Chapter 246-274 WAC
Greywater Reuse for Subsurface Irrigation

Preliminary Significant Analysis

September 20, 2010

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Section 1. Introduction.

Greywater is generated when washing machines, showers, bathtubs, bathroom sinks, kitchen sinks, and dishwashers are used. Greywater does not include flows from toilets or urinals, which is referred to as blackwater. Using greywater in place of potable water can help address some of the adverse impacts affecting Washington's water supply.

According to state statute, Washington's water supply is becoming increasingly limited, particularly during summer and fall months and dry years when demand is greatest.[1] Dry years are a natural feature of Washington's normal climate cycle.[2] In addition, the state's recent report on the economic impacts of climate change indicates that water resources will be one of the areas most affected.[3]

Increased water demands and changing climate patterns can result in water shortages. The easiest and most efficient method for reducing potable water use is to conserve water by using less of it. However, many people want to go beyond conservation by using greywater in place of potable water for irrigation and other uses. To accomplish this, people are interested in simple, cost-effective means of reusing greywater at their homes and other buildings as a means of cutting down on their potable water use. Using less potable water can, in turn, result in decreased costs to the building owner in terms of the amount of money spent on water service.

The quality of greywater varies depending on what goes down the drain. Greywater can contain bacteria and viruses and may contain soaps, salts, detergents, and other chemicals. Because of this, greywater can pose certain health risks. Therefore, the emphasis of the rule is on protecting public health and water quality.

To help address the adverse impacts on the water supply and provide people with an appropriate protective framework for reusing greywater, the legislature directed the Department of Health to develop rules for greywater reuse. To develop the new rule, Department of Health ("department") staff reviewed greywater literature and technical reports and other states' greywater reuse requirements. Some states, including Arizona, New Mexico, and Wyoming have developed simple regulations that allow low-risk greywater reuse with minimal regulatory oversight. Other states, such as Hawaii and Utah, apply on-site sewage system requirements to greywater reuse. At least one state, California, has recently moved from the use of more restrictive regulations to less restrictive regulations in low-risk situations.[4] Review of the greywater literature indicates that greywater can be effectively and safely managed using a graduated regulatory approach that corresponds to the level of risk involved.

The department formed a volunteer advisory committee to provide technical input about how to regulate greywater. The 14-member committee consisted of representatives from diverse stakeholder groups. The committee met throughout the fall and winter of 2009 and the winter

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[1] RCW 90.54.010(1).
[2] Department of Ecology's 2005 Drought Report to the Legislature.
[3] RCW 90.46.005, *Findings*.
[4] In California, there are estimated to be over one million illegal greywater systems that were installed to address drought concerns when the more restrictive code was in place.

and spring of 2010. Department staff drafted the rule as it was developed and committee members provided input, comment, and recommendations during the various stages of rule development. Some committee members also provided assistance in defining costs for purposes of this analysis.

Currently, greywater irrigation systems in Washington must be designed and built in accordance with WAC 246-272A, *On-Site Sewage Systems*, and the *Water Conserving On-site Wastewater Treatment Systems*, Recommended Standards and Guidance, 2007 ("RS&G"). Greywater treatment and dispersal/reuse systems must provide treatment and dispersal at least equal to that provided by conventional on-site sewage systems with design flows of less than three thousand five hundred gallons per day. All permitting, installation, location, soil-application rates, operation and maintenance, inspection, and other requirements of WAC 246-272A apply. Some of these requirements, such as tank sizing and the prohibition against the use of augmented soil, are not necessary for protecting public health and water quality and present unnecessary barriers when different protective measures can be applied to greywater alone.

The new rule establishes the necessary requirements for protecting public health and water quality when flows from toilets or urinals are not present and the only portion of the wastewater stream involved is greywater. By doing so, it removes unnecessary barriers that the current requirements present and offers a simpler, cost-effective means of reusing greywater while still protecting public health and water quality.

The use of greywater irrigation systems is entirely optional.

Section 2. What is the scope of the rule?

The proposed rule establishes a new regulatory framework for reusing greywater for subsurface irrigation of plants during the annual growing season. It allows homeowners and other building owners to reuse their greywater in place of potable water for irrigating gardens and landscapes. Using greywater for subsurface irrigation is a preferred method for reducing the use of potable water because it is cost effective and has a relatively low risk of exposure.

The department completed a comprehensive review of the literature to address key issues on the subject of greywater reuse.[5] The following conclusions can be drawn from the information available in the literature:

1. Greywater reuse is a viable option for maximizing the use of potable water.
2. Greywater comes from a variety of sources including bathrooms, kitchens, and washing machines. The characteristics of greywater vary greatly depending on the source. A subset of greywater (bathroom washbasins, showers and baths, and the laundry wastewater) contains fewer pollutants than greywater that includes wastewater from the kitchen and laundry machines used for washing dirty diapers. This is especially true when

[5] Schneider, *Greywater Reuse in Washington State*, 2009.

people do not use cleaners that contain harsh chemicals, bleaches, disinfectants, or phosphates.

3. Greywater is a source of bacteria, virus, and protozoa which can cause illness. Direct exposure routes should not be allowed. Subsurface irrigation is acceptable; however, ponding and other direct contact paths need to be avoided.
4. Greywater should be managed properly to avoid exposing people to pathogens, harming plants, clogging the irrigation system, and creating unpleasant odors.
5. Potential risks can be reduced by regulating the following:

    - Limiting the use of direct routing for greywater to the lowest risk sources
    - Limiting the volume of greywater allowed for direct routing to the irrigation system
    - Ensuring that untreated greywater does not flow to surface or ground water
    - Ensuring that greywater stays below the surface by specifying the correct cover material
    - Limiting storage of untreated greywater to less than 24 hours
    - Requiring filters be used to remove lint, hair, and other solids
    - Prohibiting the greywater from containing hazardous chemicals and recommending greywater tolerant plants and plant friendly cleaning products be used
    - Requiring a diverter to allow residents to divert the greywater to the building's wastewater system if people in the house are sick or during times irrigation is not needed

Using a graduated framework to apply risk based regulations can effectively protect public health and water quality. The proposed rule applies to greywater irrigation systems that reuse less than 3,500 gallons per day and establishes three progressive tiers of systems, each addressing higher risks. In addition, all buildings using a greywater irrigation system must be connected to an approved public sewer or other approved on-site sewage system and must have a diversion valve for redirecting the greywater to the sewer system in case of failure or other reason to stop reusing greywater.

