GEORGES RIVER COUNCIL

Stormwater Management Policy

2023

Policy administration

Dates	Policy approved 18/12/2023 This Policy is effective upon its publication. Policy is due for review 18/12/2026
Approved by	Council meeting on 18/12/2023 Council Resolution ENV047-23
Policy Type	☐ Executive Policy ☒ Council Policy
Exhibition Period	10/07/2023 - 07/08/2023
Policy Owner	Manager Development and Building Environment and Planning Directorate
Related Documents	• Georges River Council (2018) OSD Policy Review for Georges River Council (Anstad Pty Ltd) • Georges River Council DA Procedure – Stormwater Drainage from Low Level Properties • Georges River Council – 2016 Overland Flow Flood Study for Hurstville, Mortdale and Peakhurst Wards (SMEC and Catchment Simulation Solutions) • Kogarah Council (2009) Kogarah Bay Creek Risk Management Study and Plan (Webb, McKeown & Associates) • Kogarah Council (2011) Poulton Park Overland Flow Risk Management Study and Plan (Cardno) • Kogarah Council (2007) Beverley Park Overland Flow Risk Management Study and Plan February 2007, (Cardno Lawson Treloar) • Kogarah Council (2011) Moore Reserve Catchment Overland Flow Study February 2011 (BMT WBM) • Geoscience Australia Australian Rainfall and Runoff, latest version (available from www.arr.ga.gov.au)
Appendices	APPENDIX A1 - DA Stormwater and OSD Documentation Checklist APPENDIX A2 - Stormwater Concept Plan (SCP) Preparation Flow Chart APPENDIX A3 - Stormwater Detailed Plan (SDP) Preparation Flow Chart APPENDIX A4 - Certificate of Stormwater Compliance for On-Site Stormwater Management System

	APPENDIX A5 - Standard wording for Restriction to Use of Land and Positive Covenant for On-Site Stormwater Management System APPENDIX A6 - Standard wording for Restriction to Use of Land and Positive Covenant for Overland Flow Path APPENDIX A7 - Calculating % impervious area of a site for determination of OSD Storage requirements APPENDIX A8 - Design Rainfall Data APPENDIX A9 - Typical warning signs APPENDIX A10 - Flood Compatible Materials APPENDIX A11 - Policy for Stormwater Drainage from Low Level Properties APPENDIX A12 - Design Guide for Charged Drainage Systems APPENDIX A13 - Template Letter for Requesting an Easement Through a Down Stream Property
References & Legislation	• Australian Building Codes Board National Construction Code – latest edition (available from www.abcb.gov.au) • Landcom, New South Wales (2004) Managing Urban Stormwater: Soil and Construction, 2004 (Blue Book), Landcom • Flood Risk Management Manual (NSW;DPE 2023) • Standards Australia (2018) AS 1657:2018 Fixed platforms, walkways, stairways and ladders - Design, construction and installation • Standards Australia (2009) AS/NZS 2890 (Set):2009 Parking Facilities Set • Standards Australia, AS/NZS 3500.3:2018 (As Amended) – Plumbing and Drainage - Stormwater Drainage • Standards Australia (2008) HB 230—2008 Rainwater Tank Design and Installation Handbook
Document Identifier	Policy #: Pol-073.03 Doc No.: D23/325283
Breaches of Policy	Breaches of any Policy will be dealt with and responded to in accordance with adopted codes and/or relevant legislation.
Record Keeping	All documents and information obtained in relation to the implementation of this Policy will be kept in accordance with the NSW State Records Act 1998, Georges River Council's Corporate Records Policy and adopted internal procedures.

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APPENDICES

Policy statement

1. Introduction

1.1 About this Policy

This Policy provides detailed information in relation to on-site stormwater management and details the allowable management options and design requirements applying in the Georges River Council Local Government Area. The Policy includes requirements with respect to development in flood affected areas and requirements with respect to any works that will impact on Council or other public authorities.

The developer is responsible for ensuring any development proposal complies with this Policy along with relevant Australian Standards.

Urban development increases the area of impervious surfaces such as roofs, footpaths and other paved areas, which causes significant alteration to a site's hydrological cycle. Impervious surfaces act to reduce the quantity of rainwater that can infiltrate into the soil, thereby causing most rainfall to become runoff. This change results in increasing peak flow rates during flood events and increasing pollutant loads in stormwater runoff. In order to manage the potential impact of increasing impervious areas due to urban development, the following principles are embedded in this document.

- Protect quality and ensure adequate management of the quantity of water conveyed through the receiving trunk drainage system and waterways.
- Ensure run-off draining from urban developments does not adversely impact water quality.
- Reduce peak flows from developments by on-site detention measures.
- Conserve water and reduce mains water consumption.
- Prevent the risk of flooding increasing within the site or at any adjacent or downstream properties.
- Minimise public drainage infrastructure costs.

The implementation of the requirements of this document will help to achieve the above water cycle principles.

These principles collectively call for an enhanced or more considered approach to the integration of land and water planning at all levels of the urban development process. In this context, Georges River Council requires that documentation, including architectural, landscape and stormwater management plans, shall be developed in an integrated manner.

This document adopts Water Sensitive Urban Design (WSUD) principles in managing the water cycle in the urban environment of the Georges River Council area. The objective of WSUD is to maintain or to replicate (as practically as possible) the predevelopment water cycle of the development site. This is primarily undertaken through the use of design techniques and the implementation of measures that manage the impact of increasing impervious areas in a sustainable way.

This Policy is intended to provide guidance to residents, professionals, developers, private certifiers and Council staff regarding the selection, sizing and assessment of management measures to achieve defined water cycle objectives and performance criteria.

1.1A Savings Provisions Relating to Development Applications

If an application for development under the Environmental Planning and Assessment Act 1979 has been made before the commencement of this Policy in relation to land which this Policy applies and the application has not been finally determined before that commencement, the application must be determined as if this Policy had not commenced.

1.2 Objectives of this Policy

The Policy is intended to result in developments that:

(a) Reduce the peak flows from the site that passes through Council's drainage system.

(b) Reduce the likelihood and severity of downstream flooding.

(c) Do not divert flows from one drainage sub-catchment to another, unless it is proved by a qualified hydraulic engineer that there are no adverse effects to the receiving sub-catchment. The levels of the site may not be changed to redirect stormwater to another drainage sub-catchment.

(d) Minimise run-off volumes and replenish ground water.

(e) Provide drainage systems that integrate into Council's existing drainage network with minimal impact on existing users.

(f) Provide drainage systems that are low maintenance and long lasting.

(g) Prevent, or at worst minimise, the release of pollutants from the developed area.

(h) Provide drainage systems that incorporate rainwater tanks or other systems to reduce the development's reliance on mains supplied water.

(i) Provide drainage systems that improve the natural environment, or at worst have nil, or minimal impact, on the surrounding environment.

The Policy is also intended to:

(a) Encourage the production of high-quality drainage plans that can be quickly assessed.

(b) Provide clear understanding of the information and documents that must be submitted with the drainage plans.

1.3 Scope of this Policy

This Policy is applicable to all development proposals within the Georges River Council Local Government Area. It is applicable to both public and private land.

Large developments involving site areas in excess of 2000m^2 require detailed water quality modelling. Water quality requirements are detailed in Section 7.

1.4 Exempt and Complying Development

The requirements of this Policy are applicable for all types of development, including but not limited to development applications lodged with Council, Complying Developments, Exempt Developments and State Significant Developments.

With respect to Complying Development, in certain circumstances the applicant will be required to lodge plans and associated information with Council and receive written approval from Council's Development Engineers prior to a certifier issuing a Complying Development Certificate. This Council approval will typically only be required for proposals that may:

(a) Impact on Council's stormwater infrastructure that is either within or in close vicinity to the proposed development, and/or;
(b) Involve a proposed method of disposal of stormwater from the site is that is identified by Council as having the potential to cause or aggravate flooding conditions affecting adjacent or downstream properties.
(c) Involve low level property as defined in Section 1.5 of this document.

The types of proposals that will require the above-mentioned approval from Council's development engineers are identified in Section 2.3. The applicant, developer and certifier are ultimately responsible for ensuring that this requirement has been met.

It is noted that that failure to meet this requirement could incur additional costs to the applicant and delays during the construction works. Such a failure may also lead to legal action being taken against the applicant, developer or any associated persons or companies.

1.5 Definitions

Term	Meaning
Above-ground OSD Storage	A storage system for On-Site Detention (OSD), generally above-ground, where the volume is contained within an open area.
Absorption System	A method of disposal of stormwater run-off to a below ground storage to allow for infiltration into the underlying soil stratum. Note, these systems are often not feasible as the primary method of stormwater disposal from a site. Council does not allow these systems as the primary method of stormwater disposal from a site in some areas of the LGA. In other areas Council will allow their use subject to the applicant providing sufficient design and supporting documentation that the system will work effectively and not detrimentally affect any adjacent structures or properties. See Section 3.4.4 for further information.
AEP - Annual exceedance probability	The probability that a given rainfall intensity or depth or runoff flow rate or volume will be exceeded in any one year, expressed as a percentage. Note: A 1% AEP event is equal to a 1 in 100 year event (or 100-year event).
AHD - Australian Height Datum	Is a common national plan of level corresponding approximately to mean sea level.

