Greywater guidelines

For councils

A guide to the use of greywater in Queensland.

Effective August 2008
Introduction

Queensland’s ClimateSmart 2050 strategy has been developed to help the state address climate change. Through the ClimateSmart adaptation plan, the Queensland Government is working to ensure we have a secured future water supply.

The Plumbing and Drainage Act 2002 (PDA) and the Queensland Plumbing and Wastewater Code (QPW code) complements the government’s commitment to water savings through the implementation of a wide range of measures including sub-meters, expanded use of treated greywater and blackwater re-use trials.

In an aim to help protect and conserve the state’s water resources the Queensland Government will introduce a new version of the Queensland Development Code (QDC) Part MP 4.2 which addresses water savings targets in class 1 buildings and a new QDC Part MP4.3 to address alternative water sources in commercial buildings. These will commence on 1 January 2008.

The QPW code complements the QDC by providing for the approval of greywater treatment plants and setting the effluent quality criteria for greywater use.

From 1 January 2008, in both sewered and unsewered areas, appropriately treated greywater may be used for purposes such as:

- toilet flushing
- washing of paths, walls or vehicles
- cold water supply to washing machines
- lawn and garden spray irrigation.

In sewered areas greywater systems can be used with all classes of building generating up to 50 000 litres of greywater per day. However, where the amount generated per day is greater than 3000 litres, a greywater treatment plant must be installed.

The purpose of this guide is to assist plumbers to understand the technical and regulatory requirements for the installation of greywater treatment plants and greywater use facilities. It also contains details on the potential uses of treated and untreated greywater.

The guide aims to protect our high quality of our drinking water supplies and ensure wastewater systems are maintained so that we maintain our high standard of public health.

A full copy of the QPW code is available on the Department of Infrastructure and Planning website at www.dip.qld.gov.au/bcq.
Important notes

This document should be used as a guide to interpreting the requirements of the PDA and the QPW code.

All terms referred to in this guide have the same meaning as defined in the PDA, Standard Plumbing and Drainage Regulation 2003 (SPDR) or a relevant Australian/New Zealand Standard. If a definition given in a relevant standard is inconsistent with the Act, Regulation or the QPW code, the legislation prevails.

All relevant Australian and New Zealand Standards are applicable, unless otherwise outlined in the QPW code. Where there is an inconsistency, or the QPW code has additional requirements, the QPW code prevails.

Unsewered areas

The assessment of applications by council for use of greywater in unsewered areas has not changed.

Council can approve the use of greywater in unsewered areas where:
- the facility complies with the SPDR
- council is satisfied that there is enough water available to operate the facility
- either there is enough suitable land or a suitable arrangement has been made for the use of the greywater
- the greywater treatment plant is approved by the Department of Infrastructure and Planning, or the greywater diversion device has watermark approval.

Plumbers should contact council to discuss greywater use in unsewered areas.

Sewered areas

From 1 January 2008 local councils can approve the use of greywater in all classes of buildings. The maximum volume of greywater which can be used has been lifted to 50,000 litres per day. Removal of these restrictions enables commercial premises to re-use greywater.

Changes to the regulation of greywater treatment plants commenced 1 July 2008. Regulation is now based on the capacity of the greywater treatment plant rather than the amount of greywater that is generated on the premises.

- a single greywater treatment plant capable of treating less than 50 kL greywater per day will continue to be regulated under the PDA whether or not individual treatment plants are connected in any way.

  For example, installation of two greywater treatment plants with capacities of 30 kL and 25 kL respectively, even though connected, will still be governed by the provisions of the PDA as the individual capacity of each treatment plant does not exceed the 50 kL or more capacity threshold.

- a single greywater treatment plant capable of treating 50 kL or more greywater per day will be regarded as a 'large greywater treatment plant' and installation will be regulated by the chief executive officer of the Department of Natural Resources and Water under the framework set out under the Water Supply (Safety and Reliability) Act 2008

Local governments will still oversee installation of greywater treatment plants under each of the regulatory frameworks.
Council approval

All greywater use facilities consisting of either a greywater diversion device or greywater treatment plant and greywater land application area or other end uses must be approved by council.

Inspection programs are needed to ensure systems are working safely. This document is designed to assist councils manage the assessment of applications.

Council responsibilities

The PDA and associated regulations clearly set out the responsibilities of councils for greywater management in sewered and unsewered areas.

To manage greywater use effectively councils must:

• assess applications—consider all relevant issues when approving the installation or operation of a greywater use facility, particularly environmental and health issues at the site
• set approval conditions—specify site and system specific conditions of approval to operate and maintain facilities
• monitor systems—check regularly to make sure that homeowners comply with approval conditions
• communicate with homeowners—help homeowners to understand their statutory responsibilities, how to frame applications, how to manage risks and to operate systems effectively.

