PLANNING & NATURAL SYSTEMS

ATTACHMENT B

DRAFT GREAT LAKES DCP AMENDMENTS - WATER SENSITIVE DESIGN

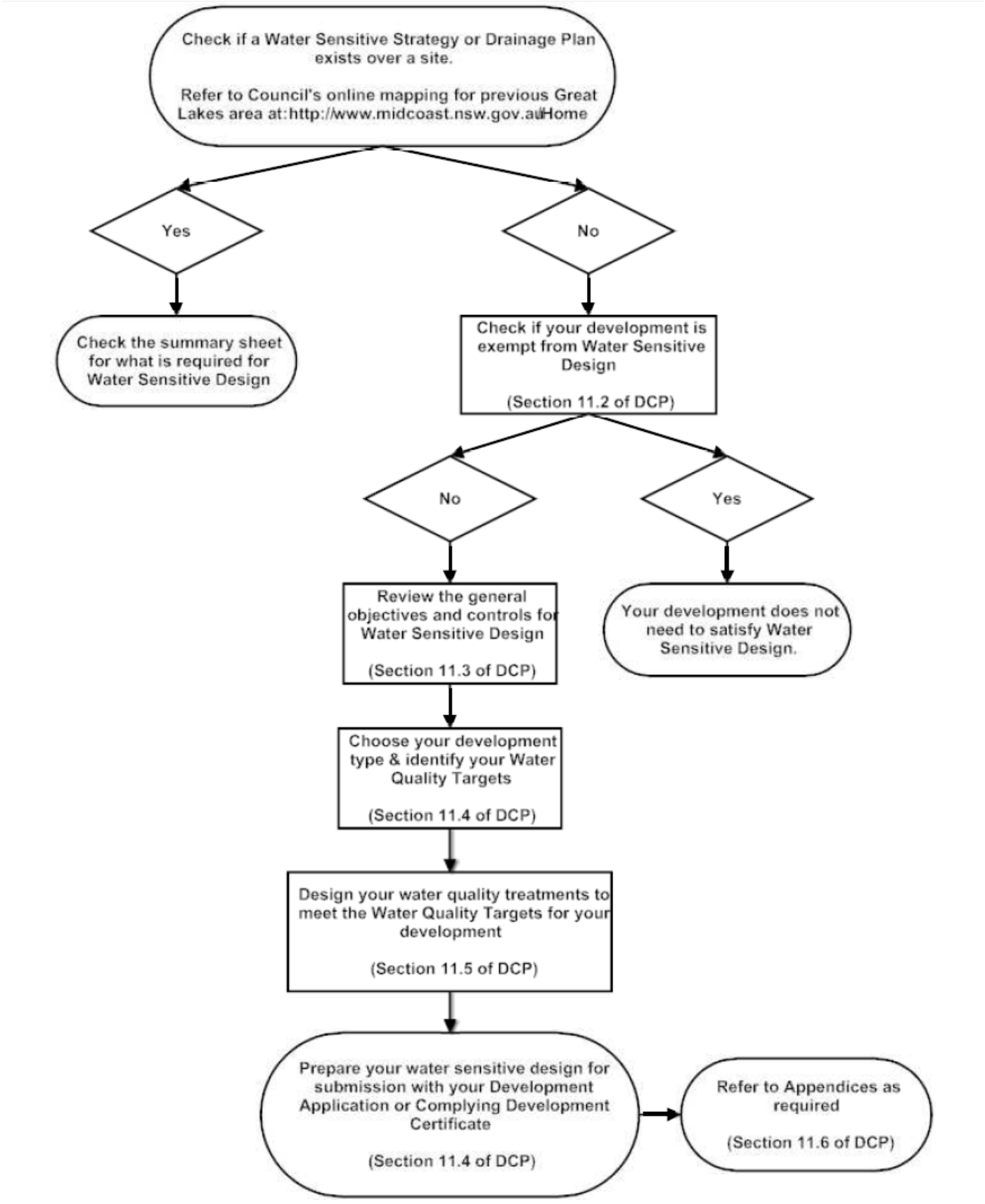
ORDINARY MEETING

26 JULY 2017

Contents

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 *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 WSD at the time of subdivision. The Strategy or Plan will set out the water quality targets for the ~~your~~ site and a Summary Sheet will provide the details of any additional WSD measures that may be required as part of the ~~your~~ development.

Where applicants ~~you~~ wish to vary the WSD measures set out in the Summary Sheet ~~you may use~~ this section of the DCP may be used to propose alternative water quality treatments to meet the water quality targets of the approved Stormwater Strategy or Drainage Plan.

To check if a ~~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 the ~~your~~ property this section of the Development Control Plan DCP will be used to assess WSD for the ~~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 WSD requirements set out within those documents regardless of the exemptions below.

General

WSD controls do not apply where the proposed development is:

1. constructed over water e.g. boat shed; *or*
2. a secondary dwelling.

Single Dwelling or Dual Occupancy

WSD controls do not apply to the development of a ~~house~~ dwelling house or dual occupancy where:

1. the total ~~footprint~~ roof area of all proposed buildings ~~have a roof area of~~ is 500m² or less; *and*
2. the property is located outside the mapped Priority Areas as contained within Appendix D ~~Applicants may also Focus Area. check Council's online mapping to see if a property is located outside of a Priority Area and is therefore exempt from WSD requirements~~.

Alterations and additions

WSD controls do not apply to alterations and additions:

1. for residential development ~~where the increase to the overall impervious surface is less than 150m2;~~ *or*
2. for any other type of development (as outlined in section 11.4.4) 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) driveways, pathways and courtyards that form part of the alterations and/or additions.

Subdivision

WSD controls do not apply to:

1. boundary adjustments;
2. strata subdivision;
3. subdivision where the resultant lots are greater than 40ha; or
4. where the resultant lots in a minor subdivision (subdivision that results in a total of 3 lots) are greater than 1ha.

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~~ or riparian ecosystems and bushland areas.
- 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 water quality targets identified for that type of development as set out in the applicable 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. Additional stormwater drainage measures may be required by Council to address potential flood issues related to the development. Instances where additional requirements apply may include:
   a. Residential development other than a dwelling house, dual occupancy or secondary dwelling~~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.
3. Water Quality Treatments:
   a. ~~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 other measures to satisfy water quality targets.
   b. 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.
   c. ~~Water Quality Treatments~~ should be integrated into landscaped areas to fit within the built environment of the development.
   d. and associated stormwater infrastructure which services more than one dwelling should be constructed on common property.
   e. ~~Water quality treatments~~ may be constructed within ~~the~~ building setback areas.
   f. ~~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 Targets.
   g. ~~Water Quality Treatments~~ cannot be constructed ~~within~~:
      i. within a drainage or sewer easements except for privately owned inter-allotment drainage; or
      ii. within private open space areas; *or*
      iii. above services e.g. electricity
   h. ~~All water quality treatments~~ should be designed in response to environmental constraints to ensure they;
      i. do not contribute to increased flooding risk;

ii. comply with flood related development controls;
iii. withstand storm surge and inundation; *and*
iv. minimise the impact of discharge points on bushland areas (refer to Appendix C).

Note: Where physical site constraints impact on the ability to connect to Council's drainage system or inter-allotment drainage and there are there are potential water quantity impacts on neighbouring properties a variation to the water quality targets in this DCP may be accepted. The applicant should contact Council in these instances.

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 be required to meet ~~have~~ different Stormwater Quality Targets ~~to meet~~. To check if a ~~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~~

Table 1: Stormwater Quality Targets Single Dwellings and Dual Occupancies

	Target Reduction Loads (based on increased pollution generated from development without treatment)			
Development Type	**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 dwelling ~~house~~ or dual occupancy on an un-serviced site;

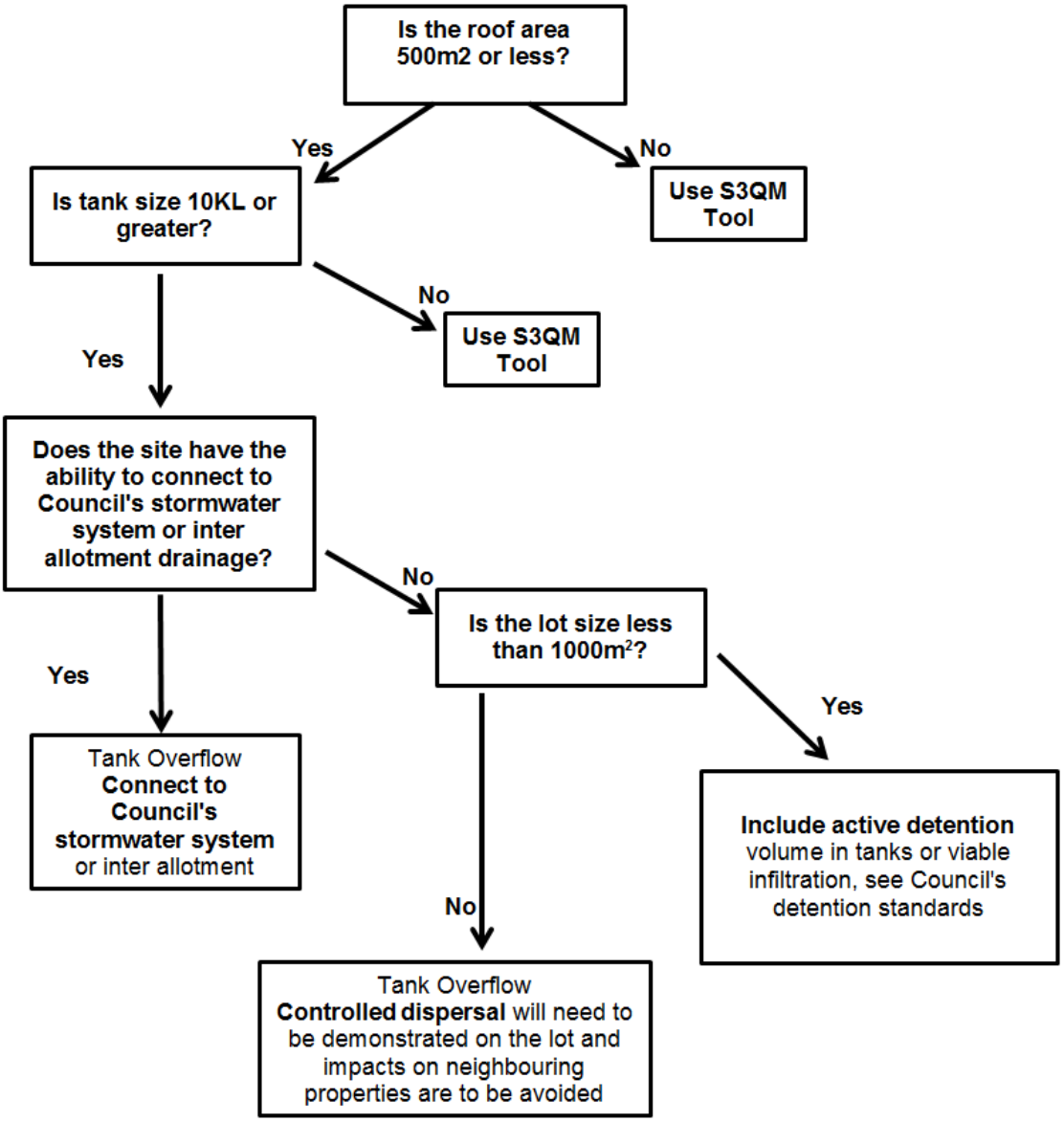
1. The Deemed to Comply Solution (un-serviced sites); *or*
2. The Small Scale Stormwater Quality Model (S3QM).

