

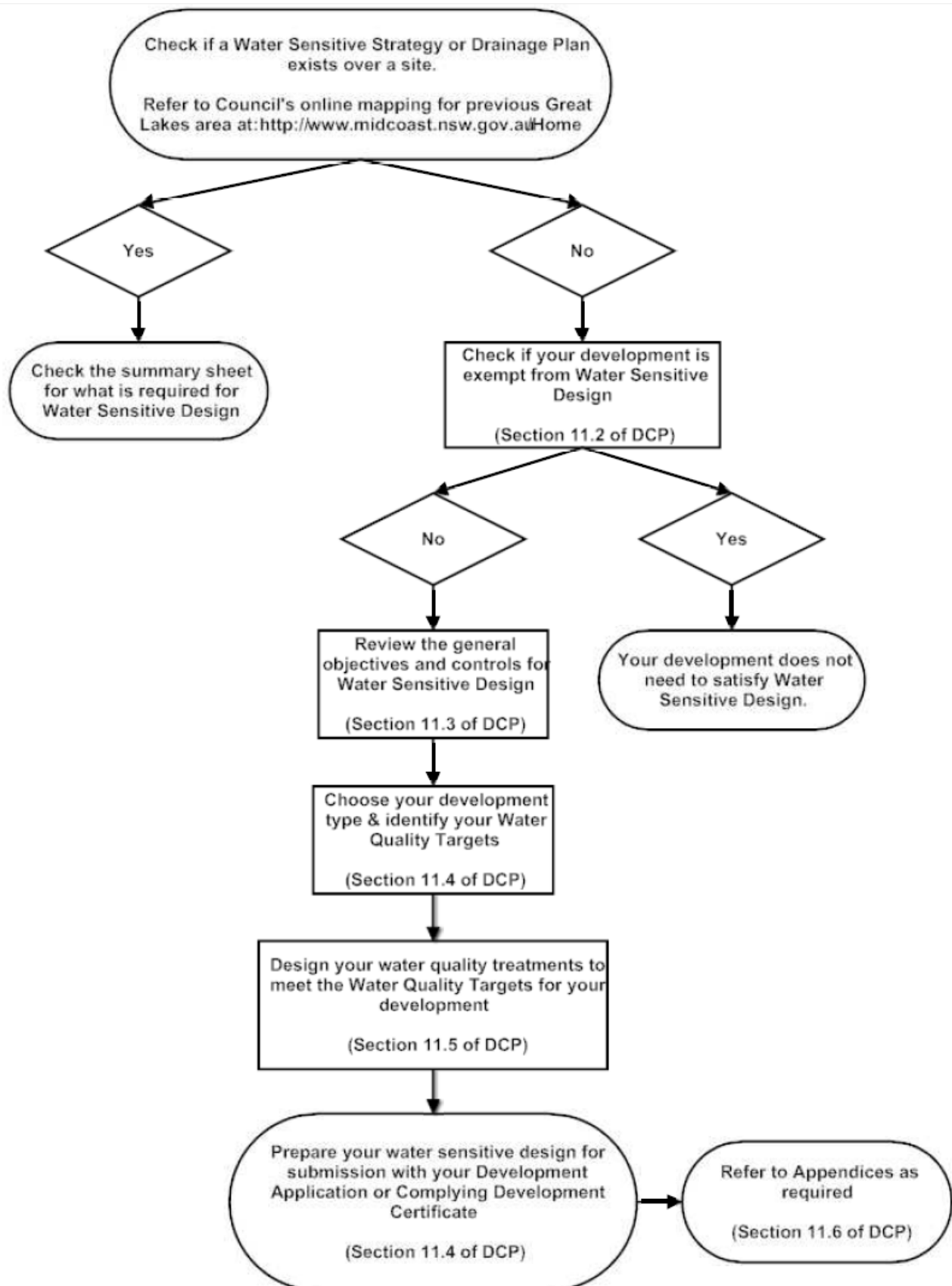
Draft Water Sensitive Design Section of Great Lakes Development Control Plan

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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.

Subdivision

Water Sensitive Design controls do not apply to;

1. boundary adjustments; or
2. Strata subdivision.

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
➤ 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

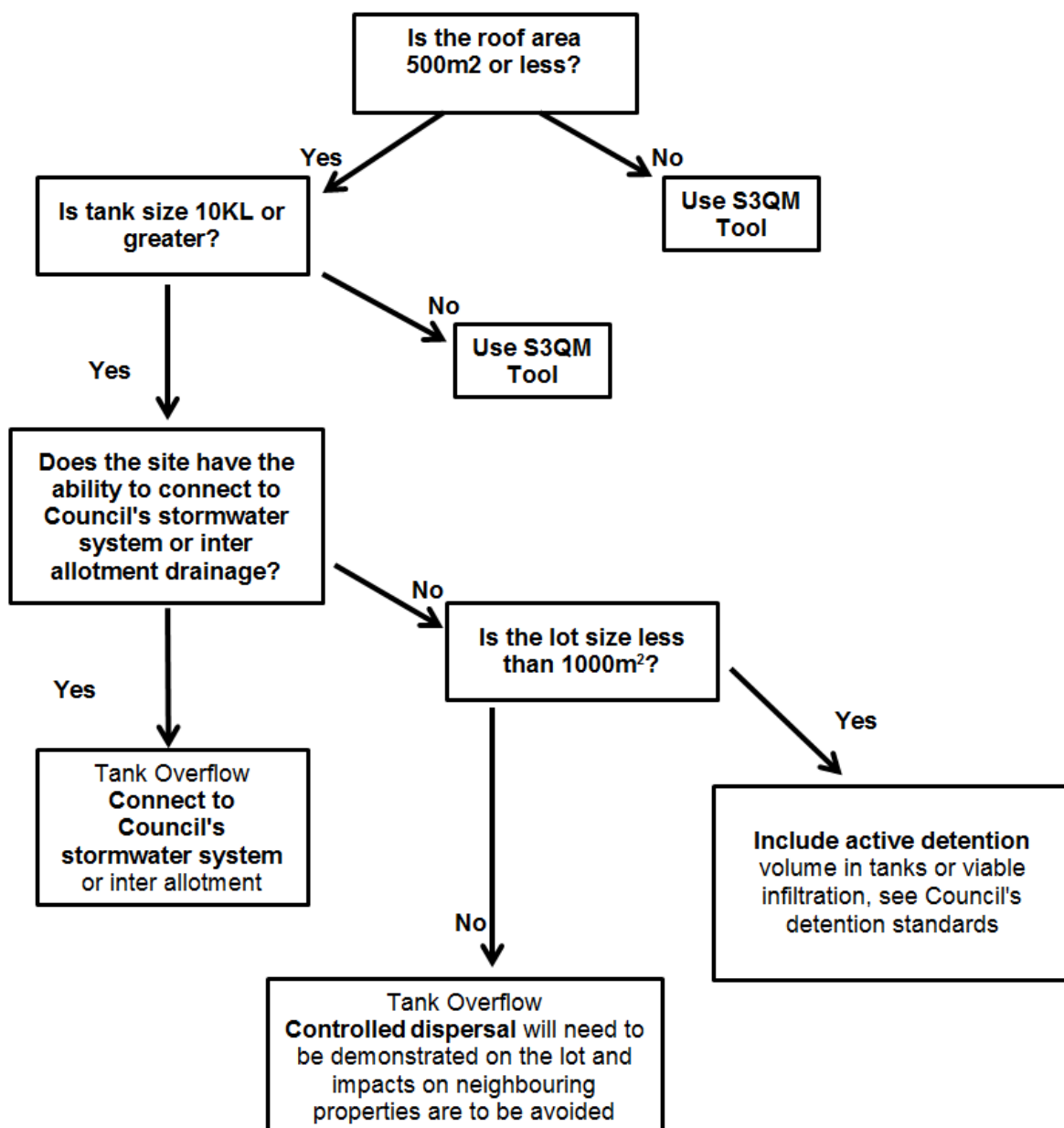
There are two options for calculating the treatments required to meet the Stormwater Quality Targets for building a house or dual occupancy on an un-serviced site;

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.

