3.9 Utilities

This section describes the affects of the proposed alternatives on the provision of water, stormwater and sewer services, and electrical power. Seattle Public Utilities provides water, stormwater drainage and wastewater utility service within the City. Electrical power service is provided by Seattle City Light.

Figure 3.9–1:
Water main and distribution network

Source: City of Seattle, 2013

3.9.1 Affected Environment

Water System

Water for domestic use and fire fighting is provided to the area by Seattle Public Utilities (SPU). Seattle has two surface sources and one small groundwater source: the Cedar River System, the South Fork Tolt Reservoir, and the Seattle Well Fields. On average, the Cedar River System supplies seventy percent of SPU's total supply.

The SPU water system is comprised of transmission and distribution pipelines, and storage facilities and pressure zones.

U District water is supplied by the Cedar River system through a 42-inch water main from the Maple Leaf reservoir (at N 85th and 12th Avenue NE), entering the study area at NE Ravenna Boulevard and Brooklyn Avenue NE, continuing south along Brooklyn Avenue NE to NE 47th Street, then south along 7th Avenue NE to Portage Bay. Figure 3.9–1 shows the water distribution network in the study area.

The SPU water system is comprised of transmission and distribution pipelines, and storage facilities and pressure zones. Almost all of the distribution lines in the U District are 8 inches in diameter, except for an area with 2-inch pipe along 8th Avenue NE between NE 52nd And NE 59th Streets. The system grid of interconnected pipes is designed for reliability.

Most of the distribution system was installed in the early 1900s except for along University Way NE between NE 47th Street and NE Campus Parkway, which was installed in 2003. Pipe materials are a combination of cast-iron and ductile-iron. The expected life span of these pipes is 100 to 120 years.

The network is maintained by SPU and repaired and improved as needed. In some cases, developers are asked to make replacements or improvements to the system near their properties as a condition of new development.

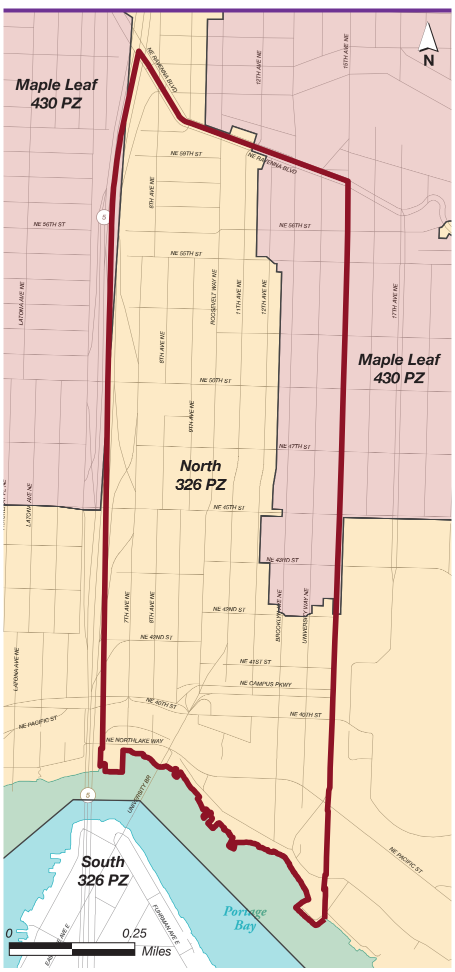
Water pressure zones are areas in which a certain maximum water pressure can be expected from the potable water distribution network.

SPU's water distribution system is primarily served by gravity, but pumps are used to serve some pressure zones to control flow and storage levels. The SPU water distribution system is divided into approximately 45 pressures zones that operate within a pressure range of about 30 to 130 psi (pounds per square inch). This range meets service level targets for providing safe drinking water and fire flow.