Associated legislation

The PDA, SPDR and QPW code should not be considered in isolation. Other federal, state and local laws or referenced standards may be relevant.

The following is a list that should be considered, but it is not a comprehensive list.

• Building Act 1975
• Building Regulation 2006
• Integrated Planning Act 1997
• Plumbing and Drainage Act 2002
• Standard Plumbing and Drainage Regulations 2003
• Public Health Act 2005
• Water Act 2000
• Water Regulations 2002
• Water Supply (Safety and Reliability) Act 2008
• Building Code of Australia
• Plumbing Code of Australia
• Australian and New Zealand Design Standards
• Australian Technical Specifications
Standards

The following standards are referenced in the QPW code and are applied provisions for the purposes of the SPDR.

- AS/NZS 1546.2 On-site domestic wastewater treatment units Part 2: Waterless composting toilets.
- AS/NZS 1546.3 On-site domestic wastewater treatment units Part 3: Aerated wastewater treatment systems
- AS/NZS 1547 On-site domestic wastewater management.

1 Assessing applications

To assess applications for greywater systems in sewered and unsewered areas, councils will need to consider system design (including desired uses—for example toilet flushing), the land application area (where appropriate) and land suitability.

1.1 System design

Is the system designed in accordance with Queensland’s plumbing standards and regulations?

As with other applications for compliance permits, under the PDA, councils will need to assess applications for greywater systems and certify that they comply with Queensland plumbing standards and regulations.

Particular attention should be taken to check that diversion devices and piping materials comply with national standards and that any treatment systems have chief executive approval through the Department of Infrastructure and Planning.

1.1.1 Diversion devices

All greywater diversion devices must have Watermark approval and comply with the requirements of the PDA.

Greywater can be diverted by connecting the laundry or bathroom waste pipe to a diversion device. The device must be fitted with a switch to divert greywater from the sewer to a subsurface or surface irrigation system. The system must also automatically divert to the sewer if there is a blockage.

A pump diversion device incorporates a surge tank to cope with influxes of greywater for distribution by a pump. The surge tank must not operate as a storage tank. Greywater must be screened as it enters the tank and the coarse screens cleaned regularly and the tank flushed periodically.

Surge tanks must be:

- vented
- fitted with an overflow line connected to the sewer
- fitted with a scour line that is connected to the sewer
- have all access openings sealed and vermin proof
- fitted with a hopper floor sloped to the scour line
- designed based on household fixture ratings of AS/NZS 3500.2, section 6.1, where note 1 under table 6.1 specifies the maximum discharge from any fixture to be 500 litres.

Greywater diversion devices must be designed and installed according to the following criteria:
• each installation must be for premises that generate up to 3000 litres per day (any premises that generates more than 3000 litres per day must install a greywater treatment plant)
• minimum maintenance requirements must be specified
• it must meet relevant health and plumbing requirements
• overflow connection to the sewer must be maintained.

1.1.2 Greywater treatment plants
A greywater treatment plant collects, stores, treats and may disinfect collected greywater to the standards specified in the QPW code.

Where the use per day is anticipated to be greater than 3,000 litres a greywater treatment plant must be installed. A greywater treatment plant requires chief executive approval from the Department of Infrastructure and Planning in accordance with the PDA.

1.1.3 Use of treated greywater
From 1 January 2008 greywater can be used for purposes such as toilet flushing, washing of paths, walls and vehicles; cold water supply to washing machines and lawn and garden spray irrigation.

Councils must assess and approve all installations of treated greywater systems. The greywater treatment plant must be approved by the Department of Infrastructure and Planning for the effluent quality relevant to the desired use—for example, a 10/10/10 standard for toilet flushing.

The plumbing and drainage must be installed to the requirements of AS/NZS 3500.

1.1.4 Materials
Greywater diversion devices must be authorised under the Product Certification and Authorisation Scheme for plumbing and drainage products as specified in the Plumbing Code of Australia (PCA).

All subsurface irrigation pipework and fittings must comply with AS 1477—PVC Pipes and fittings for pressure applications or AS 2698.2—perforated effluent pipe and associated fittings for sewerage applications.

The distribution pipe used in gravity-fed subsoil trenches must have a minimum internal diameter not less than 80mm in accordance with AS 2439—perforated plastic drainage and effluent pipe and fittings. A porous soakage hose or slotted agricultural pipe is not acceptable for distribution of primary treated greywater in trench systems due to the likelihood of clogging.
1.1.5 Acceptable sources of greywater

Greywater should only be sourced from laundries, bathrooms and hand basins. It is illegal to use kitchen greywater for irrigation in sewered areas. In unsewered areas kitchen greywater must be discharged to an on-site sewerage facility or greywater treatment plant. In these circumstances the greywater from a kitchen must be connected to a grease arrestor before diverting to the greywater treatment plant.

