

Section 10

REUSE OPTIONS

This section describes the current status of the beneficial use of reclaimed water in King, Pierce, and Snohomish Counties, documents issues associated with reuse, and presents an assessment of the reclaimed water reuse potential in the three-county area.

What is “Reuse”?

Reuse is the beneficial use of reclaimed water. Reclaimed water is defined as effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or controlled use that would not otherwise occur, and it is no longer considered wastewater. Additional definitions of reuse terms may be found in Appendix D. The “reuse” of water in Washington is authorized under a comprehensive state law—the Reclaimed Water Act (chapter 90.46 RCW)—that defines this type of water, provides for different categories of use, and lays out an administrative process for it to be used safely under state permits.

Reclaimed water can be used for activities such as irrigation to help meet the water supply needs of people by allowing high-quality water from our potable water sources to be reserved for drinking, using current water resources more efficiently, and ensuring supply for certain uses at a time when new sources are increasingly difficult to find and develop. The use of reclaimed water may also benefit the environment by decreasing the need for withdrawals from streams and groundwater, recharging aquifers in continuity with streams with reclaimed water, and potentially augmenting streamflows in the future (if current research is completed and shows no negative impacts on fish and habitat).

The potential uses of reclaimed water are still in their infancy, both across the state and in the Puget Sound region. Statewide, the Washington State Department of Ecology (Ecology) has issued permits for 14 reuse projects that are either built or are under construction, and has identified another 14 in some stage of planning. Within the Puget Sound region, the quantity of wastewater that can practically be put to non-potable use offers the potential to offset a significant portion of the region’s future demand, particularly for peak demand summer months when sources of potable supply may be strained. For reclaimed water to be used on a large scale in the region, particularly for uses that do not require potable water (e.g., landscape irrigation, industrial cooling), it must be available throughout the region at a price that appeals to potential users, and existing structural barriers to use, such as lack of a distribution system, must be overcome. Although uses of reclaimed water in the region must meet comprehensive state standards as stringent as any in the country, future use will also require continued efforts to address any public health or environmental issues associated with its use beyond those associated with non-potable applications.

Some of the potential supply options described in this report overlap in classification as reuse, conservation, or stormwater. The capture, diversion, discharge, treatment, etc., of stormwater is addressed in Section 11. Other conservation options are discussed in Section 8.

Overview of Water Reuse Projects in the Region

In the region, there are currently several water reuse projects in various stages of implementation. Table 10-1 summarizes the status of water reuse projects in the three-county area and provides an overview of the primary water reuse projects in King, Snohomish and Pierce Counties is discussed below. Table 10-2 summarizes water reuse projects in Snohomish, King, and Pierce Counties. As indicated in the table, several projects have been implemented and are currently in operation. Several more are in the design, planning, and feasibility stages.

Table 10-1: Status of Reuse Projects in the Three-County Area

| County | In Operation | In Design/ Construction | In Planning or Development | Feasibility |
|-----------|--------------|----------------------------|-------------------------------|--------------|
| Snohomish | | | | |
| Number | 3 | 1 | 1 | 3 |
| Capacity | 0.26 mgd | 4 mgd ¹ | 1.5 mgd | Unknown |
| King | | | | |
| Number | 4 | 1 | 2 | 1 |
| Capacity | 3.51 mgd | Pilot | 3.7-5 mgd | 4 mgd |
| Pierce | | | | |
| Number | 1 | 0 | 5 | 2 |
| Capacity | 1 mgd | None | >1.16 mgd | 6.8–15.2 mgd |

mgd = million gallons per day

¹ Uses 8 mgd reclaimed water, replacing 4 mgd of potable supply.

In Snohomish County, the project showing most promise is the Kimberly-Clark Industrial Cooling Water project that will use approximately 8 million gallons per day (mgd) of reclaimed water from the City of Everett’s Water Pollution Control Facility for non-contact cooling purposes. This will save an estimated 4 mgd of potable water from the Lake Chaplain source. In addition, the planned irrigation of a poplar tree plantation adjacent to the Water Pollution Control Facility may use approximately 1.5 mgd of reclaimed water in the future.

In King County, the City of Snoqualmie currently operates a 1.5-mgd reclaimed water system for the Snoqualmie Ridge Golf Course. In addition, King County reuses 2 mgd of treated water at its West Point and South (Renton) wastewater treatment facilities for in-plant uses and for a nearby park. A golf course and industrial facility will also soon be served. The County is also currently involved in the planning and design stage for a reclaimed water project in the Sammamish River Valley. The construction is expected to begin within one to two years. The project could eventually reach 5 to 7 mgd serving non-potable users in the valley.

In Pierce County, the Pierce County Wastewater Utility uses about 1 mgd of treated wastewater for internal process uses such as screen washing at the Chambers Creek Regional Wastewater Treatment Plant. In addition, there are several ongoing studies evaluating landscape irrigation using reclaimed water, and a study by the City of Tacoma that has identified the potential for 1.6 to 10 mgd of reuse opportunities at the Simpson Tacoma Kraft Mill.

Table 10-2: Summary of Reclaimed Water Projects in Snohomish, King, and Pierce Counties

| General Information | | | | Quantity & Use | | | | Logistics | | | Financial | | | | Benefits & Constraints | |
|---------------------|------------------------|--|-------------------------------|----------------|---|-------------------------|-----------------------|---------------------------------------|---|---|-------------------------|------------------------------|---------------------------|---------------------------|---------------------------------|--|
| County | Status ¹ | Project | Previous/Current Water Source | mgd | Intended Use | Seasonal or Year-Round | Water Quality | Wastewater Source | Reclamation Entity | Conveyance to Point of Use | Capital Cost | Operation & Maintenance Cost | Cost per mgd ² | Cost per ccf ² | Potential Benefits ³ | Potential Constraints (incl. water rights) |
| Snohomish | In Operation | WWTPs | Unknown | Unknown | In-plant use | Unknown | NA | Everett treatment plant | Same as source | Internal | Unknown | Unknown | Unknown | Unknown | OE | Unknown |
| Snohomish | In Design/Construction | Kimberly-Clark Paper Mill | City of Everett | 4 ⁴ | Non-contact cooling in heat exchanger | Year-round | Class C | Everett treatment plant | Same as source | New pipeline and pump by others | \$250,000 ⁵ | \$25,000 ⁵ | \$11,000 ⁵ | \$0.02 ⁵ | OE, TI, CB | Unknown |
| Snohomish | Planning/Development | Poplar tree farm | New development | 1.5 | Irrigation-tree farm | Seasonal | Class D | Everett treatment plant | Same as source | Little needed-adjacent to plant | \$100,000 | \$15,000 | \$15,000 | \$0.08 | TI, HI, CB | Unknown |
| Snohomish | Feasibility Stage | Old Weyerhaeuser Mill Site | New development | Unknown | Industrial cooling | Year-round | NA | Everett treatment plant | Same as source | New Kimberly-Clark pipe | Unknown | Unknown | Unknown | Unknown | OE, TI, CB | User perception |
| Snohomish | Feasibility Stage | Everett Parks | City of Everett | Unknown | Irrigation-golf & parks | Seasonal | Class A | Everett treatment plant | Same as source | New Kimberly-Clark pipe | Unknown | Unknown | Unknown | Unknown | OE, TI | User perception |
| Snohomish | Feasibility Stage | Nursery | City of Everett | Unknown | Irrigation-plants | Seasonal | Class C | Everett treatment plant | Same as source | Little needed-adjacent to plant | Unknown | Unknown | Unknown | Unknown | OF, TI, CB | User perception |
| King | Operational 2000 | City of Snoqualmie – golf course | New development | 1.5 | Irrigation-golf & public landscaping | Seasonal | Class A | City-owned sources | City-owned treatment plant | NA | \$1,660,000 | \$22,000 | \$100,000 | \$0.50 | OF | Unknown |
| King | Operational 1994 | West Point treatment plant | SPU | 0.7 | In-plant use & irrigation-public landscapes | Year-round | Class A | West Point treatment plant | Same as source | None needed-using on site | \$800,000 | \$200,000 | \$375,000 | \$0.77 | OE | Unknown |
| King | Operational 1996 | Renton treatment plant | Renton | 1.3 | In-plant use & irrigation-public landscapes | Year-round | Class A | Renton treatment plant | Same as source | None needed-using on site | \$3,000,000 | \$400,000 | \$488,000 | \$1.00 | OE | Unknown |
| King | Operational | Fort Dent Park in Tukwila | Tukwila | 0.1 | Irrigation-ballfields | Seasonal | Class A | Renton treatment plant | Same as source | Built 1 mile pipe | \$1,000,000 | \$6,000 | \$842,000 | \$4.20 | OE, CB | Unknown |
| King | Planning/Development | Lakehaven Utility District-Mirror Lake | Lakehaven Utility District | 0.7-2.0 | Groundwater recharge through septic systems | Year-round | Groundwater standards | Reclaimed water from Lakehaven | Same as source | New pipes to homeowners' septic systems | \$6,000,000-\$8,000,000 | Unknown | Unknown | Unknown | CB | Unknown |
| King | Planning/Development | Pilot satellite plant | River | 3 | Non-potable | Seasonal | Class A | Sewage | Satellite plant (annual cost based upon 35 yrs and 6.25%) | New pipes | \$32,000,000 | \$500,000 | \$924,000 | \$4.08 | OE, OF, CB | Unknown |
| Pierce | Operational 1984 | Chambers Creek Treatment Plant | City of Tacoma | 1 | Non-potable, process | Year-round | Class D | Chambers Creek Regional WWTP | Pierce County | On-site | \$250,000 | Unknown | \$30,000 ⁶ | \$0.06 ⁶ | OE | Unknown |
| Pierce | Planning/Development | Chambers Creek Properties | New development | Unknown | Irrigation-golf | Seasonal and year-round | Class D | Chambers Creek Regional WWTP | Same as source | 0.5 to 2 miles | Unknown | Unknown | Unknown | Unknown | OF, CB | Unknown |
| Pierce | Planning/Development | Existing Orting Cascadia | Orting New development | 1 | Irrigation-golf, school, parks | Seasonal | Class A | Orting treatment plant | Same as source | New pipelines | \$7,200,000 | \$121,000 | \$684,000 | \$3.41 | OF, OE, TI | Unknown |
| Pierce | Planning/Development | Crystal Mountain | New development | 0.1 | Snowmaking & irrigation-landscape | Seasonal | Class A | Crystal Mountain WWTP | Same as source | New pipes | \$8,700,000 | \$700,000 | \$13,806,000 | \$68.84 | OF, TI | Public Health approval |
| Pierce | Planning/Development | Mt Rainier Resort-Park Junction | New development | 0.1 | Irrigation-golf/public landscape & HVAC | Seasonal | Class A | Unknown | Same as source | Unknown | Unknown | Unknown | Unknown | Unknown | OF | Public Health approval |
| Pierce | Feasibility Stage | Simpson Tacoma Kraft Mill | City of Tacoma | 10 | Non-potable | Year-round | Class A | Tacoma-Central treatment plant | Same as source | 1.5 miles | \$29,000,000 | \$3,000,000 | \$527,000 | \$2.63 | OE, CB | Unknown |
| Pierce | Feasibility Stage | Stone Consolidated Mill ⁷ | River | 5.2 | Non-potable | Year-round | Class A | Tacoma-Chambers Creek treatment plant | Same as source | 0.5 miles | \$16,000,000 | \$2,000,000 | \$625,000 | \$3.12 | OE, CB | Cost |

