

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

GRAYWATER CONTROL REGULATION

REGULATION #86

5 CCR 1002-86

ADOPTED: May 11, 2015
EFFECTIVE: June 30, 2015

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REGULATION NO. 86

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86.1 Authority

This regulation is promulgated pursuant to the Colorado Water Quality Control Act (CWQCA) sections 25-8-101 through 25-8-703, C.R.S. In particular, it is promulgated under section 25-8-205(1)(g), C.R.S.

86.2 Purpose and Scope

A. Purpose

Graywater is expected to carry human pathogens with various risk levels and pathways that have the potential to be dangerous to public health. Therefore, the purpose of this regulation, as authorized by section 25-8-205(1)(g), is to describe requirements, prohibitions, and standards for the use of graywater for nondrinking water purposes, to encourage the use of graywater, and to protect public health and water quality.

B. Scope

This regulation establishes the allowed users and allowed uses of graywater within the state of Colorado; establishes the minimum state-wide standards for the location, design, construction, operation, installation, modification of graywater treatment works; and establishes the minimum ordinance or resolution requirements for a city, city and county, or county that chooses to authorize graywater use within its jurisdiction.

86.3 Severability

The provisions of this regulation are severable, and if any provisions or the application of the provisions to any circumstances is held invalid, the application of such provision to other circumstances, and the remainder of this regulation shall not be affected thereby.

86.4 Voluntary Local Graywater Control Programs

Each local city, city and county, or county has the discretion to decide whether to adopt any of the graywater uses along with the associated minimum design criteria and control measures set forth in this regulation.

86.5 Materials Incorporated by Reference

The materials incorporated by reference cited herein include only those versions that were in effect as of June 30, 2015 and not later amendments to the incorporated material.

All materials referenced in this regulation may be examined online, where available, or at the Water Quality Control Division, at the Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

86.6 Applicability

- A. All graywater uses and graywater treatment works must comply with the minimum requirements of this regulation as set forth in a local graywater control program.
1. Graywater treatment works may only be installed and operated within the jurisdiction of a city, city and county, or county with a local graywater control program.
 2. Graywater treatment works installed prior to the effective date of this regulation are only allowed under a local graywater control program and must meet the local requirements adopted pursuant to these regulations. Graywater treatment works that reuse graywater for outdoor subsurface irrigation which were approved by a local public health agency prior to May 15, 2013 and pursuant to 5 CCR 1002-43, section 43.4(J) or pursuant to 5 CCR 1003-6, section IV.J, and which are in compliance with all requirements imposed by the local public health agency, are deemed to be in compliance with the requirements of this regulation unless or until any modification to the graywater treatment works is made.
 3. Graywater treatment works installed under a local graywater control program which is later revoked or rescinded must within 365 days:
 - a. Be physically removed or permanently disconnected; or
 - b. Be regulated under a limited graywater control program for existing graywater systems. In this case, the local city, city and county, or county must continue the limited graywater control program for the existing graywater treatment works only; or
 - c. Be regulated under another jurisdiction's local graywater control program which assumes authority over the existing graywater treatment works. The existing graywater treatment works will need to comply with the new city, city and county, or county's local graywater control program, including any required graywater treatment works modifications.
 4. In the event that a property with a compliant graywater treatment works is annexed or de-annexed into a jurisdiction with differing graywater requirements, the property owner must within 365 days:
 - a. Ensure the graywater treatment works is physically removed or permanently disconnected; or
 - b. Ensure the graywater treatment works is incorporated into another city, city and county, or county's local graywater control program. This includes conforming to the minimum requirements of the new local graywater control program and may include improving or modifying the graywater treatment works.
- B. Graywater use is only allowed under a local graywater control program and must meet the local requirements adopted pursuant to these regulations. Unauthorized graywater use and discharges are prohibited.
- C. This regulation does not apply to: discharges pursuant to a Colorado Discharge Permit System (CDPS) permit, wastewater that has been treated and released to state waters prior to subsequent use, wastewater that has been treated and used at a domestic wastewater treatment works for landscape irrigation or process uses, on-site wastewater treatment works authorized under Regulation #43, reclaimed wastewater authorized under Regulation #84, water used in an industrial process that is internally recycled, and rainwater harvesting.

86.7 Enforcement and Division Oversight

- A. The local city, city and county, or county with a local graywater control program has exclusive enforcement authority regarding compliance with the ordinance or resolution and, if applicable, rule.
- B. The Colorado Water Quality Control Division oversees state-wide implementation of this regulation. As part of the state-wide implementation, a local city, city and county, or county that chooses to adopt a local graywater control program must notify the Water Quality Control Division within 60 days of program adoption, implementation, revision, or modification. A copy of the ordinance or resolution and, if applicable, rule must be submitted to: Water Quality Control Division, Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

86.8 Definitions

- (1) “Agronomic rate” means the rate of application of nutrients to plants that is necessary to satisfy the nutritional requirements of the plants.
- (2) “Agricultural irrigation” means irrigation of crops produced for direct human consumption, crops where lactating dairy animals forage, and trees that produce nuts or fruit intended for human consumption. This definition includes household gardens and fruit trees.
- (3) “Closed sewerage system” means either a permitted domestic wastewater treatment works, which includes a permitted and properly functioning OWTS with a design capacity more than 2,000 gpd, or a properly functioning and approved or permitted OWTS with a design capacity of 2,000 gpd or less.
- (4) “Commission” means the Water Quality Control Commission created by section 25-8-201, C.R.S.
- (5) “Component” means a subpart of a graywater treatment works which may include multiple devices.
- (6) “Cross-Connection” means any connection that could allow any water, fluid, or gas such that the water quality could present an unacceptable health and/or safety risk to the public, to flow from any pipe, plumbing fixture, or a customer’s water system into a public water system’s distribution system or any other part of the public water system through backflow.
- (7) “Design” means the process of selecting and documenting in writing the size, calculations, site specific data, location, equipment specification and configuration of treatment components that match site characteristics and facility use.
- (8) “Design flow” means the estimated volume of graywater per unit of time for which a component or graywater treatment works is designed.
- (9) “Dispersed subsurface irrigation” means a subsurface irrigation system including piping and emitters installed throughout an irrigation area.
- (10) “Division” means the Water Quality Control Division of the Colorado Department of Public Health and Environment.
- (11) “Facility” means any building, structure, or installation, or any combination thereof that uses graywater subject to a local graywater control program, is located on one or more contiguous or adjacent properties, and is owned or operated by the same person or legal entity. Facility is synonymous with the term operation.

- (12) "Floodplain (100-year)" means an area adjacent to a river or other watercourse which is subject to flooding as the result of the occurrence of a one hundred (100) year flood, and is so adverse to past, current or foreseeable construction or land use as to constitute a significant hazard to public or environmental health and safety or to property or is designated by the Federal Emergency Management Agency (FEMA) or National Flood Insurance Program (NFIP). In the absence of FEMA/NFIP maps, a professional engineer shall certify the floodplain elevations.
- (13) "Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot or as designated by the Federal Emergency Management Agency or National Flood Insurance Program. In the absence of FEMA/NFIP maps, a professional engineer shall certify the floodway elevation and location.
- (14) "Graywater" means that portion of wastewater that, before being treated or combined with other wastewater, is collected from fixtures within residential, commercial, or industrial buildings or institutional facilities for the purpose of being put to beneficial uses. Sources of graywater are limited to discharges from bathroom and laundry room sinks, bathtubs, showers, and laundry machines. Graywater does not include the wastewater from toilets, urinals, kitchen sinks, dishwashers, or nonlaundry utility sinks.
- (15) "Graywater treatment works" means an arrangement of devices and structures used to: (a) collect graywater from within a building or a facility; and (b) treat, neutralize, or stabilize graywater within the same building or facility to the level necessary for its authorized uses.
- (16) "Indirect connection" means a waste pipe from a graywater treatment works that does not connect directly with the closed sewerage system, but that discharges into the closed sewerage system through an air break or air gap into a trap, fixture, receptor, or interceptor.
- (17) "Legally responsible party" (1) For a residential property, the legally responsible party is the property owner. (2) For a corporation, the legally responsible party is a responsible corporate officer, either: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for approval application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. (3) For a partnership or sole proprietorship, the legally responsible party is either a general partner or the proprietor, respectively. (4) For a municipality, State, Federal, or other public agency, the legally responsible party is a principal executive officer or ranking elected official, either (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).
- (18) "Limited local graywater control program" is a local graywater control program limited to existing graywater treatment works and which does not accept new graywater treatment works.
- (19) "Local agency" means any local city, city or county, county agency including, but not limited to, a department, local public health agency, or district which is delegated the authority to administer all or a portion of the responsibilities of the local graywater control program.
- (20) "Local graywater control program" is a local ordinance or resolution and, if applicable, rule, including implementation practices, authorized by a city, city and county or county which is in compliance with the minimum requirements of this regulation.