1.1.6 Design suggestions for homeowners

The following design features can be suggested to homeowners.

Filters

Greywater contains solid particles and land application systems should have an inline filter installed to avoid blockages. Such filters will need frequent maintenance to ensure that greywater flow is not reduced significantly.

Flushing inlets

As greywater contains both micro-organisms and nutrients for their growth, biofilms of micro-organisms may develop on the inside of pipes and drippers clogging the system. It may be necessary to have points in the irrigation systems that allow pipes and drippers to be flushed.

Piping

Unless the correct dispersal piping system is chosen it is possible for plant roots to grow inside the pipes and cause blockages. Homeowners should choose easily replaceable piping systems or those that inhibit microbial and plant root growth.

1.2 Land application area

The proposed land application area must be sufficient to cope with the volume of greywater generated by the treatment plant.

1.2.1 Estimating greywater volumes

The volume of greywater produced by any household will vary according to the dynamics of the household. This is influenced by the number of occupants, the age of the occupants, their lifestyle and water usage patterns.

To determine an appropriate land application area for greywater, consider the volume of greywater likely to be generated under normal circumstances at the premises. Estimates of greywater generated are included in AS/NZS 1547:2000—on-site domestic wastewater management (see table 1 below).

Table 1: Recommended estimates for greywater generated by an average house (three bedroom home and four occupants) 2

<table>
<thead>
<tr>
<th>Greywater flow</th>
<th>litres/person/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily greywater flow from bathroom</td>
<td>60</td>
</tr>
<tr>
<td>Daily greywater flow from laundry</td>
<td>35</td>
</tr>
<tr>
<td>Total for bathroom and laundry</td>
<td>95</td>
</tr>
</tbody>
</table>

Notes:
1. The estimates assume a top loading washing machine and no water saving devices in the bathroom and laundry.
2. These volume estimates are recommended average figures. Councils may upon considering the public health and environmental conditions for the particular site vary these estimates to reflect local conditions.
Greywater flow is based upon the number of bedrooms rather than the number of people who occupy a dwelling because the number of bedrooms will remain constant, while the number of people may vary over time. To estimate the potential quantity of greywater generated in a household the following steps should be used:

1. Calculate the estimated number of occupants of a home as follows:
   - two persons for first bedroom
   - one person per additional bedroom

2. Calculate each person's daily greywater flow allocation as per table 1.

1.2.2 Calculating land application areas

Estimated greywater volumes are used to calculate the required land application area. Formula and sample calculations are provided in Appendix 1.

1.2.3 Options for small allotments

Where there is not enough land to distribute all greywater from a house, councils may consider design options that limit the amount of greywater to be diverted.

On smaller allotments it may be possible to divert greywater from just one source, such as the laundry, and reduce the volume of greywater used for irrigation. Sample calculations are provided in Appendix 1.

1.3 Land suitability

Is the proposed land application area suitable for greywater irrigation?

Greywater contains many impurities, including nutrients, nitrogen and phosphorus that may harm the environment. Great care must be exercised when designing land application areas to ensure that they are sustainable. There are some contaminants that cannot be treated or degraded in the soil. Therefore, the land application area must be capable of absorbing, assimilating or treating the chemical impurities and nutrients without medium and long-term degradation of the soil or the surrounding environment.

Greywater treatment systems are designed primarily to treat organic matter and are not normally designed to remove chemical salt such as sodium, nitrate and phosphate, which may be found in greywater. Greywater must therefore be contained within the premises on which it is generated.

1.3.1 Relevant considerations

To assess land suitability the primary considerations will be:

- **Will the land be susceptible to ponding and run-off?** Is the soil type likely to resist absorption of greywater? Is there sufficient soil depth to absorb greywater without ponding?
- **Is the greywater likely to seep through to adjoining properties?** Is the soil type likely to absorb and retain greywater? Is the slope of the land application area too steep and will it cause seepage off-premises?
- **Is the greywater likely to seep into the underground water table?** Is the soil type likely to absorb and retain greywater or will it allow rapid seepage? How far is the land application area from the underground water table? Will the slope of the land increase the likelihood of seepage?
- **Is the greywater likely to seep into areas, on premises, that will affect the stability of buildings?** Is the soil type likely to promote seepage? How far is the land application area from adjacent buildings? Will the layout of the application (slope, proximity to buildings) prevent seepage and undermining of existing structures such as retaining walls?
Most of the information required for land suitability assessment can be obtained by visually assessing the property, siting plans and using existing information about local soil types and topography. In circumstances where there is a high risk of seepage or contamination, councils may require more detailed information about soil profiles and soil structure. It will be up to councils to determine their requirements in terms of soil and land assessment for greywater system applications. Homeowners should be advised to contact council prior to submitting an application so they are aware up-front of any costly requirements for independent technical reports.

