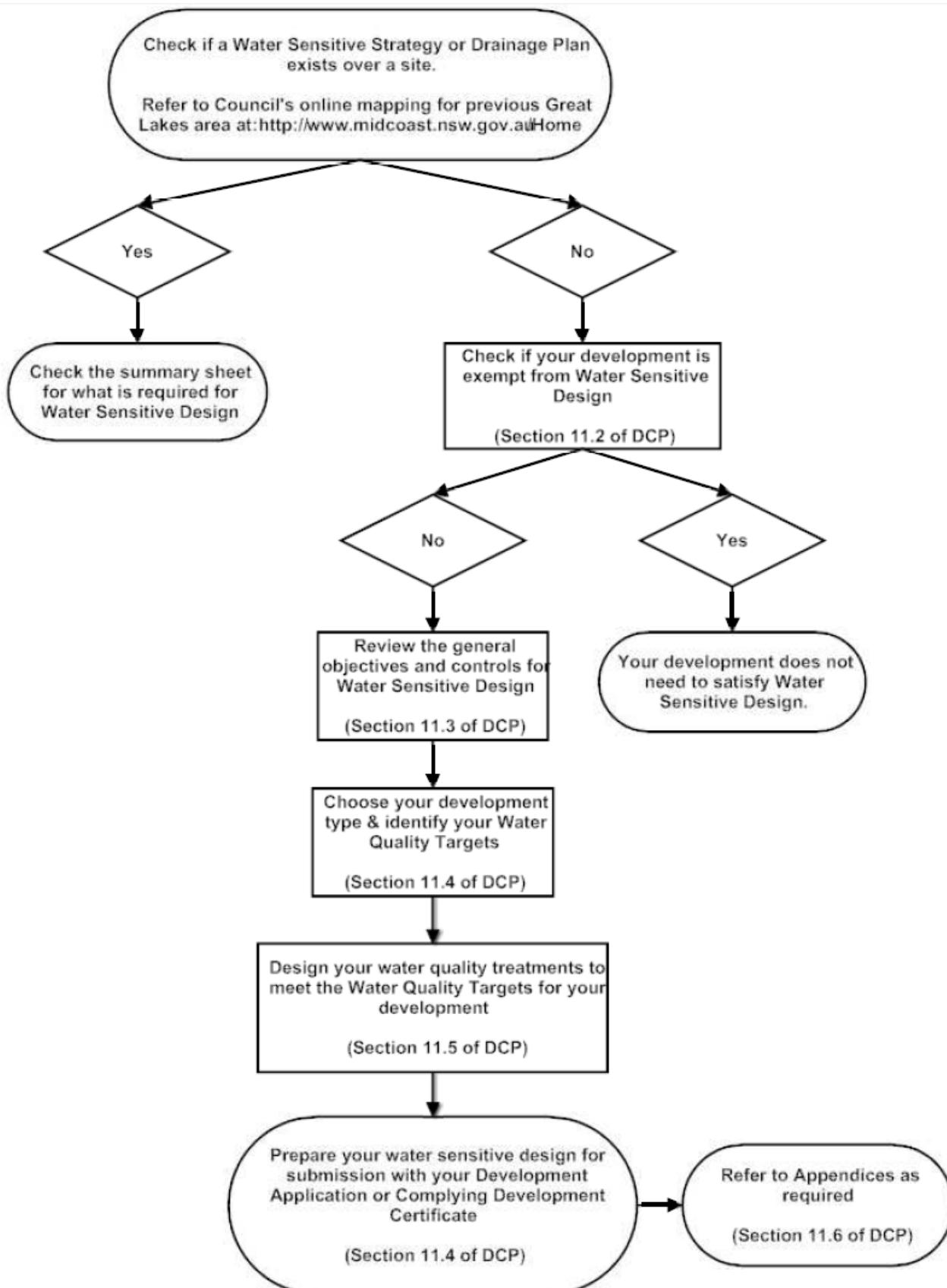


11. Water Sensitive Design

11.1 Flow Chart of Water Sensitive Design Process



11.2 Where do Water Sensitive Design Controls Apply?

Water sensitive design (WSD) controls must be addressed as part of a development application or complying development certificate on sites covered by the Great Lakes Local Environmental Plan 2014.

Council approved Stormwater Strategy or Drainage Plan

Sometimes a property can be included in a Council approved Stormwater Strategy or Drainage Plan which has considered Water Sensitive Design at the time of subdivision. The Strategy or Plan will set-out the water quality targets for your site and a summary sheet will provide the details of any additional Water Sensitive Design measures that may be required as part of your development.

Where you wish to vary the Water Sensitive Design measures set-out in the summary sheet you may use this section of the DCP to propose alternative water quality treatments to meet the water quality targets of the approved Stormwater Strategy or Drainage Plan.

To check if your property is included in a Council approved Stormwater Strategy or Drainage Plan check Council's online mapping at <http://www.greatlakes.nsw.gov.au/Home>

If there is no Council approved Stormwater Strategy or Drainage Plan associated with your property this section of the DCP will be used to assess Water Sensitive Design for your development.

Exemptions to Water Sensitive Design

Note: sites that are included within a Council approved Stormwater Strategy or Drainage Plan will still need to meet the Water Sensitive Design requirements set out within those documents regardless of the exemptions below.

Single Dwelling or Dual Occupancy

Water Sensitive Design controls do not apply to a house or dual occupancy where;

1. the total footprint of all proposed buildings have a roof area of 500m² or less and;
2. the property is located outside the mapped focus area. Check Council's online mapping to see if your property is located outside of a focus area - <http://www.greatlakes.nsw.gov.au/Home>

Alterations and additions

Water Sensitive Design controls do not apply to alterations and additions;

1. on residential development where the increase to the overall impervious surface is less than 150m²; or
2. for any other type of development where the increase to the overall impervious surface is less than 10%

Note: impervious surfaces include roof area and all other hard surfaces including (but not limited to) driveway, pathways and courtyards that form part of the alterations and additions.

11.3 General Objectives and Controls for Water Sensitive Design

Objectives

- To safeguard the environment by maintaining or improving the quality of stormwater run-off.
- To protect and restore aquatic, estuarine and riparian ecosystems.
- To harvest rainwater and urban stormwater runoff for use where appropriate.
- To control the hydrological impacts of development on receiving surface and ground water systems by controlling the frequency, magnitude and duration of flows to preserve, as far as practicable, pre-development groundwater and surface water regimes and interactions.
- To control the impacts of development on channel bed and bank erosion by controlling the magnitude, nature and duration of sediment-transporting flows.
- To promote disconnection of impervious areas to the drainage system by introducing appropriate measures to minimise the rate, frequency and volume of urban runoff events in order to improve WSD performance.
- Wherever possible, water quality measures should be designed and constructed at the subdivision stage for the whole development when complete.