The Department of Health is proposing this rule to meet the requirements of RCW 90.46.015 which mandates that the department adopt rules for greywater reuse.

Portions of the Rule Requiring Significant Analysis

A significant legislative rule is defined under 34.05.328(5)(c)(iii) as a rule, other than a procedural or interpretive rule, that:

- Adopts substantive provisions of law pursuant to delegated legislative authority, the violation of which subjects a violator of such rule to a penalty or sanction;
- Establishes, alters, or revokes any qualification or standard for the issuance, suspension, or revocation of a license or permit; or
- Adopts a new, or makes significant amendments to, a policy or regulatory program.

RCW 34.05.328(1) requires that the agency perform a cost / benefit analysis, and make several other determinations, for significant legislative rules. The department evaluated the proposed

rules to determine which sections are significant and require analysis. The significant rule sections are identified in the table below and are analyzed in the section-by-section analysis that follows (Section 5). The other sections are non-significant, as indicated below.

Table 1: Rule Identification

Section	Section Title	Significant Rule?
	Purpose and Administration	
001	Purpose – Intent	No. Interpretive
003	Applicability	No. Procedural
005	Other Applicable Requirements	No. Restates other existing requirements
007	Administration	Partially. Otherwise restates existing requirements
	General requirements, Tier-specific provisions	
009	Definitions	Partially.
011	General Requirements	Yes.
100	Tier 1 Greywater Irrigation Systems	Yes.
200	Tier 2 Greywater Irrigation Systems	Yes.
300	Tier 3 Greywater Irrigation Systems	Yes.
400	Greywater Reuse Technologies	Yes.
405	Location – Horizontal Setbacks	Yes.
	Design, Installation, and Operation and Maintenance – Tiers 2 and 3	
410	Design – general	Yes.
415	Design - irrigation field components	Yes.
420	Soil and site evaluation	Yes.
425	Installation permit	Yes.
430	Installers	Yes.
435	Installation inspection	Yes.
440	Operation and Maintenance	Yes.
	Failures – All Tiers	
445	Failures	Yes.
	Enforcement, Waivers and Effective Date	
450	Enforcement	No. Procedural
455	Hearings	No. Procedural
460	Waivers	No. Procedural
465	Effective Date	No. Procedural

Section 3. What are the general goals and specific objectives of the proposed rule's authorizing statute?

RCW 34.05.328(1)(a) requires that the department "clearly state in detail the general goals and specific objectives of the statute that the rule implements."

RCW 90.46.015 authorizes this rulemaking. It states that the department of health shall adopt rules for greywater reuse by December 31, 2010. RCW 90.46.220(8) further provides that permit requirements for the distribution and use of greywater will be established in rules adopted by the department of health under RCW 90.46.015. The general goal of RCW 90.46 is to promote water conservation through both the reuse of greywater and the use of reclaimed water in place of potable water.

The specific objectives of the statute, in relation to greywater, can be better understood by considering RCW 90.46.140 and RCW 43.20.230, which also address department authority regarding greywater. RCW 90.46.140 provides:

(1) The department of health shall develop standards, procedures, and guidelines for the reuse of greywater, consistent with RCW 43.20.230(2), by January 1, 1998.
(2) Standards, procedures, and guidelines developed by the department of health for reuse of greywater shall encourage the application of this technology for conserving water resources, or reducing the wastewater load, on domestic wastewater facilities, individual on-site sewage treatment and disposal systems, or community on-site sewage treatment and disposal systems.
(3) The department of health and local health officers may permit the reuse of greywater according to rules adopted by the department of health.

RCW 43.20.230(2) authorizes the department, consistent with the water resource planning process of the Department of Ecology, to:

> Develop criteria, with input from technical experts, with the objective of encouraging the cost-effective reuse of greywater and other water recycling practices, consistent with protection of public health and water quality[.]

The department's standards and guidelines for the reuse of greywater have been in place for some time, and reflect existing on-site sewage system regulation under WAC 246-272A. The proposed rule establishes a new, separate regulatory program for greywater reuse for subsurface irrigation during the growing season that both protects public health and water quality, based on the risks associated with greywater alone, and encourages cost-effective reuse of greywater.

Section 4. What is the justification for the proposed rule package?

RCW 34.05.328(1)(b) requires that the department determine that the rule is needed to achieve the general goals and specific objectives of the statute and analyze alternatives to rulemaking and the consequences of not adopting the rule.

The proposed rule will achieve the relevant statutes' goals and objectives by protecting public health and water quality and establishing cost-effective, efficient means of reusing greywater for subsurface irrigation in place of potable water. There is no alternative to rulemaking because development and adoption of this rule is mandated by statute.

Section 5. What are the costs and benefits of each rule included in the rules package?

RCW 34.05.328(1)(d) requires that the department determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.

There are a total of 23 rules proposed. Of those, 16 are significant or partially significant.

Section-by-Section Analysis – Costs and Benefits.

<u>007 – Administration</u>. Subsection (1) of this section allows local health jurisdictions to take up to three years after the effective date of the rule to implement it, and specifies that WAC 246-272A will apply to greywater reuse during any period of time that a local health jurisdiction is not implementing the new rule. Subsection (2) provides that if local health is unable to adjust its resources to implement the new rule in accordance with subsection (1), the provisions of WAC 246-272A will continue to apply to greywater reuse for subsurface irrigation in that jurisdiction.