The U District study area is within two pressure zones (PZ), North 326 PZ and Maple Leaf 430 PZ. North 326 extends the length (north and south) of the study area from I-5 to 12th Avenue NE. Maple Leaf 430 extends north and south along the study area on Brooklyn Avenue NE, University Way NE, and 15th Avenue NE. Pressure zone boundaries are shown in Figure 3.9–2. A pressure improvement project was completed in the North 326 PZ in 2009 to ensure all retail service connections are greater than 20 psi during normal operations.

The majority of SPU's hydrants are able to deliver more than adequate flows to combat fires. However, there are some areas where a combination of factors including pipes with small diameters or old design standards cannot deliver fire flows to existing buildings under current codes required for new buildings. During fire flow conditions, the combination of storage and delivery system capacity must be adequate to provide water at the required flow rate and a minimum 20 psi in the main line. SPU Utilities System Management (USM) maintains models of the water distribution and transmission system. The modeling analysis determines the capacity of the main to provide peak hourly demand and fire flow.

Figure 3.9–2:
Pressure zone boundaries



Source: City of Seattle, 2013

Sanitary Sewer

SPU Drainage and Wastewater Utility collects and conveys sewage through a system of sanitary sewers, detention tanks/pipes, storm drains, pump stations, outfalls, and treatment facilities.

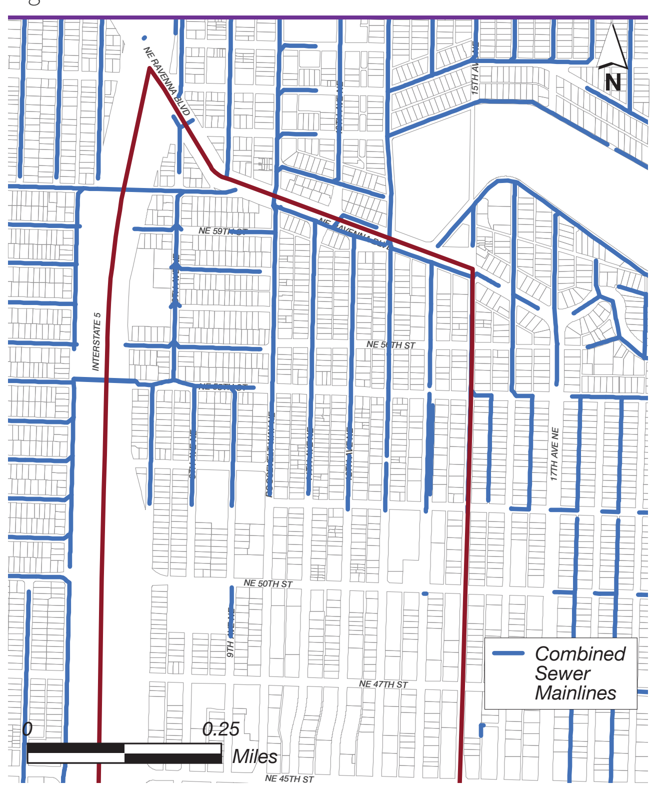
The U District study area contains both combined and separated wastewater infrastructure. In a separated system, stormwater runoff is directed to a separate storm drain system, while wastewater goes to a sanitary sewer and on to the wastewater treatment plant before discharging into a receiving water body. Combined sewer systems collect stormwater runoff and domestic sewage in the same pipe and transport it to a sewage treatment plant prior to discharge. Metropolitan King County is responsible for treating all wastewater in the city. Wastewater from the study area goes to the West Point Treatment Plant located about four miles northwest of downtown Seattle, along the Puget Sound shoreline.

Combined System

In the U District study area, the combined sewer system is found in residential areas bounded by NE Ravenna Boulevard, I-5, Roosevelt Way NE, and NE 53rd Street and portions of 12th Avenue NE, and the Ave (See Figure 3.9–3). The installation of the system is old, most pipes date back to the early 1900s. The pipes range from 8 to 12 inches in diameter and are primarily constructed of vitrified clay and concrete. SPU regularly inspects, repairs, and replaces pipe as needed. As needed, new development may be required to make system improvements. With maintenance, the expected life span of these sewers is indeterminate.