Controls

1. All development must meet the relevant targets set-out in the Stormwater Quality Targets Table within this section of the DCP, except in the instance of a Council approved Stormwater Strategy or Drainage Plan which will specify the targets to be met for identified parcels of land.
2. Water Quality Treatments intended to meet the relevant Stormwater Quality Targets are to be calculated and designed in accordance with this section of the DCP, except in the instance of a Council approved Stormwater Strategy or Drainage Plan which may prescribe the measures to satisfy water quality.
3. Additional stormwater drainage measures may be required by Council to address potential flood issues related to the development. Instances where additional requirements may apply include;
 - a. development density that is greater than a dual occupancy; or
 - b. development in areas where there is insufficient capacity in existing stormwater infrastructure to absorb the increased stormwater runoff.
4. Wherever practical, water quality treatments are to be designed as part of any additional stormwater flow modification measures such as detention and infiltration in such a way as to retain, treat and infiltrate runoff events.
5. Water quality treatments should be integrated into landscaped areas to fit within the built environment of the development.
6. Water quality treatments cannot be constructed within;
 - a. drainage or sewer easements except for privately owned inter-allotment drainage; or
 - b. private open space areas.
7. Water quality treatments may be constructed within the building setback areas.
8. All water quality treatments should be designed in response to environmental constraints to ensure they;
 - a. do not contribute to increased flooding risk;
 - b. comply with flood related development controls; and
 - c. withstand storm surge and inundation.
9. Water quality treatments can be any shape or size to fit in with the remainder of the house and lot, as long as the area is consistent with that calculated to meet the relevant Water Quality Treatments.

11.4 Development Type

11.4.1 Single Dwellings and Dual Occupancies

11.4.1.1 Stormwater Quality Targets

Note: sites that are part of a Council approved Stormwater Strategy or Drainage Plan may have different Stormwater Quality Targets to meet. To check if your property is included in a Council approved Stormwater Strategy or Management Plan go to Council's online mapping at <http://www.greatlakes.nsw.gov.au/Home>

Development Type	Target Reduction Loads (based on increased pollution generated from development without treatment)			
	Gross pollutants	Total Suspended Solids	Total Phosphorus	Total Nitrogen
<ul style="list-style-type: none">➤ Single Dwelling➤ Dual Occupancy	90%	80%	60%	45%

11.4.1.2 Un-serviced Sites (not connected to reticulated water)

Calculating Water Sensitive Design Measures

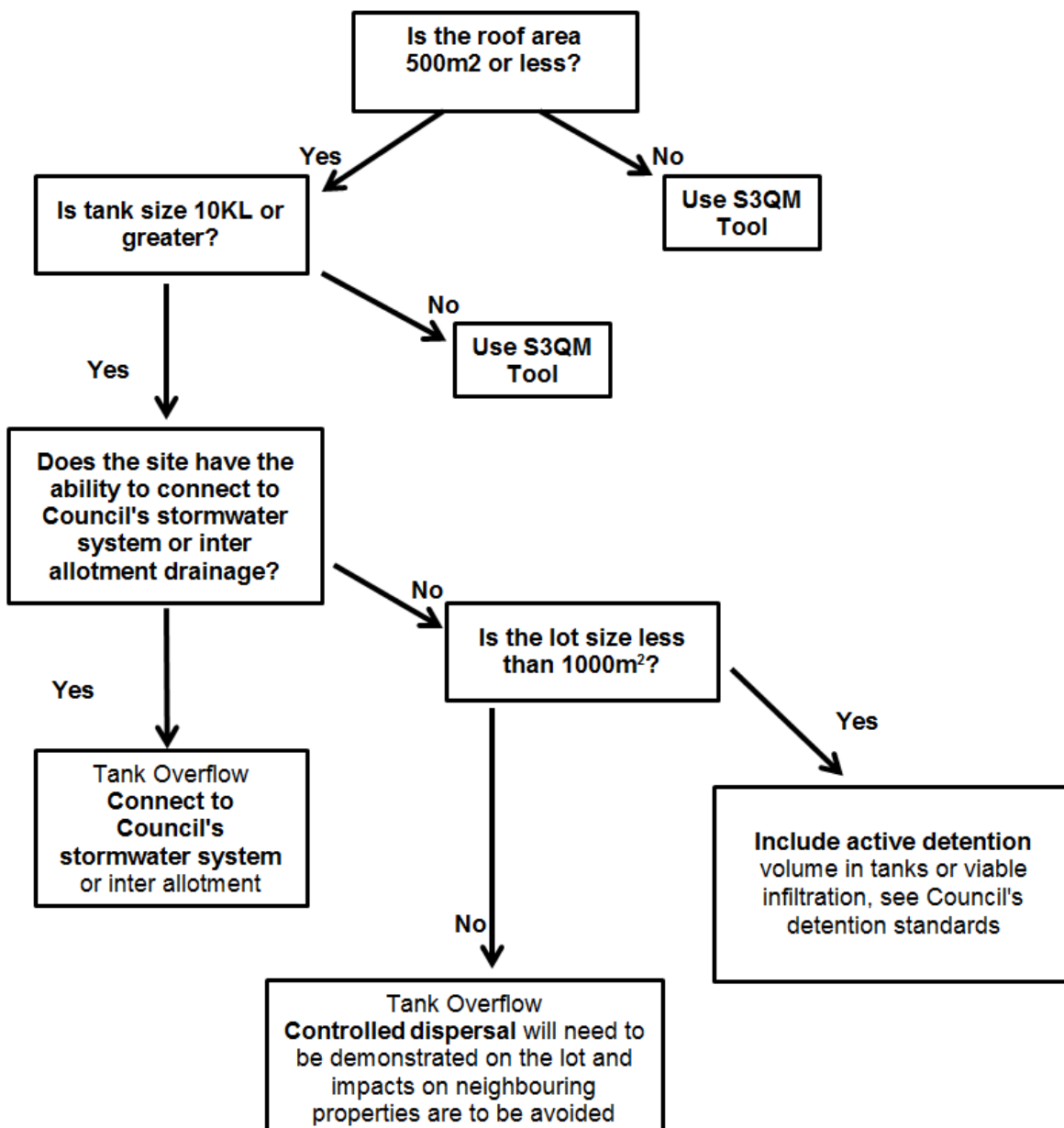
There are two options for calculating the treatments required to meet the Stormwater Quality Targets for building a house or dual occupancy on an un-serviced site;

1. The Deemed to Comply Solution (un-serviced sites); or
2. The Small Scale Stormwater Quality Model (S3QM).

1. Deemed to Comply Solution (un-serviced sites)

The Deemed to Comply Solution (un-serviced sites) seen in the flowchart below is a simplified alternative that outlines the minimum size of the rainwater tank needed and provides guidance on where to direct tank overflow. To satisfy water sensitive design using this method the proposed development must meet the following criteria:

1. Where a Stormwater Strategy or Drainage Plan has stipulated a Water Quality Target of 'Neutral or Beneficial Effect' this flowchart cannot be used.
2. 100% of the roof area including any proposed outbuildings will be directed to the rainwater tank;
3. water from the rainwater tank will be used to service the household; and
4. all other hard surfaces including (but not limited to) driveway, pathways and courtyards will be directed to adjoining landscaped areas within the property.



2. The Small Scale Stormwater Quality Model (S3QM)

The Small Scale Stormwater Quality Model (S3QM) is an online tool that can be used in all circumstances and offers greater flexibility in designing water quality treatment options. It uses the characteristics of the site and proposed development to calculate the required water quality treatments to meet the Stormwater Quality Targets. A link to the tool and user guide is available at www.S3QM.com.au

Council's preferred options for water quality treatments within the S3QM are;

- Biofiltration (raingarden for clay soils or infiltrating raingarden for sandy soils);
- Swales; and
- Buffers.

Other water quality treatment options within the S3QM are not generally supported by Council, however if you are unable to make the preferred options work on your development, other treatments may be considered on a case-by-case basis.

The S3QM Tool will indicate whether the selected measures comply with applicable stormwater targets. If the proposed measures do not comply, the user can adjust them to suit so that they do, or use a "deemed to comply" solver within the tool that provides sizes of rainwater tanks and bioretention systems needed to meet the targets.