Costs: Building owners who want to install a greywater irrigation system under the new rule may incur costs by having to wait for their local health jurisdiction to implement the new rules, or by being unable to install a greywater irrigation system if the local health jurisdiction is unable to implement the proposed rule. If the project is delayed until the local health jurisdiction implements the new rule, the costs could include those associated with continuing to use potable water for irrigation. If the project proceeds under current requirements for greywater reuse systems, the costs could exceed the costs under the new proposed rule, depending on the complexity of the system.

Benefits: There is no specific funding available to local health jurisdictions associated with this new rule. Allowing local health jurisdictions adequate time to adjust their resources, and recognizing that some jurisdictions may not be able to accomplish this within the three year period, helps to ensure that local health will be able to provide adequate service to building owners who want to install greywater irrigation systems, and to properly enforce the rules as necessary.

<u>009 – Definitions</u>. This section defines words used in the rule. Some of the definitions are for ease of reference, defining words that are already defined by statute, for example, while others establish new regulatory definitions. The new substantive definitions are included below within the appropriate subsection.

<u>011 – Greywater Irrigation Systems – General Requirements</u>. This section establishes the general requirements that apply to all greywater irrigation systems: Tiers 1, 2 and 3. A greywater irrigation system is defined as "an integrated system of components located on the property it

serves, or on nearby property where it is legally allowed to be used, that conveys greywater from the residence or other building where it originates and provides subsurface irrigation of plants during the growing season."

Greywater means "domestic type flows from bathtubs, showers, bathroom sinks, washing machines, dishwashers, and kitchen or utility sinks. Greywater does not include flow from a toilet or urinal. Greywater conveyed through Tier 1 and Tier 2 systems is limited to flows from bathtubs, showers, bathroom sinks, washing machines, and laundry utility sinks." This section:

- Requires that the greywater consist only of domestic type flows
- Limits the use of greywater to subsurface irrigation during the growing season. Growing season is defined as "the period of time between the last frost of spring and the first frost of autumn, when annual plants die and biennials and perennials cease active growth and become dormant. The growing season may be extended with the use of a greenhouse so long as the plants irrigated within the greenhouse continue active growth."
- Prohibits use of greywater containing hazardous products or infectious materials
- Prohibits the surfacing of greywater
- Prohibits installation in environmentally sensitive areas, as determined by the local health officer
- Requires that the system is located in suitable soil on land that is stable. Suitable soil is defined as "unsaturated soil above the seasonally high water table and the restrictive layer in which the movement of water, air, and growth of roots is sustained to support healthy plant life and conserve moisture."
- Requires that the irrigation rates are no greater than the evapotranspiration rate of the irrigation field. Evapotranspiration rate is defined as "the sum total of plant transpiration, evaporation off of the soil surface, and water used for plant growth."
- Requires a readily accessible and visibly labeled diversion valve
- Requires that pipes and above-ground tanks be labeled to indicate that the greywater is "nonpotable water"
- Requires that mulch, if used, be permeable enough to allow rapid infiltration of greywater

Costs: The costs of these general requirements are those related to:

- Installing a diversion valve. The cost of a 3-way greywater diverter valve will vary with size and manufacturer. It is estimated to cost about $20 to $50 for a retrofit and may be less when included as part of new construction. In addition, assuming that installation of the diverter valve alters the home's plumbing, a plumbing permit will be necessary. The cost range for a plumbing permit, depending on location and whether the permit is part of a building permit or stand alone, is estimated to range from less than $50 to about $110, with some jurisdictions charging an additional cost per fixture of about $5 to $20. In several jurisdictions that charge plumbing permit fees specifically for irrigation systems, costs range from $50 to $80.

  Under RCW 18.106.150, a building owner is not required to hire a plumber to perform plumbing work on the owner's property. If the owner chooses to hire a plumber, the cost of this type of plumbing service is estimated to range from about $75 to about $400 depending on the complexity of the job.

- Costs could arise related to the sensitivity of the area. Possible costs include adding a treatment component, such that the system becomes a Tier 3 system, or not being able to build a greywater irrigation system at the proposed location.

Benefits: The overall benefit of these requirements is protection of public health and water quality.

- Limiting the use of greywater to subsurface irrigation keeps the greywater underground where it is unlikely to come into contact with humans.
- Requiring that it be used only during the growing season ensures that plants will be taking up the greywater and avoids the improper disposal of greywater in an irrigation field that is not being used to grow plants. This limitation also decreases the likelihood that the greywater will be reused during periods of prolonged rainfall and soil saturation when the greywater might surface.
- Limiting the irrigation rate to the evapotranspiration rate of the irrigation field keeps the flow of greywater consistent with the plants' needs and ability to uptake the greywater.
- The use of suitable soil ensures that the greywater is used in soil that is capable of growing plants and hydraulically accepting the greywater.
- The diversion valve ensures that the greywater can be diverted away from the greywater irrigation system and into the approved sewage disposal system when necessary; for example, when the growing season is over, the soils are saturated or frozen, the maximum gallons per day is reached, the greywater system is not working, or the owner chooses not to use it.
- Prohibiting the use of greywater systems in environmentally sensitive areas, as determined by the local health officer, recognizes that there may be local areas in which the use of greywater irrigation would be undesirable because of the likelihood of adverse impact on water quality.
- Requiring that mulch be adequately permeable helps to ensure that the greywater does not surface

<u>100 – Tier 1 Greywater Irrigation System</u>. This section establishes the specific requirements for the design, installation, and use of simple greywater irrigation systems at single-family residences. A Tier 1 system is defined as a "light greywater irrigation system with maximum design flows of 60 gallons per day serving a single-family residence." Single-family residence is defined as "one single-family house that is not used for commercial or other non-residential purposes."

