CHAPTER G2: SUSTAINABLE STORMWATER MANAGEMENT AND EROSION/SEDIMENT CONTROL

NOTE: This Chapter should not be read in isolation. You may need to consider other chapters of this DCP when preparing your application.
## Table of Changes

<table>
<thead>
<tr>
<th>Old Section</th>
<th>New Section</th>
<th>Recommended Change</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header and title</td>
<td>-</td>
<td>Change header throughout the document and the title to “Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control”.</td>
<td>To ensure consistency in titling.</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>Amend Advisory Note Box to sort the supporting documents.</td>
<td>To rationalise the supporting documentation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Include reference to the new supporting document - Stormwater Protection on Construction Sites as per Council resolution D15/17098.</td>
<td>To rationalise and consolidate existing policies of Council into the DCP where considered advantageous.</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>Insert new objective “xi) Provide Green and Golden Bell Frog (GGBF) friendly stormwater detention ponds in areas where GGBF are present.”</td>
<td>In response to Recommendation i) MIN14.726.</td>
</tr>
<tr>
<td>6.1</td>
<td>-</td>
<td>• Insert List of Figures below Table of Contents.</td>
<td>• The previous diagram poorly explained what small scale development was. The revised flowchart clearly explains both small/medium and large scale development.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Include reference to Figure 1 in the first paragraph.</td>
<td>• In response to MIN14.726.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Replace flow chart with new Figure 1</td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td>-</td>
<td>• Insert additional text after the dot point in the first row as follows: “Operation and maintenance plan for large scale development or for small/medium scale development only if proposed stormwater treatment measures are</td>
<td>• Inserted header/footers into the supporting documents to rationalise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• To clarify when an operation and maintenance plan is required for small/medium scale development.</td>
</tr>
</tbody>
</table>

---
| Supporting Document 1 - Development Application and Construction Certificate Checklist | - | • Insert header/footer to rationalise supporting documentation.  
• Expand commentary for operation and maintenance plan. |
| Supporting Document 2 - Sustainable Stormwater Technical Guidelines | - | • Insert header/footer to rationalise supporting documentation.  
• 3.4.2 – Text amended in first paragraph in relation to operation and maintenance plan. |
| Supporting Document 3 - Stormwater Protection on Construction Sites | - | • Insert header/footer to rationalise supporting documentation.  
• Include the relevant content of POL12/130 – Stormwater Protection on Construction Sites as supporting documentation to the chapter as per Council resolution D15/17098.  
To rationalise and consolidate existing policies of Council into the DCP where considered advantageous. |
Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Contents

1 Purpose ........................................................................................................................ 5
2 Application .................................................................................................................... 5
3 Context ......................................................................................................................... 5
4 Objectives ..................................................................................................................... 6
5 Controls ........................................................................................................................ 6
  5.1 Stormwater ............................................................................................................. 6
  5.1.1 Minor and Major Systems Design ........................................................................ 6
  5.1.2 Climate Change Controls .................................................................................... 8
  5.1.3 Onsite Stormwater Detention (OSD) ................................................................. 8
5.2 Stormwater Reuse ................................................................................................ 10
5.3 Stormwater Quality and Waterway Protection ...................................................... 10
  5.3.1 Erosion and Sediment Control ......................................................................... 11
  5.3.2 Stormwater Retention - General ...................................................................... 11
  5.3.3 Small/medium scale development – Site Discharge Index .............................. 12
  5.3.4 Large scale development .............................................................................. 12
  5.3.5 Design and maintenance of stormwater treatment measures ......................... 14
5.4 Waterfront Land .................................................................................................... 15
  5.4.1 Development on waterfront land .................................................................... 16
  5.4.2 Coastal Areas .................................................................................................. 17
6 Advisory Information ................................................................................................... 18
  6.1 Development Application Documents ................................................................. 18
  6.2 Construction Certificate Documents ................................................................... 20
  6.3 Occupation Certificate and/or Subdivision Certificate Plans ............................... 21
  6.4 Other legislation or policies you may need to check ............................................ 21

Figures

Figure 1: Determining whether your development is small/medium scale or larger scale.. 19
## Amendment history

<table>
<thead>
<tr>
<th>Version Number</th>
<th>Date Adopted by Council</th>
<th>Commencement Date</th>
<th>Amendment Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14 October 2014</td>
<td>22 October 2014</td>
<td>New</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Draft</td>
</tr>
</tbody>
</table>
Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

1 Purpose

The purpose of this Chapter is to:

- Give applicants guidance about how to implement sustainable stormwater management in the development application process.
- Provide design principles for stormwater management that assist development.
- Outline controls for the management of stormwater (including water quality, waterway stability, detention, erosion and sediment control).

Advisory Note: In addition to the provisions outlined in this Chapter, you must refer to the supporting documents/checklists:


2 Application

This Chapter applies to all development in Shoalhaven. Different sections of the Chapter will apply depending on the scale, location and type of the development.

Note: For areas that are located within the Sydney Drinking Water Catchment (SDWC) Area, specifically Kangaroo Valley and parts of Sassafras, the SDWC SEPP will apply and prevail where it conflicts with this Chapter.

3 Context

Stormwater is a generic term for rainfall that is concentrated after it runs off all urban surfaces such as roofs, pavements, carparks, roads, gardens and vegetated open space and includes water in stormwater pipes and channels. Stormwater represents a significant proportion of the natural water cycle.

To some degree, all development has an impact on the behaviour of stormwater through the addition of impervious surfaces, diversions and drainage and through changes to water quality. Sustainable stormwater management is the application of controls on stormwater to mitigate, manage and control changes to the natural water cycle, to protect environmental values and to protect human life and assets.

Note: Impervious means a surface that does not allow water to infiltrate into the ground, including roofs, roads, pavements, hard surfaced sports courts, any “sealed” areas and permanent water bodies such as swimming pools.
4 Objectives

The objectives are to:

i. Manage stormwater flow paths and systems to ensure the safety of people and property.

ii. Protect and enhance natural watercourses and their associated ecosystems and ecological processes.

iii. Maintain, protect and/or rehabilitate modified watercourses and their associated ecosystems and ecological processes towards a natural state.

iv. Mitigate the impacts of development on water quality and quantity.

v. Encourage the reuse of stormwater.

vi. Integrate water cycle management measures into the landscape and urban design to maximise amenity.

vii. Minimise soil erosion and sedimentation resulting from site disturbing activities.

viii. Minimise the potential impacts of development and other associated activities on the aesthetic, recreational and ecological values of receiving water.

ix. Ensure the principles of ecologically sustainable development are applied in consideration of economic, social and environmental values in water cycle management.

x. Ensure stormwater systems and infrastructure are designed, installed and maintained so as not to increase the risk to life or safety or people.

xi. Provide Green and Golden Bell Frog (GGBF) friendly stormwater detention ponds in areas where GGBF are present.

5 Controls

5.1 Stormwater

5.1.1 Minor and Major Systems Design

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>A1.1</td>
</tr>
<tr>
<td></td>
<td>The design and construction of minor and major drainage systems are to be in accordance with proposed stormwater controls in this Chapter and Council's <em>Engineering Design Specification</em>.</td>
</tr>
<tr>
<td></td>
<td>Minor System Drainage</td>
</tr>
<tr>
<td></td>
<td>A1.2</td>
</tr>
<tr>
<td></td>
<td>For residential and rural residential areas, the</td>
</tr>
</tbody>
</table>
## Performance Criteria

(see section 4.1.1 of *Sustainable Stormwater Technical Guidelines*).

- Stormwater discharge from the **development** or work will be managed to safely convey stormwater flows.
- Runoff from the **development** is discharged without adverse impacts on existing infrastructure and neighbouring properties.
- Ensure continuity of overland flow paths where possible.
- Ensure stormwater systems are designed in accordance with industry standards.

## Acceptable Solutions

- **drainage** must be designed to cater for a 5 year ARI event.
  - A1.3 For mixed residential/commercial, commercial and industrial development, the drainage must be designed to cater for a 10 year ARI event.
  - A1.4 Runoff from impervious areas must not be concentrated or directed onto neighbouring properties.
  - A1.5 Kerb and gutters may not be required if it is proven that soil permeability is sufficient to allow natural infiltration of stormwater runoff without causing adverse impacts onsite or to neighbouring properties.
  - A1.6 Runoff from roof gutters and downpipes can be directed to an existing or proposed stormwater system, when it can be proved that the systems design capacity is not exceeded.

### Major System Drainage

- **Major system drainage** must be designed for a 100 year ARI event.
  - A1.7 Trunk stormwater systems, which include open channels, large conduits and overland flow paths are designed for storms up to 100 year ARI event.
  - A1.9 It is unacceptable to provide overland flow paths on private land within subdivisions. The following overland flow paths may be used to act as major system flow routes;
    - Roadways including footpath,
    - Pathways and
    - Parkland or open space.
  - A1.10 Flow paths must be designed to ensure a velocity depth product of less than 0.3m\(^2\)/s for a 100 year ARI storm event.
  - A1.11 Runoff from impervious areas must not be concentrated or directed onto neighbouring properties.
  - A1.12 Consideration must be given to continuity of the overland flow path and as such where, for example, a roadway acting as an overland flow path discharges stormwater to a pathway, park, stormwater reserve, etc., the footpath must have a reverse crossfall to facilitate the overland flow. Other obstructions, such as
### Performance Criteria | Acceptable Solutions
---|---
ersures that water flows around the return and away before it breaks over the top of the kerb at the low point.

**Note:** An overland flow path is the path that stormwater may take if the piped or channelled stormwater system becomes blocked or its capacity exceeded. Overland flow paths provide a fail safe system to ensure that stormwater is not likely to cause flood damage.

### 5.1.2 Climate Change Controls

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
</table>
P2 | Major system design must consider the impact of changes to rainfall intensity due to climate change. | A2.1 Climate change impacts, such as changes to rainfall intensity, are incorporated into system design as per relevant policies and/or Australian Rainfall & Runoff (AR&R) Guidelines. |
P3 | Where relevant, major and minor system design must consider the impact of sea level rise. | A3.1 Sea level rise is incorporated into system design as per relevant policies and/or AR&R Guidelines. |

### 5.1.3 Onsite Stormwater Detention (OSD)

**Note:** Detention is the collection and temporary storage of stormwater to reduce the peak runoff from a site. Stormwater detention measures temporarily detain stormwater onsite in order to prevent flooding and erosion further downstream.