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

The Deemed to Comply Solution (un-serviced sites) ~~seen~~ flowchart in Figure 1 ~~the flowchart below~~ is a simplified alternative that outlines the minimum size of the rainwater tank needed to meet Water Quality Targets and provides guidance on where to direct tank overflow. To satisfy WSD 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 must ~~will~~ be directed to the rainwater tank;
3. water from the rainwater tank must ~~will~~ be used to service the household;
4. all other hard surfaces including (but not limited to) driveway, pathways and courtyards must ~~will~~ be directed to adjoining landscaped areas within the property; *and*

Figure 1: Deemed to Comply Solution - Single Dwellings and Dual Occupancies (un-serviced sites)



Note: For dual occupancies, the roof area and tank size in Figure 1 refers to the total roof area and tank size of both dwellings.

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; and
- Rainwater tanks.

Other water quality treatment options within the S3QM are not generally supported by Council, however if ~~you are~~ applicants are unable to make the preferred options work for a given ~~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,~~ the tool allows the user to adjust the treatment options until an acceptable solution is found and the stormwater targets are met ~~or use a "deemed to comply" solver within the tool that provides sizes of rainwater tanks and bioretention systems needed to meet the water quality targets~~.

Once an acceptable complying solution is identified, the S3QM allows the user to print a WSD Certificate, which should be attached to the Development Application or application for a Complying Development ~~Application~~ Certificate 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.

For further information on the S3QM, ~~including~~ an example of how to apply the tool contact Council. Guidance on how to assess the soil type for a given property is available in Appendix B.

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 dwelling ~~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

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- Swales; ~~*and*~~
- Buffers; and
- Rainwater tanks.

Other water quality treatment options within the S3QM are not generally supported by Council, however if ~~you are~~ applicants are unable to make the preferred options work for a given ~~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,~~ the tool allows the user to adjust the treatment options until an acceptable solution is found and the stormwater targets are met ~~or use a "deemed to comply" solver within the tool that provides sizes of rainwater tanks and bioretention systems needed to meet the water quality targets~~.

Once an acceptable complying solution is identified, the S3QM allows the user to print a WSD 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.

For further information on the S3QM, ~~including~~ an example of how to apply the tool contact Council. Guidance on how to assess the soil type for a given property is available in Appendix B.

2. The Deemed to Comply Solution (serviced sites)

The Deemed to Comply Solution ~~that is~~ set out in Table 2 ~~the sizing table below~~ is a simplified alternative to using the S3QM to size the water quality treatment. Table 2 ~~that~~ outlines the size of the raingarden needed based on lot size, roof area and tank size. Where a Stormwater Strategy or Drainage Plan has stipulated a Water Quality Target of 'Neutral or Beneficial Effect' Table 2 cannot be used.

To use the Deemed to Comply Solution in Table 2 the proposed development must meet the following criteria:

~~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. Rainwater re-use within the development must be connected to toilet, laundry and outdoor taps.

Notes: Where the lot size, tank size and roof size are not identical to the areas listed, use the next largest lot and/or roof size. 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.

4. ~~Where the lot size and roof size are not identical to the areas listed, use the next largest lot and / or roof size.~~
5. ~~Driveways are required to be directed to flow into the raingarden. Where site constraints prevent this, Council may accept the addition of 1m^2 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.~~

Table 2: Deemed to Comply Solution - Single Dwellings and Dual Occupancies (serviced sites)

Lot Size (m^2)	~~House~~ Dwelling Roof Area (m^2)	Minimum Rainwater Tank Size (KL)	Minimum Raingarden Area (m^2)
Measured by the legal property boundary except for R5 – Large Lot ~~Rural~~ Residential Zone~~s~~ which use~~s~~ 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	6-10	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	6-10	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	6-10	4
600	250 - 300	6-10	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	6-10	6
800	400 - 500	610	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	6-10	8
1000	500	6-10	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) to calculate water quality treatments required 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 application for a Complying Development Certificate ~~Application~~.

Water Sensitive Design 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 the 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 details on how water demands will be managed and monitored.~~
- When Deemed to Comply Sizing has been used, ~~provide~~ a summary on ~~your~~ the plans must be provided.
- When the Small Scale Stormwater Quality Model is used, a 'Certificate' issued by the model must be provided. Note: Where more than one catchment has been ~~used in the model include catchments and areas for the catchments on the site plan~~ selected in the model, the location and total area of each catchment is to be identified on the site plan.
- Detailed engineering drawings including 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).

~~**Note:** All applications will need to include detailed engineering drawings of the proposed treatment measures~~.

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 be required to meet ~~have~~ different Stormwater Quality Targets ~~to meet~~. To check if a ~~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~~

Table 3: Stormwater Quality Targets - Subdivision

	Target Reduction Loads (based on increased pollution generated from development without treatment)			
Site Characteristics	**Gross pollutants**	**Total Suspended Solids**	**Total Phosphorus**	**Total Nitrogen**
Lots over 2,500m^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 **or** where the percentage of existing impervious surface is greater than 10% of the area (regardless of lot size). ➢ Development located within the Coastal Drainage Areas (refer to ~~Catchment~~ Coastal Drainage Maps in Appendix A). 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 WSD 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; *and*
- 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 WSD Strategy (WSDS) 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 ~~WSD 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 WSDS ~~Strategy~~ is to include the following details:

1. **Background information** - including 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. **Hydrological requirements -** 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, and development staging (if applicable).
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 and other sensitive environments within the site that 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.~~ **Soil and water management plan** - 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 in the first instance, followed by ~~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 treatment measure ~~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 in relation to flooding (probability of damage).

d. Assessment of the frequency of discharge from the site pre and post development taking into consideration the sensitivities of the receiving surface or ground water systems and the acceptable limits for altering the hydrological regime.

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) and any specific MidCoast Council Guidelines;

    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 WSD 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.

Note: All WSDS ~~Strategies~~ and Development Applications containing WSDS elements must comply with; Australian Standard 3500:2003, 'Plumbing and Drainage," Standards Australia, 2003 and any other applicable standard pertaining to the relevant discipline for example Landscaping, Civil Design, Road Construction etc.

Additional assistance in the preparation of a WSDS ~~Strategy~~ is available on Council's website. ~~at~~ ~~http://www.greatlakes.nsw.gov.au/Home~~

Application Requirements

Developments that require a WSDS ~~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 WSDS 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 be required to meet ~~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~~

Table 4: Stormwater Quality Targets Intensive Livestock Agriculture or Intensive Plant Agriculture

	Target Reduction Loads (based on increased pollution generated from development without treatment)			
Development Type	**Gross pollutants**	**Total Suspended Solids**	**Total Phosphorus**	**Total Nitrogen**
➢ 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 WSD Strategy (WSDS) specific to this form of development.

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

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 WSDS ~~Strategy~~ will need to include the WSDS ~~Strategy~~ as part of a Development Application along with the completed checklist for intensive Livestock Agriculture or Intensive Plant Agriculture ~~large scale developments~~ (available from Council's website). ~~Additional assistance in the preparation of a WSD 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 be required to meet ~~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~~

Table 5: Stormwater Quality Targets Other Development - excluding Single Dwelling, Dual Occupancy, Subdivision and Intensive Livestock Agriculture or Intensive Plant Agriculture

	Target Reduction Loads (based on increased pollution generated from development without treatment)			
Site Characteristics	**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 **or** where the percentage of existing impervious surface is greater than 10% of the area (regardless of lot size). ➢ Development located within the Coastal Drainage Areas (refer to ~~Catchment~~ Coastal Drainage Maps in Appendix A). Where development is partially located within a Coastal Drainage Area, targets are to be determined in consultation with Council Staff.	90%	80%	60%	45%

WSD Assessment Method

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

11.4.4.2 Lots less than 2,500m^2 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; and
- Rainwater tanks.

Other water quality treatment options within the S3QM are not generally supported by Council, however if ~~you are~~ applicants are unable to make the preferred options work for a given ~~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,~~ the tool allows the user to adjust the treatment options until an acceptable solution is found and the stormwater targets are met ~~or use a "deemed to comply" solver within the tool that provides sizes of rainwater tanks and bioretention systems needed to meet the water quality targets~~.

Once an acceptable complying solution is identified, the S3QM allows the user to print a WSD 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 of a ~~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.~~
- When the Small Scale Stormwater Quality Model is used, a 'Certificate' issued by the model must be provided. **Note:** Where more than one catchment has been selected in the model, the location and total area of each catchment is to be identified 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).

Notes: Where Council considers the development density, complexity of the site, site constraints or location which may result in an increased risk to the environment, the applicant may be requested to submit a WSD Strategy based on MUSIC modelling regardless of lot size.