- (21) "Local public health agency" means any county, district, or municipal public health agency and may include a county, district, or municipal board of health.
- (22) "Modification" means the alteration or replacement of any component of a graywater treatment works that can affect the quality of the finished water, the rated capacity of a graywater treatment works, the graywater use, alters the treatment process of a graywater treatment works, or compliance with this regulation and the local graywater control program. This definition does not include normal operations and maintenance of a graywater treatment works.
- (23) "Mulch" means organic material including but not limited to leaves, prunings, straw, pulled weeds, and wood chips.
- (24) "Mulch basin" means a type of irrigation or treatment field filled with mulch or other approved permeable material of sufficient depth, length, and width to prevent ponding or runoff. A mulch basin may include a basin around a tree, a trough along a row of plants, or other shapes necessary for irrigation.
- (25) "On-site wastewater treatment system" or "OWTS" means an absorption system of any size or flow or a system or facility for treating, neutralizing, stabilizing, or dispersing sewage generated in the vicinity, which system is not a part of or connected to a sewage treatment works.
- (26) "Percolation test" means a subsurface soil test at the depth of a proposed irrigation area to determine the water absorption capability of the soil, the results of which are normally expressed as the rate at which one inch of water is absorbed. The rate is expressed in minutes per inch.
- (27) "Potable water system" means a system for the provision of water to the public for human consumption through pipes or other constructed conveyances, where such system has less than fifteen service connections or regularly serves less than an average of at least 25 individuals daily at least 60 days per year.
- (28) "Professional engineer" means an engineer licensed in accordance with section 12-25-1, C.R.S.
- (29) "Public nuisance" means the unreasonable, unwarranted and/or unlawful use of property, which causes inconvenience or damage to others, including to an individual or to the general public.
- (30) "Public water system" means a system for the provision of water to the public for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least 25 individuals daily at least 60 days per year. A public water system is either a community water system or a non-community water system. Such term does not include any special irrigation district. Such term includes:
- (a) Any collection, treatment, storage, and distribution facilities under control of the supplier of such system and used primarily in connection with such system.
 - (b) Any collection or pretreatment storage facilities not under such control, which are used primarily in connection with such system.
- (31) "Single family" means a detached or attached structure, arranged and designed as a single family residential unit intended to be occupied by not more than one family and that has separate water and sewer services connections from other dwelling units.
- (32) "Site evaluation" means a comprehensive analysis of soil and site conditions for a graywater irrigation area.

- (33) "Soil horizon" means layers in the soil column differentiated by changes in texture, color, redoximorphic features, bedrock, structure, consistence, and any other characteristic that affects water movement.
- (34) "Soil profile test pit" means a trench or other excavation used for access to evaluate the soil horizons for properties influencing effluent movement, bedrock, evidence of seasonal high ground water, and other information to be used in locating and designing a graywater irrigation area.
- (35) "Soil structure" means the naturally occurring combination or arrangement of primary soil particles into secondary units or peds; secondary units are characterized on the basis of shape, size class, and grade (degree of distinctness).
- (36) "Suitable soil" means unsaturated soil in which the movement of water, air, and growth of roots is sustained to support healthy plant life and conserve moisture. Soil criteria for graywater subsurface irrigation are further defined in section 86.12.
- (37) "Subsurface irrigation" means a discharge of graywater into soil a minimum of four inches (4") and no deeper than twelve inches (12") below the finished grade.
- (38) "State waters" means any and all surface and subsurface waters which are contained in or flow in or through this state, but does not include waters in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.

Table 8-1 Abbreviations and Acronyms

ANSI	American National Standards Institute
BK	Blocky
C.R.S.	Colorado Revised Statutes
CDPS	Colorado Discharge Permit System
FEMA	Federal Emergency Management Agency
gpd	gallons per day
GR	Granular
mg/L	milligrams per Liter
MPI	Minutes Per Inch
NFIP	National Flood Insurance Program
NSF	NSF International, formally known as National Sanitation Foundation
O&M	Operations and Maintenance
OWTS	On-site Wastewater Treatment System(s)
PR	Prismatic

86.9 Administration

A. Local Coordination

Nothing in this regulation shall be deemed to limit the authority of local cities, cities and counties, or counties, pursuant to section 29-1-203, C.R.S., to enter into intergovernmental agreements with each other pertaining to the coordinated adoption and operation of local graywater control program.

B. Minimum Requirements for a Local Graywater Control Program

- 1. The local city, city and county, or county that chooses to authorize graywater use within its jurisdiction must adopt an ordinance, resolution, or for certain program elements, a rule, which meets the following minimum requirements:

- a. The ordinance or resolution must be in compliance with the minimum requirements of this regulation.
- b. The ordinance or resolution must require compliance with all applicable federal, state, and local requirements.
- c. The ordinance or resolution must define the legal boundary of the local city, city and county, or county's local graywater control program which, at a maximum, is limited by the provisions in Titles 30 and 31 of the C.R.S. and the Colorado Constitution. If coordination with other agencies results in graywater implementation not being allowed within a portion of the local city, city and county, or county then these areas must be clearly excluded.
- d. The ordinance, resolution, or rule must explicitly state which graywater use categories defined in section 86.10 are allowed within the local city, city and county, or county's local graywater control program boundary.
- e. The ordinance or resolution must identify the local agency or agencies for all graywater regulatory activities including, but not limited to, design review, inspection, enforcement, tracking, and complaints.
- f. The ordinance or resolution must clearly indicate whether a fee(s) will be imposed for graywater activities, which local agency establishes the fee(s) and where fee(s) information is located.
- g. The ordinance or resolution must include a requirement for a searchable tracking mechanism that is indefinitely maintained by the local agency that must include, at a minimum, the following information:
 - i. Legal address of each facility with graywater treatment works, allowed graywater uses at each facility, and a graywater treatment works description.
 - ii. The legally responsible party associated with every graywater treatment works.
 - iii. Where required, the certified operator associated with every graywater treatment works.
 - iv. Any changes to the legally responsible party, certified operator, and status of the graywater treatment works must be updated within 60 days.
- h. The ordinance, resolution, or rule must include a requirement for a local agency to develop a graywater design criteria document. The design criteria document must meet the minimum requirements of this regulation but may be more stringent. The graywater design criteria must define a site and soil evaluation methodology for subsurface irrigation systems unless only single family dispersed subsurface irrigation systems are allowed.
- i. The ordinance, resolution, or rule must include a requirement and process for the local agency to approve or deny the installation of new graywater treatment works or modifications to an existing graywater treatment works. As part of the approval process the local agency(ies) must review a design submittal and perform a construction verification in accordance with:

- i. All graywater treatments works must submit the following design information: the graywater uses, graywater treatment system location, design flow calculations for the graywater treatment works, fixtures that are the source of the graywater, design of the plumbing or irrigation system, any supporting soil analysis information, a description of the products or components, legally responsible party information, and contact information for system designer or professional engineer and operator, if applicable. The application for graywater treatment works must be signed by the legally responsible party.
- ii. All graywater treatment works must be inspected or verified and accepted by the local agency.
- j. The ordinance, resolution, or rule must require all graywater treatment works to have an operation and maintenance (O&M) manual. The O&M manual must remain with the graywater treatment works throughout the system's life and be updated based on each modification and approval made to the system. The O&M manual must be transferred, upon change of ownership or occupancy, to the new owner or tenant.
- k. The ordinance, resolution, or rule must clearly indicate if any reporting is required for graywater regulatory activities, the required parameters, and the required frequency.
- l. The ordinance or resolution must include a requirement for the local agency to administer and enforce the provisions of the ordinance or resolution.

C. Discontinuation of local graywater program

A local city, city and county, and county that decides to revoke or rescind an adopted local graywater control program must require that all previously allowed graywater treatment works either:

- 1. Be physically removed or permanently disconnected; or
- 2. Be regulated under a limited graywater control program for existing graywater systems. In this case, the local city, city and county, or county must continue a limited graywater control program for the existing graywater treatment works. The limited graywater program must include a graywater control program for the existing graywater treatment works but no new graywater treatment works. At a minimum, the limited graywater control program must include items: 86.9(B) items a, b, e, g, j, and l. If the limited graywater control program allows modifications to existing treatment works then items d, h, and i must also be included; or
- 3. Be regulated under another jurisdiction's local graywater control program which assumes authority over the existing graywater treatment works. The existing graywater treatment works will need to comply with the new city, city and county, or county's local graywater control program, including any required graywater treatment works modifications.

86.10 Graywater Use Categories

General: The graywater use categories allowed are defined below. A single facility may have multiple graywater treatment works as long as all applicable use and design requirements are satisfied.

- A. Category A: Single family, subsurface irrigation

Category A graywater use must meet the following:

1. Allowed users: Single family.
2. Allowed graywater sources: Graywater collected from bathroom and laundry room sinks, bathtubs, showers, and laundry machines.
3. Allowed uses: Outdoor, subsurface irrigation within the confines of the legal property boundary.
4. Design flow: The design flow for a single family graywater treatment works is limited to a 400 gallons per day (gpd) or less combined flow for all approved uses.

B. Category B: Non-single family, subsurface irrigation, 2,000 gallons per day (gpd) or less

Category B graywater use must meet the following:

1. Allowed users: Non-single family users.
2. Allowed graywater sources: Graywater collected from bathroom and laundry room sinks, bathtubs, showers, and laundry machines.
3. Allowed uses: Outdoor, subsurface irrigation within the confines of the legal property boundary.
4. Design flow: The design flow for a non-single family graywater treatment works is limited to 2,000 gallons per day (gpd) or less for outdoor irrigation for the entire facility.

C. Category C: Single family, indoor toilet and urinal flushing, subsurface irrigation

Category C graywater use must meet the following:

1. Allowed users: Single family.
2. Allowed graywater sources: Graywater collected from bathroom and laundry room sinks, bathtubs, showers, and laundry machines.
3. Allowed uses: Indoor toilet and urinal flushing and outdoor, subsurface irrigation within the confines of the legal property boundary.
4. Design flow: The design flow for a single family graywater treatment works is limited to 400 gallons per day (gpd) or less combined flow for all approved uses.

D. Category D: Non-single family, indoor toilet and urinal flushing, subsurface irrigation

Category D graywater use must meet the following:

1. Allowed users: Non-single family users.
2. Allowed graywater sources: Graywater collected from bathroom and laundry room sinks, bathtubs, showers, and laundry machines.
3. Allowed uses: Indoor toilet and urinal flushing and outdoor, subsurface irrigation within the confines of the legal property boundary.

4. Design flow: There is no maximum design flow for a non-single family graywater treatment works for indoor toilet and urinal flushing. There is no maximum design flow for the amount of wastewater from the facility that can go to a closed sewerage system. The design flow is limited to 2,000 gallons per day (gpd) or less for outdoor irrigation for the entire facility.