### 1.3.2 Options for councils to manage land assessment

Councils have two options for assessing land suitability:

(i) **Individual lots**—the first option is to assess land suitability on a case-by-case basis for individual lots when an application is submitted.

(ii) **Blanket assessments**—alternatively, councils may wish to identify in advance of applications, larger areas of land where it is possible to generalise about the suitability of individual lots.

Councils may use a combination of individual lot and blanket assessments to manage greywater applications.

### 1.3.3 Relevant siting parameters

When assessing the suitability of land for greywater irrigation councils should take into account flood potential, exposure, slope, landform, potential for run-off, upslope seepage, site drainage, fill, buffer distances and geology. A checklist is provided in table 1.3.3.

Councils need to assess these features and determine if any will make the land unsuitable for greywater irrigation. In some cases the problems posed by a limiting feature or features can be overcome by using special designs or by modifying the site. Advice can be provided to applicants about more suitable design options.

**Table 1.3.3: Site assessment checklist**

<table>
<thead>
<tr>
<th>Site feature</th>
<th>Minor limitation</th>
<th>Moderate limitation</th>
<th>Major limitation</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood potential</td>
<td>Below 1:100 year usage</td>
<td>Below 1:20 year usage</td>
<td></td>
<td>High runoff and contamination risk</td>
</tr>
<tr>
<td>Exposure</td>
<td>High sun and wind exposure</td>
<td>Low sun and wind exposure</td>
<td></td>
<td>Poor evapotranspiration</td>
</tr>
<tr>
<td>Slope percentage</td>
<td>0–10</td>
<td>10–20</td>
<td>&gt;20</td>
<td>Run-off, erosion</td>
</tr>
<tr>
<td>Landform</td>
<td>Hill crest, convex side slows and plains</td>
<td>Concave side slopes &amp; foot slopes</td>
<td>Drainage plains and incised channels</td>
<td>Groundwater pollution hazard Resurfacing hazard</td>
</tr>
<tr>
<td>Run-on and upslope seepage</td>
<td>None–low</td>
<td>Moderate</td>
<td>High–diversion not practicable</td>
<td>High runoff and contamination risk</td>
</tr>
<tr>
<td>Erosion potential</td>
<td>No signs of erosion potential present</td>
<td>Signs of erosion, e.g. rills, mass movement and slope failure, present</td>
<td></td>
<td>Soil degradation and transport, system failure</td>
</tr>
<tr>
<td>Site drainage</td>
<td>No visible signs of surface</td>
<td>Visible signs of surface dampness,</td>
<td></td>
<td>Groundwater pollution hazard</td>
</tr>
<tr>
<td>Soil Feature</td>
<td>Minor limitation</td>
<td>Moderate limitation</td>
<td>Major limitation</td>
<td>Restrictive feature</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>---------------------</td>
<td>------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Depth to bedrock or hardpan (m)</td>
<td>&gt;1.0</td>
<td>0.5 – 1.0</td>
<td>&lt;0.5</td>
<td>Indicates potential for excessive runoff and/or waterlogging</td>
</tr>
<tr>
<td>Depth to high episodic or</td>
<td>&gt;1.0</td>
<td>0.5 – 1.0</td>
<td>&lt;0.5</td>
<td>Groundwater pollution hazard, resurfacing</td>
</tr>
</tbody>
</table>

A checklist of critical factors for soil assessment is provided and may be used by councils in determining the suitability of land for greywater irrigation (table 1.3.4).
1.3.5 Explanation of soil and siting parameters

**Soil depth**

Soil depth of less than 0.5 metres to bedrock might not have enough capacity to filter nutrients and pathogens. Shallow soils also incur a risk of effluent resurfacing near the land application area. The recommended minimum soil depth will vary depending on the type of land application system used and the site and soil characteristics. The values given in table 1.3.4 are based on ideal site and soil conditions. If these conditions are less than ideal the minimum soil depth requirement should be increased.

**Depth to episodic/seasonal water table**

Attention should be given to groundwater protection, particularly if the groundwater is used or may be used for potable or irrigation water supplies. Once a particular contaminant has reached the groundwater, the rate of transport may be much greater than in the unsaturated zone and movement will be in the direction of the regional groundwater movement. Micro-organisms can be carried substantial distances in this zone.

Minimum depths from the greywater infiltrative surface to the minimum periodic water table or gravel layer in a floodplain adjoining a river or stream are recommended to maintain aerobic conditions in the soil prevent surface ponding and prevent contamination of groundwater. These minimum depths will vary, depending on the type of application system proposed and the site and soil characteristics of the site.

The values given in table 1.3.4 are a recommended minimum, based on ideal site and soil conditions. If conditions are less than ideal, the minimum depth to the water table should be increased.

