD and the Puget Sound Regional Council. Typically this assumes that only 90% occupancy and 75% of redevelopment potential is realized recognizing that not every property is developed to the highest use allowed by underlying zoning.

Further investigation is performed in areas zoned for mixed-use buildings as development is proposed, because the ratio of residential to commercial development has a significant impact on flow projections. This ratio is determined by future developers and cannot be known in advance. This affects the downtown area in particular, but also affects the Bel-Red corridor due to recent re-zoning in that area. Initial assumptions made by the City for long-range planning (prior to development proposals) are discussed in Chapter 3.

7.2.1 Modeled Trunks and Basins

Because Bellevue has a minimum pipe diameter standard of 8 inches, the upper reaches of the conveyance system provide ample capacity for peak flows. Therefore, only trunk lines (pipes which collect flow from other pipes) where flow capacity could be an issue are modeled. The wastewater conveyance system consists of approximately 525 miles of sewer pipe ranging in size up to 24 inches, of which about 90 percent are 8 inches or less. Approximately 18 percent of the system's pipes have been modeled.

The study area is divided into 57 basins as described in Chapter 5. Several of these basins contain only short pipe runs that drain relatively small areas. Because of minimum pipe size and slope standards, these pipes provide ample capacity for peak flows and are not modeled. The "minor" basins are 33, 44, 47, 48, 50, 51, 52, 53, 54, 55, 56, 57, and 58.

Each of the 44 remaining wastewater basins (the "major" basins) is further divided up into sub-basins to facilitate sanitary sewer flow generation in the hydraulic model. Each sub-basin is defined such that it contains a single land use category, and so that its entire geographic area drains to a single modeled pipe.

7.3 Modeling Results and Recommendations

The 2002 Comprehensive Wastewater Plan provided detailed hydraulic analysis results for the 42 major wastewater basins in the City's service area at the time (prior to acquiring additional basins from Coal Creek Utility District). Capacity improvements were recommended in three areas – a trunk line in basin 7, a trunk line and pump station in basin 10, and a trunk line in basin 25. Since 2002, the improvements in basin 7 and 25 have been completed. The improvements in basin 10 (CIP S-52 and S-53) were delayed pending route selection for Sound Transit's East Link light rail project (due to potential conflicts), but are now in design. All of the parameters used to determine wastewater flows were revisited as part of the development of this Plan update. Chapter 4 contains a discussion of those parameters. The hydraulic model's depiction of the piping system, and the sub-basin characteristics, boundaries and flow entry points to the system were reviewed.

In developing this plan, the hydraulic model's depiction of the piping system and sub-basin characteristics, boundaries and flow entry points to the system were reviewed. As a result of this review, the model files required some modification. The switch to SWMM was made because it was determined to be more cost efficient than HYDRA. Model files were converted from the HYDRA model to SWMM format, which resulted in minimal changes to analysis results. The effectiveness of SWMM should be occasionally reevaluated as new features are added to the program or new needs arise.

Basins were considered as having a potential capacity problem if the SWMM model predicted overflowing or significant surcharging in the basin. (Significant surcharging was defined as multiple nodes surcharging more than 1 ft above crown of pipe) Potential capacity problems were identified in 23 of the 44 modeled basins. These basins are listed in Table 7-1. After identifying basins with potential capacity problems, these basins were analyzed by comparing the model results to actual flow that had been observed through flow monitoring. Further investigation was determined to be necessary in 11 of the 23 basins. These 11 basins were discussed with engineering and operations & maintenance staff, and recommendations were developed taking into account the model results, observed flow, and field experience.

Table 7 - 1: Basins with Potential Capacity Problems

Basin Number	Further Investigation Recommended	Recommendation
1	Y	Capacity Improvements and I&I Investigation
2	N	---
3	Y	Capacity Improvements and I&I Investigation
4	N	---
5	N	---
7	Y	Flow Monitoring
10	N	Capacity Improvements and I&I Investigation
19	Y	Flow Monitoring
20	Y	I&I Investigation and Flow Monitoring
22	Y	No Action Required
23	N	---
25	N	---
30	N	---
31	Y	Capacity Improvements and I&I Investigation
34	Y	No Action Required
35	Y	Flow Monitoring
36	Y	Capacity Improvements and I&I Investigation
37	N	---
38	N	---
39	Y	I&I Investigation
40	Y	I&I Investigation
41	Y	I&I Investigation
42	N	---

7.3.1 Basins Requiring No Action

Although it was determined that further investigation would be required for basins 22 and 34, this investigation concluded that no action would be necessary. This was due to either the model being conservative when estimating pipe capacity, or flow monitoring being sufficiently higher than predicted flow combined with no issues of surcharging or flooding from field experience and observations.

7.3.2 Basins Requiring Flow Monitoring

Flow monitoring is recommended in basins 7, 19, 20 and 35. Generally, these areas are a concern because of the inconclusive model results and King County flow monitoring results. More information is needed to confirm whether there is a problem that needs to be addressed. In these particular areas, there have been no field observations of surcharge, or the problem is expected 5+ years in the future. Flow monitoring will help verify modeling results and determine if these pipes will require capacity improvements. These basins are discussed in detail below.

7.3.2.1 Basin 7

There are two pipe sections in Basin 7 (downtown) that the model predicts may not have sufficient capacity at build out.

The first section runs underneath 100th Ave NE, along the western side of the basin, collecting flows from the residential areas next to downtown. These are 8 inch concrete pipes with a slope of about 1%. The model shows surcharging of 5-10 feet, and the water level comes to about 2-3 feet from the surface level. About 500 GPM of the 650 GPM total flow is I&I in the model, however there has not been flow monitoring done on this section of pipe. Flow monitoring will confirm whether the pipe is currently or will become under capacity, and whether reducing I&I or capacity improvements will be necessary.

The second section of pipes are near the south end of the basin on Bellevue Way SE just south of Main St, and carry about 1500 GPM of wastewater. These pipes are 15 inch concrete pipes with a slope of about .15%. The model shows surcharging of less than 1 foot in the model at build out. Flow monitoring will help calibrate the model in this trunk in the quickly growing, high density downtown area.

7.3.2.2 Basin 19

Basin 19 includes a trunk line that runs north-south in the vicinity of Glendale Golf Course and Kelsey Creek. This trunk line is predicted to have insufficient capacity at buildout in the model, based on conservative assumptions. The trunk is mostly 10-12 inch pipe of an unknown material with a slope of .5%-1%. This is an area that is fairly close to build out.

The model predicts flooding of about 100,000 gallons at four nodes, and surcharging of 5 to 10 feet in many places. However, field crews have not observed any flooding or surcharging issues, and

there have been no reported overflows. Flow monitoring should confirm or deny if there is a capacity shortage, and will help to calibrate the model for future predictions.

7.3.2.3 Basin 20

A 3,000 foot section of sewer main located along Valley Creek in Basin 20 (Bridle Trails neighborhood) is estimated to be at capacity during a peak storm event, based on flow monitoring results. However, no known sewer overflows have been observed. The section has an estimated capacity of about 350-400 GPM at the flattest segment, based on pipe size and slope, and peak flow was observed at approximately 390 GPM.

At this time, level sensing is recommended to monitor for potential surcharging, and longer-term, more comprehensive flow monitoring is recommended to refine I&I estimates and verify previous studies.

7.3.2.4 Basin 35

Basin 35 includes a section of pipe along West Lake Sammamish Parkway SE that is predicted to have inadequate capacity in buildout conditions. The model predicts one node flooding about 6,000 gallons and surcharging of about 5 feet. These pipes have about a .5% slope. Near Vasa Park the pipe reduces from 15-inch PVC upstream down to 10-inch AC downstream before discharging into KCWTD's interceptor, in an area where overflows are difficult to detect. Flow and surcharge level monitoring is recommended to determine if overflows are occurring.

7.3.3 Basins Requiring I&I Investigation

I&I investigation is recommended in basins 1, 3, 10, 20, 31, 36, 39, 40 and 41. This should generally consist of finding sources of I&I, the approximate amount of I&I from each source, and evaluating the costs and benefits of resolving the sources of I&I compared to a capital project to increase capacity. Any I&I investigation will include some sort of flow monitoring.

7.3.3.1 Basins 1 and 3

Basins 1 and 3 have had several confirmed overflows at pump stations over the last 5 years. These overflows generally occur due to insufficient capacity in the flat lake lines which serve as trunk lines for the basins. Basins 1 and 3 have an I&I rate of about 5,500 gallons per acre per day (gpad) and 2,000 gpad respectively. Additionally, field reports at various pump stations in the basins show that the I&I accumulates very quickly. This suggests that a significant portion of the I&I is coming from either unauthorized roof drainage or other surface water sources as opposed to water that must first infiltrate through the ground before it can enter a cracked pipeline. Because of the high I&I rate and the speed at which it occurs, an I&I investigation is recommended to determine if a reduction of I&I would be a more cost efficient solution than a capital project at preventing overflows.

7.3.3.2 Basin 20

Although no known overflows have been observed in Basin 20, the Valley Creek sewer main is believed to be at full capacity during peak storm events, as described above.

In addition to flow monitoring, I&I investigations are recommended to determine if peak flows can be effectively reduced, to mitigate the potential risk of overflows and avoid the need for capacity improvements.

7.3.3.3 Basin 31

Portions of Basin 31 are believed to be at full capacity during peak storm events, based on flow monitoring data and estimated pipe capacity. In addition to now receiving re-routed discharge flows from Pump Station No. 4 (described below), significantly high I&I has been observed in Basin 31 (including upstream of (Pump Station No. 4).

Although no known overflows have been observed in Basin 31, I&I investigations are recommended to determine if a cost-efficient near-term solution can be found to reduce the potential risk of overflows in Basin 31, until Pump Station No. 4 flows can be re-routed.

7.3.3.4 Basin 36

Pipes downstream of Newport lift station in Basin 36 do not have sufficient capacity to handle flow from the lift station during large enough storm events, resulting in multiple overflows into Lake Washington in the last five years. The basin wide I&I rate is about 2500 GPM. About 300 GPM of flow is I&I and 100 GPM is sanitary into Newport lift station. Pipes downstream of the pump station have a capacity of about 350 GPM. An I&I investigation is recommended to determine if a reduction of I&I would be a more cost efficient solution than a capital project at preventing overflows.

7.3.3.5 Basins 39, 40 and 41

Basin 39 has had overflows into private property due to under capacity pipes and excessive I&I twice in the last 5 years, during major storm events. The I&I rates in these basins are 4,000 and 5,000 gpad respectively. To help prevent these overflows, a high flow bypass was installed in 2011. While there have been no overflows since the bypass was installed, the model predicts surcharging of about 5 feet at most nodes downstream of the bypass, which comes within 1 foot of surface level. A small section of Basin 39 has been previously tested for I&I, and some unauthorized connections have been resolved. An I&I investigation into the areas of Basin 39 and 41 which are upstream of the bypass or the outlet of the bypass will determine if the bypass is sufficient to prevent overflows, and determine if any I&I is coming from unauthorized connections.

The 2001 King County I&I investigation indicated very high I&I in Basin 40 (approximately 10,000 gpad), however the 2010 study did not replicate these findings (roughly 1,800 gpad estimated). It is

recommended that further study be conducted to establish predictable flows with a higher degree of confidence, to allow better calibration of the hydraulic model.

7.3.4 Basins Requiring Capacity Improvements

Some form of capital project is recommended in the following basins, to address apparent existing capacity problems. Additional capacity improvements in other basins may also be required, contingent upon results of flow monitoring and I&I investigations described above.

7.3.4.1 Basins 1 and 3

Known overflows have occurred in Basins 1 and 3, as described above. If I&I investigations do not indicated a more cost-effective alternative, then capacity improvements will be required to avoid future overflows into Lake Washington.

