A Utilities Appendix

Table of Contents

A Utilities Appendix

Utilities Figures

Utilities Appendix

A City Utilities: Inventory, Capacity and Future Needs Assessment

Seattle City Light: electricity

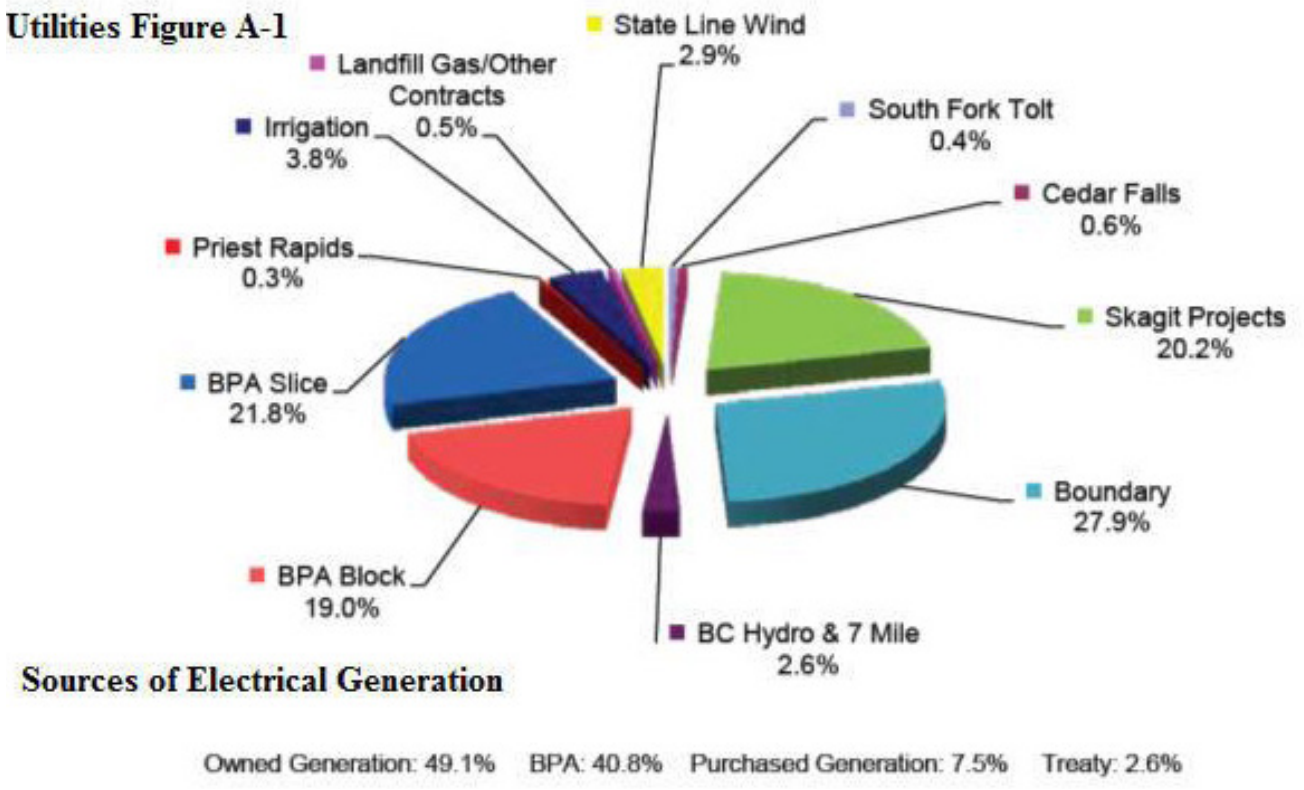
Seattle City Light (SCL) is the City-owned electric utility serving all of Seattle and some portions of other cities and unincorporated King County north and south of the city limits.

Seattle City Light: inventory & capacity

SCL supplies power from a portfolio of sources that includes self-generated assets and purchased power. SCL typically purchases 50% of all power delivered to its customers. Utilities Figure A-1 below shows the sources of power.

The current resource portfolio includes SCL-owned generation resources; long-term contract resources supplemented with power exchange agreements, near-term purchases, and sales made in the wholesale power market; and conservation. City Light-owned generation facilities include the Boundary Project, on the Pend Oreille River in northeast Washington, and the Skagit Project, which consists of three hydroelectric dams (Ross, Diablo and Gorge) on the Skagit River. The Newhalem Hydroelectric Plant on Newhalem Creek, the Cedar Falls Dam on the South Fork Tolt River are also smaller generating facilities owned by SCL.