**Soil permeability**

Permeability is a measure of the ability of a soil to transmit water and is quoted as the value for the least permeable layer of a soil profile. It is affected by soil properties like structure, texture and porosity.

In general, highly permeable soils such as gravels and sands can allow wastewater to percolate rapidly through the soil profile, possibly allowing the transport of pathogens and nutrients to groundwater and off-site. Low permeability soils, such as medium and heavy clays, can encourage water logging and surfacing of the applied wastewater.

Permeability can be estimated by a field assessment of soil texture and structure, where the properties of a soil are correlated with a certain indicative permeability.
Table 1.3.5: Soil permeability categories based on soil texture and structure

<table>
<thead>
<tr>
<th>Soil permeability category</th>
<th>Soil structure</th>
<th>Soil texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gravels and sands</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Weakly pedal</td>
<td>Sandy loams</td>
</tr>
<tr>
<td>2b</td>
<td>Massive</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>Highly or moderate pedal</td>
<td>Loams</td>
</tr>
<tr>
<td>3b</td>
<td>Weakly pedal or massive</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Highly or moderate pedal</td>
<td>Clay loams</td>
</tr>
<tr>
<td>4b</td>
<td>Weakly pedal</td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>Massive</td>
<td></td>
</tr>
<tr>
<td>5a</td>
<td>Highly pedal</td>
<td>Light clays</td>
</tr>
<tr>
<td>5b</td>
<td>Moderately pedal</td>
<td></td>
</tr>
<tr>
<td>5c</td>
<td>Massive</td>
<td></td>
</tr>
<tr>
<td>6a</td>
<td>Highly pedal</td>
<td>Medium to heavy clays</td>
</tr>
<tr>
<td>6b</td>
<td>Moderately pedal</td>
<td></td>
</tr>
<tr>
<td>6c</td>
<td>Massive</td>
<td></td>
</tr>
</tbody>
</table>

Soil texture
Soil texture refers to the field behaviour characteristics of a soil when it is manipulated. It relates to the relative proportions of clay (< 0.002mm diameter), silt (0.002–0.05mm diameter) and sand (0.05–2.0mm diameter) in the soil as well as its chemical characteristics. Soil texture can have a significant effect on the ability of the soil to transmit or retain irrigated greywater.

Bulk density
Bulk density is the mass of dry soil per unit bulk volume. It is a measure of soil porosity and structure. Specific soil textures have a critical bulk density. The following bulk densities for the specified soil textures should not pose problems for land application areas:

<table>
<thead>
<tr>
<th>Soil feature</th>
<th>Grams per cubic centimetre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy loam</td>
<td>&lt; 1.8</td>
</tr>
<tr>
<td>Loam and clay loam</td>
<td>&lt; 1.6</td>
</tr>
<tr>
<td>Clay</td>
<td>&lt; 1.4</td>
</tr>
</tbody>
</table>

pH
The pH value of a soil influences soil conditions and vegetation growth. Soil pH affects the solubility and fixation of some nutrients in soils. Soils with a pH of between 4.5 and 8.5 should pose no constraints for land application areas.

Climate
Climate influences the amount of greywater used for all types of land application systems. Areas with high evaporation compared with precipitation are preferred for land application systems, as they allow greater use of the hydraulic load. Areas using irrigation and experiencing periods when rainfall exceeds evaporation must revert greywater to the sewer during periods of wet weather. Applying greywater during wet weather could make pollutants leach to groundwater, or the greywater could surface, with consequent environmental and health risks. Councils may wish to use water balance data (historical precipitation and evaporation) to determine whether or not greywater irrigation is appropriate for local climate conditions or to provide advice on design of irrigation systems.

Flood potential
It is best to locate all the components of greywater use facilities above the one in 100 year probability flood contour, but the one in 20 year probability contour may be used as a limit for greywater discharge.
land application areas. Electrical components, vents and inspection openings of wastewater treatment devices should be sited above the one in 100 year probability flood contour.

**Exposure**
Sun and wind exposure on land application areas should be maximised to enhance evaporation. Factors affecting exposure include the geographical aspect of the area, vegetation and buildings near the proposed application area. Evaporation may be reduced by up to two-thirds in some locations by a poor aspect or overshadowing and sheltering by topography, buildings or vegetation.

**Slope**
Excessive slope might pose problems for installing systems and create difficulties in evenly distributing the treated wastewater to land, resulting in run-off from surface land application areas. The recommended maximum slope will vary depending on the type of land application system used and the site and soil characteristics. The values given in table 1.3.3 are based on ideal site and soil conditions. If these conditions are less than ideal the maximum slope requirement should be reduced.