7.3.4.2 Basin 10

Recommended improvements to address capacity problems due to anticipated development in Basin 10 include the following existing CIP projects:

- East CBD Trunk Capacity Improvements (Existing CIP Plan No. S-52)
- Bellefield Pump Station Capacity Improvements, Phase II (Existing CIP Plan No. S-53)
- Wilburton Sewer Capacity Upgrade (Existing CIP Plan No. S-60)

These projects are necessary due to planned growth in the eastern portion of downtown (east of approximately 108th Ave NE/SE) and recently re-zoned land in the Wilburton area (particularly along 116th Ave NE/SE).

7.3.4.3 Basin 31

At least twenty years ago, the Pump Station No. 4 discharge was diverted to Basin 31 from Basin 30. The diversion was requested by KCWTD because there was insufficient capacity in the KCWTD Lake Sammamish Interceptor that collects Basin 30 flows. KCWTD has indicated that they intend to increase the capacity in the Lake Sammamish Interceptor, but this project was recently delayed for at least several more years.

The diversion caused two problems for the City of Bellevue. The first problem is that sedimentation now occurs in Bellevue's 18-inch pipeline in Basin 30, which used to be downstream of the pump station and no longer carries sufficient flow to flush debris. This pipeline now requires frequent cleaning by O&M staff. The second problem is that, although no known overflows have occurred, Basin 31 is now believed to be flowing at roughly full capacity during periods of peak I&I.

It is recommended that the City re-route the Pump Station No. 4 discharge back to Basin 30 when KCWTD's Lake Sammamish Interceptor again has adequate capacity. Re-diversion should alleviate both the Basin 30 sedimentation problem and the Basin 31 capacity problem. Re-diversion would require changes in valve positioning , inspection of the old force main to verify that it is in adequate condition, potentially some pipe rehabilitation, and confirmation that the pumps at Pump Station No. 4 can handle the increased head. In addition, Pump Station No. 4 was last rehabilitated in 1991, so rehabilitation is expected to be needed again within the next five to ten years.

7.3.4.4 Basin 36

Known overflows have occurred in Basin 36, as described above. If I&I investigations do not indicated a more cost-effective alternative, then capacity improvements will be required to avoid future overflows into Cascade Key and Lake Washington.

This Page is Intentionally Blank

CHAPTER 8
Operations and Maintenance

This chapter discusses current City of Bellevue wastewater utility operations and maintenance programs. A description of the Utilities Department's organizational structure, including the role of the Operations & Maintenance Division is provided in Chapter 1.

8.1 Routine Operations

Routine operations involve the development and analysis of procedures to ensure that wastewater system facilities are operated properly and are functioning efficiently. When local system failures occur for any reason, the Utility's practice is to work continuously until proper system function is restored. Dedicated staff members are on call 24 hours a day so that necessary repairs to the system can be made promptly.

The City maintains a catalog of standard operating procedures to assure efficient and consistent practices.

8.1.1 Annual Maintenance Plan

The Operations and Maintenance Division prepares an annual maintenance plan that describes various tasks and how much of each task is expected to be performed in that year. The plan is also used as an analysis tool for evaluating the services provided, appropriate levels of service, and necessary resources. The maintenance plan provides improved workload forecasting. Long term uses for the plan include analysis of multi-year trends and management self-audits.

8.1.2 Safety

City employees are provided with appropriate safety and personal protective equipment for the tasks and work environments they encounter as part of their jobs. Staff members are also provided with necessary training to ensure that they understand and practice all applicable safety regulations.

Safety procedures meet or exceed all OSHA, state, and federal standards of the industry for maintenance and construction. Safety legislation is tracked by the City's Risk Management

Office assuring compliance interdepartmentally. Routine safety meetings are held every month to review hazards and responses with an emphasis on accident prevention and safety awareness. All maintenance personnel attend these meetings.

Table 8-1, Certified Wastewater Utility Maintenance Services Staff

Current # of Positions	Title	Certification	Level
1	Operations Manager		
1	Utilities Assistant Director – O&M		
1	Operations Manager (Water, Wastewater, Storm Drainage)		
1	Wastewater Operations Superintendent	WWCPA	I
1	Senior Engineering Technician	WWCPA	II
1	Crew Leader	WWCPA	II
1	Crew Leader	WWCPA	I
1	Technical Specialist Pump Ops.	WWCPA	III
2	Technical Specialist Pump Ops.	WWCPA	I
1	Technical Specialist Condition Assessment	WWCPA	II
1	Technical Specialist Condition Assessment	WWCPA	I
1	Lead Worker Programs	WWCPA	I
1	Skilled Worker	WWCPA	II
8	Skilled Worker	WWCPA	I
1	Maintenance Worker	WWCPA	I
2	Maintenance Worker		

Note: WWCPA = Washington Wastewater Collection Personnel Association.

8.1.3 Urgent Problem Response

Utility staff are available on standby 24 hours per day to respond to urgent problems according to prescribed standard operating procedures. These problems include unexpected pipeline or equipment failure, localized pipeline restrictions, sanitary sewer overflows, and lines accidentally dug up by a contractor.

8.1.4 Power Outage Response

On-site backup generators are installed at 12 pump stations, based on a historical assessment of where continuous service was determined to be the most critical. This assessment (in 1990) evaluated the frequency, magnitude and causes of overflows, and prioritized facilities based on where the associated costs and impacts to the community provided the most value. At this time, approximately 50% of the City's wastewater pumping capacity has on-site backup power.

For the remaining pump stations, portable generators are used as a backup power source, and typically provide power within ninety minutes of notification of power failure.

Permanent on-site power is proposed to be added at an additional 3 pump stations as part of the City's current CIP Plan, as described in Chapter 9. The additional generators will free up staff resources in the event of a City-wide power outage where ice, fallen trees, or other hazards make portable generator access to remote pump stations difficult. They will improve the Utility's ability to maintain customer service, and reduce the opportunity for sewage overflows due to power outages.

8.1.5 Security

The Sewer Utility has instituted multiple security measures to manage the potential risks of vandalism and sabotage.

Security for the wastewater utility's SCADA network is provided by isolating the system, controlling access, regularly scanning internal and external drives, and similar measures. The SCADA system has no internet connectivity, to preclude opportunity for system hacking. Credentials are required both to physically access the SCADA computers, and to log into the system. File transfer to/from the system is only allowed on USB drives that have been scanned and certified "clean" by the Utility's telemetry security group.

Physical security is provided at the wastewater utility's sites through locks, intrusion alarms, and other measures. Alarms are sent to pagers as well as to the SCADA system.

8.2 Records and Data Management

The Operations and Maintenance Division uses the Maximo electronic database system as a tool to capture and process information about the wastewater system and the activities associated with its operations and maintenance. Maximo has two basic functions: workload planning and performance reporting. The Maximo system allows tracking of labor and equipment needs in terms of work orders for a particular task or group of tasks throughout the year. Maximo is used as a guide to project financial and manpower requirements and the frequency of maintenance events. Maximo is also used to record failure information. A list of wastewater task items is used to track work performed.

8.2.1 Record Keeping

A record of all maintenance and work order requests is retained in the Maximo program. Each task item has a budget and is tracked for manpower and resource requirements quarterly. Work Orders track the cause of problems and are linked to other work plan categories for department labor and resource management. When crews perform Work Orders, files are checked for previous responses to identify the history at the location or asset. If discrepancies are found on as-built drawings, corrections are reviewed and plotted as redlines on existing maps and records, and then sent to the Utility's mapping staff for revision. Hard copy as-builts of Utility facilities are scanned and saved to a network drive. They are available to the public in the City's Permit Center.

Video records of sewer inspections are stored in the city's the Electronic Content Management System, and linked to Granite XP software by the asset number for each pipe, for easy retrieval. Granite XP is a user interface software program that is used to view sewer inspection videos.

8.2.2 System Operation and Performance Data

Telemetry data from pump station events are transmitted to the SCADA (Supervisory Control and Data Acquisition) system in the city's telemetry center. An additional SCADA computer is located in the Wastewater section. This data includes the operational status of each pump and generator and the status of various station alarms, wet well levels, pump set points and lead/lag pump alternation throughout the sewer system. The time of each change in status is recorded. This allows tracking of pump and generator run times, the duration of alarm conditions, and when alarms are acknowledged by an operator. The data reporting software provides access to the detailed data for the previous week. Other reporting options produce summaries of the data on an hourly or daily basis for any time period stored on the system. Information telemetered from all pump stations began to be stored on the system during 1992. Currently all data received since 1992 is available for creating reports or for data analysis

The City's telemetry data management system can be accessed to obtain pump station operation data tables, trending historical data and current on-line data. The utility maintains up-to-date pump station operations manuals that document system operation. This data is used to help evaluate actual system performance under a variety of operational conditions.

8.2.3 Work Requests and Customer Complaints

Requests for work are generated from three different sources. Roughly one quarter come from citizens, about half come from City staff, and the remainder are for preventive maintenance activities. All work request data is tracked using the Utility's maintenance management information system (Maximo).

The most common work requests from citizens are related to sewer backups, requests for information, and private companies notifying the Utility that they have cleared a customer's side sewer blockage into the main. Customers are notified of planned work or the results of their request by phone or field contact.

The City receives very few odor complaints. Three wastewater pump stations (Bellefield, Bagley and #12) are equipped with odor control facilities. The only known sewer system odor problem occurs infrequently on NE 4th Street, above KCWTD's Medina Force Main, and only when KCWTD's nearby odor control facility is off-line. The odor control facility is located where the Medina Force Main drains to KCWTD's Eastside Interceptor (near Main Street and 116th Ave NE), and odor is generally not detectable on NE 4th Street when the facility is operating.

Work requests are scheduled by a crew leader according to priority. Urgent request response is immediate. Secondary priority response is typically within forty-eight hours.

8.2.3.1 Locates

Underground sewer line locations are identified on request to prevent damage by contractors. Personnel operate on an on-call basis for emergency response. Locates are marked in the field based on Utility maps and as-builts, and existing records are updated with new information when new systems are added or discrepancies are discovered.

8.2.3.2 Investigative Tasks

Investigative tasks include video inspection of pipes, flow monitoring, dye testing and smoke testing. Since these tasks are primarily used to identify structural problems and defects, investigate I & I, and provide general condition assessment of the sewer system, they are addressed in Chapter 6, System Renewal and Replacement.

8.3 Preventive Maintenance

Regular inspection and maintenance of system components such as pump and flush stations, manholes, pipelines, and lakelines are scheduled to prevent equipment failure. In general, repairs or maintenance are made to equipment on scheduled visits to a facility, provided the work can be done without interrupting facility operation. Other repairs are scheduled for a later time, when impact on the system can be minimized. Regular inspection and cleaning is scheduled for manholes and pipelines to prevent blockages or structural failure.

8.3.1 Pump Stations

All pump stations are on a monthly maintenance schedule. Inspection and wet well maintenance is performed the first ten business days of each month and scheduled repairs and maintenance activities are performed during the remainder of the month. At each visit, maintenance personnel perform routine minor repairs, clean and lubricate pumps, controls, and all pumping appurtenances. Wet wells are hosed down several times until sludge and debris are discharged. Pump run hours and amp/cycles are recorded in an inspection log.

Telemetry equipment is maintained and tested by simulating alarms, running tests on telemetering boxes and verifying telemetry headquarters alarms. Telemetry output is reviewed daily for early warning of problems likely to result in an alarm, and pre-emptive action is taken if necessary.

Pumps are scheduled for internal cleaning whenever monthly inspection or telemetry records indicate a significant reduction in performance. Typically, three to four pumps in the system are lifted each week for cleaning. Other periodic maintenance includes exercising auxiliary power generators and checking odor control equipment.