Onsite Stormwater Detention may be required for all development **except**:

(a) For alterations, additions, ancillary structures and second storey additions in areas within the 5 year ARI flood extents as identified in a flood study or floodplain risk management study adopted by Council where:
   (i) The addition is less than 10% of the existing development footprint; and
   (ii) The overall site impervious areas are less than 50% of the site.
(b) For change of use where no increase in impervious area is proposed;
(c) For new developments in subdivisions where OSD has already been provided for the entire subdivision.
To ensure that the use of onsite stormwater detention (OSD) is appropriate the needs of the development including:

- Post development peak flow should match as closely as possibly pre-development peak flow.
- OSD measures are made safe.
- The development does not place an unacceptable financial burden on landowners or the community.
- OSD designed in accordance with industry standards.

OSD is to be sized to match pre-development peak flow rates for the 5, 20 and 100 year ARI rain events for that site.

For development other than subdivision, pre and post-development peak flow calculations must be based on the impervious percentages (as outlined below) or the actual impervious surface area (whichever is greater) as detailed on development plans.

For subdivisions, pre and post-development peak flow calculations must be based on the impervious percentages as outlined below.

Area impervious:

- Open Space – 25%
- Normal residential – 60%
- Half width road reserve – 95%
- Medium density residential lots – 80%
- Commercial areas – 90%
- Industrial areas – 80%

OSD design must consider downstream boundary conditions for the 100 year ARI level of the receiving water.

Detention storage must be located at a level above the 5 year ARI flood level.

If OSD is provided in landscaped areas, the desirable maximum depth of ponding under design conditions is 300mm, this can be increased to 1200mm provided that site slopes of the basin are ≥1:6, or the provided storage is fenced off.

For subdivisions it is recommended that OSD is at the individual dwelling scale. Where OSD is proposed on public land, the OSD system must be kept to a minimum.

50% of any retention volume can contribute towards the OSD volume required for the development, provided the systems are interconnected.

Note: Peak flow is the maximum instantaneous outflow from a catchment during a storm event.
5.2 Stormwater Reuse

This section applies to all development that is not subject to BASIX.

**Note:** The Building Sustainability Index (BASIX) applies to residential development. For more information, see State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004.

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P5</td>
<td>To optimise the reuse of stormwater to provide an alternative water supply.</td>
</tr>
<tr>
<td>A5.1</td>
<td>Residential buildings not affected by BASIX are encouraged to install rainwater tanks to meet a portion of supply such as outdoor use, toilets, laundry.</td>
</tr>
<tr>
<td>A5.2</td>
<td>Any overflow from rainwater tanks will be directed into an existing stormwater system where possible, alternatively the overflow will be managed so that it does not cause nuisance to neighbouring properties (see Sustainable Stormwater Technical Guidelines).</td>
</tr>
<tr>
<td>A5.3</td>
<td>Stormwater use within public open space (irrigation, street cleaning, public amenities) is encouraged.</td>
</tr>
</tbody>
</table>

5.3 Stormwater Quality and Waterway Protection

This section aims to encourage a decentralised approach to stormwater management that considers the natural hydrological and ecological processes of the surrounding environment. This may include onsite collection, treatment and utilisation of water flows as part of an integrated treatment train provided either in addition to or in lieu of conventional stormwater treatment measures.
5.3.1 Erosion and Sediment Control

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P6</td>
<td>A6.1</td>
</tr>
<tr>
<td>The development or work will not cause erosion and siltation.</td>
<td>An erosion and sediment control plan or soil and water management plan must be prepared in accordance with:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Managing Urban Stormwater: Soils and Construction Volume 2 (DECCW, 2008) (Blue Book Vol. 2) and,</td>
</tr>
<tr>
<td></td>
<td>• Council’s policy on Stormwater Protection on Construction Sites</td>
</tr>
</tbody>
</table>

Note: An erosion and sediment control plan is a set of drawings showing how soil and water is to be managed during construction of a development. A soil and water management plan is a document which sets out strategies and controls for a development or site to prevent pollution of the environment from all pollutants during the construction stage. Where a conflict arises between guiding documents the ‘Blue Book’ will take precedence. The above standards are minimum requirements. Additional works may be required depending upon exposed areas and prevailing weather conditions (refer to Sustainable Stormwater Technical Guidelines).

5.3.2 Stormwater Retention - General

This section applies to all development where the amount of impervious surfaces post-development will be greater than the amount of impervious surfaces pre-development.

Note: See section 3.1 for a definition of “impervious”.

Retention is the storing of water for beneficial use. Retention can apply to all forms of water including rainwater, stormwater and recycled water. It may occur by storing water in a tank, which is used for a purpose such as irrigation, or infiltration.

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P7</td>
<td>A7.1</td>
</tr>
<tr>
<td>Adequate retention storage</td>
<td>The volume of retention storage provided is to be</td>
</tr>
</tbody>
</table>
is provided in the development.

[storage depth*] X [increase in impervious surfaces compared to pre-development]

*as outlined below (refer to Sustainable Stormwater Technical Guidelines for further details).

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Storage Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alterations, additions, auxiliary structures &amp; second storey additions</td>
<td>10mm</td>
</tr>
<tr>
<td>Single dwelling &amp; dual occupancy</td>
<td>10mm</td>
</tr>
<tr>
<td>Medium Density</td>
<td>9mm</td>
</tr>
<tr>
<td>High Density</td>
<td>8mm</td>
</tr>
<tr>
<td>Industrial</td>
<td>6mm</td>
</tr>
</tbody>
</table>

### 5.3.3 Small/medium scale development – Site Discharge Index

This section applies to small/medium scale development. You can check if your development is small/medium scale by reviewing the diagram in Section 6. This section does not apply to alterations, additions, ancillary structures and second storey additions where:

a) The addition is less than 10% of the existing development footprint; and
b) The overall site impervious areas are less than 50% of the site.

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P8</td>
<td>Site discharge will have a minimal impact on receiving waterways and stormwater systems.</td>
</tr>
<tr>
<td>A8.1</td>
<td>Development should be designed to achieve a site discharge index (SDI) that does not exceed 0.1 (refer to Sustainable Stormwater Technical Guidelines for further details).</td>
</tr>
</tbody>
</table>

**Note:** Permissible Site Discharge is the maximum discharge from the site during a 1 in 5 year ARI storm event under pre-development (existing) site conditions.

### 5.3.4 Large scale development

This section applies to large scale development. You can check if your development is large scale by reviewing the diagram in Section 6.
## Performance Criteria

To ensure that large scale development minimises its impacts by:

- Post development pollutant loads being minimised so as to not unduly impact on the quality of receiving waterways.
- Protecting stream stability and habitats by providing retention, infiltration and detention to limit post development flows.

## Acceptable Solutions

<table>
<thead>
<tr>
<th>A9.1</th>
<th>Pollutant load reduction must be a minimum percentage reduction of the post development average annual load of pollutants in accordance with those outlined below; or</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pollutant</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Gross pollutants</td>
</tr>
<tr>
<td></td>
<td>Total suspended solids</td>
</tr>
<tr>
<td></td>
<td>Total phosphorus</td>
</tr>
<tr>
<td></td>
<td>Total nitrogen</td>
</tr>
<tr>
<td></td>
<td>Total hydrocarbons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A9.2</th>
<th>For development within Sydney’s drinking water supply catchments, a neutral or beneficial effect must be demonstrated in accordance with the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011; and</th>
</tr>
</thead>
<tbody>
<tr>
<td>A9.3</td>
<td>Water quality modelling, demonstrates reductions in pollutant loads (refer to Sustainable Stormwater Technical Guidelines); and</td>
</tr>
<tr>
<td>A9.4</td>
<td>For greenfield sites or sites draining to a natural stream of 3rd order or lower, the 1.5 year ARI pre-development peak discharge must be maintained; and</td>
</tr>
<tr>
<td>A9.5</td>
<td>For development discharging to a natural stream of 3rd order or lower that is not tidal, the post development duration of stream forming flows must be no greater than 2 times the pre-development duration of stream forming flows at the site discharge point, i.e. a stream erosion index of 2; and</td>
</tr>
<tr>
<td>A9.6</td>
<td>For development discharging to a tidal area, outlets must be designed to limit erosion and sedimentation at the discharge point.</td>
</tr>
</tbody>
</table>

**Note:** Infiltration means the downward movement of water from the surface to the subsoil.
5.3.5 Design and maintenance of stormwater treatment measures

This section sets out controls for large scale development that require stormwater treatment measures. You can check if your development is large scale by reviewing the diagram in Section 6.

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P10</td>
<td>A10.1 Where practicable, trunk drainage is to be provided as a natural vegetated stable channel; and</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: Trunk drainage is generally defined as stormwater drainage beyond immediate property and street drainage.</td>
</tr>
<tr>
<td></td>
<td>A10.2 An Operation and Maintenance Plan is submitted to Council for all stormwater treatment measures proposed, whether remain in private ownership or to be handed over to Council; and</td>
</tr>
<tr>
<td></td>
<td>A10.3 System design allows for maintenance (i.e. access and room to operate safely) at all times; and</td>
</tr>
<tr>
<td></td>
<td>A10.4 Stormwater treatment measures must not be connected until the majority of catchment infrastructure is completed and landforms stabilised; and</td>
</tr>
<tr>
<td></td>
<td>A10.5 Where the development is staged, sacrificial zones must be included in the design of the stormwater treatment measures. Sacrificial zones are to be rectified upon completion of development at the developers cost; and</td>
</tr>
<tr>
<td></td>
<td>A10.6 Structural stormwater treatment measures must be able to bypass flows in excess of the design discharge with negligible afflux resulting from over topping or blockage of the device; and</td>
</tr>
<tr>
<td></td>
<td>A10.7 In the event of a stormwater discharge, structure stormwater treatment measures must not allow the release of any previously trapped material and must be designed to prevent or manage any additional surcharge from any inlet or pit; and</td>
</tr>
<tr>
<td></td>
<td>A10.8 Stormwater treatment measures must consider mosquito control in their design. Designs should consider:</td>
</tr>
<tr>
<td></td>
<td>• Permanent water ponding;</td>
</tr>
<tr>
<td></td>
<td>• Water depth;</td>
</tr>
<tr>
<td></td>
<td>• Exposure to sunlight and wind; and</td>
</tr>
<tr>
<td></td>
<td>• Proximity to residential development.</td>
</tr>
</tbody>
</table>
Performance Criteria | Acceptable Solutions
--- | ---
Reference to expert advice is to be made where necessary; and
A10.9 **Development** must provide for stormwater treatment measures to be contained on the lot unless otherwise agreed to by **Council**, prior to granting **development** approval; and
A10.10 **Development** must provide for stormwater treatment measures to be contained on the lot unless otherwise agreed to by Council, prior to granting development approval; and
A10.11 All filter media used in stormwater treatment measures must meet the current specifications of the *Guidelines for filter media in biofiltration systems* (Version 3.01) *(Facility for Advancing Water Filtration 2009)* or a demonstrated equivalent, verified by a soil laboratory registered by the National Association of Testing Authorities; and
A10.12 Design of stormwater treatment measures is in accordance with *Sustainable Stormwater Technical Guidelines*.

