

Stormwater Drainage

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I.0 Introduction

I.1 Development to which this Part applies

This Part applies to all land within the Auburn local government area where Council is the consent authority.

I.2 Objectives

- a. To preserve and protect the amenity and property of existing residents, land owners and the community.
- b. To ensure the safety of residents and the community.
- c. To meet reasonable expectations and statutory requirements.
- d. To protect the physical environment and receiving waters of catchments.

I.3 Other documentation

The following documents referred to in this Part are located on Council's website www.auburn.nsw.gov.au:

- On-site detention (OSD) submission checklists and calculation sheet;
- OSD works-as-executed (WAE) survey and certification submission form and checklists;
- Section 88B instrument wording;
- Water quality measures;
- Council's standard drawings; and
- Sediment erosion control details.

These will assist applicants to fulfil all necessary requirements.

I.4 Structure of this Part

This Part is structured as follows:

- Section 2.0 contains controls for property drainage;
- Section 3.0 contains controls for disposal of stormwater from site;
- Section 4.0 contains controls for Council's drainage system;
- Section 5.0 contains controls for on-site detention;
- Section 6.0 contains controls on flood risk management;
- Section 7.0 contains controls on rainwater reuse;
- Section 8.0 contains controls on erosion and sediment control; and
- Section 9.0 contains submission requirements;

2.0 Property drainage

Objectives

- a. To control surface runoff from pervious and impervious areas (roofs, driveways, landscaping and paving) using a system of roof gutters, downpipes and surface inlet pits and to be piped to a suitable on-site detention system, where required (see section 5.0 for OSD requirements).
- b. To direct stormwater runoff to Council's drainage system without adversely impacting on adjoining or downstream properties.

2.1 The drainage system

Performance criteria

- PI** The development ensures roof and surface stormwater is collected and controlled within the property for major and minor storm events prior to discharging into Council's stormwater system.

Development controls

D1 Pipes

The minimum pipe size shall be 100mm diameter and shall increase to 150mm diameter where the catchment draining to the pit is likely to contain significant leaf litter or other debris.

Minimum pipe grade permitted shall be 1%, unless otherwise approved by Council's engineers. Pipes shall be designed to be self cleansing without causing scour. The minimum pipe velocity shall be 0.6m/s during the design storm and a maximum velocity of 6.0m/s.

Property drainage system shall be designed to 20 year average recurrence interval (ARI) and designated overland flow paths up to 100 year ARI.

D2 Pits

Standard grated gully pit, standard grated gully pit with kerb inlet and junction pits shall be in accordance with Council's standard drawings (see Council's website at www.auburn.nsw.gov.au).

All pits shall comply with the following requirements. See Table I for pit dimensions.

- Surface inlet pits shall be sufficiently large to accept the predicted inflow.
- Pits deeper than 1.8m to be reinforced.
- PVC pits are only permitted in landscaped areas and courtyards (not in driveways).
- All masonry pits shall be cement rendered.
- Step irons spaced 300mm apart shall be provided for pits deeper than 1.2m.
- Pits and grated trench drains shall be positioned within the site to ensure:
 - All runoff from roofed and paved areas is collected;
 - Runoff does not enter garages or buildings; and

- Long term ponding of stormwater does not occur.
- Pedestrian access to buildings is not restricted by significant flow depths.
- Runoff from paved driveways and paths, or concentrated runoff from grassed and landscaped areas, shall not flow over the public footpath.
- Pits or cleansing eyes shall be provided at a maximum spacing of 30 metres along a length of pipe to facilitate cleaning.
- A cleaning eye or pit shall be provided at every bend.
- Trash screens shall be provided at the boundary pit.
- Runoff from the site shall be routed through a sediment trap pit before it is discharged into Council’s drainage system. Such sediment traps pits shall be minimum 450mm x 450mm with the invert level of the pit 200mm below the invert level of the outlet pipe.

Table I – Pit dimensions.

Depth to invert at outlet (mm)	Minimum internal dimensions of pit (mm)	
	Width	Length
≤ 600	450	450
> 600 ≤ 900	600	600
> 900 ≤ 1200	600	900
> 1200	900	900

2.2 Overland flow paths

Performance criteria

- PI** Overland flow paths within the development are considered in case of pipe blockage or major storm events.

Development controls

- DI** Provision shall be made to ensure runoff from storms up to the 100 year ARI, which cannot be conveyed within the piped drainage system (minor system including overflows from roof gutters) is safely conveyed within formal or informal overland flow paths (major system) to Council’s system.

Where it is not practicable to provide paths for overland flows, the piped drainage system shall be sized to accept runoff up to the 100 year ARI.

2.3 Flow or runoff across property boundaries

Performance criteria

- PI** Development should not flood adjoining properties.

Development controls

- DI** Runoff currently entering the site from upstream properties shall not be obstructed from flowing onto the site and shall not be redirected so as to increase the quantity or concentration of surface runoff entering adjoining properties.

Where the overland flow rates are high, the requirements outlined in section 6.0 on flood risk management will need to be satisfied.

- D2** Where increased seepage is anticipated or becomes evident as a result of building or site works and is likely to adversely impact on adjoining properties or the public footpaths, adequate subsoil cutoff drains shall be provided and connected to the piped drainage system.

2.4 Water quality

Performance criteria

- PI** Water quality devices prevent pollutants from commercial, industrial developments and car parking areas entering the waterways.

Development controls

- D1** Silt arrestors are required within commercial, industrial developments and car parking areas.

Note: Refer to Council's website at www.auburn.nsw.gov.au for water quality guidelines.

- D2** Oil arresters are required for the carparks of industrial and commercial developments where:

- There are 10 or more parking spaces proposed; or
- There is significant traffic generation within the development.

3.0 Disposal of stormwater from site

Objectives

- a. To ensure that stormwater drainage from properties is directed to one of the following:
- Council's stormwater drainage system;
 - Sydney Water Corporation drainage system; or
 - Waterways.
- b. To avoid environmental impact on private property and the public domain.

3.1 Discharge to kerb

Performance criteria

- PI** High stormwater flows should not discharge onto the local road system.

Development controls

- D1** Discharge into the kerb and gutter shall be permitted if the discharge from the site does not exceed 30L/s. Only one discharge line shall be permitted within the footpaths per development. Unless specifically approved otherwise by Council, multiple pipelines within the footpaths shall not be permitted.

Where the outlet pipe from the property exceeds 100mm in diameter, a converter pit is to be constructed inside the front boundary of the property. Flows between the converter pit and the kerb and gutter shall be discharged using a galvanised steel rectangular hollow section.

Note: All developments except single dwellings in Zone 6 of Figure 1 shall be connected to Council's underground drainage system. The downstream system shall be extended to the development site at no cost to Council.

3.2 Connection to Council and Sydney Water underground drainage systems

Performance criteria

PI All connections to the stormwater network are in accordance with Council and Sydney Water standards and specifications.

Development controls

DI Where an adequate Council drainage line is available, connection into the system shall be permissible by means of an existing pit or constructing a new pit to Council's specifications. If the pipe diameter is greater than or equal to 900mm and an existing pit is available within the 30 metres of the property boundary, a slope junction shall be constructed in accordance with the requirements of the Australian Standards. Where a slope junction connection is made, an inspection of the connection within the pipeline shall be carried out by Council officers. An additional inspection fee shall apply in such cases.

Council may direct or permit drainage to be discharged into Council's piped drainage system or a stormwater channel, notwithstanding the requirements outlined in section 3.1 above.