Light greywater means "flows from bathtubs, showers, bathroom sinks, washing machines, and laundry-utility sinks." It does not include flows from the kitchen sink or dishwasher. A Tier 1 system may serve a single-family residence connected to an approved public sewer system or on-site sewage system. A maximum of two Tier 1 systems may be used at one residence. This section:

- Requires that the greywater is diverted to subsurface irrigation through a single diversion point

- Prohibits the use of pumps to convey the greywater and limits the means of delivery to gravity distribution
- Prohibits storage of the greywater
- Requires calculation of the total minimum irrigation area needed to receive the greywater
- Requires distribution of the greywater throughout the irrigation field
- Requires that the system be covered with at least four inches of appropriate material
- Requires that the system be properly operated and maintained
- Requires that the owner maintain a record of the system
- Allows local health jurisdictions to require registration of the system
- Allows local health jurisdictions to require additional review when two Tier 1 systems are installed or the property is served by an on-site sewage system with design flows of less than three thousand five hundred gallons per day.

Costs:

- The cost for a homeowner to install a Tier 1 system is about $100 to $300 dollars, in addition to the costs for a diverter valve.

  Examples of simple greywater systems include a "laundry-to-landscape" system and a simple branched drain system. The laundry-to-landscape system takes water directly from the washing machine to the irrigation area. It generally involves a 3-way diverter valve at the washing machine, a one inch pipe to carry the water out of the house, and a one inch irrigation tube for placement in the soil. Two irrigation zones can be created by using another 3-way diverter valve or 2-way ball valves. Installation of this system by the homeowner is estimated to be about $100 to $200.

  The branched drain system uses branched-drain pipes as well as 3-way diverter valves and pipes and tubing. The branched pipes allow further splitting of the greywater to different irrigation fields. Installation of this type of system by the homeowner is estimated to cost about $150 - $300.

In comparison, under requirements currently applicable to greywater irrigation systems, WAC 246-272A and the *Water Conserving On-site Wastewater Treatment Systems*, Recommended Standards and Guidance, 2007, a simple gravity system with design flows of less than three thousand five hundred gallons per day, installed by the homeowner for all of the home's greywater is estimated to cost about $3,500.

- In those local health jurisdictions where registration is required, there will be an additional registration cost for Tier 1 systems. It is difficult for local health jurisdictions to determine how much registration of a Tier 1 system will cost, since it is a brand new requirement. For purposes of comparison, the costs of permitting on-site sewage systems under WAC 246-272A can range from about $180 to $1700, depending on the location and complexity of the system. However, registration does not involve a complex permitting review process, and can be expected to be minimal in comparison to permitting costs.

Benefits: The Tier 1 requirements add specific requirements to the general requirements set forth in WAC 246-274-011. The Tier 1 provisions provide homeowners with a simple, cost-effective means of reusing greywater which also serve to protect public health and water quality.

- Using only gravity to disperse the greywater avoids the intricacies and costs of pumps which can become easily clogged and wear out.
- Not storing the greywater maintains the simplicity of the system and avoids the risks associated with multiplication of bacteria and increased strength of the greywater.
- Distributing the greywater throughout the irrigation field avoids the possibility of pooling.
- Covering the system with appropriate material such as mulch, humus, or compost ensures that the components of the system are not exposed.
- Maintaining a record of the system is important to its proper operation and maintenance especially when the building is sold to a new owner.
- Allowing registration of the system means that local health can determine whether or not it is necessary in their jurisdiction to require homeowners to notify them if they are installing a greywater irrigation system.
- Allowing local health to determine if additional review is necessary in the case of installation of two systems helps to ensure that the slightly higher risk associated with the use of two systems can be addressed as appropriate by the local health officer. Allowing additional review, as necessary, when the home is served by an on-site system with design flows of less than three thousand five hundred gallons per day means that any issues related to the on-site system, such as encroachment into the required reserve area by the greywater irrigation field, can be evaluated and addressed.

<u>200 – Tier 2 Greywater Irrigation Systems</u>. This section establishes specific requirements for the use of Tier 2 greywater irrigation systems. A Tier 2 system is a "light greywater irrigation system serving a residential or non-residential building" that may reuse up to 3,500 gallons per day of greywater. A Tier 2 system may only serve a building connected to an approved public sewer system or large on-site sewage system, or a single-family residence connected to an approved on-site sewage system with design flows of less than three thousand five hundred gallons per day and reusing no more than 300 gallons per day unless otherwise authorized by the local health officer.

This section allows greater reuse of greywater than does Tier 1. Because of this, the implementation and oversight requirements are also increased in order to address the increased risks. This section:

- Requires even application of the greywater to the plants throughout the irrigation field. This is typically achieved with pressure distribution.
- Requires warning signs at each fixture from which greywater is diverted in a non-residential building
- Requires the owner to maintain a record of the system
- Requires the owner to obtain an installation permit from the local health officer
- Allows the greywater to be stored for up to 24 hours

Unlike a Tier 1 system, a Tier 2 system requires even application of greywater, typically through pressure distribution, may include a storage tank, and requires an installation permit.

Costs:

- The cost of installing a Tier 2 system will depend on the amount of greywater being reused and the size of the area being irrigated, which will determine the size and type of the components needed. It will also depend on whether the services of an installer are required.

  In general, the components of a Tier 2 system can be packaged such that the tank, pump, and filter come together in one package. These packaged systems are estimated to cost from about $600 to $1,000. The additional cost of the drip irrigation piping may be about the same as the costs of $100 to $300 for the Tier 1 components, or more, depending on size of the irrigation field. Packaged systems that include drip irrigation kits are estimated to cost from about $1,300 to about $2,500 and above. These costs plus the costs associated with a diversion valve and an installation permit are the costs of a Tier 2 system for a homeowner who designs and installs his or her own system.