WWTP = wastewater treatment plant ccf = 100 cubic feet mgd = million gallons per day.

¹ In Operation = Currently Operating; In Design/Construction = Funds Committed, Construction or operation imminent; In Planning/Development = Some thought, possible concept report; Feasibility Stage = Discussion but no detail on specifics

² Financial calculations based on 25-year life, 6% interest rate unless otherwise noted.

³ OE = Offset Existing Use of Water TI = Treatment Improvement; CB = Community Benefit; HI = Habitat Improvement; OF = Offset Future Use of Water

⁴ Uses 8 mgd of reclaimed water, replaces 4 mgd potable.

⁵ Marginal cost only.

⁶ Based on capital costs only as O&M not readily available.

⁷ Going out of business but site could be redeveloped.

Reuse Project Descriptions and Status

A description of each reuse project in the three-county Central Puget Sound region is provided below. The descriptions fall into one of four categories:

- “In Operation” means that the facility is operating at this time,
- “In Design/Construction” means that the project proponent or sponsor has committed funds and is in the process of designing or constructing the facility and that operation is imminent,
- “In Planning or Development” means that some thought has gone into the project and possibly a written assessment has been prepared, and
- “Feasibility Stage” means that it has been discussed but concepts have not been developed at any level of detail.

Data that is readily available is presented below. Because some information is not available, the level of detail included may vary depending on the source and amount of information.

Snohomish County

Projects in Operation

Various Wastewater Treatment Plants in Snohomish County

The City of Arlington uses approximately 0.05 mgd of secondary effluent, primarily in the operation of its belt presses. Alderwood Water District uses an estimated 0.2 mgd of secondary effluent for washdown and for the operation of belt presses. The City of Everett uses less than 0.01 mgd of the secondary effluent produced at the plant for various uses around the wastewater treatment facility. The City of Marysville and Olympus Terrace Sewer District do not reuse secondary effluent. The use of significant amounts of secondary effluent appears to be related to dewatering processes. Facilities that operate their own dewatering equipment tend to use larger amounts of treated effluent as process water within the plant.

Projects in Design/Construction

Kimberly-Clark Industrial Cooling Water

| | |
|---------------------------|--|
| <i>Location:</i> | Kimberly-Clark Paper Mill |
| <i>Sponsors:</i> | Kimberly-Clark Corporation and City of Everett |
| <i>Date of Operation:</i> | To Be Determined |
| <i>Capital Cost:</i> | \$250,000 |
| <i>O&M Cost:</i> | \$25,000 per year |

The City of Everett and Kimberly-Clark have entered into an agreement to build a deepwater outfall into Port Gardner Bay. Construction of the outfall and the attendant piping system have created an opportunity to send reclaimed water to Kimberly-Clark for industrial closed system cooling at a very low marginal cost. This project will reduce the amount of unfiltered water that is withdrawn from Chaplain Reservoir, thereby reducing the withdrawals from the Sultan River system. The Kimberly-Clark facility will use approximately 8 mgd of reclaimed water from the City’s water pollution control facility. This will replace approximately 4 mgd

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of unfiltered industrial water that is currently delivered from Chaplain Reservoir. Peak production savings are estimated at 5.4 mgd from Chaplain Reservoir. The costs noted above are only the marginal costs associated with conveying the reclaimed water to the mill site and operating the system, and are over and above the basic costs for constructing and operating the deep water outfall.

Projects in Planning or Development

Poplar Tree Plantation Irrigation

| | |
|---------------------------|---|
| <i>Location:</i> | Poplar tree plantation located adjacent to the Water Pollution Control Facility |
| <i>Sponsors:</i> | City of Everett |
| <i>Date of Operation:</i> | Summer 2001 |
| <i>Capital Cost:</i> | \$100,000 |
| <i>O&M Cost:</i> | \$15,000 |

The purpose of this project is to use reclaimed water and biosolids in a safe and efficient manner, and to demonstrate the benefits of using reclaimed water to grow nonfood crops. The City of Everett owns a 40-acre plot of land located north of the Water Pollution Control Facility's polishing pond, which has historically been used for agricultural purposes. This property is within the treatment facility's boundary and offers an extraordinary opportunity for hybrid poplar cultivation. The City of Everett is proposing to irrigate the poplar tree plantation with approximately 1.5 mgd of reclaimed, Class D water during the dry summer months. The project will reduce treated municipal effluent discharge to the Snohomish River, thereby enhancing water quality in the river.

Feasibility Stage Projects

Old Weyerhaeuser Mill Site

| | |
|------------------|--|
| <i>Location:</i> | Old Weyerhaeuser Mill Site |
| <i>Sponsors:</i> | Potential Industrial User and Everett Public Works |

The old Weyerhaeuser mill site is being considered for a large industrial facility that would require a large volume of cooling water. The potential exists to supply this demand with reclaimed water.

City of Everett Municipal Landscape Irrigation

| | |
|------------------|--|
| <i>Location:</i> | City of Everett Parks and Golf Courses |
| <i>Sponsors:</i> | City of Everett |

Construction of a pipeline to provide reuse cooling water to Kimberly-Clark will provide piping across the Snohomish River for additional uses. The excess capacity available may be put to use as landscape irrigation projects are identified along the pipeline corridor.

Commercial Nursery Nonfood Crop Irrigation

| | |
|------------------|---------------------------------------|
| <i>Location:</i> | Nurseries near Poplar Tree Plantation |
| <i>Sponsor:</i> | City of Everett |

A reuse opportunity exists at nurseries located in proximity to the City of Everett-owned Poplar Tree Plantation. Nearby locations would minimize conveyance issues and costs.

