



# Frequently Asked Questions about Reclaimed Water Use

from Ecology's Water Quality Program

## **Q: What is reclaimed water?**

**A:** Reclaimed water is a water supply obtained through the treatment of the waste water used for municipal or domestic purposes. Sometimes called water recycling or water reuse, reclaimed water may also include incidental contributions of industrial process water or storm water. The process of reclaiming water involves an engineered treatment system that speeds up nature's restoration of water quality. The treatment allows the water to be ready for the many uses described in this document.

## **Q: Why is reclaimed water important?**

**A:** Washington's economy and quality of life are intimately tied to our water. Throughout history, investments in water and wastewater infrastructure have been central components of successful civilizations.

We rely heavily on rain and snowmelt to replenish our aquifers and supply our lakes, streams, and rivers with water. At the same time our population is increasing, global warming models predict that snow stored in the mountains will continue to decrease. With reduced snow to melt, less water will be available during critical summer months for both in-stream needs and human water demands.

Reclaimed water can be used to meet these increasing demands by replacing potable (drinking) water supplies for many non-potable uses. Reclaimed water may also replace diversions from aquifers, rivers, or lakes. This allows the water replaced by reclaimed water to stay in the stream for fish, wildlife, and recreation.

## **Q: How could I use reclaimed water?**

**A:** Successful projects exist for practically any type of reclaimed water use imaginable. All reclaimed water is highly treated and must meet a specific set of treatment and reliability standards to assure that it is appropriate for the intended use. The *Washington State Water Reclamation and Reuse Standards*, Ecology Publication Number 97-23, lists the required level of treatment for the most common uses.

Reclaimed water is used for non-potable (not for drinking) purposes, such as landscapes, public parks, and golf course irrigation. Other non-potable applications include agriculture, industrial cooling water, toilet flushing, dust control, construction activities, and created wetlands and ponds. Reclaimed water also recharges aquifers and increases flows in our rivers and streams.

**Q: Is reclaimed water safe?**

**A:** Other states such as California, Nevada, Arizona, and Florida have used reclaimed water successfully for decades. Washington's reclaimed water standards are based on this experience and are among the most protective in the country.

Reclaimed water is highly engineered for safety and reliability so that the quality of reclaimed water is more predictable than many existing surface and groundwater sources. Reclaimed water is considered safe when appropriately used.

Although reclaimed water is of very high quality, it is not used directly for drinking water in the United States. Reclaimed water planned for use in recharging our aquifers or augmenting our surface water receives adequate and reliable treatment before mixing with naturally occurring water and undergoing natural restoration processes. Some of this water eventually becomes part of our drinking water supplies.

**Q: Who is using reclaimed water in Washington?**

**A:** In 1997, four cities (Yelm, Sequim, Ephrata, and Royal City) received state funding support to design and construct demonstration projects modeling reclaimed water use within the state.

By 2005, 17 facilities had been constructed or upgraded to operate under the state reclaimed water standards. The constructed utilities can produce between one thousand gallons and seven million gallons of water per day. Uses of reclaimed water from these facilities include crop and landscape irrigation, toilet flushing, dust control, construction water, industrial cooling, created wetlands, groundwater recharge, and stream-flow augmentation. There are also several facilities engaged in various stages of planning, design, or construction. The Tulalip Indian Tribe constructed a reclaimed water facility for use at the casino and other tribal properties. Other tribes are planning and constructing reclaimed water facilities.

Ecology has completed a document of 15 case studies that share the planning, treatment, and creative use of reclaimed water throughout the state.

**Q: What type of permit do I need?**

**A:** Anyone who generates reclaimed water must obtain a state reclaimed water permit before putting the water to use. State law requires the permits to be issued only to public entities or to entities permitted under the state Water Pollution Control Act (Ch 90.48 RCW). Although the state Department of Health has permitting authority for commercial and industrial uses of reclaimed water, in most cases these requirements are included within a single permit issued by Ecology. Ecology issues the permit to the generator of the reclaimed water and usually combines the reclaimed water permit with requirements for NPDES or state wastewater discharges from the same facility.

The reclaimed water permit includes requirements for treatment, water quality, monitoring, distribution, and use of reclaimed water. State law also gives the treatment facility owner the exclusive right to the water and provides exemptions from the appropriative water right permitting requirements. However, the owner may not be able to divert reclaimed water from an existing effluent discharge location if this would impair existing downstream water rights.