Utilities Figure A-1
Sources of Electrical Generation



In addition to these power sources, SCL purchases power from a variety of other sources including:

- the Bonneville Power Administration (BPA), including firm amounts under the Block Product and a share in the output from the Federal System (Slice Product), which depends on water conditions
- British Columbia Hydro
- Lucy Peak, a hydro project located near Boise Idaho
- Priest Rapids, a hydro project within the Grant County Public Utility District
- Grand Coulee Project Hydroelectric Authority, a share in the State Line Wind Project located in Southeast Washington and Northeast Oregon
- Biomass and landfill gas through Burlington Biomass, Columbia Ridge Landfill Gas Project and King County West Point Wastewater Treatment Plant.

Under an exchange agreement with the Northern California Power Agency, City Light delivers energy to NCPA in the summer and in exchange NCPA delivers energy to City Light in the winter.

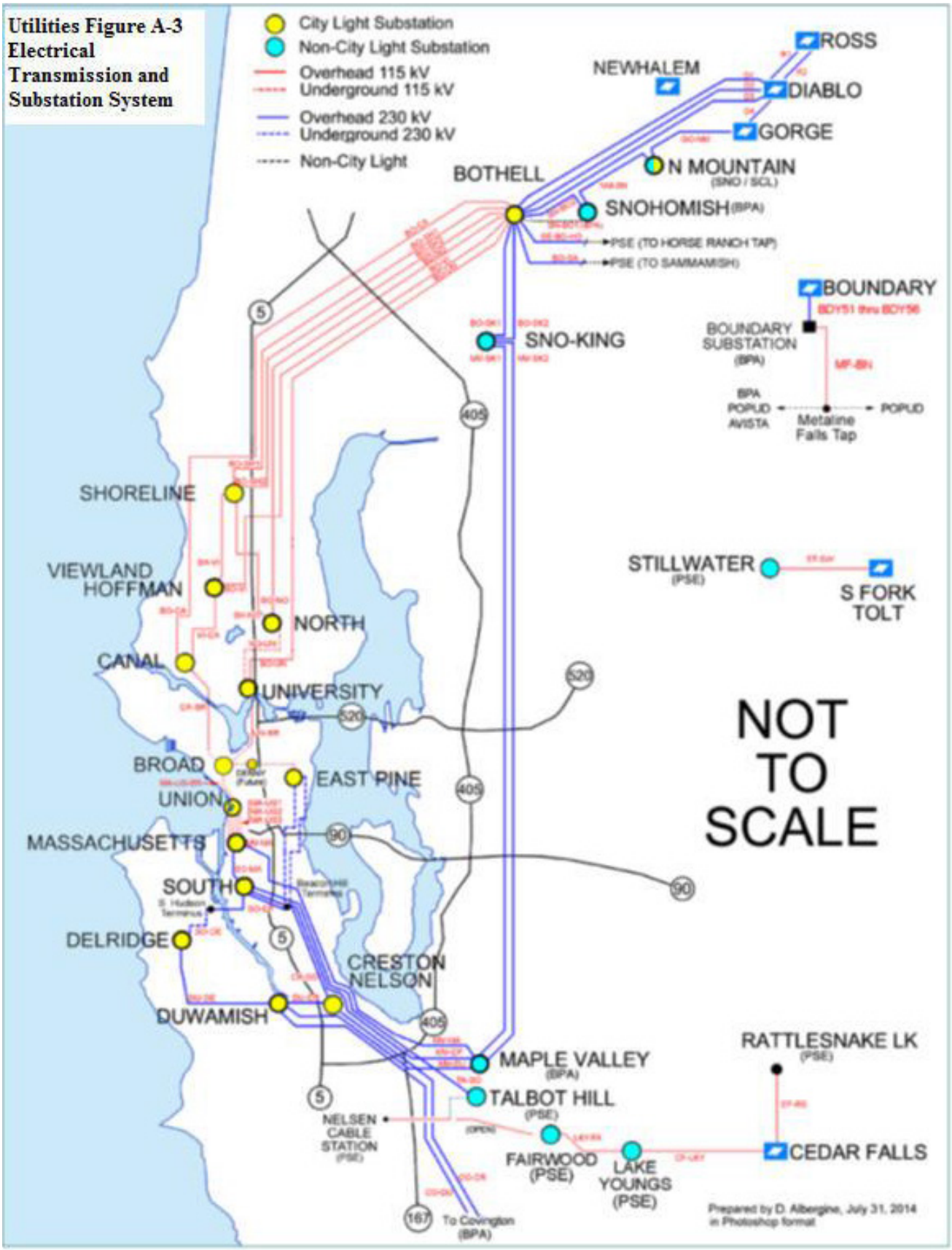
SCL owns and maintains approximately 657 miles of transmission lines which carry power from the Skagit and Cedar Falls generating facilities to 14 principal substations. SCL is dependent on other transmission line owners, i.e., the Bonneville Power Administration (BPA), to bring power from its Boundary Dam hydroelectric plant and from other contracted resources, to serve its load in Seattle. The transmission grid interconnection with other utilities also provides additional reliability to meet load requirements. Power is distributed from SCL's principal substations via high voltage feeder lines to numerous smaller distribution substations and pole transformers which reduce voltage to required levels for customers. SCL owns and maintains 2,428 circuit miles of distribution lines within Seattle that deliver power from the 14 principal substations to approximately 365,200 customers (See Utilities Figure A-2 and A-3).