5.4 **Waterfront Land**

This section applies to all waterfront land.

*Note:* Waterfront land is defined by the *Water Management Act* 2000.

Where the development is on waterfront land, watercourses must be defined according to:

- *Shoalhaven LEP 2014* Natural Resource Sensitivity – Water Map; or
- The *Water Management Act* 2000; or
- Where necessary, the relevant NSW State Government agency must be consulted to determine the appropriate classification.

The watercourse category is the rank of the stream based on environmental and riparian value. Category 1 being the highest, most valuable, and category 3 being the lowest. The category will determine the core riparian zone (CRZ) which must be protected/rehabilitated and a vegetated buffer width provided as outlined in Table 1- Watercourses and CPZ.

*Note:* The core riparian zone is the area beyond the top of bank of a watercourse that is to be protected under the *Water Management Act* 2000.

The size of the core riparian zone relates to stream category and
stream order. The watercourse categories identified in Table 1 refers to the SLEP 2014 Watercourse Categories.

The Water Management Act 2000 uses a different method to order streams – the Strahler Method. This method ranks the stream based on the number of upstream tributaries draining to it at that point.

Table 1: Watercourses and CPZ

<table>
<thead>
<tr>
<th>Watercourse type</th>
<th>Width of core riparian zone</th>
<th>Vegetated buffer width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitive area (watercourse category 1) – Environmental Corridor</td>
<td>40m</td>
<td>10m</td>
</tr>
<tr>
<td>Sensitive area (watercourse category 2) – Terrestrial and Aquatic Habitat</td>
<td>20m</td>
<td>10m</td>
</tr>
<tr>
<td>Sensitive area (watercourse category 3) – Bank Stability and Water Quality</td>
<td>10m</td>
<td>Merit based</td>
</tr>
</tbody>
</table>

5.4.1 Development on waterfront land

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P11</td>
<td>To effectively provide for buffers and setbacks to watercourses through:</td>
</tr>
<tr>
<td></td>
<td>• Core riparian zones (CRZ) areas being established or maintained in accordance with the relevant guidelines; and</td>
</tr>
<tr>
<td></td>
<td>• Development or works on waterfront land complying with State Government legislation and guidelines.</td>
</tr>
<tr>
<td></td>
<td>A11.1 The minimum width of the CRZ is in accordance with the above Table or as specified by the Water Management Act 2000; and</td>
</tr>
<tr>
<td></td>
<td>A11.2 The CRZ must be maintained, restored or rehabilitated using appropriate local species with a range of canopy, understory and groundcover species to enable a healthy and diverse ecosystem; and</td>
</tr>
<tr>
<td></td>
<td>A11.3 Where appropriate, applicants must re-use topsoil from the development site that contains known or potential seedbank on the development site; and</td>
</tr>
<tr>
<td></td>
<td>A11.4 Transport infrastructure and services (i.e. sewer, electricity, gas and communication) should preferably be located outside the CRZ. Where services must traverse the CRZ it must be demonstrated that there will be minimal impact on the function and integrity of the CRZ; and</td>
</tr>
<tr>
<td></td>
<td>A11.5 In general, pathways, cycleways and pervious recreational areas are not permitted in the CRZ except where an opportunity presents for the community to connect with and explore the watercourse in a</td>
</tr>
</tbody>
</table>
Performance Criteria | Acceptable Solutions
--- | ---
strategic location. It must also be demonstrated that there will be minimal impact on the riparian function and that the integrity of the riparian land is maintained; and

**Note:** Pervious means a surface that permits water to infiltrate into the ground.

A11.6 Bushfire asset protection zones (APZ) are not permitted within the CRZ or vegetated buffer and should be incorporated into the development footprint; and

A11.7 Crossings of waterways or other activities must have regard to the requirements for fish passage. Minimum structures for fish passage must be provided in accordance with relevant NSW state government requirements; and

A11.8 Works carried out on waterfront land comply with the Water Management Act 2000. Refer to Council’s Sustainable Stormwater Technical Guidelines and the NSW Office of Water website, specifically for:
- In-stream works
- Laying pipes and cables in watercourses
- Outlet structures
- Riparian corridors
- Vegetation Management Plans
- Watercourse crossings

A11.9 Stormwater disposal over/across/through public waterfront reserves should be avoided to prevent erosion and need for remedial actions.

**Note:** Where there is no other option but to dispose of stormwater over/across/through public waterfront reserves this may be supported through the creation of an easement (88B Instrument).

### 5.4.2 Coastal Areas

This section applies to all development discharging stormwater to coastal cliffs or coastal dunes.
### Performance Criteria | Acceptable Solutions
--- | ---
P12 Stormwater discharge will not cause significant erosion of the cliff or dune face. | A12.1 The quantity of stormwater discharged to the cliffs or dune face is limited by complying with the controls for waterfront land in this Chapter; and
A12.2 Stormwater is discharged to stable well vegetated areas and/or energy dissipation structures are provided; and
A12.3 Maximise the capture and discharge of roof and surface flow stormwater to the street, or if not away from the cliff line, discharging to the bottom of the cliff.
A12.4 A development must not direct stormwater discharges to the base of a dune or cliff where the cliff or dune is Crown land.

**Note:** Where there is no other option but to discharge to the base of a dune or cliff, additional approvals/licences may be required from Council or Crown Lands.

### 6 Advisory Information

### 6.1 Development Application Documents

The information you must submit with your development application depends upon the scale of your development. Figure 1 on the following page will help you to determine whether, for the purposes of stormwater management, your proposed development is a large scale or a small/medium scale development.
Figure 1: Determining whether your development is small/medium scale or larger scale

- Is your development:
  - A Torrens or Community Title subdivision creating 10 or more additional lots?
    - Yes
    - No
  - A subdivision of land greater than 3,500 m²?
    - Yes
    - No
  - An integrated housing subdivision?
    - Yes
    - No
  - A development with an area greater than 2,500 m²?
    - Yes
    - No
  - An industrial, commercial or residential development, alteration or an addition to development, where the total new impervious area exceeds 1,000 square metres?
    - Yes
    - No

Your development is **small/medium scale development**

Your development is **large scale development**
Large scale

An integrated water cycle management strategy (IWCMS)

**Note:** Integrated water cycle management is the management of the water cycle in the urban and industrial context as a whole, including water use, water collection, water recycling and disposal. An IWCMS must include a report and drawing demonstrating how the development meets the relevant stormwater controls (refer to Council’s Sustainable Stormwater Technical Guidelines).

Small/medium scale

A stormwater management plan (SMP)

**Note:** A SMP may comprise a concise report and/or drawing/s that provide sufficient information to demonstrate how the development meets the relevant stormwater controls (refer to Council’s Sustainable Stormwater Technical Guidelines).

### 6.2 Construction Certificate Documents

The information you must submit with your construction certification application depends upon the type of development activity you will carry out. The following table provides guidance on the information to be submitted:

<table>
<thead>
<tr>
<th>Development activity</th>
<th>Construction Certificate Documents</th>
</tr>
</thead>
</table>
| Installation of stormwater controls including drainage, water quality, waterway stability, detention. | For all proposed stormwater treatment measures, regardless of whether they will remain in private ownership, or be handed over to Council:  
  - Drainage design drawings; and  
  - Operation and maintenance plan for large scale development or for small/medium scale development only if proposed stormwater treatment measures are being handed over to Council. |
| Disturbance of soil surfaces, cut or placement of fill, or storage of materials on any land   |  
  - Erosion and sediment control plan where less than 2,500m² of land is to be disturbed  
  - Soil and water management plan where more than 2,500m² of land is to be disturbed  
  **Note:** See Section 5.3 above for a definition of these plans. |
| Onsite detention                                          |  
  - Onsite detention drawings and calculations                                                             |
| Design of major drainage systems                          |  
  - Calculations for design events and 100 year ARI flows, including the calculated flow path extents.     |
6.3 Occupation Certificate and/or Subdivision Certificate Plans

You must submit works as executed plans (being a topographic survey of the constructed elements of a stormwater system) before Council can issue an occupation and/or subdivision certificate. Further details are included in the Sustainable Stormwater Technical Guidelines.

6.4 Other legislation or policies you may need to check

Note: This section is not exclusive and you may be required to consider other legislation, policies and other documents with your application

| Council Policies & Guidelines               | Engineering Design Specifications            |
|                                           | Sustainable Stormwater Technical Guidelines |
|                                           | Stormwater Protection on Construction Sites |
| External Policies & Guidelines            | Australian Rainfall & Runoff (AR&R) Guidelines |
|                                           | Guidelines for filter media in biofiltration systems - Facility for Advancing Water Filtration |
| Legislation                               | State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004 |
|                                           | State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 |
|                                           | Water Management Act 2000 |
STORMWATER MANAGEMENT DEVELOPMENT APPLICATION AND CONSTRUCTION CERTIFICATION CHECKLIST.

Is the development:

- Large scale? OR Small/Medium scale?