11.4.4.3 Lots over 2,500m^2 in size

Water Sensitive Design Strategy

A WSD 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 WSDS ~~Strategy~~ is to include the following details:

1. **Background information** - including 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. **Hydrological requirements -** identify the hydrological requirements needed to maintain the existing flow regimes of receiving environments.
4. **Proposed development** – a description of ~~describe~~ the proposed development ~~at the site~~, including site boundaries, proposed land uses, densities, population, infrastructure, development staging (if applicable).
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 and other sensitive environments within the site that 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. **Soil and water management plan** - 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).
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 in the first instance, followed by ~~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 treatment measure ~~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 in relation to flooding (probability of damage).
    d. Assessment of the frequency of discharge from the site pre and post development taking into consideration the sensitivities of the receiving surface or ground water systems and the acceptable limits for altering the hydrological regime.

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) and any specific MidCoast Council Guidelines;
    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 WSD 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.

Note: All WSD Strategies and development applications containing WSD elements must comply with Australian Standard 3500:2003, 'Plumbing and Drainage," Standards Australia, 2003 and any other applicable standard pertaining to the relevant discipline for example Landscaping, Civil Design, Road Construction etc.

Additional assistance in the preparation of a WSDS ~~Strategy~~ is available on Council's website along with examples of how to apply the development requirements from this section to large scale developments. ~~at~~ http://www.greatlakes.nsw.gov.au/Home

Application Requirements

Developments that require a WSDS ~~Strategy~~ will need to include the WSDS ~~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 WSD Strategy is available from Council's website.~~

11.5 Design of Water Quality Treatments

11.5.1 Water Sensitive Design Strategy and MUSIC Modelling

Sites that have a WSD 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 WSD 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. 100% of the roof area is to be directed to the raingarden either via the rainwater tank or direct connection of the roof to the raingarden. The proportion of the roof area directed to the tank is to be calculated either in S3QM or using a deemed to comply solution.

   ~~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, an alternative approach to disposing of the stormwater that ~~the raingarden will need to be directed to an infiltration trench unless demonstrated by a suitably qualified engineer or equivalent~~ that ~~there is~~ has no negative impacts on current or future infrastructure is required (refer to Council's website for further guidance)
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 must be ~~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 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).

Figure 2: Cross-section of a Raingarden - clay soils

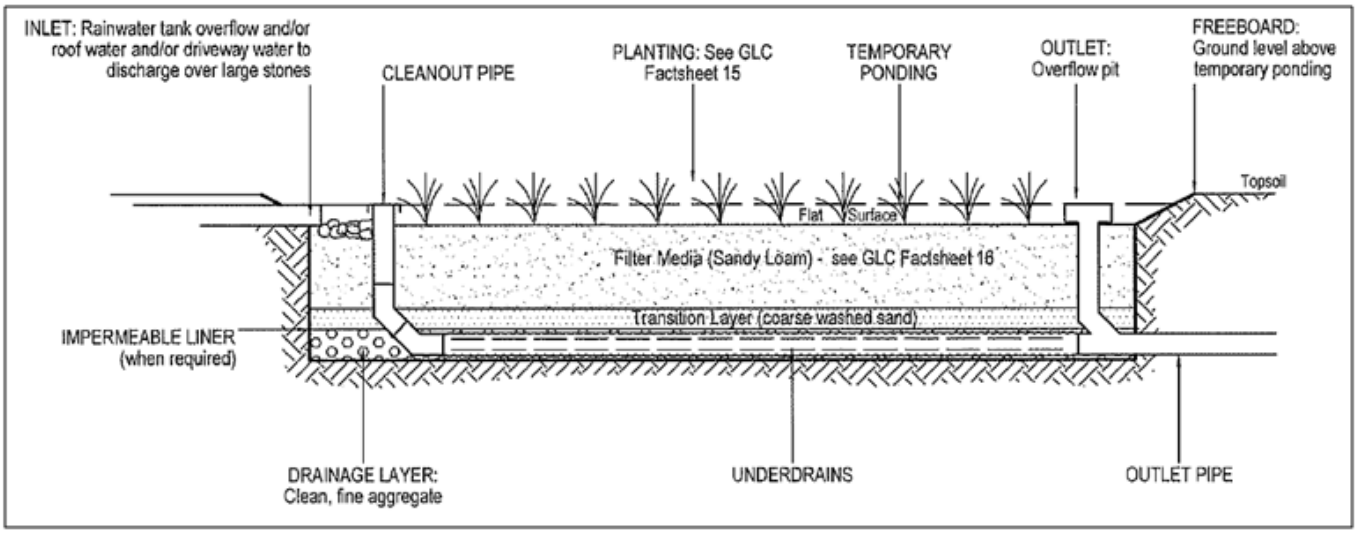
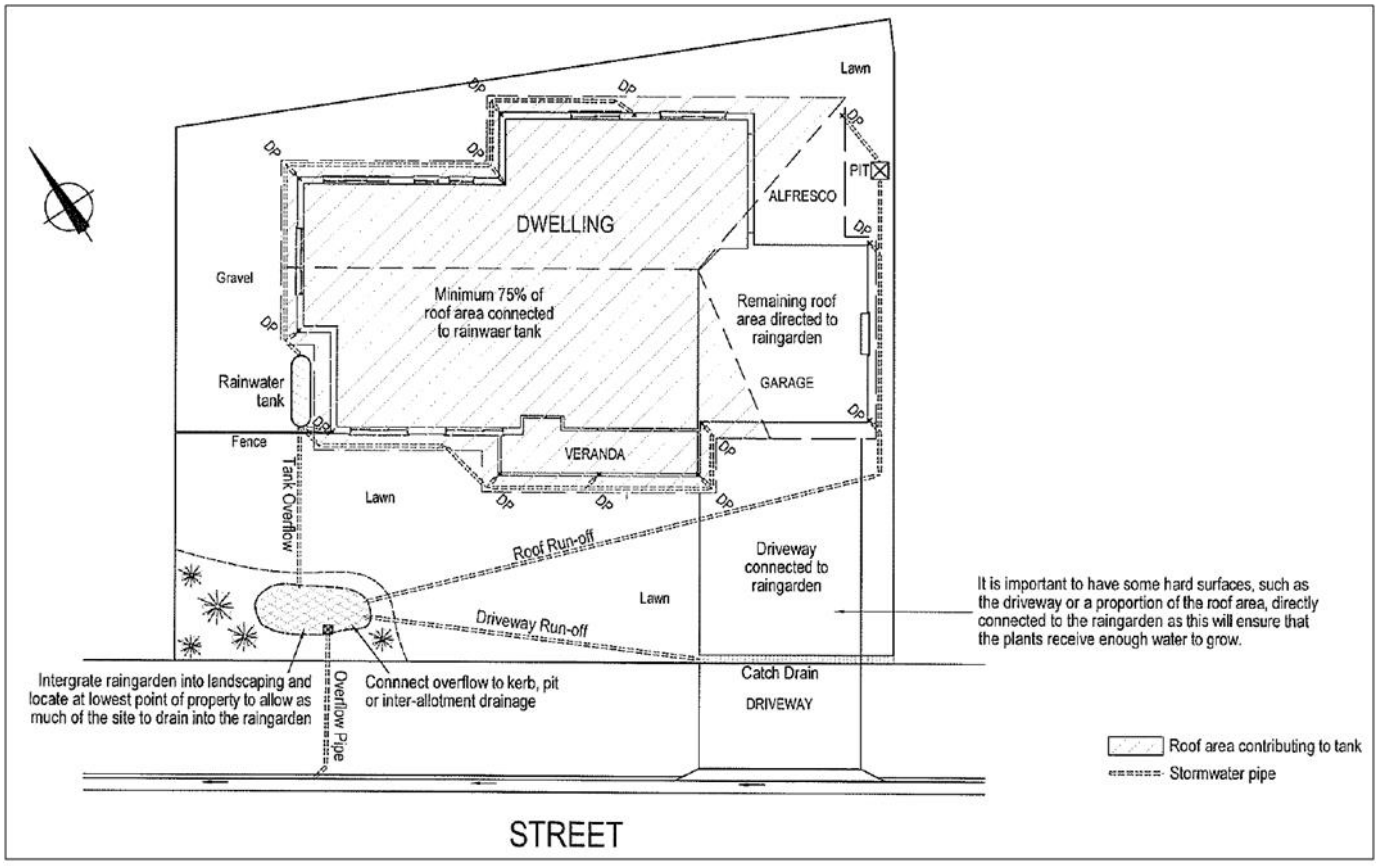


Figure 3: Example Layout of a Raingarden



11.5.3 Infiltrating Raingarden - Sandy Soils

Controls

1. Water quality treatments are to be designed and constructed in accordance with Council's WSD 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. 100% of the roof area is to be directed to the raingarden either via the rainwater tank or direct connection of the roof to the raingarden. The proportion of the roof area directed to the tank is to be calculated either in S3QM or using a deemed to comply solution.

   ~~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, an alternative approach to disposing of the stormwater that ~~the raingarden will need to be directed to an infiltration trench unless demonstrated by a suitably qualified engineer or equivalent~~ that ~~there is~~ has no negative impacts on current or future infrastructure is required (refer to Council's website for further guidance)
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 must be ~~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 $1m^2$ 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 any ~~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 properties.
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. The following controls also apply to the design and location of infiltrating raingardens:

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.