3.3 Discharge to a natural watercourse

Development controls

DI Discharge to a suitable natural watercourse or creek may be permissible subject to the approval of Council's development engineer and the responsible authority. The outlet at the point of discharge is to be designed to ensure the velocities are reduced sufficiently to prevent erosion of the receiving watercourse.

3.4 Properties sloping away from street

Performance criteria

PI Stormwater does not adversely affect downstream properties. Development generally relies on gravity as a means of disposing of stormwater.

Development controls

DI Council shall not approve stormwater systems which drain against the natural grade of the land. Where the property falls away from the road frontage, it shall have or shall obtain the benefit of an inter-allotment drainage easement through properties downstream (see section 3.7) unless the development satisfies the conditions outlined in section 3.5 below permitting on-site disposal.

3.5 On-site disposal

Performance criteria

PI In the limited instances that on-site disposal is appropriate, satisfactory soil permeability rates (supplied by geotechnical engineers) demonstrate and ensure no adverse impacts on downstream properties.

Note: As the Auburn local area is made up of predominantly clay, absorption trenches are generally ineffective.

Development controls

- On-site disposal shall not be permitted. However, for dwelling houses with a site coverage exceeding Section 2.2 Development Control D1 in the Dwelling and Dual Occupancies DCP, where the property falls away from its road frontage and does not have, or cannot obtain the benefit of a drainage easement, Council shall give consideration to permitting driveways and landscaped areas to discharge to an on-site absorption trench provided all the following requirements are satisfied: Letters have been obtained from all the adjoining downstream property owners causing an impasse, indicating their unwillingness to grant an easement with reasonable compensation.
- All roof areas shall be discharged to the road via a charged drainage system using sewer grade PVC pipes up to 100 year ARI storm event.
- The total impervious area draining to the trench shall not be greater than 60m².
Note: This applies to the site cover for existing lots only. New land subdivisions shall not be permitted to dispose of collected runoff on-site.
- The absorption trench shall be constructed within a designated grassed area in accordance with Council's standard design. The minimum dimensions shall be 1.0m wide x 0.6m deep x 6.0m long.
Note: Net volume of 1.8 cubic metres shall be required within the absorption trench. It requires 20% void ratio gravel/metal, 175 litres/Lm jumbo trench and two 600 x 600 inlet pits either side of the trench.

Trenches shall be constructed parallel to the contour of the land, with the front and rear of the trench at least 3 metres away from any building or boundary unless special circumstances exist.

- Downstream buildings and improvements shall be required to have sufficient height above finished ground levels to prevent inundation or damage attributable to runoff from the subject site.
- Overflows from the on-site absorption trenches shall not be permitted to flow directly into bushland areas, which are considered to be significant by Council.

3.6 Pumped discharge

Performance criteria

PI Stormwater drainage systems generally do not rely on pump out systems.

Development controls

- DI** Use of pumps shall not be permitted except to drain an underground parking area of a proposed development, and the only inflow is seepage and runoff from an access driveway. The area of the driveway shall be kept to a minimum. The potential catchment contributing runoff to the basement shall not exceed 5% of the basement area or 60m² whichever is the greater. See Table 2 for pump requirements.

Table 2 – Pump requirements.

Driveway catchment area	60m ² or 5% of basement area
Pump discharge rate	100 year ARI 5 minute storm duration
Required storage volume in tank	100 year ARI 90 minute storm duration
Required additional storage volume in car park area (aboveground volume)	Up to 100 year ARI 12 hour storm duration

Note: 100mm freeboard required for lockup garages and storages.

Dual pumps shall be used in case of pump failure with each pump designed for the maximum discharge.

Combined aboveground and underground storages shall be provided.

- Underground – 100 year ARI 90 minute storm; and
- Aboveground – up to 100 year ARI 12 hour storm

A positive covenant shall be executed and registered against the title of the lot requiring ongoing maintenance and repair of the pump. The covenant shall commit the owner to checking the condition of the pump by pumping water for at least five minutes every six months and a log book maintained of these periodic checks. The covenant shall provide Council with the authority to enter the land and view the log book and the condition of the pump twice a year following the giving of two days notice.

3.7 Inter-allotment drainage easements

Performance criteria

- PI** Properties drain to the natural catchment through a stormwater pipe traversing through a downstream property into Council’s stormwater system.

Development controls

- DI** Where the creation of an inter-allotment drainage is required, the securing of such an easement is the applicant’s responsibility and shall be addressed prior to the lodgement of the development application. A letter of agreement from the affected property owner(s) shall accompany the development application to demonstrate to Council that a suitable easement can be obtained.

Any consent issued for such development shall be on a deferred commencement basis and shall not become operational until the easement has been prepared by a surveyor and has been registered with the NSW Department of Lands.

Such easements shall be 1.2m wide – for up to 300mm lines unless otherwise approved by Council’s Development Engineer.

The easement shall be in favour of the lot(s) benefited or Council, with Council being the body to release or modify the easement.

Where adjoining downstream property owners are unwilling to grant an easement to drain water, under Section 88K of the *Conveyancing Act 1919*, the applicant/owner of the subject property may lodge an application to the Supreme Court under this section to obtain the required easement.

4.0 Council drainage system

Objective

- a. To ensure the efficient and effective planning, management and maintenance of Council’s existing and future stormwater systems and reduce environmental and property damage.

4.1 Easements to drain water

Note: Council is responsible for improving and maintaining proposed and existing pipe systems through private properties.

Development controls

- DI** Council shall require the creation of an easement in its favour, at the cost of the applicant, over all pipelines in which council has an interest, such as pipes which transfer runoff from a public land. With both new easements and existing easements the conditions below shall apply.

The required width of the easement shall be a minimum of 1.2m for pipes less than 300mm and 4 times the pipe diameter for pipes greater than 300mm diameter.

Only pavement and landscaped areas shall be permitted over Council easements without impeding any overland flow. The construction of a demountable carport spanning the easement shall be considered. If approved it shall be necessary for the owner to enter a deed of agreement with Council to remove the structure at the owner’s expense if access to the easement is required. Any such approvals shall not extinguish or limit Council’s rights under the easement. Eaves, suspended patios or pedestrian bridges shall not be permitted to encroach on the easement for heights less than 3.0m.

Where no easement exists over a stormwater line in which Council has an interest, or the existing easement is undersized, Council shall generally require the creation of such an easement as a condition of development consent. All setbacks shall account for the future presence of an easement.

Footings located near the easement shall be taken a minimum of 0.75 metre below the zone of load transfer (taken as a 45° plane from the edge of the easement, starting at the invert level of the pipe, by either the use of deep beam footing or by piers. The invert of the pipeline within the easement shall be determined and shown on the building plans lodged as part of the construction certificate.

4.2 Restrictions as to use for overland flow

Performance criteria

- PI** Overland flow associated with Council's drainage system remains unimpeded and unobstructed.

Development controls

- DI** Where the property is affected by overland flow associated with Council's drainage system Council may require the creation of a Restriction as to Use on land under Section 88B of the *Conveyancing Act 1919*, to facilitate the passage of overland flow through the property. The restriction shall prohibit the placement of any structure of a permanent nature, or the varying of any finished ground level within the designated flow path without the prior consent of Council.

The path of overland flow shall be determined by a qualified civil and hydraulic engineer. The area of land affected by the Restriction as to Use shall be the width of the overland flow.

4.3 Contribution towards drainage works

Performance criteria

- PI** The public drainage system is maintained whilst higher demands are placed on it through additional development within the catchment.