During wet weather, wastewater volumes in combined sewer systems can exceed the system's capacity so are therefore designed to overflow occasionally, discharging excess wastewater directly into nearby water bodies. In the study area, combined sewer overflows drain into the Portage Bay Combined Sewer Overflow (CSO) facility located east of the University Bridge. A lift station and combined sewer outfall located at

Figure 3.9–3: **Combined Sewer Mainlines**



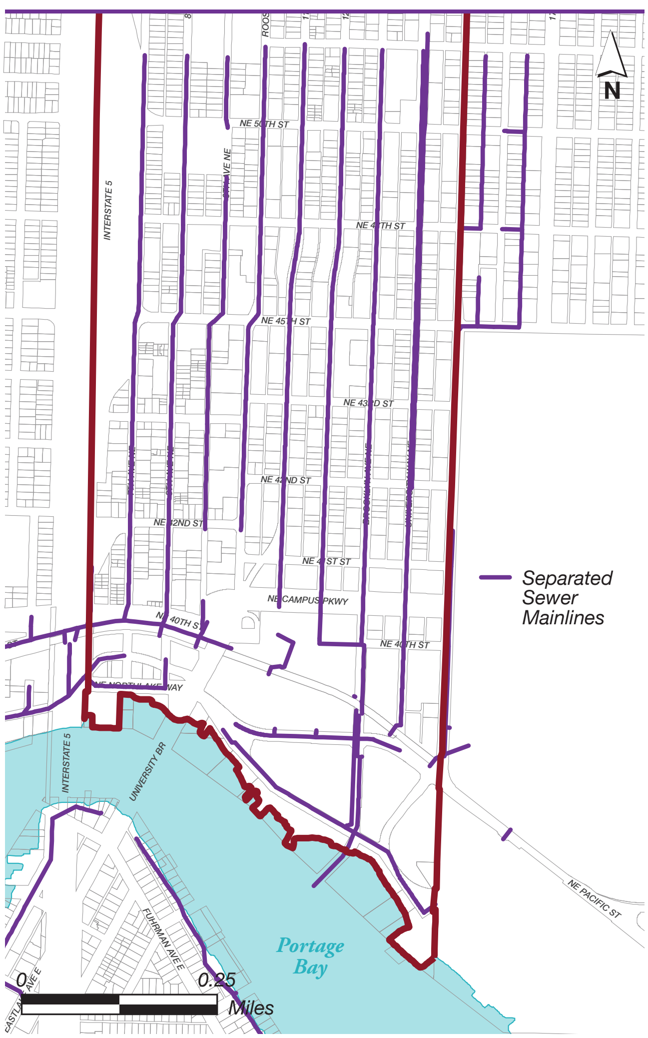
Source: City of Seattle, 2013

Brooklyn Avenue NE and Boat Street manage combined sewer flows. During major storm events the combined system can over flow untreated water into Portage Bay through this CSO facility. CSOs from regulated outfalls are allowed at times, when the system reaches capacity, and as permitted by agreements with the Washington Department of Ecology. The City and King County have made significant up-grades to the conveyance and detention capacity of the combined sewer system to limit these overflows but some storms and other circumstances will still exceed the limit of the system.

Separated System

As shown in Figure 3.9–4, the majority of the sanitary sewage in the study area is collected in a separate system of pipes that route directly to the West Point Treatment Plant. Wastewater collection and conveyance is managed primarily through a series of gravity lines ranging from 8 to 12 inches in diameter. Almost all mainlines in the study area were installed in the early 1900s and are constructed of concrete and vitrified clay.