ARI - Average Recurrence Interval	Means the long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years or with an annual exceedance probability of 5%. ARI is another way of expressing the likelihood of occurrence of a flood event.
Basement Car Parking	Refers to a car parking area wholly or partly accommodated underground, below a building.
Below Ground OSD storage	A below-ground structure constructed for storage of On-Site Detention (OSD). Is typically a concrete or masonry tank.
Charged System	A system consisting of sealed PVC downpipes and stormwater pipes that provides for the discharge of roof water to a point (eg. an isolation pit or the inlet of a water tank) at a level higher than the ground level at the downpipe.
DCP - Discharge Control Pit	A chamber that receives the majority of stormwater from a site and discharges it to the gutter or drain at a controlled rate not exceeding the PSD (Permissible Site Discharge).
Design Floor Level	Means the level specified in this Policy which applies to the relevant land use type within the relevant Flood Risk Precinct.
ESD - Ecologically Sustainable Development	Development practices using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Environmental Planning and Assessment Act 1979 and Protection of the Environment Administration Act 1991.
Effective Warning Time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to raise furniture, evacuate people and transport their possessions.
Extreme Flood	An estimate of the probable maximum flood (PMF), which is the largest flood likely to ever occur.
Flood	A relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and / or local overland flooding associated with major drainage as defined by the FMM before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunamis.
Flood Awareness	An appreciation of the likely effects of flooding and knowledge of the relevant flood warning and evacuation procedures.
Flood Compatible Building Components	A combination of measures incorporated in the design and/or construction and alteration of individual buildings or structures subject to flooding, and the use of flood compatible materials for the reduction or elimination of flood damage.

Flood Compatible Materials	Those materials used in buildings which are resistant to damage when inundated.
Flood Evacuation Strategy	The proposed strategy for the evacuation of areas within effective warning time during periods of flood as specified within any Policy of Council, the FRMP, the relevant State government disaster plan, by advices received from the State Emergency Services (SES) or as determined in the assessment of individual proposals.
Flood Fringe Areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
Flood Risk	Risk is based on the consideration of consequences of full range flood behaviour on communities & their social settings, and the natural & built environment.
Flood Storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.
Floodplain	(Being synonymous with flood liable and flood prone land) this is the area of land that is subject to inundation by the probable maximum flood (PMF).
FRM - Floodplain Risk Management	The management of flood risk to communities.
FRMP - Floodplain Risk Management Plan	A plan prepared for one or more floodplains in accordance with the requirements of the FDM.
FRMM - Flood Risk management Manual	The policy and manual for the management of flood liable land. (NSW;DPE 2023).
FRMS - Floodplain Risk Management Study	A study prepared for one or more floodplains in accordance with the requirements of the FDM.
Floodway Areas	Areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.
Freeboard	A factor of safety expressed as the height above the design flood level. Freeboard provides a margin to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as climate change.
Gravity Drainage System	One that consists of pits and pipes conveying roof and paving run-off with gravity fall.
Habitable Floor Area	• In a residential situation: a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom;

	• In an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
Hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this plan, the hazard is flooding which has the potential to cause harm or loss to the community.
Hydraulic Grade Line Analysis	A set of hydraulic calculations or software outputs defining the position of the peak hydraulic grade line (HGL) along a drainage pipe during storms of a given AEP. The HGL indicates the depth to which water will rise in the system, and the pressures on pipes.
Inter-Allotment Drainage	A system of stormwater pipes located within an easement through a property that receives stormwater from two or more development sites for connection to the external stormwater drainage network (a local or State Government authority).
Infiltration	The vertical movement of water through a permeable substance, such as sand or soil. The rate at which the flow occurs is dependent on the properties of the substance and the relative volume of voids (air spaces) that it contains. In the case of clay soils or sandstone, infiltration rates are extremely slow whereas in sandy soils the rate of infiltration may be much faster. Various underground systems include void type storage, trench type storage, and soak ways.
LGA	Local Government Area
Local Overland Flooding	Means inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
Low Level Property	A property: • That naturally falls away from the street frontage. and / or • At which the ground levels at the property boundary at the street frontage are lower than the adjacent street kerb level.
Maintenance Schedule	A set of operating instructions for prospective property owners or occupiers setting out the routine maintenance necessary to keep a site's stormwater system working properly.
OSD - On-Site Stormwater Detention System	A system of temporary storage of stormwater generated within a site so as to restrict the discharge leaving the site to a pre-determined rate.
On-Site Stormwater Retention	Procedures and schemes whereby stormwater is retained for on-site utilisation. They include various types of rainwater tanks and stormwater harvesting systems.
Orifice	Circular hole with sharp edges machined to 0.5mm accuracy in a corrosion resistant steel plate which controls the rate of discharge from the Discharge Control Pit of an On-Site Detention (OSD) System.
Outbuilding	A building which is ancillary to a principal residential building and includes sheds, garages, carports and similar buildings.

Overland Flow Path	The natural or formed route that stormwater runoff will take when it cannot enter the below ground stormwater system.
Permeable	A property of a porous material (or surface) that allows a liquid to flow through it.
Policy	Council's adopted Stormwater Management Policy.
Positive Covenant / Restriction of Use	A legal obligation placed on a property title requiring owners to repair and/or maintain a site's stormwater system or dedicated overland flow paths**.**
Probability	A statistical measure of the expected chance of flooding (see AEP and ARI).
PMF - Probable Maximum Flood	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.
PMP - Probable Maximum Precipitation	The greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986. *Manual for Estimation of Probable Maximum Precipitation*, 2nd edition, Operational Hydrology Report No. 1, WMO-No. 332, Geneva, ISBN 92-63-11332-2). It is the primary input to the estimation of the probable maximum flood.
PSD – Permissible Site Discharge	The maximum allowable discharge leaving the site in litres/second/hectare (L/s/ha), or in litres/sec (L/sec) when applied to a specific site.
Qualified Stormwater Engineer *or* ***Stormwater Engineer***	A person who is a practising Civil Engineer registered on Engineers Australia's National Engineering Register (NER)) with competence in stormwater engineering.
Reliable Access	During a flood, the ability for people to safely evacuate an area subject to imminent flooding within effective warning time, having regard to the depth and velocity of flood waters, the suitability of the evacuation route, and without a need to travel through areas where water depths increase.
Risk	The chance of something happening that will have an impact. It is measured in terms of consequences and probability (likelihood). In the context of this plan, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
SCP – Stormwater Concept Plan	The conceptual layout of the site stormwater drainage management plan submitted with a development or subdivision *applicatio*n.
SDP – Stormwater Detailed Plan	A plan that includes and defines all designed components of the drainage system. The plan is of sufficient detail to allow for construction of the system. The design will ensure that all components of the system are functional and include structural certification for these.

SDA – Stormwater Drainage Application	An application required in addition to any development consent in accordance with Section 68 of the Local Government Act 1993 and Section 138 of The Roads Act 1993, for any proposed extension or modification of Council's stormwater system or direct connection to Council's stormwater system.
SSR – Site Storage Requirement	The minimum volume of OSD (in m^3/hectare or in m^3 when applied to a specific site) required for storage to ensure that spillage will not occur when the stormwater outflow is restricted to the PSD.
Survey Plan	A plan prepared by a registered surveyor which shows the information required for the assessment of an application in accordance with the provisions of this Policy.
Water Sensitive Urban Design	A process of urban design for development or re-development that seeks to mimic the natural water cycle so as to create a sustainable development in terms of its treatment of stormwater, supply of water and conveyance of wastewater.
Works as Executed (WAE) Plan	A plan showing the levels, dimensions and location of what is constructed. In the context of this Policy, the plan refers to the stormwater drainage system including any OSD system, and where applicable, any overland flow paths. **Note**: The WAE Plan must be prepared by a registered surveyor and certification provided by a practising qualified Stormwater Engineer.

1.6 Relationship to BASIX

BASIX applies to all residential dwelling types and is part of the development application process in NSW. There are BASIX requirements for water and energy usage and thermal comfort performance.

BASIX may require the installation of rainwater tank storage for reuse. This Policy specifies additional requirements that are independent of BASIX in order to achieve Council's required stormwater quantity and quality targets.

2. The Development Assessment Process

This Section sets out the steps in the development assessment process from the Stormwater Concept Plan through the detailed design to the construction. It also provides a summary of requirements both at and after the completion of construction and final approval.

Council will assess stormwater and flood controls in accordance with the requirements of this Policy. In cases where a proposal deviates from the requirements of this Policy, but is shown to meet criteria including but not limited to all objectives defined in Section 1.2, Council may assess the proposal based on performance provisions meeting the objectives of the Policy.

2.1 Stormwater Concept Plan

A Stormwater Concept Plan is required to support the Development Application for the proposed development. The objective of the Stormwater Concept Plan is to identify the site's drainage constraints and to demonstrate that the proposed on-site stormwater management system can be integrated into the proposed site layout.