11.4.1.3 Serviced Sites (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 a serviced site;

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

1. 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.

2. The Deemed to Comply Solution (serviced sites)

The Deemed to Comply Solution that is set-out in the sizing table below is a simplified alternative that outlines the size of the raingarden needed based on lot size, roof area and tank size. 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 table cannot be used.
2. A minimum of 75% of the total roof area, including any proposed outbuildings, will be directed to the rainwater tank with the remaining area directly connected to the raingarden.
3. Where the lot size and roof size are not identical to the areas listed, use the next largest lot and / or roof size.
4. Driveways are required to be directed to flow into the raingarden. where site constraints prevent this, Council may accept the addition of 1m² to the applicable raingarden area and the driveway being directed to an adjoining landscaped area within the property, or the S3QM Model may be used to demonstrate compliance with the relevant Water Quality Targets.

Lot Size (m ²)	House Roof Area (m ²)	Minimum Rainwater Tank Size (kL)	Minimum Raingarden Area (m ²)
Measured by the legal property boundary except for R5 Rural Residential Zones which use development footprint, including the driveway, to calculate lot size.	A minimum of 75% of the total roof area, including any proposed outbuildings, will be directed to the rainwater tank with the remaining area directly connected to the raingarden.	Water from the rainwater tank is to be used outdoors, in the toilet and laundry.	Area is measured by the surface area of the filter material used.
400	150	2	4
400	200	2	5
400	150 - 200	3	4
400	150 - 200	5	4
400	150 - 200	10	3
500	150 - 200	2	5
500	250	2	6
500	150	3	4
500	200 - 250	3	5
500	150 - 200	5	4
500	250	5	5
500	150 - 250	10	4
600	150 - 250	2	6
600	300	2	8
600	150 - 200	3	5
600	250 - 300	3	6
600	150 - 250	5	5
600	300	5	6
600	150 - 200	10	4
600	250 - 300	10	5
800	200 - 300	2	8
800	400	2	10
800	500	2	12
800	200	3	6
800	250 - 400	3	8
800	500	3	10
800	200 - 250	5	6
800	300 - 400	5	8

800	500	5	10
800	200 - 300	10	6
800	400 - 500	10	8
1000	200 - 250	2	8
1000	300 - 400	2	10
1000	500	2	12
1000	200 - 300	3	8
1000	400	3	10
1000	500	3	12
1000	200 - 300	5	8
1000	400 - 500	5	10
1000	200 - 400	10	8
1000	500	10	10

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).

11.4.2 Subdivision

11.4.2.1 Stormwater Quality Targets

Note: sites that are part of a Council approved Stormwater Strategy or Management 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>

Site Characteristics	Target Reduction Loads (based on increased pollution generated from development without treatment)			
	Gross pollutants	Total Suspended Solids	Total Phosphorus	Total Nitrogen
Lots over 2500m ² in size where the percentage of existing impervious surface is less than 10% of the area. ➤ Lot size is calculated over the parent lot prior to subdivision. This means development cannot be broken down into stages for the purposes of measuring the 2,500m ² threshold.	90%	Neutral or Beneficial Effect on Water Quality - meaning loads of pollutants from future development must be equivalent to or less than that from the existing land use prior to development.		
➤ Lots less than 2,500m ² in size <u>or</u> where the percentage of existing impervious surface is <u>greater</u> than 10% of the area (regardless of lot size). ➤ Development located within the Coastal Drainage Areas (refer to Catchment Maps in Appendices). Where development is partially located within a Coastal Drainage Area, targets are to be determined in consultation with Council Staff.	90%	80%	60%	45%

11.4.2.2 Minor - results in a total of 3 Lots

For minor subdivision, Water Quality Targets are identified based on the parent lot prior to subdivision but it is expected that the construction of the water sensitive design measures will occur on the individual lots at the time of further development. To ensure that WSD can be achieved on the proposed lots a stormwater drainage plan will be required at the subdivision stage.

Application Requirements

At a minimum, the stormwater drainage plan is to:

- Identify the applicable water quality targets.
- Demonstrate how WSD infrastructure on each block will drain to Council's stormwater infrastructure / system in a concept stormwater drainage plan that has been prepared by an Engineer.

11.4.2.3 Major - results in over 3 Lots

A Water Sensitive Design Strategy based on MUSIC modelling will be required to address water quality over the parent lot for the entire development when fully operational. This means development cannot be broken down into stages. On-lot treatments, apart from rainwater tanks, will not be considered except in the R5 Large Lot Residential Zone where Council is satisfied there are no other practical alternatives.

Water Sensitive Design Strategy

A Water Sensitive Design Strategy (WSDS) is a written report detailing management of water quality during and after development. It also outlines the stormwater quantity and integrated water cycle management measures that are to be implemented on the development site. At a minimum, the Strategy is to include the following detail:

1. **Background information** - include any relevant previous studies, concurrent studies and mapping data.
2. **Site context** - identify sub-catchments, surface and subsurface hydrology, soil type, topography and receiving environments (both within and downstream of the site). This should also include characteristics of the ecological values of the site and receiving environments.
3. Identify the hydrological requirements needed to maintain the existing flow regimes of receiving environments.
4. **Proposed development** - describe the proposed development at the site, including site boundaries, proposed land uses, densities, population, infrastructure, development staging.
5. **Water Quality Targets** - include the applicable water quality targets that apply to the proposed development.
6. **Constraints and opportunities** - identify the key constraints and opportunities for water management on the site, including flooding. This should include the identification of natural watercourses other sensitive environments within the site should be preserved and / or remediated by the development.
7. **Best planning practices** - the capital and life-cycle costs of infrastructure required to meet the Water Quality Targets can be minimised by considering site planning opportunities early in the planning process, such as development layouts, integration with open space, riparian zones etc. If left to the end of the planning process, it can be far more difficult and costly to incorporate the required treatments. The applicant should therefore show how the planning of the development has considered the WSD measures at all stages of the process. Opportunities for multiple use of stormwater infrastructure should be investigated for example the water quality benefits of modified detention basins and unlined, vegetated channels.
8. A conceptual soil and water management plan (SWMP) for the construction stage prepared in accordance with the 'Blue Book Volume 1' (Landcom 2004) and the 'Blue Book Volume 2' (DECC 2008). As a minimum the plan must contain;
 - a. Detailed calculations to determine the soil loss and the size of any sediment basins that may be required;
 - b. Design standard for drainage control;
 - c. Location, size, timing and diagrams of all erosion control and sediment control measures;
 - d. Locations, calculations and engineering details of any sediment basins;
 - e. Design to achieve the construction phase water quality objectives;
 - f. Site maintenance and monitoring;
 - g. Audit reporting; and
 - h. Roles and responsibilities.
9. **Integrated Water Cycle Management** - this section should demonstrate how the potable water will be supplemented with roof water, treated stormwater and / or wastewater. Source control rainwater and capture and reuse should be considered for all developments prior to large scale infrastructure.
10. **Stormwater management** - this section should demonstrate how the Water Quality Targets and applicable flow regimes for receiving environments will be met. The following details are required to be submitted;