SCL's current generation capability (owned and contracted) is adequate to serve existing customers. Because of the nature of City Light's hydroelectric system, the utility is not presently constrained by

Utilities Figure A-2
Electrical Generation Resources

Utilities Figure A-3

Electrical Transmission and Substation System



its ability to meet peak loads (typically referred to as capacity). At times, the system may be constrained in its ability to carry load over periods of heavy load hours (6 a.m. to 10 p.m.) during the winter. On an average monthly basis, City Light currently has sufficient resources to meet expected customer load in the next few years, even under serious drought conditions.

SCL sells on the wholesale energy markets the energy it does not need to meet customer load. The utility also buys energy in the wholesale markets to enhance the value of its resource portfolio and to meet occasional short-term energy deficits.

Seattle City Light: future needs assessment

New resources will be needed to meet load growth and to comply with I-937 over the next 20 years. The timing of resource acquisition depends on the rate of load growth, hydro volatility, together with the I-937 schedule for acquiring renewable resources and/or renewable energy credits.

For the transmission and distribution components of SCL's system, projected growth will be accommodated by planned transmission and distribution capacity additions. The addition of a downtown substation is being permitted to meet the load growth in the Denny Triangle and South Lake Union.

Capacity would also be expanded at the North, Duwamish, Shoreline, University and Creston substations. New substations also may be built in the next five to twenty years in Interbay, SODO, and the Highline area, depending on load growth projections and emerging real construction. Substations in the Northeast and Northwest parts of the City may also be built in the 20-year period. City Light owns properties for the Interbay, Northeast, and Northwest substations.

Seattle Public Utilities: drinking water

Seattle Public Utilities (SPU) provides drinking water to a service area population of 1.3 million within the greater Seattle metropolitan region of King County and portions of southern Snohomish County. SPU provides retail water service to customers in the City of Seattle, and portions of the cities of Shoreline, Lake Forest Park and Burien, as well as portions of unincorporated King County south of the City of Seattle. SPU also provides retail water service to Shorewood Apartments on Mercer Island and Seattle Tacoma International Airport. In addition, SPU sells wholesale water to 19 municipalities and special purpose districts, plus Cascade Water Alliance, who in turn provide the water to their own retail customers (See Utilities Figure A-4). SPU operates under an annual Operating Permit issued by the Washington State Department of Health. More information about the water system can be found in Seattle's latest Water System Plan.