The Stormwater Concept Plan shall include:

1. A Survey Plan prepared by a registered surveyor showing boundaries, detail of existing features of the site including all buildings, other structures, trees, driveways, pathways, grass and landscaped areas, utility services within and in the vicinity of the site and in front of property (street), any easements, contours and spot levels.
2. A proposed layout of the site including location of all buildings, other structures, trees and landscaped areas, identifying all pervious and impervious areas as well as surface flow paths and the location of the proposed on-site stormwater management systems.
3. If the site is (wholly or partly) affected by local overland or mainstream flooding, locations of overland flow paths/ floodways, calculations of the peak 1% AEP (Annual Exceedance Probability, equivalent to 100-year ARI (Average Recurrence Interval)) flow rate and flood levels. Where flood studies have been completed by the Council, available information can be obtained on application to the Council.
4. Method of draining the site including the location of the connection to Council's stormwater system, if applicable. The location and method of discharge to natural areas such as bushland and waterways are to be identified.
5. Any existing or proposed Council or private drainage easements or stormwater infrastructure within or adjoining the site.
6. For any low-level property, where site stormwater disposal cannot be drained to the street frontage, then a drainage easement is required through adjoining downstream property(ies). Council requires that adequate arrangements have been made with documentary correspondence provided to demonstrate:

    (a) That the applicant or proponent has contacted the owner of the property proposed to be burdened by the stormwater easement with an in-principle proposal for the creation of an easement, specifying the location of this, the width, drainage system design, and the final works required.

(b) That the adjoining burdened property owner has agreed, in principle to the proposal which shall be documented in the form of legal agreement prepared by solicitors, at full cost to the applicant.

In the absence of this documentation, Council cannot be satisfied that adequate arrangements with respect to site stormwater disposal have been made and would not therefore be able to approve the application.

7. Drawings to scale depicting the size and dimensions of drainage components including OSD tanks, rainwater tanks, absorption systems and overland flow paths.
8. On-Site Stormwater Detention System details including the storage location, dimensions, design levels of the storage including the orifice level, top water level and ground surface levels, cross sections, volume calculations and orifice size calculations and details.
9. A Soil and Water Management Plan is to be lodged with the Development Application. The plan is to detail the measures that will be provided to manage erosion, sediment control and water during development. The plan is to be consistent with the objectives and controls as detailed in Landcom, New South Wales (2004) Managing Urban Stormwater: Soil and Construction (the 'Blue Book').

Any proposal to use an absorption system as the primary method of stormwater discharge to Council must submit a Detailed Stormwater Plan and associated documentation including a geotechnical report for assessment prior to any development consent.

Note: Council will only consider proposals for absorption systems in locations as specified in Section 3.4.4.1 of this Policy. Systems will only be acceptable if it is confirmed in writing by Council's Development Engineers that the design meets the requirements of Section 3.4.4 of this Policy. To obtain written approval, contact may be made through Council's Development Advisory Service. A fee will apply to cover the cost of assessment.

Aside from absorption systems, as stated above, a Stormwater Concept Plan that meets the requirements of this Policy will typically be sufficient during the development assessment stage. A Detailed Stormwater Plan prepared by a professional engineer specialising in hydraulic engineering shall be submitted for approval with the Construction Certificate to the Principal Certifier (PC).

However, at Council's discretion applicants may be required to lodge a Stormwater Detailed Plan, prior to development consent particularly for designs that include one or more of the following:

- On-Site Detention;
- A Charged Drainage System;
- Drainage to either an existing or proposed inter-allotment drainage system;
- A site identified as being flood affected.

2.2 Stormwater Detailed Plan

A Stormwater Detailed Plan is required to support the application for a Construction Certificate for a proposed development. The objective is to finalise the design of all

components of the proposed on-site stormwater management system and provide a set of plans and details for construction purposes.

The Stormwater Detailed Plan shall include:

1. All information required for a Stormwater Concept Plan as stated in Section 2.1.
2. Any required additional calculations to support any variation to the approved concept design or detailed component design.
3. Design plans and supporting documentation showing:
    (a) Location and layout of all buildings, other structures, driveways, impervious and landscaped surfaces.
    (b) Location and extent (including cross sections) of storages, management measures and discharge control devices.
    (c) Full OSD design including the OSD layout, proposed construction materials and detailed level design, and full orifice details. Calculations are to be included to show that the OSD storage provided is in accordance with the requirements of Section 4.6.
    (d) Clear identification and quantifying of any impervious areas that bypass the OSD system and how these areas are to be drained.
    (e) Hydrologic and hydraulic calculations for sizing management measures and estimating flow rates and velocities of runoff leaving the site under post development conditions.
    (f) Catchments draining to proposed management measures.
    (g) Maximum water surface levels and surcharge paths.
    (h) Internal drainage system details including location of downpipes, surface channels, kerbs, pits, pipes and sub-surface drainage.
    (i) Detailed roof drainage design including calculations in accordance with NCC Clause 7.4.3.
    (j) Invert and surface levels of pits, pipe sizes and gradients and finished surface levels of paved and landscaped areas.
    (k) Floodway / flow path extent with levels shown on the plans. Information relating to overflow paths shall include contours of the land within which the overflow path will be located, overflow path cross sections and details of ground surfaces (such as surface types, e.g. grass).
    (l) Fencing details and any openings details to allow for overland flow paths.
    (m) Full details of any notification and warning signage required and details of its permanent fixing. See Appendix A9 for examples of standard warning signage.
4. Details of the connection to Council's drainage system including the location and levels of the point of connection (kerb, public or private pipe/pit or a natural area).
5. When the proposed development is located in a flood affected area, or discharges into a stormwater pipe, channel, or natural water body, a Hydraulic Grade Line

Analysis that recognises the effect of downstream controls shall be provided. The 1% AEP flood levels of the external system are to be used for this purpose.

6. Location of drainage easements within or near the development site including any stormwater infrastructure details.

2.3 Requirements where Council approval of stormwater management design is required prior to release of a Complying Development Certificate

Prior to the release of a Complying Development Certificate, stormwater design details and plans must be lodged with Council through Council's Pre-Lodgement Advisory Service, and the written approval of Council must be obtained where the following are proposed:

1. The property is low level as defined in this Policy and it is proposed to discharge a portion or all of the site's stormwater to the street gutter at the street frontage
2. It is proposed to discharge a portion or all of the site's stormwater directly into Council's pit / pipe drainage system. This includes Council's existing system or a proposed modification or extension to Council's system.
3. A proposal that includes development of a site that is burdened by a Council drainage easement.
4. A proposal for a site for which a current Council diagram requested through 'Dial Before You Dig' displays Council stormwater asset(s) for e.g. a pit and/or pipe within the property being developed, or at any location within 2 metres of the property.
5. An absorption system is proposed to drain the whole development or a portion of the development that is greater than 50 square metres.
6. The drainage system is proposed to be discharged to another authority's stormwater infrastructure, for example, a Sydney Water channel, pipe or culvert, a Road and Maritime Service owned street drainage on a State Road, or infrastructure within Railway Lands. In all of these cases the applicant will need to provide Council with evidence that the authority has reviewed and approved the proposed discharge into their system.

In the above circumstances, the applicant must receive written approval from Council's Development Engineers with respect to the proposal prior to a certifier issuing a Complying Development Certificate. A fee will apply.

Note: Council's engineers may require additional design, information or reports including, but not limited to, peg-outs of stormwater infrastructure, CCTV of Council's drainage system, and flood modelling to allow for assessment of the proposal.

2.4 Post Development Approval Process

2.4.1 *Inspections on Private Property*

For Development Applications, the developer is to liaise with the certifying stormwater engineer about the organisation of inspections through the construction process. They are to provide the engineer adequate access during the construction of the on-site stormwater management system and prior to filling, to check the general locations and size of pipes and any hidden elements of the system.

The Final Inspection shall be carried out by the certifying stormwater engineer prior to issuing the Compliance Certificate. This inspection is to be comprehensive and shall include checks that:

(a) The method of disposal and the discharge connection from the site are in accordance with the approved stormwater plans.

(b) On-Site Stormwater Detention systems are sized in accordance with the development consent.

(c) Rainwater tank systems and connections from these systems for reuse have been installed and are compliant with BASIX requirements along with any additional requirements detailed in the development consent.

(d) Any absorption systems are sized and have been constructed in accordance with the approved stormwater plans.

(e) Pits and pipes are clean and are free draining, pipes are cut flush and do not protrude into pits and benching is provided at the bottom of pits.

(f) Orifices are secure and correctly sized and located, and trash screens have been installed as detailed.

(g) All design details are according to approved plans.

(h) All roof and hard paved areas have been drained in accordance with the approved stormwater plans.

(i) Any required warning signs are permanently fixed and detail the correct information.

A condition of consent will be imposed on any approval issued by Council to require (a)-(i) above as relevant. Certifiers should ensure a similar check is carried out as part of any CDC final certification process.

2.4.2 *Works within the Public Road or Footway to install Piped Connection to the Street Gutter*

Most developments require a drainage connection to the street gutter located in the public road. Consequently, most development involves the carrying out of excavation or other work within the footway or carriage way of a public road (road reserve).

Work must not be carried out in a public road unless consent has been granted by the Council (or other relevant roads authority such as NSW Roads and Maritime Services) under the Roads Act 1993.

A person wishing to undertake such work must obtain a Road Opening Permit from the Roads Authority, usually Council, for routine works such as connection to the kerb and gutter across a nature strip for a single domestic drainage connection.