Figure 4: Cross-section of an Infiltrating Raingarden - sandy soils

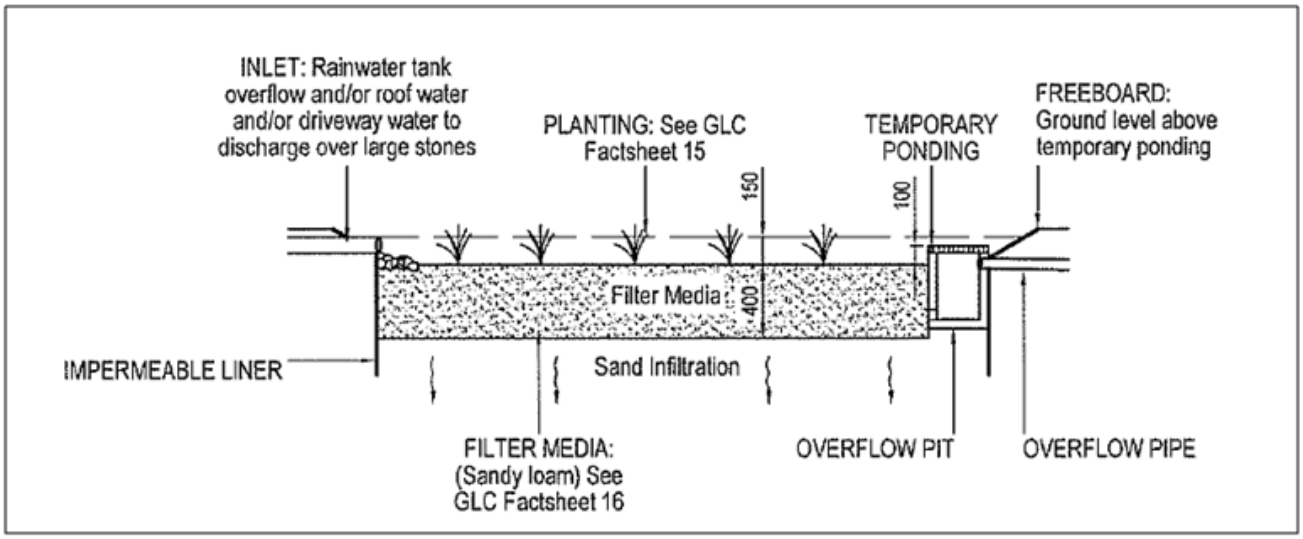
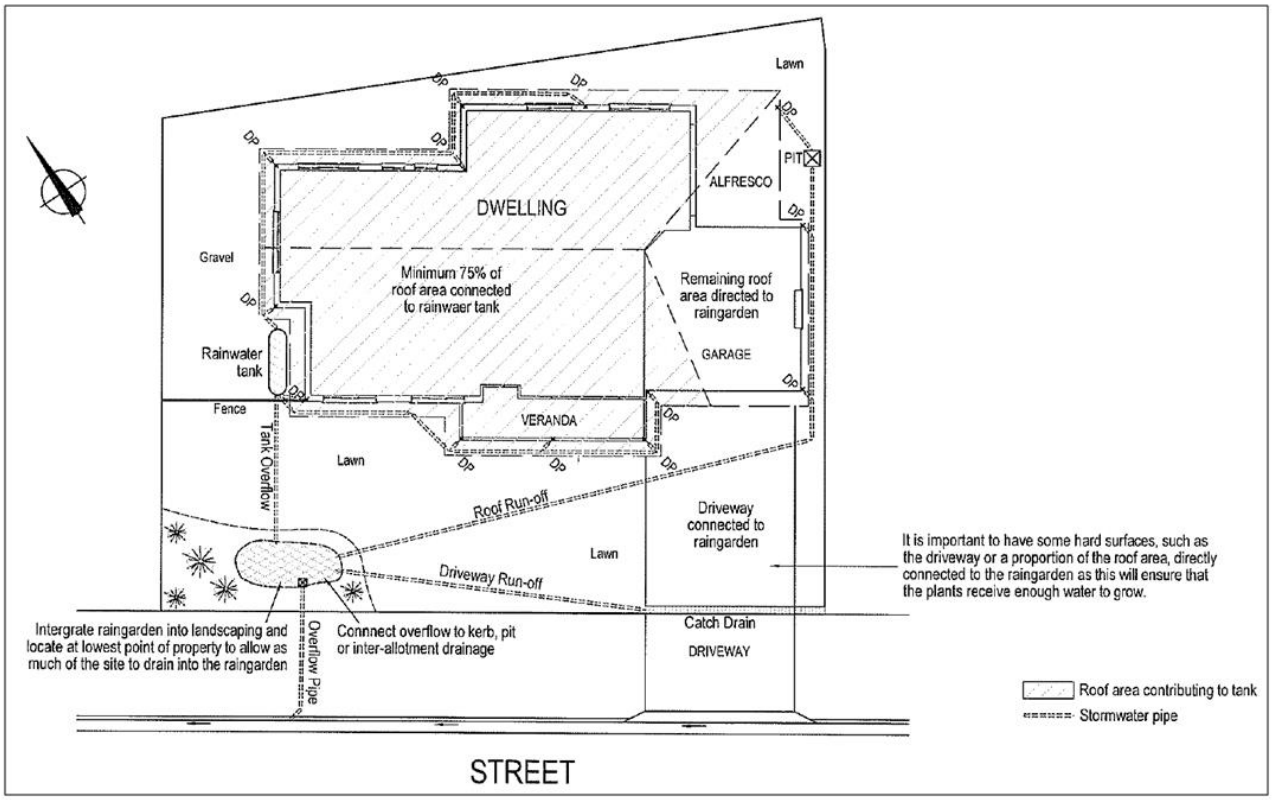


Figure 5: Example Layout of a Raingarden



11.5.4 Swale

Controls

1. A swale must be:
    a. ~~A swale must be~~ constructed with a 1-5%fall.
    b. ~~Swales should~~ be situated to prevent overflow towards existing or future infrastructure including any neighbouring properties

2. 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.

Note: A swale width is measured at the base as shown in Figure 6.

Figure 6: Cross-section of a Swale

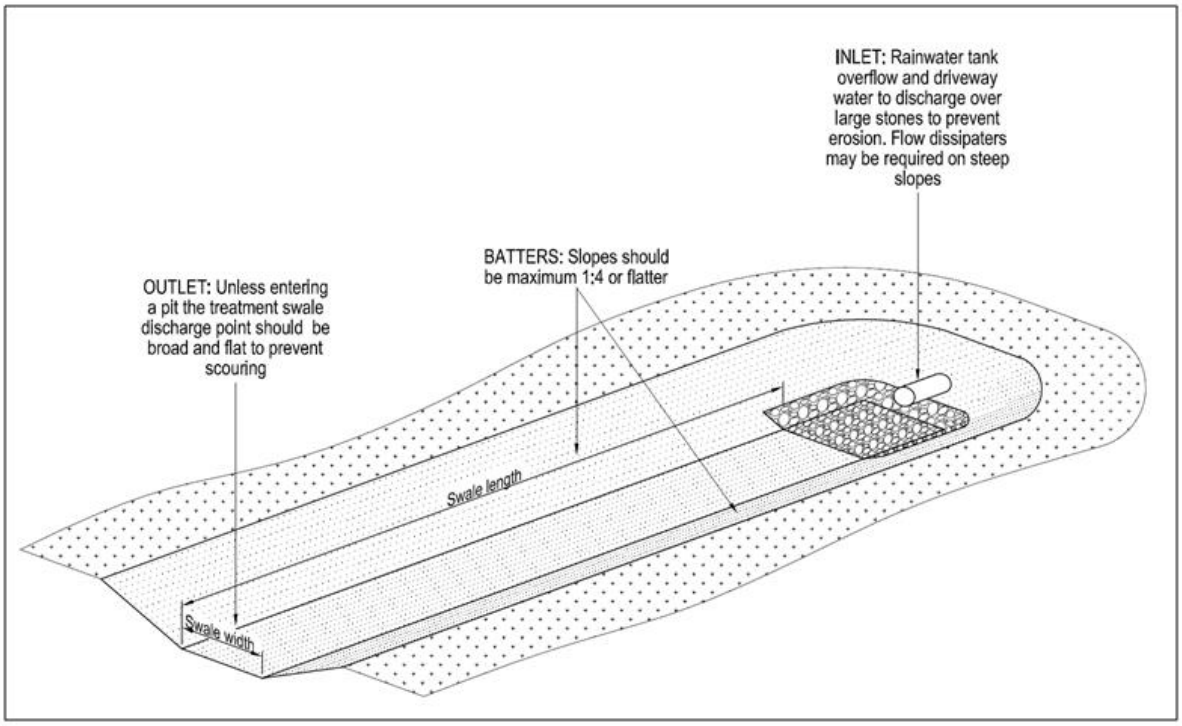
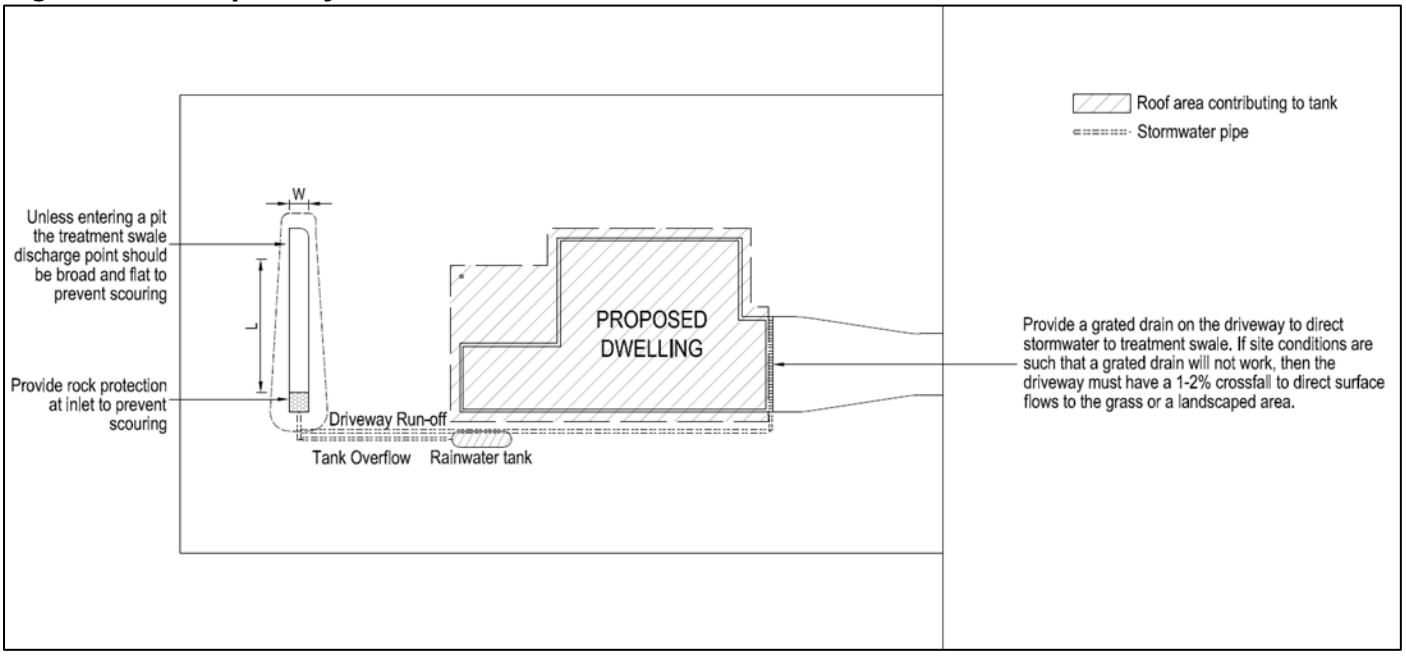