Maintenance personnel carry written inspection and maintenance procedure checklists for most other processes. Inspection information is currently maintained in hard copy files and tracked by the Maximo system to provide a record of maintenance costs and to identify trends.

8.3.2 Flush Stations

Flush stations are maintained in the same manner as other pump stations. Flush stations are checked monthly to see that pumps, motors, dehumidifiers, and the 24-hour clock are working properly. The 24-hour clock controls operation of the flush station. The flush stations are not currently linked to the telemetry system; however, cell phone communication provides remote control of on/off capabilities.

Replacement of flush station inlet screens was proposed as a maintenance activity in 2003, to mitigate the risk of pulling debris or wildlife through the pumps. This potential improvement was abandoned because Washington Department of Fish and Wildlife indicated it would trigger a requirement to extend the inlets farther into the lakes, to a minimum 20-feet depth, at an estimated cost of $500,000 per flush station. Since that time, flush station operational impacts from inlet debris have been less than anticipated, and are handled on a case-by-case basis by contracted divers when needed.

8.3.3 Pipelines

Where specific problems are identified, pipelines are cleaned by rodding, flushing, biotreatment, and/or high pressure jet-rodding (jetting). Rodding removes stoppages in sewer lines using power mechanical equipment, hand rods, or an electric snake. Flushing runs large volumes of water through mainlines to scour pipe walls where sedimentation or grease solidification has occurred due to low scouring velocities and where jetting is impossible due to radical directional changes in pipeline or the presence of low slope side sewer connections. Jetting cleans out trapped debris with a high-pressure, high-velocity water hose.

The inspection/cleaning schedule for each pipeline depends on its history of problems and its associated criticality. Pipelines that are susceptible to blockage, for example those with very low slope which are subject to grease accumulation and sedimentation, are scheduled for frequent visual inspections and cleaning. Most of these pipelines are serviced once a month; some are serviced quarterly. Other examples of pipelines requiring frequent inspections include those pipelines downstream from industrial sites or apartment complexes with high flow volumes, lines in easements, lines with extensive root intrusion, and pipelines in critical locations with poor access.

8.3.4 Special Pipelines

Special case pipelines include lake lines, siphons, and force mains. All of these lines have limited access, complicating preventive maintenance activities.

Lake lines are very low slope lines located along the shores of Lake Washington and Lake Sammamish. The lake lines collect sanitary flow from lakeshore properties and adjacent upland areas. Flush stations are used to push the sewage collected by these lines to a series of lift and pump stations due to the relatively flat piping installation. These flows are eventually pumped into the gravity sewer system. Lake lines are cleaned primarily on an immediate response basis, but several lake lines are on a regular cleaning schedule due to past observed overflows and/or tendency for sedimentation. Cleanouts are opened and visually inspected for grease buildup. Changes in accessibility are recorded.

Siphons are serviced monthly. Grease and sediment are removed from the dosing chamber where one exists. Force mains are checked only when a problem is suspected.

8.3.5 Manholes

Manhole inspections are included as part of an ongoing manhole survey program. All manholes are visually inspected for structural defects, system problems, and accessibility. The goal is to visually inspect one-third of the system annually. Certain “critical” manholes near streams, lakes, and other critical area buffers are surveyed on a more frequent basis. This continuing

program of inspections allows the City to maintain manholes in good condition, increase personnel familiarity with the system, and decrease the City's liability.

Inspection information is recorded in the City's Maximo database, including manhole condition, work completed, and work needed. If defects or grease accumulations are identified, maintenance is scheduled. Manholes are cleaned if there is evidence of surcharging. An automated manhole survey checklist is used to assure consistent investigation and identification of items that will need repair.

8.4 Fats, Oils and Grease/Industrial Waste Program

The City takes a proactive approach to reducing the problems of fats, oils and grease (FOG) in the system. The objectives of the FOG program are to keep non-sewage discharges out of the system, identify the responsible party once they have entered the system and correct the behavior or require pretreatment through escalating enforcement. FOG discharges include polar fats from animal waste and non-polar fats such as oils from automobiles. These objectives are achieved by requiring pretreatment systems to be installed at businesses that generate these discharges. These facilities are installed and maintained by the waste producers with periodic City inspection. Pretreatment systems are required by Bellevue's Sewer Code through the development review process.

Table 8-2 lists the industrial dischargers located in Bellevue that are permitted by the King County Industrial Waste Program (KCIW). In general the discharge characteristics are similar to that of any gas station remediation site or dairy/soda manufacturing in that there is a potential for caustics or a pH that has the potential to contribute to premature degradation of the collection system. KCIW enforces conditions of discharge permits to ensure discharges do not adversely affect local or regional systems.

Through a cooperative agreement with the Building Authority, the installation, sizing, and approval of FOG pretreatment systems is determined by Utilities water quality staff and inspected by Utilities staff or by plumbing inspectors from the City's Development Services Department. The program's focus is on commercial facilities, food service and automotive establishments. Once equipment is installed customers are sent an annual notice reminding them of maintenance needs and requesting the details be voluntarily submitted to the Utilities. The information is managed in a database.

Table 8-2, Permitted Industrial Dischargers

Business Name	Permit Type	Business Type	Address
Cummings and Lutes LLC dba Arscentia	LETTER OF AUTHORIZATION	PHOTO PROCESSING	13037 BEL-RED ROAD, SUITE 100
King County WTD - Eastgate Interceptor Rehabilitation Project	LETTER OF AUTHORIZATION	CONSTRUCTION DEWATERING	160TH AVENUE SE TO 154TH AVENUE SE
L & M Services	LETTER OF AUTHORIZATION	GENERAL TYPE	1600 132ND AVENUE NE SUITE 150
Sound Transit - East Link Geotechnical Investigation	LETTER OF AUTHORIZATION	CONSTRUCTION DEWATERING	110TH AVENUE NE AND 6TH STREET
Avalon Bay Communities Inc. - Avalon Square	MAJOR DISCHARGE AUTHORIZATION	GROUNDWATER REMEDIATION - PETROLEUM	10410 NE 2ND STREET
Bellevue, City of - Decant Facility (120thNE)	MAJOR DISCHARGE AUTHORIZATION	DECANT STATION	120 TH NE & BELLEVUE-REDMOND ROAD
Bellevue, City of - Decant Facility (NE 6thStreet)	MAJOR DISCHARGE AUTHORIZATION	DECANT STATION	NE 6TH STREET & 148TH AVE NE
Bellevue, City of - Eastgate Landfill	MAJOR DISCHARGE AUTHORIZATION	SOLID WASTE - LANDFILL	150TH AVE SE & SE 26TH STREET
Bellevue, City of - Eastgate Maintenance Yard	MAJOR DISCHARGE AUTHORIZATION	DECANT STATION	4001 135TH AVENUE SE
Evered Motors Inc.	MAJOR DISCHARGE AUTHORIZATION	GROUNDWATER REMEDIATION -PETROLEUM	420 116TH AVE NE
ExxonMobil Oil Corporation - Site 7-4090 (DA4042)	MAJOR DISCHARGE AUTHORIZATION	GROUNDWATER REMEDIATION - PETROLEUM	10122 NE 8TH STREET
ExxonMobil Oil Corporation - Site 99-BLV (DA4177)	MAJOR DISCHARGE AUTHORIZATION	GROUNDWATER REMEDIATION - PETROLEUM	1500 145TH PLACE SOUTHEAST
Metro Transit Bellevue Base	MAJOR DISCHARGE AUTHORIZATION	TRANSPORTATION FACILITY	1790 - 124TH AVENUE NE
Metro Transit East Base	MAJOR DISCHARGE AUTHORIZATION	TRANSPORTATION FACILITY	1975 - 124TH NE
Safeway Inc. - Bread Plant	MAJOR DISCHARGE AUTHORIZATION	FOOD PROCESSING-BAKERY	2100 120TH AVENUE NE
Bellevue Park II LLC Construction Site	MINOR DISCHARGE AUTHORIZATION	CONSTRUCTION DEWATERING	10203 NE FIRST STREET
Overlake Hospital Medical Center	MINOR DISCHARGE AUTHORIZATION	HOSPITAL	1035 116TH AVENUE NE
Bellevue, City of - Fire Department Training Center	NO CONTROL DOCUMENT REQUIRED	GENERAL TYPE	1838 116TH AVENUE NE
JBC Designs	NO CONTROL DOCUMENT REQUIRED	GENERAL TYPE	13411 NE 20TH
Coca-Cola Bottling Company of Washington	PERMIT	FOOD PROCESSING-SOFT DRINKS	1150 124TH AVENUE NE
King County SWD - Factoria Transfer Station	PERMIT	SOLID WASTE - TRANSFER FAC	13800 SE 32ND ST.
Safeway Inc. - Beverage Plant	PERMIT	FOOD PROCESSING-SOFT DRINKS	1500 124TH AVE NE
Safeway Inc. - Milk and Ice Cream Plant	PERMIT	FOOD PROCESSING-DAIRY	1723 124TH AVENUE NE

Grease problems are handled through a combination of regularly scheduled sewer main cleaning activities and targeted education and enforcement of known or suspected grease producing dischargers. Bellevue's sewer code provides authority to require customers who generate fats, oils, and grease to install pretreatment units at their establishments.

Water quality and maintenance staff routinely coordinate to maintain clean lines and identify problem waste producers. Interactive GIS mapping is being developed to help identify and prioritize education and enforcement of pretreatment requirements. This GIS mapping will collate information from maintenance activities into a visual representation of grease issues, help determine grease producing areas, and program effectiveness.

8.4.1 Industrial Waste/Other Prohibited Discharges

Other prohibited discharges include sediments and pollutants from construction dewatering or industrial discharges, as well as, chemicals, rags or debris ("ragging"). King County Industrial Waste, as the lead approval agency, works with Utilities staff in a cooperative program to review and approve the discharge location and volume for construction dewatering. Ragging issues and other illegal discharges are generally identified by maintenance personnel and referred to the Water Quality section for education and enforcement.

8.5 Emergency Procedures

The prioritized emergency response objectives of the wastewater utility are to 1) protect life, 2) protect health and safety; property; and 3) protect the environment.

The City has an Emergency Operations Plan which defines emergency management organization, responsibilities, and procedures for all City functions in the event of an emergency or disaster. The plan provides for coordinated response to emergencies among all City departments, as well as with county, state and federal agencies, and adjacent jurisdictions. The City's plan is supplemented by the Utilities Department's Emergency Response Book (aka Red Book). This book describes how Bellevue Utilities Department staff will respond to an emergency, including functions and responsibilities of personnel, procedures to be followed, maps of the area, means of establishing communications between various organizations, and lists of people to contact during an emergency.

Wastewater Utility personnel have been instructed that, in case of an emergency, they should first ensure their family's safety and then report to work. During an emergency, the Utility first attempts to locate any problems such as obstructed sewer mains that are reported by either the public or by utility personnel sent out to assess the system. Utility personnel also perform critical site assessments and report any damage. The Assistant Director for Operations and Maintenance is responsible for implementing the Utility's emergency response program.

8.6 Maintenance-Driven Capital Projects

Areas of recurring operation or maintenance problems are regularly discussed and evaluated for consideration of possible design improvements or capital investment projects to address them. Potential projects may be identified in prioritization studies/meetings, asset management condition assessments, and other forums.

Potential projects are discussed at monthly meetings of the department's Technical Team, which is comprised primarily of lead staff from the Engineering and Operations/Maintenance Divisions. The Technical Team evaluates the appropriateness of proposed capital project solutions based on staff research and recommendations.