Note that:

- Private accredited certifiers do not have authority to grant consent under the Roads Act 1993.
- Approval for carrying out works in a public road or footway is granted separately to development consent or a Complying Development Certificate.

- Most developments require a Damage Deposit (Bond) to be lodged with Council prior to the issuing of a Construction Certificate to ensure the reinstatement and protection of Councils assets. A satisfactory final inspection of the public road including, but not limited to, the footway, footpath, kerb and gutter and road pavement will be required to be undertaken by a Council inspector prior to release of the damage deposit. This inspection will be undertaken after the issuing of an Occupation Certificate or Subdivision Certificate.
- Regardless of the controls set out in this section, any overriding requirements of the Roads Authority shall be met in accordance with the Roads Act 1993.

2.4.3 *Works on Council Stormwater Infrastructure*

Any modifications or connections to Council's Stormwater system (ie. the drainage pit / pipe system) are required to be assessed and approved by Council through the Stormwater Drainage Application process. An application is required in accordance with Section 68 of the Local Government Act 1993 and Section 138 of the Roads Act 1993.

This approval is granted separately by Council to a Development Application Consent or Complying Development Certificate.

If works are required in association with the development consent, the Stormwater Drainage Application approval will be required to be obtained prior to the issuing of a Construction Certificate.

See Section 5 for further details for this application process including the requirements for inspections.

2.4.4 *Variations to the Approved Stormwater Design*

Any proposed modification to the design of the development that impacts upon site drainage and the stormwater system must be submitted for assessment by Council.

Where the Development was approved under a Complying Development Certificate and this required the approval of Council's engineer as outlined in this policy, the further written approval of Council's Development Engineer to any amended stormwater design will be required prior to release of an amended Complying Development Certificate where the operation of site drainage is affected.

Where the Development was approved via a Development Application, modification through a Section 4.55 application under the Environmental Planning and Assessment Act 1979.
The stormwater engineer will need to certify that proposed amended system satisfies the requirements of Council as outlined in this document and submits all calculations and information that lead to this assertion. Council will not allow the variation unless these requirements have been met to the satisfaction of Council's assessing Development Engineer.

Where Council standards outlined in this document have not been met, the unsatisfactory components of the system shall be removed and reconstructed. The certifying stormwater engineer is to inspect and confirm that the system has been rectified to meet the requirements of this Policy and AS/NZS 3500.3:2018.

2.4.5 *Works-As-Executed (WAE) Drawings*

Works-As-Executed drawings for the system shall be submitted to Council to demonstrate that adequate storage capacities, finished surface levels and pit and pipe invert levels have been provided in the constructed system. Where the built system varies from the approved

design plans, the certifying stormwater engineer shall certify that the constructed system satisfies Council requirements in this document and shall submit all supporting documentation including verifying compliance to design standards including capacity requirements.

The WAE drawings are also to include survey detail of the provision of any overland flow paths, flood storage and other allowances for flood affectation, for example open style fencing on flood affected sites.

The WAE drawings (plans) must be prepared by a registered surveyor and certification provided by a practising qualified Stormwater Engineer.

2.4.6 *Maintenance Schedule*

A maintenance schedule is to be prepared by either the plumber or the certifying stormwater engineer that details the components of the stormwater system. The schedule is to include the required maintenance and frequency for each component to allow the system to function effectively.

For flood affected properties the maintenance schedule must be prepared or certified as suitable by the stormwater engineer.

2.4.7 *Compliance Certificate*

A Certificate of Stormwater Compliance shall be prepared and certified by the certifying stormwater engineer in conjunction with the works as-executed drawings and the final inspection prior to the issue of a Subdivision or Occupation Certificate. The Compliance Certificate shall include:

- Certification that the built management measures will function in accordance with the approved design.
- Identification of any variations from the approved design and their impact on performance.
- Certification that these variations will not impair the performance of the built management measures or alternatively, provision of details of the remedial works required to make the system function according to the required design standard and in accordance with the development consent.

The certifying stormwater engineer is to issue a ‘Certificate of Stormwater Compliance for On-Site Stormwater Management System’ as provided in Appendix A4.

2.4.8 *Creation of Restriction on Use of the Land and Positive Covenant*

To ensure that an on-site stormwater management system is not altered during the life of the development, a Restriction on Use of the land is created. This prevents owners making changes to any of the site drainage components which would alter the way the on-site facilities work, without the permission of Council. To ensure that the on-site stormwater management system is adequately maintained, a Positive Covenant is registered on the title of the property which places the responsibility for the maintenance on the owner of the land. By registering the covenant and restriction on the property title, the obligations will be transferred to future owners. The Positive Covenant is to be stated to benefit Georges River Council.

A sketch plan showing the location of the various components of the on-site stormwater management system and a copy of the maintenance schedule must be included as

attachments to the Positive Covenant. This will ensure future owners are aware of their maintenance obligation.

For existing lots, the Positive Covenant and Restriction on Use shall be registered on the title of Torrens Title land. For newly created lots the covenant and restriction on use shall be imposed under Section 88B of the Conveyancing Act, 1919.

The creation of a Restriction on Use of the land and Positive Covenant over the on-site stormwater management system and its registration with Land Registry Services shall be undertaken prior to the issue of an Occupation Certificate for the site. It should also be noted that only in exceptional circumstances shall Council permit deferral of the construction of the on-site stormwater management systems.

A Restriction on Use of the Land and Positive Covenant will be required for developments that have stormwater systems that include one or more of the following:

(a) On-Site Detention;

(b) Any pump-out system;

(c) Any system that includes an absorption system that is the primary method of draining the site.

Council will also require a creation of Restriction on Use of the Land and a Positive Covenant to allow for the preservation and maintenance of any designated overland flow path through the site.

The terms and conditions are to be in accordance with the development consent.

Standard terms and conditions to be used for Restrictions on Use of the Land and Positive Covenants in relation to both on-site stormwater management systems and overland flow paths are presented in Appendix A5 and Appendix A6 respectively. Council may require these terms and conditions to be altered in some instances.

3. Stormwater Drainage System – General

3.1 Design Standards

The stormwater plans and documentation shall comply with this Policy.

The consulting engineer is also to ensure that the requirements and guidelines of Australian Rainfall and Runoff 2019, the NSW Floodplain Development Manual 2005 and AS/NZS 3500: 2018 (or documents that supersedes these) have been met.

3.2 Roof and Property Drainage Systems

For developments involving new buildings and extensions to existing buildings, roof drainage is to be designed according to the current editions of the National Construction Code and Standards Australia AS/NZS 3500:2018 (as amended). Generally, roof eaves gutters and downpipes are to be designed for rainfall intensities up to the 5% AEP event using the methods presented in the standard noted above. If a development has box gutters or eaves gutters that may possibly overflow into the interior of a building or an adjoining site that is not public land, the design shall need to verify that the gutters will safely overflow without water entering the building for rainfall intensities up to the 1% AEP event. Design details and calculations of the roof drainage shall be included in the Detailed Stormwater plan.

Gravity pipe drainage systems within properties must be designed for at least the 5% AEP event and design consideration must allow the safe passage of surface overflows through a property up to the 1% AEP event. Pipe diameters shall be a minimum 100mm sewer-grade PVC for all developments. Outlet pipes from surface inlet pits shall be at least 100mm diameter. Minimum pipe covers and gradients, minimum pit dimensions and other factors relating to pipelines through the site shall conform to AS/NZS 3500:2018 or the version of the standard that supersedes this.

This Policy may not provide specific requirements for all aspects of a drainage system design. Where this is the case, and the Policy does not direct the designer to another document, the designer is to comply with the National Construction Code (NCC) and Standards Australia AS/NZS 3500:2018 (as amended). In the case that the NCC and the Australian Standards have contradicting requirements the NCC is to be followed.

The provision of OSD systems is applicable for all areas of the Council. For further information on whether an OSD system is required for a development and the design requirements see Section 4.

3.2.1 *Silt Arrestor Pit*

A grated pit must be located inside the property just upstream of the point of discharge from the site. This pit must have minimum dimensions of 450mm x 450mm and shall have a 150mm deep sump and galvanised mesh screen permanently fixed over the outlet pipe or pipes. A minimum of 4 x 30mm diameter seepage holes shall be provided in the pit base.

For drainage into the surrounding soil, the pit base shall be constructed on a layer of 200mm thick aggregate base wrapped in geotextile fabric. All non-plastic drainage pits must be benched and streamlined. The use of plastic pits is limited to areas not subject to vehicle loads.

3.2.2 *Collection of Water from Driveways sloping toward the Street*

For driveways on private property sloping to a street and greater than 10m in length, drainage control devices grated surface inlet pits are to be installed across the front boundary in order to control excess stormwater flowing across Council's footpath.

In addition to the above requirement, collection of stormwater runoff from driveways is to be undertaken for discharge to the site's OSD system when applicable.

3.2.3 *Ground Level Adjacent to Buildings*

The ground level and any required grading adjacent to buildings with respect to floor levels is to be in accordance with the requirements of the National Construction Code (NCC). On sites that have been identified as flood affected it is likely that requirements exceeding those stated in the NCC will be applicable.