Figure 3.9–4: **Separated Sewer Mainlines**



Source: City of Seattle, 2013

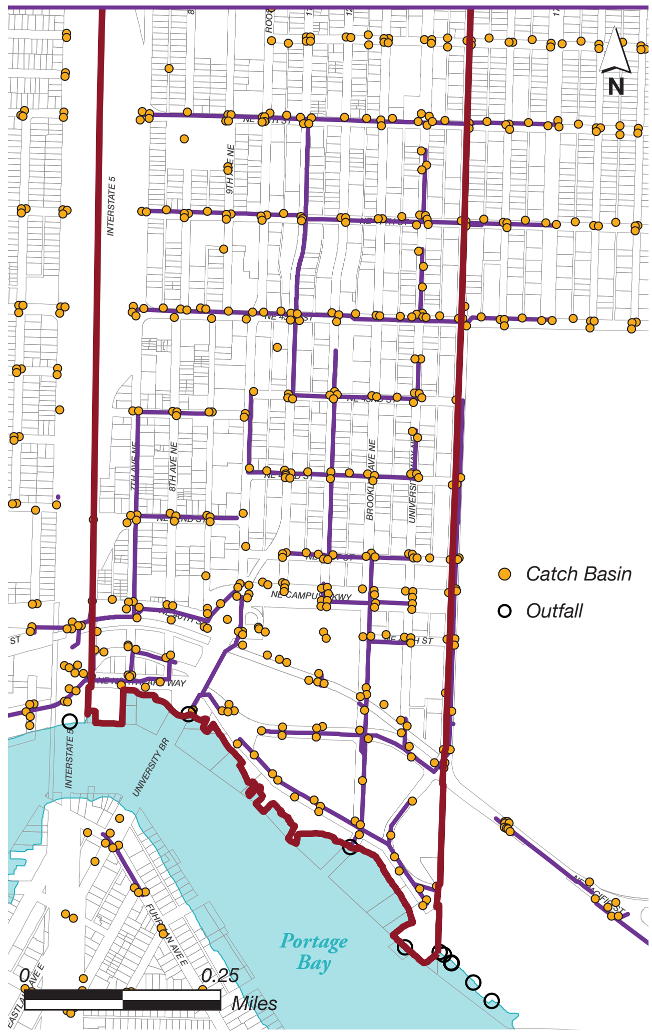
As shown in Figure 3.9–4, sewer lines run north-south through the study area and exit the study area to the southwest where they connect into larger reinforced concrete trunk mains located at 7th Avenue NE running along NE 40th Street.

Stormwater

Stormwater in the study area is collected from streets and properties through a combination of combined and separate pipe networks managed by SPU. The combined system is described in the sanitary sewer discussion, above.

SPU manages stormwater drainage through asset based management and operational standards. The stormwater system is shown in Figure 3.9–5. The mainlines collecting and conveying stormwater range from 15 to 30 inches in diameter. Almost all of the mainlines were installed in 1972 and are constructed of reinforced concrete pipe. Some newer sections along University Way NE, installed in 2005, are made of ductile iron pipe. The drainage system includes a series of catch basins running along main drainage lines to take surface water runoff from roadways and parking lots. A monitoring station at the east side of Brooklyn Avenue NE monitors stormwater discharge through a 36" diameter reinforced concrete pipe installed in 1972.

Figure 3.9–5:
Stormwater Mainlines, Catchbasins, Drainage Outfall



Source: City of Seattle, 2013

In addition to structural infrastructure, SPU regulates plans, builds and maintains green stormwater infrastructure (GSI). Examples of green stormwater infrastructure include permeable pavement, bioretention facilities, and green roofs. Starting in 2009, Seattle has required GSI as part of stormwater mitigation for all redevelopment.