Capital project alternatives are evaluated using life cycle cost analyses that consider the economic, environmental and social costs and benefits. Criteria considered when determining if a capital project is the appropriate way to address a particular problem include:

- Ability of the capital project to resolve the problem so that expected customer service levels are provided;
- Claims history associated with the problem and the estimated effect of the capital project on future claims;
- Expected maintenance costs with and without the capital project implementation;
- Capital project cost;
- Environmental and social costs and benefits of the capital project; and
- Availability of other options for reducing the maintenance effort;

Most of the capital project recommendations that result from this process are constructed under either the City's pipeline renewal and replacement CIP program (which is discussed in more detail in Chapter 9), or the Minor Capital Improvement Program, intended to resolve unanticipated system issues that are not too large in scope.

This Page is Intentionally Blank

CHAPTER 9
Recommended System Improvements

Recommended wastewater system improvements fall into three general categories:

- **Existing System Capacity Improvements**. These projects address known or potential system capacity or reliability problems in the existing system.
- **System Capacity Expansion to meet Planned Growth**. These projects and programs address projected system capacity problems due to forecasted future development.
- **Infrastructure Renewal and Replacement**: These projects and programs are intended to reduce the number and severity of system failures due to age.

Within each of these categories, some projects and programs are recommendations that are currently funded in the City's Capital Investment Program (CIP), while others are proposed new recommendations to address emerging issues. Specific recommendations are listed below:

- Recommended Programs and Improvements to address capacity concerns in the existing system:
    - Flow Monitoring to corroborate Model Results (New Program)
    - I&I Investigations (New Program)
    - Add On-site Power at Sewer Pump Stations (Existing CIP Plan No. S-59)
    - Capacity Projects if I&I Investigation does not Resolve Capacity Concerns:
        - Newport Capacity Improvements (New Project)
        - Fairweather Basin Capacity Improvements (New Project)
        - Cozy Cove Basin Capacity Improvements (New Project)
        - Other Basins as indicated

- Recommended System Capacity Expansion to meet Planned Growth:
    - Sewer Service Extensions Program (Existing CIP Plan No. S-30)
    - East CBD Trunk Capacity Improvements (Existing CIP Plan No. S-52)
    - Bellefield Pump Station Capacity Improvements, Phase II (Existing CIP Plan No. S-53)
    - Wilburton Sewer Capacity Upgrade (Existing CIP Plan No. S-60)
    - Midlakes Pump Station Capacity Improvement (Existing CIP Plan No. S-61)
    - Utility Facilities for 120th Ave NE Segment 2 (Existing CIP Plan No. S-63)

- Recommended Infrastructure Renewal and Replacement:
  - Downtown Park Sewer Pipe Replacement (Proposed for existing CIP S-66)
  - Asbestos Cement Force Main Replacement Program (Proposed New CIP Program)
  - Sewage Pump Station Improvements (Existing CIP Plan No. S-16)
  - Sewer System Trunk Rehabilitation Program (Existing CIP Plan No. S-24)
  - Minor Capital Improvement Projects (Existing CIP Plan No. S-32)
  - Sewer Lake Line Replacement Program (Existing CIP Plan No. S-58)
  - Sewer System Pipeline Replacement (Existing CIP Plan No. S-66)

Allocated funding and/or estimated costs, as well as a summary of each recommended project and program are provided below.

In addition to current recommendations, the status of projects recommended in the 2002 Bellevue Comprehensive Wastewater Plan and the 1999 CCUD Comprehensive Sewer Plan are summarized below and in Appendix D.

Bellevue's Sewer Utility Capital Investment Program (CIP) is a separate, Council-adopted document that prioritizes projects and identifies project funding for a 7-year period. The CIP provides for orderly system expansion and improved system reliability and integrity in conformance with utility policies explained in Chapter 2. Project schedules and the allocation of funds for projects and programs are reevaluated and prioritized during each CIP update every two years, concurrent with the City's operating budget development. The 2013-2019 CIP is included in Appendix E.

9.1 Basis for Cost Estimates

Cost estimates in this Plan are "planning level" estimates and, as such, have been prepared without detailed engineering data. The cost estimates presented reflect the "most probable" capital cost. Actual project costs can be expected to vary by as much as +50 percent to -30 percent. Project costs estimates vary due to design changes made during preparation of final engineering plans and specifications, and as a result of changes in the cost of materials, labor, and equipment.

The capital cost includes the estimated construction cost, the construction contingency, state and local sales tax, and costs for administrative, engineering, financial and legal services. Costs for land and rights-of-way were not included in this analysis. The construction contingency is an allowance for undefined items. This allowance is intended to cover costs that are almost certain to be incurred and therefore is an integral part of the estimate.

Costs cited in this report are based on preliminary layouts of the proposed projects and are stated in 2013 dollars.

9.2 Project Funding

Currently funded CIP projects and programs are presented in Tables 9-1 and 9-2, with detailed information provided in Appendix E. These program and project funding levels are consistent with the City's currently adopted (2013-2019) CIP. The funding priorities shown can be expected to change and should not be construed as a commitment by the City to fund a particular program at the level shown. The City updates the 7-year CIP, with detailed funding sources and project scheduling, every 2 years. The most current Council-adopted 7-year CIP plan should be referenced to determine actual project commitment schedules. During each update, all proposed CIP projects are evaluated against specific criteria and available resources, they are then prioritized, funded, and scheduled accordingly.

The City funds several ongoing capital programs with annual funding allocations. The annual budgets for these projects were established based on the City's experience and/or studies to determine anticipated needs. Table 9-1 lists ongoing programs with average anticipated annual funding. These on-going capital programs are also summarized later in Chapter 9 and in Appendix E.

Table 9-1, Currently Funded Ongoing Capital Improvement Programs

CIP Plan Number	Program Description	Approximate Annual Budget (2013 dollars)[1]
S-16	Sewage Pump Station Improvements	$480,000
S-24	Sewer System Pipeline Rehabilitation[2]	$1,687,000
S-30	Sewer Service Extensions	$399,000
S-32	Minor Capital Improvement Projects	$148,000
S-58	Sewer Lake Line Replacement Program[3]	$113,000
S-66	Sewer System Pipeline Replacement	$1,040,000
	TOTAL ANNUAL COSTS	$3,867,000

1. Funding increases annually to account for inflation.
2. S-24 funding is currently funded at approximately $1,176,000 in 2013, but $1,687,000 annually thereafter.
3. S-58 is currently funded at approximately $1,194,000 in 2013 and $651,000 in 2014 to replace approximately 1,300-feet of lake line in Meydenbauer Bay, but $113,000 annually thereafter is budgeted for ongoing condition assessment.

Table 9-2 lists recommended singular capital projects (not ongoing programs) that are currently funded, with the total funding currently allocated to each. These projects are also summarized later in Chapter 9 and in Appendix E.

Table 9-2, Currently Funded Capital Improvement Projects

CIP Plan Number	Project Description	Approx. Total Budget[1,2]	Approx. Schedule for Completion
S-52	East CBD Trunk Capacity Improvements	$2,894,000	2015
S-53	Bellefield Pump Station Capacity Improvement	$9,984,000	2016
S-59	Add On-site Power at Sewer Pump Stations	$1,228,000	2020
S-60	Wilburton Sewer Capacity Upgrade	$5,322,000	2016
S-61	Midlakes Pump Station Capacity Improvements[3]	$4,001,000	TBD[2]
S-63	Utility Facilities for 120th Ave NE Segment II	$1,170,000	2016
	TOTAL	$24,600,000	

1. Only the project costs incurred by the City of Bellevue's Sewer Utility are shown.
2. Total budget for specific (not ongoing) capital projects is not adjusted to 2013 dollars. Budget for future years is added as future dollars without applying the discount rate.
3. The Midlakes pump station capacity improvements construction schedule will be determined based on actual Bel-Red corridor growth, to maximize asset life of the existing pump station. Design of the capacity improvemnets is scheduled for 2014.

9.3 Recommended Future Projects

Proposed projects and programs (not currently funded) to address emerging issues are shown in Table 9-3. These projects are identified in Chapter 7, System Hydraulic Analysis, and are summarized later in Chapter 9.

Table 9-3, Proposed Projects and Investigational Activities

Program Description	Estimated Total Funding Required (2013 dollars)
Flow Monitoring to Corroborate Computer Model Results[1]	$120,000
I&I Investigations to Optimize Efficiency of Capital Investment[2]	$855,000
Asbestos Cement Force Main Replacement Program; Initially at Lake Hills #6 and Lake Hills #12 Pump Stations[3]	$1,500,000
TOTAL	$2,475,000

1. Assumes 6 months of continuous flow monitoring at 6 locations, plus purchase of one portable manhole depth recorder.
2. Assumes 30,000-ft of I&I investigation in each of 8 basins (240,000-ft total). Does not include the City's costs for community education and I&I elimination programs.
3. Assumes 3,000-ft of 8" pipe at Pump Station No. 12 and 800-ft of 8" pipe at Pump Station No. 6

9.4 Existing System Capacity Improvements

The projects and programs described below address known or potential system capacity or reliability problems in the existing system.

9.4.1 Flow Monitoring to Corroborate Computer Model Results

There are a few areas in the system where surcharging or overflows have not been observed, but where hydraulic modeling results indicate there may be capacity problems. These areas are shown in Figure 9-1 and include:

- In Bellevue Way, south of Main Street to SE 3rd Street (Basin 7)
- In 100th Ave NE, from Main Street to NE 8th Street (Basin 7)
- Kelsey Creek and Glendale Golf Course (Basin 19)
- Vasa Park, near discharge to King County interceptor (Basin 35)
- Bridle Trails, along Valley Creek between NE 48th St and NE 37th St (Basin 20)

Flow monitoring and manhole depth measurement are recommended to determine whether capacity problems actually exist in these locations, or if the hydraulic modeling assumptions are too conservative. Flow monitoring would also allow more accurate calibration of peak flows, and ascertain whether I & I is a significant source of capacity constraints.

9.4.2 I&I Investigations

Sewer mains or pump stations have experienced surcharging in some areas where flow monitoring or other observations suggest relatively high I&I. The source and magnitude of I&I should be investigated through smoke testing, dye testing, video inspection, and other measures. The goal of I&I investigations would be to identify and alleviate I&I and potentially reduce surcharging to the point that costly capacity improvements might be avoided. This program would implement and be consistent with the Utility's Inflow and Infiltration Monitoring and Reduction policy, as described in Chapter 2.

O&M staff report anecdotally that I&I may spike quickly in these areas following the start of rain, which implies inflow (improper, direct connection of sump pumps and drains) may be a larger factor than infiltration (groundwater leaks into pipes and manholes).

Areas recommended for I&I investigations are shown in Figure 9-1 and include the following:

- Basin 31
- Basins 39, 40 and 41 (Eastgate/Somerset/Factoria)
- Newport (Basin 36)
- Near Cozy Cove, Evergreen East, and Yarrow Point Pump Stations (Basins 1 and 3)
- Wilburton (Basin 10)

Public education and involvement will be critical, to help locate and correct improper connections to the sanitary sewer. Although the City has code authority to assess fines if necessary, a collaborative approach that involves working with homeowners to understand the consequences of I&I and identify and disconnect improper sump pump, roof drain and parking lot connections is generally a more effective strategy.

9.4.3 Fairweather and Cozy Cove (Basins 1 and 3) Capacity Improvements

If I&I investigation does not yield sufficient, cost effective flow reduction, then capital projects to increase sewer capacity in the Fairweather and Cozy Cove basins will be needed. These improvements may entail increased capacity at Yarrow Point, Cozy Cove, and/or Evergreen East Pump Stations, as well as increased lake line pipe sizing. The scope and priority of capacity improvements would be refined following I&I investigations.

9.4.4 Newport Capacity Improvements

If I&I investigation does not yield sufficient, cost effective flow reduction, then capital projects to increase sewer capacity in the Newport area will be needed. Pipelines downstream of Newport Lift Station do not have sufficient capacity to handle flow from the lift station during large storms. During extreme events (when I&I is highest), this piping overflows and sewage is conveyed through the storm system to Cascade Key and Lake Washington.