3.2.4 *Collection of condensates from air conditioners*

The collection of condensates from air conditioning systems to the site's drainage system is acceptable subject to:

(a) The site's discharge being connected directly to an underground drainage system and not to the street gutter and.
(b) It being discharged in a manner that will not cause environmental issues including stagnation causing algae growth or breeding of mosquitoes in the summer months and;
(c) It being discharged in a manner that will not cause safety issues including slipperiness.

3.3 Property Drainage Outlet Connection

Any connection to the street gutter or a connection to a Council or other public authority pit / pipe drainage system within the road reserve must meet the following requirements:

(a) If the proposed discharge is from a low-level property as defined within this Policy it must meet the requirements set out in Section 3.4. Written confirmation from Council's Development Engineers will be required that confirms that discharge to the street gutter or a pit / pipe drainage system at the street fronting the site will be permitted by Council. This confirmation must be received prior to development consent. The applicant shall lodge a pre-DA application in this regard, and a fee will apply.

(b) A boundary silt arrestor pit (minimum 450mm by 450mm) shall be provided for any stormwater outlet discharging from the site. The silt arrestor pit is to be wholly within the property boundary.

(c) Piped drainage within all Council land including roads and footways shall be laid at minimum 1% gravity fall directed toward the point of discharge. Charged systems on Council land will not be permitted.

(d) When the maximum design stormwater discharge from the property does not exceed 25 L/s as calculated:

    (i) In accordance with the Permissible Site Discharges in Table 3 for properties that are required to provide OSD; or

(ii) By the stormwater engineer for the critical 5% AEP storm event for properties that are not required to provide OSD this flow can be discharged to the kerb and gutter,

the following requirements apply:

- Discharge to the kerb shall be made via 100mm diameter pipes or 75 or 100mm high rectangular hollow section if the kerb is at least 150mm high. If the kerb is less than this height a suitable proprietary galvanised steel kerb adapter is to be installed to avoid cracking. Where multiple conduits are required across the footpath a minimum clear separation of 100mm is to be provided at the kerb.
- The Concept Design is to clearly detail the proposed alignment of the connection from the property boundary to the connection point at the street gutter with design and existing levels (as shown on the Detailed Survey) to show evidence that:
  - The pipeline can be made without altering the footway levels.
  - The alignment of the pipeline is feasible and does not conflict with any structures, trees, existing underground services and does not encroach along the standard service authorities network corridors within the footway.
  - The pipeline will have consistent minimum 1% gravity fall. This is to be verified on the plan by detailing design levels of the pipe and existing levels at relevant locations as shown on the Detailed Survey Plan.
  - An inspection opening is to be provided at any bends in the system. Any inspection opening is to be buried under the grassed section of a nature strip unless otherwise approved by Council.
- Discharge to the street gutter will be limited to a single outlet point, to be located directly in front of the site.
- With the exception of the kerb connection point, a minimum of 75mm cover is to be consistently achieved. A minimum of 150mm cover is to be achieved for pipes under driveways.
- The piped connection to the street gutter may be extended beyond the frontage of the development site subject to all the following requirements being met:
  - The connection to the street gutter must be made within a 45-degree splay of the frontage corner of the site being developed. For example, if the perpendicular distance between the property boundary and the street kerb is 3.6 metres the connection at the street gutter must be made within 3.6 metres of the development's street frontage.
  - The connection may not cross any existing or approved neighbouring driveway access and connection to street gutter is to be made a minimum of 500mm clear of any driveway layback.

- In the event that a pipeline needs to extend beyond the frontage of the development site, consideration may need to be given to the acquisition of an easement to drain water within a neighbouring property/properties near the street boundary so as to achieve gravity fall to the street.

(e) A direct connection into Council's (or another authority's) underground stormwater system will be required in instances when one or more of the following is applicable:

- The development includes 3 or more dwellings.
- The development is commercial or industrial with a site area greater than 800sqm.
- For development types stated above and where the closest direct connection to Council or other Authority's drainage system is 100 metres or further from the subject site, Council will consider an exemption to this requirement provided the following parameters are met:
  - Each connection must have a design maximum discharge rate of less than 25 litres per second.
  - The longitudinal grade along the street gutter between all connections is a minimum of 3% and the connections at the street gutter are at a minimum 15 metre spacings.
  - All discharge from basements must be connected to the internal stormwater system within the site and draining via the OSD where applicable.
  - The connections meet all other requirements specified in this Section 3.3.

  Note: The maximum design discharge is:

  - For developments that do not require OSD the maximum design discharge rate is to be determined in accordance with Table 3.
  - For developments that do not require OSD< the maximum design discharge is to be calculated for the critical 5% AEP storm event by a qualified stormwater engineer.

Any proposal to discharge a low level property to an existing or proposed stormwater system at the street frontage of the site shall need to meet the requirements of Section 3.4.

Any direct connection into Council's stormwater system shall typically be required to be made with the connecting pipe's invert at or above at the top third of the Council pipe or at a level approved by Council.

If necessary to allow for a direct connection, an extension of Council's piped drainage system may be required. An extension will typically require a Council pit to be constructed within the street frontage of the development site.

A proposed connection or extension to Council's piped drainage system will need to be applied for through the Stormwater Drainage Application process as required

under Section 68 of the Local Government Act 1993 and Section 138 of the Roads Act 1993. A Hydraulic Grade Line Analysis of the connecting pipeline will be required to accompany the application for Council's consideration. All costs associated with this application and any approved works are at the applicant's expense. Refer to Section 5 for further details regarding the Stormwater Drainage Application process.

(f) Any connection to a Sydney Water or Roads and Maritime Services owned stormwater system will need their approval.

3.4 Drainage of Low Level Properties

3.4.1 *General*

A low level property is defined in this Policy as a property:

(a) That naturally falls away from the street frontage; and / or

(b) At which the ground levels at the property boundary at the street frontage are lower than the adjacent street kerb level.

The procedural document 'Stormwater Drainage for Low Level Properties' as included in Appendix A11 provides guidance in relation to the options to drain low level properties.

This section provides more detail with respect to these options, including when they will be permitted and the applicable design requirements.

3.4.2 *Charged Drainage Systems*

Charged lines will be generally permitted for the discharge of roof runoff from Dwelling Houses, Secondary Dwellings, Ancillary Outbuildings (for all new dwelling houses or alteration and additions to existing dwelling houses).

For commercial / industrial sites of up to 750 square metres, charged drainage systems may be permitted.

Charged drainage systems must be drained via a rainwater tank as per the BASIX requirements for the site.

In instances where there is no BASIX requirement a Rainwater tank system with a minimum storage capacity of 2500 litres for residential and minimum 5000 litres for commercial / industrial shall be provided that connects to one or more of the following:

(i) A flushing toilet;

(ii) A laundry for washing purposes;

(iii) A combined landscaped area within the property of more than 60 square metres.

Charged systems will not be permitted in cases where the discharge is proposed to be diverted to a catchment that does not naturally receive this water where there are known flooding issues downstream of the discharge point, or the discharge will cause or aggravate flood conditions downstream of the discharge point.

The use of a charged system does not exempt a property from the installation of On-Site Stormwater Detention in accordance with this Policy.

The following design requirements are applicable to charged systems:

(a) All stormwater from the site must drain by gravity piped drainage within all Council land including roads, footways, and prior to the connection or discharge to any connection point.

(b) Only sewer grade PVC or pressure pipes are to be used to convey charged flows. All pipes must be a minimum of 100mm diameter and all joints must be solvent welded.

(c) All pipes and downpipes are to be sealed to a minimum of 0.5m above the maximum water level in the system.

(d) A raised pit at the property boundary will not be supported.

(e) Adequate head is to be provided between the pipe outlet level at the property boundary and the rainwater tank overflow pipe invert level. A minimum of 1.5 metres head is required and is to be supported by a Hydraulic Grade Line analysis including a longitudinal section.

(f) All gutters and pipes in the system must be designed for a 1% AEP storm event.

(g) A cleaning eye must be provided at all low points in the system within a pit that is drained to an on-site absorption system. The cleaning eye is to have a cap with a 5mm overflow hole to allow for trapped water to discharge slowly.

(h) The design and installation shall comply with Standards Australia HB 230—2008 Rainwater Tank Design and Installation Handbook or similar.

(i) All impervious ground surfaces must be drained to an appropriate system. Any proposed absorption system is to be designed in accordance with Section 3.4.4.

(j) A typical drawing of a charged stormwater line is illustrated in Appendix A12.

3.4.3 *Discharges to Natural Areas*

Discharge to natural areas such as bushland, a watercourse, creek or bay is allowed subject to approval by Council, and compliance with the following requirements:

(a) For discharge to creeks and bays, natural areas are to be protected against erosion at the point of discharge by means of an energy dissipator (level spreader) located within the property and positioned so that it will not impact on neighbouring properties. The dissipater must be setback a minimum of 5.0m from the rear boundary.

(b) For discharge to bushland the natural area is to be protected against erosion at the point of discharge by means of anti-scouring measures such as an energy dissipator (level spreader) and outlet apron located within the property and positioned so that it will not impact on neighbouring properties. The dissipater must be setback a minimum of 3.0m from the rear boundary.