Once an acceptable complying solution is identified, the S3QM allows the user to print a Water Sensitive Design Certificate, which should be attached to the Development Application or Complying Development Application for submission to the certifying authority. The commitments made using the S3QM, if approved, then form part of the conditions of any Development Approval issued.

Further information on the S3QM including an example of how to apply the tool and guidance on how to assess the soil type on your property is available from Council.

11.4.1.4 Application Requirements

Developments that have used either the Deemed to Comply Solution or the Small Scale Stormwater Quality Model (S3QM) will need to submit the following information along with the completed small scale development checklist (available from Council's website) as part of a Development Application or Complying Development Application. All applications will need to include detailed engineering drawings of the proposed treatment measures.

WSD Information Required:

- Site plan showing roofed and other impervious areas, treatment measure locations and drainage layouts including lines and connections.
- Calculation of roof area, driveway and other impervious areas on site plan.
- BASIX certificate for residential developments.
- For commercial and industrial sites which are not covered by BASIX, a summary of water conservation measures to be applied on site, including an estimate of total water demands and expected savings associated with water conservation measures, as well as detail on how water demands will be managed and monitored.
- When Deemed to Comply Sizing has been used, provide a summary on your plans.
- When the Small Scale Stormwater Quality Model is used, a 'Certificate' issued by the model.
- Where more than one catchment has been used in the model include catchments and areas for the catchments on the site plan.
- Plans and cross-sectional drawings of stormwater treatment systems, showing inlets, outlets and overflow points (these may be prepared from standard drawings, with site-specific levels and dimensions included).