9.4.4.1 Add On-site Power at Sewer Pump Stations

This project will add on-site power generation capability at three high priority pumping stations which currently rely on portable generators during power outages. Specific locations will be selected based on analysis of the likelihood and consequence of sewage overflows, giving consideration to volume of base flow versus wet well capacity; proximity to surface water bodies; and geographic distance from portable equipment.

Twenty-three of Bellevue's thirty-eight pump and lift stations rely on portable power generation equipment during extended power outages. As a result, staff and equipment resources have been stretched during large storm events with massive losses of power, such as during and following the December 2006 windstorm.

On-site generation would more readily prevent sewage overflows, comply with DOE and DOH regulations, protect the City from violations of the NPDES Municipal Stormwater Permit, minimize closures of public and private beaches, minimize public health and safety risks, and free up staff for other storm response.

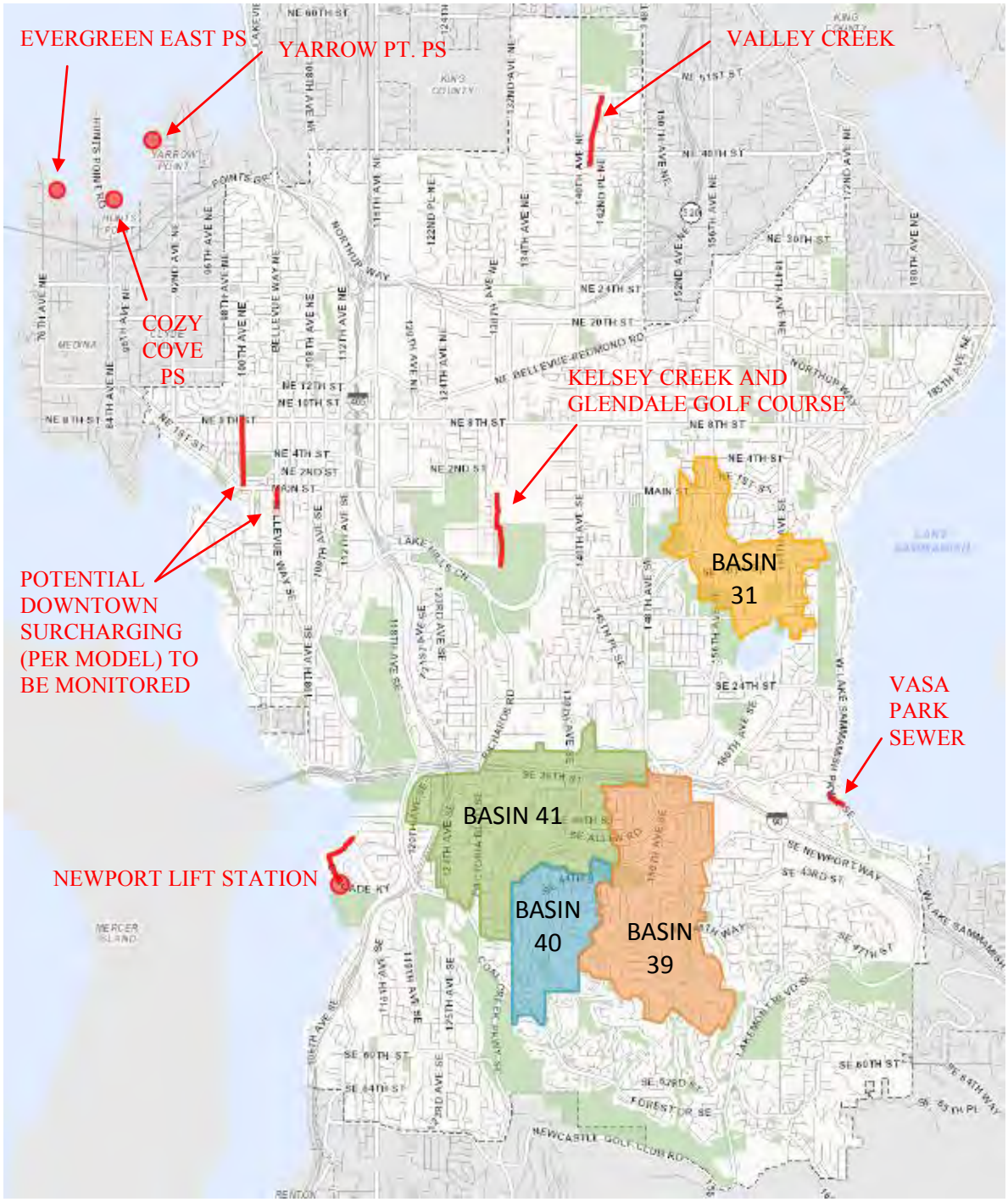


Figure 9-1: Recommended Locations for Flow Monitoring and/or I&I Investigation

9.5 System Capacity Expansion to meet Planned Growth

The projects and programs below address projected system capacity constraints due to forecasted future development. Except for the first program which may occur throughout the service area, project locations are illustrated in Figure 9-2. Project costs for capacity projects are recovered from benefitting properties as they are redeveloped.

These projects are consistent with City Comprehensive Plan Policy UT-4, which indicates utility system capacity should not determine land use. The current wastewater system capacity would limit Wilburton redevelopment.

9.5.1 Sewer Service Extensions Program

Bellevue's ongoing Sewer Service Extensions Program is funded by CIP Plan #S-30. Past projects completed as part of this program are listed in Table D-3.

This program facilitates orderly extension of the sewer system, which local, county, and state policies encourage, and provides an affordable option for customers who might otherwise not be able to develop their property. Projects are typically constructed in areas where the City is approached by affected property owners or in conjunction with other Utility or roadway construction. Each project requires majority support of affected property owners, except when health or safety is at risk. The program eliminates dependence on septic systems by providing sewer service. It reduces costs and disruption to communities when constructed in conjunction with other projects.

Property owner interest fluctuates annually, resulting in some years with no construction, and other years with substantial new construction. As the sewer system approaches build-out, fewer requests for sewer system extension are anticipated. Benefited properties pay their share of the project costs through connection charges when they connect.

9.5.2 East CBD Trunk Capacity Improvements

This project will replace approximately 1,600 feet of sewer pipe in 112th Ave NE with larger diameter pipelines to convey sewage generated from planned growth in the eastern side of downtown Bellevue (generally east of 110th Ave NE). This project (Bellevue CIP Plan #S-52) has been delayed (see Section 9.4), but is now moving forward following a decision on Sound Transit's East Link light rail alignment.

9.5.3 Bellefield Pump Station Capacity Improvements (Phase II)

Phase II of the Bellefield Pump Station Expansion is needed to provide adequate capacity for ultimate development on the eastern side of downtown Bellevue. The project includes construction of a new pump station and force main, followed by demolition of the existing pump station. Project design is proceeding. The project is funded under CIP Plan #S-53.

9.5.3.1 Wilburton Sewer Capacity Upgrade

This project will replace up to approximately 4,200 feet of existing 12-inch and 16-inch diameter pipe with larger diameter pipe to provide sufficient capacity for anticipated upstream development. Design alternatives which achieve similar objectives will be evaluated during pre-design.

This project is needed to provide sufficient sewer capacity to allow planned re-development within the Wilburton area. This redevelopment involves changing land uses from primarily automobile sales lots to office, retail, multi-family residential, and hotels, that require more sewer capacity. Portions of the existing trunk are currently at capacity. Redevelopment that would increase sewer flows to this trunk line cannot be allowed until the trunk capacity is increased.

Subsequent I&I investigation is also recommended as listed below. I&I investigation is recommended to avoid surcharging and prolong the useful life of the downstream 16-inch diameter pipe in SE 8th Street, which was installed circa 1983.

9.5.3.2 Midlakes Pump Station Capacity Improvements

The existing station can pump 800 gallons of sewage/day (gpd), just sufficient for the light industrial zoning in the area it has served since its original construction in 1968. Planned development in the Bel-Red Corridor includes residential housing and retail shops which will generate much more sewage. A limited amount of redevelopment can occur before the pump station capacity must be increased, to avoid significant risk of sewage overflow to the West Tributary of Kelsey Creek.

This project will increase the station capacity to 1,100 gpd, sufficient until 2030, depending on the rate of re-development. Design is proposed for completion in 2014. Construction could be completed as early as 2016, however it may be deferred until actual building permits for the Bel-Red corridor indicate a near-term need for expanded capacity. That portion of the project cost associated with replacing the existing capacity would not be collected from connection charges to re-developing properties, since the station would require significant retrofit to replace old facilities and equipment even without expansion.

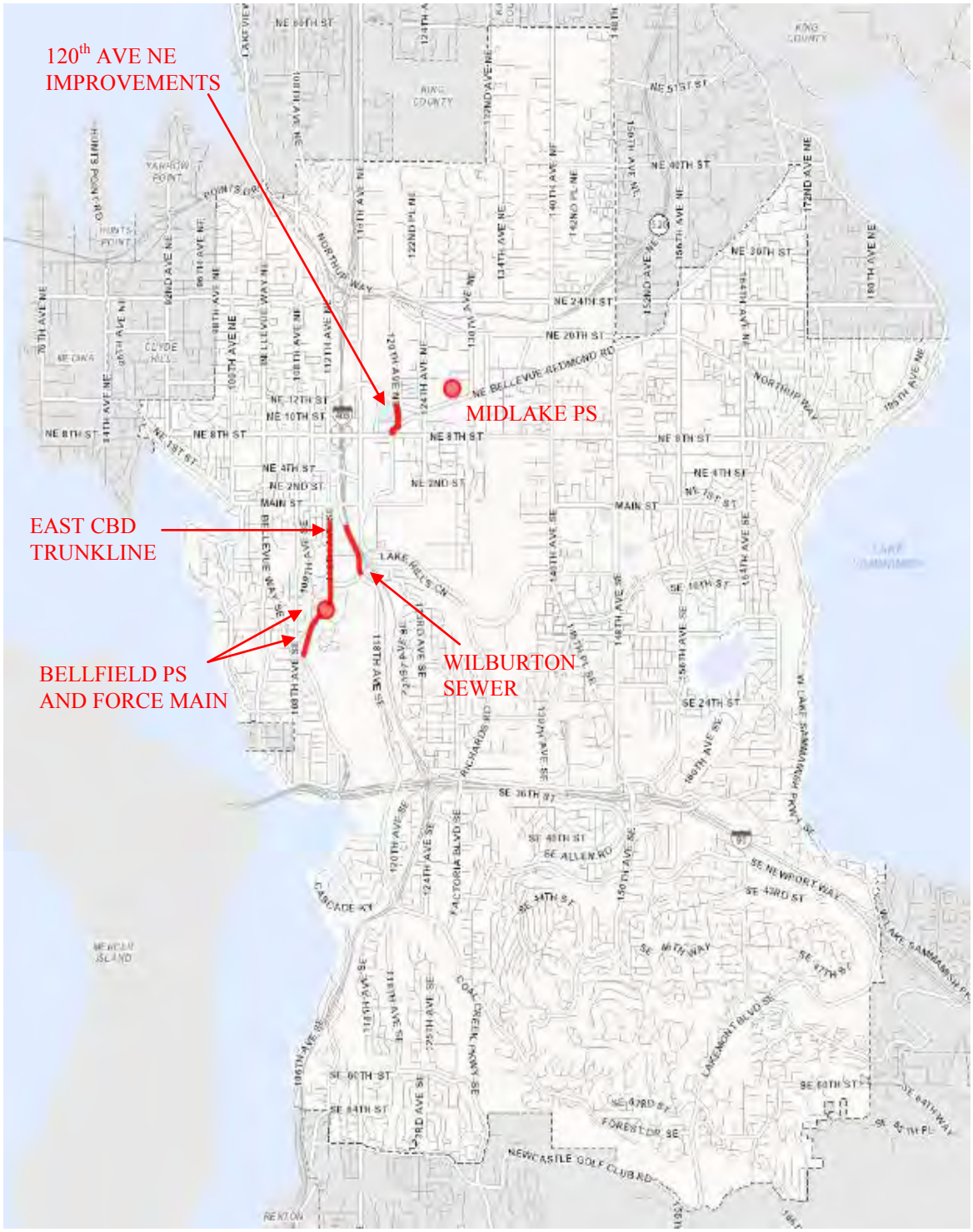


Figure 9-2: Recommended Capacity Improvements

9.5.4 Sewer Facilities for 120th Ave NE Improvements (Segment 2)

Much of 120th Avenue NE is currently without sewer facilities. Commercial and residential development along the street will require sewer facilities be constructed in the street, to obtain sewer service. Collaboration with the Transportation Department will occur to ensure the design and construction are completed in coordination with the street design.