- a. A description of the proposed stormwater treatment measures and their location and, where relevant, the size of the sub-catchment that will drain to the facility.
 - b. Specific design elements including the hydraulic basis for sizing, dimensions of the stormwater treatment measures and access arrangement for maintenance.
 - c. It should include stormwater quality and flow modelling results and identify the location, size and configuration of stormwater treatment measures proposed for the development. Consideration should be given to quality and quantity across the frequency spectrum from quarterly (0.25 year ARI) treatment flows up to the safe control of 100 year ARI discharges to ensure appropriate levels of risk (probability of damage).
11. **MUSIC Water Quality Model** -
- a. Modelling for the determination of the size and configuration of WSD elements must utilise MUSIC modelling. Modelling must be calibrated and in accordance with the Draft NSW MUSIC Modelling Guidelines - August 2010 (or later version);
 - b. Where the Water Quality Targets are neutral or beneficial effect, the model should accurately represent site conditions, i.e. before and after development using appropriate source and treatment nodes. It is recommended for major subdivision that discussions are held with Council to determine pre-existing site conditions prior to undertaking the MUSIC modelling;
 - c. Details of all assumptions that have been adopted in the MUSIC model such as proportion of impervious surfaces, notional dwelling sizes and landscaped areas; and
 - d. An electronic copy of the MUSIC model must accompany the Development Application.
12. **Integration with the urban design** - demonstrate how Water Sensitive Design elements will integrate with the urban design.
13. **Costs** - prepare operation and maintenance cost estimates of proposed water cycle management measures. Both typical annual maintenance costs and corrective maintenance or renewal / adaptation costs should be included.
14. **Operation and Maintenance Plan** - this will outline inspection and maintenance requirements to ensure proposed measures remain effective. Examples of maintenance check lists are also available from Council.
15. All WSD Strategies and development applications containing WSD elements must comply with;
- a. Australian Standard 3500:2003, 'Plumbing and Drainage,' Standards Australia, 2003
 - b. Any other applicable standard pertaining to the relevant discipline for example Landscaping, Civil Design, Road Construction etc.

Additional assistance in the preparation of a Water Sensitive Design Strategy is available on Council's website at <http://www.greatlakes.nsw.gov.au/Home>

Application Requirements

Developments that require a WSD Strategy will need to include the Strategy and MUSIC modelling as part of a Development Application along with the completed checklist for large scale developments (available from Council's website). Additional assistance in the preparation of a Water Sensitive Design Strategy is available from Council's website along with examples of how to apply the development requirements from this section to large scale developments.

11.4.3 Intensive Livestock Agriculture or Intensive Plant Agriculture

Stormwater Quality Targets

Note: sites that are part of a Council approved Stormwater Strategy or Management 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">➤ Intensive Livestock Agriculture➤ Intensive Plant Agriculture	90%	80%	60%	45%
Tip: check the dictionary in the Great Lakes Local Environmental Plan 2014 for definitions of Intensive Livestock Agriculture and Intensive Plan Agriculture - http://www.legislation.nsw.gov.au				

Water Sensitive Design Strategy (Intensive Livestock Agriculture and Intensive Plant Agriculture)

Intensive Livestock Agriculture and Intensive Plant Agriculture is defined within the dictionary of the Great Lakes Local Environmental Plan 2014 and requires a Water Sensitive Design Strategy specific to this form of development.

A Water Sensitive Design Strategy (WSDS) is a written report detailing management of water quality for the proposed development. The requirements for the strategy will depend on the nature and scale of the development and it is recommended that discussions are held with Council prior to submitting an application. Expert agronomic and water quality advice may be required to develop the Water Sensitive Design Strategy. As a minimum, the Water Sensitive Design Strategy is to include the following detail:

1. **Site context** - identify sub-catchments, surface and subsurface hydrology, soil type and nutrient status, topography and receiving environments (both within and downstream of the site). Include any relevant previous studies.
2. **Proposed development** - describe the proposed development at the site, including site boundaries, land uses, livestock densities (where relevant), nutrient application rates (where relevant), operational strategies (e.g. paddock rotation) and infrastructure.
3. **Stormwater management** - this section should demonstrate how the Water Quality Targets will be met. Depending on the scale and nature of the development the following details are to be submitted;
 - a. a nutrient budget for the site based on the soil type and nutrient status;
 - b. a description of the proposal land management practices and stormwater treatment measures and their location;
 - c. justification for the proposed land management practices and stormwater treatment measures based on agronomic advice and stormwater quality results of MUSIC modelling (or similar). Details of all assumptions that have been used in the assessment must be included.

Application Requirements

Developments that require a WSD Strategy will need to include the Strategy as part of a Development Application along with the completed checklist for large scale developments (available from Council's website). Additional assistance in the preparation of a Water Sensitive Design Strategy is available from Council's website along with examples of how to apply the development requirements from this section to large scale developments.

11.4.4 Other Development - excluding Single Dwelling, Dual Occupancy, Subdivision and Intensive Livestock Agriculture or Intensive Plant Agriculture

11.4.4.1 Stormwater Quality Targets

Note: sites that are part of a Council approved Stormwater Strategy or Management 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>

Site Characteristics	Target Reduction Loads (based on increased pollution generated from development without treatment)			
	Gross pollutants	Total Suspended Solids	Total Phosphorus	Total Nitrogen
<p>Lots over 2500m² in size where the percentage of existing impervious surface is less than 10% of the area.</p> <p>➤ Lot size is calculated over the parent lot prior to subdivision. This means development cannot be broken down into stages for the purposes of measuring the 2,500m² threshold.</p>	90%	Neutral or Beneficial Effect on Water Quality - meaning loads of pollutants from future development must be equivalent to or less than that from the existing land use prior to development.		
<p>➤ Lots less than 2,500m² in size or where the percentage of existing impervious surface is <u>greater</u> than 10% of the area (regardless of lot size).</p> <p>➤ Development located within the Coastal Drainage Areas (refer to Catchment Maps in Appendices). Where development is partially located within a Coastal Drainage Area, targets are to be determined in consultation with Council Staff.</p>	90%	80%	60%	45%

Water Sensitive Design Assessment Method

1. Properties that have an area of 2,500m² or less (as defined by the legal property description) are generally assessed using the Small Scale Stormwater Quality Model (S3QM).
2. Properties that have an area that is greater than 2,500m² in area (as defined by the legal property description) are generally required to submit a Water Sensitive Design Strategy based on MUSIC modelling.
3. Instances where Council considers the development density or location to pose an increased risk of environmental impacts may be required to submit a Water Sensitive Design Strategy based on MUSIC modelling regardless of lot size.

11.4.4.2 Lots less than 2,500m² in size

The Small Scale Stormwater Quality Model (S3QM)

The S3QM is an online tool that 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.

Application Requirements

Developments that are using 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. 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.
- The "Certificate" issued by the Small Scale Stormwater Quality 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).

11.4.4.3 Lots over 2,500m² in size

Water Sensitive Design Strategy

A Water Sensitive Design Strategy (WSDS) is a written report detailing management of water quality during and after development. It also outlines the stormwater quantity and integrated water cycle management measures that are to be implemented on the development site. At a minimum, the Strategy is to include the following detail:

1. **Background information** - include any relevant previous studies, concurrent studies and mapping data.
2. **Site context** - identify sub-catchments, surface and subsurface hydrology, soil type, topography and receiving environments (both within and downstream of the site). This should also include characteristics of the ecological values of the site and receiving environments.
3. Identify the hydrological requirements needed to maintain the existing flow regimes of receiving environments.
4. **Proposed development** - describe the proposed development at the site, including site boundaries, proposed land uses, densities, population, infrastructure, development staging.
5. **Water Quality Targets** - include the applicable water quality targets that apply to the proposed development.
6. **Constraints and opportunities** - identify the key constraints and opportunities for water management on the site, including flooding. This should include the identification of natural watercourses other sensitive environments within the site should be preserved and / or remediated by the development.
7. **Best planning practices** - the capital and life-cycle costs of infrastructure required to meet the Water Quality Targets can be minimised by considering site planning opportunities early in the planning process, such as development layouts, integration with open space, riparian zones etc. If left to the end of the planning process, it can be far more difficult and costly to incorporate the required treatments. The applicant should therefore show how the planning of the development has considered the WSD measures at all stages of the process. Opportunities for multiple use of stormwater infrastructure should be investigated for example the water quality benefits of modified detention basins and unlined, vegetated channels.
8. A conceptual soil and water management plan (SWMP) for the construction stage prepared in accordance with the 'Blue Book Volume 1' (Landcom 2004) and the 'Blue Book Volume 2' (DECC 2008). As a minimum the plan must contain;
 - a. Detailed calculations to determine the soil loss and the size of any sediment basins that may be required;
 - b. Design standard for drainage control;
 - c. Location, size, timing and diagrams of all erosion control and sediment control measures;
 - d. Locations, calculations and engineering details of any sediment basins;
 - e. Design to achieve the construction phase water quality objectives;
 - f. Site maintenance and monitoring;
 - g. Audit reporting; and
 - h. Roles and responsibilities.
9. **Integrated Water Cycle Management** - this section should demonstrate how the potable water will be supplemented with roof water, treated stormwater and / or wastewater. Source control rainwater and capture and reuse should be considered for all developments prior to large scale infrastructure.
10. **Stormwater management** - this section should demonstrate how the Water Quality Targets and applicable flow regimes for receiving environments will be met. The following details are required to be submitted;
 - a. A description of the proposed stormwater treatment measures and their location and, where relevant, the size of the sub-catchment that will drain to the facility.
 - b. Specific design elements including the hydraulic basis for sizing, dimensions of the stormwater treatment measures and access arrangement for maintenance.
 - c. It should include stormwater quality and flow modelling results and identify the location, size and configuration of stormwater treatment measures proposed for the development. Consideration

should be given to quality and quantity across the frequency spectrum from quarterly (0.25 year ARI) treatment flows up to the safe control of 100 year ARI discharges to ensure appropriate levels of risk (probability of damage).

11. MUSIC Water Quality Model -

- a. Modelling for the determination of the size and configuration of WSD elements must utilise MUSIC modelling. Modelling must be calibrated and in accordance with the Draft NSW MUSIC Modelling Guidelines - August 2010 (or later version);
- b. Where the Water Quality Targets are neutral or beneficial effect, the model should accurately represent site conditions, i.e. before and after development using appropriate source and treatment nodes. It is recommended for major subdivision that discussions are held with Council to determine pre-existing site conditions prior to undertaking the MUSIC modelling;
- c. Details of all assumptions that have been adopted in the MUSIC model such as proportion of impervious surfaces, notional dwelling sizes and landscaped areas; and
- d. An electronic copy of the MUSIC model must accompany the Development Application.

12. Integration with the urban design - demonstrate how Water Sensitive Design elements will integrate with the urban design.

13. Costs - prepare operation and maintenance cost estimates of proposed water cycle management measures. Both typical annual maintenance costs and corrective maintenance or renewal / adaptation costs should be included.

14. Operation and Maintenance Plan - this will outline inspection and maintenance requirements to ensure proposed measures remain effective. Examples of maintenance check lists are also available from Council.

15. All WSD Strategies and development applications containing WSD elements must comply with;

- a. Australian Standard 3500:2003, 'Plumbing and Drainage,' Standards Australia, 2003;
- b. Any other applicable standard pertaining to the relevant discipline for example Landscaping, Civil Design, Road Construction etc.

Additional assistance in the preparation of a Water Sensitive Design Strategy is available on Council's website at <http://www.greatlakes.nsw.gov.au/Home>

Application Requirements

Developments that require a WSD Strategy will need to include the Strategy and MUSIC modelling as part of a Development Application along with the completed checklist for large scale developments (available from Council's website). Additional assistance in the preparation of a Water Sensitive Design Strategy is available from Council's website along with examples of how to apply the development requirements from this section to large scale developments.

11.5 Design of Water Quality Treatments

11.5.1 Water Sensitive Design Strategy and MUSIC Modelling

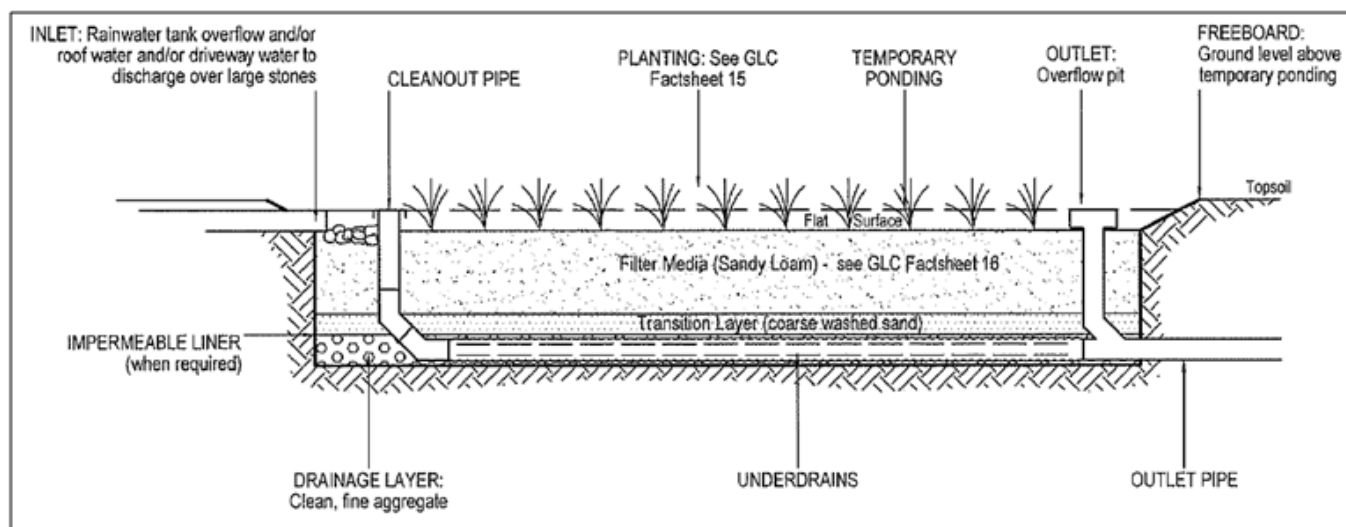
Sites that have a Water Sensitive Design Strategy based on MUSIC modelling generally employ a broad range of water quality treatments and the design of the water quality treatments are developed as part of a strategy. A stormwater plan, detailing the design and location of the proposed treatments will need to be submitted to Council with the development application.