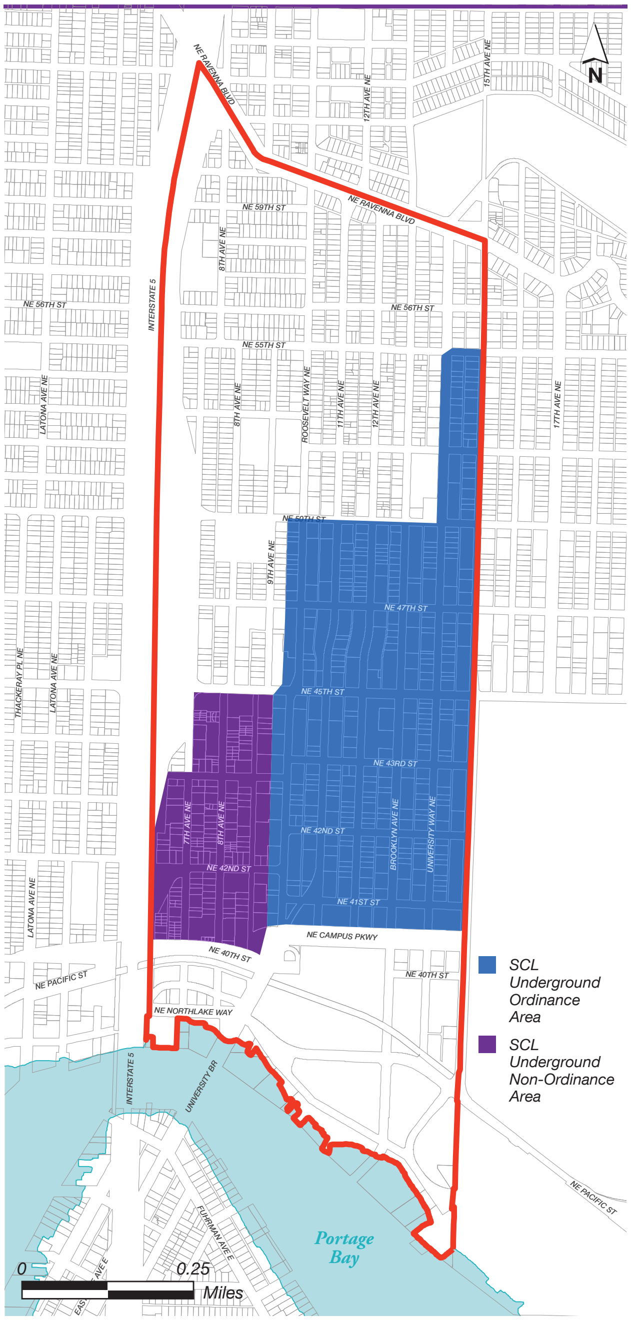
Electric Power

Power in the U District is provided and maintained by Seattle City Light (SCL). SCL is publicly owned and relies on hydropower energy sources.

Power is brought to the study area through the University Substation, located just south of the study area and the North Substation, located north of the study area. In general, power is provided through three distinct 26kV distribution systems, briefly described below:

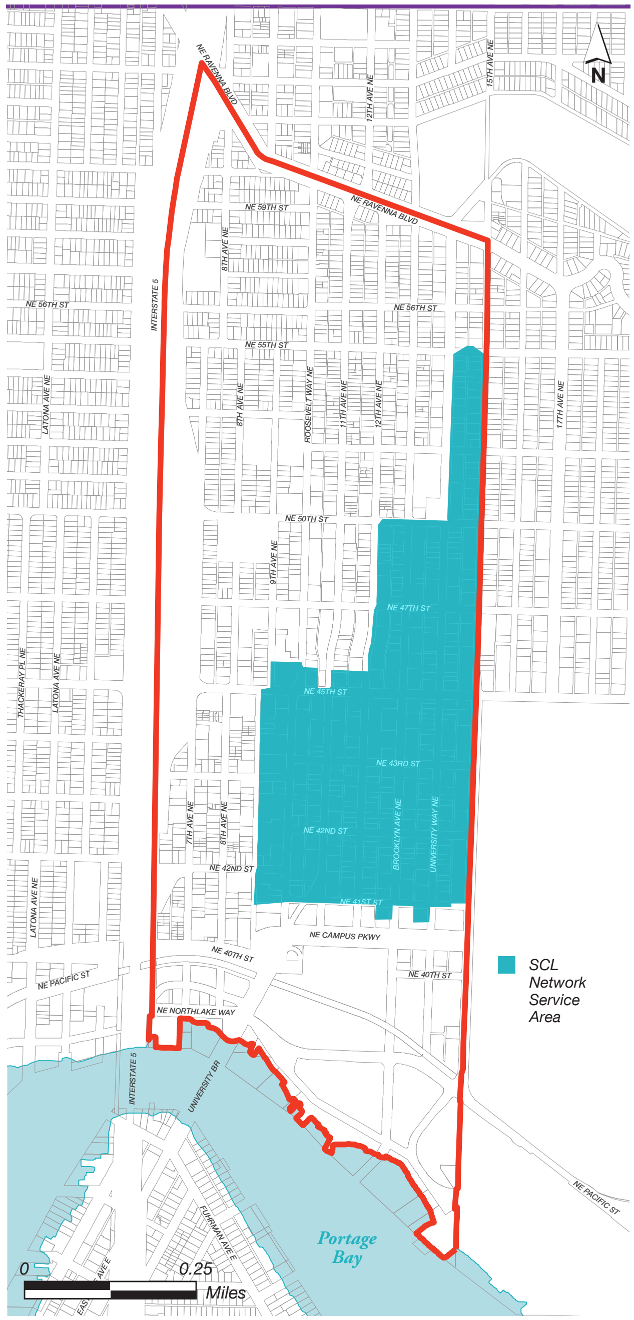
- **Network distribution system.** As shown in Figure 3.9–6, the network distribution system is generally bounded by NE South Street, Campus Parkway, 15th Avenue NE and Roosevelt Way NE. Network systems are typically used in situations where extremely high reliability is essential, such as for hospitals, airports, major data processing centers, as examples. The trade-off for this level of reliability is higher cost to the consumer. In the study area, this system cannot be expanded and is generally operating at capacity under existing conditions.

Figure 3.9–6:
Electric Network Service Area



Source: Seattle City Light, 1989

Figure 3.9–7:
Underground Electric Service Area



Source: Seattle City Light, 2000

- **Looped radial distribution system.** The looped radial system serves those areas not served by the network distribution system and also overlaps in some areas with the network system. The looped radial system is also highly reliable and appropriate for most residential, commercial and office uses. The looped radial system can be expanded to accommodate new growth and development.
- **University of Washington distribution system.** Seattle City Light provides electrical power to the University of Washington, but is not responsible for distribution of power throughout the campus, which is handled by the UW. This system is currently operating at maximum capacity and the UW is considering options to expand service to the main campus.

The network and looped radial distribution systems are separate systems that cannot be interconnected. Similarly, the UW system is separate from the network and looped radial system.

As shown in Figure 3.9–7, two areas within the study area are designated for underground utility service. The first is called the "University District Underground Ordinance Area" and requires by ordinance that all services by undergrounded.[1] With the exception of some properties along 9th Avenue NE, this area is served by the network distribution system, described above and shown in Figure 3.9–6. The second area designated for underground service is referred to as the "Non-Ordinance Area." In this area, alleys are too narrow to maintain a 26kV overhead system, so undergrounding is required for new service or upgrades to existing service.

3.9.2 Significant Impacts

The proposed action would adopt new or maintain existing development standards. By itself, this action would not directly result in impacts to utilities.

New or existing development standards would allow future development over time at varying heights and densities. Development under any of the alternatives would create additional load on the utility infrastructure in this area and is briefly discussed below.

1 *July 10, 1989 Seattle City Light Memorandum from Jerry Swanson to Kay Kinnish. Subject: Ordinance and Non-Ordinance Areas in the University District*

Impacts Common to all Alternatives

WATER

The increased density and intensity of development that would be permitted by any of the alternatives, including No Action, could result in greater demands on the water supply and distribution system. However, new development will be required to include practices which will incorporate efficient plumbing fixtures, water-conserving landscaping, and water reuse opportunities that can reduce per capita water demand. These practices will reduce the overall impact to water use resulting from the proposed alternatives. It should be noted that the potential impact to water use is equally likely under the no action alternative as under the action alternatives. Therefore, increased water use is not considered a significant impact of the proposal.