**Q: What is required during planning?**

**A:** The Reclaimed Water Act, Chapter 90.46 RCW, is the law enacting reclaimed water use in Washington.

Deliberate planning is essential. State law encourages reclaimed water use, requiring consideration in both wastewater and water supply planning (RCW 90.48.112 and 90.46.120). Planning should focus on specific community needs. It is important to begin assessing options as early as possible to assure coordination of wastewater treatment, water supply, various use options, and other planning processes.

The project should consider all treatment, storage, and supply systems needed to distribute and use the water effectively. The reclaimed water must be acceptable to the public and address their concerns of risk and liability. Reclaimed water must be marketed to potential customers and contracts established to assure a successful project for the long term.

The best projects also go beyond the public involvement requirements of the state and federal environmental review processes. Public involvement should be more than education and information dissemination. By listening to the needs of all interested parties, the resulting project is more likely to better meet the long-term needs of the public and have strong support.

Both Ecology and the state Department of Health are available to provide technical assistance to help develop a successful project. Chapter E1 in Ecology’s *Criteria for Sewage Works Design* (Publication 98-37) provides more detail to help planning.

**Q: What is the cost of reclaimed water?**

**A:** Each project is unique. Both economic feasibility and financing are necessary components of a successful reclaimed water project. Economic feasibility assesses the overall costs and value of the project. Financing determines how to pay for it.

Even when reclaimed water infrastructure appears cost prohibitive, it may not reflect total costs and benefits. Cost analysis must evaluate all of the needs driving the project. Costs vary depending on project type, the treatment required, and the proximity of the treatment plant to the site of use.

In general, retrofitted distribution costs are about twice that of lines in new developments. The table (below) summarizes national data cited in *Water Reclamation and Reuse*, Asano 1998. As shown, the capital costs for Class A are about 20 percent more than for traditional secondary treatment. However, it is important to note that costs vary widely between projects.

<b>Cost of Reclaimed Water Treatment</b>			
<b>Treatment Level</b>	<b>1.0 MGD</b>	<b>5.0 MGD</b>	<b>10.0 MGD</b>
<b>Primary</b>	<b>\$3.0 M</b>	<b>\$5.5 M</b>	<b>\$7.5 M</b>
<b>Secondary</b>	<b>\$6.0 M</b>	<b>\$14.0 M</b>	<b>\$25.0 M</b>
<b>Advanced (Class A)</b>	<b>\$8.5 M</b>	<b>\$18.5 M</b>	<b>\$35.0 M</b>

**Q: What should I include in the cost analysis?**

**A:** A cost analysis should compare the total cost of reclaimed water to the total costs of the alternatives. It is important to note that the costs of both wastewater treatment and new water supplies will continue to rise. The analysis of alternative projects may include all of the costs listed below:

- Obtaining water rights (if available).
- Providing water supplies for use during times of drought.
- Constructing storage facilities to match water supply and demand.
- Siting, constructing, or upgrading existing drinking water supply treatment and distribution systems.
- Siting, constructing, or upgrading existing wastewater treatment facilities and outfalls.
- Mitigating environmental impacts.
- Economic impacts of delaying development.
- Economic impacts of the ability to attract new industry requiring water supplies.
- The cost of retrofitting new developments to install reclaimed water distribution lines at a future date.

**Q: How do I finance my project?**

**A:** Washington state law includes reclaimed water facilities as water pollution control facilities eligible to compete for financial assistance loans through the Centennial Clean Water Fund and the Clean Water State Revolving Fund. Grants may be available in cases of hardship. Project components funded through Ecology usually must be publicly owned. These typically include collection systems, treatment facilities, distribution lines, water storage, dedicated use areas (infiltration basins, wetlands, sprayfields, outfalls), and public education efforts.

A utility should also pursue other sources of funding. Grants and loans may be available from a variety of federal, state, and local agencies. When costs for producing and distributing reclaimed water that benefit others will be paid by wastewater utility customers, this can stop an otherwise successful project. This is likely to change over time as reclaimed water becomes more competitive with the cost of other wastewater treatment requirements and the cost of obtaining new water supplies. By recognizing the long-term economic value and determining who benefits for the whole project, many utilities have been resourceful in obtaining grants and loans or partnership arrangements that distribute the costs more equitably.

**Q: What are the requirements to distribute reclaimed water?**

**A:** A reclaimed water permit is required. The permit establishes the required water quality and authorizes the distribution, storage, and use of the reclaimed water. The permit includes approved locations, uses, and related conditions needed to assure human health and environmental protection. The owner of the reclaimed water facility receives an exclusive right to the use and distribution of the water. Whenever the water is transferred to another party for distribution or use, the permittee must do so under a legal contract to assure proper and safe water use.