(circle one)

Development Application Checklist

*Large scale development – Integrated water cycle strategy*

<table>
<thead>
<tr>
<th>Item</th>
<th>Supplied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background information of persons involved in the preparation of the strategy (i.e. name, qualifications and experience)</td>
<td></td>
</tr>
<tr>
<td>Detailed information about the proposed development including location, boundaries and relevant site analysis information (i.e. total area, impervious area, site slope, rainfall ARI’s)</td>
<td></td>
</tr>
<tr>
<td>A list of all relevant controls and objectives</td>
<td></td>
</tr>
<tr>
<td>A description of how the proposed management measures meet development controls and objectives</td>
<td></td>
</tr>
<tr>
<td>A comparison of constraints and opportunities on the site</td>
<td></td>
</tr>
<tr>
<td>Conceptual soil and water management plan for the</td>
<td></td>
</tr>
</tbody>
</table>
The size, location, level and configuration of proposed management measures

Calculations for retention volumes

Calculations and modeling used to determine and size proposed management measures (include assumptions)

Summary of capital, operational and maintenance costs of proposed management measures when these measures are to be handed over to Council ownership,

Summary of inspection and maintenance requirements for the proposed management measures to ensure the proposed measures remain effective.

---

**Small scale development – Stormwater management plan**

<table>
<thead>
<tr>
<th>Item</th>
<th>Supplied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculations for retention volumes and the Site Discharge Index required for the development</td>
<td></td>
</tr>
<tr>
<td>Calculations for onsite detention (if required)</td>
<td></td>
</tr>
<tr>
<td>A drawing showing the:</td>
<td></td>
</tr>
<tr>
<td>o proposed drainage flow paths including piped and overland flow paths</td>
<td></td>
</tr>
<tr>
<td>o location and area of pervious and impervious surfaces</td>
<td></td>
</tr>
<tr>
<td>o proposed location and approximate size of stormwater control measures, demonstrating how the Site Discharge Index and retention volumes are achieved</td>
<td></td>
</tr>
<tr>
<td>o proposed location and approximate size of onsite detention</td>
<td></td>
</tr>
</tbody>
</table>
# Construction Certificate Checklist

**Design drawings showing:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Required?</th>
<th>Supplied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal points of discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detention including all necessary levels, dimensions, volumes, etc;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overland flow paths</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trunk drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe sizes and levels of critical points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of works</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-allotment drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsoil drainage;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pit design;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constraints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood prone land;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated water cycle management measures;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities locations and constraints.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainwater tank details (refer to Shoalhaven Water’s compliance checklist)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Shoalhaven Development Control Plan 2014

Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Supporting Document 1: Development Application and Construction Certificate Checklist

<table>
<thead>
<tr>
<th>Raingardens and infiltration areas showing the:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>o location on a plan</td>
<td></td>
</tr>
<tr>
<td>o proposed dimensions</td>
<td></td>
</tr>
<tr>
<td>o proposed construction materials,</td>
<td></td>
</tr>
<tr>
<td>including depths and types of any</td>
<td></td>
</tr>
<tr>
<td>media layers,</td>
<td></td>
</tr>
<tr>
<td>o location of all incoming pipes.</td>
<td></td>
</tr>
<tr>
<td>o location of overflow pit and proposed piped</td>
<td></td>
</tr>
<tr>
<td>connection to back of kerb. If no kerb</td>
<td></td>
</tr>
<tr>
<td>exists then show the location of any</td>
<td></td>
</tr>
<tr>
<td>proposed overland flow path.</td>
<td></td>
</tr>
<tr>
<td>o invert level of the proposed overflow pipe</td>
<td></td>
</tr>
<tr>
<td>at the overflow pit, showing the invert</td>
<td></td>
</tr>
<tr>
<td>level of the pipe where it will discharge</td>
<td></td>
</tr>
<tr>
<td>at the kerb (this shows that the overflow</td>
<td></td>
</tr>
<tr>
<td>can drain freely to the street).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Permeable paving</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>o Show the extent of any permeable paving</td>
<td></td>
</tr>
<tr>
<td>o Show the total area of permeable paving</td>
<td></td>
</tr>
<tr>
<td>o Show what type of paving will be used</td>
<td></td>
</tr>
<tr>
<td>o Show a typical profile of the pavement</td>
<td></td>
</tr>
<tr>
<td>o Provide detail proving the subgrade</td>
<td></td>
</tr>
<tr>
<td>has sufficient bearing strength</td>
<td></td>
</tr>
</tbody>
</table>

| Operation and Maintenance Plan (for all large |  |
| scale development or for small/medium scale   |  |
| development if being handed over to Council)  |  |

| On Site Detention Plan and calculations         |  |

| Soil and water management Plan / Erosion and   |  |
| sediment control plan                          |  |
SHOALHAVEN CITY COUNCIL

SUSTAINABLE STORMWATER TECHNICAL GUIDELINES
# Table of Contents

1. **Introduction** .......................................................... 4
2. **Using the proposed stormwater controls document** ............................................. 4  
   2.1 **Background** .......................................................... 4  
   2.2 **Development characterisation** ......................................................... 4  
3. **Documentation to be submitted** .......................................................... 6  
   3.1 **Development Application** .......................................................... 6  
   3.2 **What should be included in an Integrated Water Cycle Management Strategy (IWCMS)?** .......................................................... 6  
      3.2.1 **Qualifications and experience of person/s preparing an IWCMS** ............. 6  
      3.2.2 **Inclusions in an IWCMS** .......................................................... 6  
   3.3 **What to include in a Stormwater Management Plan (SMP)** ................................ 7  
   3.4 **Requirements for a Construction Certificate** ........................................... 8  
      3.4.1 **Drainage design drawings** .......................................................... 8  
      3.4.2 **Operation and Maintenance Plan** ................................................ 10  
      3.4.3 **Onsite Detention (OSD) Plan** ...................................................... 11  
      3.4.4 **Erosion and Sediment Control Plan/Soil and Water Management Plan** ........ 11  
   3.5 **Occupation certificate and/or subdivision certificate** .................................. 11  
4. **Proposed stormwater controls and background information** ................................ 11  
   4.1 **Proposed Controls for Stormwater Quantity Management** .......................... 11  
      4.1.1 **Proposed Performance Criteria for Minor and Major systems design** .......... 11  
      4.1.2 **Proposed Climate Change Controls** ............................................... 13  
      4.1.3 **Proposed Onsite Stormwater Detention (OSD)** ....................................... 15  
   4.2 **Proposed Controls for Stormwater Reuse** ............................................... 16  
   4.3 **Proposed Controls for Stormwater Quality and Waterway Protection** ............ 16  
      4.3.1 **Erosion and sediment control** ...................................................... 16  
      4.3.2 **Stormwater retention** ........................................................................ 17  
      4.3.3 **Proposed specific controls for Small/medium scale development – Site Discharge Index (SDI)** .......................................................... 19  
      4.3.4 **Proposed specific controls for large scale development** .......................... 21  
      4.3.5 **Proposed design and maintenance of stormwater treatment measures** ........ 23  
   4.4 **Proposed Specific Controls for Waterfront Land** ........................................... 24
Shoalhaven Development Control Plan 2014

Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Supporting Document 2: Sustainable Stormwater Technical Guidelines

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5</td>
<td>Proposed specific control for coastal areas</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>References</td>
<td>26</td>
</tr>
<tr>
<td>6</td>
<td>Appendix A: Stormwater Management for small/medium developments</td>
<td>28</td>
</tr>
</tbody>
</table>
Glossary

Core Riparian Zone (CRZ) – The area beyond the top of bank of a watercourse that is to be protected under the Water Management Act 2000. The size of the Core Riparian Zone relates to stream category and stream order.

Detention – the collection and temporary storage of stormwater to reduce the peak runoff from a site

Erosion and Sediment Control Plan – a set of drawings showing how soil and water is to be managed during construction of a development.

Impervious – a surface that does not allow water to infiltrate into the ground, including roofs, roads, pavements, hard surfaced sports courts, any “sealed” areas and permanent water bodies such as swimming pools.

Infiltration – the downward movement of water from the surface to the subsoil.

Integrated Water Cycle Management (IWCM) – The management of the water cycle in the urban and industrial context as a whole, including water use, water collection, water recycling and disposal.

Interallotment drainage – Interallotment drainage is stormwater drainage that drains individual properties to trunk or street drainage.

Onsite retention (OSR) – retention of water onsite (refer to Retention).

Overland flow path – the path that stormwater may take if the piped or channelled stormwater system becomes blocked or its capacity exceeded. Overland flow paths provide a fail safe system to ensure that stormwater is not likely to cause flood damage.

Peak flows – the maximum instantaneous outflow from a catchment during a storm event.

Permeable paving – Permeable paving is pavement that allows water to pass through the pavement, either in gaps between pavers or through pores in specially made pavers or pavements.

Permissible site discharge – the maximum discharge from the site during a 1 in 5 year ARI storm event under pre-development (existing) site conditions.
Pervious - a surface that permits water to infiltrate into the ground.

Potable water – water that is fit for human consumption.

Raingardens - Gardens designed to collect rainwater and stormwater that are generally planted out with moisture loving plants. These gardens generally store water and sometimes infiltrate

Retention – the storing of water for beneficial use. Can apply to all forms of water including rainwater, stormwater and recycled water. May occur by storing water in a tank which is used for a purpose such as irrigation, or infiltration.

Roofwater – rain (water) that falls on the roof of a building.

Runoff – see stormwater.

Soil & Water Management Plan (SWMP) - strategies and controls for a development or site to prevent pollution of the environment from all pollutants during the construction stage.

Stormwater – rainfall that is concentrated after it runs off all urban surfaces such as roofs, pavements, car parks, roads, gardens and vegetated open space and includes water in stormwater pipes and channels.

Stream order – the rank of a watercourse using the Strahler system, based on the number of upstream tributaries draining to it at that point

Subsoil drainage – Subsoil drainage is drainage that collects water that flows below the ground, usually as part of a treatment system, or to prevent water movement into a structure.

Trunk drainage – Trunk drainage is generally defined as stormwater drainage beyond immediate property and street drainage.

Water Sensitive Urban Design (WSUD) – a design approach promoting sustainable management of the total water cycle through the ecologically sensitive design of homes, streets (and their drainage systems) and whole suburbs.
Shoalhaven Development Control Plan 2014

Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Supporting Document 2: Sustainable Stormwater Technical Guidelines

**Watercourse category** – the rank of stream based on environmental and riparian value, category 1 being the highest, most valuable, and category 3 being the lowest.

**Works as executed plans** – topographic survey of the constructed elements of a stormwater system.
1 Introduction

This document, the Sustainable Stormwater Technical Guidelines, is a technical reference to assist in compliance with the proposed stormwater controls.