Figure 7: Example Layout of a Swale



11.6 Water Sensitive Design Chapter Appendices

Appendix A – Water Sensitive Design Coastal Drainage Areas (Maps)

~~11.6.1 WSD Catchment Areas~~

New development that occurs wholly within the Coastal Drainage Area as indicated by ~~of~~ the WSD Coastal Drainage Catchment Area Maps in this Appendix ~~(refer to WSD Appendices)~~ will be required to meet the ~~Performance~~ Target Reduction Loads in Table 3: Stormwater Quality Targets Subdivision and Table 5: Stormwater Quality Targets Other Development - excluding Single Dwelling, Dual Occupancy, Subdivision and Intensive Livestock Agriculture or Intensive Plant Agriculture. ~~the Stormwater Quality Targets table.~~

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

Figure A.1: Overview of WSD Coastal Drainage Catchment Areas (Map Sheet 1)

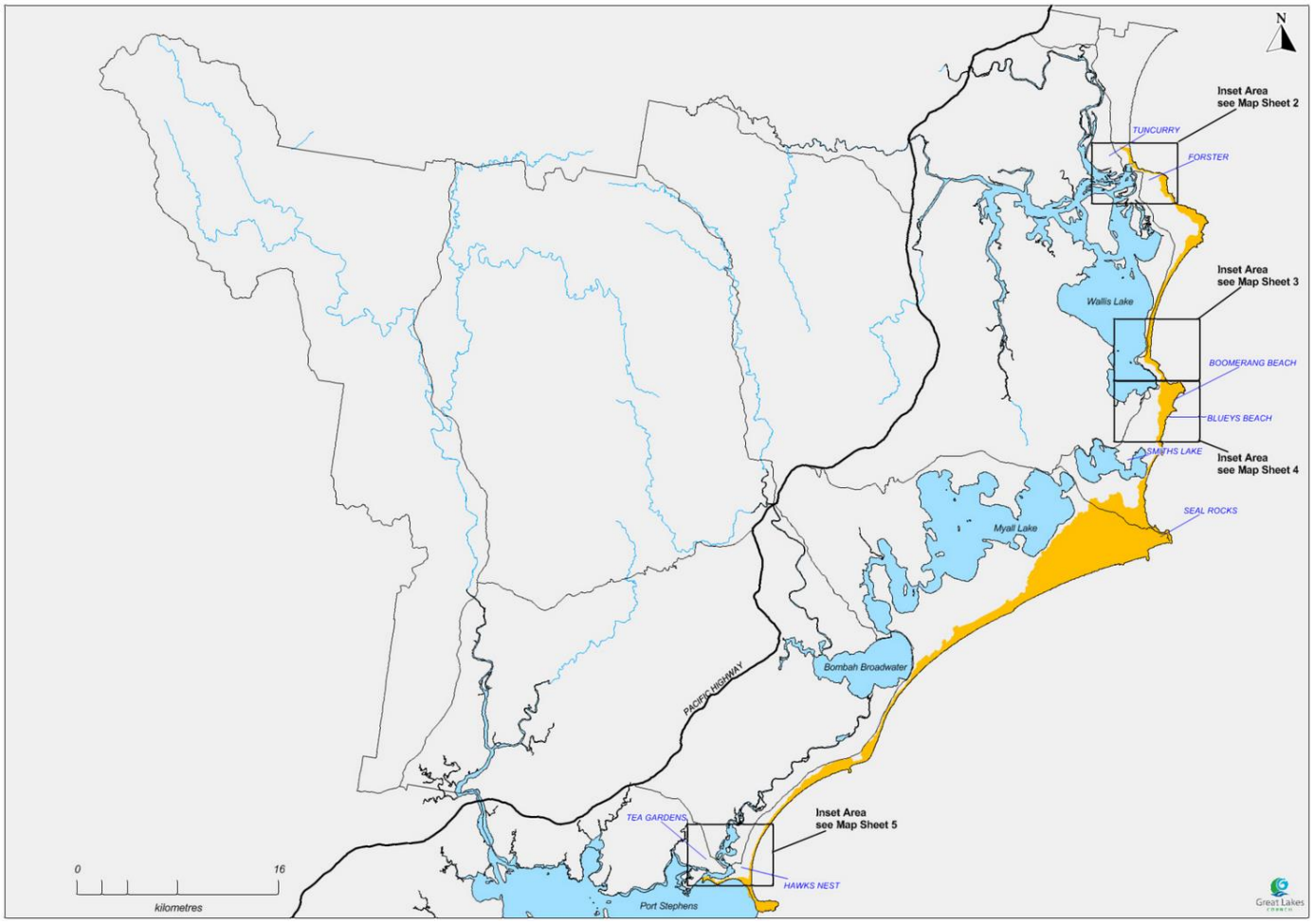


Figure A.2: Tuncurry & Forster Coastal Drainage Catchment Area (Map Sheet 2)

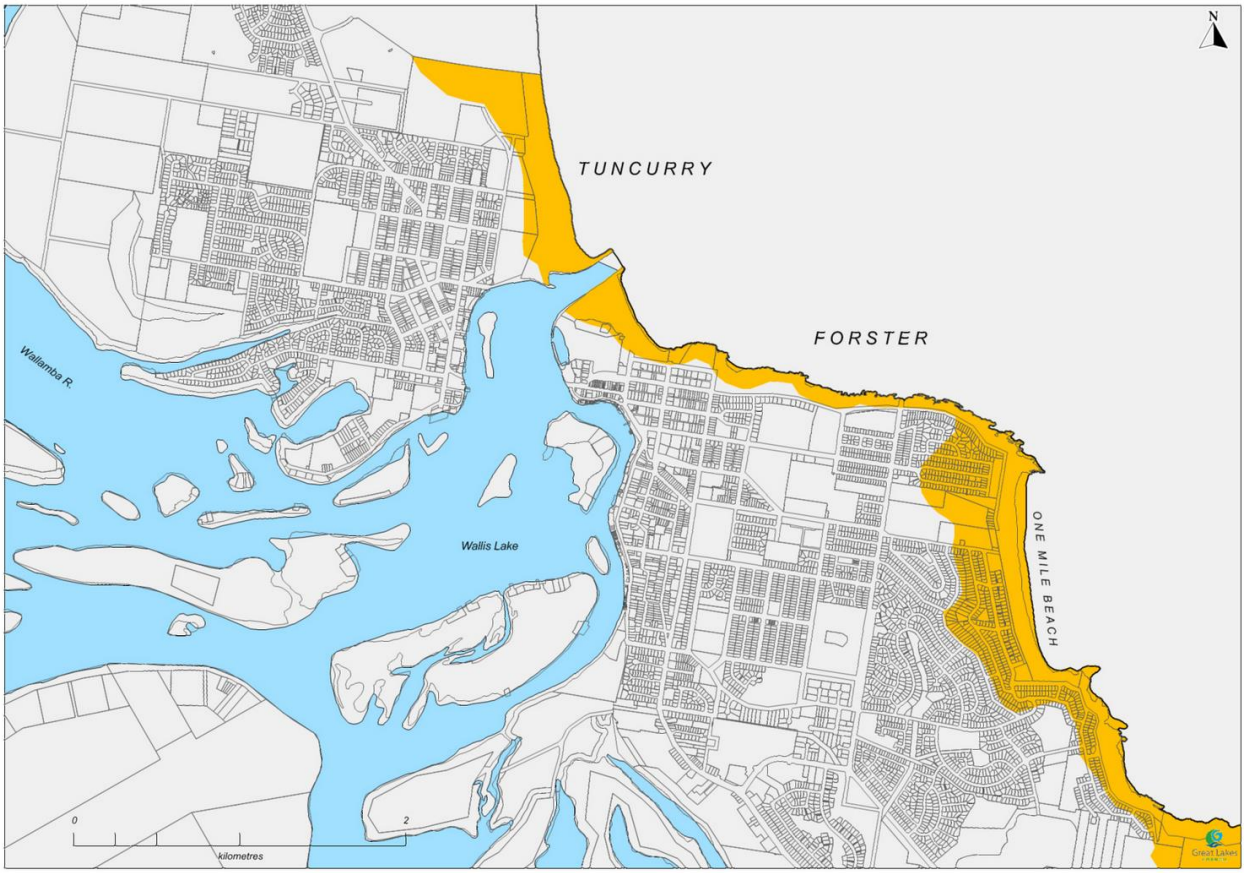


Figure A.3: Seven Mile Beach Coastal Drainage Catchment Area (Map Sheet 3)

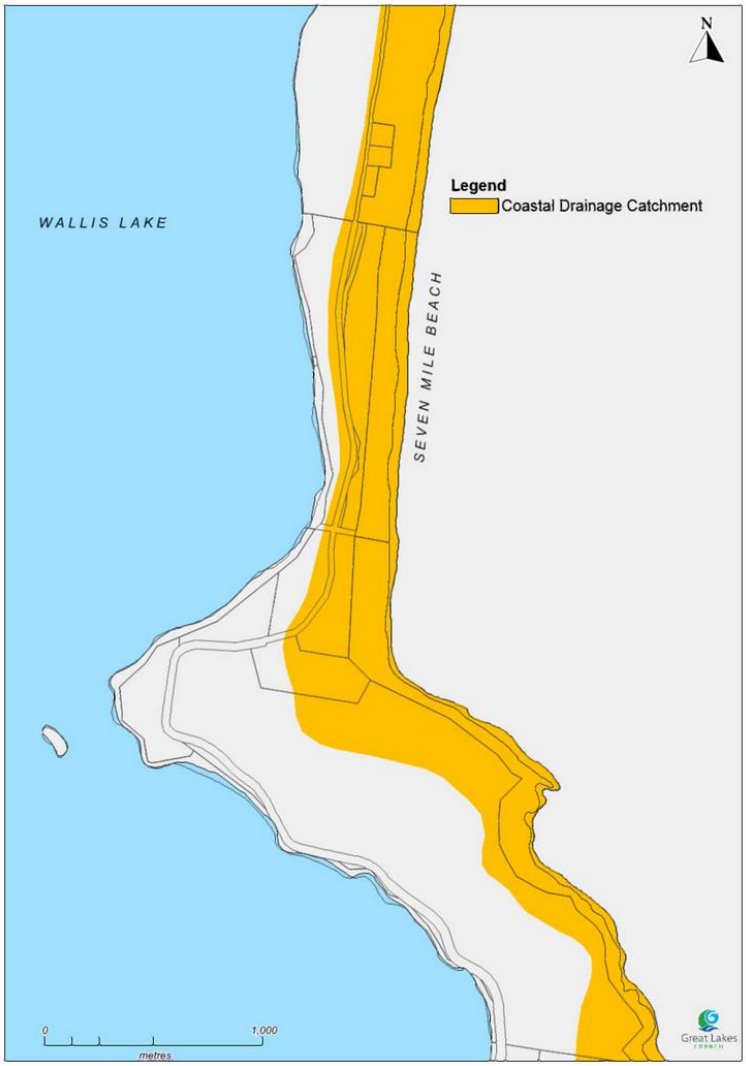


Figure A.4: Pacific Palms Coastal Drainage Catchment Area (Map Sheet 4)

