

Appendix D

WATER REUSE

This section provides supplemental information to Section 10, Water Reuse Options. The information provided here includes:

- Definitions
- Regulations and Permitting Pertaining to Reuse
- Reclaimed Water Standards: Treatment and Quality Requirements for Reclaimed Water Use

Definitions

Reuse/Reclaim

“**Reclaimed water**” is defined in Chapter 90.46 RCW "Reclaimed Water Use" 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 a controlled use that would not otherwise occur and is no longer considered wastewater.

“**Reclaim**” or “**reclamation**” is the *treatment process* by which the water is cleaned to a quality appropriate for the intended use. Water is not reclaimed until it is treated by the specified treatment processes to the required minimum quality for the specified use.

“**Reuse**” is defined in the state standards as *the beneficial use* of reclaimed water. It is also frequently used to describe the second or subsequent use of water without additional treatment.

“**Greywater**” means wastewater having the consistency and strength of residential domestic type wastewater. Greywater includes wastewater from sinks, showers and laundry fixtures.

“**Conventional Wastewater Treatment**” refers to the treatment of wastewater at a centralized treatment plant with biological and physical/chemical unit processes. Processes used provide secondary treatment meeting federal technology standards and range from waste stabilization ponds to fixed media (trickling filters) or suspended growth (activated sludge) processes. Conventional wastewater treatment is also used to define the first stages of treatment where advanced treatment processes are required.

“**Package Treatment Plant**” is a pre-built system based on conventional treatment technologies and standard flows and loadings. Package plants frequently use designs that

reduce construction and operating costs, such as common-wall construction. Benefits must be weighed against the potential for loss of operator flexibility and reliability, process control and long-term performance.

Sewage and Stormwater

“Sewage” means water-carried human wastes from residences, buildings, industrial and commercial establishments, or other places, together with such groundwater infiltration, surface waters, or industrial wastewater as may be present.

“Stormwater” means water from rainfall or snowmelt. Urban stormwater runoff, which is often collected by storm drains and transported to receiving waters, contains pollutants that are accumulated as rainwater or snowmelt flows across roads and the surface of the earth. Such pollutants include oil and grease, chemicals, nutrients, heavy metals, bacteria, viruses, and oxygen-demanding compounds. **Note: Stormwater issues are presented in Section 11.**

“Combined Sewerage System (CSS)” refers to a wastewater collection system designed to carry sanitary sewage and stormwater in a single pipe to a treatment facility.

“Combined Sewer Overflows (CSOs)” occur during wet weather events in approximately 900 cities that have combined both sanitary and storm sewers, and contain a mixture of raw sewage, industrial wastewater, and storm water. CSOs have caused beach closings, shellfish bed closures, and public health problems.

Infiltration & Inflow (I&I)

“Infiltration” means groundwater that enters a sewer system through sewer joints, cracks, service connections and other sources.

“Inflow” means surface water (usually stormwater) that enters the sewer system through storm drains, roof drains, manhole covers and other sources.

“Sanitary Sewer Overflows (SSOs)” are raw sewage overflows from separate sanitary sewer systems and occur when the volume of flows in a sewer system exceeds its capacity due to, among other things, unintentional inflow and infiltration of storm water. Such inflow and infiltration can occur because of inadequate preventative maintenance programs and insufficient sewer rehabilitation. SSOs can also occur during periods of dry weather.

“Groundwater” means water in a saturated zone or stratum beneath the surface of land or below a surface water body.

“Recharge” means the controlled subsurface addition of water that results in the replenishment of groundwater. Indirect recharge is reclaimed water applied to infiltration basins or other subsurface system that percolates through the soil to groundwater aquifers. Direct recharge of reclaimed water is typically accomplished via injection wells but may be accomplished by other methods that directly recharge into the groundwater saturated zone by a subsurface means.

“Recharge Area” means an area in which there are downward components of flow in underlying groundwater and infiltration moves downward into the deeper parts of the groundwater.

“**Non-potable**” means water that is not used or intended to be used as, or is unsuitable for, a source of drinking water supply.

“**Potable**” means water that is used or intended to be used as, or is suitable for, a source of drinking water supply.

“**Streamflow Augmentation**” means the discharge of reclaimed water to rivers and streams of the state or other surface water bodies, but not wetlands.

“**Total Solids**” The total solids of a wastewater are analytically defined as all the matter that remains as residue upon evaporation at 103-105°C. Total solids include “suspended solids” which is the portion of solids that can be filtered out of the water using a 1.2-micrometer filter. The fraction of solids that passes through the filter consists of “colloidal” and “dissolved” solids. The colloidal fraction is particulate matter with a size range from 0.001 to 1 micrometer. The “dissolved solids” consist of both organic and inorganic molecules and ions that are present in true solution in water.