State standards require maintaining residual chlorine in distribution lines for maintenance. All reclaimed water pipes are color coded purple to distinguish them from drinking water supply lines. The permit also includes

requirements for cross-connection controls and pipe separation between drinking water, reclaimed water, and sanitary sewer lines.

**Q: What is an exclusive right?**

**A:** Whenever utilities put water to beneficial use in Washington, they must do so under an appropriate water right unless they have a specific exemption under state law. To streamline the permitting processes, the Reclaimed Water Use Act provides an exemption for the owner of reclaimed water facilities from these appropriate water right permitting requirements. The law provides a right to distribute and use reclaimed water under the reclaimed water permit. This right is called an exclusive right and belongs to the owner of the water reclamation treatment facility.

**Q: How do I know if the project would impair an existing water right?**

**A:** State law requires that reclaimed water use not impair existing downstream water rights without compensation or mitigation. An impairment analysis is required to evaluate whether existing water right holders might be impaired when a reclaimed water facility decreases or eliminates its discharge of waste water.

Sometimes the impairment analysis is simple. For example, when no water rights have historically used the wastewater return flow, a short paragraph is sufficient documentation. In complex situations, Ecology is able to provide assistance with the impairment analysis if contacted early in the planning process.

**Q: How much treatment is required to produce reclaimed water?**

**A:** To protect public health, state law requires adequate and reliable treatment for reclaimed water use. The departments of Ecology and Health use a multi-barrier approach (described below) to assure this requirement is met at all times.

Reclaimed water used to recharge aquifers, increase flows in rivers and streams, or that has the greatest potential for human contact must have the highest level of treatment. The requirements may be less stringent for non-potable uses where human contact is less likely to occur.

State standards list four basic classes of reclaimed water: A, B, C, and D. Class D, the lowest class of reclaimed water, requires a minimum of secondary treatment plus additional disinfection. Class D reclaimed water may be used only in restricted areas on non-food crops. Increasingly stringent levels of disinfection differentiates Class D from the higher levels of Class C and B reclaimed water. Class A or better reclaimed water requires additional treatment steps to remove more contaminants prior to disinfection.

The table on page 9 lists the class of reclaimed water required for common uses.

**Q: What is a multi-barrier approach?**

**A:** A multi-barrier approach is a required sequence of prevention, control, and treatment steps to keep water from leaving the reclamation facility until it meets the required quality. This assures that only water meeting the standards is distributed.

- The first step, source control, prevents contaminants from entering the waste water through best management practices and pre-treatment.
- Next, the waste water is treated through a series of processes including biological oxidation to meet the federal secondary treatment standards.

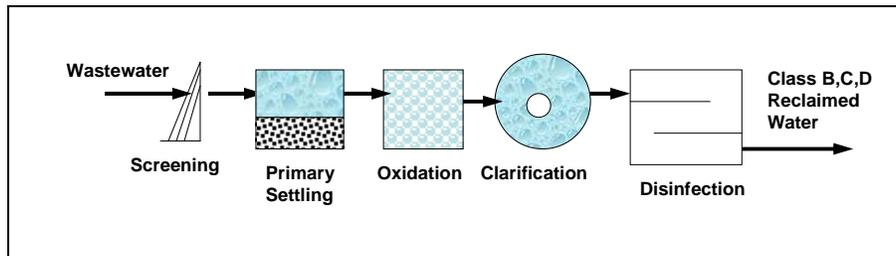
- Class A reclaimed water receives additional chemical coagulation and filtration.
- More treatment steps are added for some uses such as aquifer recharge or surface water augmentation.
- All reclaimed water receives a very high level of disinfection.

In addition to the treatment steps, reclaimed water facilities use continuous monitoring, alarms, extra stand-by treatment units, and emergency areas to retreat or divert improperly treated water to assure a high quality product.

**Q: What is secondary treatment?**

**A:** Secondary treatment is the minimum federal and state technology requirement for discharge of municipal wastewater effluent. To meet secondary treatment requirements, the waste water must receive a series of treatment steps that remove suspended solids, organic material, and pathogens to levels prescribed by state and federal law. First, the waste water is screened and settled to remove large solids. Then, waste water receives biological treatment (oxidation) supplying oxygen to microorganisms that remove most of the remaining solids and organic material in the waste water. The effluent then receives the required amount of disinfection.