86.11 Graywater Use Requirements - Control Measures

A. All graywater uses

All graywater treatment works must be operated in accordance with the following control measures:

1. Graywater must be collected in a manner that minimizes the presence or introduction of:
 - a. hazardous or toxic chemicals in the graywater to the greatest extent possible;
 - b. human excreta in the graywater to the greatest extent possible;
 - c. household wastes; and
 - d. animal or vegetable matter.
2. Use of graywater is limited to the confines of the facility that generates the graywater.
3. The graywater treatment works must be operated and maintained in accordance with the O&M manual, including all manufacturer recommended maintenance activities. The O&M manual must remain with the graywater treatment works throughout the system's life and be updated based on each modification and approval made to the system. The O&M manual must be transferred, upon change of ownership or occupancy, to the new owner or tenant.
 - a. For Category D graywater treatment works that have a capacity to receive greater than 2,000 gallons per day (gpd), operational and maintenance records must be maintained for a minimum of the past five (5) years.
4. The owner or operator of a graywater treatment works must minimize exposure of graywater to humans and domestic pets.
5. Graywater use and graywater treatment works must not create a public nuisance.
6. Graywater must not be stored for more than 24 hours unless the graywater has been treated by a graywater treatment works that meets the design requirements of section 86.12. All graywater must be stored inside a tank(s) that meets the design requirements of section 86.12(B)(5).
7. Temporary or semi-temporary connections from the potable water system or public water system to the graywater treatment works are prohibited. Permanent connections from the potable water system or public water system to the graywater treatment works must meet the design requirements of 86.12(B)(6).

B. Subsurface irrigation graywater use

Graywater use for subsurface irrigation must also comply with the following additional control measures:

1. Agricultural irrigation with graywater is prohibited.
2. Irrigation is prohibited when the ground is frozen, plants are dormant, during rainfall events, or the ground is saturated.
3. Irrigation scheduling must be adjusted so that application rates are closely matched with soil and weather conditions.
4. Graywater must be applied in a manner that does not result in ponding, runoff, or unauthorized discharge to state waters. For dispersed subsurface irrigation systems, the graywater must be applied at an agronomic rate. For mulch basins systems, the graywater must not be applied in excess of the soil adsorption rate.
5. For mulch basin systems, mulch must be replenished and undergo periodic maintenance as needed to reshape or remove material to maintain surge capacity and to prevent ponding and runoff.

C Indoor toilet and urinal flushing graywater use

Graywater use for indoor toilet and urinal flushing must also comply with the following additional control measures.

1. Graywater for toilet and urinal flushing use must be disinfected.
 - a. Graywater treatment works that utilize chlorine for disinfection must have a minimum of 0.2 mg/L and a maximum of 4.0 mg/L of free chlorine residual throughout the indoor graywater plumbing system, including fixtures.
 - b. Single family graywater treatment works that utilize non-chemical methods, such as UV, for disinfection must have a chlorine puck present in each toilet or urinal tank.
2. Graywater for toilet and urinal flushing must be dyed with either blue or green food grade vegetable dye and be visibly distinct from potable water.

86.12 Graywater Treatment Works - Design Criteria

A. Graywater treatment works flow projections

All graywater treatment works must be sized using the following flow projection methods:

1. Residential users: Flow to graywater treatment works must be calculated on the occupancy and the fixtures connected to the graywater treatment works. The calculated graywater flow is the number of occupants multiplied by the estimate graywater flow in terms of gpd/occupant from the attached fixtures.
 - a. The occupancy must be calculated based on a minimum of two (2) occupants for the first bedroom and one (1) occupant for each additional bedroom.
 - b. The estimated graywater flow from each fixture is based on the design flow of the fixture. If the fixture's design flow is unknown then the estimated graywater flow per occupant is:
 - i. Traditional fixtures: 25 gpd/occupant for each shower, bathtub, and wash basin and 15 gpd/occupant for each clothes washer.

- ii. Water saving fixtures: 20 gpd/occupant for each shower, bathtub, and wash basin and 8 gpd/occupant for each clothes washer.
- 2. Non-residential users: Graywater treatment works must be sized in accordance with fixture or water use records taking into account the number of fixtures attached to the graywater treatment works.

B. Graywater treatment works design criteria

All graywater treatment works must comply with the following design criteria:

- 1. The graywater treatment works must be designed to meet the design requirements of this regulation and meet any additional requirements of the Colorado Plumbing Code.
- 2. The design flow of each treatment component or combination of multiple components must be greater than the calculated peak graywater production if upstream of the storage tank or no tank is present.
- 3. The graywater treatment works must have a diversion valve that directs graywater to either the graywater treatment works or a closed sewerage system. The diversion valve must be easily operable and clearly labeled. The diversion valve must be constructed of material that is durable, corrosion resistant, watertight, and designed to accommodate the inlet and outlet pipes in a secure and watertight manner. The bypass line must be indirectly connected to the closed sewerage system.
- 4. Piping that allows the treatment process(es) or a storage tank to be bypassed prior to graywater use is prohibited unless the graywater bypass piping has an indirect connection to a closed sewerage system.
- 5. Graywater treatment works must include a tank to collect and store graywater except for subsurface irrigation systems that discharge to a mulch basin which meets the sizing criteria of section 86.12(C)(3)(g)(ii)(a) for Category A and C graywater treatment works or 86.12(D)(4)(g)(ii)(a) for Category B and D graywater treatment works.

The storage tank must:

- a. be made of durable, non-absorbent, water-tight, and corrosion resistant materials;
- b. be closed and have access openings for inspection and cleaning;
- c. be vented:
 - i. for indoor tanks: the tanks must be vented to the atmosphere outside of the house;
 - ii. for outdoor tanks: the storage tank must have a downturned screened vent;
- d. have an overflow line:
 - i. with the same or larger diameter line as the influent line;
 - ii. without a shut off valve;

- iii. that is trapped to prevent the escape of gas vapors from the tank; and
 - iv. that is indirectly connected to the closed sewerage system;
 - e. have a valved drain line with the same or larger diameter line as the influent line that is indirectly connected to the closed sewerage system;
 - f. be a minimum of 50 gallons;
 - g. be placed on a stable foundation; and
 - h. have a permanent label that states "CAUTION! NON-POTABLE WATER. DO NOT DRINK."
6. Category A and Category B graywater treatment works may, but are not required to, have a backup potable water system that provides potable irrigation water when graywater is not being produced or is produced in insufficient quantities. Category C and Category D graywater treatment works must have a backup potable water system connection.

Backup potable water system connections must meet the following requirements:

- a. For non-public water system, potable water system connections: uncontrolled cross connections between a potable water system and a graywater treatment works are prohibited. All cross connections must be protected by a reduced pressure principle backflow prevention zone assembly or an approved air gap.
 - b. For public water system potable water system connections: uncontrolled cross connections between a public water system and a graywater treatment works are prohibited. The graywater treatment works design must protect the public water system from cross connections by meeting the requirements of Regulation #11: Colorado Primary Drinking Water Regulations.
7. Use or installation of graywater treatment works cannot be used as a factor to reduce the design, capacity or soil treatment area requirements for OWTS or domestic wastewater treatment works.
8. Wastewater from graywater treatment works (e.g., filter backwash water) must be properly contained and disposed into a closed sewerage system or an approved Underground Injection Control (UIC) well.
9. All graywater piping shall be clearly distinguished and must be clearly labeled, including pipe identification and flow arrows.
10. Graywater treatment works located in a 100-year floodplain must meet or exceed the requirements of FEMA and the local emergency agency. The graywater system must be designed to minimize or eliminate infiltration of floodwaters into the system and prevent discharge from the system into the floodwaters.
11. Graywater treatment works are prohibited in floodways.
12. The graywater treatment works must be located:
- a. Within the confines of the legal property boundary and not within an easement; and

- b. Outdoor tanks must not be exposed to direct sunlight.

C. Category A: Graywater treatment works design criteria

In addition to the requirements in sections 86.12(A) and 86.12(B), graywater treatment works for “Category A: Single family, subsurface irrigation” uses must include the following components:

1. The graywater treatment works must include either:
 - a. For mulch basin systems, a filter is not required but the mulch basin design must meet the design criteria in sections 86.12(C)(2) and 86.12(C)(3).
 - b. For dispersed subsurface irrigation systems, a cartridge filter is required. The cartridge filter must be a minimum of 60 mesh. The filter must be located between the storage tank and the irrigation system. If a pump is being used to pressurize the graywater distribution system, the filter must be located after the pump. The dispersed subsurface irrigation system must meet design criteria in sections 86.12(C)(2) and 86.12(C)(4).
2. Subsurface irrigation system designs, including dispersed subsurface irrigation systems and mulch basin systems, must meet the following criteria:
 - a. The subsurface irrigation components of the graywater irrigation system must be installed a minimum of four inches (4”) and a maximum of twelve inches (12”) below the finished grade.
 - b. The subsurface irrigation components of the graywater irrigation system must be installed in suitable soil, as defined in section 86.8(36).
 - c. There must be a minimum of twenty-four inches (24”) of suitable soil between the subsurface irrigation components of the graywater irrigation system and any restrictive soil layer, bedrock, concrete, or the highest water table. Restrictive soil layers are soil types 4, 4A, and 5 in Table 12-2.
 - d. The system design shall provide the user with controls, such as valves, switches, timers, and other controllers, as appropriate, to ensure the distribution of graywater throughout the entire irrigation zone.
 - e. When used, emitters shall be designed to resist root intrusion and shall be of a design recommended by the manufacturer for the intended graywater flow and use. Minimum spacing between emitters shall be sufficient to deliver graywater at an agronomic rate and to prevent surfacing or runoff.
 - f. All irrigation supply lines shall be polyethylene tubing or PVC Class 200 pipe or better and Schedule 40 fittings. All joints shall be pressure tested at 40 psi (276 kPa), and shown to be drip tight for five minutes before burial. Drip feeder lines can be poly or flexible PVC tubing.
 - g. All irrigation systems must meet the following setback distances in Table 12-1.