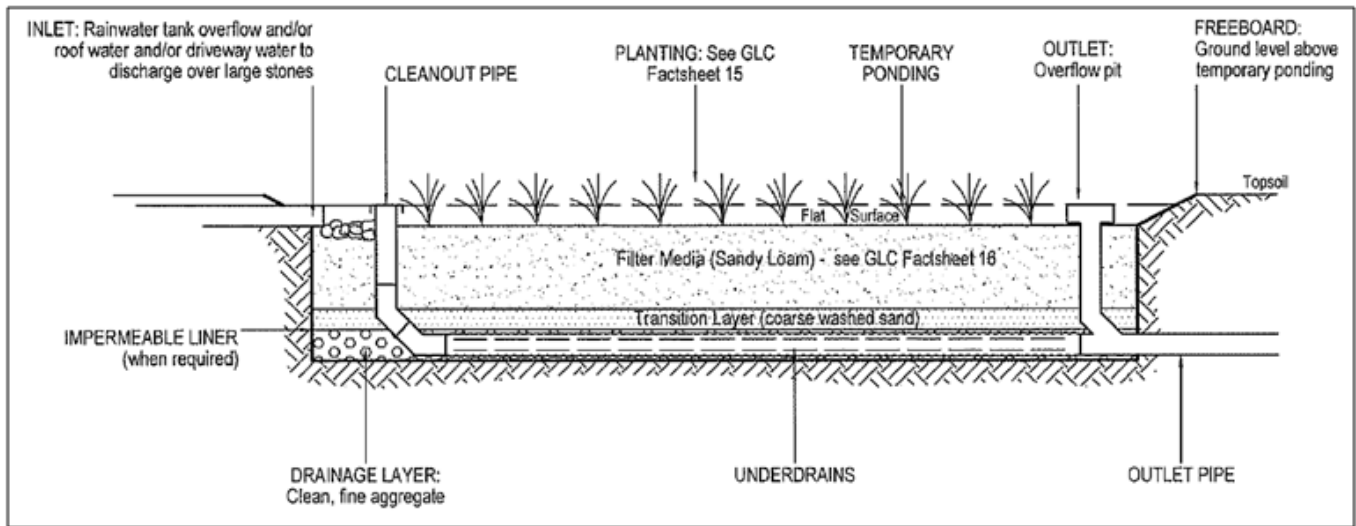
11.5 Design of Water Quality Treatments

11.5.2 Raingarden - Clay Soils

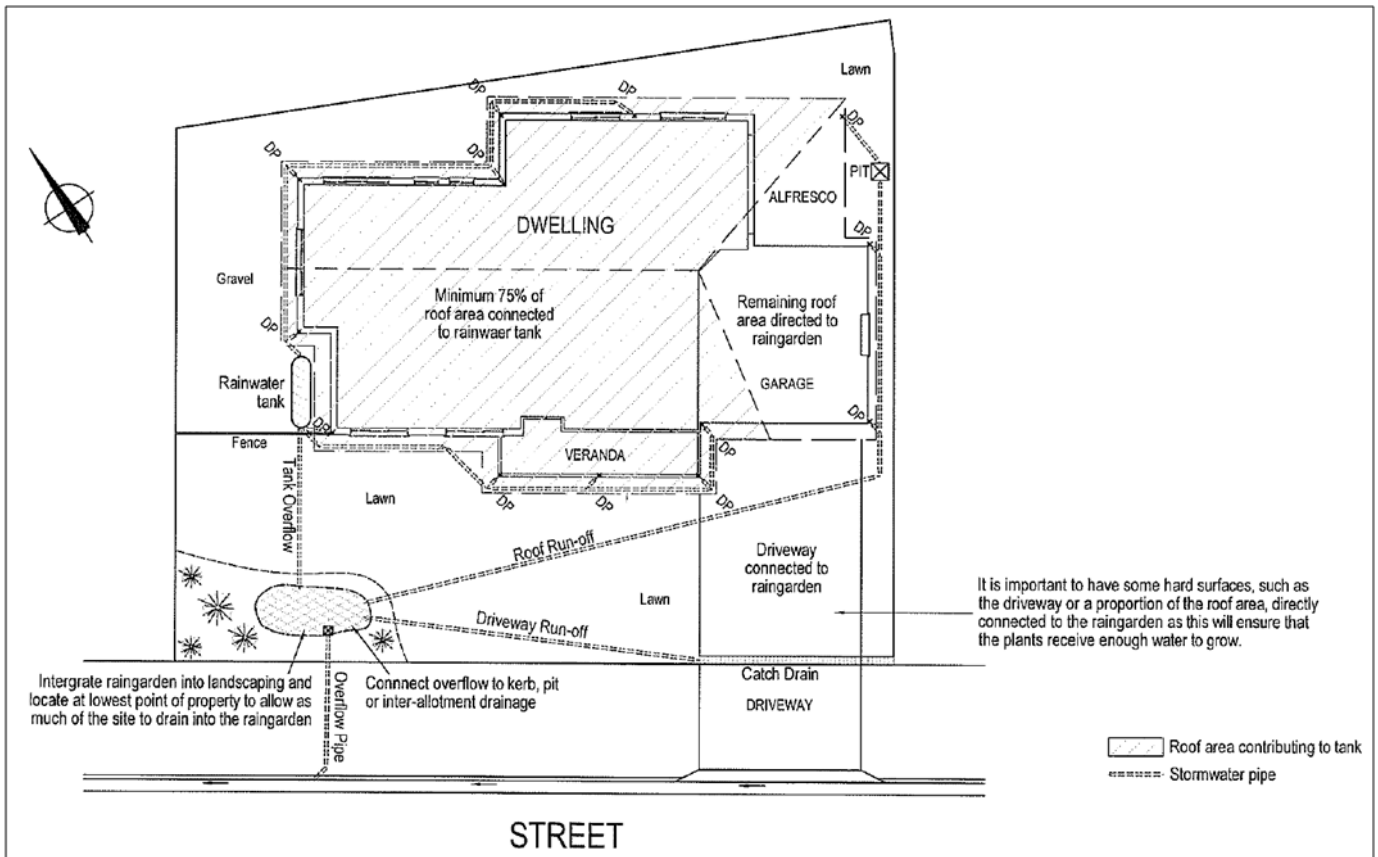
Controls

1. Water quality treatments are to be designed and constructed in accordance with Council's Water Sensitive Design Standard Plans. The Standard Plans are available from the Great Lakes section of Council's website at <http://midcoast.greatlakes.nsw.gov.au>
2. Raingardens should be located at the lowest point on the property to allow as much of the site as possible to drain into the raingarden, including the overflow from the rainwater tank.
3. A minimum of 75% of the roof area must be directed to the rainwater tank, with the remaining area directly connected to the raingarden. Except where the driveway is directly connected to the raingarden, in which case 100% of the roof area may be directed to the rainwater tank.
4. Raingardens are required to be connected to the existing stormwater network. Where this cannot be achieved, for example if the property has no inter-allotment drainage, the raingarden will need to be directed to an infiltration trench unless demonstrated by a suitably qualified engineer or equivalent that there is no negative impacts on current or future infrastructure.
5. The structural root zone and tree protection zone of trees that will be retained in the development should be avoided when locating the raingarden. Details on distances required are outlined in the Australian Standard AS4970-2009, 'Protection of trees on development sites'. As a rule of thumb, the area required to avoid both of these zones is the diameter of the tree at breast height (1.4m) x 12. If there is any excavation within either of these zones further input from an arborist is required.
6. A minimum of 50% of the surface area of a raingarden is required to be planted with a minimum of two species from Council's approved plant list which is available from Council's website at <http://www.midcoast.nsw.gov/Home>
7. The area of the raingarden is based on the surface area of the filter medium of the raingarden.
8. The driveway is directed to flow into the raingarden. Where site constraints prevent this, Council may accept the driveway being directed to an adjoining landscaped area within the property and the addition of 1m² to the applicable raingarden area, or the S3QM Model may be used to demonstrate compliance with the relevant Water Quality Targets.
9. The separation distance between a raingarden and existing or future building is a minimum of 5m. A raingarden that is proposed to be located closer than 5m will be required to be sealed by lining the base and sides with an impermeable liner (0.75mm HDPE or equivalent). In instances where there is no separation between a raingarden and an existing or future building, certification will be required by a suitably qualified engineer or equivalent to ensure measures are in place to prevent any damage to the building.
10. Where a raingarden is located within an area of high groundwater, i.e. groundwater is within 700mm of the ground surface, all assets are to be lined to prevent contamination of local groundwater sources unless it can be demonstrated, to Council's satisfaction, that unlined systems will sufficiently protect groundwater quality.
11. Where the slope from the tank overflow, downpipes, and driveway exceeds 10%, energy dissipation is required at the inlet to the raingarden (refer to Council's standard for Driveways).

Cross-section of a Raingarden - clay soils



Example Layout of a Raingarden



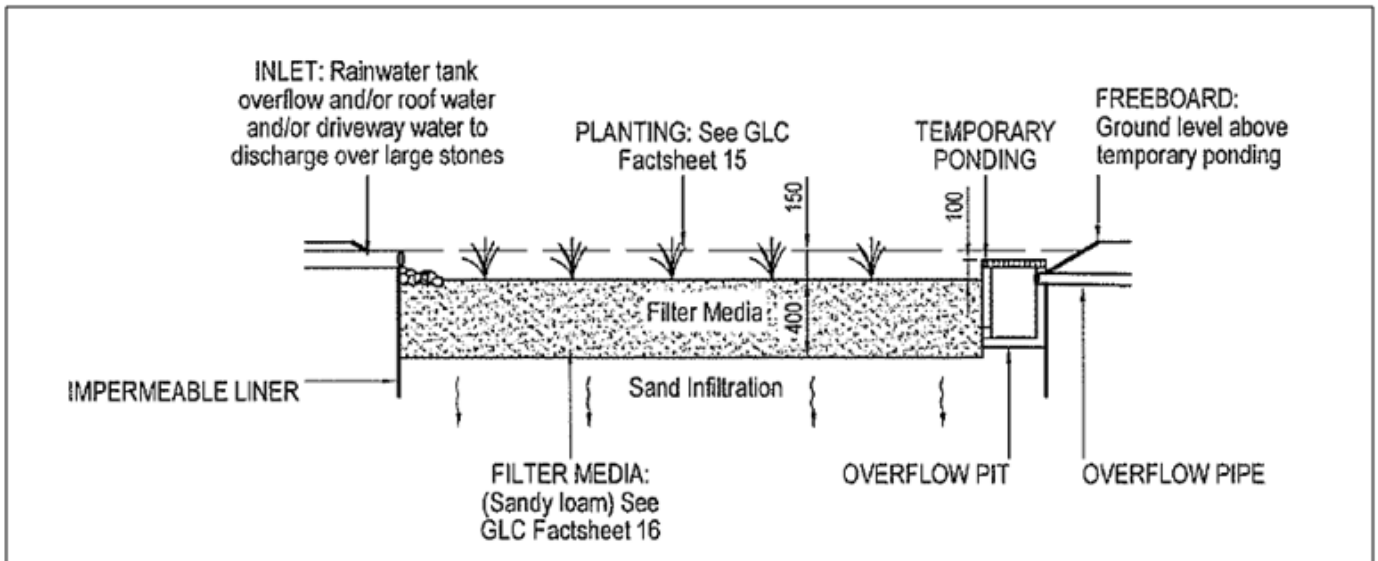
11.5.3 Infiltrating Raingarden - Sandy Soils