King County

Projects in Operation

City of Snoqualmie – Class A Reclaimed Water for Golf Course

| | |
|---------------------------|------------------|
| <i>Location:</i> | Snoqualmie Ridge |
| <i>Sponsor:</i> | Weyerhaeuser |
| <i>Date of Operation:</i> | Summer 2000 |
| <i>Capital Cost:</i> | \$1.66 million |
| <i>O&M Cost:</i> | \$22,000 |

The City of Snoqualmie developed a 1.5-mgd Class A reclaimed water project that included irrigation for a PGA golf course and public landscape areas for the Snoqualmie Ridge Development. The reclaimed water project went on line in the summer of 2000. The project was financed by the developer, Weyerhaeuser. The project cost was \$1.66 million, excluding a holding pond. The annual operation and maintenance cost is estimated to be \$22,000. The public potable water supply for the area is from the City of Snoqualmie, which has a combination of wells and spring sources. The wells primarily serve the new development at Snoqualmie Ridge, and the spring source primarily serves the original area of the City.

King County West Point and South (Renton) In-Plant Use

| | |
|---------------------------|---|
| <i>Location:</i> | West Point and Renton Wastewater Treatment Plants |
| <i>Sponsor:</i> | King County |
| <i>Date of Operation:</i> | 1994/1996 |
| <i>Capital Cost:</i> | \$3.8 million |
| <i>O&M Cost:</i> | \$600,000 |

At both the West Point and Renton wastewater treatment plants, facilities have been developed to produce a total of approximately 2 mgd of reclaimed water. These reuse facilities have been in use since 1994 and 1996, respectively. The capital costs for West Point and Renton reuse facilities were \$800,000 and \$3,000,000, respectively. The annual operating and maintenance costs are \$200,000 and \$400,000, respectively. A portion of reclaimed water is used for landscape irrigation at the treatment plants.

Fort Dent Park in Tukwila

| | |
|---------------------------|----------------|
| <i>Location:</i> | Fort Dent Park |
| <i>Sponsor:</i> | King County |
| <i>Date of Operation:</i> | March 1998 |
| <i>Capital Cost:</i> | \$1 million |
| <i>O&M Cost:</i> | \$6,000 |

Fort Dent Park in Tukwila uses approximately 0.1 mgd of reclaimed water for irrigation of ball fields. Reclaimed water originates at the South Treatment Plant and is conveyed approximately one mile to the park. The capital cost was \$1 million and the annual operation and maintenance is an estimated \$6,000. An extensive public outreach program was conducted prior to the inception of the project and the project has been irrigating four softball fields and one soccer field with no expression of public concern. The project has been expanded to include irrigation of additional soccer and rugby fields.

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As part of its drought response plan in 2001, the County is in the process of expanding the facilities serving Fort Dent to include nearby Foster Links golf course, and an industrial facility will soon be served.

Projects in Design/Construction

Pilot Scale Project at West Point Wastewater Treatment Plant

Location: West Point Wastewater Treatment Plant
Sponsor: King County
Date of Operation: Present

The objective of this project is to develop information regarding the effectiveness, operability, and costs of technologies that have the potential to:

- Reduce the costs of producing Class A reclaimed water at small, upstream “satellite” plants for commercial/irrigation use, or
- Cost-effectively remove nutrients, pathogens, organics, and/or other contaminants from wastewater to make reclaimed water suitable for discharge to surface waters for supplementing instream flows.

Selected technologies will be demonstrated at King County’s West Point regional wastewater treatment plant to develop data and operating experience needed to assess the benefits and costs.

Projects in Planning or Development

Reclaimed Water Demonstration Program

Location: Sammamish River Valley
Sponsor: King County
Date of Operation: Planned 2005

The King County Council authorized expanding the County’s development of reclaimed water usage as part of its Regional Wastewater Services Plan. King County Department of Natural Resources (KCDNR) initiated a process, through a multi-stakeholder task force convened in early 2000, to develop evaluation criteria for potential satellite treatment facilities and to solicit ideas and information concerning potential reclaimed water projects. KCDNR received 12 nominations for water reuse demonstration projects in Bellevue, Newcastle, Issaquah, Covington, North Creek, Tukwila, the University of Washington, and near the Sammamish River. KCDNR reviewed the nominations using the criteria developed by King County and the Stakeholder Task Force. KCDNR has developed a public outreach strategy as part of the Work Program Development. The purpose of this strategy is to ensure the successful development of a reclaimed water program that is consistent with the schedule of having the first reuse satellite plant built by 2005. King County will be pursuing a reclaimed water project in the Sammamish River Valley. The current plan is to construct a 3-mgd satellite treatment plant and provide reclaimed water to parks, golf courses, and agricultural activities in the area. The project could grow to service as much as 10 mgd in the future. The project is being initiated during the summer of 2001 with a demonstration garden along the Sammamish River using reclaimed water for irrigation.

Lakehaven Utility District – Aquifer Recharge Project in the Mirror Lake Area

Location: Mirror Lake Area
Sponsor: Lakehaven Utility District
Capital Cost: \$6 to \$8 million

The District is reviewing the possibility of sewerage an area with a low-pressure sewer system, installing reclaimed water mains at the same time. The unsewered area that is being considered is generally bounded by 16th Avenue SW to the west, First Avenue South to the east, 313th Street to the south, and SW 304th Street to the north. If approved by the District Board and the homeowners, the District would install a reclaimed water line to the existing on-site septic systems to either utilize the leaching field of the homeowner after the homeowner has connected to the District sewer system, or utilize the right-of-way to infiltrate some of the reclaimed water, or both. The estimated recharge potential is between 0.7 and 2 mgd, with a capital cost estimated to be \$6 to \$8 million. Some oversizing was done in the design, since this facility would be part of a regional project. The distance from the wastewater treatment plant to the boundary of the area is about one mile. This is a creative project that is not a recognized use of reclaimed water under existing regulations.

Feasibility Stage Projects

Lakehaven Utility District – Reclaimed Water

Location: Federal Way Area
Sponsor: Lakehaven Utility District
Capital Cost: \$21.1 million

Lakehaven Utility District evaluated the use of Class A reclaimed water, plus reverse osmosis, for direct aquifer recharge as part of a supply options evaluation. The estimated capital cost was \$21.1 million (1998 dollars) to produce about 4 mgd. The District determined that Tacoma’s Second Supply Line was initially less expensive from both a capital and operation standpoint. The proposal evaluated would have injected the reclaimed water into the aquifer, and there was a high level of concern by the public and news media over the mixing of drinking water and reclaimed water. As proposed, the reclaimed water would have been treated to a higher quality than the groundwater. Although there was public resistance to the idea of drinking reclaimed wastewater, there appeared to be little resistance to the idea of leaching field discharges that would have used natural purifying processes. Because public acceptance may be higher, using leaching fields and “naturally” purifying the water may be a better approach to developing reclaimed water projects.

Pierce County

Projects in Operation

Pierce County Wastewater Utility – Process Water at Wastewater Treatment Plant

Location: Chambers Creek Regional Wastewater Treatment Plant
Sponsor: Pierce County Wastewater Utility
Date of Operation: 1984

The Chambers Creek Regional Wastewater Treatment Plant consumes 1 mgd of treated wastewater for process uses, such as backwashing screens. Treated wastewater is conveyed

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from the secondary clarifiers to points in the treatment process. The piping improvements to make internal reuse possible have been constructed as adjuncts to other projects. It is a year-round use that reduces the amount of potable water that would be used for processes, frees up water for uses requiring Class A water, and provides an internal water source when water supply levels are low and potable water must be conserved.

Projects in Design/Construction

There are no projects in this category at this time.

Projects in Planning or Development

Chambers Creek Properties Master Site Plan – Landscape Irrigation and Reclamation Ponds

Location: Chambers Creek Regional Wastewater Treatment Plant

Sponsor: Pierce County Wastewater Utility

Date of Operation: Preliminary golf course design in 2001, no construction date set

In 1992, the Pierce County Wastewater Utility purchased 658 acres of adjacent gravel mine for expansion of the treatment facility and as a site where the byproducts of wastewater treatment, biosolids and reclaimed wastewater, could be put to beneficial use. In 1997, the Chambers Creek Properties Master Site Plan was adopted with provisions for irrigating the site with reclaimed wastewater. It shows a golf course with 40 acres of ponds containing reclaimed wastewater. Preliminary golf course design is scheduled in 2001. The potential benefits include reduction in summertime wastewater treatment plant discharge volumes, delay in need for certain discharge improvements, and a more dispersed discharge.