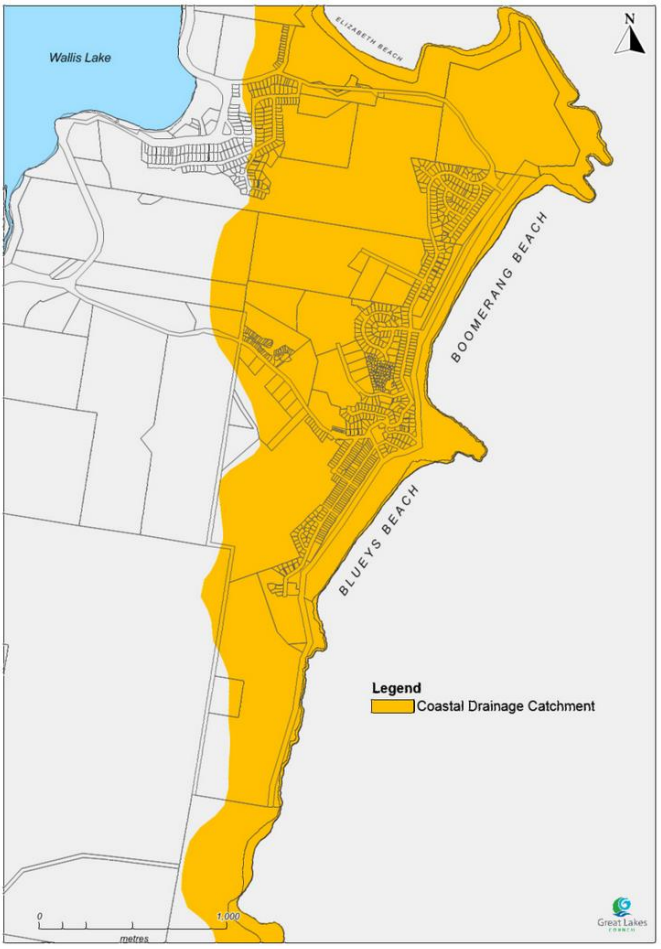
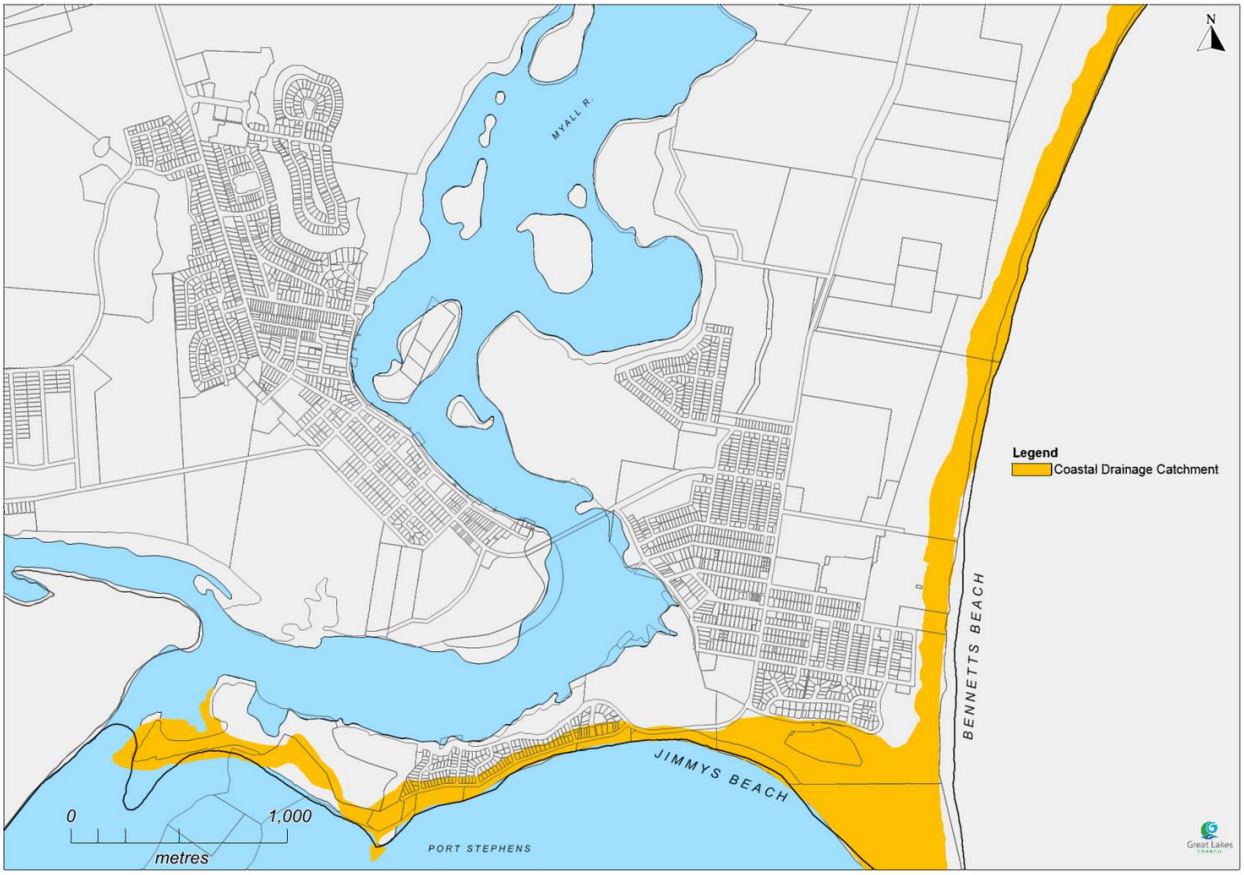


Figure A.5: Hawks Nest Coastal Drainage Catchment Area (Map Sheet 5)



Appendix B - Guidance on Assessing Soil Texture

~~**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 the property in question. A simple field based technique can be used to determine soil texture shown in the table below.

Table B.1: Soil Texture Guide

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).

Appendix C – Bushland Hydrology

~~11.6.3~~

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.