SANITARY SEWER SYSTEM

Development that would be permitted by the alternatives could result in greater demands on the local sewer collection system and on the downstream conveyance and treatment facilities. Although there will be a greater overall need for sewage facilities with increased density, new development can reduce per-capita demand, as newer, low- or no-flow plumbing fixtures and equipment replaces older, less efficient, installations. This could help reduce this overall impact. Since the potential increased demand is equally likely under the no-action alternative as under the action alternatives, increased demand for sanitary sewer service is not considered a significant impact of the proposal.

Current drainage code will require redeveloped sites that discharge to the combined sewers to provide stormwater detention with either Green Storm Water Infrastructure (GSI) that allows some water to infiltrate and be kept on site, or traditional underground tanks and vaults that temporarily hold the water and slowly release it to the sewer. Either of these methods will help control peak rates of stormwater through the local combined sewer systems, limiting the frequency of street flooding from the local collector pipes and reducing the risk of Combined Sewer Overflows from the trunk mains.

STORM SEWER SYSTEM

Current drainage code will require redeveloped sites that discharge to the storm sewers to provide stormwater detention with Green Storm Water Infrastructure (GSI) that allows some water to infiltrate, and be kept on site, before the rest is released to the storm sewer. No significant impacts to the stormwater system are anticipated under any of the alternatives.

ELECTRICITY

Under all scenarios, including the No Action Alternative, future growth and development will increase demand for electrical energy. The existing substation and transmission infrastructure may be adequate to meet future needs. Further studies are required to determine whether major upgrades to the substation infrastructure will be required.

Under any scenario, the local distribution system may need improvements or reconfiguration to meet future growth needs throughout the study area. As noted above, the network distribution system is currently operating at capacity and cannot be expanded. Therefore, development concentrated in the network distribution area may have a higher impact to the electrical system than development spread over a wider area and/or in the area served by the looped radial distribution system.

3.9.3 Mitigating Measures

Depending on the nature of future site-specific development, mitigation may be necessary to address site-specific impacts that could occur under any of the alternatives.

Leadership in Energy and Environmental Design (LEED) provides a framework and ranking system to reduce the impact of development on the environment including the utility infrastructure. By using LEED methods to reduce energy and other resources, projects can reduce the overall effects of new or re-development. Encouraging the use of the LEED or a similar standard score card (Built Green) for resource use reduction with some type of development incentives would help to reduce the effects on the utility infrastructure.

WATER

- The use of low- or no-flow fixtures and water saving devices in new construction and renovations.
- Collection and re-use of storm water for non-potable uses (irrigation, toilet flushing, mechanical make up water, etc.) would reduce demand on the public water supply.

COMBINED SEWER

- As individual sites redevelop, current Stormwater Code standards, including Green Stormwater Infrastructure, will help control peak rates of stormwater through the local combined sewer systems and reduce the risk of combined sewer overflows.

STORMWATER

- New development in the area will be required to meet the 2009 City of Seattle Drainage Code. Stormwater collected on site will be required to be held on site with Green Stormwater Infrastructure (GSI) methods, or detained before discharge to the city storm system. These measures will reduce the peak rate of water discharged to the combined and storm sewer systems.

ELECTRIC POWER

- Evaluate and identify the future service system needs through collaborative planning process between Seattle Department of Development and Seattle City Light.
- The installation of photovoltaic and other local generating technologies will reduce the demand on the public generating and distribution facilities.
- Construction and operation of LEED compliant (or similar ranking system) buildings will reduce the level of increase required in power systems.
- Reduce the use of power in building heating and cooling with passive systems and modern power saving units.

3.9.4 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to utilities are anticipated.