  The cost of hiring an installer to install a greywater irrigation system under the proposed rule is not yet known. For purposes of comparison, the cost of hiring an installer to install a greywater system that uses pressure distribution under current requirements can cost between about $5,000 and $10,000 depending on design capacity. For homeowners and building owners who choose to or who must hire an installer for a Tier 2 system, the cost of installation (including the system components) could approach the cost of installing a greywater system under current requirements depending on the size and complexity of the system. However, because requirements under the proposed rule are simpler than on-site sewage system requirements, the cost of installation is likely to be less[6]. The installation costs plus the costs associated with a diversion valve and the installation permit are the costs for a Tier 2 system when the building owner hires an installer. Designer costs are addressed under section 410.

Benefits: The Tier 2 requirements add additional protective requirements to the general safeguards of WAC 246-274-011.

- Even application of greywater to the plants in the irrigation field helps to ensure that the greywater is taken up by the plants rather than surfacing or being disposed of in the soil.
- Keeping storage of greywater to a maximum of 24 hours allows the use of a pump without creating risks of over-multiplication of bacteria and odor problems.
- Signs in non-residential buildings help to ensure that the public does not inadvertently put a prohibited material down the drain.
- Review and approval by the local health officer helps to ensure that the greater greywater reuse is properly done.

[6] Cost comparisons throughout this section regarding "on-site sewage systems" refer to systems with design flows of less than three thousand five hundred gallons per day, regulated under WAC 246-272A.

- Limiting use of Tier 2 systems to buildings served by approved public sewers or large on-site sewage systems, except in the case of an on-site system with design flows of less than three thousand five hundred gallons per day serving a single-family residence, or as authorized by the local health officer, helps to ensure that any risks related to the on-site system, such as encroachment into the required reserve area by the greywater irrigation field, are properly addressed.

300 – Tier 3 Greywater Irrigation Systems. This section establishes specific requirements for Tier 3 greywater irrigation systems, which are defined as a "light or dark greywater irrigation system serving a residential or non-residential building and using a treatment component." Dark greywater means "flows from dishwashers and kitchen and non-laundry utility sinks alone or in combination with light greywater." A Tier 3 system may only serve a building connected to an approved public sewer system or a large on-site sewage system, or a single-family residence connected to an approved on-site sewage system with design flows of less than three thousand five hundred gallons per day and reusing no more than 300 gallons per day unless otherwise authorized by the local health officer.

This section includes the same requirements that are applicable to Tier 2 systems. In addition, it establishes the instances in which a treatment component is required and allows storage for more than 24 hours. Treatment component is defined as "a technology that treats greywater in accordance with WAC 246-274-400 in preparation for subsurface irrigation of plants."

Costs:

- With the addition of a treatment component, the costs associated with installation of a Tier 3 system may approach the costs of a greywater reuse system under current requirements. The cost of installation of a greywater reuse system, under the on-site sewage system requirements, that includes a treatment component can range from about $16,000 to $20,000 depending on location and complexity. The cost of installation of a Tier 3 system may approach the low end of this cost range.

Benefits: Tier 3 adds additional protective requirements to the general safeguards of WAC 246-274-011, for the still more complex reuse of greywater.

- Increasing the situations in which greywater can be reused including the use of dark greywater, storage of greywater for more than 24 hours, irrigation of a green roof, and use in a high public exposure area like a playground or sports field allows and encourages further water conservation.
- These situations can increase the risk associated with greywater and the addition of a treatment component helps to address the increased risks. For example, dark greywater tends to contain more contaminants than light greywater; storage for more than 24 hours can increase contamination of the greywater; and the use of greywater in an area like a sports field raises the possibility of a large number of people being exposed to the greywater if it were to surface. In these instances, soil treatment alone, for those small portions of greywater not taken up by the plants, is insufficient to protect public health and water quality.

400 – Greywater reuse treatment technologies – Tier 3. This section applies to treatment technologies for Tier 3 systems. It:

- Identifies the National Sanitation Foundation (NSF) standards that proprietary treatment products must meet in order to treat light and dark greywater. A proprietary treatment product is defined as "a greywater treatment technology, method, or material, subject to a patent or trademark, that functions to treat greywater generated by residential or non-residential buildings."
- Requires that proprietary treatment products be certified by NSF as meeting the applicable standard.
- Allows the use of public domain technologies for which the department has developed recommended standards and guidance for the technologies.

The level of treatment provided by products that meet the applicable standard provides adequate protection of public health and water quality in the increased risk situations described above in section 300. NSF Standard 350-1 is identified as the standard that proprietary products must meet for light greywater, while NSF Standard 40 is identified as the standard that must be met for dark greywater. NSF Standard 350-1 is a new standard and is currently the only protocol available for light greywater. NSF Standard 40 is an older standard that is required in certain instances under current on-site sewage system requirements.

The ultimate treatment levels are similar for both standards; however, different standards and testing protocols are required for light and dark greywater because of the difference in their influent characteristics. The testing protocol for meeting NSF Standard 40 is not representative of light greywater because the influent characteristics do not represent light greywater. They do, however, represent dark greywater which is much closer to combined wastewater in this regard.

The NSF standards are national standards. A manufacturer who satisfies the testing and certification requirements of this rule may be able to market its product in other states as well. And, a manufacturer that is certified by NSF as meeting NSF Standard 40, for purposes of marketing in other states, would meet the requirements of this section for dark greywater. The department is not aware of any manufacturers in Washington state that market products as meeting NSF Standard 40 who are not certified by NSF as meeting the standard nor is the department aware of any proprietary product manufacturers located in Washington State that market treatment products for light greywater.

Costs: The primary entity available to test proprietary products is the NSF, located in Ann Arbor, Michigan. Other American National Standards Institute (ANSI)-certified facilities may do the testing if they use the same protocol. Costs are estimated to be similar.

- For proprietary products intended to treat dark greywater, the cost of NSF testing to meet Standard 40 ranges from $75,000 to $100,000. The cost for NSF certification that the product meets the standard is $5,000 to $15,000 annually.[7]

[7] Costs provided by NSF.