(c) Where there is an existing open channel or creek or pipe system in proximity connection may be permitted subject to seeking Council approval prior to determination of the application.

(d) Outflow aprons are normally constructed of riprap or concrete with embedded riprap using at least $\mathbf{D_{50}}$ rock sizes of 250mm. Pipelines larger than 375mm diameter with an outlet in a location that will result in scour must have the outlet angled at 30 degrees to the direction of the flow within the watercourse.

(e) Energy dissipaters reduce water velocity by directing the water stream into obstructions placed in the flow path and/or by inducing a hydraulic jump. Energy dissipaters are to be designed to reduce velocities to below 2.0 m/s for the 1% AEP flood event flow.

(f) For discharge to a Council reserve or bushland, the stormwater dissipation measures must be incorporated fully within the property with the energy dissipation at the pipe outlet to reduce the velocity of runoff and the incidence of scour. The discharge is not to enter, cause nuisance to, or affect any downstream property.

(g) The structure of any spreader installed is to be of a robust and durable construction type.

(h) At Council's discretion, it may be required to install either a rock-lined natural channel or a pipeline to convey runoff from the property to the nearest drainage line or water course. Any such works would need to be approved through the Stormwater Drainage Application process and require the applicant to acquire a drainage easement.

3.4.4 *Absorption Systems*

3.4.4.1 ***Absorption System as the Primary Method of Stormwater Discharge***

Note that absorption systems are often not suitable as a method of stormwater disposal due to reasons including but not limited to unsuitable soil conditions such as heavy clays, limited depth to rock (e.g. less than 1.5 meters), a high water table and steepness of a site (greater than 10%) all of which prevent the effective absorption of water into the ground to a sufficient degree to manage stormwater run-off.

An absorption system that meets all technical requirements within this Policy may be considered as the primary method of draining a single dwelling and / or a secondary dwelling in suitable parts of the following suburbs:

- Connells Point
- Kyle Bay
- Blakehurst
- Hurstville Grove
- Sans Souci
- Carss Park
- Kogarah Bay

Absorption systems will not be considered (regardless of any geotechnical report and supporting information) as the primary method of draining a development site in all other locations within the Local Government Area.

The absorption system design will need to be lodged and approved by Council prior to any development consent or Complying Development Certificate being obtained.

The design will need to be proven to meet the following design requirements:

(a) The design plan must be accompanied by a geotechnical report from a suitably qualified practising geotechnical engineering consultant and results of a recognised Constant Head Test conducted as per the methods outlined **under sections 6.7.1 of AS1289-2001 (Methods of testing soils for engineering purposes)**.
Note: Constant head test is the most appropriate method in the Georges River Local Government Area.

(b) The hydraulic conductivity / infiltration rate must be tested at a minimum of two (2) test samples taken per site at the location of the proposed absorption system (samples collected from a minimum depth of 1.00 m below the surface). The On-Site Stormwater Absorption System is to be designed using the infiltration rate of the soil of the site. The geotechnical report is to also determine the depth to rock and the presence and depth of the water table.

(c) The trench depth must be minimum 1.0m below natural ground level. Evidence is to be provided that the base of the proposed system will be at least 500mm above both the bedrock and the water table. Alternative design should be considered where there is difficulty in achieving above requirement.

(d) The absorption system will need to allow for runoff from 2% AEP (1 in 50-year ARI) event for all hard surfaces that are drained to it. This will need to be accurately determined and calculations are to be provided to Council. The calculations for the absorption system are to include storms ranging in duration from 5 minutes to 72 hours. The IFD data used is to be that detailed in Appendix A8. A reservoir routing calculation with Inflow and Outflow calculations may be used.

(e) Absorption systems cannot be considered if the design soil hydraulic conductivity /infiltration rate is less than 100mm/hour (0.0277 lit/m2/sec or $2.7x10^{-5}$ m/sec).

(f) The absorption trench shall be located parallel to proposed or existing site contours. The maximum natural grade of the ground levels at the site of the system is 1 in 10 (vertical: horizontal) or 10% in any direction.

(g) A debris/silt collection pit shall be placed immediately upstream of the underground system, with a capped observation riser installed over the underground system.

(h) The absorption system is to meet the following setback requirements:

i. It must be a minimum 3 metres clear from all property boundaries.
ii. It must be a minimum 3 metres clear from all structures. This may be reduced to 1.5 metres subject to certification by a suitably qualified practising structural engineer that both structure and absorption system's integrity, stability and function will not be impacted by their proximity.
iii. It must be a minimum of 1 metre clear from all areas subject to vehicular traffic.

(i) The existing ground levels above and adjacent to the system are not to be raised to allow for additional storage, to meet depth to bedrock.

(j) Absorption systems must not contribute in any way to saturating soils behind retaining walls, existing or proposed. The entire design storage volume of the absorption system is to be below ground.

(k) The absorption system is not to be within one metre of any Sydney Water Sewer main. See Sydney Water's 'Technical guidelines, Building over and adjacent to pipe assets, October 2015'.

(l) Detail will need to be included to show that the absorption system is not within the Tree Protection Zone of any trees (either within the property or on neighbouring properties). Council may require the lodgement for assessment of a report by an AQF Level 5 arborist.

3.4.4.2 ***Minor Absorption Systems***

Up to a maximum of 50sqm of impervious area may be discharged to an absorption system on a site subject to:

(a) The system meeting all the required setbacks as detailed in Section 3.4.4.1 and;

(b) The area available for the absorption system being greater than or equal to a quarter of the impervious area being drained. (eg 20sqm of impervious area would need to be drained to an absorption system of 5sqm or larger), and;

(c) The proposed absorption system should have a depth at least 1.00m below the surface; and

(d) Certification by a qualified stormwater engineer that the absorption system and soil conditions are sufficient for storms up and including the 5% AEP (1 in 20 years) event.

(e) The existing stormwater disposal system is functioning and in satisfactory operational condition. Documentary evidence must be provided such as a service protection report, and

(f) The submitted stormwater plan must include the location of the existing system and ensure the proposed system does not compromise the existing system.

3.4.5 *Discharge to an Easement*

3.4.5.1 ***Introduction***

Any formal stormwater discharge from a property through other privately-owned land, Council-owned land other than the road reserve, Crown land and land owned by another government agency requires a drainage easement to be registered on the land title(s). This registration will define the extent of the easement, the properties and authorities burdened by and benefitting from the easement, and may include details as to any restrictions and rights and responsibilities including access and maintenance.

3.4.5.2 ***Discharge to Council's or other Public Authority's Drainage System***

Council will generally allow discharge from a site to a Council-owned drainage system that passes through the development site.

In situations where Council's drainage system passes through an adjacent property, the owner would need to acquire an easement to allow for the connection between the property boundary and the Council system or easement.

The proposed connection to Council's piped drainage system will need to be applied for through the Stormwater Drainage Application process. Refer to Section 5 for further details regarding this process.

In the case of a connection to a stormwater system belonging to another Authority, the applicant shall be required to produce evidence to Council's Development Engineer's satisfaction of compliance with the requirements of that Authority, prior to the issue of a Development Consent or Complying Development Certificate.

3.4.5.3 ***Discharge to an Existing Inter-Allotment Drainage System***

In cases where an existing inter-allotment drainage system is in place and the property developing is legally entitled to connect into the system, connection will be allowable subject to:

(a) Evidence including detailed calculations being provided to show that the system is of sufficient capacity to allow for the connection. The critical duration 5% AEP storm event (typically the 5-minute duration storm) will be required to be assessed to determine if this requirement has been met.

(b) Council may also consider it acceptable if it can be shown that the proposal will allow for the capacity of the system to be significantly increased in comparison to the existing situation.

(c) Evidence being provided to show that the system is in a serviceable condition.

(d) Evidence being provided to Council demonstrating that the development site benefits from a legal easement to drain water such as an 88B instrument, legal in principle agreement for grant of an easement or transfer granting easement documents.

(e) A Licenced plumber practicing in stormwater drainage works to certify the requirements noted in Points a) to c) and where a plumber cannot certify compliance with AS3500 a practising stormwater engineer is to assess and certify part a)

3.4.5.4 ***Proposed New Inter-Allotment Drainage***

Where an inter-allotment drainage easement is proposed to be created to facilitate a development, it is the responsibility of the applicant to negotiate with affected property owners to secure an easement. Typically, Council will require a deferred commencement condition that a plan of easement prepared by a registered surveyor has been registered with Land Registry Services.

Prior to development consent a detailed plan of the proposed stormwater pipeline will need to be prepared. The plan will need to clearly identify that the inter-allotment drainage system can feasibly be built through all affected properties. The pipeline is to be designed in accordance with AS/NZS3500.3:2018. The capacity of the system is to be designed to allow for a 1% AEP event. Sufficient calculations and methodology of the system's capacity is to accompany the detailed plan.

The detailed plan will need to include:

(a) A survey of the full extent of the proposed easement to the downstream connection point and surroundings. The survey is to be prepared by a registered surveyor and is to include boundaries, detail of existing features of the site including buildings and other structures, walls and retaining walls, driveways, paths, trees, grass and landscaped areas, utility services, spot levels and contours.

(b) Full details of the proposed alignment and width of the easement.