**Secondary Treatment and Disinfection**

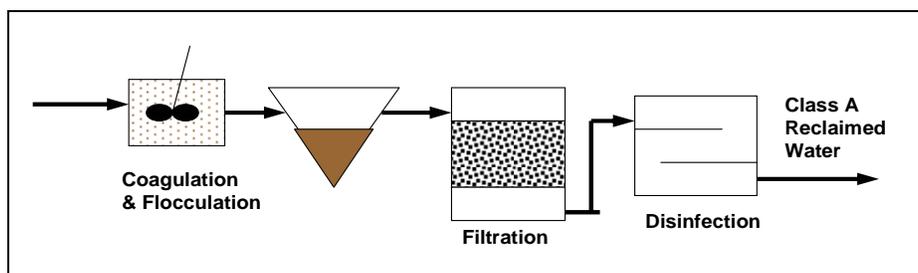


**Q: What additional treatment processes are required for Class A reclaimed water?**

**A:** Class A reclaimed water may be used in public areas such as parks and schoolyards. Class A reclaimed water receive additional treatment steps beyond secondary treatment.

- Chemicals such as aluminum sulfate (alum) are added to form larger particles from the smaller remaining particles in the water. This process is called coagulation.
- Filters remove the coagulated particles, and the water is disinfected with processes such as ultraviolet light, chlorine, or ozone to destroy any surviving bacteria, viruses, or other pathogens.

**Class A Treatment Processes**



**Q: Can microfiltration membranes be used to achieve Class A treatment?**

**A:** Microfiltration membranes are becoming increasingly popular. Within the last few years, membrane technology has improved enough to extend the membrane life and reduce the cost of the treatment process. Washington state standards do not include the use of microfiltration membranes for Class A reclaimed water production. As an interim standard, Ecology and Health decided to use the California standards for membrane treatment to show equivalency to the filtration steps for Class A reclaimed water. Appropriate factors of safety should be included in design to assure that there is adequate capacity to store untreated or partially treated waste water during membrane maintenance so that only properly treated reclaimed water leaves the facility for use.

**Q: What treatment is necessary for wetlands use?**

**A:** There are three basic types of wetlands: constructed treatment wetlands, constructed beneficial use (created) wetlands, and natural wetlands. Treatment requirements differ based on the type of wetlands receiving the reclaimed water. In all cases, it is important that the reclaimed water enhances and does not degrade wetland functions.

Wetland functions depend upon the amounts of water they receive at various times during the year (this is called the hydroperiod). Some wetlands are sensitive to the addition of nitrogen and phosphorus. Treatment requirements must assure protection of the diverse plants and wildlife that depend upon the wetlands. Anyone considering a wetlands project should work closely with Ecology's wetlands biologists.

**Q: What treatment beyond Class A is necessary for aquifer recharge?**

**A:** Reclaimed water recharging underground water supplies requires additional treatment beyond Class A. The reclaimed water must meet drinking water standards once it reaches the aquifer. Monitoring of both the reclaimed water and wells is used to assure the exceptional quality of the water.

The degree of treatment depends on whether the reclaimed water is released at the surface to percolate through the soil or is injected directly into the aquifer.

For surface percolation, the reclaimed water treatment process must include nitrogen removal and may have additional requirements depending upon site specific conditions such as type of soils and depth to the aquifer.

For direct injection of reclaimed water into an aquifer, reclaimed water must receive an additional treatment step called reverse osmosis (RO) before injection. RO is a membrane system that removes dissolved salts and minerals from solution based on reversing osmotic pressure differentials. RO is also very effective for pathogen removal although additional disinfection is still required as part of the multi-barrier approach.

**Q: What treatment is necessary for surface water (streamflow) augmentation?**

**A:** The quality of reclaimed water used to augment surface water tends to be very site specific. Contact Ecology early in planning for assistance.

The reclaimed water must meet not only the state reclaimed water standards but also the state surface water quality standards and the federal requirements for discharge to surface water under the Clean Water Act. Additional requirements may be necessary to protect aquatic life under the Endangered Species Act.

## **Q: What is the future of reclaimed water in Washington State?**

**A:** For customers, the benefits of reclaimed water use are high. Usually, the reclaimed water is available at a lower cost than drinking water. In addition, because wastewater treatment is an ongoing and essential public service, the resulting reclaimed water supply is drought resistant and relatively assured.

The environmental and economic consequences of using water once and throwing it away make reclaimed water use an increasingly attractive alternative.

Alternative water supplies such as reclaimed water are beginning to take hold as more communities throughout Washington realize the value of this alternative water resource. In some cases, the impetus for using reclaimed water begins with a need to eliminate or decrease wastewater discharges. In other cases, it begins with the need for more water supplies. Most successful projects include elements of both.