Controls

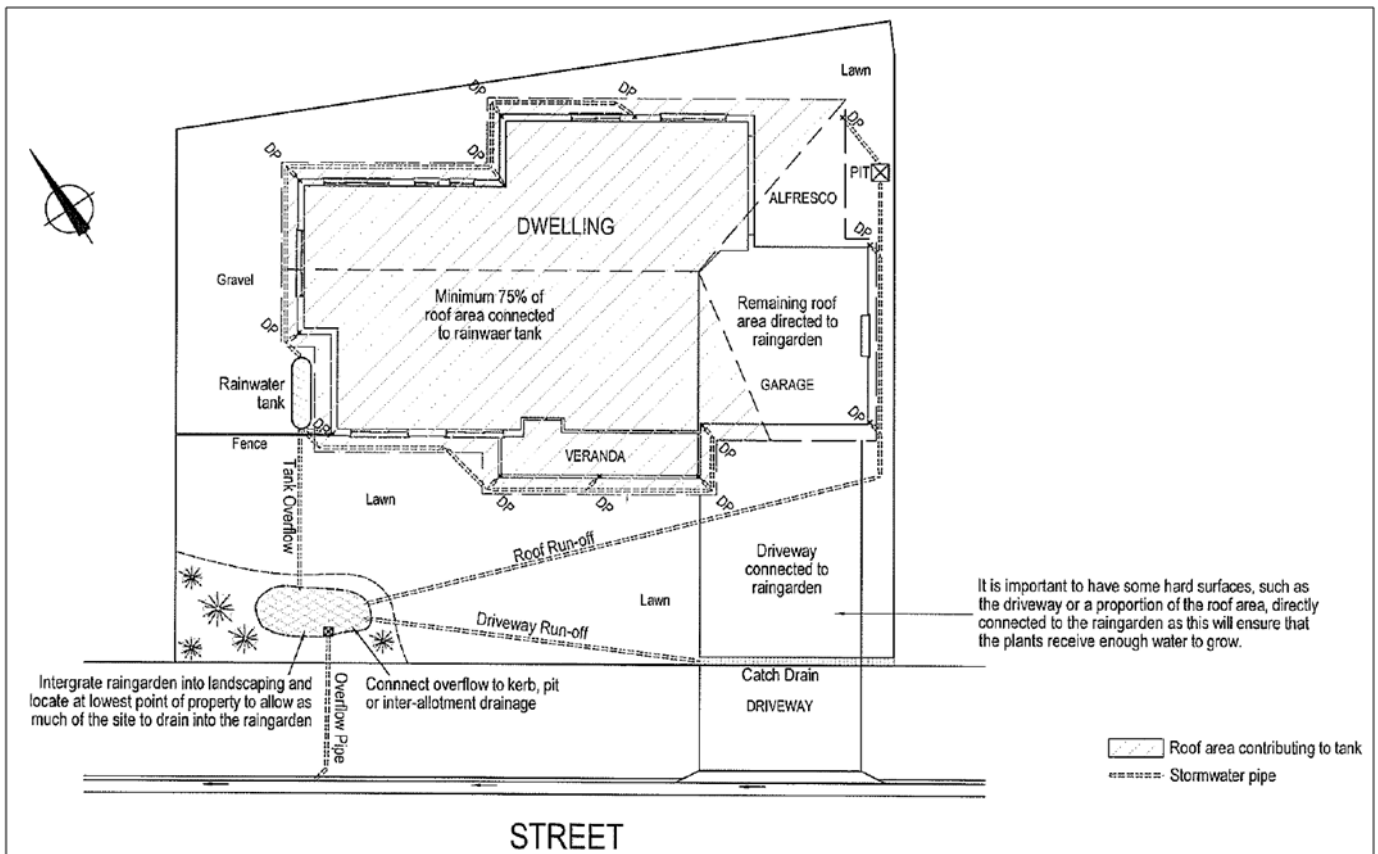
1. Water quality treatments are to be designed and constructed in accordance with Council's Water Sensitive Design Standard Plans. The Standard Plans are available from the Great Lakes section of Council's website at <http://www.midcoast.nsw.gov.au/Home>
2. Raingardens should be located at the lowest point on the property to allow as much of the site as possible to drain into the raingarden, including the overflow from the rainwater tank.
3. A minimum of 75% of the roof area must be directed to the rainwater tank, with the remaining area directly connected to the raingarden. Except where the driveway is directly connected to the raingarden, in which case 100% of the roof area may be directed to the rainwater tank.
4. Raingardens are required to be connected to the existing stormwater network. Where this cannot be achieved, for example if the property has no inter-allotment drainage, the raingarden will need to be directed to an infiltration trench unless demonstrated by a suitably qualified engineer or equivalent that there is no negative impacts on current or future infrastructure.
5. The structural root zone and tree protection zone of trees that will be retained in the development should be avoided when locating the raingarden. Details on distances required are outlined in the Australian Standard AS4970-2009, 'Protection of trees on development sites'. As a rule of thumb, the area required to avoid both of these zones is the diameter of the tree at breast height (1.4m) x12. If there is any excavation within either of these zones further input from an arborist is required.
6. A minimum of 50% of the surface area of a raingarden is required to be planted with a minimum of two species from Council's approved plant list which is available from Council's website at <http://www.midcoast.nsw.gov.au/Home> The remaining 50% can be planted with species of the owners choosing provided the plants can tolerate both wet and dry conditions.
7. The area of the raingarden is based on the surface area of the filter material used.
8. The driveway is directed to flow into the raingarden. Where site constraints prevent this, Council may accept the driveway being directed to an adjoining landscaped area within the property and the addition of 1m² to the applicable raingarden area, or the S3QM Model may be used to demonstrate compliance with the relevant Water Quality Targets.
9. Infiltrating raingardens are only appropriate on sandy soils. Evidence that the development will be constructed on sandy soils must be provided with your application.
10. Infiltrating raingardens cannot be used in areas of high groundwater, i.e. groundwater within 700mm of the ground surface and alternative water quality treatments will be required. If there is a potential for high groundwater, this will need to be investigated further through a geotechnical report.
11. Where the infiltrating raingarden is located along a property boundary, additional protection is required, a kerb or similar permanent water tight structure is to be constructed along the same boundary to ensure stormwater does not flow into the adjacent property.
12. In instances where there is no separation between the infiltrating raingarden and existing or future buildings, certification will be required by a suitably qualified engineer or equivalent to ensure measures are in place to prevent any damage to the adjoining building.
13. Where the slope between the raingarden inlet and the tank overflow, downpipes, and driveway exceeds 10%, energy dissipation is required at the inlet to the raingarden (refer to Council's Standard Plans).

14. Infiltrating raingardens must be lined with an impermeable liner (0.75mm HDPE or equivalent) so that stormwater travels down through the filter material and not out the sides into surrounding sands;
 - a. Sides are required to be lined to a total depth of 600mm, sitting 200mm below the filter material.
 - b. The bottom of the infiltrating raingarden is left free draining into the sandy sub-soils.
 - c. Where the infiltrating raingarden is located along a property boundary or less than 2m from a building, driveway or other infrastructure, the liner is to be extended to a total depth of 1m sitting 600mm below the depth of the filter media.
 - d. Where the infiltrating raingarden is located 1m or closer to a building, a certificate from a geotechnical engineer or structural engineer is to be submitted to the Certifying Authority demonstrating that the location of the poses no risk to existing or future buildings or that particular controls can be put in place to protect the building.