(c) The stormwater drainage to be installed within the easement and detail of its connection to the downstream system.

(d) A long section of the drainage pipe within the easement to the downstream connection point including a hydraulic grade line, pipe invert levels, surface levels, design grades, pit details and flow rates, etc. for the critical 1% AEP storm event.

(e) All trees that overhang the proposed easement or are within 5 metres of the proposed easement shall be accurately indicated.

The proposed drainage system will need to be shown to not disturb any structures or the root zone of any tree. Council may require that a qualified structural engineer or AQF5 qualified consulting arborist respectively certify that these requirements have been met.

3.5 Dedication of Easements

3.5.1 *Requirement to Create an Easement over Council's Drainage System*

Where an easement has not been registered over a Council-owned stormwater system within a property, an easement to drain water, located centrally over the pipe / flow path system shall be created in favour of Council in conjunction with the Development Application process.

In cases where an easement is registered but is not in accordance with the required width identified in Table 1 or is not accurately located over the Council system, the existing easement will need to be extinguished and a new compliant easement be created.

In instances where the development proposal does not require or propose the relocation of Council's stormwater system, Council will typically agree to reimburse the applicant the costs charged by NSW Government Land Registry Services in relation to the registration of the drainage easement. The survey and related costs associated with the registration of the easement may be submitted to Council prior to engagement. Council will consider the reimbursement of these costs to the applicant upon completion of the easement's registration subject to them being at market rate.

3.5.2 *Required Easement Widths*

For Council owned pipes and inter-allotment drainage easements, the required width of easements shall be according to Table 1 and Table 2 respectively:

Table 1 – Required Drainage Easement Widths for Council Stormwater Assets

Council's Pipe Diameter (mm) / Stormwater Asset Width	**Easement Width (m)**
Council pipes less than 500mm diameter [b]	2.5 [a]
Council pipes greater than 500mm	Pipe internal diameter plus 1 metre on both sides (rounded to the nearest 100mm) [a]

Culverts	Culvert external width plus 1 metre on either side (rounded to the nearest 100mm) [a]
Open Channel and Creeks	Subject to Council consideration. It is recommended that the applicant organise a meeting with Council's development and drainage engineers to discuss the proposal and easement requirements.

[a] Subject to the depth and profiles of the pipe or culvert the necessary easement width may be required to be altered to vary from this table.

[b] Typically the minimum allowable diameter of a newly constructed Council pipe is 375mm.

Table 2 – Required Drainage Easement Widths for Inter-Allotment Drainage

Pipe Diameter (mm)	Easement Width (m)
100 or 150	0.9m [a]
225 and 300	1.5m [a]
Greater than 300mm diameter	Subject to Council consideration. It is recommended that the applicant organise a meeting with Council's development and drainage engineers to discuss the proposal and easement requirements.

[a] Subject to the depth and profiles of the pipe or culvert the necessary easement width may be required to be altered to vary from this table.

3.6 Pump-Out Systems

The use of a pump-out system for stormwater disposal will only be permitted for drainage of sub-surface seepage flows from underground areas, such as basement garages where the seepage flows are minor and intermittent, and for the drainage of basement driveways only. The system must be designed in accordance with the following criteria:

(a) The pumped system shall be designed in accordance with all requirements of AS/NZS3500.3:2018.

(b) The pump system shall consist of two pumps, connected in parallel, with each pump being capable of emptying the holding tank at the rate equal to the minimum of either 4 litres per second or the rate of inflow generated from 1% AEP 5-minute duration storm event of the area of the contributing ramp that draining into the system.

(c) Pump holding tank shall be capable of holding the total volume of runoff generated by the 1% AEP 3 hour storm event ~~of~~ for the area of the contributing ramp assuming pumps are not working. The minimum tank must be greater than 3.0 cubic meters.

(d) Install two 900x900 mm square grates at the opposite corner of the basement pump tank top surface.

(e) The rising main from the pumped system must discharge into the OSD system on site when applicable.

(f) For proposals that do not require OSD, the rising main must be discharged to a silt arrestor pit that drains to the site's discharge point by gravity fall.

(g) In accordance with Section 2.4.8, a Restriction on Use of the land and Positive Covenant will be required for developments that have stormwater systems that include a pump-out system. The pump system shall be regularly maintained and serviced, every six (6) months.

3.7 Drainage of Single dwelling alterations & additions and extensions when impervious area is not increased by more than 50sqm for a house of roof area up to 250sqm

Stormwater drainage from such an extension or addition can be connected to the existing drainage system subject to the following requirements:

(a) Total impervious area (hard surfaces) cannot be more than 55% of the site area.

(b) A certificate from a qualified civil engineer must be provided certifying that existing stormwater system can manage the excess water due to the proposed additions or extension with Details of the existing stormwater drainage system (works as executed stormwater drainage plan) supplied.

(c) The certification is to be supported by evidence of the adequacy of the existing connection by carrying out an accredited Service Protection Report by a licensed plumber. The report must identify how downpipes are connected to a satisfactory existing disposal system and supported by a peg-out survey, dye testing and CCTV footage report with photographic evidence be provided for the length of existing pipe/pits leading to a legal disposal system.

(d) This exemption only applies to alterations and additions or minor works per site. Note: Incremental applications for works that are considered, by Council's Development engineer to unacceptably increase stormwater run-off are not eligible for this exemption and will be subject to the requirements set-out elsewhere this policy.

(e) The subject property is not identified as being affected by flood.

4. On-Site Stormwater Detection (OSD) System

4.1 Introduction

On-Site Stormwater Detention (OSD) involves the temporary storage and controlled release of stormwater generated within a site. OSD is required to ensure that the change in stormwater runoff from a site due to development does not increase flooding problems downstream. OSD systems must be properly maintained to make sure that stormwater flows from the site are regulated for the life of the development.

OSD is only one aspect of the management of the water cycle on a site. OSD can be provided most efficiently and effectively when it is considered as early as possible in the development process, so that the most efficient and effective system can be designed and installed.

Developers and designers are encouraged to use principles of good aesthetics when preparing an OSD design. Long term viability, ease of maintenance, access to the drainage system and storage areas also need to be considered in the design process. The OSD system designer must consult with the architect and landscape designer prior to completing an OSD design. This will ensure that all drawings correspond in terms of location of buildings, walls, existing trees being retained, and landscaping treatments proposed on the site.

The system is most easily maintained when owners have a clear idea of the location and function of the components of the system.

4.2 On-Site Stormwater Detention – General Requirements

The OSD Policy aims to ensure that developments will not increase the risk of flooding at any downstream properties, in all flood events up to and including the 1% AEP storm event.

OSD systems shall be provided to all new developments and redevelopments unless otherwise exempted by Council.

The OSD system shall be designed on the following basis:

(a) OSD designs shall be prepared by a qualified Hydraulic Engineer. OSD systems shall be designed and constructed in accordance with the requirements of this Policy, except as otherwise authorised by Council at the time of development consent.

(b) All runoff generated from the development site shall be directed to the OSD storage. All pipes shall be a minimum 100mm diameter and designed to convey the 5% AEP design storm event.

(c) For sites with minimal falls towards the street, and other sites where it is not possible to discharge all runoff to the OSD system, a maximum of 20% of the total site area of the development may bypass the OSD. Any impervious surfaces that bypass the OSD are to drain to an appropriate system. If an absorption system is to be utilised, it must be designed in accordance with Section 3.4.4 of this Policy.

(d) The OSD storage volume and maximum discharge rates are to be in accordance with the requirements within this Policy.

(e) OSD can be provided in the form of an above-ground basin or an underground tank. Above-ground tanks may be considered for development as detailed in Section 4.9.1.

(f) OSD is **not to be designed** as a High Early Discharge (HED) system unless specifically requested by Council. It has been determined that HED systems are not typically advantageous within the LGA with respect to the severity and characteristics of downstream flooding.

(g) The orifice diameter shall not be less than 30mm.

(h) Overland flows into the site from the external catchments upstream of the development shall not be blocked or enter the OSD system. These flows shall be collected separately and conveyed to bypass the OSD system via a suitable pipeline or gravity flow path without detention.

(i) OSD systems are to drain by gravity to Council's drainage system or other public drainage network. In the case of single dwellings, or primary house and secondary dwellings where it is not feasible to drain the OSD storage by a gravity system, consideration may be given by Council to drain the OSD system via a charged system to the front of the site. The charged system must be in accordance with section 3.4.2 of this policy. Gravity drainage shall be required between the property boundary and Council's street gutter or drainage system.

(j) OSD systems shall be provided with an overflow spillway directed towards the street or other approved point of discharge. Spillways are not to direct the overflow onto adjoining properties.

(k) In cases where a connection is to be made directly to Council's or another authority's pit / pipe system, it is required that design details be provided demonstrating that there is to be a safe overland flow path designed to the 1% AEP event from the OSD to the street gutter in the event of the connection to Council's stormwater system becoming blocked.

(l) The OSD system is to be designed to be clear of all underground sewers and other services. The engineer is to ensure that the requirements of all service authorities with assets in the vicinity of the system are met.