“**Biochemical Oxygen Demand (BOD5)**” means the quantity of oxygen utilized in the biochemical oxidation of organic matter present in water or wastewater reported as a five-day value established as determined using approved methods.

Treatment Classes of Reclaimed Water

1. “**Class A Reclaimed Water**” means reclaimed water that, at a minimum, is at all times *an oxidized, coagulated, filtered, disinfected* wastewater. The wastewater shall be considered adequately disinfected if the median number of total coliform organisms in the wastewater after disinfection does not exceed 2.2 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed, and the number of total coliform organisms does not exceed 23 per 100 milliliters in any sample.

“**Oxidized Wastewater**” means wastewater in which organic matter has been stabilized such that the biochemical oxygen demand (BOD) does not exceed 30 mg/L and the total suspended solids (TSS) do not exceed 30 mg/L, is nonputrescible, and contains dissolved oxygen.

“**Coagulated Wastewater**” means an oxidized wastewater in which colloidal and finely divided suspended matter have been destabilized and agglomerated prior to filtration by the addition of chemicals or by an equally effective method.

“**Filtered Wastewater**” means an oxidized, coagulated wastewater which has been passed through natural undisturbed soils or filter media, such as sand or anthracite, so that the turbidity as determined by an approved laboratory method does not exceed an average operating turbidity of 2 Nephelometric turbidity units (NTU), determined monthly, and does not exceed 5 NTU at any time.

“**Disinfected Wastewater**” means wastewater in which pathogenic organisms have been destroyed by chemical, physical or biological means.

2. “**Class B Reclaimed Water**” means reclaimed water that, at a minimum, is at all times an oxidized, disinfected wastewater. The wastewater shall be considered adequately disinfected if the median number of total coliform organisms in the wastewater after disinfection does not exceed 2.2 per 100 milliliters, as determined

from the bacteriological results of the last 7 days for which analyses have been completed, and the number of total coliform organisms does not exceed 23 per 100 milliliters in any sample.

3. **“Class C Reclaimed Water”** means reclaimed water that, at a minimum, is at all times an oxidized, disinfected wastewater. The wastewater shall be considered adequately disinfected if the median number of total coliform organisms in the wastewater after disinfection does not exceed 23 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed, and the number of total coliform organisms does not exceed 240 per 100 milliliters in any sample.
4. **“Class D Reclaimed Water”** means reclaimed water that, at a minimum, is at all times an oxidized, disinfected wastewater. The wastewater shall be considered adequately disinfected if the median number of total coliform organisms in the wastewater after disinfection does not exceed 240 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed.

“Storage” means containment (ponds, tanks, or similar units) provided for the safekeeping of wastewater for additional treatment or of reclaimed water for future use.

“Clean Water Act (CWA)” means the Federal Water Pollution Control Act of 1972 and amendments of 1977, 1981, and 1987. The objective of the Clean Water Act is to restore and maintain the chemical, physical and biological integrity of the nation's (surface) waters. The Act contains four important principles:

1. Discharge of pollutants to navigable waters is not a right. A permit is required.
2. The discharge permit limits the amount of pollutants to be discharged.
3. Wastewater must be treated with the best treatment technology that is economically achievable regardless of the condition of the receiving water.
4. Effluent limits are based on treatment technology but limits that are more stringent may be imposed if the technology-based limits do not prevent violations of the receiving water quality standards.

With the passage of the 1987 Amendments, the U.S. Congress ushered in a new era in clean water funding. The new CWA called for the replacement of the long-running federal Construction Grants program with an innovative State Revolving Fund (SRF program).

The Washington State Department of Ecology (Ecology) is responsible for issuing wastewater discharge permits under the State Water Pollution Control Act (Chapter 90.48). Under the act, Ecology operates a state waste discharge permit program for discharges to surface and groundwater, sewerage systems, and storm drains. Ecology also has authority to carry out provisions of the federal Clean Water Act. Ecology issues both State Water Pollution Control Act and National Pollutant Discharge Elimination System permits.

“National Pollutant Discharge Elimination System (NPDES)” is an acronym for National Pollutant Discharge Elimination System. The Clean Water Act requires that all discharges from any point source (pipes or man-made ditches) into waters of the United States must obtain an NPDES permit. This does not necessarily mean that a household must obtain a permit to connect to a city sewer, but the facilities where discharges go directly into surface waters must obtain a permit.