Appendix D – Priority Area Maps Single Dwelling and Dual Occupancy

Figure D.1 – Karuah & North Arm Cove Priority Area Map

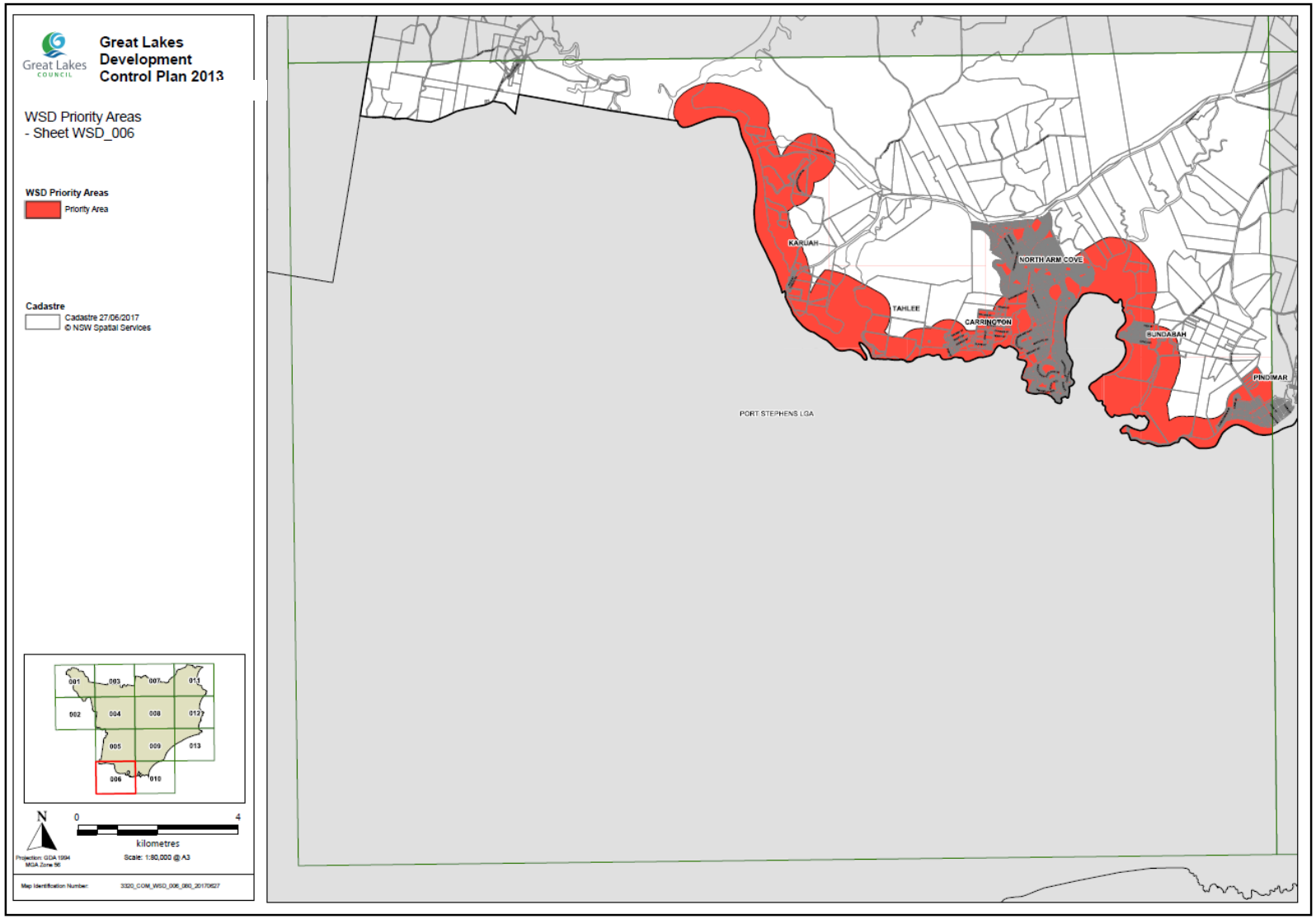


Figure D.2 – Coolongolook Priority Area Map

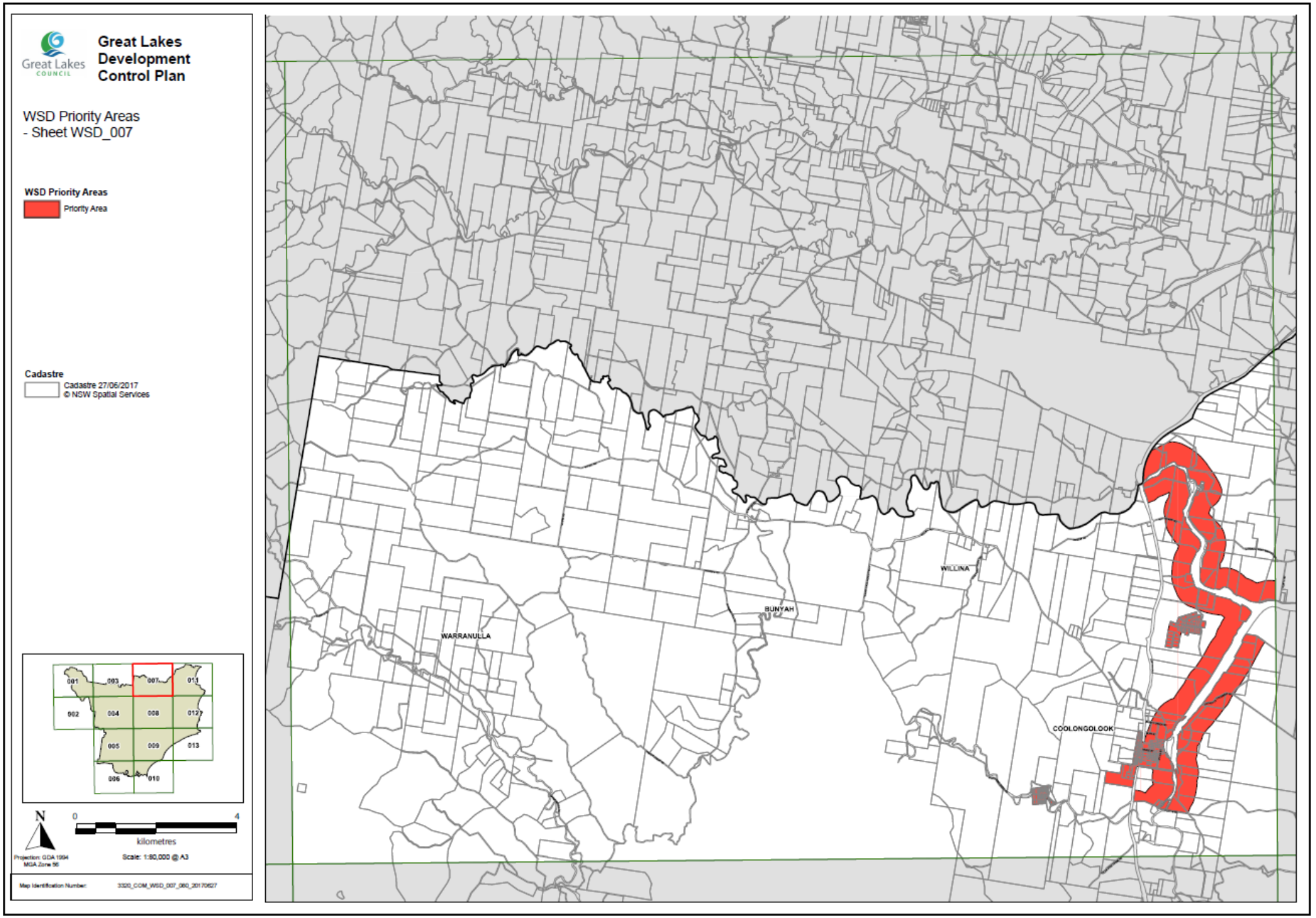


Figure D.3 – Bulahdelah Priority Area Map

Figure D.4 – Nerong Priority Area Map

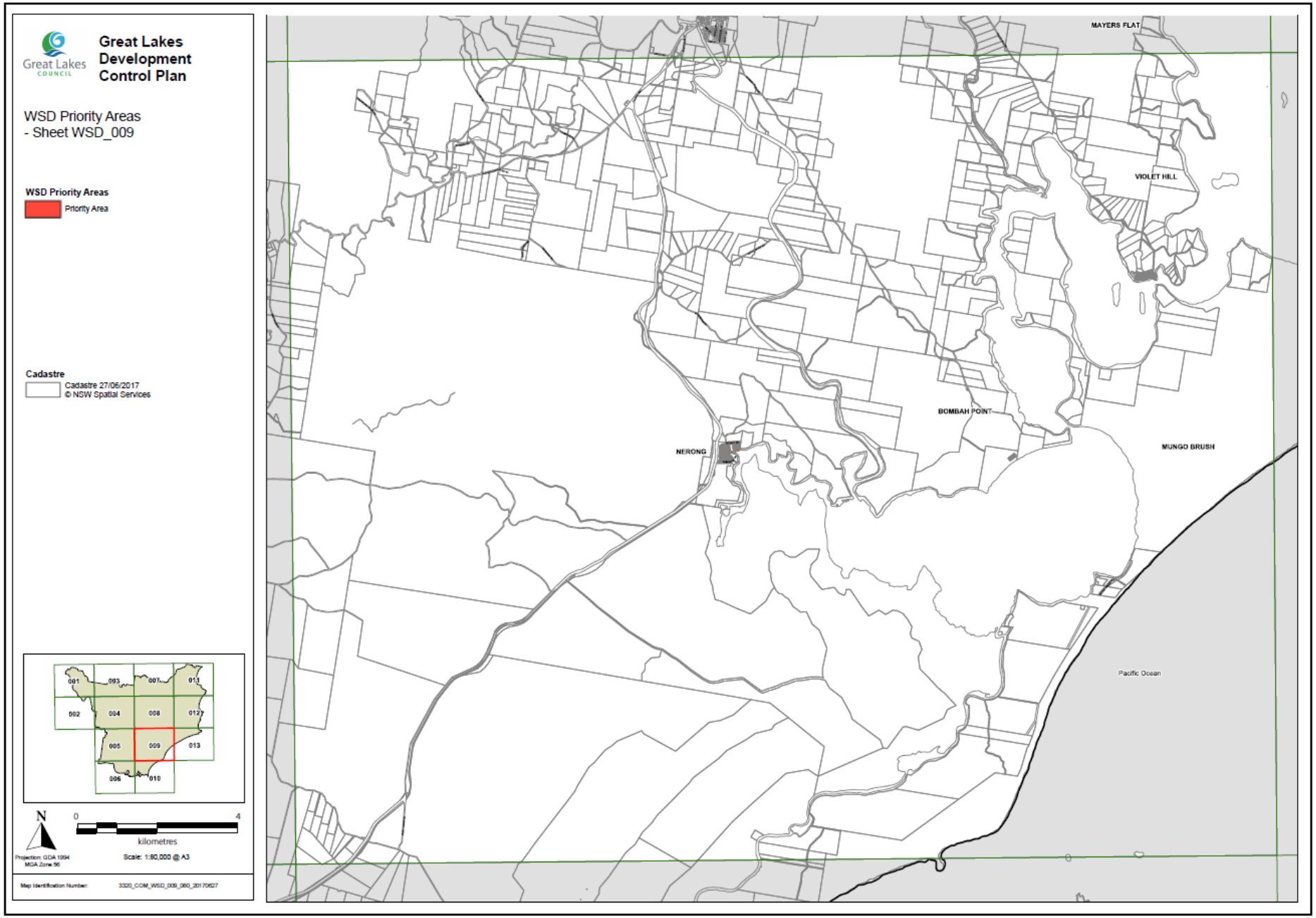