Table 12-1: Graywater System Setback Requirements

<u>Minimum Horizontal Distance Required from:</u>	<u>Graywater Storage Tank</u>	<u>Irrigation Field</u>
Buildings	5 feet	2 feet

Property line adjoining private property	10 feet	10 feet
Property line adjoining private property with supporting property line survey	1.5 feet	1.5 feet
Water supply wells	50 feet	100 feet
Streams and lakes	50 feet	50 feet
Seepage pits or cesspools	5 feet	5 feet
OWTS disposal field	5 feet	25 feet
OWTS tank	5 feet	10 feet
Domestic potable water service line	10 feet	10 feet
Public water main	10 feet	10 feet

- h. The irrigation field may only be located on slopes of less than thirty percent (30%) from horizontal.
3. Mulch basin systems must be designed to meet the following requirements:
- a. A site and soil evaluation must be conducted for each proposed graywater irrigation area to determine the site suitability. The site and soil evaluation must include:
- i. Site information, including:
 - (a) a site map; and
 - (b) location of proposed graywater irrigation area in relation to physical features requiring setbacks in Table 12-1.
 - ii. Soil investigation to determine long-term acceptance rate of a graywater irrigation area as a design basis. Soil investigation must be completed by either:
 - (a). a visual and tactile evaluation of soil profile test pit, or
 - (b) a percolation test.
- b. Irrigation rates must not exceed maximum allowable soil loading rates in Table 12-2 based on the finest textured soil in the twenty-four inches (24") of suitable soil beneath the subsurface irrigation components.

Table 12-2: Soil Type Description and Maximum Hydraulic Loading Rate

<u>Soil Type</u>	<u>USDA Soil Texture</u>	<u>USDA Structure - Shape</u>	<u>USDA Soil Structure-Grade</u>	<u>Percolation Rate (MPI)</u>	<u>Loading Rate for Graywater (gal./sq. ft./day)</u>
0	Soil Type 1 with more than 35% Rock (>2mm); Soil Types 2-5 with more than 50% Rock (>2mm)	--	0 (Single Grain)	Less than 5	Not suitable without augmentation 1.0 with augmentation
1	Sand, Loamy Sand	--	0	5-15	Not suitable without augmentation 1.0 with augmentation
2	Sandy Loam, Loam, Silt Loam	PR BK GR	2 (Moderate) 3 (Strong)	16-25	0.8
2A	Sandy Loam, Loam, Silt Loam	PR, BK, GR 0 (none)	1 (Weak) Massive	26-40	0.6
3	Sandy Clay Loam, Clay Loam, Silty Clay Loam	PR, BK, GR	2, 3	41-60	0.4
3A	Sandy Clay Loam, Clay Loam, Silty Clay Loam	PR, BK, GR 0	1 Massive	61-75	0.2
4	Sandy Clay, Clay, Silty Clay	PR, BK, GR	2, 3	76-90	Not suitable
4A	Sandy Clay, Clay, Silty Clay	PR, BK, GR 0	1 Massive	91-120	Not suitable
5	Soil Types 2-4A	Platy	1, 2, 3	121+	Not suitable

- c. Suitable soil may consist of original, undisturbed soil or original soil that is augmented. Not suitable soil may be augmented as needed to ensure suitable soil is used.
- d. If the original soil is augmented, the mixture used for augmentation must meet the following criteria to ensure that suitable soil is achieved:
- i. The mixture must have an organic content that is at least five percent (5%) and no greater than ten percent (10%);
 - ii. The mixture must be a well blended mix of mineral aggregate (soil) and compost where the soil ratio depends on the requirements for the plant species; and
 - iii. The mineral aggregate must have the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8	100
No. 4	95 - 100
No. 10	75 - 90
No. 40	25 - 40
No. 100	4 - 10
No. 200	2 - 5

- e. If the original soil is augmented, the additional soil must be tilled into the native soil a minimum of six inches (6") below irrigation application zone.
- f. Soil types 0 and 1 must be augmented before use. Soil type 4, 4A, and 5 are not suitable for subsurface irrigation.
- g. Mulch basins must be designed to meet the following requirements:
 - i. Mulch shall be permeable enough to allow rapid infiltration of graywater.
 - ii. The minimum void space mulch basin volume must be either:
 - (a) Three (3) times the anticipated average daily flow for graywater treatment works without a storage tank to allow for graywater volume surges and to prevent surfacing or runoff.
 - (b) One and a half (1.5) times the anticipated average daily flow for graywater treatment works with storage tank meeting the section 86.12(B)(5) design criteria.
 - iii. Piping to mulch basins must discharge a minimum of four inches (4") below grade into a container for dispersal of graywater into the mulch basin. The container must be designed to have four inches (4") of freefall between the invert of the discharge pipe and the mulch. The container must have an access lid for observation of flow and to check mulch levels.
 - iv. The mulch basin must have a minimum depth of twelve inches (12") below grade and not more than twenty four (24") below grade.
- 4. Dispersed subsurface irrigation systems must be sized using one of the following methodologies:

- a. Irrigation area equation:

The minimum graywater irrigation area must be calculated using the following equation.

$$LA = GW / (CF \times ET \times PF)$$

Where:

$$LA = \text{Landscaped area (square feet)}$$

- GW = Estimated graywater flow (gallons per week)
- CF = $0.62 \text{ (square foot x inch / gallon) } = ((7.48 \text{ gallons/ 1-cu-ft) / 12 inch/ft}$
- ET = Evapotranspiration rate (inch / week), as determined by USDA Natural Resources Conservation Service CO652.0408 "Figure CO4-1: Map of Colorado Climate Zones" dated April 1978, or weekly averages based on actual conditions;
- PF = Plant factor, 0.5;

or,

- b. The mulch basin system design criteria in Section 86.12(C)(3), except 86.12(C)(3)(g).

D Category B: Graywater treatment works design criteria

In addition to the requirements in sections 86.12(A) and 86.12(B), graywater treatment works for "Category B: Non-single family, subsurface irrigation, 2,000 gallons per day (gpd) or less" uses must include the following treatment components:

1. The graywater treatment works must include either:
 - a. For mulch basin systems, a filter is not required but the mulch basin design must meet design criteria in sections 86.12(D)(3) and 86.12(D)(4).
 - b. For dispersed subsurface irrigation systems, a cartridge filter is required. The cartridge filter must be a minimum of 60 mesh located between the storage tank and the irrigation system. If a pump is being used to pressurize the graywater distribution system the filter must be located after the pump. The dispersed subsurface irrigation system must meet the design criteria in sections 86.12(D)(3) and 86.12(D)(4), except 86.12(D)(4)(g).
2. Signage: Notification shall include posting of signs of sufficient size to be clearly read with the language below in the dominant language(s) expected to be spoken at the site.
 - a. A permanent warning sign must be visible at all fixtures from which graywater is collected. The signs must state that, "WATER FROM THIS FIXTURE IS REUSED. CHEMICALS, EXCRETA, PETROLEUM OILS AND HAZARDOUS MATERIALS MUST NOT BE DISPOSED DOWN THE DRAIN";
 - b. Each room that contains graywater treatment works components must have a sign that says "CAUTION GRAYWATER TREATMENT WORKS, DO NOT DRINK, DO NOT CONNECT TO THE POTABLE DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM."; and
 - c. Each irrigation area must have a sign that says "CAUTION GRAYWATER BEING USED FOR IRRIGATION. DO NOT DRINK, DO NOT CONNECT TO THE POTABLE DRINKING WATER SYSTEM."

3. Subsurface irrigation system designs, including dispersed subsurface irrigation systems and mulch basin systems, must meet the following criteria:
 - a. The subsurface irrigation components of the graywater irrigation system must be installed a minimum of four inches (4") and a maximum of twelve inches (12") below the finished grade.
 - b. The subsurface irrigation components of the graywater irrigation system must be installed in suitable soil, as defined in section 86.8(36).
 - c. There must be a minimum of twenty-four inches (24") of suitable soil between the subsurface irrigation components of the graywater irrigation system and any restrictive soil layer, bedrock, concrete, or the highest water table. Restrictive soil layers are soil types 4, 4A, and 5 in Table 12-2.
 - d. The system design shall provide the user with controls, such as valves, switches, timers, and other controllers, as appropriate, to ensure the distribution of graywater throughout the entire irrigation zone.
 - e. When used, emitters shall be designed to resist root intrusion and shall be of a design recommended by the manufacturer for the intended graywater flow and use. Minimum spacing between emitters shall be sufficient to deliver graywater at an agronomic rate and to prevent surfacing or runoff.
 - f. All irrigation supply lines shall be polyethylene tubing or PVC Class 200 pipe or better and Schedule 40 fittings. All joints shall be pressure tested at 40 psi (276 kPa), and shown to be drip tight for five minutes before burial. Drip feeder lines can be poly or flexible PVC tubing.
 - g. All irrigation systems must meet the setback distances in Table 12-1.
 - h. The irrigation field may only be located on slopes of less than thirty percent (30%) from horizontal.
4. Dispersed subsurface irrigation systems and mulch basin systems must be designed to meet the following requirements:
 - a. A site and soil evaluation must be conducted for each proposed graywater irrigation area to determine the site suitability. The site and soil evaluation must include:
 - i. Site information, including:
 - (a) a site map; and
 - (b) location of proposed graywater irrigation area in relation to physical features requiring setbacks in Table 12-1.
 - ii. Soil investigation to determine long-term acceptance rate of a graywater irrigation area as a design basis. Soil investigation must be completed by either:
 - (a) a visual and tactile evaluation of soil profile test pit, or
 - (b) a percolation test.