Seattle Public Utilities: inventory & capacity

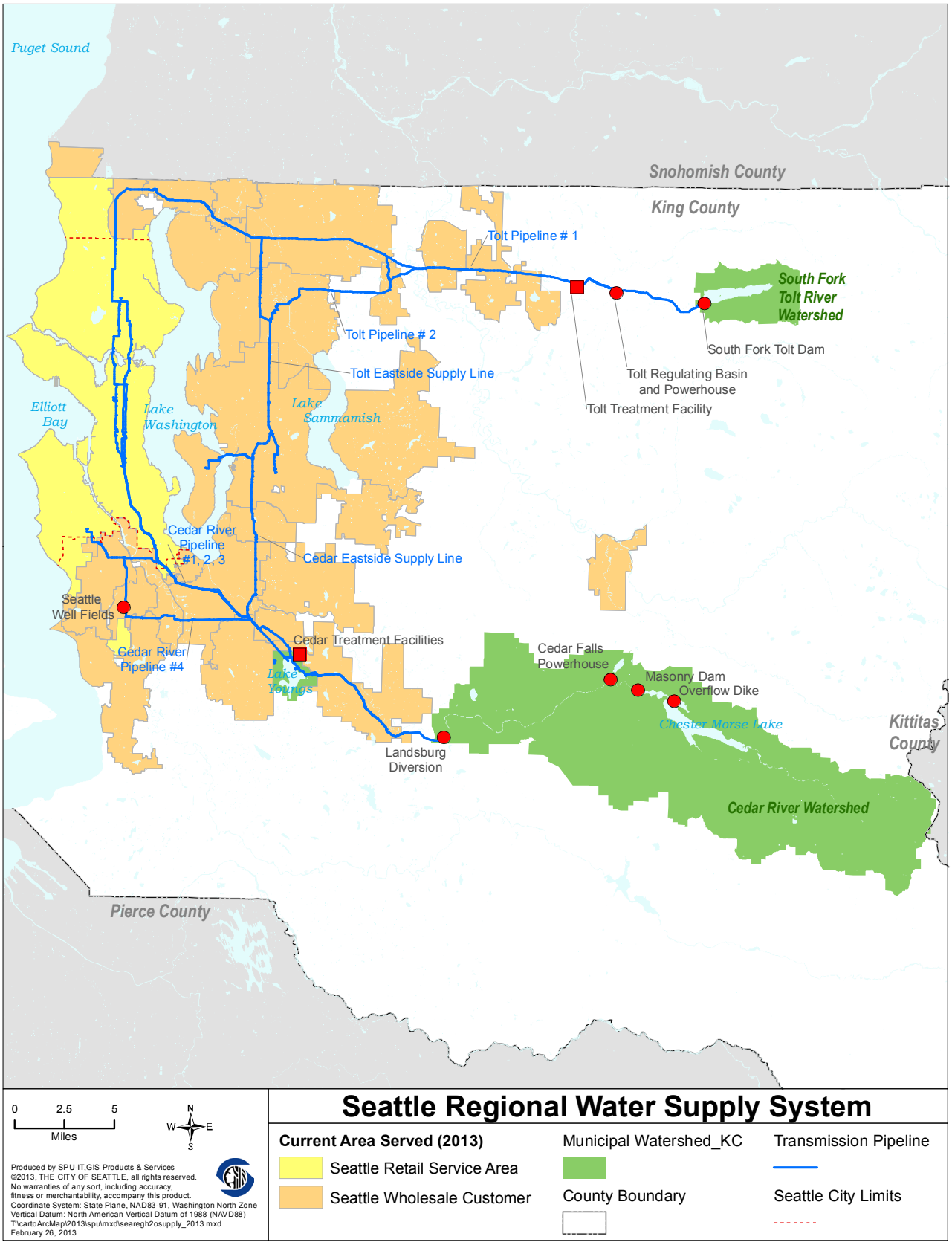
SPU supplies drinking water from two major water supply sources, the Cedar River Watershed and the South Fork of the Tolt River Watershed, both on the western slopes of the Cascade Mountains. In addition, a small amount of water from Seattle Well Fields, which are located north of Seattle Tacoma International Airport, is available to provide drought and emergency supply. In total, these sources can supply up to 172 million gallons of water per day on an average annual basis. Water from these sources is treated to meet drinking water quality regulations. The treated water is then delivered to Seattle retail and wholesale customers through a network of approximately 1,880 miles of transmission and distribution system pipelines, 400 million gallons of treated water storage facilities (reservoirs, tanks and standpipes), and 31 pump stations. System-wide treatment and transmission capacity is 310 million gallons per day (See Utilities Figure A-4).

Utilities Figure A-4

Drinking Water Service Area

Utilities Figure A-5

Drinking Water Facilities and Transmission Pipelines



Seattle Public Utilities: future needs assessment

SPU expects water supply to be adequate to serve the City's existing and forecast population for at least the next 20 years. This assessment considered an analysis of future climate change impacts on both supply and demand. That analysis indicated that, although available supply could be reduced by as much as 4 percent in 2025 and 6 percent in 2050 under the warmest climate change scenario analyzed, this reduced supply would still exceed climate-impacted demands in those time periods.