11.5.2 Raingarden - Clay Soils

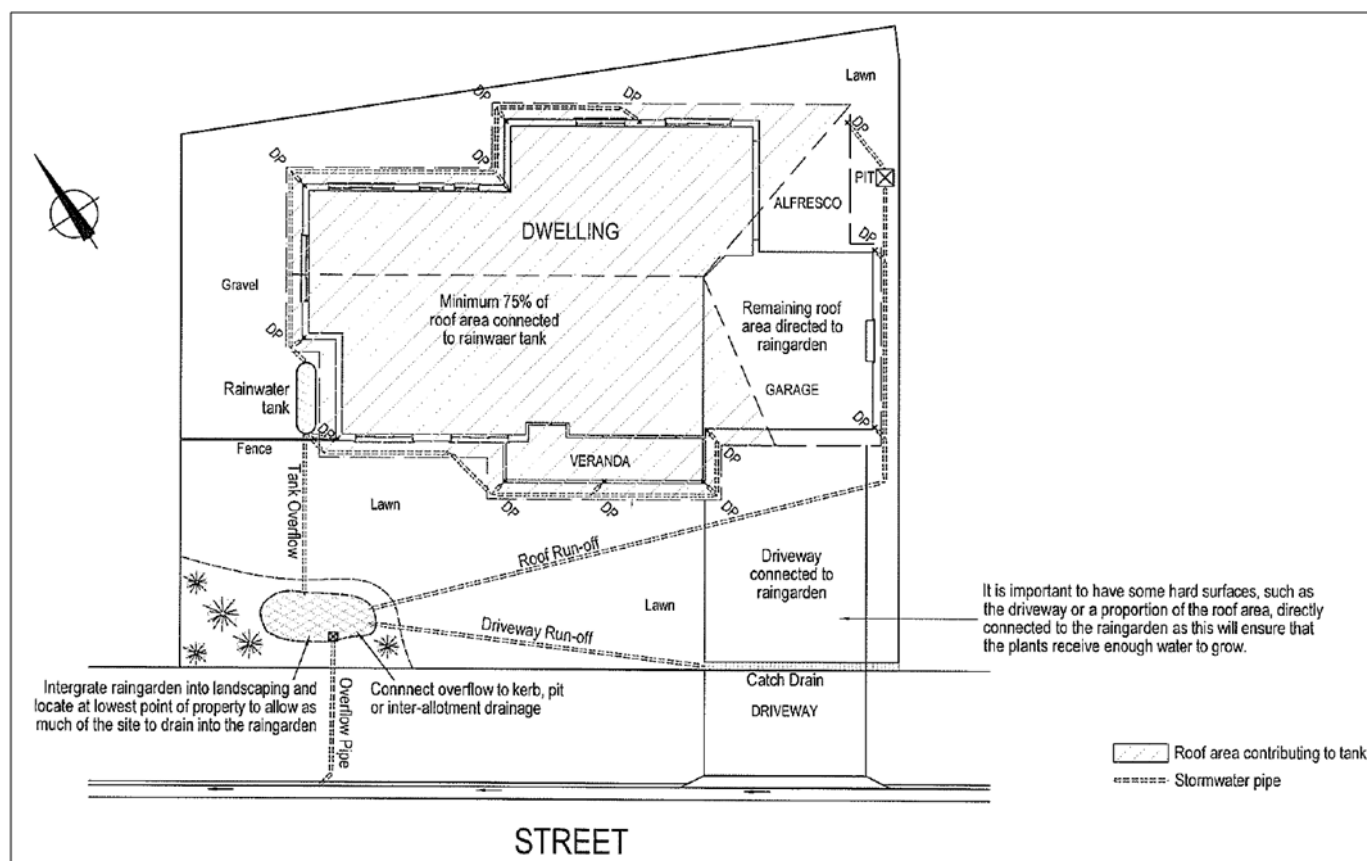
Controls

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



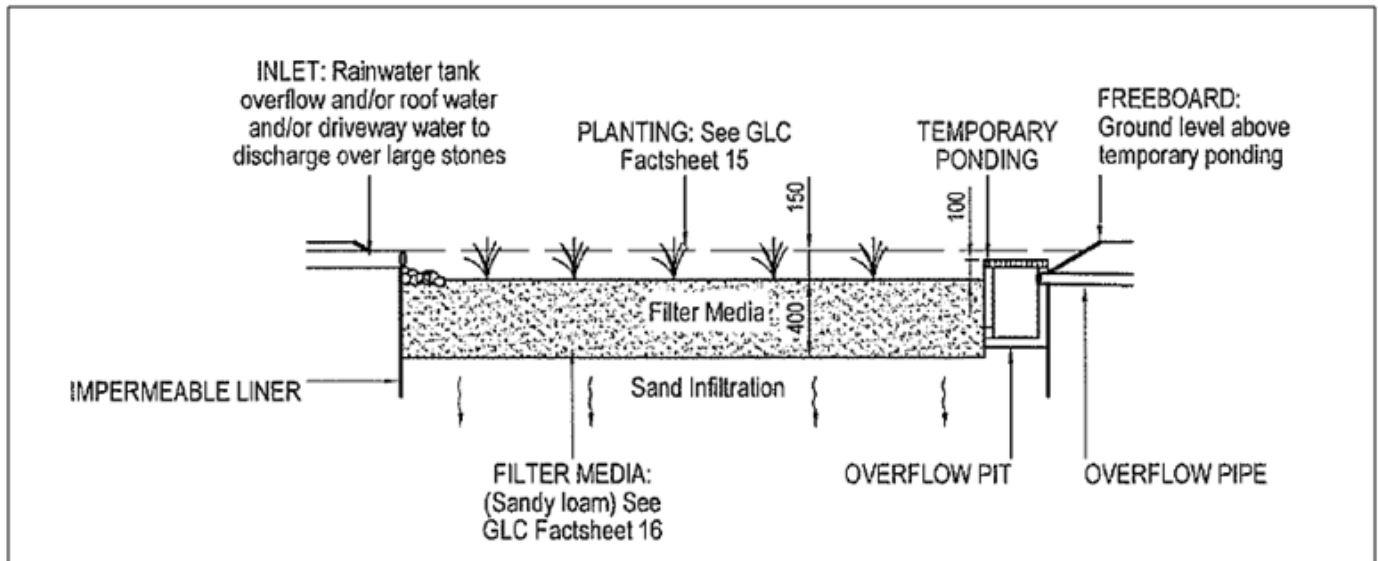
11.5.3 Infiltrating Raingarden - Sandy Soils

Controls

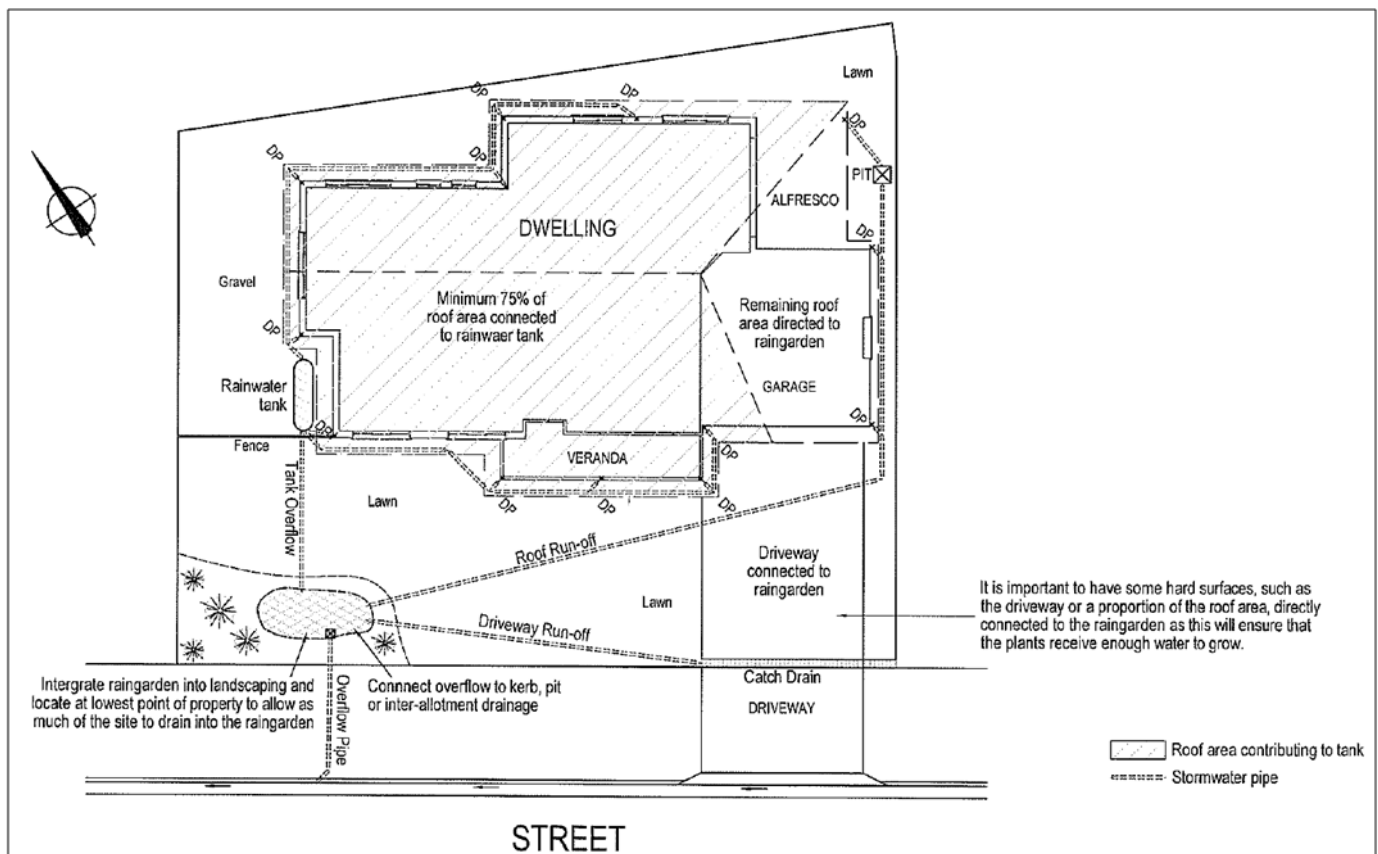
1. Water quality treatments are to be designed and constructed in accordance with Council's Water Sensitive Design Standard Plans. The Standard Plans are available from the Great Lakes section of Council's website at <http://www.midcoast.nsw.gov.au/Home>
2. Raingardens should be located at the lowest 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