Cross-section of an Infiltrating Raingarden - sandy soils



Example Layout of a Raingarden

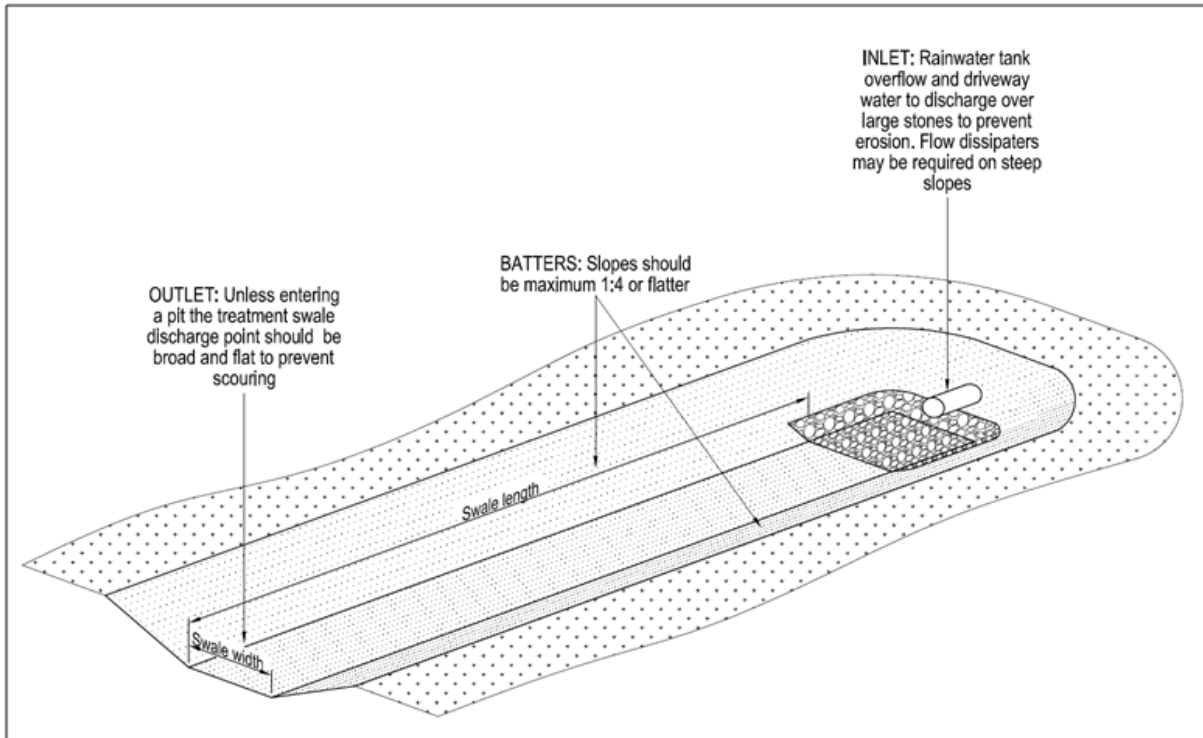


11.5.4 Swale

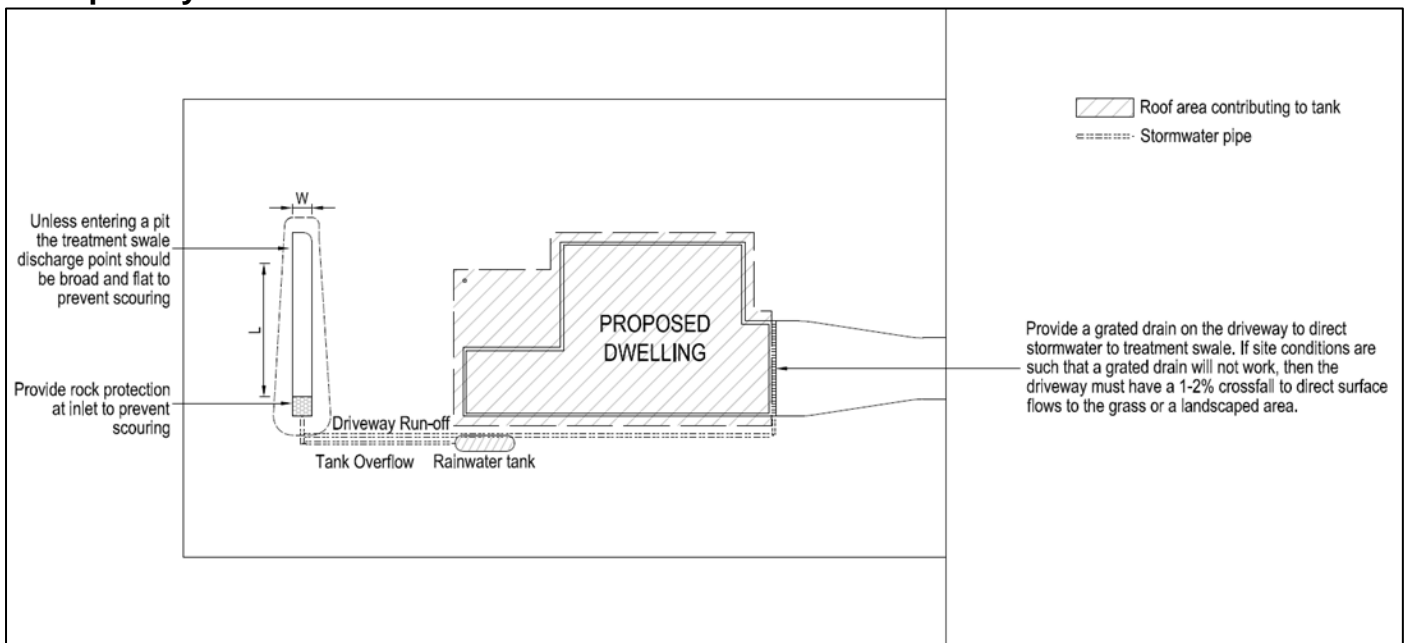
Controls

1. A swale must be constructed with a 1-5% fall.
2. A swale width is measured at the base.
3. Swales should be situated to prevent overflow towards existing or future infrastructure including any neighbouring properties.
4. Depending on the site conditions and proximity to existing or future infrastructure a swale will need to be discharged into one of the following:
 - a. existing stormwater network;
 - b. landscaped area; or
 - c. an infiltration trench.