One reason for this outlook is the anticipated continued reduction in per capita water use in SPU's service area. Total water use in SPU's regional water system declined by 15% from 2000 to 2013 while the population served has grown by 30%. The regional water conservation program administered by SPU for the Saving Water Partnership – a collaborative program run by Seattle and 18 of SPU's wholesale customers – has been a contributor to this reduction in water use. For the 2013-2018 period, the Saving Water Partnership has set a goal to reduce per capita water use from current levels so that total average annual retail water use of members of the Saving Water Partnership is less than 105 million gallons per day despite forecasted population growth.

Distribution and storage facilities that serve Seattle residents and businesses have adequate capacity to serve the city. There are, however, a few areas where SPU's water system has hydrants that cannot provide fire flows to existing buildings as required under current codes for new buildings. This can be caused by a combination of factors including pipes with small diameters or areas with low water pressure due to older design standards, or pipes whose interiors have been reduced by deposits. There are also areas that were originally built to now-obsolete fire codes. Depending on the location and type of development, parts of SPU's water distribution system may need to be upgraded to meet current fire flow standards for the planned development. Additionally, there are also parts of the retail service area in which water mains need to be extended to serve a particular parcel. SPU will work with developers to have needed water infrastructure in place for the development.

In addition to the distribution system improvements needed to support new development, investments are needed to replace aging infrastructure that has reached the end of its economic life. SPU is currently applying an asset management assessment to determine which facilities would be replaced using the funds available in the six-year CIP instead of being repaired.

Seattle Public Utilities: drainage & sewer

Seattle Public Utilities is charged with managing drainage and sewer systems to meet public safety, water quality, and resource protection goals. SPU's drainage and sewer service area covers the City of Seattle. King County is responsible for operating the sewage treatment plants that treat all City of Seattle sewage as well as the interceptor lines that deliver sewage to these facilities.

Seattle Public Utilities: inventory & capacity

Although a few small areas are still served by septic systems, almost all areas of the city are served by sewer. Three types of drainage and sewer systems are used in Seattle:

- combined drainage and sewer (a single set of pipes carries water from drainage water and sewage)
- separate drainage sewer systems, (the pipes carrying drainage are completely separate from the pipes carrying sewage) and
- partially separated drainage and sewer (one set of pipes carries sewage and some drainage water – general from street runoff, while the other set carries only drainage water).

The SPU system collects residential, commercial, and industrial sewage and delivers it to interceptor lines operated by the regional sewage treatment agency (King County). While King County operates a regional system including various treatment plants, sewage from Seattle is primarily treated at the West Point Sewage Treatment Plant before being discharged into Puget Sound (See Utilities Figure A-5). The

West Point Treatment Plant is a secondary treatment facility, with a monthly average capacity of 133 million gallons per day (MGD) and daily peak flow capacity of 440 MGD. Of the daily peak flow capacity, 300 MGD would receive secondary treatment and the remainder would receive primary treatment. The West Point Treatment Plant serves 1.3 million people including residents of Seattle, King County north of Seattle, and South Snohomish County.

The capacity of the drainage and sewer system in some areas is limited during peak storm events. During or following intense or prolonged periods of rainfall, some of the systems cannot accommodate the combined drainage and sewage flows, resulting in combined sewer overflows (CSOs) being discharged into area waters. CSOs occur in both the regional and the City systems. There are two "wet weather" treatment facilities, Alki and Carkeek, that partially treat a portion of this overflow, but in many areas the overflows discharge completely untreated water.

Seattle Public Utilities: future needs assessment

Generally, the City-operated drainage and sewer facilities in Seattle have been planned and sized to serve the maximum or build out conditions under zoning at the time and will be adequate to serve the level of increased growth proposed in the Plan. The capacity of the sewer system is limited in confined areas of the city, where there have been historic hydraulic and system backup problems. In addition, there are areas of drainage deficiencies and water quality issues in the City. These problems are being addressed through developer- funded facility upgrades and by Seattle Public Utilities' Capital improvement Program (CIP).

Seattle Public Utilities: solid waste

Various state and local regulations and guidelines influence Seattle's solid waste planning. Chief among the regulations is the State of Washington's 1969 legislation Revised Code of Washington (RCW) 70.95 requiring local solid waste plans. Seattle Public Utilities manages this responsibility by regularly reviewing and updating Seattle's Solid Waste Plan. The Plan has a 20-year horizon and provides strategies for future solid waste management needs.