Development controls

- DI** The applicant shall pay a contribution towards the provision of trunk drainage works inter-allotment drainage, road drainage, or a contribution towards costs previously incurred by Council in the construction of works to facilitate development of the catchment.
- D2** Contributions towards drainage shall be required for developments within a catchment identified by Council's Development Contributions Plan (Section 94 plan).

4.4 Construction of pipe drainage in public areas

Performance criteria

- PI** All works carried out in public roads are constructed to Council's specifications and Australian Standards.

Development controls

- DI** **Drainage pipes** – size, class, cover, joints.

All pipes shall be designed to comply with Council's standards and specifications. Generally, pipes which drain through a public area such as a public road or park shall be minimum 375mm diameter class 2 reinforced concrete pipes. The minimum finished cover shall be 500mm unless otherwise approved by Council. All pipes shall be rubber ring jointed.

- D2** **Gully pits** – shall be in accordance with Council's standard drawings.

D3 Excavation

Trenches shall be excavated to the grade line shown on approved drawings. All soft, yielding and other unsuitable material shall be removed and the trench shall be thoroughly compacted and finished to a smooth surface of uniform bearing value.

D4 Laying pipes

Pipes shall be laid true to grade and alignment and bedding shall comply with the Council standards and specifications for the appropriate loading conditions. The pipes shall be aligned so that the centre of inlet pipes intersects with the centre of the outlet pipe at the downstream face of the pit.

D5 Backfilling shall comprise the material types nominated for the appropriate loading conditions specified in Council's standards and specifications.

5.0 On-site detention

Objective

- a. To ensure that through the on-site detention (OSD) of stormwater, discharge is controlled thereby ensuring the development does not increase the risk of downstream flooding of roads and properties, or erosion of unstable waterways.

5.1 Provision of on-site detention**Performance criteria**

PI OSD of stormwater is generally incorporated into all development as a means of controlling and managing the flow of stormwater to Council's drainage system.

Development controls**D1 Developments requiring OSD**

OSD shall be required for all proposed development, re-development or new land subdivisions, except where:

- The proposal is a one-off extension up to:
 - 50m² of impervious area for a single dwelling, dual occupancy or an outbuilding; or
 - 150 m² impervious area for industrial development.

Note: Subsequent extensions require OSD facility.

- The proposal is a single dwelling or dual occupancy where the site coverage complies with Section 2.2 Development Control D1 in the Detached Dwellings and Dual Occupancy DCP Part;
- The applicant can demonstrate to Council's satisfaction, the development is subject to mainstream flooding or is subjected to major overland flow. A flood report prepared by a suitably qualified engineer is required in this case; or
- The property falls within zones 6, 7 and 8 as indicated in Figure 1.

5.2 Design

Performance criteria

- PI** Sufficient storage is provided to ensure peak flow rates at any point within the downstream drainage system do not increase as a result of the development during all storm events up to the 100 year ARI.

Development controls

D1 Permissible site discharge (PSD)

The PSD and site storage provisions shall comply with Table 3.

Alternative values for the required storage volume shall be permitted if the applicant can demonstrate to Council's satisfaction, using appropriate computer modelling, that the relevant PSD shall be satisfied. Computation methods based on the approximate triangular method or the rational method shall not be acceptable.

Stormwater runoff from all new roof areas shall be routed through the OSD facility. Runoff entering the site from upstream properties shall be directed bypassing the on-site detention system.

D2 Site storage requirements

The site storage requirements (SSR) for all properties are shown in Table 3.

Table 3 – Site storage requirements.

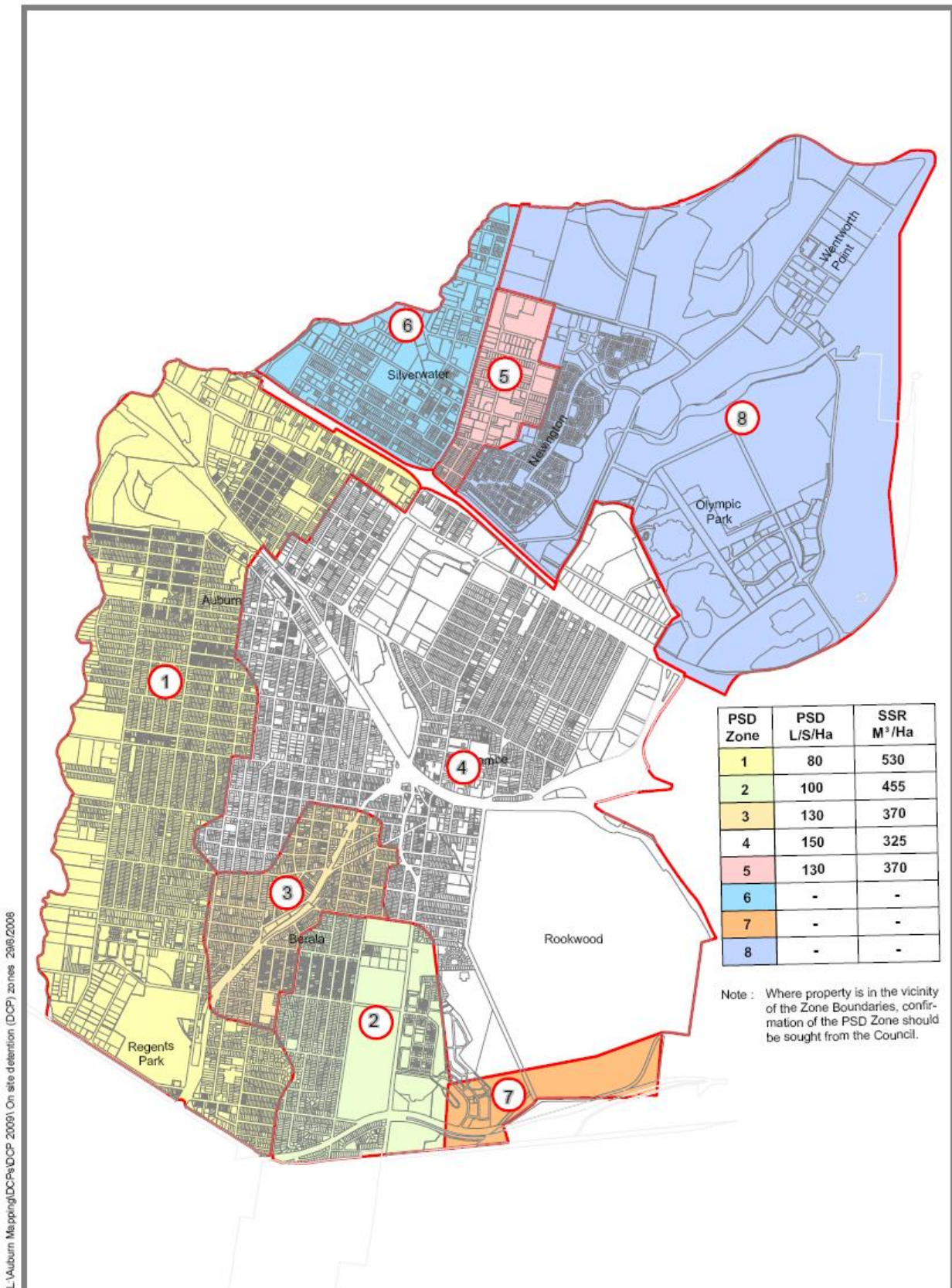
PSD Zone	Description	PSD L/s/Ha	SSR M ³ /Ha
1	Duck River Catchment	80	530
2	Nottinghill Rd Catchment	100	455
3	Woodburn Rd Catchment	130	370
4	Lower Haslams Cr Catchment	150	325
5	Silverwater Rd Catchment	130	370
6	Lower Duck River Catchment	–	–
7	Upper Cook's River Catchment	–	–
8	Sydney Olympic Park Catchment	–	–

See Figure 1 for catchment zones. The area used when determining permissible site discharge and storage volume shall include the entire site area which will contribute runoff to the detention storage facility during a 100 year ARI storm event.