**Run-on and up-slope seepage**
Run-on of precipitation to the land application area from up-gradient areas should be avoided. Run-on should be diverted around any land application area by using earthworks or a drainage system approved by council. Up-slope seepage can be at least partly controlled by installing groundwater cut-off trenches, provided the lowest level of the trench is above the level at which effluent can enter the land application area.

**Erosion potential**
Greywater use facilities should not be put on land that shows evidence of erosion or that has potential for mass movement or slope failure.

**Site drainage**
Greywater use facilities should not be installed on damp sites. Poor drainage and surface dampness are often indicated by the type of vegetation growing on the site. Sedges and ferns are likely to grow in damp conditions. Seepage springs and soaks are also indications of poor site drainage. Site drainage can best be determined by inspecting the soil at the site.

**Fill**
Fill can be described as soil resulting from human activities that have led to modification, truncation or burial of the original soil or the creation of new soil parent material by a variety of mechanisms. Fill often has highly variable properties, such as permeability. Fill can be prone to subsidence and could contain material that might not be suitable for plant growth or for constructing land application systems. Fill can be removed, but if this is not possible, a detailed assessment of the fill might be needed. Fill less than 0.3 metres deep could be suitable, depending on the nature of the material and the suitability of the underlying soil.

**Buffer distances**
Buffer zones should be kept between greywater use facilities and sensitive environments on- and off-site, to ensure protection of community health, the environment and community amenity. A buffer distance should be left between greywater use facilities (particularly land application areas) and features like boundaries of premises, driveways, buildings and swimming pools.

See Tables T4, T5, T6 and T7 of the QPW code for setback distances. These setback distances may be varied under performance where the council is satisfied that the performance criteria are satisfied. See section 8B of the SPDR.

**Rocks and rock outcrops**
The presence of rock outcrops usually indicates highly variable bedrock depths and can be associated with preferential pathways (short circuits) for effluent to flow along rock fissures and surface elsewhere. The presence of rocks can limit evaporation and interfere with drainage. Rocks can also interfere with trench and pipe installations. Cobble and larger stones can collapse into installations causing problems with even effluent distribution.

**Geology/regolith**
Land application areas should not be installed near major geological discontinuities, fractured or highly porous regolith, as these structures can provide preferential pathways for wastewater to groundwater.

2 Monitoring greywater systems

2.1 Inspection programs

A monitoring program should take into account factors such as any approval conditions and the type of system. It is up to council to determine the details of its monitoring program.

Council may choose to audit all greywater systems on a regular basis. It could also conduct random audits on greywater systems installed in its area. Councils have an obligation to take action against defective systems that pose a risk to public health, amenity or environment.

Council can pass a local law requiring annual registration of greywater systems using powers under the Local Government Act 1993. However, this is at the discretion of council. The registration fee could be used to cover the cost of conducting inspection programs. A council with a small number of greywater systems may not warrant the collection of a registration fee.

2.2 Complaint based audits

As part of the council’s strategy for monitoring greywater systems, councils will also need to respond to complaints about the operation of greywater systems, such as complaints about odour problems, or greywater run-off to neighbouring properties.

Complaints received about greywater systems may influence council’s audit and inspection program.

3 Communicating with homeowner

3.1 General information

All councils should provide homeowners with information about greywater legislation and council requirements.

Homeowner information and guidelines for plumbers are also available on the Department of Infrastructure and Planning website (www.dip.qld.gov.au).
3.2 Local policies and procedures

It is also important for councils to advise homeowners about local policies and application procedures such as:

- how to lodge applications
- required forms and fees
- additional information required with application.

3.3 Ideas for homeowner

If councils have any particular preferences for greywater system design, then homeowners should be advised of these up-front.

Council may find it helpful to have information about soil types in its area readily available to homeowners. This could assist homeowners to make decisions about whether to apply for a greywater system.

General information about soil types could also be published on council’s website.
Appendix 1: Calculating land requirements for subsurface irrigation

Before councils can approve plans for homeowners to install a greywater system with a land application system it must ensure the property has sufficient land to distribute the generated greywater.

To calculate whether the homeowner has sufficient land, councils must first estimate:
1. area available (A available)—the area of land available for greywater irrigation
2. greywater generated (G volume)—the amount of greywater generated by the household
3. area needed (A needed)—the area of land needed to soak up all of the greywater generated.