This project will design and construct new sewer pipe in 120th Ave NE in conjunction with City street improvements, where needed to provide sewer service for redevelopment of adjacent properties. The project will be completed in segments. Segment 2 is from NE 8th St to NE 12th St and will construct approximately 700 feet of 15-inch or 18-inch pipe. Segment 3 (CIP Plan No. 65) had also been funded, but has been deleted when further analysis showed that a new sewer main would not be needed in that section.

9.5.5 Other Projects Driven by Development

This plan does not attempt to identify every capital improvement needed to serve all potential individual developments within the study area. Specific onsite or offsite capacity improvements that are needed as a result of local development activity (such as high-rise residential developments) are generally outside the scope of this sewer system plan.

Wastewater system improvements that are constructed solely to facilitate specific development projects are funded by the developer. Where the project also includes upgrade or replacement of existing infrastructure, the City may participate in the portion of the project related to upgrading existing facilities. Some potential projects include:

- Sound Transit East Link Light Rail (multiple locations)
- Proposed Bellevue Square expansion
- Spring District Development in Bel-Red Corridor
- High Density Mixed-Use and Residential Redevelopment Downtown or in the Bel-Red Corridor

9.6 Infrastructure Renewal and Replacement

The projects and programs described below are intended to reduce the number and severity of system failures due to age.

The City's current policy is to establish sewer rates so that adequate funds will be available to address anticipated R&R needs as they occur. The cost-effectiveness of funding these R&R expenditures through rates has been analyzed using the Utility's rate model. A discussion of this program's impact on rates can be found in Chapter 10, Financial Information.

9.6.1 Downtown Park Sewer Replacement

A sewer pipeline through the middle of Downtown Park has adequate capacity for current flows, but has experienced significant sulfur damage and will require replacement soon. The pipeline consists of approximately 950-ft of 8" concrete pipe, flowing from NE 4th St due south to the corner of NE 1st St & 102nd Ave NE.

The pipe is located in a highly visible and popular public recreation area, and will impact park visitors. It passes beneath a public fountain, multiple other water features, the middle of the park lawn, and the park's southern parking lot. Due to the sensitive site location, it is anticipated that significant public involvement may be necessary.

9.6.2 Asbestos Cement Force Main Replacement

Many pump stations pump to old force mains, some of which are made of asbestos cement (AC) pipe. AC pipe deteriorates faster than other types of force mains in Bellevue's system. Based on deterioration observed in Bellevue Utilities' gravity sewer mains, the AC force mains may be approaching the end of their useful life.

The consequence of failure of a sewer force main break is high. The condition of AC force mains should be evaluated in the near future and replaced if necessary. There are eight pump stations with AC force mains. The two highest consequence force mains are listed below:

- Lake Hills Pump Station No. 12 delivers 258 feet of head to an 8-inch AC force main installed in 1963. This force main is about 3000 feet long.
- Lake Hills Pump Station No. 6 pumps to a 4-inch force main with about 65 feet of head. This force main pipeline alignment goes through private property and is buried very near to (and possibly underneath) houses adjacent to Phantom Lake. This force main is about 800 feet long.

The Utility should develop a strategic asset replacement strategy for force mains. The first tasks would be to assess the force main condition, estimate the remaining life of the piping and estimate replacement costs. After the assessment phase, CIP S-66 could be expanded to include force mains, or a new CIP program could be created, focused exclusively on force main replacement. Prioritization of force main replacement should be based on the estimated consequences and probability of failure.

9.6.3 Sewage Pump Station Improvements Program

Bellevue's ongoing Sewage Pump Station Improvements Program is funded by CIP Plan #S-16. Projects completed as part of this program since 2001 are listed in Table D-1. The next scheduled projects are:

- Wastewater Pump Station Condition Assessment Study
- Sewer Pump Station Wet Well Rehabilitation
- Lake Heights Sewer Pump Station Rehabilitation
- Wilburton Sewer Pump Station Rehabilitation

It has been approximately 28 years since the first stations where rehabilitated as part of this program. Pump station equipment is generally considered to have a useful life of approximately 25 years. The 2013 Wastewater Pump Station Condition Assessment will provide an updated, comprehensive evaluation of the condition of pump stations that have not been upgraded in approximately ten years or more. The assessment will allow for continued proactive funding, and for future investment consistent with best asset management principles.

9.6.4 Sewer System Pipeline Rehabilitation Program

Bellevue's ongoing Sewer System Pipeline Rehabilitation Program is funded by CIP Plan #S-24. Projects completed as part of this program since 2001 are listed in Table D-2.

An estimate of future pipeline Renewal and Replacement (R&R) needs and the annual expenditures to address them was developed as part of the City's asset management program. These estimates will be revised as better and/or more complete information becomes available. Details about the development of annual cost estimates for this program can be found in the System Renewal and Replacement chapter of this plan, Chapter 6.

9.6.5 Minor Capital Improvement Projects

Bellevue's ongoing program of Minor Capital Improvement Projects is funded by CIP Plan #S-32.

Minor capital projects are identified when new information or changing circumstances identify an unanticipated system problem that can best be addressed by a small capital project, generally under $50,000. This program allows for the timely correction of minor system deficiencies and maintenance issues as they arise. The program facilitates efficient and proactive maintenance of the sewer system.

Occasionally, an issue is identified that requires a more significant capital project to address than the normal funding level for this program can accommodate. When these types of significant projects are identified, a new capital project is recommended to address them. Examples of past projects completed by this program since 2001 are shown in Table D-4.

9.6.6 Sewer Lake Line Replacement Program

Bellevue's ongoing Sewer Lake Line Replacement Program is funded by CIP Plan #S-58. This program began in 2009, and consists of two parts.

1) One-time replacement of approximately 1,300 feet of sewer pipe currently buried under Meydenbauer Bay with an on-shore buried pipe.
2) Ongoing assessment of the remaining 19+ miles of lakelines to determine remaining life expectancies, recommend maintenance practices to maximize the remaining life, and to develop design strategies, priorities, and replacement schedules.

The long term program will include condition assessment to determine remaining life expectancies and maintenance recommendations, and will include preliminary engineering studies to identify and evaluate replacement options for specific reaches of pipe.

Replacement of the lake lines is expected to be technically challenging, environmentally sensitive, and relatively very expensive compared to other sewer projects. It is anticipated that no single solution will work at all locations, such that a variety of options may be needed based on site-specific factors. Stakeholder input will be critical to making final decisions. Any option selected will impact entire neighborhoods and require consensus among diverse interest groups.

Several replacement alternatives will be considered for each reach of pipe, but no recommendations have yet been made. It is likely that some solutions will work in some locations but not in others, depending upon cost, local stakeholder concerns, and other factors. Poor lake line accessibility and potential recreational and environmental impacts make renewal and replacement of the lake lines very difficult.

Additional discussion of lake line replacement is provided in Chapters 5 and 6.

9.6.7 Sewer System Pipeline Replacement

This pipeline replacement program is differentiated from the Sewer System Pipeline Rehabilitation Program. The replacement program will replace sewer pipes throughout the service area. Initiated in 2013, the current budget is sufficient to replace or re-line 0.5 to 0.75 miles of sewer pipe per year. The pipes replaced would be those where life cycle cost analyses indicate replacement is a more economical solution than continuing to make point repairs. Replacement methods may include trenchless rehabilitation techniques such as cured-in-place pipe, and pipe bursting, and/or open trench replacement. This program will compliment S-24, Sewer System Pipeline Rehabilitation, which focuses on making point repairs to extend the useful life of sewer pipes. Adding this program is consistent with the Asset Management Program strategy to meet expected and required customer service levels at the lowest life cycle cost.

Many of the City's sewer pipes are over 60 years old, and approaching the end of their useful life. Many pipes have required multiple repairs to prevent new and/or respond to reported sewage overflows. Several miles of sewer pipe have been identified where the cost to repair, maintain and/or rehabilitate the pipes exceeds the cost to replace the pipeline. As the system ages more will be identified.

This program's current funding level will not provide the resources for a long term sustainable level of pipeline replacement. However, it allows Bellevue Utilities to replace pipelines that have clearly reached the end of their useful economic life. The proposed replacement rate of up to 0.75 miles of pipe per year implies that sewer pipe system-wide would need to last an average of more than 650 years, much longer than the EPA's recommendation of 100 years. While sufficient for now, the annual program budget will eventually need to increase to meet asset management program goals. Ultimately, a sustainable rate of replacement will need to approach five to six miles per year. More information on forecasted funding needs for sewer system pipeline replacement is provided in Chapter 6.

9.7 System Improvements Since 2002

The City's 2002 Comprehensive Wastewater Plan outlined a program of improvements to Bellevue's sewer system. Those projects are listed in Table 9-4 along with the year they were completed. A brief discussion of each of these projects is provided in Appendix D.

Table 9-4, Capital Improvement Projects/Programs Recommended in the City's 2002 Comprehensive Wastewater Plan

Project Description	CIP Plan Number	Proposed Schedule in 2002 plan	Year Completed
Sewage Pump Station Improvements[1,2]	S-16	2002-2008	Ongoing
Bellefield Pump Station Interim Expansion (Phase I)[1]	S-47	2002-2008	2003
Upper Vasa Creek Erosion Control/Slope Stabilization[1,3]	S-32	2002-2008	2011
Sunset Creek Channel Improvements[1]	S-49	2002-2008	2003
New Bogline Lift Station[1,4]	S-50	2002-2008	Cancelled
Auxiliary Power Upgrades at Sewage Pump Stations[1]	S-51	2002-2008	2003
Sewer System Trunk Rehabilitation Program[1,2]	S-24	Ongoing	Ongoing
Sewer Service Extensions Program[1,2]	S-30	Ongoing	Ongoing
Minor Capital Improvement Projects[1,2]	S-32	Ongoing	Ongoing
West CBD Trunk Capacity Improvements	S-54	2015	2012
East CBD Trunk Capacity Improvements	S-52	2010	In Design
Bellefield Pump Station Capacity Improvements (Phase II)	S-53	After 2010	In Design

1. These projects were shown in Table 9-3 of the 2002 Bellevue Comprehensive Sewer Plan.
2. Sub-projects completed under ongoing programs are shown in Tables 9-2, 9-3, 9-4 and 9-5
3. Upper Vasa Creek Erosion Control/Slope Stabilization was completed as part of the Minor Capital Improvement Projects program
4. Reasons for cancellation given in appendix D

Tables D-1 through D-4 in Appendix D show the sub-projects completed under the Sewage Pump Station Improvements Program S-16, Sewer System Trunk Rehabilitation Program S-24, Sewer Service Extensions Program S-30, and Minor Capital Improvement Projects S-32.