5.3 Runoff bypassing the storage facility

Development controls

- D1** A portion of the new impervious areas (excluding roof area) shall discharge directly to Council's system if it cannot be drained to the storage facility, provided that the PSD is reduced to compensate for the smaller catchment. No more than 15% of the total site area shall be permitted to bypass the basin. The modified PSD shall be selected from the figure in the OSD calculation sheet. The calculation of storage requirement shall be based on the area which bypasses the basin.



L:\Auburn Mapping\DCPs\DCP 2009\On site detention (DCP) zones 23/6/2008

Figure I – On-site detention zones.

5.4 Providing storage

Development controls

- DI** Storage may be provided underground in tanks, aboveground as a shallow pond on a driveway, or as a combination of underground and aboveground storage. See Table 4 for parameters.

The system shall be designed to safely convey all possible overflow from the storage basin to an adequate Council road gutter or drainage system. The total blockage case shall be considered. Where overflow is through an adjoining downstream property and a suitable overland flow path is not available, the overflow shall be collected within a drainage pipeline with a design capacity equivalent to the 100 year ARI runoff from the site.

In the interests of safety and amenity, ponded water depths shall not exceed the values indicated in Table 4 below.

Table 4 – Storage parameters.

Parking/paved areas	150mm desirable 200mm maximum over grate.
Landscaping	300mm desirable 600mm maximum over grate.
Fenced storage	1000mm maximum
Roof area	as required by structural integrity
Underground storage	900mm minimum 1200mm desirable

In certain circumstances, however, these ponding depths may be exceeded but only with Council approval.

Underground storage facilities shall possess the following characteristics:

- Be structurally designed to adequately withstand all service loads;
- Contain a sediment trap immediately upstream of the outlet pipe, consisting of an area 450mm x 450mm (minimum) depressed 200mm below the invert level of the outlet pipe;
- Be graded to drain completely. Long term ponding of water over the floor of the basin will not be acceptable;
- Contain an overflow outlet. The top water level over the overflow to be not less than 100mm below garage floor levels or 250mm below habitable floor levels;
- Contain an inspection/access 900mm x 900mm every 5 metres. One grate to inspect the orifice and another grate to inspect the return pipe inlet shall be provided as shown on Council’s standard detail; and
- Contain step irons where the tank depth is in excess of 1.2 metres.

Aboveground storage facilities shall possess the following characteristics:

- The top water level over the overflow shall not be less than 100mm below garage floor levels or 250mm below habitable floor levels;
- Not be located across the boundary of a lot;
- Not restrict pedestrian access from the public road to buildings;

- Be designed in a manner, which minimises inconvenience caused by the basin,
- The basin walls shall be of masonry type (water proof) construction to ensure basin modifications do not occur; and
- Additional 20% of storage shall be provided if the storage is provided with landscape/courtyard area.

A WAE survey of the detention basin shall need to be prepared to demonstrate that adequate storage volume has been provided. A WAE survey certificate and certification checklist shall be submitted as outlined in the OSD WAE survey and certification submission form and checklists prior to the issue of an occupation certificate or subdivision certificate. A positive covenant shall be executed and registered against the title of the lot containing the aboveground basin in accordance with Council's standard terms as outlined in the Section 88B instrument wording.

D2 The level of the outlet shall be high enough to be independent of the head in Council's system. Calculations shall be provided to demonstrate that the control will be satisfactory in ensuring the correct PSD.

D3 Pipe and pit losses

Friction and minor losses in pipes and pits leading from the storage facility is a method often employed to control the PSD. This method of outflow control is the most desirable and shall be employed where practicable.

D4 Sharp edged orifices

Orifices shall be made of minimum 200mm x 200mm flat stainless steel, 3mm thick. The sharp edged orifice plate shall be tooled to the exact dimension as calculated. Orifices shall be securely fastened over the outlet pipe using four (4) bolts to prevent its unauthorised removal.

The OSD calculation sheet may be used to calculate the required orifice diameter. This formula assumes the water level immediately downstream of the orifice is not above its obvert.

D5 Debris screens

Pipes or orifices with a diameter less than 150mm shall not be acceptable except where protected against blockages using a removable, rustproof screen or wire cage installed around the outlet. The minimum surface area of the screen shall be 50 times the area of the outlet pipe or orifice.

6.0 Flood risk management

Objectives

- a. To alert the community to the hazard and extent of land affected by potential floods.
- b. To increase public awareness of the potential of floods greater than the 100 year ARI flood and to ensure essential services and land uses are planned in recognition of all potential floods.
- c. To reduce the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods.

- d. To allow development in the floodplain which reflects the sensitivity of the proposed development to the flood hazard, and subject to appropriate design and siting controls, to ensure that the particular consequences that could still arise from flooding remain acceptable having regard to the State Government's Flood Policy and the likely expectations of the community.
- e. To deal equitably and consistently with applications for development on land affected by potential floods, in accordance with the principles contained in the Floodplain Management Manual, issued by the NSW Government.
- f. To apply a merits-based approach to all development decisions which takes account of social, economic and ecological as well as flooding considerations.
- g. To ensure that fencing does not result in the undesirable obstruction of the free flow of floodwater, and does not become unsafe during floods and potentially become moving debris which threatens the integrity of structures or the safety of people.

Note: The provisions of this section of the Plan effectively outline Council's Floodplain Risk Management Policies (FRMP) as required by the State Government's Flood Policy and Floodplain Management Manual.

6.1 General requirements

Performance criteria

- P1** The proposed development does not result in any increased risk to human life.
- P2** The additional economic and social costs which may arise from damage to property from flooding is no greater than that which can reasonably be managed by the property owner and general community.
- P3** The proposal should only be permitted where effective warning time and reliable access is available for the evacuation of an area potentially affected by floods. Evacuation should be consistent with any relevant disaster plans (DISPLAN) or flood plan where in existence.
- P4** Development does not detrimentally increase the potential flood affectation on other development or properties.
- P5** Development does not result in significant impacts upon the amenity of an area by way of unacceptable overshadowing of adjoining properties, privacy impacts (e.g. by unsympathetic house-raising) or by being incompatible with the streetscape or character of the locality.
- P6** The proposal does not adversely impact upon the recreational, ecological, aesthetic or utilitarian use of the waterway corridors, and where possible, should provide for their enhancement, in accordance with ecologically sustainable development principles.

Note: The procedure to determine what controls apply to proposed development involves:

- Identifying the land use category of the development (Table 6);
- Determining what part of the floodplain the land is located within (determine relevant Flood Risk Precinct (FRP) by referencing maps held by Council or by site-specific study). Note that the proposed filling of the site, where unacceptable and permitted, may change the applicable FRP, for the purposes of applying the provisions of this Part); and

- Applying the controls referred to in clauses D1 and D2 in this section and relevant performance criteria.

Development controls

D1 Compliance with the controls applicable to the proposed land use category and FRPs within which the site is located, as specified in Table 5:

- Haslams Creek floodplain;
- Duck river floodplain (to be reviewed upon preparation of a FRMP for this Floodplain); and
- Cooks river floodplain.