Figure D.5 – Tea Gardens & Hawks Nest Priority Area Map

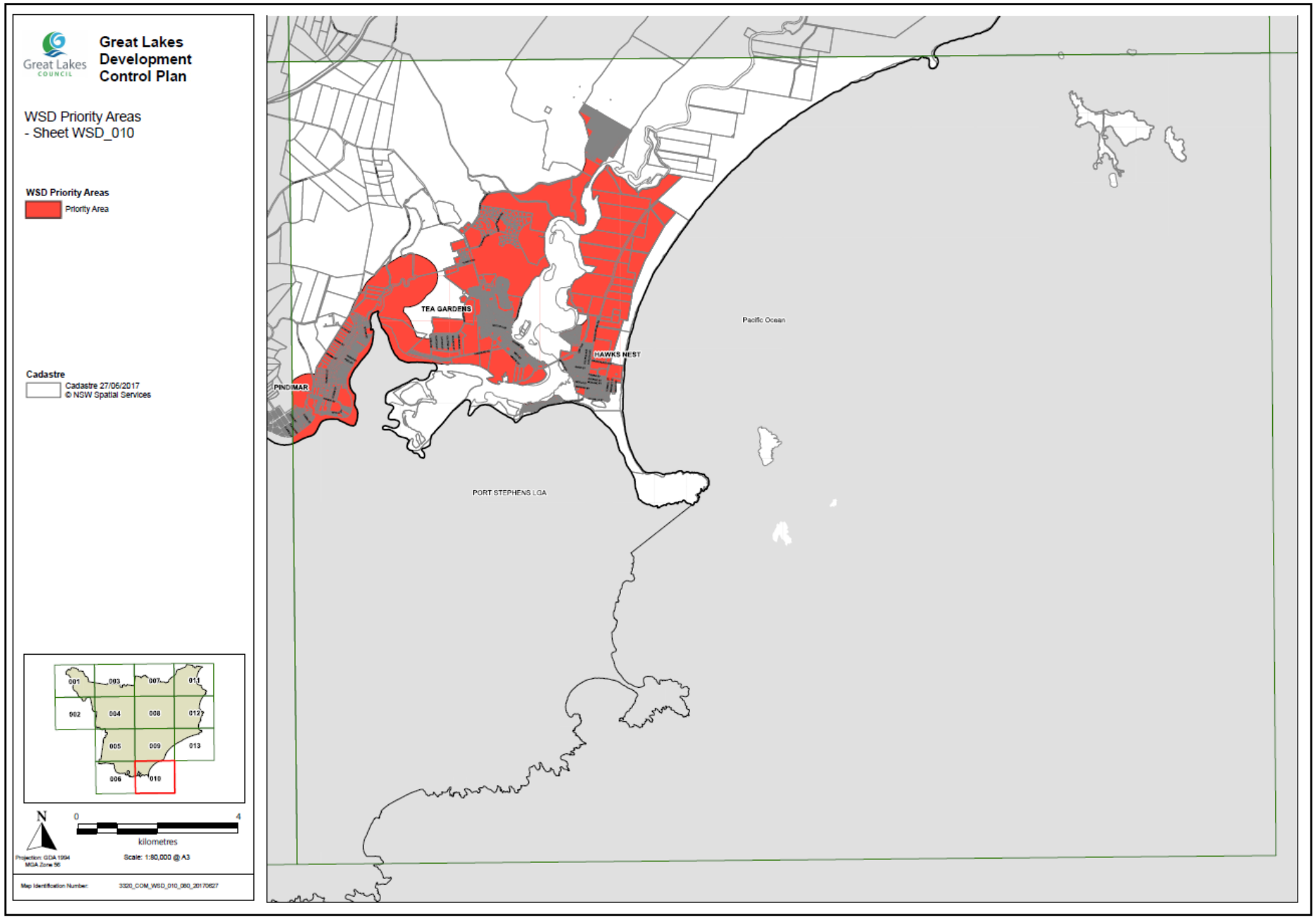


Figure D.6 – Tuncurry & Forster District Priority Area Map

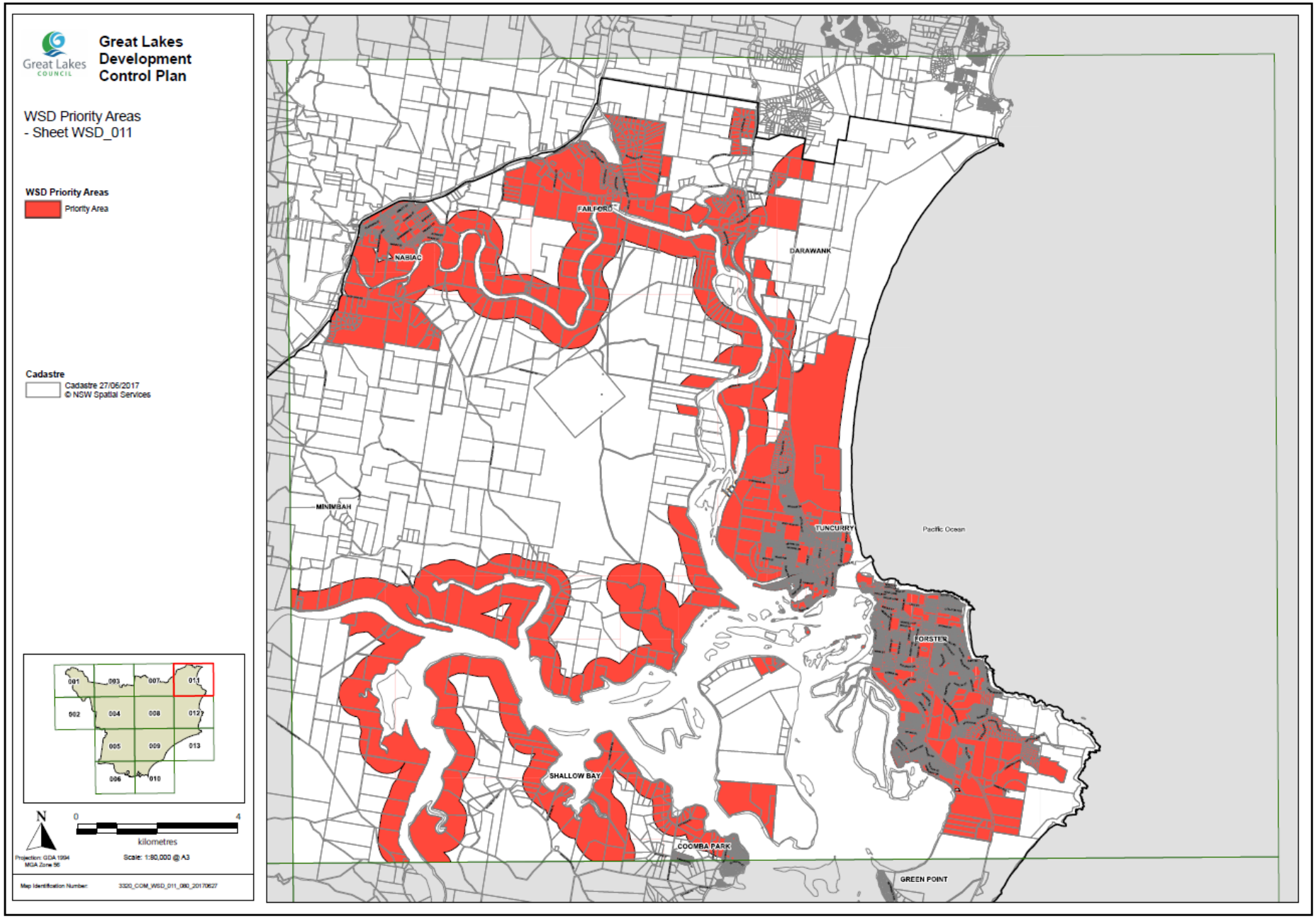


Figure D.7 – Pacific Palms & District Priority Area Map

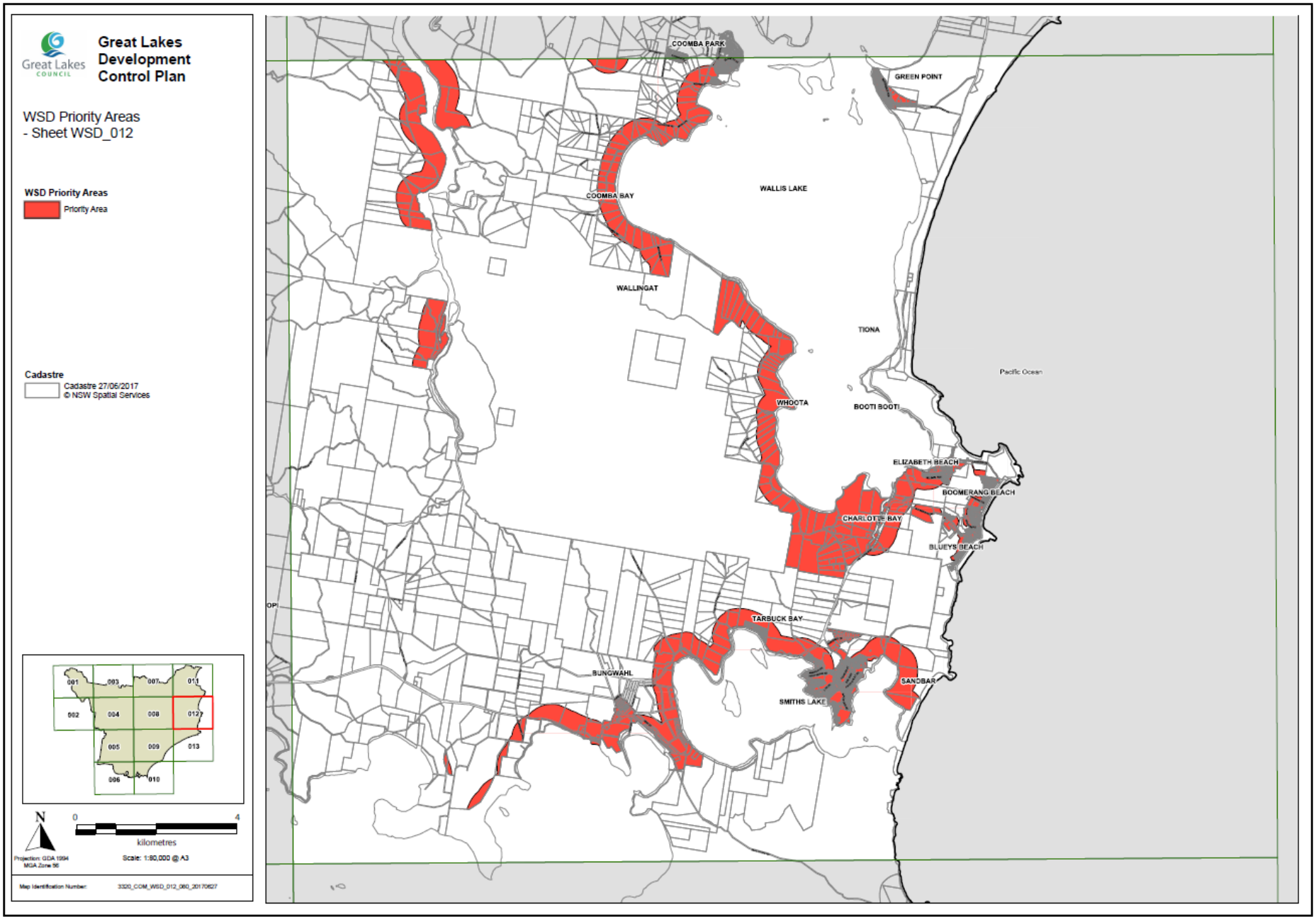


Figure D.8 – Seal Rocks Priority Area Map