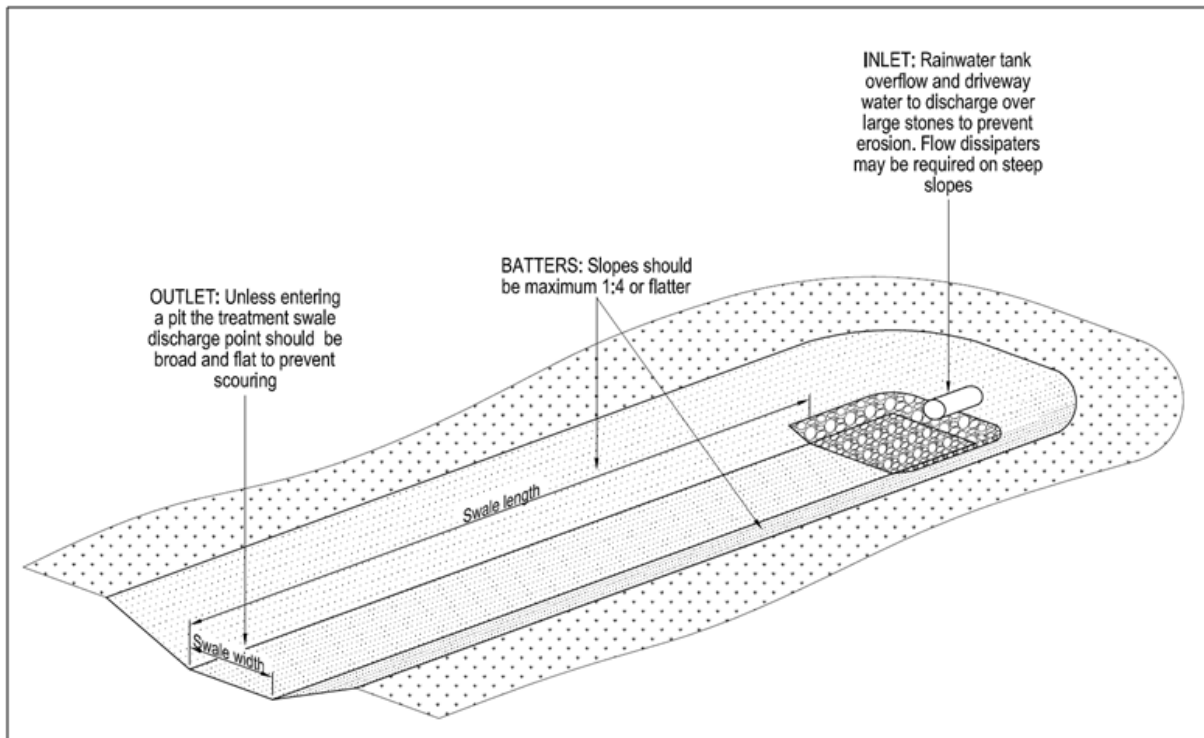


11.5.4 Swale

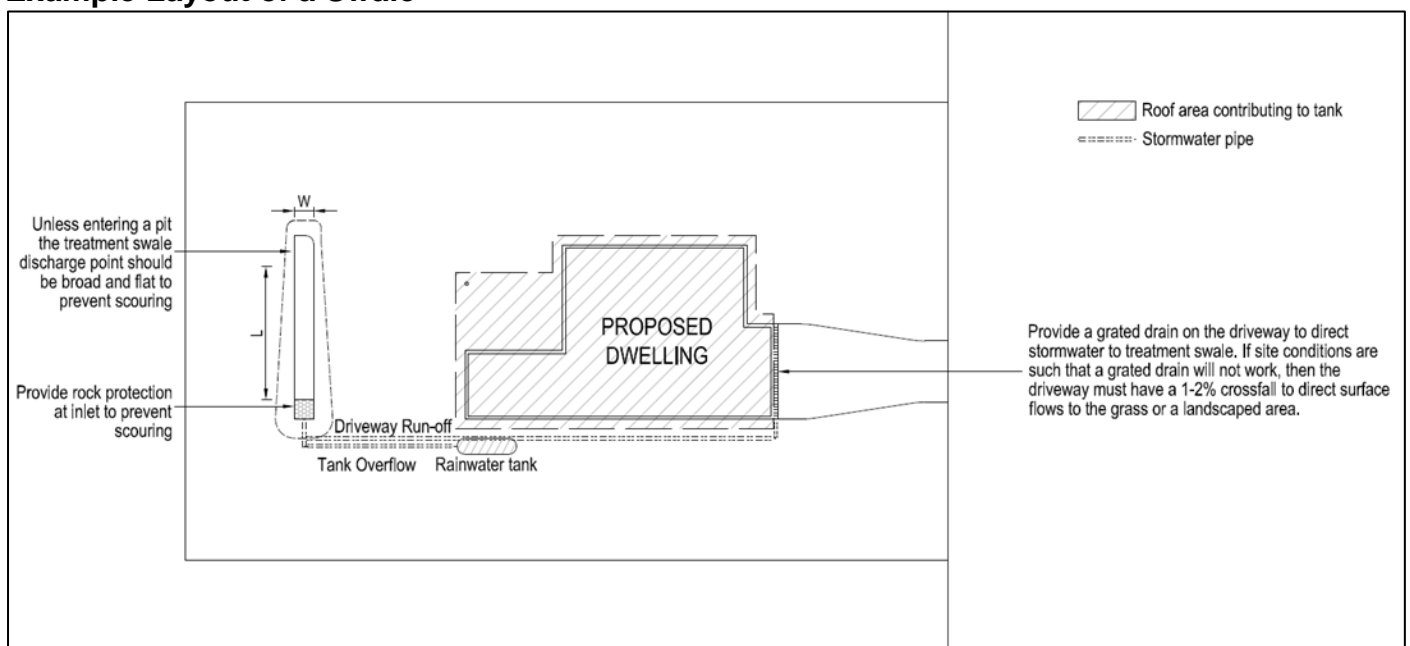
Controls

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



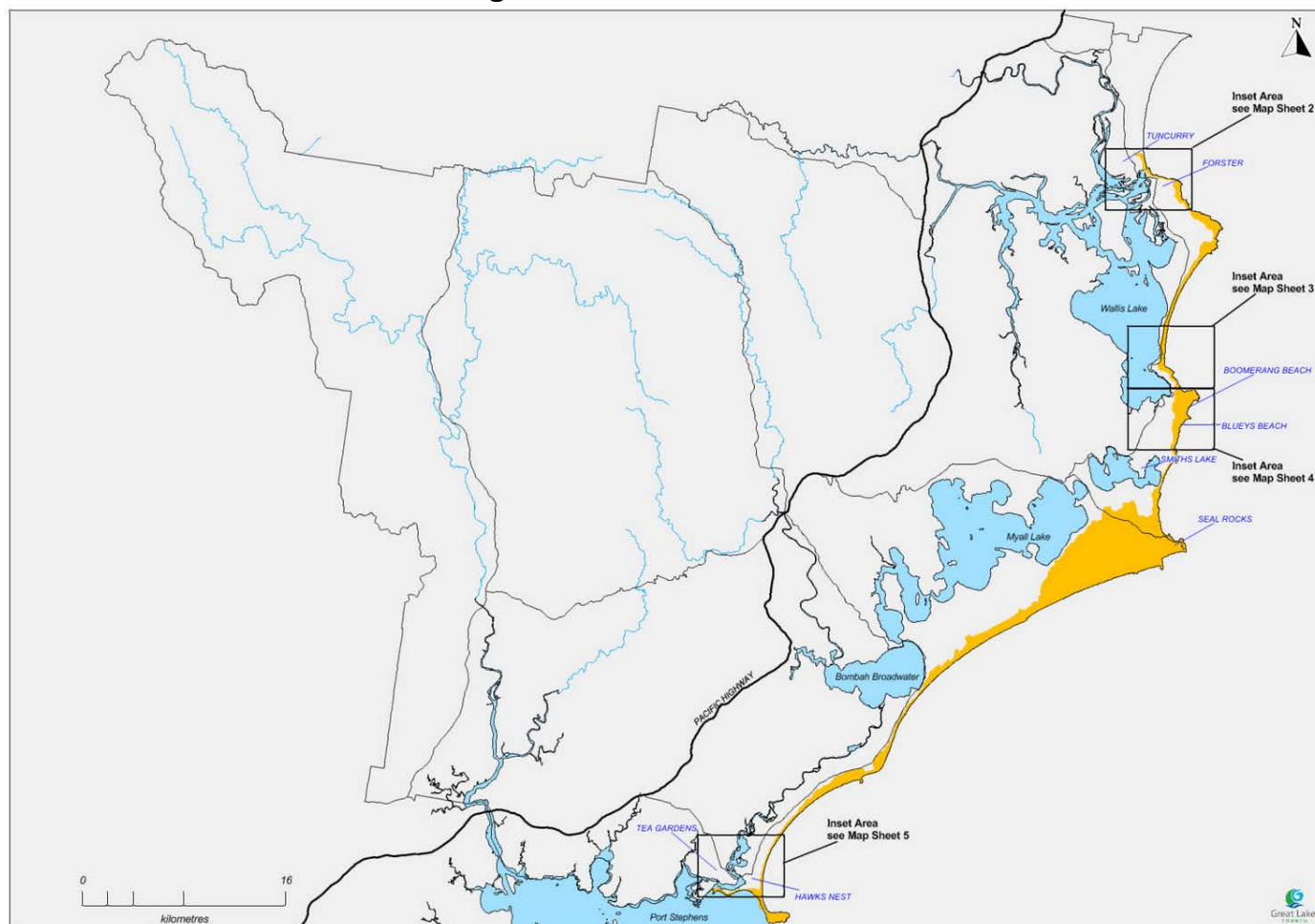
11.6 Appendices

11.6.1 Water Sensitive Design Catchment Areas

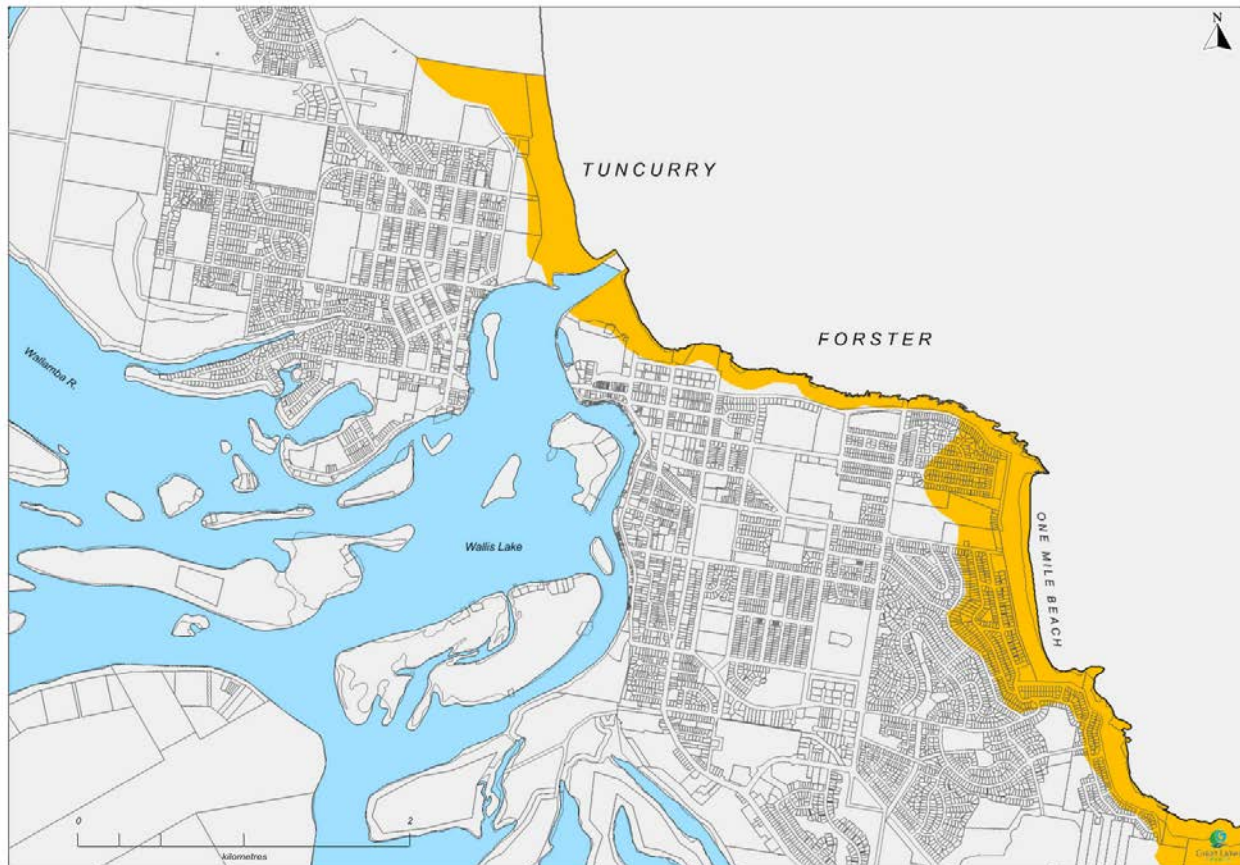
New development that occurs wholly within the Coastal Drainage area of the Water Sensitive Design Catchment Maps (refer to Water Sensitive Design Appendices) will be required to meet the Performance Target Reduction Loads the Stormwater Quality Targets table.

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.