The following calculations are included as a guide to determine whether a homeowner has sufficient application area to deal with greywater generated on the premises. The calculations are based on the following estimates provided in the QPW code for greywater use in sewered and unsewered areas from a house with three bedrooms and four occupants:

- Daily greywater flow from bathroom = 60 litres/person/day.
- Daily greywater flow from laundry = 35 litres/person/day.
- Daily greywater from combined bathroom and laundry = 95 litres/person/day.
Sample calculation

1. Calculate area available for irrigation

\[ A_{\text{available}} = \text{area of gardens and lawns not covered by buildings or impermeable surfaces, leaving appropriate setbacks from buildings and boundaries. See the QPW code for setback distances.} \]

An example:
Allotment = 700 m²
Dwelling = 192 m²
Available greywater irrigation area = 130 m²

2. Calculate volume of greywater that will be generated

Using estimates from the QPW code:

Greywater flow from bathroom and laundry combined = 95 litres/person/day

Assume four person household:

\[ G \text{ volume (l/week)} = 4 \times 95 \times 7 = 2,660 \text{ litres/week} \]

3. Calculate the area needed to soak up this volume of greywater

The ability of the soil to soak up greywater will depend on the type of soil that is present on-site. For this example, assume the soil is a clay loam with average permeability and a design irrigation rate (DIR) of 25 mm/week (AS/NZS 1547:2000 table 4.2A4).

\[ A_{\text{needed}} = \frac{G \text{ volume (l/week)}}{DIR \text{ (mm/wk)}} \]
\[ = \frac{2,660}{25} \]
\[ = 106 \text{ m}^2 \]

In this case the homeowner does have the area of land (106 m²) needed to distribute all the greywater from the bathroom and laundry.

If there is plenty of land, then a facility can be planned that uses all the greywater generated.

For many Queensland homes in closely settled sewered areas, there will not be sufficient area of land available to soak up all the greywater generated within the home. Other options available to the homeowners with smaller blocks are:

(i) limit the volume diverted. Plan a facility that only uses part of the greywater generated—for example, only divert greywater from the laundry, or the bathroom.

(ii) diversion times. Only diverted greywater for limited times during the week.

Options for smaller blocks (1) – limit source of greywater

1. Calculate area available for irrigation

\[ A_{\text{available}} = \text{area of gardens and lawns not covered by buildings or impermeable surfaces, leaving appropriate setbacks from buildings and boundaries. See the QPW code for setback distances.} \]

Example of small allotment:
Allotment = 450 m²
Dwelling = 192 m²
Available greywater irrigation area = 60 m²
2. Calculate volume of greywater that will be generated

Using estimates from QPW code.

Greywater flow from laundry alone = 35 litres/person/day

Assume four person household:
G volume from laundry (l/week) = four persons x 35 l/person/day x seven days
= 980 litres/week

3. Calculate the area needed to soak up this volume of greywater

The ability of the soil to soak up greywater will depend on the type of soil that is present on-site. For this example, assume the soil is a clay loam with average permeability and a design irrigation rate (DIR) of 25 mm/week (AS/NZS 1547:2000 table 4.2A4).

\[
A_{\text{needed}} (m^2) = \frac{G \text{ volume from laundry} (l/wk)}{\text{DIR (mm/wk)}} \]

= 980/25
= 39m²

4. Look at all of the possible options:

a) application area needed 2660 l/wk for bathroom & laundry 25 (mm/wk)
   = 106 m²
b) application area needed 1680 (l/wk) for bathroom 25 (mm/wk)
   = 67 m²
c) application area needed 980 (l/wk) for laundry 25 (mm/wk)
   = 39 m²

Option (c) indicates that the homeowner has sufficient land to plan a system that only irrigates with greywater from the laundry.

Options for smaller blocks (2)—limit diversion and irrigation times

Plan to operate the facility so that greywater is only diverted for limited times during the week.

1. Calculate area available for irrigation

\[
A_{\text{available}} (m^2) = \text{area of gardens and lawns not covered by buildings or impermeable surfaces, leaving appropriate setbacks from buildings and boundaries. See the QPW code for setback distances.}
\]

Example of small allotment:
Allotment = 450m²
Dwelling = 192m²
Available greywater irrigation area = 60m²

2. Calculate volume of greywater that will be generated

Using estimates from QPW code:

Greywater flow from bathroom and laundry combined = 95 litres/person/day

Assume four person household:
G volume if only irrigating two days/week (l/week) = four persons x 95 l/ person/day x two days
= 760 litres/week

3. Calculate the area needed to soak up this volume of greywater
The ability of the soil to soak up greywater will depend on the type of soil that is present on-site. For this example, assume the soil is a clay loam with average permeability and a design irrigation rate (DIR) of 25 mm/week (AS/NZS 1547:2000 Table 4.2A4).

\[
A_{\text{needed}} (m^2) = \frac{G \text{ volume from two days irrigating (l/wk)}}{\text{DIR (mm/wk)}} = \frac{760}{25} = 30 m^2
\]

Under section 85(7) of the PDA, a council may impose reasonable and relevant conditions on a compliance permit. Councils may decide to issue a compliance permit/certificate with operating conditions that will restrict irrigation days.