City of Orting Seasonal Landscape Irrigation – Phase 1

Location: City of Orting

Sponsors: City of Orting and Cascadia Development Corporation

Date of Operation: 2005

Capital Cost: Total \$7.2 million, made up of:
\$4.2 million (City of Orting)
\$3.0 million (Cascadia Development Corporation)

O&M Cost: \$75,000 Orting treatment plant
\$46,000 Orting distribution system

Reclaimed water use is included as a condition of service in the wastewater treatment agreement between the City of Orting and the Cascadia Development. Under the agreement, seasonal landscape irrigation will be implemented in two phases using a Class A reclaimed water. The waste stream generated by Cascadia will be treated by the City of Orting Wastewater Treatment Facility. Reclaimed water will be pumped back to Cascadia for irrigation of the Cascadia Golf Course, elementary school fields and parks, and yet to be identified uses in the City of Orting. There was no public opposition to this project. Total water saved is projected to approach 1.0 mgd by approximately 2007. Capital improvements will include \$2.5 million for treatment plant upgrades and a pump station; \$0.5 million for a storage reservoir and pressure booster pump for Orting Valley; and \$1.2 million for distribution system improvements in Orting. The City of Orting intends to charge for the reclaimed water but does not expect to recover total costs. The remainder of costs will be borne by the wastewater utility. This cost arrangement is justified by the project's providing

an environmental benefit of limiting discharge to the Carbon River during low flow times of the year, which helps prevent degradation of water quality and enables the City to meet clean water regulatory requirements.

City of Orting Seasonal Landscape Irrigation – Phase 2

As development to the Cascadia area increases and wastewater quantity increases, additional water reclamation is planned for irrigation purposes at Orting Valley Parks in White Hawk and Village Green, and on school fields. The City of Orting and Cascadia Development Corporation hope to begin implementing additional reuse in 2010.

Crystal Mountain Snowmaking and Summer Landscape Irrigation

| | |
|---------------------------|--|
| <i>Location:</i> | Crystal Mountain |
| <i>Sponsors:</i> | Crystal Mountain and Crystal Mountain Sewer District |
| <i>Date of Operation:</i> | 2003 |
| <i>Capital Cost:</i> | \$8.7 million |
| <i>O&M Cost:</i> | \$0.7 million |

Crystal Mountain Sewer District and Crystal Mountain have been investigating the feasibility of using Class A reclaimed water for winter snowmaking and for summer landscape irrigation. It is estimated that the program would have a peak month demand of 0.16 mgd and use 28.0 million gallons annually. The recent draft facility plan proposes phased sewer installation and treatment plant upgrades that will be capable of producing Class A reclaimed water. Crystal Mountain has the option to conduct pilot evaluation of snowmaking and irrigation prior to full-scale implementation.

Mt. Rainier Resort at Park Junction

| | |
|---------------------------|-------------------------------------|
| <i>Location:</i> | Mt. Rainier Resort at Park Junction |
| <i>Sponsors:</i> | Mt. Rainier Resort |
| <i>Date of Operation:</i> | 2003 (Tentative) |

Mt. Rainier Resort at Park Junction would be a destination resort located 12 miles from the Nisqually entrance to Mount Rainier National Park. The proposed resort includes a 270-room lodge, 18-hole golf course, 500-seat conference center, shopping, and 300+ vacation homes and condominiums. The resort is proposing to produce and use Class A reclaimed water for golf course and public areas to landscape irrigation. Additionally, the resort hopes to obtain approval to use reclaimed water for HVAC heating and cooling.

Feasibility Stage Projects

Process Water at Simpson Tacoma Kraft Mill

| | |
|------------------|---------------------------|
| <i>Location:</i> | Simpson Tacoma Kraft Mill |
| <i>Sponsor:</i> | City of Tacoma |

The evaluation of industrial and irrigation reuse opportunities has been an ongoing and continuous process in Pierce County since 1991. A feasibility study was conducted in 1991 to evaluate the potential use of secondary effluent from the City of Tacoma's central wastewater treatment plant as process water in the Simpson Tacoma Kraft Mill. The study selected options that would make use of 10 to 20 mgd as part of a future evaluation.

City of Tacoma Water Reuse Feasibility Study

Location: Tacoma Area
Sponsor: City of Tacoma

As a follow-up to the 1991 study, a Water Reuse Feasibility Study was conducted in 1994 by the City of Tacoma Water Department. The 1994 study evaluated the technical and economic reality of treating secondary effluent from three Tacoma-area wastewater treatment plants to a reclaimed water quality required for industrial and irrigation uses. Three alternatives were developed:

- **Chambers Creek Regional Wastewater Treatment Plant service area:** Treat a total of 9.1 mgd of reclaimed water for use by the Stone Consolidated West Tacoma Mill (5 mgd), irrigation sites southeast of wastewater facility (1.7 mgd), and irrigation sites to the northeast (2.4 mgd). (Note: Since the referenced report was published, Abitibi-Consolidated closed its West Tacoma Mill [formerly the Stone Consolidated West Tacoma Mill], but the site could be redeveloped.)
- **Tacoma Central Wastewater Treatment Facility service area:** Produce a total of 19.3 mgd of reclaimed water for use in 11 industries in tideflats area (15.9 mgd) and for various irrigation sites (3.4 mgd).
- **Tacoma North End Wastewater Treatment Facility service area:** Produce 0.7 mgd of reclaimed water from North End facility and distribute to various landscape irrigation sites.

The evaluation concluded that alternatives using reclaimed water for industrial processes were more cost-effective than those for irrigation, and that opportunities associated with the Central Wastewater Treatment Facility’s tideflats area were most attractive. Based on these findings the best opportunities for further study are the Simpson Tacoma Kraft Mill in the tideflats area and the Abitibi-Consolidated (formerly Stone Consolidated) West Tacoma Mill.

Follow-up Conservation and Water Reuse Studies

Location: Simpson Tacoma Kraft and Stone Consolidated (Abitibi-Consolidated) Mills
Sponsor: City of Tacoma

In 1997, the Simpson Tacoma Kraft and Stone Consolidated West Tacoma Mill Conservation and Water Reuse Assessment was conducted to identify methods to permanently decrease water use at the mills through appropriate and cost-effective conservation, water recovery, and/or water reuse measures. That evaluation concluded that potential for conservation and reuse benefits did exist at both facilities as summarized in Table 10-3.

Table 10-3: Potential Water Conservation Savings and Reuse at Simpson Tacoma Kraft and Stone Consolidated West Tacoma Mills

| Facility | Conservation Savings | Reuse Opportunities |
|---|----------------------|---------------------|
| Simpson Tacoma Kraft | 8 mgd | 1.6 to 10 mgd |
| Stone Consolidated (West Tacoma) ¹ | 1.4 mgd | 5.2 mgd |

¹ The Abitibi-Consolidated (formerly Stone Consolidated) West Tacoma Mill has closed, but the site could be redeveloped in the future.

Summary of Regulatory Framework

Chapter 90.46 RCW, the Washington State Reclaimed Water Act, states that the people of the state have a primary interest in the development of facilities to provide reclaimed water to replace potable water in non-potable applications, to supplement existing surface and groundwater supplies, and to assist in meeting the future water requirements of the state. The state legislature directed Ecology and the Washington State Department of Health (DOH) to develop standards, guidance and implementation procedures for the use of reclaimed water. Outside the scope of the Reclaimed Water Act, there are other legal requirements—such as the Total Maximum Daily Loads (TMDLs) for impaired waters, and the water and habitat prescriptions under Endangered Species Act (ESA)—which have significant implications for reuse of reclaimed water, due to the heightened water quality standards and need to maintain instream flows.

State law requires issuance of a single permit for reclaimed water projects that meet state standards. The principal state standards addressing water reuse were developed jointly by the Departments of Ecology and Health, and are used by Ecology when issuing permits for reclaimed water projects (after DOH review). The standards were adopted in 1997 and are referenced in “Water Reclamation and Reuse Standards.”¹ These standards are comprehensive in nature, addressing treatment and quality of water, potential health aspects related to disinfection, and potential for ingestion and inhalation. They classify uses of reclaimed water into four categories—A, B, C, and D—depending on the quality of reclaimed water required, and they form the basis for all reuse projects in the state. All reclaimed water must be oxidized and disinfected. Class A water (the highest quality water) must also be coagulated and filtered.

The types of Washington State-approved uses for reclaimed water include, but are not limited to, the following:

- Irrigation of non-food crops
- Irrigation of food crops
- Landscape irrigation
- Impoundments
- Fish hatchery basins
- Water jetting for consolidation around pipelines
- Fire fighting and protection
- Industrial boiler feed
- Decorative fountains
- Street Cleaning
- Flushing of sanitary sewers
- Washing aggregate and making concrete
- Toilet and urinal flushing
- Dust control
- Dampening of soil for compaction
- Washing of corporation yards, lots, and sidewalks
- Ship ballast
- Industrial cooling
- Industrial process

Some local governments have policies related to use of reclaimed water, which are described in the following pages. The policies generally support and encourage the approved use of reclaimed water as part of efforts to reduce the demand and reliance on potable water sources.