Land use categories

Seven major land use categories have been adopted. The specific uses, as defined by the applicable environmental planning instruments, which may be included in each category, are listed in Table 6.

Flood risk precincts

Each of the floodplains within the local government area can be divided based on different levels of potential flood risk. Figure 2 delineates the three catchments within the Auburn local government area, each containing separate floodplains. The relevant FRPs for each of the floodplains are outlined below:

Haslams creek floodplain:

- High flood risk
This has been defined as the area within the envelope of land subject to a high hydraulic hazard (in accordance with the provisional criteria outlined in the Floodplain Management Manual) in a 100 year flood or potentially subject to evacuation difficulties.
- Medium flood risk
This has been defined as land below the 100 year flood level (plus freeboard) subject to low hydraulic hazard (in accordance with the provisional criteria outlined by the Floodplain Management Manual).
- Low flood risk
This has been defined as all other land within the floodplain (i.e. within the extent of the probable maximum flood) but not identified as either a high flood risk or medium flood risk FRP, where risk of damages are low for most land uses.

Duck River floodplain

FRMPs are yet to be finalised for this floodplain. In the interim, the controls applicable to the Haslams Creek floodplain will be applied. No FRP maps apply and appropriate FRPs must be determined on an individual site basis.

Cooks River floodplain

FRMPs are yet to be finalised for this floodplain. In the interim, the controls applicable to the Haslams Creek floodplain will be applied. No FRP maps apply and appropriate FRPs must be determined on an individual site basis.

Note:

1. FRPs are delineated by Council when preparing FRMPs.
2. A FRMP has been prepared for the Haslams Creek catchment, and accordingly, a FRP map is available only for this catchment from Council.
3. Council will prepare FRP Maps to identify flood hazards associated with main channels, creeks and rivers only. Other areas potentially affected by local overland flooding will require further study by the applicant, to determine the applicable FRP. Properties identified as being potentially flood affected in the Haslams Creek catchment, requiring further study, are depicted on Figure 2.
4. There may be areas beyond those mapped by Council, subject to potential flooding. These areas will require further study if identified, to determine an appropriate FRP.
5. Where the applicant is required to undertake further study to determine the applicable FRP, this will need to be undertaken by using an appropriate hydraulic analysis methodology by a suitably qualified hydraulic engineer with experience in urban flood studies.
6. Blockage needs to be included when analysing overland flow paths, pipes, etc. This analysis should be carried out on the basis that all bridges, culverts, pipes, etc. are at least 50% blocked.

D2 A 30m setback from the mean high water mark applies to properties fronting Duck River north of Carnarvon Street 15m south of Carnarvon Street and 10m to Haslams Creek.

D3 Development proposals shall provide appropriate documentation including a report from a qualified engineer to demonstrate the raised structure will not be at risk of failure from the forces of floodwaters and the provision of details such as landscaping and architectural enhancements which ensure that the resultant structure will not result in significant adverse impacts upon the amenity and character of an area.

D4 The proposal shall not have a significant detrimental impact on:

- water quality;
- native bushland vegetation;
- riparian vegetation;
- estuaries, wetlands, lakes or other water bodies;
- aquatic and terrestrial ecosystems;
- indigenous flora and fauna; or
- fluvial geomorphology.

D5 The filling of flood prone land, where acceptable and permitted by this Part, must involve the extraction of the practical maximum quantity of fill material from that part of the site adjoining the waterway.

6.2 Fencing

Performance criteria

PI Fencing is to be constructed in a manner which does not affect the flow of floods so as to detrimentally increase flood affectation on surrounding land.

- P2** Fencing is certified by a suitably qualified engineer, to ensure that the proposed fencing is adequately constructed so as to withstand the forces of floodwaters, or collapse in a controlled manner to prevent the undesirable impediment of floodwaters.

Development controls

- D1** Fencing within a high FRP shall not be permissible except for security/permeable/safety fences of a type approved by Council.
- D2** A 30m setback from the mean high water mark applies to properties fronting Duck River north of Carnarvon Street 15m south of Carnarvon Street and 10m to Haslams Creek.
- D3** Council shall require a development application for all new solid (non-porous) and continuous fences in the high and medium risk FRPs, unless otherwise stated by exempt and complying development provisions.
- D4** An applicant shall demonstrate that the fence would create no impediment to the flow of floodwaters. Appropriate fences may include:
- An open collapsible hinged fence structure or pool type fence;
 - Other than a brick or other masonry type fence (which will generally not be permitted); or
 - A fence type and siting criteria as prescribed by Council.
- D5** Other forms of fencing shall be considered by Council on merit.

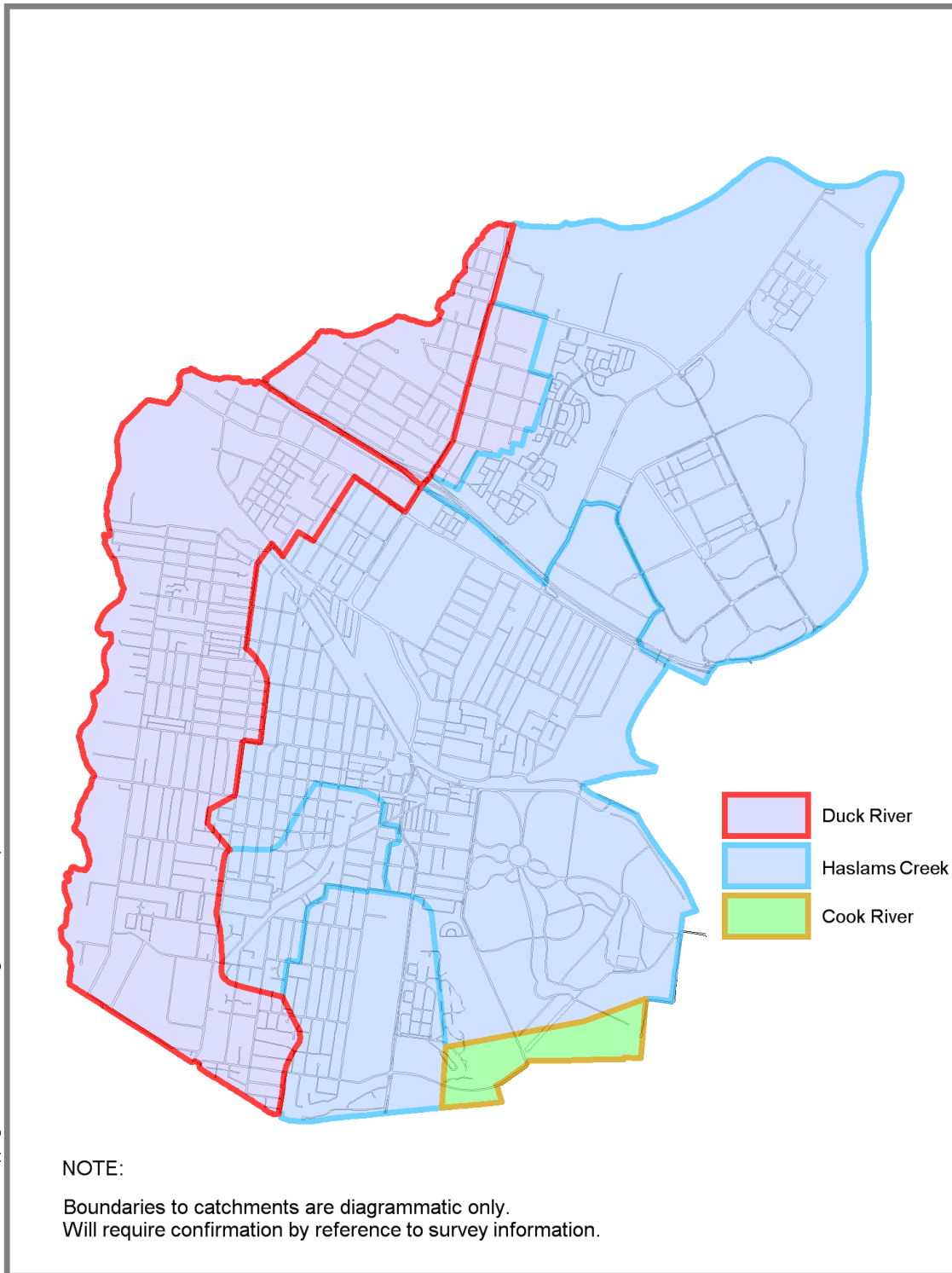


Figure 2 – Drainage catchments.