“Total Maximum Daily Load (TMDL)” is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an

allocation of that amount to the pollutant's sources. Water quality standards are set by the state. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the state has designated. The calculation must also account for seasonable variation in water quality. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

“Discharge Area” In groundwater, this means an area in which there are upward components of flow in underlying groundwater, and groundwater flows and exits to the surface as springs, seeps, or baseflow to streams and rivers.

“Surface Discharge” means direct release of the flow into streams, rivers, lakes, or marine waters.

“Cross Connection” means any physical arrangement whereby a potable water supply is connected, directly or indirectly, with any non-potable or unapproved water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture or other device which contains, or may contain, contaminated water, liquid, gas, sewage or other waste of unknown or unsafe quality which may be capable of imparting contamination to the potable water as a result of backflow.

“Backflow Prevention” means a Department of Health-approved method to prevent the flow in piped systems in reverse of the normal direction due to back siphonage or back pressure conditions. Back siphonage is caused by negative pressures in the supply piping. Back pressure occurs when the supply piping is connected to another system with a higher pressure that forces non-potable water back into the distribution system.

“Conservation” means policies and activities implemented to encourage or cause the efficient use of water on a long-term basis.

“Supply” means water that is transported from a source, under pressure through a distribution network of buried pipes. Smaller pipes, called house service lines, are attached to the main water lines to bring water from the distribution network to your house. In many community water supply systems, water pressure is provided by pumping water up into storage tanks that store water at higher elevations than the houses they serve. The force of gravity then "pushes" the water into your home when you open your tap. Houses on a private supply usually get their water from a private well. A pump brings the water out of the ground and into a small tank within the home, where the water is stored under pressure.

A public water system may obtain its supply from single or multiple sources (of supply) that include enhanced conservation measures, water rights changes, artificial recharge, use of reclaimed, reused and/or greywater, groundwater (wells), surface water, springs, interties, and/or other alternative means (rainwater collection, fog collection, etc.) and/or other means of storage.

“Safe Drinking Water Act (SDWA)” is the main federal law that ensures the quality of Americans' drinking water. Under SDWA, the Environmental Protection Agency sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. The 1996 Amendments emphasize sound science and risk-based standard setting, small water supply system flexibility and technical assistance, community-empowered source water assessment and protection, public right-to-know, and water system infrastructure assistance through a multibillion-dollar state revolving loan fund.

RCW 70.119A. The legislature finds and declares that the provision of safe and reliable water supplies is essential to public health and the continued economic vitality of the state of

Washington. Maintaining the authority necessary to ensure safe and reliable water supplies requires that state laws conform with the provisions of the federal safe drinking water act. It is the intent of the legislature that the definition of public water system be amended to reflect recent amendments to the federal safe drinking water act. RCW 70.119A.900 - Short title -- 1989 c 422. *This act shall be known and cited as the "Washington state safe drinking water act."*

Regulations and Permitting Pertaining to Reuse

Reclaimed Water Act

The Legislature expressly encourages the development and use of reclaimed water through the Washington State's Reclaimed Water Act (Chapter 90.46 RCW), which states:

It is hereby declared that the people of the state of Washington 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 legislature further finds and declares that the utilization of reclaimed water by local communities for domestic, agricultural, industrial, recreational, and fish and wildlife habitat creation and enhancement purposes, including wetland enhancement, will contribute to the peace, health, safety, and welfare of the people of the state of Washington. To the extent reclaimed water is appropriate for beneficial uses, it should be so used to preserve potable water for drinking purposes. Use of reclaimed water constitutes the development of new basic water supplies needed for future generations. The legislature further finds and declares that the use of reclaimed water is not inconsistent with the policy of anti-degradation of state waters announced in other state statutes, including the Water Pollution Control Act chapter 90.48 RCW and the water resources act, chapter 90.54 RCW.

In response to Chapter 90.46 RCW, the Washington State Department of Health (DOH) and Department of Ecology developed interim water reclamation and reuse standards that were adopted in 1993; the final *Water Reclamation and Reuse Standards* were adopted in 1997 (#97-23; September 1997).

Water Reclamation and Reuse Standards

The *Water Reclamation and Reuse Standards* provide design, treatment and use criteria for the most common uses of reclaimed water. These uses include irrigation, impoundments, groundwater recharge, commercial and industrial uses, streamflow augmentation and wetlands. The standards stipulate the minimum quality of water that is suitable for each use. There are four basic classes of reclaimed water, Class A, B, C and D, with A being the highest quality. The Definitions section of this Appendix summarizes the water quality requirements for reclaimed water classifications A-D, and the table at the end of the Appendix summarized the allowable uses for each classification.