- b. Irrigation rates must not exceed maximum allowable soil loading rates in Table 12-2 based on the finest textured soil in the twenty-four inches (24") of suitable soil beneath the subsurface irrigation components.
- c. Suitable soil may consist of original, undisturbed soil or original soil that is augmented. Not suitable soil may be augmented as needed to ensure suitable soil is used.
- d. If the original soil is augmented, the mixture used for augmentation must meet the following criteria to ensure that suitable soil is achieved:

- i. The mixture must have an organic content that is at least five percent (5%) and no greater than ten percent (10%);
- ii. The mixture must be a well blended mix of mineral aggregate (soil) and compost where the soil ratio depends on the requirements for the plant species; and

iii. The mineral aggregate must have the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8	100
No. 4	95 - 100
No. 10	75 - 90
No. 40	25 - 40
No. 100	4 - 10
No. 200	2 - 5

- e. If the original soil is augmented, the additional soil must be tilled into the native soil a minimum of six inches (6") below irrigation application zone.
- f. Soil types 0 and 1 must be augmented before use. Soil type 4, 4A, and 5 are not suitable for subsurface irrigation.
- g. Mulch basins must be designed to meet the following requirements:
 - i. Mulch shall be permeable enough to allow rapid infiltration of graywater.
 - ii. The minimum void space mulch basin volume must be either:
 - (a) Three (3) times the anticipated average daily flow for graywater treatment works without a storage tank to allow for graywater volume surges and to prevent surfacing or runoff.
 - (b) One and a half (1.5) times the anticipated average daily flow for graywater treatment works with storage tank meeting the section 86.12(B)(5) design criteria.
 - iii. Piping to mulch basins must discharge a minimum of four inches (4") below grade into a container for dispersal of graywater into the mulch basin. The container must be designed to have four inches (4") of freefall between the invert of the discharge pipe and the mulch. The

container must have an access lid for observation of flow and to check mulch levels.

- iv. The mulch basin must have a minimum depth of twelve inches (12") below grade and not more than twenty four (24") below grade.

E. Category C: Graywater treatment works design criteria

In addition to the requirements in Sections 86.12(A) and (B), graywater treatment works for "Category C: Single family, indoor toilet and urinal flushing, subsurface irrigation" uses must include the following treatment components:

1. The graywater treatment works must be certified under "Class R" of NSF/ANSI 350 Onsite Residential and Commercial Water Reuse Treatment Systems.
2. If a disinfection process is not part of NSF/ANSI 350-2011 equipment, separate disinfection system equipment is required. For graywater treatment works that use sodium hypochlorite (bleach), the graywater treatment works must be capable of providing a free chlorine residual of 0.2 to 4.0 mg/L in the graywater throughout the indoor graywater plumbing system.
3. The graywater treatment works must include a dye injection system that is capable of providing a dye concentration that is visibly distinct from potable water.
4. Category C graywater treatment works that use graywater for subsurface irrigation may divert graywater prior to the disinfection and dye process. The subsurface irrigation system design must meet:
 - a. For mulch basin systems, the mulch basin design must meet the design criteria in sections 86.12(C)(2) and 86.12(C)(3).
 - b. For dispersed subsurface irrigation systems, the dispersed subsurface irrigation system must meet design criteria in sections 86.12(C)(2) and 86.12(C)(4).

F. Category D: Graywater treatment works design criteria

In addition to the requirements in Sections 86.12(A) and (B), graywater treatment works for "Category D: Non-single family, indoor toilet and urinal flushing, subsurface irrigation" uses must include the following treatment components:

1. The graywater treatment works must be certified under "Class R" or "Class C" of NSF/ANSI 350 Onsite Residential and Commercial Water Reuse Treatment Systems. Required classification shall be dictated by the size of the graywater treatment works and if the graywater sources are residential or commercial as defined by NSF/ANSI 350.
2. Separate disinfection system equipment is required if a disinfection process is not part of NSF/ANSI 350-2011 equipment. A graywater treatment works must be capable of providing a free chlorine residual of 0.2 to 4.0 mg/L in the graywater throughout the indoor graywater plumbing system.
3. The graywater treatment works must include a dye injection system that is capable of providing a dye concentration that is visibly distinct from potable water.
4. Signage: Notification shall include posting of signs of sufficient size to be clearly read with the language below in the dominant language(s) expected to be spoken at the site.

- a. A permanent warning sign must be visible at all fixtures from which graywater is collected. The signs must state that, "WATER FROM THIS FIXTURE IS REUSED. CHEMICALS, EXCRETA, PETROLEUM OILS AND HAZARDOUS MATERIALS MUST NOT BE DISPOSED DOWN THE DRAIN";
 - b. Each room that contains graywater treatment works components must have a sign that says "CAUTION GRAYWATER TREATMENT WORKS, DO NOT DRINK, DO NOT CONNECT TO THE POTABLE DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM."; and
 - c. Each toilet and urinal must have a sign that says: "TO CONSERVE WATER, THIS BUILDING USES TREATED NON-POTABLE GRAYWATER TO FLUSH TOILETS AND URINALS."
5. Category D graywater treatment works that use graywater for subsurface irrigation may divert graywater prior to the disinfection and dye process. The subsurface irrigation system design must meet:
- a. For mulch basin systems, the mulch basin design must meet design criteria in sections 86.12(D)(3) and 86.12(D)(4).
 - b. For dispersed subsurface irrigation systems, the dispersed subsurface irrigation system must meet the design criteria in sections 86.12(D)(3) and 86.12(D)(4), except 86.12(D)(4)(g).
6. For graywater treatment works that have a capacity to receive greater than 2,000 gallons per day, the design must be prepared under the supervision of and submitted with the seal and signature of a professional engineer licensed to practice engineering in the State of Colorado in accordance with the requirements of the Colorado Department of Regulatory Agencies (DORA) – Division of Registrations.

86.13 Operation and Maintenance Manual

All graywater systems must have an O&M manual. The O&M manual must include the following items:

- A. A graywater treatment works description including: equipment list, design basis data including but not limited to, design volumes, design flow rates of each component and service area, system as-built drawing, and process description.
- B. Maintenance information for the graywater treatment works including but not limited to: component maintenance schedule, instructions for component repair, replacement, or cleaning, replacement component source list, testing and frequency for potable containment device, and instructions for periodic removal of residuals.
- C. Operational ranges for parameters including but not limited to: disinfectant concentration levels, filter replacement parameters, pressure ranges, tank level, and valve status under normal operation.
- D. Step-by-step instructions for starting and shutting down the graywater treatment works including but not limited to: valve operation, any electrical connections, cleaning procedures, visual inspection, and filter installation.
- E. A guide for visually evaluating the graywater treatment works and narrowing any problem scope based on alarm activations, effluent characteristics, system operation, and history.

F. A list of graywater control measures in which the graywater treatment works must be operated.

86.14 Certified Operator

A graywater treatment works must be operated by qualified personnel who meet any applicable requirements of Regulation #100, the Water and Wastewater Facility Operators Certification Requirements.

86.15 - 86.20 Reserved

86.21 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE; APRIL 13, 2015 RULEMAKING, FINAL ACTION MAY 11, 2015, EFFECTIVE JUNE 30, 2015

The provisions of sections 25-8-202(1)(c) and 25-8-205(1)(g), C.R.S., provide the specific statutory authority for the Graywater Control Regulation adopted by the Water Quality Control Commission (commission). The commission has also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis, specific statutory authority, and purpose.

BASIS AND PURPOSE

I. Purpose

The commission has determined that the adoption of the requirements set forth in Regulation #86 are necessary to protect public health and the environment in the state. The commission believes that the implementation of graywater use in Colorado will proceed more expeditiously by limiting the initial regulatory scope. This approach promotes development of local graywater programs through two initial graywater uses with specific treatment and control measure requirements. The commission expects the adoption of modifications to Regulation #86 over time to allow for additional graywater uses, graywater users, and expanded treatment options. The commission anticipates future reviews of this regulation to include a review for improved organization and readability, and also anticipates that the next review will consider whether to allow agricultural irrigation as a use, and whether to adopt variance provisions.

It is the intent of the commission that this regulation promote the use of graywater by providing a comprehensive framework which, when followed, will assure responsible use of graywater compatible with the state's public policy to foster the health, welfare and safety of the inhabitants of the state of Colorado and to protect, maintain, and improve, where necessary and reasonable, the water quality in Colorado.

II. House Bill 13-1044 Background

House Bill 13-1044 was signed into law on May 15, 2013, and authorizes the use of graywater in Colorado. The legislation defined "graywater" and "graywater treatment works" and established a basic implementation framework for graywater use within Colorado.

Under the statute, each local city, city and county, or county are able to decide whether to allow graywater use within its jurisdiction via the adoption of a resolution or ordinance that meets minimum local, state and federal requirements, including but not limited to the Colorado Plumbing Board regulations, local graywater control programs, water rights requirements, and operator certification requirements. All graywater users must wait until all relevant regulations are effective before implementing graywater treatment works.

III. Regulatory Goals

Through adoption of this regulation, the commission is encouraging the use of graywater. Because graywater has the potential to be a human pathogen pathway, the commission is adopting measures to

adequately protect public health. The graywater regulation is structured so that local governments will have flexibility to adopt ordinances, resolutions, and rules that are appropriate in each individual circumstance. Local graywater control programs are voluntary, and may allow one or both of the authorized graywater uses. The local graywater control program may be more stringent but must meet the minimum requirements of Regulation #86. Since neither the local implementing agencies nor the state agencies were allocated funds for graywater regulation, ordinance, code, resolution, and other supporting graywater control legal framework, the regulation aims to be cognizant of resource limitations linked to local implementation. At this time, the commission is authorizing two graywater uses – indoor toilet flushing and outdoor subsurface irrigation. The commission anticipates that the allowed graywater uses may be expanded in the future after Colorado gains some experience and further scientifically based research can define the risks and benefits.

IV. Applicability

The statute states that, “graywater may only be used in areas where the local city, city and county, or county has adopted an ordinance or resolution approving the use of graywater”, and ordinances and resolutions must be “in compliance” with the commission’s regulation and other federal, state, and local. §§ 25-8-205(1)(g)(II), 31-11-107(1) and 31-15-601(1)(m), C.R.S.

The Commission declined to grandfather preexisting graywater systems. All graywater systems in Colorado must meet the requirements of this regulation.