A detailed description of regulations and permitting for water reuse and reclamation is provided in Appendix D.

¹ Washington State Department of Ecology. September 1997. “Water Reclamation and Reuse Standards,” publication number 97-023. Available online at <http://www.ecy.wa.gov/biblio/97023.html> (cited May 7, 2001).

County, City, and Utility Policies on Water Reuse and Reclamation

While the need to maximize existing water resources is a common goal for Snohomish, King, and Pierce Counties, the individual needs, priorities, and political climate of each county has resulted in different policies regarding water reuse. The policies for water reuse and reclamation for the three counties are included below. In some cases the major water supplier in a county, such as Seattle Public Utilities or Tacoma Water, has written policies or statements that apply within their respective service areas. By and large, the policies that have been adopted generally support expanded use of reclaimed water.

Snohomish County

There are no formal policies on water reuse and reclamation at this time in Snohomish County.

King County

King County Government

The King County government has adopted several policies concerning reclaimed water (Ord. 13680 § 5, 1999).

- **Policy TPP-1:** “King County shall provide secondary treatment to all base sanitary flow delivered to its treatment plants. Treatment beyond the secondary level may be provided to meet water quality standards and achieve other goals such as furthering the water reuse program or benefiting species listed under the ESA.”
- **Policy TPP-7:** “King County may explore the possibility of constructing one or more satellite treatment plants in order to produce reclaimed water.”
- **Policy TPP-8:** “King County shall continue water reuse and explore opportunities for expanded use at existing plants, and shall explore water reuse opportunities at all new treatment facilities.”
- **Policy WRP-13:** “King County shall continue to fund pilot-scale and water reuse demonstration projects, in whole or in part, from the wastewater utility rate base.”

As part of its preliminary planning for a proposed third regional wastewater treatment plant, the King County Council has directed that production of reclaimed water be included in the facility’s design.

East King County Groundwater Advisory Committee

- **SE-1: Guideline Revision.** The East King County Groundwater Advisory Committee strongly supports the use of reclaimed water. Also, the East King County Groundwater Advisory Committee strongly encourages the Department of Ecology to include groundwater protection in the guidelines for reuse of effluent. The guidelines need to give special attention to reuse of effluent in the most physically susceptible areas.

- **GC-2: Total Water Consumption by Golf Courses.** Limitations on water use shall be placed on golf course development to ensure equitable use of groundwater resources consistent with zoning. King County Department of Natural Resources will propose, for Metropolitan King County Council’s consideration, amendments to the King County Development Regulations to require that all golf course development shall—through a variety of conservation measures such as use of reclaimed water, maximized use of drought tolerant landscaping, and minimized green areas—limit the groundwater use to that of the equivalent residential development allowed by zoning. (For groundwater calculation purposes, single-family residential use is 400 gallons per house per day.) Until the development regulations are changed, the guidance for environmental review (AP-1C) will include this analysis.

City of Seattle

Seattle Public Utilities (SPU) is currently developing official policy specific to water reuse. SPU also addresses the issue in its Draft 2001 Water System Plan stating:

SPU recognizes the value of reclaimed water as a means to conserve and extend the useful life of the potable water supply. SPU supports and encourages coordinated regional water, wastewater, and reclaimed water planning efforts. SPU recognizes that King County is exploring the development of reclaimed water and may ultimately be a wholesale supplier.

Pierce County

Pierce County government maintains official policies regarding water conservation and reuse. The Pierce County Coordinated Water System Plan, WC Policy-8, specifically addresses water reuse inclusion in water system planning and states:

All public water systems shall incorporate within their water system plans an inventory of potential sources and uses for reclaimed water. The inventory shall include, at least, the following:

- *Potential Sources:*
 - *Fish hatcheries;*
 - *Stormwater impoundments;*
 - *Sewage treatment effluent; and*
 - *Industrial and commercial process and cooling water.*
- *Potential Uses or Users:*
 - *Industries;*
 - *Nurseries;*
 - *Golf courses and other landscape irrigators;*
 - *Artificial recharge of aquifers;*
 - *Parks and parkways;*
 - *Agricultural irrigation;*
 - *Flushing of sanitary sewers;*
 - *Fire protection; and*
 - *Street cleaning, dust control, and other washing applications.*

The Chambers Creek Properties Master Site Plan (Master Site Plan), adopted by the Cities of Lakewood, Steilacoom, and University Place, as well as by Pierce County, calls for use of treated wastewater in the reclamation of two gravel mines adjacent to the Chambers Creek

Regional Wastewater Treatment Plant and owned by the Pierce County Wastewater Utility. The Master Site Plan also provides for integration of water reclamation ponds into the recreation area, water features, and on-site irrigation uses.

City of Tacoma

Tacoma Water maintains a separate policy as a condition of service for large irrigation customers to encourage development of water reuse sources of supply. The “Tacoma Water Proposed Policy on Irrigation Supply for Large Users” states:

New water service to new cemeteries, large parks, and golf courses for irrigation needs will include a requirement to evaluate other potential sources of water, an assessment of the amount of water available, and an estimated cost of source development. In the event that water service is provided by Tacoma Water, the service will be considered an “interruptible water supply.” During water system emergencies and/or dry conditions, water service may be reduced in compliance with Tacoma Water’s Shortage Response Plan.

Issues Associated with Development and Use of Reclaimed Water

The issues surrounding the use of reclaimed water reflect the various interests of the groups and people concerned about reuse. They include, but are not limited to, regulatory, technical, environmental, legal, financial, public acceptance, and political issues. Some tend to drive water planning in the direction of increased use of reclaimed water, and some drive in the opposite direction. The public level of concern relative to reuse varies widely, and tends to depend on the end use of the reclaimed water. End uses of reclaimed water have been divided into three categories: “Direct Potable,” “Non-Potable,” and “Indirect Potable,” reuse applications.

“Direct Potable” Reuse

Although it may be technically feasible, “direct potable” use of reclaimed water for drinking purposes is currently viewed skeptically by the public. However, the public generally has little concern for using reclaimed water for other purposes such as irrigating a golf course.

“Direct potable” reuse means a “pipe-to-pipe” connection between the reclaimed water treatment facility and the potable water distribution system. Washington State regulations do not provide for “direct potable” reuse, and it is not done anywhere in the United States except in a scientific research setting. The Forum has chosen not to further address this category, and to focus on reuse applications that have a greater potential for use in this region.

“Non-Potable” Reuse

“Non-potable” uses have the greatest potential application to this region. The types of uses approved by the state standards include irrigation of non-food crops; irrigation of food crops;

landscape irrigation; discharge to impoundments; use in fish hatchery basins and decorative fountains; flushing of sanitary sewers; street cleaning; washing of corporation yards and lots and sidewalks; dust control; dampening of soil for compaction at construction sites; landfills, etc.; water jetting for consolidation of backfill; fire fighting and protection; toilet and urinal flushing; washing aggregate and making concrete; industrial boiler feed; industrial cooling; and industrial process. Some of these types of reuse are occurring in the three-county area, as described above. As can be seen from the review of the variety of potential uses, they are many and varied. Although all are considered non-potable uses, some will likely be more controversial from the public's perspective than others.

Regulatory

The primary regulatory document, "Water Reclamation and Reuse Standards," prepared by the Departments of Ecology and Health, establishes different treatment and water quality standards (Class A, B, C, and D) for different non-potable uses. As a minimum, all classes of reclaimed water A, B, C, and D, include oxidation and disinfection. Class A is also coagulated and filtered. Through its determination of approved uses, treatment standards, and water quality standards, the Water Reclamation and Reuse Standards regulate reclaimed water use. An important example relates to the different levels of water quality required for different uses. If an entity wants to provide reclaimed water for both irrigating playgrounds (Class A) and flushing sanitary sewers (Class D), the entity would have to either build two separate reclaimed water distribution systems or serve both uses with the higher quality water (Class A). For more details, refer to Appendix D, which includes a listing of the class of reclaimed water approved for different applications.

Technical

There are several technical issues associated with "non-potable" reuse applications, some of which serve to encourage reclaimed water use, while others constrain reclaimed water use. Issues include increasingly stringent wastewater disposal requirements; proximity of treatment facilities to existing or potential reclaimed water customers; and the difficulties associated with retrofitting existing in-plant or on-site distribution systems to accept reclaimed water.

Increasingly stringent requirements for wastewater treatment and discharge to surface waters can serve as important drivers for reclaimed water, because the marginal cost of reclaimed water decreases as these standards become more stringent. In the Puget Sound area, reclaimed water may currently cost more than existing supplies of potable water because of the need to upgrade treatment components at wastewater facilities to reclaimed water standards, and the need to construct separate reclaimed water distribution systems.