**Options for smaller blocks (3)—limit sources and irrigation times**

Option 3—a combination of options one and two

1. **Calculate area available for irrigation**

\[
A_{\text{available}} (m^2) = \text{area of gardens and lawns not covered by buildings or impermeable surfaces, leaving appropriate setbacks from buildings and boundaries. See the QPW code for setback distances.}
\]

Please note: The required setback distance may be greater according to local council policy.

**Example of small allotment:**

- Allotment = 400m²
- Dwelling = 192m²
- Significant paved areas
- Available greywater irrigation area = 25m²

2. **Calculate volume of greywater that will be generated**

Using estimates from QPW code.

Greywater flow from laundry alone = 35 litres/person/day

\[
\text{Assume four person household:}
G \text{ volume – laundry only, three days/week (l/week)} = \text{four persons x 35 l/person/day x three days = 420 litres/week}
\]

3. **Calculate the area needed to soak up this volume of greywater**

The ability of the soil to soak up greywater will depend on the type of soil that is present on-site. For this example, assume the soil is a clay loam with average permeability and a design irrigation rate (DIR) of 25 mm/week (AS/NZS 1547:2000 table 4.2A4).

\[
A_{\text{needed}} (m^2) = \frac{G \text{ volume – laundry only, 3 days a week (l/wk)}}{\text{DIR (mm/wk)}} = \frac{420}{25} = 17 m^2
\]

Councils may issue a compliance permit/certificate for this sort of system with approval conditions limiting irrigation to three days per week.

Future developments such as swimming pools, driveways, sheds and paved entertainment areas will affect the application area available for subsurface irrigation.
The calculations provided in these guidelines are examples of how councils may wish to consider greywater applications in sewered and unsewered areas. However, the method of assessment used for deciding greywater applications remains the responsibility of councils to determine.
## Appendix 2: Assessment checklist

For implementation of greywater systems

<table>
<thead>
<tr>
<th>1. Site details</th>
<th>Site location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street address</td>
<td><strong>Include number, street, suburb/locality &amp; postcode</strong></td>
</tr>
<tr>
<td>Council Area</td>
<td><strong>Postcode</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner/Developer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
</tr>
<tr>
<td><strong>Address</strong></td>
</tr>
<tr>
<td><strong>Postcode</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phone No.</th>
<th>Mobile No.</th>
<th>Fax No.</th>
</tr>
</thead>
</table>

### Siting details

- Site plans attached [Yes] [No]
- Photographs attached [Yes] [No]

### Intended water supply

- [ ] Rainwater
- [ ] Reticulated water supply

<table>
<thead>
<tr>
<th>2. Is the land application area sufficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimated greywater volume (litres/day)</strong></td>
</tr>
<tr>
<td><strong>Land application area (required) (m²)</strong></td>
</tr>
<tr>
<td><strong>Land application area (available) (m²)</strong></td>
</tr>
</tbody>
</table>

### Check buffer distances

- [ ] Permanent waters
- [ ] Other sensitive environments
- [ ] Boundary of premises
- [ ] Swimming pool
- [ ] Buildings

Is there sufficient land area available for land application systems [Yes] [No]
3. Siting assessment

- **Climate**
  - Are low temperatures excepted - particularly below 15°C: [ ] Yes [ ] No
  - Is high rainfall likely to be a problem in this location: [ ] Yes [ ] No

- **Exposure**
  - Is the land application area exposed to sunlight and to prevailing winds: [ ] Yes [ ] No

- **Landform**
  - Does the land have drainage plains and incised channels: [ ] Yes [ ] No

- **Run-on and seepage**
  - Does the land have high run-on and upslope seepage with no diversion practical: [ ] Yes [ ] No

- **Erosion potential**
  - Does the land show signs of high erosion e.g. rills, mass movement/slope failure present: [ ] Yes [ ] No

- **Site drainage**
  - Does the land show visible signs of surface dampness, such as moisture-tolerant vegetation, (eg bottle brush, paper bark trees, or ferns), seepages, soaks and springs: [ ] Yes [ ] No

- **Landfill**
  - Has the property been cut and filled, or sited on imported fill: [ ] Yes [ ] No

- **Flood potential**
  - Land application area above 1 in 20 Year flood level: [ ] Yes
  - Land application area above 1 in 100 Year flood level: [ ] Yes

- **Slope**
  - Which slope grading does the land have: [ ] 0-10% [ ] 10-20% [ ] >20%

- **Groundwater**
  - Horizontal distance to groundwater well used for domestic water supply: [ ] m
  - Bores in the area and their purpose:

- **Soil**
  - Depth to bedrock or hardpan: [ ]
  - Depth to high episodic or seasonal water table: [ ]

- **Type, characteristics, permeability**

- **Other matters e.g. density of allotments within the area**

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**Greywater guidelines for Queensland councils**

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