Table 5 – Development controls.

Haslams Creek Floodplain

(Also applies to Duck River and Cooks River Floodplain in interim - subject to review)

	Flood Risk Precincts (FRP's)																						
	Low Flood Risk						Medium Flood Risk						High Flood Risk										
	Essential Community Facilities	Critical Utilities	Subdivision	Residential	Commercial & Industrial	Recreation & Non-Urban	Concessional Development	Essential Community Facilities	Critical Utilities	Subdivision	Residential	Commercial & Industrial	Recreation & Non-Urban	Concessional Development	Essential Community Facilities	Critical Utilities	Subdivision	Residential	Commercial & Industrial	Recreation & Non-Urban	Concessional Development		
Planning Consideration																							
Floor Level		5								2,3,4	2,3	1	6									1	2,6
Building Components		2								1	1	1	1									1	1
Structural Soundness		3								2	2	2	2									1	1
Flood Affection		2							1	2	2	2	2									1	1
Evacuation		2,4	*	3,4	4				*	3,4	3,4	1	3									1	3
Management & Design		1,2,3	1						1	2,3,5	2,3,5	2,3,5	2,3,5									2,3,5	2,3,5

Not Relevant
 Unsuitable Land Use

* Refer to 'Management & Design' planning consideration for subdivision

Note: Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.

Floor level

1	All floor levels to be equal to or greater than the 5 year ARI flood level plus freeboard unless justified by site specific assessment.
2	Floor levels of open car parking areas to be equal to or greater than the 20 year ARI flood plus freeboard. This may be achieved with a suspended floor which allows the continued passage of flood waters or filling if justified by a site specific assessment, as required with reference to flood affection and other controls below. Enclosed car parking (e.g. garages or basement car parking) must be protected from the 100 year ARI flood.
3	Habitable floor levels to be equal to or greater than the 100 year ARI flood plus freeboard.
4	Below ground swimming pools should be free from inundation from storms up to the 5 year ARI. Where required, the private open space of a dwelling should be a usable outdoor recreation area which, during storm events equal to less than the 5 year ARI, is free from inundation by overland flows exceeding 50mm.
5	All floor levels to be equal to or greater than the probable maximum flood plus freeboard.
6	Floor levels to be as close to the design floor level (the level nominated above that would apply if not concessional development) as practical and no lower than the existing floor level when undertaking alterations or additions.

Note: The freeboard height in the Haslams Creek floodplain is variable primarily, due to the implications of sub-critical and super-critical flows caused by obstructions to the flowpath of flood waters, and can be determined by reference to a map and tables produced as part of the Haslams Creek FRMP and held in the offices of Council. The freeboard height for the Duck River and Cooks River floodplains is 0.5m.

Building components and method (Also see Table 7)

1	All structures to have flood compatible building components below or at the 100 year ARI flood level.
2	All structures to have flood compatible building components below or at the PMF level.

Structural soundness

1	Engineers report to certify that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood.
2	Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood.

3	Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF flood.
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Flood affectation

1	Engineers report required to certify that the development will not increase flood affectation elsewhere.
2	The impact of the development on flooding elsewhere to be considered.

Note: When assessing flood affectation the following must be considered:

1. Loss of storage area in the floodplain (except for filling occurring up to the 20 year ARI.
2. Changes in flood levels caused by alteration of conveyance of flood waters.
3. Filling between the 20 year and 100 year ARI flood levels will not be permitted.

Evacuation

1	Reliable access for pedestrians required during a 5 year ARI flood.
2	Reliable access for pedestrians and vehicles required during a PMF flood.
3	Reliable access for pedestrians or vehicles is required from the dwelling, commencing at a minimum flood level equal to the lowest habitable floor level to an area of refuge above the PMF level, either on-site or off-site.
4	Applicant to demonstrate that the development is to be consistent with any relevant DISPLAN or flood evacuation strategy.

Management and design

1	Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this Part.
2	Site Emergency Response Flood plan required (except for single-dwelling houses) where floor levels are below the design floor level.
3	Applicant to demonstrate that area is available to store goods above the 100 year flood plus 0/5m (freeboard).
4	Applicant to demonstrate that area is available to store goods above the PMF flood plus 0.5m (freeboard).
5	No external storage of materials below design floor level which may cause pollution or be potentially hazardous during any flood.

Table 6 – Floodplain management controls – land use categories.

Essential community facilities	Critical utilities	Subdivision	Residential	Commercial or industrial	Non-urban activities or open space	Concessional development
Place of public entertainment facilities; or public administration buildings which may provide an important contribution to the notification and evacuation of the community during flood events. Hospitals and educational establishments.	Telecommunication facilities; electricity generating or infrastructure land uses may cause pollution during flooding, essential evacuation periods of flood or if affected during flood events, would unreasonably affect the ability of the community to return to normal activities after flood events.	Subdivision of land which involves creation of new allotments for any particular purpose.	Bed & Breakfast accommodation; the boarding houses; dwelling houses; home industry; infrastructure land uses (other than critical infrastructure); multi dwelling housing; neighbourhood shops; permanent group homes; residential flat buildings; seniors housing; serviced apartments; transitional group homes.	Amusement centres; bulky goods premises; car parks; child care centres; business premises; community facilities; depots; educational establishments; food and drink premises (excluding pubs); function centre; hazardous industries; hazardous storage establishments; health consulting rooms; health service facilities;	Cemetery; depot; extractive industries; helipad; marinas; mining; recreation areas and recreation facilities (outdoor); stock and sale yard.	(a) In the case of residential development: (i) an addition to an existing dwelling house of not more than 10% or 35m ² (whichever is the lesser) of the habitable floor area which existed at the date of commencement of this Plan; (ii) the construction of an outbuilding with a maximum floor area of 20m ² ; or

Essential community facilities	Critical utilities	Subdivision	Residential	Commercial or industrial	Non-urban activities or open space	Concessional development
				hotel or motel accommodation; industries; light industries; liquid fuel depot; medical centres; offensive industries; offensive storage establishments; office premises; passenger transport facilities; place of public entertainment; places of public worship; public administration building; recreation facilities (indoor); recreation facilities (major); registered clubs; resource recovery facility; service stations; sex service premises; shops; storage premises; vehicle body repair workshops; vehicle repair stations; vehicle sales or hire premises; warehouse or distribution centres; wholesale supply.		(iii) re-development for the purposes of substantially reducing the extent of flood affectation to the existing building. (b) In the case of other development: (i) an addition to existing premises of not more than 10% of the floor area which existed at the date of commencement of this Plan; or (ii) re-development for the purposes of substantially reducing the extent of flood affectation to the existing building. (c) In the case of all development: (i) earthworks or filling operations covering 100m ² or more than 0.3m deep, which do not raise ground levels above the 20-year ARI flood level, and is not located within the foreshore building line.