The technical guidelines contain background information on the purpose of the proposed stormwater controls, useful references to assist in compliance with the controls as well as example calculations and example drawings.

Appendix A contains a range of information and example calculations on the design and construction of stormwater management measures for small/medium scale development.

2 Using the proposed stormwater controls document

2.1 Background

The proposed stormwater controls document contains two main components:

1. Characterisation of a development and guidance on what documentation is to be submitted with:
   - a development application,
   - an application for a construction certificate, and
   - an application for an occupation certificate

2. Controls which must be met in relation to:
   - stormwater drainage design
   - onsite detention
   - water conservation
   - erosion and sediment control
   - stormwater quality and waterway protection

2.2 Development characterisation

Council has divided development into two scales, large scale and small/medium scale based on potential stormwater impacts. The scale of development defines the level of
information required to be submitted at the Development Application stage and Construction Certification stage of a development.

*Compare your proposed development with the criteria in Table 2.1 to determine what the scale of your development is.*

**Table 2.1 Development scale**

<table>
<thead>
<tr>
<th>Is the proposed development:</th>
<th>Yes to any of these questions</th>
<th>Your development will be classed as a <strong>large scale development</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• A Torrens or Community title subdivision creating 10 or more additional lots?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• A subdivision of land greater than 3,500 square meters irrespective of how many Torrens or Community title allotments are created?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• An integrated housing subdivision?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• A development with an area greater than 2,500 square meters?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• An industrial, commercial or residential development, alteration or an addition to development, where the total new impervious area exceeds 1,000 square metres*?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*This includes the construction or designation of car parking spaces, whether the spaces are covered or uncovered, basement or elevated type car parking spaces or car parking spaces that are remote to the development which they serve*)
3  Documentation to be submitted

3.1 Development Application

It is proposed that the following documents will be required to be submitted with your development application:

<table>
<thead>
<tr>
<th>Large scale development</th>
<th>An Integrated Water Cycle Management Strategy (IWCMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOTE: An IWCMS must include a report and drawings demonstrating how the relevant proposed stormwater controls have been met</td>
</tr>
<tr>
<td>Small/medium scale development</td>
<td>A Stormwater Management Plan (SMP)</td>
</tr>
<tr>
<td></td>
<td>NOTE: A SMP may comprise a concise report and/or drawing/s that provide sufficient information to demonstrate how the relevant proposed stormwater controls have been met</td>
</tr>
</tbody>
</table>

3.2 What should be included in an Integrated Water Cycle Management Strategy (IWCMS)?

An IWCMS is a detailed report and drawings that demonstrates how relevant objectives and performance criteria of the proposed stormwater controls are being met.

3.2.1 Qualifications and experience of person/s preparing an IWCMS

An IWCMS must by prepared by suitably qualified and experienced practitioner/s. Typically an engineer and/or environmental practitioner would prepare an IWCMS. It may be necessary to employ more than one specialist to complete an IWCMS.

3.2.2 Inclusions in an IWCMS

An IWCMS must include a report and drawings demonstrating how the relevant performance criteria of the proposed stormwater controls have been met.

The report shall include:
1. background information of persons involved in the preparation of the strategy (i.e. name, qualifications and experience)

2. detailed information about the proposed development including location, boundaries and relevant site analysis information (i.e. total area, impervious area, site slope, rainfall ARI’s)

3. a list of all relevant objectives and performance criteria from the proposed stormwater controls

4. a description of how the proposed management measures meet objectives and performance criteria

5. a comparison of constraints and opportunities on the site

6. the size, location, level and configuration of proposed management measures

7. calculations for retention volumes

8. calculations and modeling used to determine and size proposed management measures (include assumptions)

9. a summary of capital, operational and maintenance costs of proposed management measures when these measures are to be handed over to Council ownership,

10. a summary of inspection and maintenance requirements for the proposed management measures to ensure the proposed measures remain effective.

3.3 What to include in a Stormwater Management Plan (SMP)

A SMP may comprise a concise report and/or drawing/s that provide sufficient information to demonstrate how relevant objectives are met. The plan will contain calculations for retention volumes (refer section 4.3.2) and the Site Discharge Index (refer section 4.3.3).

Appendix A of this document has a range of information to assist in the preparation of a SMP.

The objective of a SMP is to assess stormwater flows on the site and determine mitigation measures required to meet proposed stormwater controls. The SMP is not required to be
lengthy; however, it must provide sufficient information for assessment stating how proposed stormwater controls are being met.

The SMP must include:

- Calculations for retention volumes and the Site Discharge Index required for the development
- Calculations for onsite detention (if required)
- A drawing showing the:
  - proposed drainage flow paths including piped and overland flow paths
  - location and area of pervious and impervious surfaces
  - proposed location and approximate size of stormwater control measures, demonstrating how the Site Discharge Index and retention volumes are achieved
  - proposed location and approximate size of onsite detention.

### 3.4 Requirements for a Construction Certificate

A range of detailed documentation must be submitted prior to the release of a construction certificate. The information must demonstrate, in detail, how the objectives of this document are being met and must be prepared in accordance with Council’s *Engineering Design Specification Chapter D5* as well as other relevant guidelines and Australian Standards.

Information to be submitted when requesting a Construction Certificate includes:

#### 3.4.1 Drainage design drawings

Drainage design drawings for stormwater management measures must be prepared in accordance with Council's *Engineering Design Specification Chapter D5*. These drawings must include as a minimum:

- Rainwater tank:
Shoalhaven Development Control Plan 2014
Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control
Supporting Document 2: Sustainable Stormwater Technical Guidelines

- location on a plan
- height
- foundation
- volume
- proposed water end uses (i.e. toilet flushing, laundry, hot water, outdoor)
- plumbing arrangements (i.e. if potable water top-up is proposed in the tank, or if switching mechanisms are proposed)
- pump location & noise insulation; and
- overflow locations

(refer to Shoalhaven Water’s Rainwater Tank compliance checklist for further detail

- Legal points of discharge;
- Detention including all necessary levels, dimensions, volumes, etc;
- Easements;
- Overland flow paths;
- Trunk drainage;
- Pipe sizes and levels of critical points;
- Extent of works;
- Inter-allotment drainage;
- Subsoil drainage;
- Pit design;
- Constraints (including i.e. ecological, archaeological and geotechnical);
- Flood prone land;
Shoalhaven Development Control Plan 2014

Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Supporting Document 2: Sustainable Stormwater Technical Guidelines

- Integrated water cycle management measures;

- Utilities locations and constraints.

- Raingardens and infiltration areas showing the:
  - location on a plan
  - proposed dimensions
  - proposed construction materials, including depths and types of any media layers,
  - location of all incoming pipes.
  - location of overflow pit and proposed piped connection to back of kerb. If no kerb exists then show the location of any proposed overland flow path.
  - invert level of the proposed overflow pipe at the overflow pit, showing the invert level of the pipe where it will discharge at the kerb (this shows that the overflow can drain freely to the street).

- Permeable paving
  - Show the extent of any permeable paving
  - Show the total area of permeable paving
  - Show what type of paving will be used
  - Show a typical profile of the pavement
  - Provide detail proving the subgrade has sufficient bearing strength

3.4.2 Operation and Maintenance Plan

An Operation and Maintenance Plan is required for all proposed stormwater treatment measures on large scale development irrespective of whether the stormwater treatment measures are to be handed over to Council or kept in private ownership. An Operation and Maintenance Plan is only required for small/medium scale development when the proposed stormwater treatment measures are being handed over to Council. The plan
shall address the types of maintenance required and their frequency to ensure optimal function of the measures proposed. Approximate annual maintenance cost and life cycle cost of the measures must also be provided for measures that will become in public ownership.

3.4.3 Onsite Detention (OSD) Plan

Where OSD is required documentation must be provided showing:

- all calculations and assumptions used to calculate pre development peak flows and post development peak flows.
- Plans and details of the OSD

3.4.4 Erosion and Sediment Control Plan/Soil and Water Management Plan

Where erosion and sediment control is required, an Erosion and Sediment Control Plan, or Soil and Water Management Plan must be provided. The plan must be prepared in accordance with the publication Managing Urban Stormwater: Soils and Construction Volume 1 and Volume 2, (Landcom, 2004).

3.5 Occupation certificate and/or subdivision certificate

Works as executed plans are to be provided in electronic and hard copy format.

4 Proposed stormwater controls and background information

4.1 Proposed Controls for Stormwater Quantity Management

4.1.1 Proposed Performance Criteria for Minor and Major systems design

Applies to development involving design and construction of minor/major drainage systems.

Useful References:
Concrete channel
No walkways or open grassed areas should be provided adjacent to the channel;
Maximum velocity x depth product = 0.3m$^2$/s;
Egress points to be provided where side slopes 1 in 6 or steeper;
Fencing required where access possible to channels with side slopes 1 in 4 or steeper.
Warning signs to be provided regarding potential inundation and flowing water.

Low flow concrete channel or pipe in a grassed/vegetated flowpath
Maximum velocity x depth product = 0.3m$^2$/s;
Maximum side slopes 1 in 5.
Warning signs to be provided regarding potential inundation and flowing water.

Constructed earthen/rocked low flow channel in vegetated flowpath
Maximum velocity x depth product = 0.3m$^2$/s;
Maximum side slopes 1 in 5.
Warning signs to be provided regarding potential inundation and flowing water.
Regular maintenance required to ensure performance of channel to transmit flows.

Vegetated Swale/buffer strip beside roads
Not suitable for roadside areas where car parking is anticipated.
Side slopes 1 in 8 preferred, 1 in 5 maximum.
Maximum velocity x depth product 0.3m$^2$/s.
Where grass swales are provided beside roadways property access must traverse the swale, with means of crossing the flowpath (e.g. culvert, bridge) needing to be maintained. If responsibility for maintenance rests with property owner, this must clearly be defined in property records (e.g. s149 Certificates, s88B instruments).
Regular maintenance required to ensure performance of swale to transmit flows.

Constructed wetlands/ponds/lakes
Batter slopes at side of wetlands/ponds are to be a maximum of 1 in 8. Where this is not possible the areas where the slope is steeper than 1 in 8 should be fenced off with a childproof fence or other suitable barrier. Land must be retained around the pond to allow Council to conduct maintenance activities (e.g. remove silt and unwanted vegetation). Edges of the wetland/pond should be planted with plants at a density to discourage entry into the water. Pathways should not be provided immediately adjacent to pond edges.