- [i]The cost of NSF testing and certification to meet Standard 350 is currently unknown because the standard is brand new, but is expected to be similar to the costs associated with Standard 40.

Benefits: Public health and water quality is protected by ensuring that a product can meet specified performance standards. Establishing consistent protocols ensures that all product manufacturers must meet the same requirements. Identifying the standards that must be met supports the use of Tier 3 systems in expanded contexts and encourages further water conservation.

405 – Location. This section defines the minimum horizontal setback requirements for all tiers of systems. Tier 1, Tier 2, and Tier 3 systems must be located a minimum distance away from items that could be adversely affected by the greywater system, or that could adversely affect the greywater system itself.

Costs:

- Building owners must have sufficient room to propose and install the system.

Benefits: Locating a greywater irrigation system away from the setback items helps to protect public health and water quality by separating the greywater system from, for example, drinking water lines and swimming pools. It can also help to protect the greywater system from unexpected drainage from a water supply line, for example.

410 – Design requirements – general – Tiers 2 and 3. This section establishes the general design requirements that Tier 2 and Tier 3 systems must meet in order to obtain an installation permit from the local health officer. This section:

- Requires that Tier 2 and Tier 3 systems be designed by a qualified professional, but provides that the local health officer may allow the resident owner of a single-family residence, not adjacent to a marine shoreline, to design a system of 300 gallons per day or less
- Requires that storage and pump tanks be of durable construction, water-tight, and tamper proof
- Defines how the operating capacity of the system is calculated
- Requires that, when the building is served by an on-site sewage system with design flows of less than three thousand five hundred gallons per day, the total flow of greywater diverted does not adversely affect the functioning of the on-site system
- Requires consideration of the sensitivity of the site where the system will be installed
- Requires documentation that greywater from a non-residential source does not consist of anything but domestic type flows
- Requires the person designing the system, if other than the homeowner, to provide the owner with the record of the system required under the Tier 2 and Tier 3 sections.

Costs:

- This section requires that most Tier 2 and Tier 3 systems be designed by a qualified professional, defined as “an on-site sewage treatment system designer licensed under

chapter 18.210 RCW or a professional engineer licensed under chapter 18.43 RCW who is knowledgeable in irrigation system design."

Designing a greywater irrigation system under the new draft rules is something that has not been done before, but is estimated to be somewhat similar to the cost for designing the less complicated on-site systems. The cost of hiring an on-site sewage system designer to design an on-site sewage system varies depending on the complexity of the system and is estimated to range from $900 to $3,500.

- Storage and pump tanks must be appropriate for greywater reuse and be of solid, durable construction not prone to excessive deterioration. Rain barrels, for example, might be appropriate storage tanks and range in cost from about $30 to $500 depending on size and style.
- Cost could arise associated with consideration of sensitivity of the site. For a proposed Tier 2 system, these costs could include adding a treatment component such that the system becomes a Tier 3 system.

Benefits:

- Qualified professionals are familiar with the public health and water quality issues related to the design of wastewater disposal systems. Greywater is a part of the wastewater stream and can involve similar issues. Qualified professionals can apply relevant knowledge and expertise to the design of greywater irrigation systems that can help to ensure protection of public health and water quality.
- Requiring that storage and pump tanks are appropriate for greywater reuse avoids the use of inappropriate items like garbage cans and other recycled objects that are prone to deterioration.
- Properly calculating operating capacity helps to ensure that the system is designed for the right amount of greywater: enough to irrigate the garden in question, but not so much that the greywater simply overflows to the approved sewage system.
- Requiring that the total flow of greywater diverted does not adversely impact on-site sewage systems with design flows of less than three thousand five hundred gallon per day helps to ensure that the functioning of the on-site system is considered and any necessary adjustments to the on-site system and its operation are made
- Taking the sensitivity of the site into consideration means that the system can be designed to address sensitive areas such as shellfish growing areas and designated wellhead protection areas where greywater constituents could result in public health or water quality concerns.
- Providing the building owner with a record of the system helps to ensure that important information about the system stays with the building.

<u>415 – Design requirements – irrigation field components – Tiers 2 and 3 greywater irrigation systems</u>. This section establishes the design requirements for the field components of Tier 2 and Tier 3 systems that must be met in order to obtain an installation permit. This section:

- Specifies how the total irrigation area needed should be calculated
- Prohibits irrigation rates from exceeding maximum allowable soil loading rates

- Requires that the subsurface components of the system be installed between four and 12 inches below the finished grade
- Requires that the four inch cover layer consist of two inches of suitable soil and two inches of mulch. Mulch is defined as "a protective covering spread or left on the ground to reduce evaporation, maintain even soil temperature, prevent erosion, control weeds, or enrich the soil."
- Requires a minimum of 24 inches of suitable soil between the system components and any restrictive layer or the highest water table during the growing season
- Describes the sort of characteristics the soil must have if it is augmented
- Defines which soil types must be augmented before use and which is not suitable for use under any circumstance.

Costs:

- For those systems designed by a qualified professional, the cost associated with these design requirements are likely to be rolled into the cost of hiring qualified professional under section 410.
- If the proposed irrigation area is located where the soils are not suitable without augmentation, the cost of a gardening soil mix will be involved. Gardening soil mixes are estimated to cost around $12 per yard. The total cost will depend on the size of the area being irrigated.
- The cost of the mulch portion of the cover will also depend on the size of the area being irrigated. Mulch is estimated to cost around $25 per yard.