More advanced treatment is necessary when higher standards are required for reclaimed water uses than for wastewater discharge to surface waters. Discharge water quality standards may become more stringent in the future for several reasons, including the general strengthening of discharge limits under the Clean Water Act, a Total Maximum Daily Load for a particular river system, and water quality concerns related to the Endangered Species Act.

The proximity of treatment facilities to users can be a driver or constraint. Transmission and distribution costs can be substantial. Because reclaimed water and potable water must be segregated, reclaimed water cannot be distributed through

existing distribution systems. Instead, entirely new, separate distribution systems must be built for reclaimed water. Therefore, the economics of projects with potential users near treatment facilities are more favorable than projects with relatively distant users. Pumping costs also increase as the elevation of the end user increases. Proximity to treatment must also be weighed with the quantity of users. A project with one distant user may not be economically feasible, yet a project with multiple users at the same distance may become feasible due to economies of scale and cost sharing. Strategic “bundling” of users and/or uses such as this can improve the practicality of reclaimed water projects.

Another technical element is the difficulty of retrofitting an existing system as compared to the more feasible incorporation of dual systems into new development. Retrofitting existing systems is usually more expensive and difficult than incorporating dual systems at the time of initial building. Construction of distribution lines is also more difficult in established areas due to disruption of traffic flow and business access—as well as adequate separation from existing potable and sanitary sewer lines. Therefore, reclaimed water use is often more practical to incorporate into new development or in conjunction with other construction activities such as road repair. Many reclaimed water projects currently underway are for new development for this reason.

Environmental

Wastewater reclamation can be used to address environmental concerns. Implementing reclaimed water projects can result in smaller withdrawals from a stream, if the reclaimed water is used as a substitute for stream withdrawals, leaving more water in the stream for fish needs or other environmental benefits. Reclaimed water can be used to augment streamflows, either by discharging year-round, or at critical times, such as periods associated with fish spawning or migration. Reclaimed water can be used to recharge aquifers, which feed streams. Reclaimed water can also reduce stream pollutant loading by re-directing the water, after additional treatment, to an out-of-stream beneficial use such as irrigation. This reduced stream pollutant loading may be important for streams with degraded water quality and can assist entities in meeting their discharge regulatory permit requirement for streams with established TMDLs.

Environmental issues associated with direct discharge streamflow augmentation can also be a constraint to using reclaimed water. State and federal laws, including the “Water Reclamation and Reuse Standards,” state surface water discharge regulations, and water quality standards, incorporate environmental protection into their guidelines for streamflow augmentation. Although streamflow augmentation must meet state water quality standards that protect all designated uses of water, endangered species, such as Puget Sound chinook salmon, may require a more detailed assessment. Such assessments must address traditional issues such as adequate water for streamflow augmentation coordinated with the timing of fish migration, spawning, and rearing, as well as non-traditional issues, such as the potential disruption to salmon olfactory-based homing instincts if a major portion of the stream consists of reclaimed water. Just as many stakeholders are concerned with current and additional diversions from streams, there are concerns about the environmental consequences of augmenting stream flow with direct discharges of reclaimed water.

Another constraining environmental issue can be the effects of diverting water previously discharged to streams on the ability to meet minimum instream flow requirements. For some streams, the discharge from a treatment plant constitutes a critical quantity of water; consumptive use of reclaimed water could reduce the downstream flow below acceptable levels. The issue becomes one of balancing the desire to provide sufficient quantity of water and the desire to protect the quality of water. The Reclaimed Water Act specifically prohibits the impairment by a reclaimed water project of a water right of a downstream user, unless there is compensation. Instream flows are only water rights under Washington law if they have been set by the Department of Ecology by regulation.

Just as with potable water supplies, construction of reclaimed water transmission lines may increase erosion, increase sediment loading to streams, interrupt streamflows, and obstruct fish passage. Mitigating these impacts increases the cost of construction.

Legal

Legal issues, such as increased liability exposure and potential impairment of existing water rights, may discourage implementation of reuse projects. Concerns over existing liability may cause entities to be overly cautious about engaging in reclaimed water projects. This heightened sensitivity may be due to three reasons. First, since reclaimed water is a relatively new undertaking in the Puget Sound region, there is not an established set of case law. Second, there is a natural tendency to be conservative when exploring unknown territory. Third, an enterprise such as reclaimed water could attract lawsuits.

Reuse projects are prohibited from impairing water rights downstream from a freshwater discharge point without appropriate mitigation or compensation. If a reuse project diverts water previously discharged to such a stream, downstream water-right holder(s) could be affected. If the downstream diversion or instream uses are important enough to justify continuing the discharge to that particular surface water, continuing the discharge may be the most desirable use of the water, irrespective of impairment of rights. One approach to such a situation might be to delay the start of the water reclamation project, or gradually phasing it in over time, to allow the downstream users enough time to find alternative water supplies.

Potential customers for reclaimed water who currently hold water rights may hesitate to stop using their right for fear of relinquishing their water right. Water rights can be temporarily transferred to the Department of Ecology's trust water rights program (RCW 90.42.040). However, given the current difficulties in obtaining water rights, many self-supplied water users may take a conservative approach to any possibility, real or perceived, of losing their water rights.

Financial

The costs of producing reclaimed water may be higher than the costs for providing water from existing and most new potable water supplies. The cost of reclaimed water results from the need for wastewater treatment in addition to that required to meet wastewater discharge standards, for constructing new transmission and distribution systems, and for modifying equipment or processes to use reclaimed water.

The costs of most wastewater treatment plants have been subsidized by both federal and state grant and loan programs. Likewise, some existing water supplies may also be under priced with respect to environmental protection. However, with the advent of ESA and other environmental regulations, the cost of developing potable water sources is likely to rise, possibly making the cost of reclaimed water more competitive.

Reclaimed water will become more cost competitive with potable water when the cost of developing new conventional water sources exceeds the cost of producing, distributing, and using reclaimed water. The marginal treatment cost of reclaimed water will also decrease as standards for water and wastewater treatment and discharge water quality become more stringent. Distribution of reclaimed water is not inherently more expensive because of the nature of reclaimed water, but distribution systems already exist for potable water, whereas distribution systems must be built for reclaimed water. The cost of distribution facilities becomes less constraining when a reclaimed water system does not have to compete with an established, paid-for potable distribution system. Reclaimed water becomes more competitive overall in the long run, once a reclaimed water distribution system has been constructed.

Another potential financial issue is that, depending on the situation, reclaimed water development could potentially cause lost revenue and stranded costs for water suppliers and wastewater treatment providers. This is a very site-specific issue, especially in the case where the water supplier is a different entity than the wastewater provider.

New distribution systems are usually required to move the reclaimed water to the user and then distribute it within the user's site. This is particularly an issue in developed areas where pipelines may have to be located in existing streets and congested right-of-ways. Retrofitting existing facilities can be much more complicated and more costly than the infrastructure for new development.

There are so many factors involved in assessing the costs of any reuse project that it is not possible to provide a unit cost that applies in all situations. Unit costs may range from \$11,000 to over \$13 million per mgd. Additional costs to consider are the environmental costs of the actions. Environmental benefits, such as potentially increasing instream flows for fish and watershed enhancement, should also be included in a cost analysis.

Public Acceptance

Of the three categories of uses described, "non-potable" uses of reclaimed water are generally the most acceptable to the public. Public acceptance can be both a driver and a constraint to "non-potable" uses.

In the yearly King County Water Use Survey, the public consistently supports use of reclaimed water for irrigation and industrial purposes (at a nearly 85 percent approval rating). The public has also shown support for reuse programs that benefit the environment.

The Central Puget Sound region's successful adoption and implementation of environmentally responsible programs such as water and energy conservation and recycling provide an indication that use of reclaimed water will likely receive widespread support over time. Strategies to gain public acceptance can frame water reuse in the context of conservation and resource sustainability while protecting

public health and safety and the environment. While the conservation ethic is a positive driver, there is an associated complicating factor: the commonly-held misperception that water is in ample supply. It is difficult for many people to understand that given our rainy climate, water is in short supply during certain seasons, especially during years when snow pack is low. Ironically, one of the strongest arguments supporting use of reclaimed water is that it is a “drought-proof” supply, in that the wastewater stream that provides the basis for reclaimed water continues year-round.

Public education is a vital component of gaining public acceptance for water reuse. Education programs addressing the benefits of water reuse for non-potable uses, as well as explaining how reuse relates to current supply and treatment systems, can help.