### **For More Information:**

Ecology's website, <http://www.ecy.wa.gov/programs/wq/reclaim/index.html>, provides information on the state standards, engineering design criteria, several guidance documents to aid planning processes, suggested reading, and links to other resources. Some of these documents are also available in printed form through Ecology's publications office at 360-407-7472.

### **For Assistance:**

The Department of Ecology and the Department of Health provide information and technical assistance to help planning groups, reclaimed water customers, utilities, and consultants assess and implement opportunities for reclaimed water. Contact Ecology's Water Quality Program in the regional office serving the planned project.

- Northwest Regional Office 425-649-7000  
(Island, King, Kitsap, San Juan, Snohomish counties)
- Bellingham Field Office 360-738-6250  
(Whatcom County)
- Southwest Regional Office 360-407-6300  
(Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, and Wahkiakum counties)
- Central Regional Office 509-575-2490  
(Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, and Yakima counties)
- Eastern Regional Office 509-329-3400  
(Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, and Whitman counties)
- Department of Health, Craig Riley, P.E. 509-456-2466, e-mail [craig.riley@doh.wa.gov](mailto:craig.riley@doh.wa.gov)
- Statewide Program Lead (Ecology), Katharine Cupps, P.E. 360-407-6452, e-mail [kcup461@ecy.wa.gov](mailto:kcup461@ecy.wa.gov)

**Table on Uses of Reclaimed Water**

<b>Uses of Reclaimed Water</b>	<b>Class of Reclaimed Water Required</b>			
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Irrigation of nonfood Crops</b>				
Trees and fodder, fiber, and seed crops	Yes	Yes	Yes	Yes
Sod, ornamental plants for commercial use, and pasture to which milking cows or goats have access	Yes	Yes	Yes	No
<b>Irrigation of Food Crops</b>				
Spray irrigation – all food crops	Yes	No	No	No
Spray irrigation – food crops which undergo physical or chemical processing sufficient to destroy all pathogenic agents	Yes	Yes	Yes	Yes
Surface irrigation – food crops where there is no reclaimed water contact – with edible portion of crop	Yes	Yes	No	No
Surface irrigation – root crops	Yes	No	No	No
Surface irrigation – orchards and vineyards	Yes	Yes	Yes	Yes
Surface irrigation – food crops which undergo physical or chemical processing sufficient to destroy all pathogenic agents	Yes	Yes	Yes	Yes
<b>Landscape Irrigation</b>				
Restricted access areas (e.g., cemeteries and freeway landscapes)	Yes	Yes	Yes	No
Open access areas (e.g., golf courses, parks, playgrounds, schoolyards, and residential landscapes)	Yes	No	No	No
<b>Impoundments</b>				
Landscape impoundments	Yes	Yes	Yes	No
Restricted recreational impoundments	Yes	Yes	No	No
Nonrestricted recreational impoundments	Yes	No	No	No
Fish hatchery basins	Yes	Yes	No	No
Decorative fountains	Yes	No	No	No
<b>Commercial</b>				
Flushing of sanitary sewers	Yes	Yes	Yes	Yes

Street sweeping, brush dampening	Yes	Yes	Yes	No
Street washing, spray	Yes	No	No	No
Washing of corporation yards, lots, and sidewalks	Yes	Yes	No	No
Dust control (dampening unpaved roads and other surfaces)	Yes	Yes	Yes	No
Dampening of soil for compaction (at construction sites, landfills, etc.)	Yes	Yes	Yes	No
Water jetting for consolidation of backfill around pipelines	Yes	Yes	Yes	No
Fire fighting and protection – dumping from aircraft	Yes	Yes	Yes	No
Fire hydrants or sprinkler systems in buildings	Yes	No	No	No
Toilet and urinal flushing	Yes	No	No	No
Ship ballast	Yes	Yes	Yes	No
Washing aggregate and making concrete	Yes	Yes	Yes	No
<b>Industrial</b>				
Boiler Feed	Yes	Yes	Yes	No
Cooling – no creation of aerosols or other mist	Yes	Yes	Yes	No
Cooling aerosols or other mist created (e.g., use in cooling towers, forced air evaporation, or spraying)	Yes	No	No	No
Process water – without exposure of workers	Yes	Yes	Yes	No
Process water – with exposure of workers	Yes	No	No	No

*If you need this information in an alternate format, please contact us at 360-407-6401. If you are a person with a speech or hearing impairment, call 711 or 800-833-6388 for TTY.*