In addition, Coal Creek Utility District's 1999 Comprehensive Sewer Plan identified recommended improvements in the portion of CCUD's service area that was transferred to Bellevue in 2003. Those projects are listed in Table 9-5. A brief discussion of each of these projects is provided in Appendix D.

Table 9-5, Capital Improvement Projects Proposed in the 1999 CCUD Plan

Project Description	Proposed Schedule	Year Completed
Canyon Creek Interceptor Replacement	2001*	Not Complete
Newport Hills Interceptor Capacity Improvements	As Required	Deferred
Abandon Gaupholm Lift Station	As Required	Deferred

*These projects were shown in Table 8-2 of the 1999 Coal Creek Utility District Comprehensive Sewer Plan.

Additional sewer facility improvement projects (not identified in the City's 2002 Plan or the 1999 CCUD Plan) have also been funded and completed or deleted since the 2002 Plan. These projects are summarized in Appendix D, and are listed in Table 9-6.

Table 9-6, Capital Improvement Projects Not Identified in 2002 Plan

Project Description	Proposed Schedule	Year Completed
WSDOT I-405/S.R. 520 Braids Sewer Relocation (CIP Plan No. S-55)	2009-2013	2011
WSDOT S.R. 520 Expansion Sewer Relocation (CIP Plan No. S-56)	2013-2020	2013
Upgrade Wastewater Telemetry System (CIP Plan No. S-57)	2009-2010	2011
Design of Sewer Facilities for NE 15th Multi Modal Corridor (CIP Plan No. S-62)[1]	2012-2012	Cancelled

1. Reasons for cancellation given in appendix D

Additional sewer facility improvement projects (not identified in the 2002 Plan or the 1999 CCUD Plan) have been funded since the 2002 Plan and are ongoing. Additional information on these projects is shown in Table 9-1 and Table 9-2. These include:

- Sewer Lake Line Replacement Program (CIP Plan No. S-58)
- Add On-site Power at Sewer Pump Stations (CIP Plan No. S-59)
- Wilburton Sewer Capacity Upgrade (CIP Plan No. S-60)
- Midlakes Pump Station Capacity Improvement (CIP Plan No. S-61)
- Utility Facilities for 120th Ave NE Improvements, Segment 2 (CIP Plan No. S-63)

Another project, Utility Facilities for 120th Ave NE Improvements, Segment 3 (CIP Plan No. S-65) was recommended and funded since the 2002 Plan, but has since been deleted for the reason described under the Segment 2 project.

CHAPTER 10
Financial Information

The City has a sound financial base that can finance the recommended capital improvements. Bond ratings from Moody's Investors Service and Standard and Poor's indicate a high level of confidence in the ability of the City's utilities to repay debt obligations, if needed. The sewer utility currently has no outstanding debt, and current sewer rates fully fund capital, operating and reserve (for future repair and rehabilitation) budgets.

The City has adopted financial policies by ordinance, as provided in Chapter 2. These policies guide the stewardship and investment of funds, use of debt, system expansion, connection and cost recovery, customer rates, and reserves for repair and rehabilitation.

10.1 Current Financial Status

Table 10-1 summarizes actual cash-basis revenues, expenses, and fund balances for the sewer utility for the most recent five-year period. Over the past five years, the utility fund balance, which represents total unexpended resources carried forward to future years, increased from $6.3 million at the beginning of 2007 to a current balance of $10.2 million at the end of 2011. During 2007 through 2011, a total of $30.0 million was transferred to the Utility Capital Improvement Fund to finance necessary capital project expenses. These transfers represent approximately 15 percent of total sewer utility expenses for the five-year period.

10.2 Financial Outlook

Table 10-2 presents a projection of annual utility revenues, expenses, and fund balances for the next five years, based on the 2012 Preliminary Forecast amounts and changes expected to occur in various categories over the subsequent four-year period as a result of new customers, general inflation, and other related factors. This type of forecast is routinely used by utility staff in developing rate adjustment proposals and assessing the impact of changing budget assumptions on future rate requirements.

Some key assumptions that were used in forecasting the future annual revenues and expenses that appear in Table 10-2 are outlined below:

1. A reduction in total sewer utility customers/wastewater volumes will equal -0.1 percent per year for 2012 through 2016. This adjustment will bring projected sewer utility revenues in line with historical averages.

2. Other revenue sources will grow by 2.6 percent per year, based on historical average trends.

3. The current Sewer Utility forecast includes KCWTD projected rate increases from the 2012-2018 King County Wastewater Treatment Division Financial Plan, including a 10.4% rate increase in 2013, 11.1% in 2015, 1.1% in 2017 and 0.7% in 2018. As per our financial policies, City of Bellevue Sewer rates for the forecast period include pass through costs from KCWTD.

4. Personnel cost will increase by an annual rate of 5.0% for 2012-2016, Other Maintenance and Operations Expenses (excluding personnel) are projected to increase 8.8% for the same time frame.

5. The utility currently has no outstanding debt obligations. No future debt financing or annual debt service expenses are assumed in this forecast.

6. Sewer rate increases are projected each year from 2012-2016 to cover the impact of anticipated KCWTD rate increases and the cost of local program operations.

Table 10-1
City of Bellevue
Sewer Utility Fund
Revenues, Expenses & Reserve Balances by Year
2008 Through 2012

	2008	2009	2010	2011	2012
Beginning Reserve Balance	$8,900,069	$8,268,468	$9,516,013	$7,489,893	$10,240,623
Annual Revenues:					
Sewer Service	$35,481,657	$39,071,467	$41,191,652	$45,249,261	$46,714,391
Interest/Other Revenues	$1,869,888	$1,666,525	$1,594,414	$1,608,507	$2,026,776
Sub-Total	$37,351,545	$40,737,992	$42,786,066	$46,857,768	$48,741,167
Annual Expenditures:					
KCWTD	$21,287,416	$23,741,308	$24,039,818	$27,232,055	$27,456,575
Utility Tax Expense	$2,121,750	$2,350,007	$2,571,636	$2,789,640	$2,928,580
Transfers to CIP	$7,386,717	$5,899,403	$6,482,124	$6,316,849	$12,788,518
Other M&O Expense	$7,187,264	$7,502,312	$11,653,194	$7,768,494	$8,212,853
Sub-Total	$37,983,146	$39,493,030	$44,746,772	$44,107,038	$51,386,526
Asset Replacement Account	$1,514,398	$1,788,238	$1,748,666	$806,433	$1,285,803
Ending Reserve Balance	$6,754,070	$7,725,192	$5,806,641	$9,434,190	$6,309,461
	$8,268,468	$9,513,430	$7,489,893	$10,240,623	$7,595,264

Notes: *All Revenues, Expenses & Reserves were obtained via JDE report:* ***YTD Budget Variance by Fund*** *with the Account Level of Detail set at "8".*

Table 10-2
City of Bellevue
Sewer Utility Fund
Forecasted Revenues, Expenses & Reserve Balances by Year
2013 Through 2017

	2013 Preliminary Forecast	2014 Preliminary Forecast	2015 Preliminary Forecast	2016 Preliminary Forecast	2017 Preliminary Forecast
Beginning Reserve Balance	$6,857,546	$6,261,168	$6,573,628	$6,068,538	$6,565,752
Asset Replacement Account	$1,402,454	$1,828,045	$2,178,899	$189,277	$689,792
Sub-Total	$8,260,000	$8,089,213	$8,752,527	$6,257,815	$7,255,544
Annual Revenues:					
Sewer Service	$49,740,765	$51,662,125	$56,558,041	$58,858,634	$62,415,527
Interest/Other Revenues	$1,764,152	$3,815,728	$1,941,685	$2,010,452	$2,113,444
Sub-Total	$51,504,917	$55,477,853	$58,499,726	$60,869,086	$64,528,971
Annual Expenditures:					
KCWTD	$30,164,847	$30,011,584	$33,258,592	$33,270,940	$34,953,144
Utility Tax Expense	$2,201,333	$2,197,630	$2,198,897	$2,200,039	$2,202,277
Transfers to CIP	$9,369,404	$10,074,985	$11,918,675	$12,665,452	$14,632,561
Other O&M Expense	$9,940,121	$12,530,340	$13,618,274	$11,734,925	$12,269,995
Sub-Total	$51,675,705	$54,814,539	$60,994,438	$59,871,356	$64,057,977
Asset Replacement Account	$1,828,045	$2,178,899	$189,277	$689,792	$1,338,326
Ending Reserve Balance	$6,261,168	$6,573,628	$6,068,538	$6,565,752	$6,388,212
	$8,089,213	$8,752,527	$6,257,815	$7,255,544	$7,726,538

Notes: *All Forecasted Revenues, Expenses & Reserves were obtained via the Sewer Financeial Model - 2013-14 Prelim Updated file located in the following drive: K:\SECURED\BUS_ADMIN - FINANCE\FORECASTS\PRELIM\SEWER.*

10.3 Funding for Capital Improvement Projects

Tables 9-2 and 9-3 show the estimated costs of capital projects and existing annual levels for ongoing capital improvement programs recommended in this comprehensive plan for the next 7 years. Based on project timing estimates, comprehensive plan recommendations can be financed at existing Capital Investment Program (CIP) funding levels by reassessing the timing and prioritization of projects in the current Capital Investment Program Plan during the city's next update. Significant acceleration of ongoing programs for system extension or trunk rehabilitation could require additional allocations from increased rates or other sources. System enhancements to comply with new state or federal regulations could also require increased CIP allocation.

To the degree that CIP funding is an important element of the Utility's annual budget and rate decisions, future funding levels may be subject to change depending on Council actions taken to address differences between annual sewer revenues and program costs, discussed in the "Financial Status" section of this chapter.

10.4 Funding for Pipeline Renewal and Replacement

Financial policies adopted in 1995, and then revised in 1998 & 2004, established an R&R Account to assist with the funding of these projects over a long term replacement period (75 years with policy recommendations on a 20 year horizon). In the early years, significant balances will be accumulated which will be used to fund capital investments during periods of high expenditures. The revised financial policy relies on this R&R Account, in conjunction with rates, to fund capital replacement and does not plan to use debt except to provide rate stability in the event of significantly changed circumstances, such as disasters or external mandates.

Revenues to the R&R account may include planned and one-time transfers from the operating funds, transfers from the CIP funds above current capital needs, unplanned revenues from other sources, Capital Recovery Charges, Direct Facility Connection Charges and interest earned on the R&R account. Table 10-3, shows the projected balances in the account from 2012-2019.

Capital Recovery Charges are temporary charges that apportion an equitable share of historical capital investment to new customers, who have not funded long-term capital projects but benefit from the existing system. Direct Facility Connection Charges are one-time charges collected from property owners that directly benefit from new utility- or privately-built facilities, unless they have previously paid their fair share through a LID or ULID.

Figure 10-1 shows the generalized flow of the Utility's revenues and expenses.