Public acceptance of siting a reclamation facility near their residence or place of business may be difficult to achieve, as it is with siting a wastewater plant or any industrial facility, including water treatment plants. A “skimming satellite plant” with no solids handling may be less likely to encounter resistance. Designs that ensure that facilities augment the neighborhood can help demonstrate the intent to be a compatible neighbor.

The public may have questions and concerns about using reclaimed water for irrigation on food crops, and may need to receive significant education on the risks and benefits. Likewise, the public may have questions about the use of reclaimed water in recreational impoundments, especially those that allow body contact with the reclaimed water. However, state standards address both such uses of reclaimed water. Making the facts, and information about safeguards built into the standards and projects, available in many forms is the first step.

Political

Political bodies can promote water reuse, encouraging its development through requiring its use or the consideration of its use, providing general support, and providing financial incentives. However, political bodies can also function to constrain use through lack of clear policy and financial disincentives.

Local governments can independently promote the use of reclaimed water as part of their water and wastewater planning. The City of Tacoma provides an example of implementing a general policy. Tacoma Water Division’s policy for providing water supply to large irrigators requires the irrigator to evaluate alternative supply options, including reuse. The proposed Cascadia development in Pierce County is an example. The City of Tacoma required consideration of reclaimed water use as a condition of providing potable water service to this development. The City of Orting also made reclaimed water use a condition of providing wastewater treatment. Political bodies can also require the use of reclaimed water when it is available. The City of Yelm has such a local ordinance.

The Reclaimed Water Act, RCW 90.46, establishes as state policy the general support for reclaimed water. Under the act, the state declared its support for reclaimed water, enumerated various benefits, directed the creation of standards, and set policy for water rights for reclaimed water. The Legislature has also amended the Water Pollution Control Act, RCW 90.48.112, to require consideration of opportunities for reclaimed water in general sewer plans and wastewater facility plans submitted to the Department of Ecology. Where the use of reclaimed water for

non-potable uses may replace or augment existing potable water supplies, the Reclaimed Water Act (RCW 90.46.120) requires that it be considered in either development of a regional water supply plan or in plans addressing potable water supply service by multiple water purveyors.

Government financial incentives can encourage wastewater reclamation and reuse projects. The incentives can take many forms including demonstration projects and cost sharing policies. In 1997, the Legislature provided funds to create five demonstration projects spanning different intended uses and different geographic locations around the state. King County is planning a similar demonstration project in the Sammamish River Valley for “non-potable” applications.²

The utility industry in an area can serve as either a driver or a constraint to reclaimed water. In some areas, water and sewer services are provided by the same entity, often a water and sewer district or a municipality. This condition normally fosters the consideration of reclaimed water because a single entity has control of more factors involved in a decision. Frequently, water is provided by companies, special purpose districts, or governmental agencies that are separate from sewer service providers. In other cases, facilities may be regionalized and have service agreements between several parties. When different entities may provide water and reclaimed water to the same area, the respective parties should pursue agreement and coordination regarding division of roles and responsibilities, intended uses, facility siting, and target consumers. This condition can make implementation of a water reclamation project more difficult as the agencies may have different goals, rate bases, policies, and governing laws.

Generic “Indirect Potable” Reuse

In “indirect potable” reuse, a highly treated reclaimed water is intentionally introduced to a surface water or groundwater system that is ultimately used as part of a municipal potable water supply. In an indirect system, the reclaimed water is blended with the natural water system and there is often a significant time delay, twelve or more months, in which the water receives additional natural treatment before the blended water is withdrawn for treatment at a potable treatment facility.

Indirect potable use refers to the “planned” and controlled use of the reclaimed water. “Unplanned” indirect potable use has been practiced for decades throughout much of the United States, including Washington, whenever treated municipal wastewater from one city is discharged to a receiving stream or river and the cities downstream use the same water body as their potable water supply source. This occurs many times on most major watercourses. Indirect potable reuse is also practiced when effluent from septic tanks or other land treatment systems reaches groundwater.

Indirect potable use provides for a method of storage and could be used to offset pressure on existing municipal water supply sources to meet growing demands. King County is in the early stages of evaluating the potential to use reclaimed water as an indirect source of potable water as a long-term option.

Examples of “planned indirect potable” reclaimed water use in the United States include:

² Washington State Department of Ecology. December 2000. “Water Reclamation and Reuse—The Demonstration Projects,” publication number 00-10-062. Available online at <http://www.ecy.wa.gov/biblio/0010062.html> (cited May 7, 2001).

- Upper Occoquan Reservoir, Virginia
- West Basin Municipal Water District, California
- Fred Hervey Water Reclamation, El Paso, Texas
- Orange County, California

Regulatory

The treatment requirements for reclaimed water discharged to surface or groundwaters are included in the “Water Reclamation and Reuse Standards” as follows.

- Section 3, Standards for Direct Aquifer Recharge, Article 3, Reclaimed Water Quality Requirements, specifically addresses the reclaimed water treatment and quality requirements related to direct recharge to potable groundwater including drinking water and groundwater quality requirements.
- Section 1, General Requirements, Article 3, Groundwater Recharge by Surface Percolation, requires meeting drinking water standards.
- Section 1, General Requirements, Article 5, Section 1, Streamflow Augmentation, requires meeting all applicable surface water quality standards.
- Section 2, Reclaimed Water Standards for Wetlands, requires meeting all applicable surface water quality standards.

Requirements for discharge of reclaimed water must also meet the applicable state and federal surface water, groundwater, and drinking water standards.

Technical

For indirect potable uses, there are a series of management and treatment steps that should be in place to reduce chemical and microbiological contaminants; methods to assess risk and monitoring; procedures to assess health effects studies; and methods to ensure reliability and quality assurance of “indirect potable” reuse systems. These factors were considered in the development of the Washington State standards, which are as stringent as any reclaimed water standards in the country. The standards require a number of reliability features as well as a multibarrier treatment approach to remove contaminants. The reclaimed water permit includes water quality requirements, monitoring, and other special conditions to assure quality and minimize risk.

A major consideration for the production of reclaimed water for “indirect potable” use is the level of required treatment prior to discharge of the reclaimed water. The National Research Council (NRC) issued a report in March 1998, *Issues in Potable Reuse*, which recommended that water agencies considering (indirect) potable reuse fully evaluate the potential public health impacts from the microbial pathogens and chemical contaminants found or likely to be found in treated wastewater through special microbiological, chemical, toxicological, and epidemiological studies; monitoring programs; risk assessments; and system reliability assessments. The NRC report reached a general conclusion that there were no current indications that treatment would not remove the chemical contaminants likely to cause health effects; that known microbial pathogens were removed or destroyed by the multiple barriers; and that adverse health effects had not been observed.

Surface and groundwaters used for potable supplies may contain the same contaminants found in wastewater, although no cases in the three-county area have been identified. One emerging issue in Europe and North America noted by the American Water Works Association Research Foundation is the presence of pharmaceuticals in potable water sources. Sources of pharmaceuticals include source water contamination from pets, livestock, and aquacultural operations, as well as human waste and the practice of direct disposal of unused pharmaceutical products into toilets. In this latter example, upstream wastewater outfalls carrying pharmaceuticals are discharged into potable water sources. Although it is important to use the highest available quality of water for drinking, it is increasingly difficult to find and protect uncontaminated water sources for potable water supplies. When such sources are not sufficient to meet potable demands, reclaimed water that is of equal or superior quality to other available supplies should be encouraged. Continuing research efforts to update information for prevention, control, and removal of pollutants is also supported.

One of the critical requirements of an “indirect potable” application is an environmental buffer or storage. This has significant implications for any proposal to have an “indirect potable” reclaimed water supply in conjunction with large lakes in the region. Many lakes in Washington appear to be good candidates for storage; however, detailed studies about the effect of a discharge on the water body would be needed before such projects could move forward. Lake stratification can greatly influence how discharges flow through a body of water. By proper study, the locations of the discharge and withdrawal can be sited to preclude or minimize the presence of reclaimed water in the diverted water. An important consideration for location of the discharge will be the impact on receiving water quality. As an example, a surface discharge into the warm upper layer of a stratified lake would require higher levels of nitrogen and phosphorous removal.

For “indirect potable” surface water supply, the reclaimed water must be treated to meet water quality standards for such discharges and be discharged to an environmental buffer such as a lake. The buffer should have sufficient holding capacity to provide an extensive holding time to facilitate natural purification processes, and possibly for mixing with the ambient surface waters. As with any surface water source intended for potable use, the withdrawn water will require additional treatment to meet drinking water standards so that all microbial, radiological, physical, and chemical contaminants are reduced to levels that meet acceptable public health risks. Such “indirect potable” applications require high levels of treatment twice, with the associated costs, although the costs may not be significantly higher than would have otherwise occurred in order to meet discharge and drinking water standards.