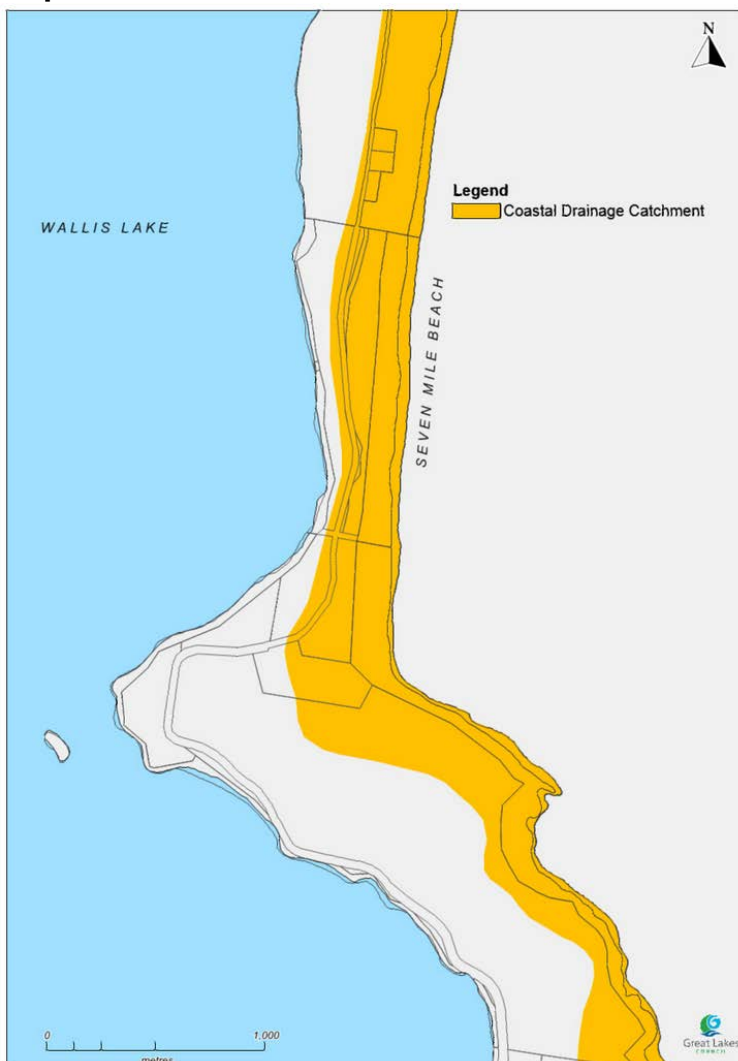
Overview of Water Sensitive Design Catchment Areas



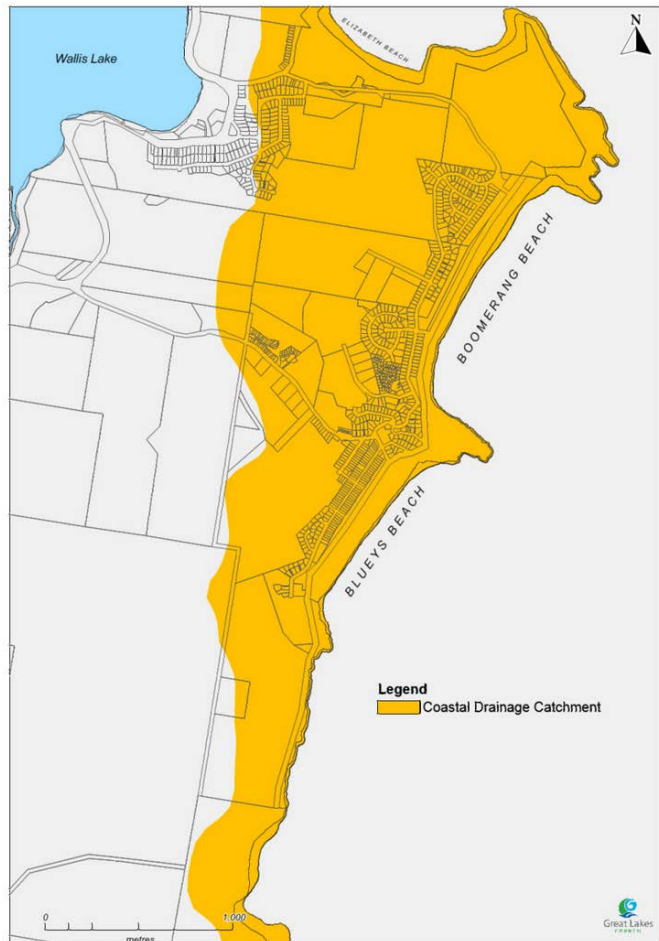
Map Sheet 2 - Tuncurry & Forster Area



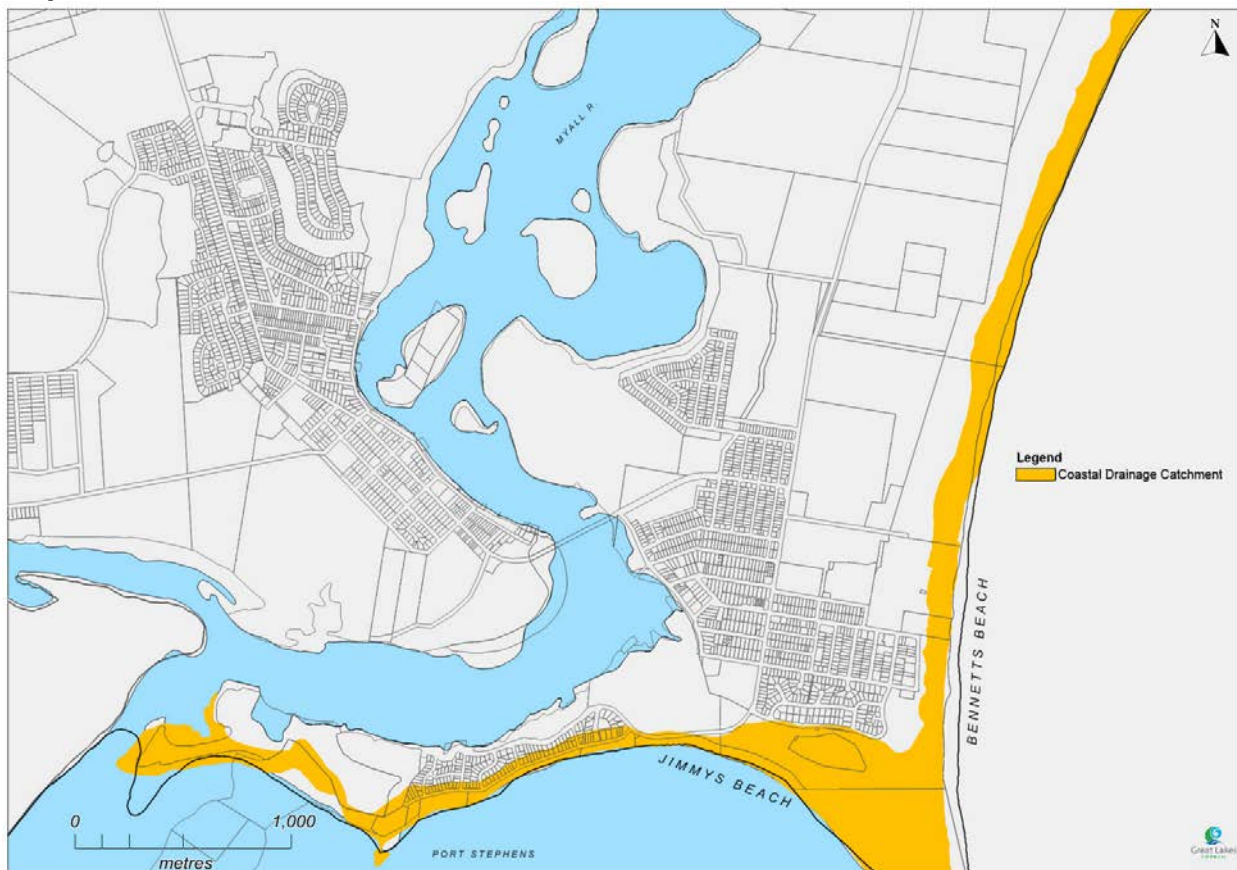
Map Sheet 3 - Seven Mile Beach



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 WSD 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.