There are some on-site waste water treatment systems (“OWTS”) that, in addition to disposal, use some of the water generated from these systems for subsurface irrigation. The purpose of these systems is sewage disposal. These systems were approved prior to May 15, 2013, pursuant to *Regulation #43: On-Site Wastewater Treatment System Regulation* (“OWTS”) (5 CCR 1002-43.4(J) or *Individual Sewage Disposal System Guidelines* (“ISDS”) (5 CCR 1003-6.IV.J) which allows a local public health agency to approve “experimental” OWTS or ISDS systems. The record indicated there are a small number of these systems, less than 10. The Commission adopted section 86.6(A)(2) to address these systems. These systems will continue to operate under Regulation No. 43 and will be deemed in compliance with this regulation unless and until modifications are made, at which time the system will need to evaluate its system and to the extent applicable must come into compliance with requirements of this regulation.

A local city, city and county or county that adopts a graywater ordinance or resolution must include the ability to compel graywater users to discontinue the practice in the event the program is discontinued. Where a local jurisdiction adopts a local graywater program, and later decides to discontinue the local graywater control program, the local government may either fully discontinue the program or adopt a limited graywater control program to allow existing graywater systems to continue. The “limited graywater control program” option means that the previously adopted local control program (including all Regulation #86 requirements) can be limited to the existing graywater treatment works and that no additional applications for graywater systems will be accepted.

V. Enforcement and Division Oversight

The statute conveys exclusive enforcement authority regarding compliance with the local ordinance or resolution to the local jurisdiction. The commission does not intend to directly enforce on individual users or graywater treatment works that are located within a local graywater control program. In cases where there is no local graywater control program in place, graywater use within the local jurisdiction will not be authorized and the user (not the local agency) may face enforcement action from the Water Quality Control Division (division).

A local city, city and county, or county that chooses to adopt a local graywater control program must notify the Division within 60 days of adoption and provide a copy of the ordinance, or resolution and, if

applicable, rule. The division may review the ordinance or resolution to ensure that the ordinance or resolution meets the minimum intent of Regulation #86, and may take action to compel any local graywater program to conform to the minimum requirements of the regulation.

VI. Definitions

The commission relied upon existing regulatory definitions where possible and adopted definitions for several terms not already defined in statute. The definitions of the terms “cross-connection” and “public water system” were taken from Regulation #11: Colorado Primary Drinking Water Regulations. The definitions of the terms “component”, “design”, “design flow”, “floodplain”, “floodway”, “local public health agency”, “on-site wastewater treatment system”, “percolation test”, “site evaluation”, “soil horizon”, “soil profile test pit”, and “soil structure” were taken or modified from Regulation #43: On-site Wastewater Treatment System Regulation. The definitions of the terms “agronomic rate”, “agricultural irrigation”, and “Division” were taken or modified from Regulation #84: Reclaimed Water Control Regulation. The definition for “indirect connection” was modified from the International Plumbing Code 2012 edition definition of an “indirect waste pipe”. The definitions of the terms “suitable soil” and “subsurface irrigation” were modified from Washington Administrative Code Chapter 246-274.

The commission created definitions for “closed sewerage system”, “facility”, “legally responsible party”, “local agency”, “local graywater control program”, “modification”, “public nuisance”, and “single family”.

VII. Administration

In section 86.9 of the regulation, the commission set mandatory minimum requirements for a resolution or ordinance and, if applicable, rule as adopted by a local agency. The minimum requirements are intended to ensure that the local graywater control program meets the statutory requirements and to ensure a comprehensive graywater program. Based on stakeholder feedback, the regulation allows some administration elements to be authorized in rule, rather than in ordinance or resolution. The minimum requirements are meant to be flexible recognizing that many local agencies will incorporate graywater into existing business processes. A local agency may adopt more stringent standards in its ordinance, resolution, or rule.

A local government may only authorize graywater use in accordance with federal, state, and local requirements. The city, city and county, or county is ultimately responsible for legal compliance with its own ordinance or resolution. Before a local city, city and county, or county adopts an ordinance or resolution to authorize the use of graywater, a board of county commissioners or a municipal governing body is encouraged to coordinate with other local agencies, including but not limited to, the local board of health, local public health agencies, any water and wastewater service providers, and basin water quality authorities. Coordination with other local agencies may be accomplished through memorandums of agreement, memorandums of understanding, agency referral mechanism, or agency agreements. The commission anticipates there may be circumstances where one regulatory entity’s rules and regulations could impact the legality of graywater use in a portion of an overall jurisdiction. For example, if a county allows graywater use but a portion of the county is served by a public water system that does not have appropriate water rights to allow graywater uses, this portion of the county must be excluded from the local graywater control program.

The ordinance, resolution, or rule must clearly state the requirements for graywater use within the jurisdiction. The local graywater control program must outline: the allowed graywater category(ies), the graywater treatment design criteria, site and soil evaluation methodology (if applicable), any regulatory fees, any testing requirements, or specific local requirements. The regulation does not require that an ordinance impose fees or water quality reporting.

A local agency’s graywater program must include a tracking mechanism for all graywater treatment works, a regulatory approval process, and mechanisms to ensure that on-going graywater use is done in compliance with the requirements of the resolution, ordinance, or rule (e.g., control measures are being met). The commission concludes that a local graywater program must address all graywater treatment

works within a jurisdiction, including single family users. Current information on the installed graywater treatment works will be useful in the event of an outbreak investigation and during property transfers. Information regarding the legally responsible party associated with every graywater treatment works will also allow the local jurisdiction to have a contact for the decision maker of each graywater treatment works.

The commission determined that the ordinance or resolution must define the local regulatory structure to implement the program to ensure compliance with the resolution or ordinance. The ordinance or resolution must clearly state which agency(ies) are involved in a local graywater control program and each agency's roles and responsibilities. These requirements are meant to encourage coordination within and between agencies.

Since the local jurisdiction will have enforcement authority, the local graywater control program must include violation notification mechanisms and escalation or enforcement actions. Possible violations of the ordinance or resolution that cause enforcement actions include, but are not limited to: not testing backflow prevention devices as required, not complying with control measures, and installation of a new or modification of an existing system without going through an approval process.

The local jurisdiction will be responsible for coordinating with the Water and Wastewater Facility Operator Board to ensure that any Regulation #100: Water and Wastewater Facility Operator Certification Requirements are being satisfied. The commission encourages local jurisdictions to incorporate a mechanism for operator compliance assurance and a referral mechanism to the Water and Wastewater Facility Operator Board.

VIII. Graywater Categories

The commission is authorizing two uses for graywater - subsurface irrigation and indoor toilet /urinal flushing. There were several factors that guided the commission in determining the graywater categories within the two allowed graywater uses, including the population exposed, potential health exposure, potential cross-connection control risk, and environmental risk. The commission established a major category distinction between a single family residential user and all other users (referred to in the regulation as non-single family). The commission anticipates that a single family user will be financially and personally vested in keeping the household graywater treatment works operating properly. Single family residents will likely be aware of the health status of the other residents in their immediate household. In contrast, non-single family users may not be as diligent in following graywater control measures, may not understand the implications to other graywater users, or may not be responsible for maintaining a graywater treatment works. Accordingly, four graywater use categories were created to address single family and non-single family graywater use for subsurface irrigation (Categories A and B) and indoor toilet and urinal flushing (Categories C and D).

Within the four graywater categories, the commission is adopting daily graywater flow restrictions to ensure that graywater treatment works are consistent with other commission regulations. The commission decided to define a daily graywater flow rate rather than use the building occupancy for a variety of reasons. A daily flow rate is more consistent with the plumbing code, and is more consistent with other commission regulations. Based on a joint American Water Works Association Research Foundation (AwwaRF) and American Water Works Association (AWWA) study titled the Residential End Uses of Water, approximately 30 to 35 gallons per day (gpd) of graywater is produced per person and approximately 18.5 gpd/person is used for toilet flushing. The commission decided on a flow limit of 400 gpd for single family users which is roughly the amount of graywater produced by 10 people and the amount that 22 people could use for indoor toilet flushing. The non-single family limit of 2,000 gpd is roughly the amount of graywater produced by 50 people and the amount that 108 people could use for indoor toilet flushing.

Graywater is expected to contain nitrogen, phosphorus, and total dissolved solids which are regulated pollutants for groundwater discharges under Regulation #41 (5 CCR 1002-41). The commission determined that the potential risks to groundwater from graywater systems are similar to the risk posed by

decentralized onsite wastewater treatment systems. Therefore, at the same time as adopting this control regulation, the commission revised Regulation #61 (section 61.14(1)(b)) to exempt graywater treatment works from the requirement to obtain a discharge permit.

IX. Control Measures

In addition to design requirements, the commission is adopting control measures, which are the required routine actions for graywater treatment works. The control measures compliment the design criteria. The control measures attempt to control potential graywater exposure through: limitation of graywater contamination at the point of production (e.g., sink), proper operation of the treatment process, and limitation of graywater exposure (e.g., toilet or irrigation system). For example, the design criteria for indoor toilet flushing use requires the installation of a dye injection system and the associated control measure is the daily operation of the dye injection system. The control measures are the critical barrier to protect public health and environment after installation of the graywater treatment works. The adopted control measures were developed after reviewing other states' graywater programs and the International Plumbing Code requirements. Some control measures are required for all graywater uses, while other control measures are only required for subsurface irrigation or indoor toilet flushing.