**Constructed basins (normally dry)**

Refuge mounds to be provided in large sites and basins with designs water depths exceeding preferred maxima.

Outlet structure must incorporate measures to prevent persons being trapped at the outlet by water pressure.

Side slopes steeper than 1 in 6 should be fenced off with a childproof fence or other suitable barrier. Water depth indicators should be provided. Signage should be provided at spillway to identify specific hazards.

Maximum depth of water when operating at design capacity:
- Car park: 150mm
- Other paved area: 200mm
- Landscaped area: 600mm
- Sporting field: 600mm
- Area enclosed by a childproof fence or otherwise not accessible: no limit.

**Gross Pollutant Trap (GPT)**

The structure should incorporate means to fend persons away from the outlet and out of the water flow area (inclined screens / racks).

The structure should incorporate means for access sufficient for maintenance requirements. This may include access for mechanical equipment for large facilities, or lifting equipment for smaller facilities incorporating bags or baskets. A regular program of inspection and maintenance must be established.

It is generally necessary to incorporate a gross solids/trash rack facility on the upstream discharges to a wetland/pond to reduce the need for maintenance to the basin.

**Proprietary In-line sediment/GPTs**

Install trash racks on outlet at sufficient spacing to prevent entry by children.

**4.1.2 Proposed Climate Change Controls**

Applies to all developments.
Useful References:

- Impacts of Climate Change on Urban Stormwater Infrastructure in metropolitan Sydney (Sydney Metropolitan Catchment Management Authority, 2011)
- *NSW Sea Level Rise Policy Statement* (Department of Environment, Climate Change and Water NSW, 2009)
4.1.3 Proposed Onsite Stormwater Detention (OSD)

Applies to development where onsite detention is required:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Onsite Detention Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the development is located within the 5 year ARI flood extents (Contact Council to determine if the property is flood affected).</td>
<td>DO NOT apply</td>
</tr>
<tr>
<td>If the development consists of alterations, additions, ancillary structures and second storey additions where the addition is &lt;10% of the existing development footprint and the overall site impervious areas are less than 50% of the site</td>
<td></td>
</tr>
<tr>
<td>If there is a change of use where no increase in impervious area is proposed; or,</td>
<td></td>
</tr>
<tr>
<td>If the new development is in a subdivision where OSD has already been provided for the entire subdivision.</td>
<td></td>
</tr>
<tr>
<td>All other development situations</td>
<td>DO apply unless demonstrated otherwise through hydrologic modeling.</td>
</tr>
</tbody>
</table>

50% of retention volumes used to manage runoff volumes can be credited towards the OSD volume as long as the detention and retention systems are interconnected.

Useful References:

- Council’s *Engineering Design Specification* Chapter D5 (Shoalhaven City Council, 1999)
4.2 Proposed Controls for Stormwater Reuse

Applies to all developments that are NOT subject to the Building and Sustainability Index (BASIX) State Environmental Planning Policy (SEPP).

In order to encourage water conservation in non-residential buildings and other areas where BASIX does not apply, the proposed stormwater control document includes a range of additional requirements for non-residential buildings and other water uses, including:

- Water efficient fittings and appliances
- Rainwater tanks for non residential developments
- Cooling towers
- Reduction in water use in public open space

Useful References:

- Managing Urban Stormwater; Harvesting and Reuse (Department of Environment and Conservation, 2006) web:

- Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Stormwater Harvesting and Reuse (National resource management Ministerial Council, 2009) web:


4.3 Proposed Controls for Stormwater Quality and Waterway Protection

4.3.1 Erosion and sediment control

Applies to any development that involves the disturbance of the soils surface, or the placement of materials that may erode, or cause erosion requires an Erosion and Sediment Control Plan.

For development where more than 2500m² is planned to be disturbed a Soil and Water Management Plan is required.
Useful References:


4.3.2 Stormwater retention

Applies to all development where the amount of impervious surfaces post-development will be greater than the amount of impervious surfaces pre-development.

The definition of retention storage for the purpose of this document is the storage volume available for reuse (e.g. rainwater tanks) and/or the volume of storage provided in systems that allow infiltration into the soil profile, e.g. bioretention trenches or wetlands.

In this context, retention should not be confused with detention which does not reduce runoff volume. However, retention volume can contribute towards your detention (OSD) requirements provided the systems are interconnected. In this case 50% of the retention volume can be credited to the OSD volume.

The volume of storage to be provided is the multiple of the “storage depth” outlined in Table 4.1 and the new impervious surface area proposed for the site. The storage depth is a representation of the amount of rainfall that would previously have been stored on site through surface ponding and infiltration prior to the addition of impervious surfaces.

To assist smaller developments, Appendix A contains information on a range of stormwater management measures that can be implemented at a residential scale to retain stormwater on site.
The following storage depths for different development types should be used (Table 3.1, see below for worked example).

### Table 4.1 Storage depths for different development types

<table>
<thead>
<tr>
<th>Development type</th>
<th>Storage depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alterations, additions, auxillary structures and second storey additions</td>
<td>10</td>
</tr>
<tr>
<td>Single dwelling and dual occupancy</td>
<td>10</td>
</tr>
<tr>
<td>Medium density</td>
<td>9</td>
</tr>
<tr>
<td>High density</td>
<td>8</td>
</tr>
<tr>
<td>Industrial</td>
<td>6</td>
</tr>
</tbody>
</table>

For example:

A new single residential dwelling is proposed consisting of a 250m$^2$ roof and 100m$^2$ of paved landscape area. A total of 350m$^2$ of impervious surface is added.

The development is a single dwelling, therefore the **storage depth** (Table 5.1) is 10mm (0.01m).

Retention storage = impervious surface x storage depth

Retention storage = 350m$^2$ x 0.01m = 3.5m$^3$

Therefore a minimum of 3.5m$^3$ of retention storage must be provided for impervious surfaces on the site, either as a rainwater tank, raingarden, or as volume in an infiltration trench, or combination.

**Useful References:**
- Appendix A of this document
4.3.3 Proposed specific controls for Small/medium scale development – Site Discharge Index (SDI)

Applies to small/medium scale developments (refer Table 2.1).

Information on how to achieve the SDI and design and construction details can be found in Appendix A.

This control DOES NOT apply to alterations, additions, ancillary structures and second storey additions where the addition is less than 10% of the existing development footprint and the overall site impervious areas are less than 50% of the site.

Site Discharge Index (SDI)

The SDI is a relatively simple tool to allow assessment of small/medium scale developments of how they meet stormwater quality and quantity goals.

The SDI is a value that relates the total area of a site with the impervious portion of the site draining directly to the stormwater network. The goal is to reduce the portion of impervious surface that drains directly to the stormwater network to a value of 0.1.

The SDI control overlaps with the stormwater retention control in that the retention control specifies the volume of stormwater to be retained on site, while the SDI encourages as much impervious surface as possible be connected to retention systems. This is also the case for OSD, and as discussed above, 50% of the retention volume may be credited towards the detention volume.

Appendix A contains information for smaller developments on systems that may assist in meeting the SDI.

The SDI calculation is carried out as follows:

- Total site area (S)
- Total impervious area (I) = Roof area (R) + Paved area (P)
- Impervious surfaces draining to a control (not directly to the stormwater network) (M)
- Impervious surface directly to the stormwater network (DC) = I – M
- Site Discharge Index (SDI) = DC / S
Shoalhaven Development Control Plan 2014
Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control
Supporting Document 2: Sustainable Stormwater Technical Guidelines

Example 1:

A new single residential dwelling on a 600m$^2$ block is proposed consisting of a 250m$^2$ roof and 100m$^2$ of paved landscape area. A total of 350m$^2$ of impervious surface is added. The entire roof (250m$^2$) drains to a rainwater tank, and half of the paved area (50m$^2$) drains to a landscaped depression in the front yard, with the remaining paved area draining directly to the street.

Site area (S) = 600m$^2$
Root area (R) = 250m$^2$
Paved area (P) = 100m$^2$
Total impervious area (I) = 350m$^2$
Area draining to a control (M) = 300m$^2$ (all of roof and half of paved area)
Area draining directly to stormwater network (DC) = 350m$^2$ - 300m$^2$ = 50m$^2$
SDI = 50m$^2$/600m$^2$ = 0.083. Less than the required 0.1, so meets the required SDI.

The development complies with the SDI

Example 2:

A block of units on a 1,000m$^2$ block is proposed consisting of a 700m$^2$ roof and 200m$^2$ of paved landscape area. The roof (700m$^2$) drains to a rainwater tank, and the paved area drains directly to the street.

Site area (S) = 1,000m$^2$
Root area (R) = 700m$^2$
Paved area (P) = 200m$^2$
Total impervious area (I) = 900m$^2$
Area draining to a control (M) = 700m$^2$ (all of roof)
Area draining directly to stormwater network (DC) = 900m$^2$ – 700m$^2$ = 200m$^2$
SDI = 200m$^2$/1000m$^2$ = 0.2. More than the required 0.1, so DOES NOT meet the required SDI.
The development does not meet the SDI. There are two options, reduce the impervious surface area proposed on the site (replace with permeable paving or landscape), or drain a larger area to some type of retention or infiltration system.

Useful References:
- Appendix A of this document

4.3.4 Proposed specific controls for large scale development

Applies to large scale developments (refer Table 2.1). It includes pollutant load reduction and flow management.

Pollutant load reduction

There shall be a minimum percentage reduction of the post-development average annual load of pollutants in accordance with Table 4.2. Or, where development occurs within Sydney’s drinking water catchment, the Neutral or Beneficial Effect (NorBE) test applies.

To model (simulate) pollutant loads, use the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) modeling program, or an equivalent as approved by Council.

Table 4.2 Stormwater pollutant load reduction

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>% post development average annual load reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Pollutants</td>
<td>90</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>85</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>65</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>45</td>
</tr>
<tr>
<td>Total Hydrocarbons</td>
<td>90</td>
</tr>
</tbody>
</table>
Stream stability and habitat

For greenfield sites, or sites draining to a natural stream of 3rd order or lower (based on the Strahler stream order system), maintain the 1.5 year ARI peak discharge to pre-development magnitude.