Table 7 – Flood compatible materials			
Building component	Flood compatible material	Building component	Flood compatible material
Flooring and sub-floor structure	<ul style="list-style-type: none"> ▪ Concrete slab-on-ground monolith construction ▪ Suspension reinforced concrete slab 	Doors	<ul style="list-style-type: none"> ▪ Solid panel with water proof adhesives ▪ Flush door with marine ply filled with closed cell foam ▪ Painted metal construction ▪ Aluminium or galvanised steel frame
Floor covering	<ul style="list-style-type: none"> ▪ Clay tiles ▪ Concrete, precast or in situ ▪ Concrete tiles ▪ Epoxy, formed-in-place ▪ Mastic flooring, formed-in-place ▪ Rubber sheets or tiles with chemical-set adhesives ▪ Silicone floors formed-in-place ▪ Vinyl sheets or tiles with chemical-set adhesive ▪ Ceramic tiles, fixed with mortar or chemical-set adhesive ▪ Asphalt tiles, fixed with water resistant adhesive 	Wall and ceiling linings	<ul style="list-style-type: none"> ▪ Fibro-cement board ▪ Brick, face or glazed ▪ Clay tile glazed in waterproof mortar ▪ Concrete ▪ Concrete block ▪ Steel with waterproof applications ▪ Stone, natural solid or veneer, waterproof grout ▪ Glass blocks ▪ Glass ▪ Plastic sheeting or wall with waterproof adhesive
Wall structure	<ul style="list-style-type: none"> ▪ Solid brickwork, blockwork, reinforced, concrete or mass concrete 	Insulation windows	<ul style="list-style-type: none"> ▪ Foam (closed cell types) ▪ Aluminium frame with stainless steel rollers or similar corrosion and water resistant material
Roofing structure (for situations where the relevant flood level is above the ceiling)	<ul style="list-style-type: none"> ▪ Reinforced concrete construction ▪ Galvanized metal construction 	Nails, bolts, hinges and fittings	<ul style="list-style-type: none"> ▪ Brass, nylon or stainless steel ▪ Removable pin hinges ▪ Hot dipped galvanized steel wire nails or similar
Electrical and mechanical equipment		Heating and air conditioning systems	
<p>For dwellings constructed on land to which this Part applies, the electrical and mechanical materials, equipment and installation should conform to the following requirements.</p>		<p>Heating and air conditioning systems should, to the maximum extent possible, be installed in areas and spaces of the house above the relevant flood level. When this is not feasible, every precaution should be taken to minimize the damage caused by submersion according to the following guidelines.</p>	
Main power supply		Fuel	
<p>Subject to the approval of the relevant authority, the incoming main commercial power service equipment, including all metering equipment, shall be located above the relevant flood level. Means shall be available to easily disconnect the dwelling from the main power supply.</p>		<p>Heating systems using gas or oil as a fuel should have a manually operated valve located in the fuel supply line to enable fuel cut-off.</p>	
Wiring		Installation	
<p>All wiring, power outlets, switches, etc. should, to the maximum extent possible, be located above the relevant flood level. All electrical wiring installed below the relevant flood level should be suitable for continuous submergence in water and should contain no fibrous components. Earth core linkage systems (or safety switches) are to be installed. Only submersible-type splices should be used below the relevant flood level. All conduits located below the relevant designated flood level should be so installed that they will be self-draining if subjected to flooding.</p>		<p>The heating equipment and fuel storage tanks should be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. All storage tanks should be vented to an elevation of 600 millimetres above the relevant flood level.</p>	

Equipment	Ducting
All equipment installed below or partially below the relevant flood level should be capable of disconnection by a single plug and socket assembly.	All ductwork located below the relevant flood level should be provided with openings for drainage and cleaning. Self draining may be achieved by constructing the ductwork on a suitable grade. Where ductwork must pass through a water-tight wall or floor below the relevant flood level, the ductwork should be protected by a closure assembly operated from above relevant flood level.
Reconnection	
Should any electrical device and/or part of the wiring be flooded, it should be thoroughly cleaned or replaced and checked by an approved electrical contractor before reconnection.	

7.0 Rainwater reuse

Objectives

To encourage all new development to:

- a. enable the re-use of rainwater; and
- b. reduce the demand for potable water.

7.1 Rainwater tanks

Performance criteria

- PI** Rainwater is retained and reused for non-potable uses of toilet flushing, laundry, garden watering and external washing (cars, etc).

Development controls

- D1** For all developments, rainwater tanks or a water reuse device shall be incorporated into the stormwater drainage system with a minimum storage size of 5,000 litres (for site area less than 1500m²) and 10,000 litres (for site area greater than 1500m²) or that amount required by BASIX for residential development.

For dwelling houses (includes alterations and additions) exceeding 60% impervious area, a minimum capacity of 4,000 litres shall be provided, or that amount required by BASIX.

- D2** All systems shall be installed under the following guidelines:
- A first flush diversion to remove roof contamination is recommended.
 - Adequate screening to prevent mosquito breeding and to prevent entry of any animals or foreign matter.
- D3** Rainwater tanks shall comply with plumbing guidelines and Sydney Water requirements.
- A sign shall be installed stating “Not for Human Consumption”.
 - Overflow from the tank shall be piped to the approved drainage system.
 - Aboveground tanks shall not be located within the front building line and shall be detailed to be compatible with the surrounding environment.

- D4** One third of the volume of the rainwater storage shall be used to offset the OSD volume requirements, provided a reticulation system to supply a reasonable quantity of on-site non-potable uses is installed.

Where the rainwater storage unit is also connected to toilets and washing machines one half of the volume shall be used to offset the OSD requirements.

Note: Minimum 50% of detention volume shall be provided as detention storage.

8.0 Erosion and sediment control

Objective

- a. To reduce sediment and pollution to downstream areas and receiving waters.

8.1 Erosion and sediment control plans (ESCPs)

Performance criteria

- P1** All runoff from surrounding land is diverted away from the area disturbed. All polluted runoff is retained on-site.
- P2** All disturbed areas are stabilised with vegetation immediately after site works are completed.
- P3** Maintenance measures must be kept in good working order so as to minimise the likelihood of sedimentation of waterways.

Development controls

- D1** The ESCP shall be in accordance with the standards outlined in Managing Urban Stormwater: Soils and Construction by the NSW Department of Housing.

ESCP for all developments and/or associated works shall be prepared to the satisfaction of Council and conform to the specifications and standards contained within this Part.

All erosion and sedimentation controls shall be in place prior to the commencement of works.

- D2** All ESCPs shall include:
- Existing site contours;
 - Details of access points to the construction site;
 - Details of all sediment and erosion control structures (see Figure 3);
 - All existing watercourses and drainage systems;
 - Timing of site rehabilitation or the landscaping program;
 - Outline of maintenance program for all erosion and sediment controls;
 - The name and contact phone number of the person responsible for ensuring the implementation of the site work plan; and
 - All measures employed shall address pollution sources including access control, soil erosion, sediment and general pollution.