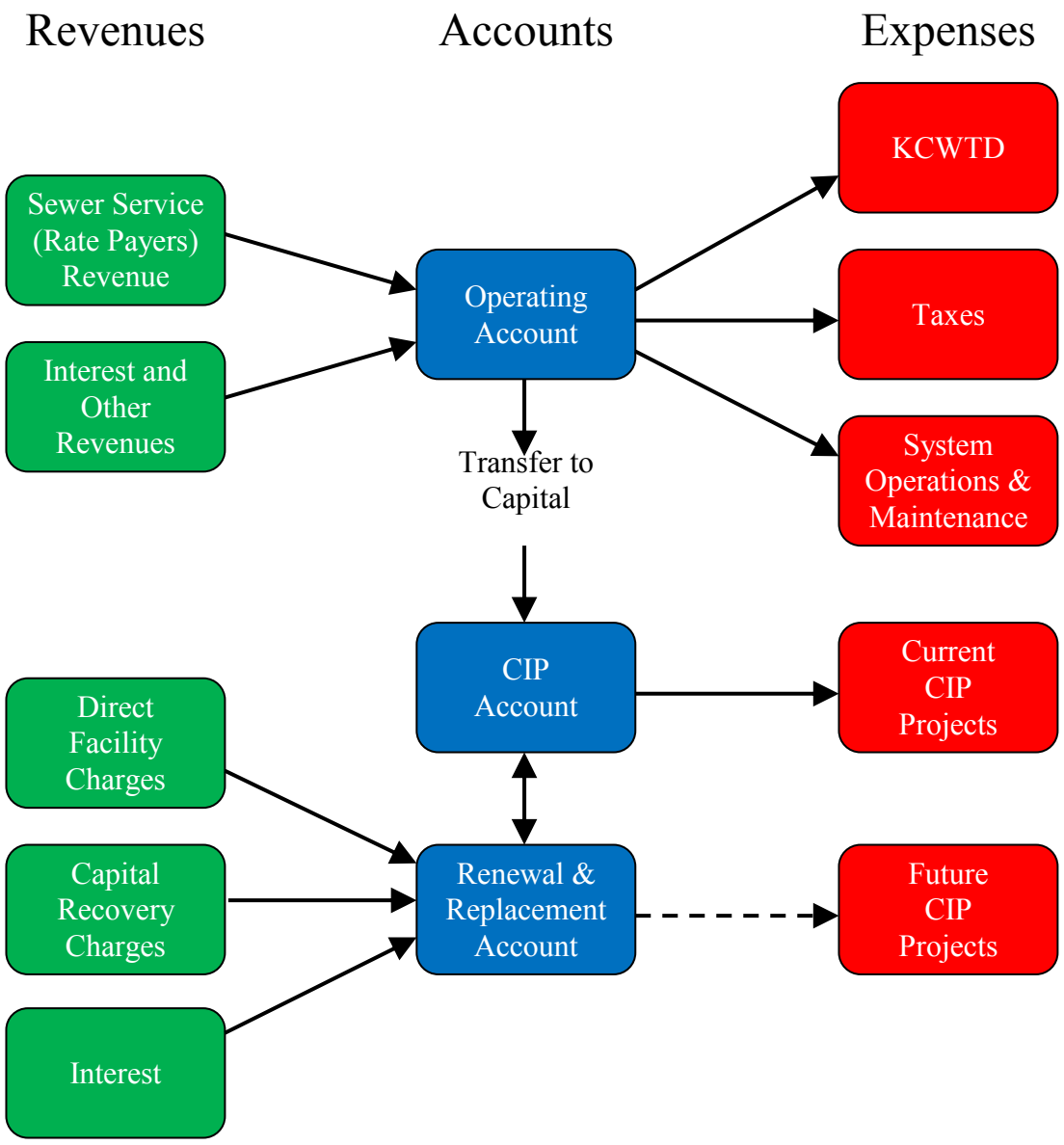


Table 10-3
City of Bellevue
Sewer Utility Renewal and Replacement Account
Forecasted Revenues, Expenses & Fund Balances by Year
2012 Through 2019

	Preliminary 2013	Estimate 2014	Estimate 2015	Estimate 2016	Estimate 2017	Estimate 2018	Estimate 2019	Estimate 2020
Beginning Fund Balance	$47,234,273	$49,627,880	$44,422,440	$42,624,393	$52,318,509	$64,234,076	$76,661,916	$90,559,593
Annual Revenues:								
Direct Facility Charges	$134,000	$0	$0	$0	$0	$0	$0	$0
Capital Recover Charges	$762,071	$775,490	$766,717	$719,552	$643,559	$547,419	$405,104	$266,028
Contribution from Rates/Other Sources	$1,110,088	$0	$0	$8,262,492	$10,106,482	$10,471,461	$11,820,358	$17,458,148
Interest on Investments	$387,449	$376,201	$348,187	$712,072	$1,165,526	$1,408,960	$1,672,215	$1,903,804
Sub-Total	$2,393,607	$1,151,691	$1,114,904	$9,694,116	$11,915,567	$12,427,840	$13,897,677	$19,627,980
Annual Expenditures:								
Renewal & Replacement Projects	$0	$1,925,000	$0	$0	$0	$0	$0	$0
Other	$0	$4,432,131	$2,912,951	$0	$0	$0	$0	$10,366,755
Sub-Total	$0	$6,357,131	$2,912,951	$0	$0	$0	$0	$10,366,755
Ending Reserve Balance	$49,627,880	$44,422,440	$42,624,393	$52,318,509	$64,234,076	$76,661,916	$90,559,593	$99,820,818

Notes: *All Revenues, Expenses & Reserves were obtained via the Forecast models for the applicable years (2012 - from the 2011-12 model, 2013-19 - from the 2013-14 model) located in the following drive: K:\SECURED\BUS_ADMIN - FINANCE\ 2013-2014 BUDGET\FORECASTS\PRELIM\SEWER FINANCIAL MODEL - 2013-14 PRELIM (FORECAST P5-R&R). Added $1,996,409 to 2012 Contribution from Rates/Other Sources to make 2012 Ending Reserve Balance equal 2013 Beginning Reserve Balance.*

10.5 Current Debt Status

Presently the sewer utility has no outstanding debt obligations. The last debt issue sold to finance prior sewer capital project construction costs was paid off in 1991.

10.6 Credit Worthiness

While operated independently, the City's water, sewer and storm and surface water utilities officially merged in 1980 into one combined "Waterworks Utility" for financial reporting purposes. This action has allowed the individual utilities to issue bonds at more favorable interest rates by presenting their combined financial resources and revenue-generating capability as related debt security.

Bonds issued by the "Waterworks Utility," although primarily related to storm and surface water capital financing needs, have earned very positive evaluation of credit worthiness based on factors that include financial position, reserve levels, and debt service coverage, for the three utilities as a whole.

The "Waterworks Utility" currently has a bond rating of "Aa1" from Moody's Investors Service. Ratings at this level indicate a strong degree of confidence by the rating agency in the ability of the City's utilities to repay related debt obligations. The Sewer Utility has no immediate plans to issues additional debt. However, if this action becomes necessary, the Utility can expect a proposed bond issue to receive a similarly favorable credit rating and, therefore, to sell at lower interest rates than would otherwise be possible.

A combined comparative balance sheet and operating statement for the Waterworks Utility for the 5-year period from 2007 through 2011 are provided in Tables 10-4 and 10-5 on the following pages.

Debt service shown on Tables 10-4 and 10-5 are related to the storm and surface water bonds noted above. The sewer utility has no outstanding debt.

Table 10-4
City of Bellevue
Waterworks Utility
Comparative Balance Sheet

($1,000's)	2008	2009	2010	2011	2012
Assets:					
Current Assets	$41,899	$36,362	$34,016	$40,226	$37,133
Restricted Assets	$60,602	$77,334	$92,078	$101,887	$123,541
Deferred Debits	$362	$293	$213	$204	$191
Net Property, Plant & Equipment	$225,449	$234,585	$245,864	$251,817	$258,260
Total Assets	$328,312	$348,574	$372,171	$394,134	$419,125
Liabilities:					
Current Liabilities (Payable from Current Assets)	$2,531	$2,992	$2,339	$2,777	$5,190
Current Liabilities (Payable from Restricted Assets)	$1,159	$1,120	$57	$42	$42
Long-Term Liabilities	$2,191	$1,297	$1,231	$1,243	$1,253
Total Liabilities & Deferred Credits	$5,881	$5,409	$3,627	$4,062	$6,485
Fund Equity:					
Contributed Capital	$223,109	$233,308	$245,705	$251,714	$258,194
Retained Earnings	$99,322	$109,857	$122,839	$138,358	$154,446
Total Fund Equity	$322,431	$343,165	$368,544	$390,072	$412,640
Total Liabilities & Fund Equity	$328,312	$348,574	$372,172	$394,134	$419,125

Notes: *All Assets, Liabilities and Fund Equity numbers were obtained via the CAFR reports for the applicable years. CAFR reports are posted on the following link: http://www.bellevuewa.gov/financial_reports.htm*

Table 10-5
City of Bellevue
Waterworks Utility
Combined Operating Statement
(Year Ending December 31)

($1,000's)	2008	2009	2010	2011	2012
Operating Revenue:					
Service Charges & Fees	$79,276	$86,878	$92,867	$98,200	$103,357
Other Revenue	$2,761	$1,415	$1,450	$1,741	$2,274
Total Operating Revenue	$82,037	$88,293	$94,317	$99,941	$105,631
Non-Operating Revenue	$4,203	$2,125	$1,470	$3,014	$2,430
Total Revenue & Income	$86,240	$90,418	$95,787	$102,955	$108,061
Operating Expenses:					
Administrative & General	$16,806	$16,639	$17,991	$19,028	$20,184
Maintenance & Operations	$45,462	$51,964	$55,352	$58,204	$60,436
Miscellaneous	$6,274	$6,345	$4,750	$7,896	$10,125
Total Operating Expenses	$68,542	$74,948	$78,093	$85,128	$90,745
Available for Debt Service:	$29,643	$29,151	$31,148	$34,252	$37,457
Actual Debt Service:	$706	$1,917	$1,118	$0	$0
Debt Service Coverage:	41.98	15.21	27.86	NA	NA

Notes: *Operating Revenue/Operating Expense all obtained from the STATEMENT OF REVENUES, EXPENSES AND CHANGES IN FUND NET ASSETS PROPRETARY FUNDS schedule located within the CAFR reports obtained from Finance. Available for Debt Service/Actual Debt Service/Debt Service Coverage numbers obtained from SCHEDULE OF REVENUE BOND COVERAGE schedule (table 17) located within the CAFR report obtained from Bob Early also located in Finance.*

10.7 Cost Per Service

Bellevue sewer utility's recent cost per service is provided in Table 10-6, and projected cost per service is shown in Table 10-7. This information only reflects the total sewer utility expenditures per total number of sewer connections, and does not account for variations in connection capacity or actual usage. This information is provided to comply with the requirements of WAC 173-240-050 and is not intended to reflect current or proposed sewer billing rates. These figures do not consider revenues from other sources, including fees related to new connections (direct facility charges and capital recovery charges), and interest.

The number of sewer accounts shown in Table 10-6 is based on actual billing data. The number of sewer accounts shown in Table 10-7 is extrapolated through 2016, assuming the same average annual growth rate in sewer accounts from 2007-2011.

Table 10 - 6: Cost Per Service

	2007	2008	2009	2010	2011
Number of Sewer Accounts	36,088	36,248	36,382	36,516	36,998
Debt Cost per Service	$0	$0	$0	$0	$0
KCWTD Fee per Service	$588	$587	$653	$658	$736
Tax per Service	$60	$59	$65	$70	$75
CIP Transfer per Service	$108	$204	$162	$178	$171
O&M Cost per Service	$177	$198	$206	$319	$210
Total Expenditure per Service	$934	$1,048	$1,086	$1,225	$1,192

Table 10 - 7: Forecasted Cost Per Service

	2012	2013	2014	2015	2016
Number of Sewer Accounts	37,031	37,223	37,416	37,610	37,804
Debt Cost per Service	$0	$0	$0	$0	$0
KCWTD Fee per Service	$742	$810	$802	$884	$880
Tax per Service	$56	$59	$59	$58	$58
CIP Transfer per Service	$227	$252	$286	$317	$351
O&M Cost per Service	$247	$270	$338	$366	$314
Total Expenditure per Service	$1,272	$1,391	$1,485	$1,625	$1,604

Detailed expenditures have not been projected beyond 2016, however Renewal and Replacement expenditures have been projected to 2100 (as described in Chapter 6) for the purpose of long-term asset management and appropriate funding.