Where a development is discharging, or ultimately discharging to a natural watercourse of category 1 or 2 (as categorised by Council) that is not tidal, then the post-development duration of stream forming flows (definition supplied below) shall be no greater than 2 times the pre-development duration of stream forming flows at the site discharge point, i.e. a stream erosion index of 2. Calculate in accordance with the methodology and worked example outlined in the *Draft NSW MUSIC Modelling Guidelines Sydney Metropolitan Catchment Management Authority, 2010*).

*Stream forming flows definition*

Stream forming flow is defined as the following percentage of the 2 year ARI flow rate estimated for the catchment under natural conditions:

(a) 10 per cent for low cohesion (e.g. sandy) bed and banks.

(b) 25 per cent for moderately cohesive bed and banks.

(c) 50 per cent for cohesive (e.g. stiff clay) bed and banks.

Useful References:

Development within Sydney’s drinking water catchment

- Developments in Sydney’s Drinking Water Catchment, Water Quality Information requirements (SCA, 2011)

Water sensitive design, conceptual and detailed


- Australian Runoff Quality (Engineers Australia, 2006)

- Water Sensitive Urban Design, Book 2 - Planning and Management (Landcom, 2009)  
  Web:
Shoalhaven Development Control Plan 2014

Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Supporting Document 2: Sustainable Stormwater Technical Guidelines


- WSUD Engineering Procedures: Stormwater (Melbourne Water, 2005)

- WSUD Technical Design Guidelines for South East Queensland (Healthy Waterways and Water by Design, 2009)

Stormwater Quality Modelling

- Australian Runoff Quality (Engineers Australia, 2006)


4.3.5 Proposed design and maintenance of stormwater treatment measures

Applies to all large scale developments

Useful References:

- Australian Runoff Quality (Engineers Australia, 2006)


- WSUD Engineering Procedures: Stormwater (Melbourne Water, 2005)

- WSUD Technical Design Guidelines for South East Queensland (Healthy Waterways and Water by Design, 2009)

- Guidelines for filter media in biofiltration systems (version 3.01) (Facility for Advancing Water Filtration, 2009)

4.4 Proposed Specific Controls for Waterfront Land

Applies to all waterfront land. Waterfront land includes:

- the bed and bank of any river, lake or estuary and
- all land within 40 metres from top of bank of a watercourse, creek, river, lake or estuary.

- For a more detailed definition, see the Water Management Act 2000.

Riparian and waterfront lands provide significant environmental services include habitat, water quality and flow management in addition to aesthetic and recreational benefits. Protection of these areas and their services is an important objective for Councils.

Any works within 40m of a watercourse is considered a controlled activity requiring approval through the issuing of a Controlled Activities Permit. The NSW Office of Water is the state government agency responsible for assessing applications and issuing permits.

Where the proposed development is on waterfront land, the watercourse category must be defined according to:

- Council’s Shoalhaven LEP (2009) Natural Resource Sensitivity – Water Map or
- the Water Management Act 2000 or

Where necessary the NSW Office of Water shall be consulted to determine the appropriate classification.

The category will define the Core Riparian Zone width which must be protected/rehabilitated and an adjoining vegetated buffer width.

Useful References:

- Guidelines for controlled activities, Riparian Corridors (Department of Water and Energy, 2008).
4.5 Proposed specific control for coastal areas

Applies to all development discharging to coastal cliffs of coastal dunes

*Useful references:*

- Coastal Slope Instability Hazard Study (SMEC, 2008)
5 References


Engineers Australia (1998), *Australian Rainfall and Runoff*, Engineers Australia

Engineers Australia (2006), *Australian Runoff Quality*, Engineers Australia

FAWB (2009). *Guidelines for filter media in biofiltration systems (version 3.01)*, Prepared by the Facility for Advancing Water Biofiltration (FAWB)


Chapter G2: Sustainable Stormwater Management and Erosion/Sediment Control

Supporting Document 2: Sustainable Stormwater Technical Guidelines


SCA, (2006), A guide to the use of MUSIC in Sydney’s Drinking Water Catchments SCA.

Shoalhaven City Council (1999), Engineering Design Specification Chapter D5, Shoalhaven City Council.

Shoalhaven City Council, (2005), Stormwater Protection on Construction Sites, Shoalhaven City Council.

Sydney Catchment Authority, (2011) Developments in Sydney’s Drinking Water Catchment, Water Quality Information requirements, SCA.

Sydney Metropolitan Catchment Management Authority (2011), Impacts of Climate Change on Urban Stormwater Infrastructure in metropolitan Sydney, Sydney Metropolitan Catchment Management Authority.

Sydney Metropolitan Catchment Management Authority, (2010), Draft NSW MUSIC Modelling Guidelines, Sydney Metropolitan Catchment Management Authority.

UPRCT, (2004), Water Sensitive Urban Design Technical Guidelines for Western Sydney, UPRCT.
6  Appendix A: Stormwater Management for small/medium developments

(sourced from: Central West Councils Salinity & Water Quality Alliance, Water Sensitive Design Technical Guidelines)
This appendix includes guidance and examples for small developments in achieving retention and SDI requirements and includes information on the following:

- Infiltration trenches,
- Raingardens,
- Porous or permeable paving, and
- Rainwater tanks.

**Infiltration Trenches**

**General Requirements**

- The Trench is to be wrapped in a non-woven geotextile with a minimum conductivity of 3600mm/hour.
- Gravel is typically used to fill the trench and is to be clean and washed prior to use and free of fines. A 30mm diameter poorly graded gravel is to be used. Use of recycled concrete or bricks is not permitted. All gravel must be inert and be of high compressive strength.
- Geocellular structures are permitted, i.e. milk crate-type structures.
- Trenches are typically 200mm below the surface but can be deeper if required.
- An overflow must be provided as shown in the accompanying sketches. The overflow must be connected to the back of kerb, or to an overland flow path.
- Sediment and debris are to be removed from stormwater before it is allowed to enter the trench unless it can be demonstrated that the proposed system enables easy removal of accumulated sediment. This is very important to ensure that the trench does not clog and fail. The selected sediment and debris filter device must be accessible and easy to maintain.
- Place a covenant or restriction as to use notice over the trench so that it shall remain in place and in use.
• Are not permitted in areas of high salinity or high groundwater. Where groundwater is within 500mm of the base of the trench, infiltration shall not be permitted.

• Trenches (or the use of geocellular structures) can be placed beneath driveways provided they are structurally sound (load bearing). Appropriate manufacturer test certificates will need to be submitted with the DA. Evidence showing consideration of creep and point loading considerations of geocellular structures is to be provided.

**Storage Volume**

Infiltration trenches are normally constructed from gravel but can also be constructed from plastic geocellular structures that look like milk crates. The space between the individual gravel rocks (called the pore space) allows about 1/3 of the volume of gravel to be filled with water. In other words, every cubic metre of gravel can store 1/3 of a cubic metre of runoff. If a geocellular structure is chosen then the porosity can be as high as 0.90 or sometimes higher.

Volume stored in an infiltration trench = total volume of trench x porosity of material.

**Minimum safe distances to Foundations**

Minimum distances that infiltration trenches should be constructed away from building footings are shown in Table A1.
Table A1: Minimum Distance of an Infiltration Trench from footings depending on Soil Type

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Hydraulic Conductivity</th>
<th>Minimum Distance from Footings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandstone</td>
<td>Assumed to be negligible</td>
<td>Do not infiltrate on these soils</td>
</tr>
<tr>
<td>Sand</td>
<td>&gt;180 mm/hr</td>
<td>1m</td>
</tr>
<tr>
<td>Sandy Clay</td>
<td>180-36 mm/hr</td>
<td>2m</td>
</tr>
<tr>
<td>Medium Clay</td>
<td>36-3.6 mm/hr</td>
<td>4m</td>
</tr>
<tr>
<td>Reactive Clay</td>
<td>3.6-0.036 mm/hr</td>
<td>5m</td>
</tr>
</tbody>
</table>

Reference: The Institution of Engineers Australia, Australian Runoff Quality Guidelines.

Manufacturers Recommendations to be adopted

If proprietary infiltration products such as geocellular structures are proposed for use, they shall be constructed in accordance with the manufacturer’s requirements. Some plastic cellular products have been shown to fail because manufacturers have failed to consider the impact of creep. All geocellular structures shall therefore consider creep and evidence shall be provided from the manufacturer of such.

Typical Details

Some typical details follow and provide some guidance as to how to construct an infiltration trench. These are not standard drawings.
Infiltration Trench Plan

Section A: Infiltration Trench Cross Section
Alternative inlet for draining impervious surfaces

An alternative inlet for stormwater runoff from impervious areas (e.g. driveway) may be to direct inflows overland via a grass swale to a gravel trench that extends to the surface. The swale would serve to both convey the water and filter out the sediments to reduce maintenance on the trench.

The swale would have a slope typically less than 5% and be well vegetated to prevent scour during runoff events and trap sediment. The swale can have gentle batters to facilitate mowing and pedestrian movement, if desired. The inlet and infiltration trench must be configured to allow a minimum of 100mm surcharge for a gravel surface.
Raingardens

General requirements

- Runoff from hardstand areas may be directed to the raingarden via:
  - an inlet pit which has a 500mm deep base below the incoming pipe and which allows sediment to settle out before discharging into the raingarden; or
  - direct discharge onto the raingarden surface
- Depth of surface ponding < 200mm
- An overflow pit is to be provided which directs overflows to the street drainage system.
- The filter media to be a free draining sand material capable of supporting plant growth (at least in the top 100mm)
- Overflows from rainwater tanks may be directed into a rain garden

Minimum safe distances to footings

Table A1 above provides minimum safe distances to footings and foundations for infiltration. These are to be adopted for raingardens.
Storage volume

Raingardens differ from infiltration trenches by providing storage on the surface, and within the garden profile.

Storage volume above ground is:

Volume of surface storage ($m^3$) = area of surface storage ($m^2$) x ave. depth (m) of surface storage.

Storage volume below ground is:

Below ground storage volume = volume of sand used ($m^3$) x porosity of sand

The total of the two is the retention storage provided by a raingarden.

Some typical raingarden sketches and photos are shown below:
Porous, or permeable paving

Permeable paving can be used to reduce the impervious area on the proposed development. For example a driveway which is constructed from permeable paving will not contribute to the total impervious area on a site.

All pavers are to be laid in accordance with manufacturers recommendations.