The standards require that reclaimed water must be reliably generated. Emergency storage or alternate permitted discharge locations must be provided for reclamation facilities for use during upset conditions. The standards also require automated alarms, redundancy of treatment units and stringent operator training and certification to meet the reliability criteria.

Reused or reclaimed water has potential environmental and public health risks associated with its use and these risks and their control measures vary depending on the ultimate use and application method. It is Ecology's responsibility to protect the environment, ensuring that the state's surface and groundwater quality standards as well as the requirements of the federal Clean Water Act are met. This responsibility generally impacts reuse projects as to the treatment and quality of water, and when, where, and how it can be discharged. DOH's regulatory authority pertains to the protection of public health. DOH activity generally centers on the disinfection, conveyance, potential for ingestion and inhalation, and method of application of reclaimed water. All reclaimed water generation and use must be covered under a reclaimed water permit that is issued jointly between the Ecology and DOH.

Total Maximum Daily Loads (TMDLs)

The TMDL Rule requires that waste load allocations be established for impaired water bodies. In some areas wastewater discharge to streams that has been allowed in the past may be required to be treated to a higher level, reduced, or eliminated due to water quality constraints as TMDLs are developed for specific water bodies. In those circumstances, the marginal costs of instituting a reuse project may become less.

Endangered Species Act (ESA)

Under the ESA, administered by the National Marine Fisheries Service, certain salmon and other fish species have been listed as threatened. The potential for negative environmental impacts, including salmon habitat, was taken into account in preparing *Water Reclamation and Reuse Standards* and requirements for monitoring impacts were built into the standards. However, it would be prudent practice to review the standards in light of the more recent ESA listing (January 8, 2001). Reuse projects offer the opportunity to leave more water in the stream or river, which may be a benefit to fish. Any planned withdrawal would require a detailed evaluation of actual impacts to the ESA-listed stream. Under the ESA's recently issued 4(d) rule, the limitation that covers urban development programs requires that a development ordinance or plan be prepared. This is not confined to minimum instream flow but requires flows that serve a variety of functions essential to various life stages of the fish. Reclamation project applications involving streamflow augmentation to bring streamflows to historical levels may require additional scrutiny to assure that issues like temperature, flow, chemical characteristics, olfactory-based homing instincts of salmon, and location of discharge are taken into account. The Tribes as well as others, including King County, have identified that these concerns must be addressed before reclaimed water is used to augment streamflow by direct discharge. It is for these reasons that streamflow improvements are proposed to be met by replacement of diversions.

Criteria for Sewage Works Design

In addition to requirements of the *Water Reclamation and Reuse Standards*, Ecology and DOH review water reclamation proposals to ascertain that they meet the requirements of the Department of Ecology's *Criteria for Sewage Works Design* (December 1998; 98-37 WQ) and other standard engineering practices. Chapter E1 specifically addresses technical water reclamation requirements for treatment reliability, storage, use requirements and cross-connection control.

Reclaimed Water Standards: Treatment and Quality Requirements for Reclaimed Water Use

Treatment and Quality Requirements for Reclaimed Water Use				
Use	Type of Reclaimed Water Allowed			
	Class A	Class B	Class C	Class D
Irrigation of Nonfood Crops				
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
Irrigation of Food Crops				
Spray Irrigation				
All Food Crops	YES	NO	NO	NO
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
Root Crops	YES	NO	NO	NO
Orchards and Vineyards	YES	YES	YES	YES
Food Crops Which Undergo Physical or Chemical Processing Sufficient to Destroy All Pathogenic Agents	YES	YES	YES	YES
Landscape Irrigation				
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
Impoundments				
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
Flushing of Sanitary Sewers	YES	YES	YES	YES
Street Cleaning				
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				
Pipelines for Reclaimed Water, Sewage, Storm				

Treatment and Quality Requirements for Reclaimed Water Use				
Use	Type of Reclaimed Water Allowed			
	Class A	Class B	Class C	Class D
Drainage, and Gas, and Conduits for Electricity	YES	YES	YES	NO
Fire Fighting and Protection				
Dumping from Aircraft	YES	YES	YES	NO
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
Industrial Boiler Feed	YES	YES	YES	NO
Industrial Cooling				
Aerosols or Other Mist not Created	YES	YES	YES	NO
Aerosols or Other Mist Created (e.g., Use in Cooling Towers, Forced Air Evaporation, or Spraying)	YES	NO	NO	NO
Industrials Process				
Without Exposure of Workers	YES	YES	YES	NO
With Exposure of Workers	YES	NO	NO	NO