Cross-section of a Swale



Example Layout of a Swale



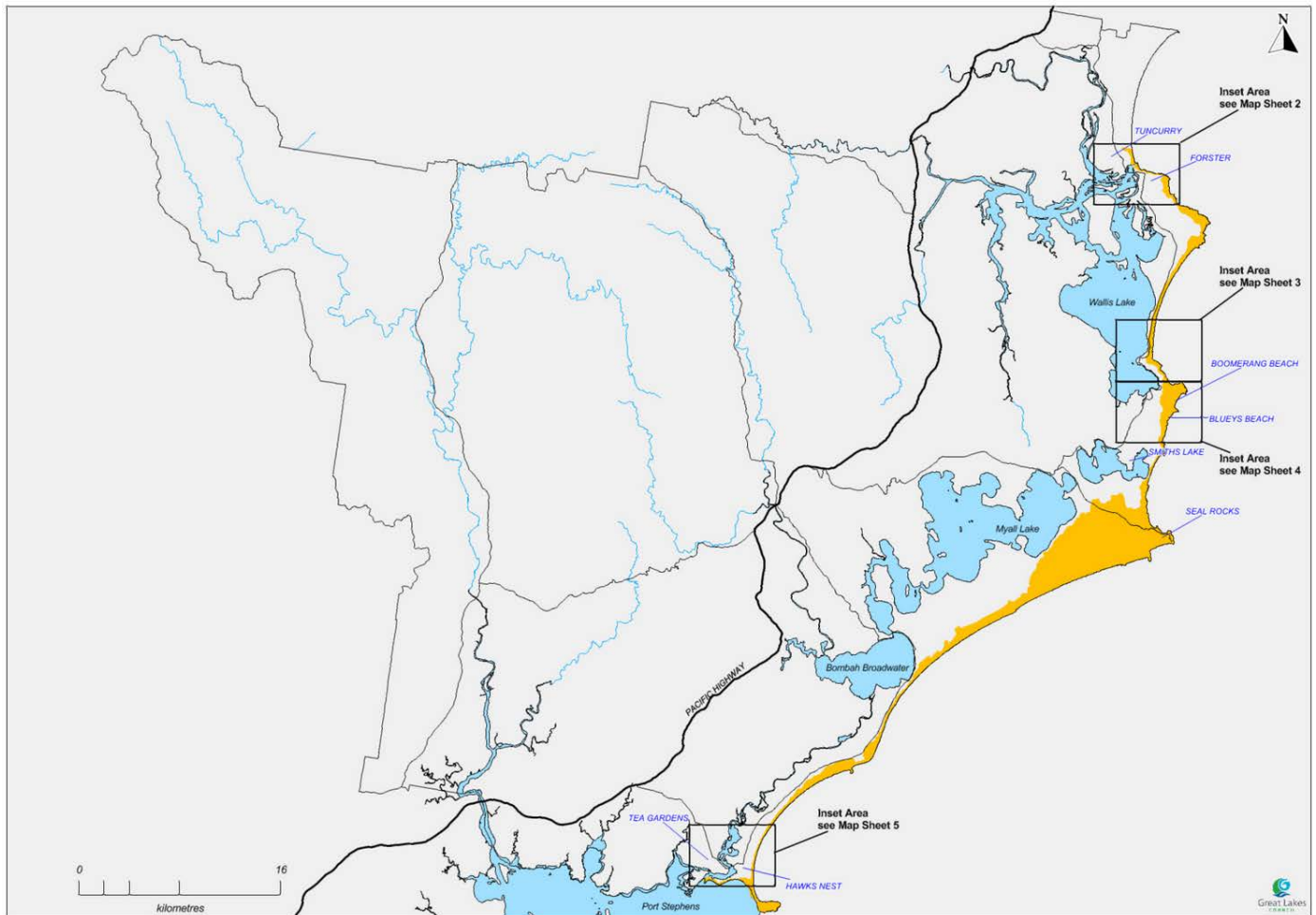
11.6 Appendices

11.6.1 Water Sensitive Design Catchment Areas

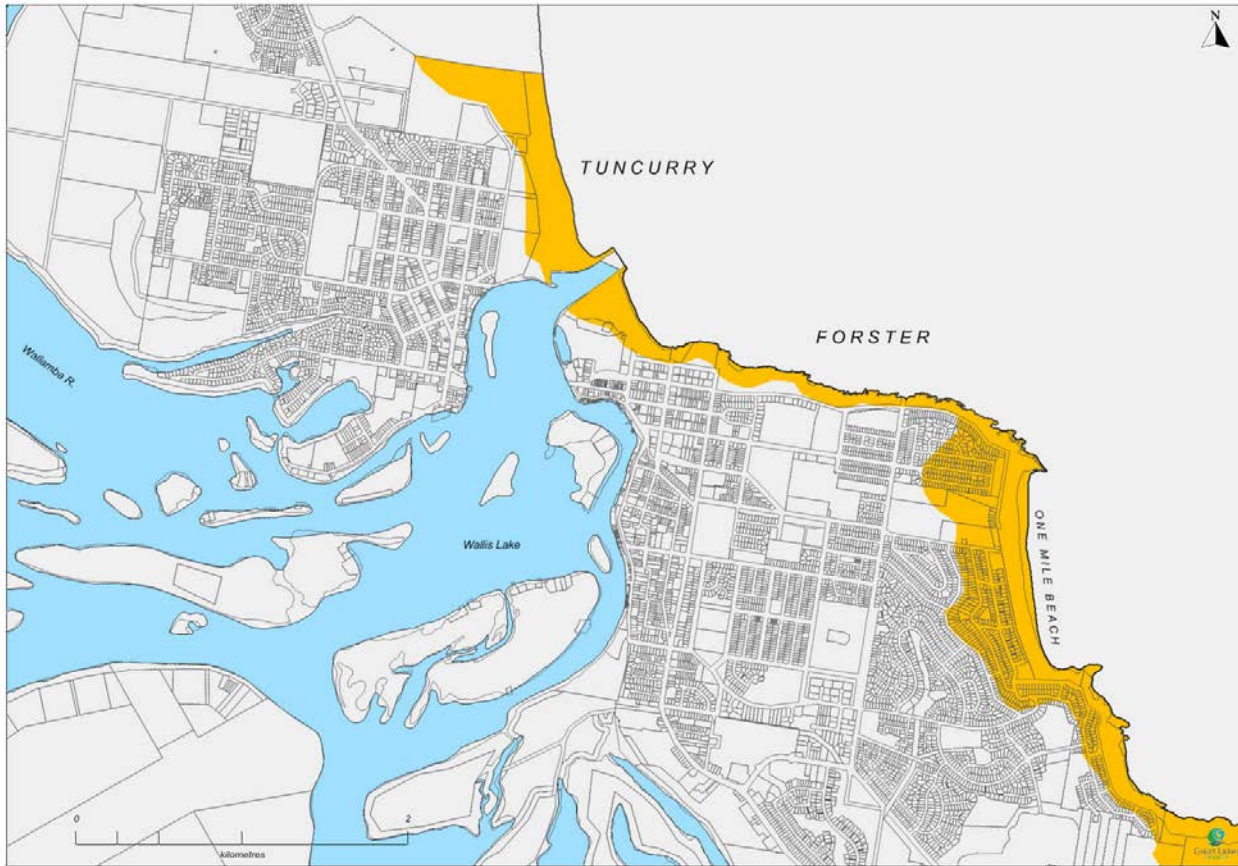
New development that occurs wholly within the Coastal Drainage area of the Water Sensitive Design Catchment Maps (refer to Water Sensitive Design Appendices) will be required to meet the Performance Target Reduction Loads the Stormwater Quality Targets table.

The Performance Target Reduction Loads for properties that are only partly affected by the Coastal Drainage Area in the Water Sensitive Design Catchment Maps (refer to Water Sensitive Design Appendices) will be determined in consultation with Council staff.

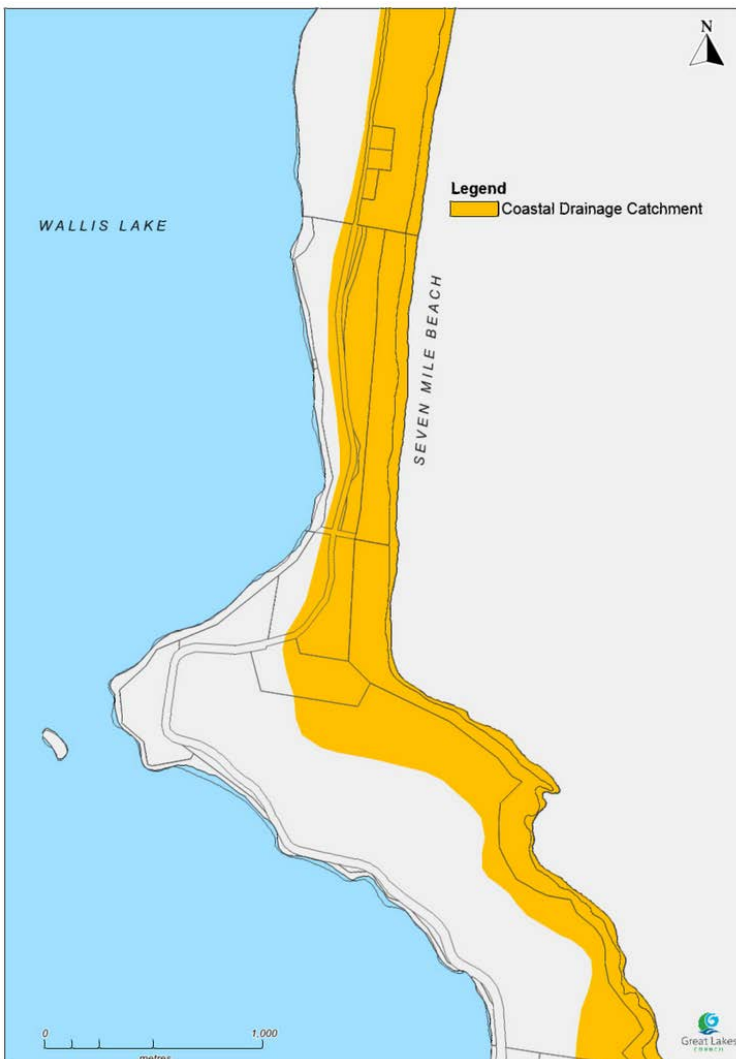
Overview of Water Sensitive Design Catchment Areas