A typical paving detail is provided below, however, advice may be required from a builder or engineer.
Rainwater Tanks

Rainwater tanks can be used as retention volume:

- If you do decide to use a tank then you need to decide what you want to use the rainwater for. Rainwater is often softer and less salty than potable water and a range of filters easily available today can ensure that rainwater will not stain your toilet or laundry.
- If you do decide to use a tank then you also need to decide how large to make it.

General Requirements:

The tank must be plumbed to deliver rainwater for the nominated end uses. Possible uses can include:

- Hot water supply
• Toilet flushing water
• Laundry washing water
• Outdoor water uses such as garden watering and car washing
• Topping up and/or filling up pools and spas
• Drinking, provided that an appropriate water filter/treatment system is used and maintained.

Any rainwater tank must comply with the following installation requirements:
• All raintanks must be installed in accordance with the manufacturer’s recommendations;
• Rainwater tank installation must be undertaken in accordance with relevant Australian Standards, Codes and Industry Guidelines (e.g. AS3500:2003 National Plumbing and Drainage, HB 230-2006 Rainwater Tank Design and Installation Handbook);
• The system must be designed to collect roof water only. Roofwater shall not be sourced from roofs coated with lead- or bitumen-based paints, or from asbestos-cement roofs;
• Be fitted with a first flush device to prevent potential contaminants from entering the tank;
• If supply is supplemented with a top up system by interconnection with a reticulated water system, backflow prevention is provided in accordance with Australian Standard AS 3500.1.2 (2003) or subsequent update;
• The tank is enclosed and inlets screened, so as to prevent the entry of foreign matter and to prevent mosquito breeding;
• Tank overflow is to be connected to a retention/infiltration device, swale, stormwater drain or appropriate landscaping such that it does not cause nuisance to neighbouring properties;
• All fixtures connected to the supply system are marked ‘RAINWATER’;
• Above ground tanks must be located wholly within the building setbacks;

• Above ground tanks shall not require excavation of more than 1 metre from natural ground level to be installed;

• Underground tanks may be located outside the building setback provided they are not visible from the street and do not rise above the surrounding ground. The tank must not be installed within the zone of influence of any foundation of any structure (or a minimum of three metres) unless the tank design is certified by a suitably qualified engineer;

• All roofwater pipe designs shall ensure that an overflow point located lower than the gutters is provided to ensure that flooding of eaves from gutters overflowing does not occur;

• All below ground tanks must have sufficient means in place to prevent the backflow of stormwater from the street system into the tank during a storm event;

• All below ground tanks must be 100% water tight and fully sealed to prevent any ingress of groundwater. All tank openings must be located so that debris and groundwater does not enter the tank;

• The tank shall not exceed a height of 2.0 metres from ground level (including the stand for the tank);

• The tank shall be located at least 450mm from any property boundary;

• Pumps are to be covered or screened to avoid noise nuisances to neighbouring properties;

• Pumps are to comply with NSW Department of Environment and Conservation (DEC) (2004) Noise Guide for Local Government;

• Maintain pressure levels in the pressure vessels to minimise noise disturbance to neighbouring properties – this done by regularly pumping up the pressure vessel if required.
• The tank is to be maintained by the property owner to ensure adequate functioning and compliance with accepted health requirements;

• All plumbing work shall be undertaken by a licensed plumber; and

**Maintenance**

Regular maintenance is important to ensure your rainwater tank works effectively. Recommended maintenance requirements include:

• Regular maintenance of first flush diverters by removing the filter screen in the bottom of the diverter and cleaning. The drip outlet should be monitored for the first 3 rainfall events and adjusted to ensure the diverter is completely drained over a 24 hour period;

• Annually check performance of the float valve or switch assembly to ensure correct operation at bottom water level as specified;

• Check the tank overflow outlet every six months to ensure that it is clear of weeds/sediment and other debris;

• Regularly clean roof gutters to remove leaves, sediment and other debris;

• The accumulation of sludge at the bottom of the rainwater tank should be checked every two years. The removal of which may be required about once every ten years depending on the amount of sediment entering the tank. This can be undertaken by either pumping or siphoning the sludge or the tank can be drained and then cleaned; and

  Note: tanks are considered confined spaces. Access within the tank is to be restricted to personnel with confined spaces training.

• The required frequency of cleaning will depend upon several factors such as local environmental conditions, the condition of the tank inlet and regular performing of other maintenance duties by the owner.
Details to be provided at Development Application Stage:

- Tank location
- Tank height
- Tank size
- Proposed water end uses, i.e. toilet flushing, laundry, hot water, outdoor etc
- Amount of credit claimed for the use of the tank;
- Pump location & noise insulation; and
- Overflow locations
1. PURPOSE

- To provide guidance to the development industry with regard to appropriate erosion and sedimentation controls
- To help maintain the health, ecological integrity and amenity of the Shoalhaven’s streams, rivers, estuaries and beaches

2. STATEMENT

Improved environmental management is needed from all sectors of the development industry to control soil erosion and consequent sediment pollution to land downstream and receiving waters.

Sediment and erosion controls consist of various sediment barriers installed along the lower side of the soil disturbance, including a stabilised construction entry/exit pad as detailed in Section 3. Appendix 1 to this document shows a typical plan for erosion and sediment control for a standard residential dwelling. Guidelines for various types of sediment controls are provided in Section 3.

3. PROVISIONS


3.1. Stabilised Entry Exit Point

Where possible, the entry/exit point of the site should be managed such that sediment is not tracked off the site. Where practicable, the entry/exit point should be restricted to one stabilised location, not necessarily at the location of the permanent driveway.
The recommended construction method for stabilising access points is an appropriately located 150–200 mm deep pad of minimum 40 mm crushed rock or recycled concrete. The access should be at least 2 metres wide and 5 metres long. Where practicable, the entry/exit pad should extend from the kerb to the slab. Geotextile filter fabric is generally not required under the aggregate pad.

Where the entry/exit pad slopes towards the road, a bund (hump) should be installed across the aggregate pad to deflect stormwater run-off to the side where it can be filtered by a sediment fence.

### 3.2. Sediment Fences

The most efficient sediment barrier for building sites is usually a specially manufactured geotextile sediment fence. The use of filter cloth or shade cloth is not recommended.

Sediment fences on building sites can be stapled to approximately 40 mm square hardwood posts or wire tied to steel posts. Wire tied sediment fences have the advantage of being readily unhooked from their support posts during working hours to allow the unloading of materials. This feature is useful on small frontage building sites where site access is limited.

In areas where it is either undesirable or impractical to bury the lower edge of the sediment fence, the lower 200 mm (min) portion of the fabric should be placed on the ground up-slope of the fence and buried under a 100 mm (min) layer of aggregate.
Sediment fences should be located down-slope of the disturbance, and ideally along a line of constant land level to prevent the concentration of stormwater run-off.
3.3. Aggregate Perimeter Banks

In flat, sandy areas where the run-off catchment consists only of the building lot, an aggregate perimeter bank may be used as an alternative to a sediment fence. An aggregate perimeter bank consists of a 300 mm high, 1000 mm wide perimeter bank formed with 40-75 mm clean aggregate.

The advantage of perimeter banks is that they allow unrestricted access and are difficult to damage. However, it is difficult to remove and recycle the clean aggregate.

3.4. Straw Bales

The use of straw bales instead of a sediment fence is usually not recommended. In most cases a sediment fence will be more effective for a greater period of time. Straw bales may be used down-slope of small stockpiles if they are appropriately secured with two stakes per bale and water is prevented from flowing under or around the bales.

3.5. Grassed Filter Strips

Grassed areas have generally not proven to be effective for the capture of sediment from building sites unless the grass is fenced-off to prevent traffic-induced damage. Grassed areas down-slope of sediment fences can be effective in collecting sediment that passes through a damaged section of fence.

At sites where there is significant areas of healthy grass down-slope of the soil disturbance, a sediment fence may not be required if stormwater run-off from the disturbance is allowed to flow evenly (not concentrated) over the grass.

- The width of the grass (in the direction of flow) should be at least 5 times the percentage slope of the grassed area. That is, 5 metres for a 1% slope and 50 metres for a 10% slope. Land with a 1% slope will fall 0.1 metres (i.e. 10 cm) every 10 metres.
3.6. Field Sediment Barriers

Sediment controls for stormwater inlets located within the property boundaries may consist of geotextile fabric covered timber frame.

Field inlet protection is necessary where inlets drain areas of bare and unprotected soil.

During storms, ponding should be allowed to occur around the stormwater inlet to assist in the settling-out of sediments. A structurally sound support frame is needed to withstand the weight of sediment-laden water.

i.e. Placed either directly over the grated inlet or around the inlet supported.

3.7. Roadside Gully Sediment Barriers

For reasons of safety and sediment control efficiency, sediment barriers generally should not be located outside property boundaries; this especially applies to sediment barriers placed on the road. Sediment barriers placed in front of roadside stormwater inlets are rarely effective and at best usually result in the sediment being washed down the street and into the nearest open gully inlet. They should only be used as a last resort.

If a roadside gully inlet barrier is to be installed, then it should not be allowed to fully block the inlet structure. On a hillside, sediment barriers may consist of a temporary dam constructed from sand or gravel bags placed at least 4 metres up-slope from the gully inlet.

- Not recommended, last resort, safety issues, permission must be obtained
- Fabric should not be placed across the grate or gully inlet
At road sag points, a sediment barrier may be constructed around the gully inlet, but should not block the inlet.

3.8. Maintenance of Control Measure

All sediment control measures need to be regularly checked and maintained in good working order. Best Practice includes anticipation of potential risks and being prepared for abnormal circumstances and emergencies. This should include stockpiling extra sediment fence on-site to facilitate emergency repairs.

The entry/exit pad will require reapplication of crushed rock if excessive sediment build-up occurs. Sediment fences should be replaced if the fabric is ripped or otherwise damaged. The maintenance of sediment fences includes the removal of sediment deposited up-slope of the fence and re-trenching the fabric where necessary.
APPENDIX 1 – TYPICAL PLAN OF EROSION AND SEDIMENT CONTROL

1. All runoff and sediment control structures will be inspected each working day and maintained in a functional condition.

2. All vegetation outside the building envelope will be retained.

(Additional notes may be included on soil type, erosion control measures, installation sequence and maintenance of ESC measures.)