Seattle Public Utilities: inventory & capacity

A network of public and private service providers and facilities collect, transfer, process, and landfill Seattle's discards. All Seattle's Municipal Solid Waste that is not recycled or composted is, by law, under city control.

SPU contracts with private firms to collect residential garbage, recyclables, and yard and food waste (organics). The same contractors collect commercial garbage. Open-market providers collect commercial recycling and organics. Businesses may choose to "self-haul" their solid waste materials.

Transfer and recycling processing facilities consolidate collected solid waste materials and route them to their next destination. Garbage and organics collected by the city's contractors goes to the transfer stations owned and operated by the city. Recycling picked up by the city's contractors goes to the city's contracted recycling processing facility. Recycling picked up from businesses may go to a recycling processor or one of the many local businesses specializing in recycled materials. Other collected materials go to the city's transfer stations, or private transfer stations or processors. Occasionally, residential garbage is taken to private transfer facilities such as when a city station temporarily needs to close.

At the transfer stations, garbage is loaded into rail containers and trucked to Seattle's contracted rail yard. Assembled trains of containers are hauled to the city's contracted landfill. Processed recyclables go to various materials markets. Organics go to the city's contracted organics contractor to be processed into compost.

SPU also runs two moderate risk waste (MRW) collection facilities. Seattle provides this service as a partner in the Local Hazardous Waste Management Program (LHWMP) in King County.

Except for the two city-owned transfer stations, the equipment and facilities necessary to operate

Seattle's solid waste system are provided by contracted services.

Seattle Public Utilities: collection

Two collection companies collect all residential solid waste materials and commercial garbage. Current contracts started in March 2009 and run until at least 2017. The companies provide all aspects of collection, including trucks, truck yards, and labor. Service areas and routes are planned to ensure efficient use of collection vehicles and to collect consistent amounts of material each day so that the daily capacity of each transfer station is not exceeded. Transfer and processing facilities need an even, predictable inflow to avoid having to stockpile incoming materials.

Seattle Public Utilities: transfer stations

The city owns and operates two transfer stations: North Transfer Station in the Wallingford neighborhood, and South Transfer Station in the South Park neighborhood. Two private transfer stations supplement city facilities.

The city's transfer facilities now serve a variety of vehicles and customers and receive a range of discarded materials that include garbage, recyclables, and compostables. In addition to transferring materials delivered by collectors, the stations play an important role in accepting materials unsuitable for curbside collection. Residents with large, bulky items or excess quantities can bring these materials to the stations for recycling or disposal. The stations also serve businesses that choose to self-haul their waste and recyclable materials.

In 2007, the Seattle City Council decided to proceed with improvements to the two city-owned stations, which were originally built in the 1960's. SPU completed construction of the new South Transfer Station in 2013. The new North Transfer Station will be complete in 2016. Demolition of the old South Recycling and Disposal Station and redevelopment of that site is scheduled to be complete in 2018.

The two private transfer facilities are located in the industrial area south of downtown Seattle.

Seattle Public Utilities: recycling and composting

SPU contracts with Rabanco Recycling Center for traditional recycling (newspaper, glass bottles, tin cans, etc.). It is located in the Duwamish Manufacturing/ Industrial Center.

Most commercial recycling is provided by private arrangements. Vendors collect both mixed and source-separated materials, and take them to a variety of processors in the Seattle area. Which processor they use depends on the material and any agreements haulers and processors may have.

For organics composting, SPU implemented new contracts in 2014 with two vendors: Lenz Enterprises, Inc., and PacifiClean Environmental of Washington, LLC. Lenz Enterprises is mainly responsible for taking organics from SPU's Seattle's North Transfer Station to its processing facility in Stanwood, Washington. PacifiClean will take mainly organics from SPU's South Transfer station to their processing facility that will be located in central Washington. Both companies have guaranteed access to backup facilities.

Seattle Public Utilities: disposal

The City of Seattle contracts with Waste Management of Washington for rail haul and disposal of all non-recyclable waste at Columbia Ridge Landfill in Gilliam County, Oregon. After it has been compacted into shipping containers at transfer facilities, garbage is hauled to the Argo rail yard and loaded onto the train. The Argo Yard is owned and operated by the Union Pacific Railroad, and is located in the Duwamish Manufacturing/Industrial Center. Trains leave Seattle six times a week, stacked two-high. Waste Management of Washington owns the containers. The Columbia Ridge Landfill and Recycling Center is owned and operated by Oregon Waste Systems, a division of Waste Management.