A. Control measures required for all graywater uses

- Graywater must be collected in a manner that minimizes the presence or introduction of hazardous or toxic chemicals to the greatest extent possible. Residual hazardous or toxic chemicals may result from activities including, but not limited to: the use of cleaning chemicals; the use of hazardous household products; waste from a water softener; cleaning car parts; washing greasy or oily rags or clothing; rinsing paint brushes; disposal of pesticides, herbicides, or other chemicals; disposing of waste solutions from home photo labs or similar hobbyist or home occupation activities; or from other home maintenance activities.
- *Graywater must be collected in a manner that minimizes the presence or introduction of human excreta to the greatest extent possible.* Human excreta may result from activities such as, but not limited to: washing diapers, washing soiled garments, and washing infectious garments.
- *Graywater must be collected in a manner that minimizes the presence or introduction of household wastes.* Residual household wastes may result from activities including, but not limited to: the use of cleaning chemicals; pharmaceuticals, or from home maintenance activities.
- *Graywater must be collected in a manner that minimizes the presence or introduction of animal or vegetable matter.* Animal or vegetable matter may result from activities such as but not limited to: cooking, cleaning, and washing pets
- *Use of graywater is limited to the confines of the facility that generates the graywater.* This control measure is a statutory requirement.
- *The graywater treatment works must be operated and maintained in accordance with the O&M manual, including all manufacturer recommended maintenance activities.* On the surface this control measure is similar to the administration section which requires each graywater treatment works to have an O&M manual. However, this control measure requires that the O&M manual be actively followed and be used to guide proper operation and maintenance of a graywater treatment works. The commission included a five (5) year minimum O&M recordkeeping requirement for Category D graywater treatment works that have a capacity to receive equal to or greater than 2,000 gallons per day since maintenance of these systems will be essential to protect public health. In the event of

an outbreak, having records will allow public health officials to have a baseline of operational information to ensure that the graywater treatment works was properly operated.

- *The owner or operator of a graywater treatment works must minimize exposure of graywater to humans and domestic pets.* Research indicates that graywater is to be expected to contain human pathogens. Therefore, the commission considers minimization of exposure to humans and pets as a common sense measure to limit possible pathogen pathways. The commission understands that some exposures will be necessary for graywater treatment works maintenance, cleaning, aerosolization when flushing of urinals and toilets, and irrigation system maintenance. Users should be aware that human pathogens are likely present, and should therefore limit their exposure as much as possible and take protective measures.
- *Graywater use and graywater treatment works must not create a public nuisance.* Graywater use and graywater treatment works must not create public nuisances such as odors and disease vectors (e.g., mosquitoes) habitat.
- *Graywater must not be stored for more than 24 hours unless the graywater has been treated by a graywater treatment works that meets the design requirements of section 86.12. All graywater must be stored inside a tank(s) that meets the design requirements of section 86.12.* Graywater stored for an extended time period will create an environment that encourages microorganism growth. Extended storage of untreated graywater will result in anaerobic (a.k.a. no oxygen) conditions and unpleasant odors. Colorado water rights laws will likely impact storage of treated graywater for an extended time period. In addition, this requirement is in conformance with the 2015 International Plumbing Code.
- *Temporary or semi-temporary connections from the potable water system or public water system to the graywater treatment works are prohibited. Permanent connections from the potable water system or public water system must be controlled with an appropriate backflow prevention assembly or backflow prevention method.* Temporary potable water connections to graywater treatment works are not allowed. An example of a temporary connection is a hose submerged in a graywater storage tank to provide irrigation water during vacation. The prohibition was put in place since temporary connections will not undergo design approval or have an appropriate backflow prevention assembly or backflow prevention method. While temporary connections are prohibited, graywater treatment works may have a permanent connection from a potable water system or public water system. Permanent connections from the potable water system or public water system must be controlled with an appropriate backflow prevention assembly or backflow prevention method as required in section 86.12.

B. Additional control measures required for subsurface irrigation use

- *Agricultural irrigation with graywater is prohibited.* In order to be protective of public health, and because insufficient information was presented at this hearing to fully evaluate the risk to public health, graywater may not be used for agricultural irrigation. The definition of agricultural irrigation includes household gardens, fruit trees, and other flora intended for human consumption. This is especially critical for local jurisdictions that allow household produced food products to be sold at farmers markets. The commission considers “human consumption” to mean any food or beverage consumed by humans, regardless of the processing method (e.g., raw, fermented, baked, canned).
- *Irrigation is prohibited when the ground is frozen, plants are dormant, during rainfall events, or the ground is saturated.* The commission intends to ensure that graywater use

does not result in ponding, runoff, or unauthorized discharge to state waters. Therefore, graywater irrigation under these conditions is not allowed.

- *Irrigation scheduling must be adjusted so that application rates are closely matched with soil and weather conditions.* The amount of water needed for irrigation is dependent on a variety of local conditions such as the flora being irrigated, weather condition, and local soils. The user needs to be mindful that the required amount of graywater and nutrients will change over time and therefore the graywater application rate must also be adjusted.
- *Graywater must be applied at an agronomic rate which does not result in ponding, runoff, or unauthorized discharge to state waters.* The definition of agronomic rate is generally consistent with the definition from Regulation #84 (which addresses centralized reclaimed water operations). While this regulation does not require a water quality test, such testing is encouraged. Graywater use must not result in ponding, runoff, or unauthorized discharge to state waters.
- *For mulch basin systems, mulch must be replenished as required due to decomposition of organic matter. Mulch basins must undergo periodic maintenance, reshaping or removal of material to maintain surge capacity and to prevent ponding and runoff.* Microbial activity within the mulch basins will result in decomposition of organic material. To maintain the required storage volume and soil permeability, the mulch beds must undergo routine maintenance. This requirement was based on the 2013 California Plumbing Code.

C. Additional control measures required for indoor toilet flushing use

- *Graywater for toilet and urinal flushing use must be disinfected.* Graywater research indicates that graywater is to be expected to contain human pathogens. Therefore, the commission is using a multi-barrier approach, including the addition of a potent disinfectant to inhibit the presence of organisms, pathogens and viruses in the graywater distribution system.
- *Graywater treatment works that utilize chlorine for disinfection must have a minimum of 0.2 mg/L and a maximum of 4.0 mg/L of free chlorine residual throughout the indoor plumbing system, including fixtures.* The free chlorine residual requirement is generally consistent with Regulation #11. The commission is not implying that graywater for indoor toilet and urinal flushing must be treated to potable water standards, as defined by Regulation #11, but that a free chlorine residual range of 0.2 to 4.0 mg/L is reliably detectable and not high enough to adversely impact plumbing fixtures.
- *Single family graywater treatment works that utilize non-chemical methods, such as UV, for disinfection must have a chlorine puck present in each toilet tank.* The commission wants to give some flexibility to Category C systems and not require chlorine injection for all systems. Since some disinfectants, such as UV, do not have a residual present in the distribution system, a chlorine puck will inhibit the presence of organisms, pathogens, and viruses within the toilet tank and bowl.
- *Graywater for toilet and urinal flushing must be dyed with either blue or green food grade vegetable dye and be visibly distinct from potable water.* The commission adopted this requirement from the 2012 International Plumbing Code. Dye is a visual indicator that the water within the building is non-potable. Because single family households are not required to have signage for indoor toilet flushing, the dye serves as the notification method that a cross connection has occurred and graywater is entering the potable water lines of the operation.

X. Treatment Works Design Criteria

A. Design criteria treatment basis

For dispersed subsurface irrigation, the commission's intention with the design criteria is to protect the subsurface irrigation system from failure. The commission anticipates that without filtration, graywater irrigation systems would fail in a similar manner to an OWTS soil treatment area. Therefore, the commission is requiring filtration prior to the irrigation distribution system to inhibit failure of the emitter systems by particulate or bio-growth clogging. Irrigation system failure will result in surfacing graywater, unequal distribution, and discharge to groundwater.

For subsurface irrigation mulch basin systems, the commission's intention is to ensure that the mulch basin has an adequate volume for surge events and that the soil is capable of adsorption of any excess graywater that is not utilized by the flora. Mulch basin system failure will result in clogged mulch basins, surfacing graywater, and excessive discharge to groundwater.

For indoor toilet and urinal flushing, the commission is requiring a treatment technology that will be protective of public health and will consistently treat graywater without on-going water quality testing. Graywater research indicates that graywater is to be expected to contain human pathogens. Graywater is an emerging research area and peer reviewed research regarding graywater as a potential disease vector and treatment technology impacts on human pathogens are limited. Until additional graywater research studies indicate a definite public health safety threshold, the commission selected the ANSI/NSF 350-2011 standard for indoor toilet and urinal flushing. ANSI/NSF 350 is a performance based treatment testing protocol which requires a third party review of water quality data. The ANSI/NSF 350 standard is required in the 2015 International Plumbing Code and is required by other western states that allow indoor toilet flushing with graywater. The 2013 California Plumbing Code sets ANSI/NSF 350 as the minimum water quality standards (unless the authority having jurisdiction has other water quality requirements). Oregon allows indoor use with an ANSI certified graywater standard. In addition to ANSI/NSF 350 treatment, the commission is requiring dye to visually differentiate graywater from potable water, as well as requiring a disinfectant to prevent biological growth in the graywater distribution system.

B. Flow projections

The commission is adopting graywater flow rates based on the 2012 Uniform Plumbing Code. The 2012 Uniform Plumbing Code includes daily flow estimates for water saving fixtures while the 2015 International Plumbing Code only has traditional fixture daily flow estimates. The commission received comments from local agencies indicating that the allowed occupancy rates and therefore overall flow rate projections are not very conservative. The commission determined that if graywater is produced at graywater treatment works designed with a storage tank at a rate higher than the estimates, that any excess graywater will overflow to a combined sewer system. Excess graywater production will not impact the graywater treatment works flow (after the storage tank) for graywater use and the overall flow to the closed sewerage system from the facility will not be impacted.

For mulch basin systems without a storage tank, excess graywater production may have a more direct impact. A mulch basin without a storage tank, which is sized for surge events at three times the daily production volume, provides some safety factor for additional daily flow. The local implementing agencies will have the flexibility to adopt more conservative flow rates. For multi-family residential systems, this flow projection design criteria allows flexibility if site specific flow information is available. The residential flow values are intended for circumstances where site specific fixture information is unknown.

C. General graywater treatment works design criteria

The commission is adopting general design criteria for all graywater treatment works including: component sizing requirements, a graywater diversion valve, no bypass lines around the treatment works, and labeling. Treatment works components must be sized to treat the anticipated peak flow rate. For example: an improperly sized filter upstream of a storage tank may result in graywater backing up into the building's plumbing system. The diversion valve is a critical component for the graywater user to allow graywater to be sent to the closed sewerage system during non-irrigation periods, divert graywater when cleaning the tank, divert graywater when hazardous chemical are being used in the building, etc. The diversion valve is intended to direct graywater prior to the graywater treatment works to a closed sewerage system. No bypass lines around the graywater treatment works prior to use is allowed. The graywater lines must also be clearly distinguished to guarantee that the graywater piping is not mistaken for potable water piping. This requirement is intended to be consistent with the anticipated Colorado Plumbing Code requirements but will apply to all graywater piping, including piping outside the structure.