Reclaimed water also can be injected into a groundwater aquifer for a variety of reasons, including preventing declining water levels in the aquifer, control of movement of contaminated plumes, withdrawal of water somewhere else in the aquifer for potable or other uses, etc. If the reclaimed water is withdrawn for use as a potable source, it would also be considered “indirect potable” reuse. The reclaimed water would mix with ambient aquifer waters and could change in chemical, biological, and radiological content between the injection and withdrawal points. Reclaimed water used in this manner will likely require additional water treatment before use.

Environmental

“Indirect potable” projects with reclaimed water require extensive treatment prior to discharge and will again require extensive treatment after withdrawal from the environmental buffer. These high levels of treatment are required for public health and aquatic habitat protection. In many circumstances, reverse osmosis and filtration through activated carbon are included in the wastewater treatment process. Both discharge and withdrawal treatment facilities will have residuals that must be properly disposed of as part of the wastewater plant’s operational procedures. The energy requirements will most likely be higher to produce suitable reclaimed water than for conventional wastewater and water treatment plants. This will be especially true for those areas currently relying on stringent watershed control practices to protect the source and thereby meeting all potable water health standards without filtration.

Many wastewater treatment plants in the region have been sited near Puget Sound, and are authorized to discharge to that body of water. Discharges of reclaimed water to fresh water systems for “indirect potable” application would, under state standards, require evaluation of impacts on beneficial uses of different kinds of receiving waters, such as body contact recreation. Habitats, water quality, fisheries, and other such issues may require study and evaluations before implementation. Using lakes or aquifers as buffers would require addressing many environmental issues, and in some situations could pose significant challenges.

Legal

The state’s “Water Reclamation and Reuse Standards” provide requirements for discharge of reclaimed water to potable aquifers. This practice is an “indirect potable” application if groundwaters are a drinking water source. Discharges to surface waters must meet all applicable federal and state water quality standards. A state or federal discharge permit would be required for the discharge of reclaimed water to the environment, which Ecology would address when issuing a reclaimed water permit. Both Ecology and DOH would likely require a description and evaluation of the discharge and the right to withdraw the water from the environmental buffer for “indirect potable” purposes to be included in general sewer and water system plans, and be approved before development. Those plans would need to include a description of any additional treatment of the recovered water that would be necessary.

Financial

“Indirect potable” applications require two high-level treatment facilities: one for wastewater (which may already be in place, but need to be enhanced), and another for the potable water supply (which may already be in place as well, depending on the quality of the system’s source water, but would also likely need to be enhanced). The additional costs for these additional layers of treatment for “indirect potable” use may be high, but should be compared to the costs of developing other water supply and wastewater disposal options. Environmental benefits and drawbacks should be factored into the decision-making process. The marginal cost of producing reclaimed water may drop if the cost of meeting more stringent standards for local governments/water supply entities increases.

Public Acceptance

Even though stringent monitoring and treatment processes are available to produce water that may be as good as or better than potable supplies, there are still public concerns about the use of reclaimed water for drinking and culinary uses. However, there is generally more public support for “indirect potable” use of reclaimed water than for “direct potable” applications. In many areas of the United States, utilities have been utilizing or planning for indirect aquifer recharge and use of surface impoundments as buffers. Even though the NRC scientists and engineers have provided a careful technical roadmap to use to evaluate “indirect potable” reclaimed water projects, public acceptance may be a more substantial barrier than technical considerations. Some aquifer-recharge projects have received highly negative public reactions. In San Diego, after a multimillion-dollar public outreach program and construction of infrastructure, the public opposition resulted in the project cancellation. In King County, the Lakehaven Utility District faced significant public concerns when recharge of reclaimed water to potable aquifers was discussed.

Political

Political bodies can function to encourage or discourage the use of reclaimed water for various purposes. In Washington and in the Puget Sound region in particular, political bodies have acted to encourage consideration of the use of reclaimed water for non-potable uses such as irrigation. Direct and indirect use of reclaimed water however raises a different set of political concerns.

Despite the indirect use of reclaimed water (intentionally or unintentionally) in other parts of the country, and the availability of appropriate technology to use reclaimed water in a manner that is protective of public health and the environment, the financial and public acceptance concerns will continue to drive the political acceptance of the practice. The non-potable use of reclaimed water offers the potential of displacing large amounts of potable water, during periods of high demand, at a reasonable cost and with a level of public acceptance. Any significant increase in the use of reclaimed water will depend upon a number of factors, including more complete development of non-potable uses, successful implementation of pilot projects, resolution of environmental issues through increased research, and changes in state law.

Preliminary Assessment of Reclaimed Water Potential

There are a significant number of operational water reuse projects in the three-county area. Reuse projects totaling approximately 25 mgd have been identified that are either in the design/planning stages or that could be developed in the near future. Of this potential 25 mgd source of reclaimed water, approximately 17 mgd would serve current water purveyors. Thus, these projects could provide water purveyors with approximately 17 mgd of additional supply.

In King County, an analysis of the water rights database and an estimate of water use for a variety of users indicates that as much as 150 to 200 mgd of water use is self-supplied. Self-supplied water comes from wells and streams pumped by the landowner/operator. Of the estimated 150 to 200 mgd total water use, approximately one-third, or 50 mgd, may be used for parks, golf courses, and cemeteries (non-potable irrigation). Demand could potentially be met from reuse projects. However, in many cases the water users are widely separated and

are located far from reclaimed water sources. Therefore, serving them with reclaimed water is not currently practical. Yet, in other cases, such as the proposed King County project in the Sammamish River Valley, there are sufficient water users in close proximity using water from the river or groundwater to make a water reuse project more feasible.

Key Issues and Next Steps for Reuse

The following steps were suggested by the Reuse Workgroup to further assess the potential use of reclaimed water as one method of meeting the water demands of the Central Puget Sound region. It should be noted that these suggested actions are the views of the Reuse Workgroup and may not reflect the views, recommendations, or opinions of the Planning Committee of the Forum. The six identified items include:

- 1. Assess the potential of self-supplied water users to use reclaimed water in Snohomish and Pierce Counties.** This effort would be similar to what has been done in King County. Potential reclaimed water customers can be divided into two groups: those currently supplied with potable water by water utilities and those self-supplied with potable water through water rights of their own. The Outlook has examined the potential for use and expansion of reclaimed water supplied by water utilities. There are also significant opportunities for water reuse projects for self-supplied water users. Snohomish and Pierce Counties should identify potential self-supplied water uses as well. Furthermore, all analyses of the potential for water reuse should consider “bundling” of multiple users where appropriate in order to increase the feasibility of reclaimed water projects. An important part of this effort is to ask the self-supplied users of their interest in water reuse options and assure they are involved in the process.
- 2. Explore opportunities for regional cooperation or cross-county participation in water reuse projects.** This concept is similar to regional cooperation of traditional conservation methods. For example, Seattle is “buying conservation” in Tacoma by funding water consumption retrofits in the Simpson mill, thereby gaining access to the conserved water. However, it is only because Seattle and Tacoma are in the process of connecting their water systems that this type of conservation effort will be possible. Similar types of arrangements could be proposed for water reuse projects.
- 3. Consider the adoption of local, regional, or statewide policies requiring the use of reclaimed water where feasible.** There are already statewide requirements to this effect in wastewater planning. These policies could take various directions including requiring or encouraging the use of reclaimed water for some purposes, requiring the evaluation of using reclaimed water for some purposes, or focusing on new development. An example of one such policy is the City of Tacoma’s policy regarding new requests by large irrigation users for water supply. Large irrigation users, such as cemeteries, large parks, and golf courses, must include an evaluation of other potential sources of water; presumably reclaimed water would be one such potential source. Tacoma’s policy could be used as a model for other jurisdictions and expanded to more explicitly identify water reuse as one of the alternate sources to be considered
- 4. Encourage the inclusion of water reuse topics in water conservation programs for schools.** Currently, there are ongoing efforts in the schools by water utilities and environmental groups to provide education and promote conservation actions. This effort is focused directly at school-aged children and young adults, but also indirectly reaches their parents. Inclusion of water reuse topics would dovetail very appropriately into these programs.

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5. Educate local elected officials and policy makers regarding water reuse so they can address issues regarding appropriate uses, health issues, and permit requirements. The goal is to work towards a shared understanding of water reuse.

6. Encourage elected officials to work with large industrial water users to consider water reuse. Industrial users are a key target audience since the economies of scale associated with large users increase the financial viability of many projects. Elected officials can be an integral component to persuading industry to consider water reuse.