Seattle Public Utilities: future needs assessment

As the City of Seattle contracts with private service providers for recycling processing, organics composting, and landfill long-haul and disposal, any pro-

grammatic changes would be made through those contracts. Since Public Health-Seattle & King County regulates all solid waste handling facilities in their jurisdiction, their approval is required for any a new public or private facilities for the transfer, recycling, composting and landfilling of solid waste materials.

Although the overall amount of waste generated in the city will increase with projected residential and employment growth over the 20 year plan horizon, the percentage of waste that will be directed to disposal is expected to decrease. Seattle's overall municipal solid waste generation (MSW) has generally followed the ups and downs of economic trends, even as population has steadily increased. Total generation saw a prolonged downward trend after 2007 through the Great Recession and through 2012. SPU expects overall waste generation to increase gradually over the next two decades, not rising to pre-recession levels of about 850,000 tons of material per year until about 2027 or after.

Seattle's diversion goal is to recycle or compost 70% of the city's MSW by 2022. In 2012 Seattle recycled or composted 56% of its MSW. Seattle recently set an additional goal, to recycle 70% of the city's construction and demolition (C&D) waste by 2020. The majority of C&D waste is managed in the private sector, from generation through processing and disposal.

Shifts in consumer patterns change over time. Likewise, new materials and combinations of materials continue to enter the consumption cycle. SPU will conduct waste composition analyses frequently enough to be able to respond to these changes. For example, SPU will continue to work with processors to designate additional recyclable materials, and modify collection programs as needed.

Future Needs Assessment

collection
Seattle will continue with its strategy to competitively contract for collection services. The contractors will adjust to changing service needs, such as more recycling, over time.

transfer
The capacity provided by the rebuild of Seattle's two transfer facilities, in conjunction with private transfer capacity, is projected to satisfy Seattle's solid waste transfer needs for at least as long as the 50-year expected life of the rebuilt facilities. Seattle's new facilities are purposely designed for flexibility in response to a changing mix of solid waste materials over time.

recycling & composting
Recycling capacity at private facilities is considered adequate for at least two decades, and Seattle will continue to contract for these services. Seattle's current contract is guaranteed through 2019. In 2014, Recology Cleanscapes opened a new high capacity mixed-material recycling facility in the Duwamish Manufacturing/Industrial Center. Furthermore, the Washington State Department of Ecology currently lists more than 280 recycling facilities in King, Pierce, and Snohomish counties. In addition to the new Recology Cleanscapes facility, at least 3 of these are large facilities that process mixed recycling and are within 20 miles of Seattle. SPU expects that many other private recyclers that handle limited ranges of materials will continue their presence in the local market.

Current composting capacity is adequate for the 20 year planning horizon. However, statewide there is concern about future capacity as more cities and counties divert more organics. Seattle's two organics contracts are guaranteed, and may be extended through 2024. As regional demand for composting increases, composting service providers are researching and developing new technologies, for example anaerobic digestion.

disposal
Columbia Ridge landfill, Seattle's current contracted landfill, projects that it will be able to receive material beyond the current contract's guaranteed 2028 end date. Seattle plans to continue with contracting for this service. Although Seattle's disposal alternatives are restricted through the life of the contract, the City will continue monitoring emerging alternate technologies. Rail-haul capacity has not been an issue. The contract provides for alternate transportation if rail lines become unavailable.

City communications facilities

The City Department of Information Technology, in collaboration with City Light and other departments, jurisdictions and institutions, installs, owns and/or operates an extensive radio and broadband information and communications technology (ICT) infrastructure, including radio for emergency services and field work, and fiber optic for transmission of voice, video and data for delivery of city services. The City leases some services from private providers, but has steadily increased the network of public infrastructure to city buildings. The City has a fiber sharing agreement with other public agencies that enables joint installation and maintenance of an extensive network of conduit and which minimizes cost, digging and installation of broadband infrastructure. The City also leases excess fiber capacity to private providers.

B Investor-Owned Utilities

natural gas

Puget Sound Energy (PSE) provides natural gas service to more than 780,000 customers in six Western Washington counties: Snohomish, King, Kittitas, Pierce, Thurston, and Lewis. As of 2014, it is estimated that PSE serves over 140,000 customers with the City of Seattle.