This regulation is consistent with the requirements for onsite wastewater treatment facilities with respect to: the impact of a graywater system on the onsite wastewater treatment facility sizing, floodplain, and floodway requirements. The onsite wastewater treatment system must be sized for the potentially full wastewater treatment flow from the facility in the event that future property owners elect to discontinue use of the graywater treatment works.

The commission determined that a storage tank is required for all graywater treatment works, except for properly sized mulch basin systems. Tanks equalize flow surges and minimize water quality variations through the day. Tanks also allow graywater application to be controlled to ensure agronomic rate control. If excess graywater is produced (over the agronomic rate), the excess graywater will be sent to the closed sewerage system via the overflow line rather than being disposed of in the subsurface irrigation system. Tanks can be used as a collection reservoir for a pressurized graywater distribution system which will allow for equal distribution of graywater throughout graywater piping. For indoor tanks, the Colorado Plumbing code may be more restrictive than the requirements in this regulation, but the design criteria adopted here set minimum standards for water quality needs. The required tank appurtenances are important design features necessary for maintaining the required control measures. Design criteria were included for tank materials, access openings, vents, overflow lines, drains, tank foundation, and signage. A minimum tank volume of 50 gallons was adopted based on the 2012 Uniform Plumbing Code. Outdoor tanks must be protected from direct sunlight to limit biological growth prior to use of stored water.

Some graywater treatment works will produce backwash waste streams. The backwash waste stream must be properly contained or disposed. An example of a graywater treatment works with a produced wastewater stream would be a filter with a backwash process. Any wastewater from the treatment process must be sent to an appropriate disposal location such as a closed sewerage system or an approved Underground Injection Control well.

Graywater treatment works must be located within the confines of the legal property boundary and not within an easement.

D. Additional design criteria for Categories A and B

In order to ensure the integrity of the irrigation system, the commission is requiring a filter. The filter must be located between the treatment system and the irrigation distribution system to inhibit failure of the soil or emitter systems by particulate clogging. A 60 mesh filter was determined to be the appropriate minimum size for protection of the irrigation system. However, the irrigation system manufacturer may recommend smaller filter sizes based on the selected graywater irrigation system components. Local governments can be more stringent and require designers to follow the manufacturer's recommendations. Prefiltration is not required but is recommended to reduce maintenance on the 60 mesh filter. The filter must be located between the tank and the

irrigation area. To prevent pump failure, the filter must be located after the pump and not on the suction side of the pump.

For mulch basin systems, the commission's aim was to not require a filter and to allow for simple graywater systems. It is anticipated that the mulch and underlying soil will act similar to a trickling filter and will provide some treatment of graywater that is not used by the flora.

E. Back up potable water system requirements for Categories A, B, C, and D

The commission is adopting different cross-connection control requirements for a graywater system served by a public water system (as defined in Regulation #11) than for graywater systems served by a non-public water system. The commission believes that installation of control devices is critical at all graywater treatment works with potable water connections. However, the commission does not want to require annual device testing for non-public water system users and customers (e.g., a single family house on an individual private well) that would not be required under the commission's existing regulations. The cross connection control requirements for public water systems are well defined in Regulation #11 and therefore this regulation does not repeat the associated requirements. For urinal and toilet flushing users, potable water supply is required for sanitary purposes since toilets and urinals must have a water supply at all times. For subsurface irrigation users, a potable water supply is optional.

F. Signage requirements for non-single family users

The regulation requires signage for public notification. The signage requirement is for non-single family users since the building occupants and visitors are less likely to be aware that a graywater treatment works is in use than at a single family residence. The required signage is for general notification and is a component of the required control measures. For non-single family users, signs are required at three locations: 1) point of graywater production (e.g., sink), 2) location of the graywater treatment works, and 3) point of graywater use (e.g., irrigation area, toilet). At the point of production, the purpose of the sign is to notify building occupants or visitors that the water is being reused and to ensure that the graywater is not being inadvertently contaminated. At the location of the graywater treatment works, the purpose of the sign is to notify occupants and building maintenance personnel in order to prevent accidental exposure to graywater. At the point of use, the purpose of the sign is to notify the persons using the irrigation area, toilet, or urinal.

G. ANSI/NSF 350 standard certified treatment for Category C and D systems

NSF/ANSI 350-2011 is a performance based water quality standard developed by the NSF Joint Committee on Wastewater Technology in 2011 for residential and commercial graywater treatment for indoor toilet and urinal flushing. The standard sets the minimum design, material, design and construction, and performance requirements for on-site residential and commercial graywater treatment systems. Technologies are tested under normal operating conditions and stress conditions and water quality results are verified by a third party certification agency. The standard does not specify the treatment technologies used to meet the water quality standard which gives flexibility of various treatment technologies to get certified. The commission finds that the ANSI/NSF standard meets an acceptable technology review protocol that would be certified by a third party agency to simplify the technology review process for the local jurisdictions. In addition, ANSI/NSF is a nationally recognized standard that is intended to be protective of public health and would consistently treat graywater without the need for on-going water quality testing. As the ANSI/NSF certification standard is relatively recent only a few manufacturers have gone through the certification process. The commission anticipates that as indoor graywater use becomes more accepted, more manufacturers will certify their products. Additionally, the ANSI/NSF 350 standard has on-site performance testing and evaluation protocol for commercial systems over 1,500 gallons per day. The commission anticipates some graywater

users will use a third party testing agency to certify their graywater treatment works to the NSF/ANSI 350 standard.

H. Disinfection requirements for Category C and D systems

Graywater research indicates that graywater is to be expected to contain human pathogens; therefore, the commission considers the use of a potent disinfectant an essential part of a multi-barrier approach to protect public health. The use of a disinfectant is required if disinfection is not already part of the ANSI/NSF equipment. The disinfectant is to inhibit the growth of microorganisms, pathogens and viruses in the indoor graywater plumbing system. For non-single family systems, the commission is requiring a free chlorine residual of 0.2 mg/L to 4 mg/L to prevent regrowth of microorganism in the graywater distribution system. Non-single family users are expected to have a large potentially impacted population and a more complicated distribution system design than single family systems. To reduce the burden on single family users, systems that use non-chemical methods for disinfection are required to use a chlorine puck in the toilet or urinal.

To maintain a multi-barrier approach, the commission is requiring that the disinfection process be capable of producing free chlorine rather than total chlorine. The disinfection process for non-single family users must be capable of injecting enough chlorine to react with all reducing agents, ammonium, organics, etc present in the graywater (aka past the breakpoint chlorination point) and that free chlorine must be present. EPA documents indicate that chloramines (which are formed prior to breakpoint chlorination) are approximately 100 times less effective than free chlorine at inactivating pathogens such as *Giardia lamblia* or viruses. Therefore, the commission believes that free chlorine is a readily available and safe, potent disinfectant.

I. Professional Engineers for Category D systems

The professional engineer requirement for graywater treatment works with a design capacity greater than 2,000 gallons per day was determined to be necessary to ensure the protection of public health and the environment. The local jurisdiction may elect to make designer requirements more stringent in their graywater control program.

XI. Irrigation System Design Criteria

A. General design criteria basis

The irrigation design requirements in this regulation are modeled after the State of Washington's graywater regulation (Chapter 246-274 WAC). Washington requires that graywater be applied directly to the plant root zone. The requirement that irrigation systems be located four (4) inches below ground rather than two (2) inches results in less potential graywater surfacing or accidental breakage incidents. The commission wants to be in general conformance with the required set back distance requirements.

The requirements adopted for single family dispersed subsurface irrigation systems are intended to prevent undersizing of the subsurface irrigation area while making the application process straightforward. For non-single family dispersed subsurface irrigation systems and mulch basin systems, the commission's intent was to adequately size the irrigation system using the best information available including site specific soil testing.

B. Irrigation system requirements for Single Family irrigation system

The intention with the dispersed subsurface irrigation systems area sizing was to have a reasonable and simple calculation for single family systems. The commission believes this equation is the simplest and most economical method to estimate the landscape area for small

graywater systems. The equation is used by other state agencies (e.g., Idaho, Washington) and designers (e.g., Oasis Design). Furthermore, this method does not require soils testing at each single family residential site. Local jurisdictions that are not comfortable without soils testing results may elect to require the mulch bed or Category B requirements for the single family dispersed subsurface irrigation systems.

C. Irrigation system requirements for Mulch Basin and Non-Single Family dispersed subsurface irrigation systems

The commission modeled the Category B and mulch basin irrigation design requirements on the State of Washington's graywater regulation (Chapter 246-274 WAC). The Washington soil type table was merged with the soil type descriptions in Regulation #43 for ease of local implementation and for consistency between commission regulations. The soil depths are not the same as the Regulation #43 requirements since Regulation #43 is intended for onsite wastewater treatment while this regulation is intended for graywater use by flora. Although intended for use by flora, the mulch basin system design criteria recognize that disposal to groundwater may result. This recognition is the basis for requiring a site and soil evaluation for all mulch basin systems, even single family systems. The site and soil evaluation requirement aims to provide site specific conditions design parameters to allow proper design for category B and mulch basin systems.

Mulch basin design requirements in other western states were researched, and detailed mulch basin design parameters were not found. Therefore the commission's goal for the mulch basin design criteria was to have sufficient volume to adsorb graywater volume surges for graywater treatment works. For graywater treatment works that do not have a storage tank the volume requirements are to capture a surge volume three (3) times the daily flow. For graywater treatment works with a storage tank the volume requirement has a safety factor of 1.5 times the daily flow. The purposes of the other mulch basin design criteria are for proper operation and to minimize potential human exposure.