Benefits:

- Properly calculating the total irrigation area helps to ensure that the amount of land dedicated to the irrigation field is consistent with the operating capacity of the system. This helps to avoid over-watering or under-watering the plants.
- Keeping irrigation rates consistent with maximum allowable soil loading rates helps to ensure that the soil is not overloaded and the greywater does not surface. Soil loading rates may be based on augmented soil. Soil loading rates are less important for irrigation systems, where the greywater is taken up by the plants, than for on-site systems, but accounting for the soil loading rate provides a safeguard for those intermittent situations in which the plants are not taking up the greywater to their maximum capacity.
- Installing the system a certain depth below the finished grade helps to ensure that it remains below the surface of the ground.
- Requiring a 24 inch distance between the system and the restrictive layer or highest water table during the growing season is intended to keep the greywater separated from the ground water.
- The use of a six inch cover helps to ensure that the system is not exposed. Use of two inches of mulch is meant to help control evaporation of the greywater.
- Balancing the content of augmented soil helps to ensure that augmented soil is suitable for growing plants.
- Requiring augmentation of soil types 1 and 2 helps to ensure that plants are grown in suitable soil, as does prohibiting the use of soil type 7 which is not conducive to plant growth nor can it reasonably be augmented.

420 – Soil and Site Evaluation – Tier 2 and Tier 3 greywater irrigation systems. This section establishes who may perform soil and site evaluation and requires that the person doing the evaluation properly define the site's soil types so that the soil is capable of supporting healthy plant life and providing treatment capabilities. This section:

- Requires that the evaluation be performed by a qualified professional or the local health officer. Soil scientists may perform soil evaluations.
- Allows the local health officer to authorize the owner of a single-family residence, not adjacent to a marine shoreline, to perform the evaluation when the proposed system is for 300 gallons per day or less.
- Requires that the person performing the evaluation identify the soil types, determine soil characteristics, and provide a report to the local health officer regarding the characteristics of the site and the soil.

Costs:

- The cost of hiring a qualified professional to design a system, described above under section 410, generally includes the cost of soil and site evaluation.

Benefits:

- Defining who can perform the evaluations helps to ensure that the site's soils are correctly evaluated. An accurate evaluation is critical to appropriate plant selection, healthy plant growth, and the proper functioning of the greywater irrigation system.
- Reporting the site and soil characteristics to the local health officer helps the local health officer to make an informed decision on the installation permit application.

425 – Installation Permit Requirements – Tier 2 and Tier 3 greywater irrigation systems**.** This section establishes installation permit application requirements and local health officer review provisions. It:

- Requires that the applicant provide general information about the applicant and the site, submit the soil and site evaluation and dimensioned site plan of the irrigation field as well as a description of the system and its design.
- Allows the local health officer to request additional information as necessary.
- Describes when the local health officer may issue, deny, modify, suspend, or revoke a permit.
- Allows the local health officer to stipulate additional requirements for a particular permit if necessary to protect public health or water quality.
- Allows the local health officer to reduce permitting requirements, or require registration instead, when a qualified professional designs a Tier 2 system for 300 gallons per day or less, for a single-family residence.

Costs:

- Since this is a brand new regulatory program, the local health jurisdictions have not previously issued installation permits for greywater irrigation systems and do not have costs available. According to a sampling of local health jurisdictions, the costs for issuing on-site sewage system permits can range from about $180 to $1,720 depending on

location and complexity. It is difficult for local health to know exactly how much they will need to charge for the new greywater irrigation system installation permits until they develop their programs.

Given that there are likely to be some similarities between review of the new greywater applications and review of on-site sewage system applications, the range of costs for a new Tier 3 permit may be somewhat similar to that for on-site systems using a treatment component, and the range of costs for a new Tier 2 permit may be somewhat similar to that for the less complicated on-site systems. Because the requirements for greywater irrigation systems are less complex than those for on-site sewage systems, it is also possible that the costs for greywater irrigation system review will be less than it is for on-site sewage systems. There is no indication that the costs would exceed on-site sewage system permit review costs.

Benefits: The permitting requirement is applicable to Tier 2 and Tier 3 systems. These are the more complicated systems that allow more reuse of greywater in terms of volume, types of buildings, types of areas irrigated, and type of greywater reused. Adequate protection of public health and water quality requires regulatory oversight that involves meaningful review of the proposed system and allows appropriate action on the application based on that review.

- An application that contains the necessary information supports a meaningful review.
- Stipulating additional requirements on the permit based on the particular facts of the situation ensures that unique and unanticipated factors will not inadvertently decrease the intended protection of public health and water quality.
- Allowing the reduction of permitting requirements for small, single-family residence systems designed by a qualified professional, as appropriate, lets the local health officer focus his or her efforts where protection of public health and water quality most calls for it, while also offering homeowners an appropriate lower-cost option for Tier 2 systems.

<u>430 – Installers – Tier 2 and Tier 3 greywater irrigation systems.</u> This section provides that only persons approved by the local health officer, including the resident owner of certain single-family residences, may install Tier 2 and Tier 3 greywater irrigation systems. It further provides that the installer must follow the approved design, have it with him or her during installation, and refrain from making any changes to the design without proper authorization. He or she must also be on site during excavation and installation.

Costs: Actual costs for installation of Tier 2 and Tier 3 systems are not yet known. For purposes of comparison, installation costs for greywater systems under current requirements for on-site sewage systems are estimated to range from $5,000 to $10,000 for pressure distribution systems, and from $16,000 to $20,000 for systems that include a treatment product. As discussed in sections 200 and 300, the costs for installation of greywater irrigation systems under the proposed rule may approach these costs in some situations but given the decreased complexity in the proposed rules may generally be expected to be at the lower end of the cost range.

In addition, it is estimated that the cost of a residential subsurface irrigation system that uses potable water generally ranges from about $5,000 to $10,000. Unlike the use of potable irrigation

systems, the use of greywater irrigation systems can result in water service cost savings which can add up over time.

Benefits: This provision helps to ensure that individuals with the capability and knowledge necessary to properly install greywater irrigation systems are the ones installing the systems. Just like proper design, proper installation helps to ensure protection of public health and water quality.

435 – Installation inspection – Tier 2 and Tier 3 systems. This section requires inspection of the system before cover, either by the local health officer or the designer, if the designer did not install the system, in order to ensure that the system meets the approved design. In addition, the local health officer must keep the application on file, with the approved design documents.