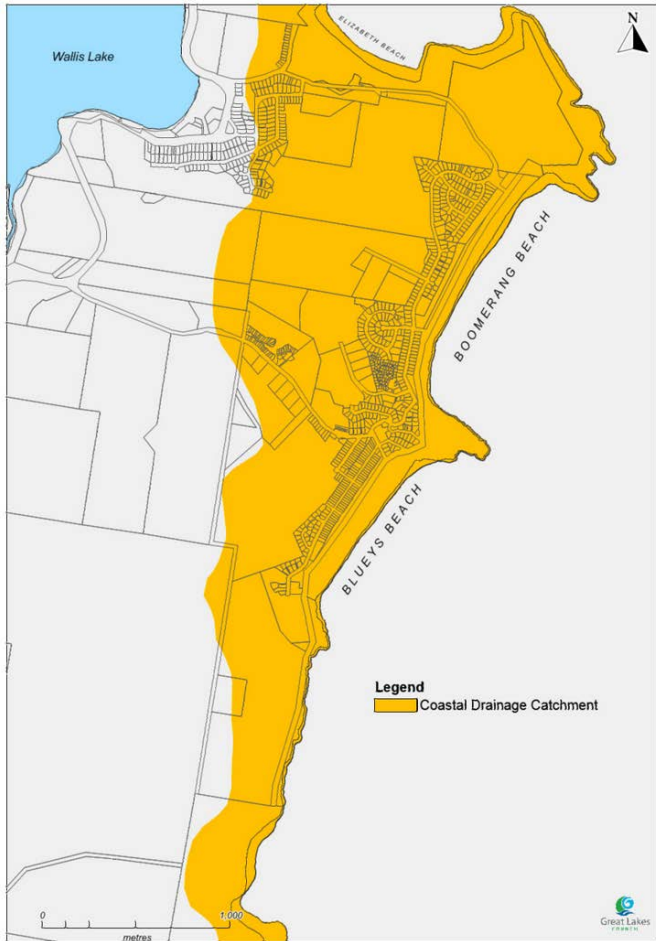
Map Sheet 2 - Tuncurry & Forster Area



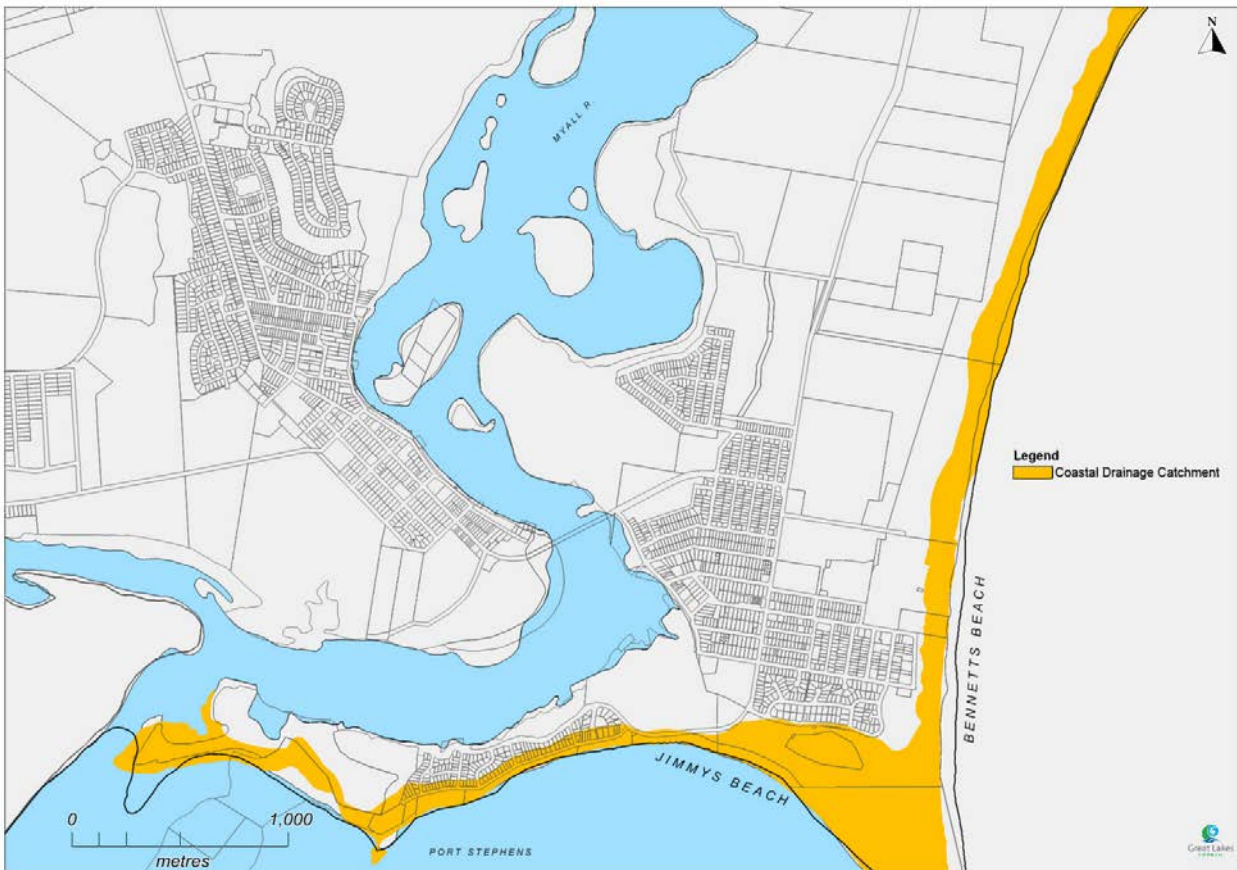
Map Sheet 3 - Seven Mile Beach



Map Sheet 4 - Pacific Palms Area



Map Sheet 5 - Hawks Nest Area



11.6.2 Guidance on Assessing Soil Texture

In applying the water quality requirements of this section, applicants will be required to determine the soil texture of their property. A simple field based technique can be used to determine soil texture shown in the table below.

Field soil texture classes

Texture Class	Coherence	Bolus Characteristics	Ribbon Length	Other Remarks
Sand	Nil to slight	Sandy to touch	Cannot be moulded	Single sand grains adhere to fingers
Sandy Loam	Slight	Sandy to touch	15 to 25mm	Medium and grains (dominant size) readily visible
Sandy Clay	Strong	Plastic to touch; fine to medium sand seen, felt or heard in a clayey matrix	50 to 75mm	
Clay	Strong	Plastic and smooth to touch, handles like plasticine	75mm and greater	Moulded into rods without fracture; moderate shearing resistance

Adapted from: Soil Conservation Commission of NSW, (1991), Soils Their Properties and Management, Sydney University Press in Association with Oxford University Press, Melbourne, Vic, (page 151).

11.6.3 Bushland Hydrology

Urban developments that drain to areas of natural bushland can cause significant erosion if the flows from those developments are not properly managed. The erosion hazard associated with such discharges is a function primarily of soil erodibility, slope and flow velocities. Stormwater systems proposed for developments adjacent to urban bushland areas should be designed to prevent or minimise the establishment of new discharge points and stormwater flow paths. Urban development proposals which drain to areas of natural bushland should also incorporate WSUD and stormwater treatment elements aimed at preventing or minimising erosion at or downstream of the discharge point. No specific targets have been set at this stage as the configuration of the outlets and the soil types requiring management vary considerably across the region.

Frequency of soil wetting within (i.e. discharge into) bushland areas has been identified as an additional significant hydrologic parameter relating to the provision of environmental conditions contributing to weed growth in areas of natural bushland. Stormwater treatment measures likely to minimise the discharge of weed propagules into bushland areas (through filtration provided by bioretention measures, for example) are therefore encouraged.