Natural gas comes from gas wells in the Rocky Mountains and in Canada and is transported through interstate pipelines by Williams Northwest Pipeline to Puget Sound Energy's gate stations.

Supply mains then transport the gas from the gate stations to district regulators where the pressure is reduced to less than 60psig. Distribution mains are fed from the district regulators and individual residential service lines are fed by the distribution mains.

PSE does not have any major projects planned in Seattle, but new projects may be developed in the future at any time due to:

- New or replacement of existing facilities to increase capacity requirements due to new building construction and conversion from other fuels.
- Main replacement to facilitate improved maintenance of facilities.
- Replacement or relocation of facilities due to municipal and state projects.

cable

The FCC provides limited regulatory authority to local jurisdictions to enable franchise agreements with providers of cable television. As of 2014, the City of Seattle had cable franchise agreements with two companies: Comcast and Wave Broadband. Comcast is the city's largest provider, serving approximately 2/3 of the city. These companies also provide telephone and broadband Internet services. As of 2014, Wave also owns CondoInternet, which offers gigabit Internet service in a limited, but growing area of Seattle.

The franchise agreements provide for consumer protection and public benefits, such as delivery of cable television and public Internet access to City community centers, public housing, and non-profits providing Internet access and skills training to technology disadvantaged residents. The companies are allowed to compete, though overlapping service areas have been minimal as of 2014. The franchise agreements have generally been for 10 year periods with some adjustment when companies are sold. See seattle.gov/cable/franchises.htm for more detail.

landline telephone

CenturyLink, which purchased QWEST Communications, is the largest telephone company, providing local landline telephone and related retail and wholesale communications services throughout the entire city. They maintain a number of poles, transmission lines and network architecture. Additionally, there are a number of small companies that provide limited telephone service, often by paying for the use of other company's infrastructure.

wireless and cellular

Seattle is served by numerous companies providing wireless and cellular services. These communications utility companies tend to own wireless and cellular transmission facilities as well as fiber backbone to

relay the data received in the transmission facilities. Common wireless technologies include point-to-point microwave as well as Wi-Fi internet services. Microwave antennas require location for line of sight transmission. Cellular and Wi-Fi transmitters have limited transmission radius and are also dependent on the strength of the antenna in user's mobile devices. As the number of users and the demand for higher data transfer (e.g. for watching or sending video) grows, the infrastructure will also require expansion. Greater distribution of fiber optics through the city enables higher bandwidth connections to these antennas. The industry is continuing to evolve, so the city is likely to see continued demand for placement of antennas, though technology developments may also result in some reduction of the number required.

radio and broadcast television

Seattle is also served by a number of radio and television broadcast facilities who maintain antennas and transmission equipment in the city which, like cellular equipment, may be located and operated on company sites, or placed on other public or private buildings through leasing arrangements. Some of these companies also operate other communications hosting or networking services. The FCC issued a limited number of low-power FM construction licenses to non-profit entities, starting in 2014, that require siting of small antennas and will enable local information distribution.

district energy

Enwave Seattle is a district energy utility franchised by the City. Enwave produce heat at a centralized plant and distributes steam to commercial, residential, and institutional customers for space and hot water heating, along with other uses, by underground lines. Its service area encompasses roughly a square-mile area of the Central Business District, extending from Blanchard Street to King Street and from the waterfront to 14th Avenue, crossing over First Hill.

Enwave Seattle is a privately-owned utility that provides heat to approximately 200 buildings in Seattle's Central Business District and First Hill neighborhoods. Enwave Seattle's mission is to deliver a reliable, cost-effective and efficient source of heat that benefits its customers, the environment and the Seattle community.

Two steam-generating plants supply the piping network. The primary plant is located on Western Avenue at University Street. The secondary plant is located on Western Avenue near Yesler Way—the site of the original plant built in 1893. Total steam generation capacity is 670,000 pounds per hour, with boilers designed to burn renewable biomass, natural gas or diesel oil if natural gas is not available. The network of insulated steel pipe encompasses a total length of over 18 miles beneath city streets and currently serves approximately 200 buildings.

The City is also working to establish district energy utility systems in South Lake Union, Denny Triangle, and First Hill. Systems for these neighborhoods are in varying planning stages, but each, if established, would likely be a closed-loop water-based utility system providing heating, hot water, and potentially cooling services to building owners. Energy sources for the utility system would largely be comprised of waste heat already in the neighborhood, including waste heat from data centers, sewer lines, and condensate from the nearby Enwave system.