Costs: If the local health officer inspects the installation, this cost is most likely included in the cost of the permit under section 425. Similarly, if the designer performs the inspection, the cost is most likely included in the costs of hiring the designer under section 410.

Benefits: Ensuring that the system is installed according to the approved design documents helps to protect public health and water quality.

440 – Operation and maintenance – Tier 2 and Tier 3. This section sets forth those things that the system owner must do in order to keep the system functioning properly:

- Obtain approval from the local health officer before altering or expanding the system
- Protect the system from outside damage
- Ensure that the greywater originates from the correct fixtures
- Provide maintenance and needed repairs, or promptly divert the greywater to the sewage system
- If the building is sold, provide the buyer with the record of the system
- If the system is abandoned or permanently removed, notify the local health officer

Costs: The costs of properly operating and maintaining the system will generally primarily involve yearly start-up costs, at the beginning of the growing season, which are likely to range from about $75 to $300.

Benefits: Proper operation and maintenance of the system prevents problems before they occur and can extend the life of the system.

445-Failures. This section mandates that the owner divert the greywater to the approved sewage system if a failure occurs or is suspected. A failure is defined as "a condition of a greywater system or component that threatens the public health by creating a potential for contact between greywater and the public. Examples of failure include:

(a) Greywater on the surface of the ground;
(b) Greywater leaking from a storage tank;
(c)Inadequately treated greywater reaching groundwater or surface water;

(d) Noncompliance with the installation permit; or
(e) Other noncompliance with the requirements of this chapter, as determined by the local health officer."

Costs: The costs of diverting the greywater to the approved sewage system serving the building may include an increase in sewage disposal rates based on the increased wastewater flow and/or an increase in water service rates for irrigation with potable water.

Benefits: Diverting the flow of greywater to the approved sewage system is a simple, very effective way of addressing a failure. It removes the risk of direct or indirect exposure to greywater and protects public health and water quality.

What is the total probable cost and total probable benefit of the rule package?

The costs associated with installing a greywater irrigation system can range from $100 to about $16,000 to $20,000, depending on the category of system. The costs of installing greywater reuse systems under current on-site sewage system requirements can range from about $5,000 to $20,000. The costs of Tier 1 systems are much less than those associated with small greywater reuse systems under current requirements. The costs of Tier 2 and Tier 3 systems may in some cases approach the costs of a greywater reuse system under current requirements, but should not exceed them.

The primary benefit of the proposed rule is twofold: (1) prevention of the potential of human illness or degradation of ground and surface water quality and (2) encouragement of water conservation. The safeguards throughout the rule serve to provide barriers to the possibility of illness or water contamination. The rule establishes the necessary requirements for protecting public health and water quality when the only portion of the wastewater stream involved is greywater. At the same time, the rule offers cost-effective means of reusing greywater that encourage water conservation.

The installation and use of a greywater irrigation system is optional. In those instances when building owners choose to use them, public health and water quality will be protected. Therefore, the department believes that the benefits of the proposed rule outweigh its costs.

Section 6. What alternative versions of the rule did we consider? Is the proposed rule the least burdensome approach?

RCW 34.05.328(1)(e) requires that agencies determine, after considering alternative versions of the rule and this analysis, that the rule being adopted is the least burdensome alternative for those required to comply that will achieve the general goals and specific objectives of the statute.

The use of a greywater irrigation system is optional. The rule is structured, though, to provide homeowners and others who want to reuse their greywater to water their plants, with cost-effective means of installing greywater irrigation systems.

- The department considered whether a homeowner should be required to pay for a permit for the simple Tier 1 systems and determined that providing local health with the option of requiring registration of the systems was adequate based on the low level of risk involved with these simple systems.
- The department considered whether professional design or installation of the small Tier 1 systems was necessary and determined that it was not necessary for a homeowner to hire a professional to design or install the system given the simplicity of the very small systems.
- For Tier 2 and Tier 3 systems, even application of the greywater throughout the drainfield is required. Pressure distribution is typically used to achieve an even distribution. The department considered whether pressure distribution should be specified as a requirement and determined that as long as even distribution was required, the technology used to meet the requirement did not need to be specified. Because the rule does not limit the technology that may be used to meet the even distribution requirement, new technologies may be used as they are developed.
- The rule requires a 24 inch separation between the bottom of the system irrigation components and the restrictive layer or the highest water table during the growing season. The department considered whether or not augmenting the soil should be allowed before determining the soil loading rate, and determined that it did not make sense to limit soil loading rates to native soils since gardening and landscaping often involve augmenting soils to achieve healthy gardening soils. Allowing the use of augmented soil means that greywater irrigation systems can be installed in areas with certain soil types (soil types 1 and 2), where the systems would otherwise not be allowed.

Section 7. Does the rule require anyone to take an action that violates another federal or state law?

RCW 34.05.328(1)(f) calls for a determination that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.

No. The rule does not require anyone to take an action that violates federal or state law.

Section 8. Does the rule impose more stringent performance requirements on private entities than on public entities unless the difference is required in federal or state law?

RCW 34.05.328(1)(g) requires a determination that the rule does not impose more stringent performance requirements on private entities than on public entities unless required by law.

No. The rule does not impose more stringent performance requirements on private entities than on public entities.

Section 9. Does the rule differ from any federal regulation or statute applicable to the same activity or subject matter?

RCW 34.05.328(1)(h) calls for a determination whether or not the rule differs from any federal regulation or statute applicable to the same activity or subject matter.

The department is not aware of any federal statute or regulation applicable to subsurface irrigation of plants with greywater.

Section 10. Has the rule been coordinated, to the maximum extent possible, with other federal, state, and local laws applicable to the same activity or subject matter?

RCW 34.05.328(1)(i) requires coordination of the rule, to the maximum extent possible, with other federal, state, and local laws applicable to the same activity or subject matter.

Yes, section 005 of the proposed rule specifically recognizes that other applicable requirements must be met.