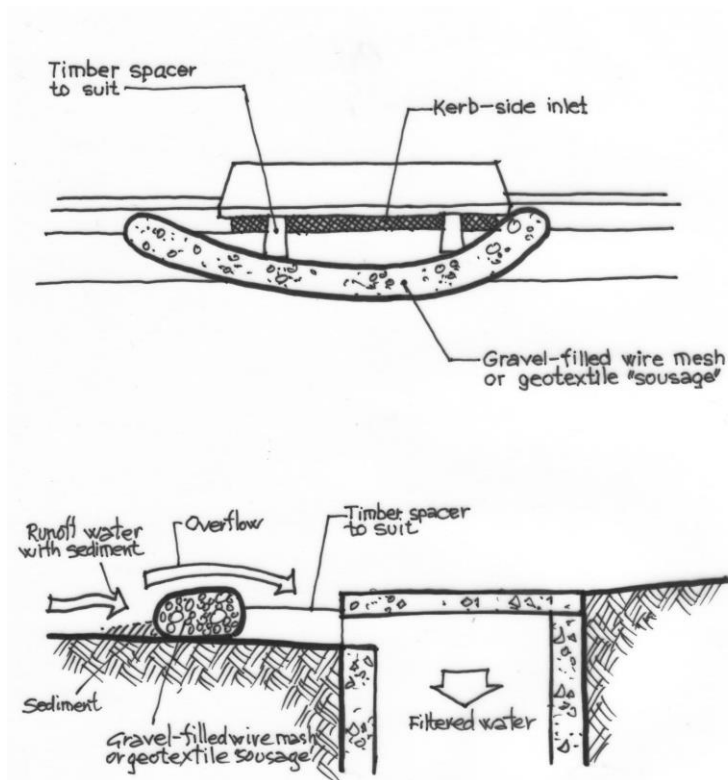


Figure 3 – Maintenance measures to minimise the likelihood of sedimentation in waterways. (**Note:** This practice is only to be used where specified in an approved SWMP/ESCP)

- D3** Erosion and sedimentation control measures shall be maintained to ensure that they are in effective working order.

8.2 Soil and water management plans (SWMPs)

Performance criteria

- PI** Soil and water management plans are prepared for larger development sites including residential flat buildings.

Development controls

- DI** SWMPs shall be prepared in accordance with the manual prepared by the Department of Housing's Managing Urban Stormwater: Soils and Construction.

The SWMP shall be prepared by a suitably experienced and qualified person (i.e. evidence of experience and qualifications shall be submitted).

8.3 Vehicle access and road cleaning

Performance criteria

- PI** Public roads are kept free of mud and dirt to prevent hazard and nuisance to vehicles using the road and to prevent pollution entering the street drains.

Development controls

- DI** Sediment tracked onto the public roadway by vehicles leaving the construction site shall be swept up immediately.

All vehicular entrances to the site shall be stabilised to prevent them becoming a source of sediment disposal.

Fences shall be erected to ensure vehicles cannot bypass unless coming from a stabilised area.

Larger developments including medium density residential shall require a heavier duty method such as shaker grids or wash-down bays to minimise the transportation of sediment.

8.4 Sediment fences

Performance criteria

PI Sediment fences are used for filtering sediment from sheet flow and not concentrated runoff to a single point.

Development controls

- D1** To be effective, sediment fences shall:
- Be perpendicular to the flow of water;
 - Be installed to prevent collapse under the weight of the water;
 - Not allow flow under, around or over the fence before a sufficient amount of ponding has occurred; and
 - Have timely maintenance to ensure volume is not reduced by collected sediment.
- D2** Fences shall be installed in accordance with the manufacturer's specifications.

The base of the filter fence shall be buried into the ground to a minimum depth of 200mm and the soil holding the fence into the ground is to be heavily compacted.

9.0 Submission requirements

9.1 Stormwater drainage plans

Performance criteria

PI The stormwater drainage plans submitted are detailed drawings to ensure Council is satisfied with the method of disposal in to Council's stormwater system.

Development controls

D1 Plans and calculations of the proposed property drainage system shall be submitted and approved by Council's Works and Services department prior to the issue of development consent.

The plans, prepared at a 1:100 scale (1:200 for large sites) shall include:

- The location of all pits and pipes, along with pit grate levels and invert levels;
- Levels at the point of discharge of the property drainage system into Council's system;
- The size and class of all pipes and the size of all pits;

- Contour spacing to be sufficient to determine site gradient;
- Finished level of all paved areas, unpaved areas, dwellings and garages;
- An indication of the path taken by overland flow during storm events where the capacity of the piped drainage system is exceeded; and
- A clear indication of any easements, drainage lines or watercourses passing through the property.

Where OSD is required, the drainage plans shall be accompanied by Council's OSD checklist. The checklist shall be completed by a qualified and experienced civil/hydraulic engineer.

The calculations to be submitted shall include:

- Catchment plans and calculation sheets, detailing the area and surface type of the sub-catchment for each collection point, the quantity of flow in the pipe, and the design pipe capacity;
- A hydraulic grade line analysis of all pipelines in excess of 225mm diameter where bypass flows are not connected to the OSD system; and
- Full details of input variables and calculations used for the design of the on-site detention system including the selection of the permitted site discharge, the sizing of storage facility, and the design of the outlet control.

Note: Completion and submission of the OSD calculation sheet will be sufficient to satisfy this requirement.

Where a charged system is required:

- The roof gutter and pipe system shall be designed to cater for 100 year ARI storm event.
- Detailed hydraulic grade lines shall be shown on the plan.
- Outlet shall be discharged within the street frontage.

Note: Refer to Council's website at www.auburn.nsw.gov.au for submission checklist.

9.2 Creation of private drainage easements

Performance criteria

- PI** Private easements to drain water are required for properties draining away from a Council stormwater drainage system. This will enable the property to drain via a downstream property into a Council pipe or gutter and ensure the stormwater remains in its natural catchment.

Development controls

- DI** Where the creation of an inter-allotment drainage easement is required, a letter of agreement from the affected downstream property owner(s) shall accompany the development application to demonstrate to Council that a suitable easement can be obtained. The subsequent construction certificate shall not be released until the easement has been prepared by a registered surveyor and has been lodged and registered with the NSW Land and Property Management Authority.

9.3 Overland stormwater inundation

Performance criteria

- PI** An overland flow analysis is required for properties that receive stormwater from the upstream catchment for the safety of the subject property and the surrounding properties.

Development controls

- DI** Where overland flow affects the property, the applicant shall be required to submit information in support of the development application to demonstrate that the proposal is consistent with the objectives outlined in Section 6. This information shall include;

A survey to Australian Height Datum of the floodway through the site, and adjoining properties where necessary, undertaken by a registered surveyor, showing all physical features which will affect the position and depth of floodwaters. This shall extend sufficiently upstream and downstream to ensure relevant hydraulic controls are contained within the survey:

- A hydrological analysis of the upstream catchment and a hydraulic analysis of the relevant section of the piped drainage system, to determine overland flow rates through the site. Where known, these values will be supplied by Council.
- Plans and calculations of the pre-developed and post-developed position, depth and velocity of the floodway through the site, and adjoining properties where relevant, prepared by a suitably experienced, qualified civil/hydraulic engineer.

The required level of detail of the supporting information may vary considerably from site to site, depending partly on how close the application finds itself to the criteria limits. A civil engineer is best placed to make a reasonably accurate assessment of the magnitude of the investigation required. It is recommended that where overland flow does affect the property, a civil engineer be consulted early in the planning phase of the development project to discuss any flood related constraints and/or provisions.