(m) For sites with multiple owners/tenants (other than strata/stratum/community title subdivisions), the discharge control pit and the OSD storage area shall be contained fully within or under common property rather than on private lots. This will reduce complications for inspections and maintenance, and these will remain the responsibility of the joint owners rather than an individual. In situations where this is not feasible, Council may consider a proposal that has an underground storage tank partly under a private courtyard or other private outdoor area. In all instances the above-ground storage tanks and control pits must be located within common areas. Relevant Restrictions on Title and Easements would be required.

Note: These provisions do not apply to strata/stratum/community title subdivisions.

(n) Council requires the submission of Concept OSD drawings to assist in determining the likely impacts that the development may have on the existing natural and built environments, both public and private. The location of the proposed OSD shall not have any impact on existing stormwater systems, overland flows and flooding

conditions. The design of the OSD shall also consider and comply with the requirements of Council's Development Control Plans.

(o) All grated pits and access covers within the OSD basin or OSD tank shall be provided with child proof locks.

(p) On partially flood-affected properties the OSD storage is to be located outside of the 1% AEP flood extents. On properties that are fully within the 1% AEP flood extents the OSD storage is to be in an area within the site that is relatively unlikely to be affected in flood events. The OSD storage is not to impede the flood flow path through the site.

(q) For aspects of the design that are not included in this Policy the engineer is to design in accordance with the requirements of NCC and/or AS/NZS 3500 (as amended). OSD must be provided for the following development types regardless of the site's impervious percentage:

Dual occupancies, townhouses, villas, home units, residential flat buildings, all commercial, industrial, special-use development and buildings and structures including public buildings, tennis courts, private roads, car parks and other sealed areas and Subdivisions.

4.3 Developments to Which OSD Applies

OSD requirements apply to all types of development and re-development within the LGA and apply to both flood-liable and flood-free sites, including the following:

(a) Single Dwellings

(b) Secondary Dwellings (Granny Flats)

(c) Single Dwelling and Secondary Dwelling combinations

(d) Townhouses, Villas, Home Units, Residential Flat Buildings

(e) All commercial, industrial, special-use development and buildings and structures including public buildings.

(f) Dual Occupancies

(g) Tennis Courts

(h) Private Roads, Car Parks and other sealed areas

(i) Subdivisions

4.4 Exemptions

OSD will not be required for the following proposals:

(a) For developments that meet both of the following requirements:
   i. The development proposal is a Single Dwelling, Secondary Dwelling, Single and Secondary Dwelling combination, alteration, and additions to a dwelling house and or ancillary development for a dwelling house such as a garage, carport, cabana, awning, deck, swimming pool.
   ii. The total impervious area upon completion of the development will be less than 55% of the lot as calculated in accordance with Appendix A7. Any

requirements detailed in Section 4.5 in relation to OSD requirements for subdivisions override this exemption.

(Note: As detailed in Appendix A7 all areas of less than 1.5 metres clearance between the outer wall of a building and the nearest adjacent property boundary shall be a minimum 50% impervious. This excludes the area under a roof eave overhang that is to be considered 100% impervious.)

(b) A lot where the site's stormwater discharges directly to a bay or stream.

(c) One-off minor developments, minor additions and repairs where the proposed development footprint area is less than 50sqm **and** the total impervious area of the site will be less than 75%, upon completion of the development, as calculated in accordance with Appendix A7.

(d) A change of use without any modifications to the building footprint and impervious areas.

(e) Subdivisions of existing dual occupancies where no changes to the buildings or site are proposed.

(f) Boundary adjustments and consolidations of allotments where no additional lots are created, and consolidation of lots without any building works.

(g) New developments in subdivisions where OSD has already been provided for the entire subdivision.

4.5 OSD Requirements for Subdivisions

The following OSD requirements apply for subdivisions:

(a) OSD is required for any new lot created by a subdivision.

(b) Where an existing residential property is to be subdivided, the OSD requirements shall only relate to the area of the new allotment(s), and the OSD storage facilities shall be located on the new allotment(s).

(c) In the case of multi lot subdivisions where strata/stratum/community subdivision can occur, a common OSD system should be constructed on one lot rather than a separate system on each individual lot. For all other types of subdivisions please refer to the requirements in 4.2(l).

(d) The OSD system is to be constructed at the time of subdivision and not to be deferred until building construction.

(e) Any easement and/or inter-allotment drainage cannot be deferred and must be created/installed at the time of subdivision.

(f) Separate OSD systems are required for each lot of a Torrens title subdivision.

4.6 Site Storage and Permissible Site Discharge

Council, with the assistance of an independent consultant, has determined appropriate OSD storage requirements and maximum permissible discharge rates.

The method of derivation modelled detention storages controlled by a single orifice outlet, allowing for both 1% AEP and 0.5 EY (exceedances per year) storm events on a single lot. Checks were also made for runoff from multiple lots.

The storage and discharge rates have been adopted to allow for a fair and equitable approach to the provision of OSD that provides the designer with clear requirements. This also removes the need for complex calculations by the designer.

The required OSD storage requirements and permissible discharge are to be calculated in accordance with Table 3.

Table 3 - Maximum Permissible Discharge (PSD) and Minimum Site Storage Requirements (SSR)

Site's Impervious Area Percentage upon completion of development (as calculated in accordance with Appendix A7) **	**Maximum Permissible Discharge (PSD) L/s/ha**	**Minimum Site Storage Requirements (SSR) m^3/ha**
Less than 55% (by considering drainage, landscape, and architectural plans)	OSD is not required for dwelling house, secondary dwelling, alteration, and additions to dwelling house and ancillary development for dwelling house such as garage, carport, cabana, awning, deck, swimming pool. For all other development types OSD is required.	
55% to less than 65%	182	206
65% to less than 75%	166	240
75% to less than 85%	152	270
85% or higher	136	295

** **As detailed in Appendix A7 all areas of less than 1.5 metres clearance between the outer wall of a building and the nearest adjacent property boundary are to be considered as minimum 50% impervious. This excludes the area under a roof eave overhang that is to be considered 100% impervious.**

The maximum permitted discharge from the OSD is the PSD multiplied by the site area in hectares. For example, for the 550sqm lot considered in Appendix A7, with a post-developed impervious percentage of 60%, the maximum discharge would be 182 x 0.0550 = 10 L/s. This can be used to determine the diameter of an orifice plate used as a flow control using the equation shown in Section 4.11.

The volume of the OSD storage is the SSR multiplied by the site area in hectares. In the example in Appendix A7, the required volume is 206 x 0.0550 = 11.3m^3.

4.7 Rainwater Tank Offset

Up to a maximum of 20% of the OSD storage volume required may be offset by rainwater tank storage for reuse. One third of the provided rainwater tank storage can be used to offset the OSD up to this maximum 20% limit. The rainwater tank storage must be connected in accordance with the BASIX requirements or in the case of no rainwater tank reuse required under BASIX to one or more of the following:

(i) A flushing toilet

(ii) A Laundry for washing purposes.

(iii) A tap for irrigation of a combined landscaped area of more than 60sqm within the property.

The discharge from the rainwater tank storage must be directed into the OSD system unless impractical, in which case the OSD offset concession will not apply.

Note that a Rainwater Tank Offset is not permissible to reduce the required OSD storage as specified for developments that comply with Section 4.8.

4.8 Provision of On-site Detention for Secondary Dwellings and Minor Additions

Developments **that meet all of the following requirements** 1 to 3 as below will be required to provide On-Site Detention (OSD) for the development proposal only.

1. The roof area of the development is no greater than 80 square metres.
2. The total of all new paved, concrete or other impervious ground surfaces is no greater than 30 square metres.
3. The Site's Impervious Area Percentage upon completion of development is no greater than 75% (as calculated in accordance with Appendix A7).

The OSD will meet the following requirements:

(a) The OSD storage will be a minimum of 1200 litres.

(b) The outlet control ie the orifice or internal diameter of the choke pipe is to have a diameter within the range of 35mm to 40mm.

(c) The full extent of the roof of the development is to be connected to the OSD storage.

(d) A Rainwater tank offset as detailed in Section 4.7 is not allowable.

(e) If an above ground tank or combined Rainwater and OSD tank is to be utilised the design requirements for above ground tanks as specified in Section 4.9.1 are applicable.

4.9 OSD Storage Requirements

4.9.1 *Above-Ground OSD Storage*

The following design requirements apply for above-ground OSD storage:

(a) Any retaining walls surrounding the above-ground storage, including a spillway, shall be in watertight concrete or masonry construction (timber construction is not permitted) and structurally adequate to accommodate the hydrostatic loading from full storage.

(b) Council does not permit above-ground OSD systems in areas of fill that are not accompanied by an adequate sub-surface gravity drainage system to a suitable underground drainage system.

(c) The finished floor levels of any adjacent non-habitable and habitable buildings/structures shall be a minimum 100mm and 300mm respectively, above the maximum top water level of the OSD system.

(d) In the interests of safety and amenity, ponding of water in the storage area shall be designed in a manner that minimises inconvenience and nuisance. This will

require that runoff in small frequent storms is stored where minimal inconvenience results.

(e) The preferred maximum design ponding depth is to be 300mm. In instances where this is not feasible, maximum ponding depth may be increased to 500mm.

(f) No trees are allowed within the OSD basin area.

(g) Any areas of maximum ponding depths greater than 300mm are to be enclosed with childproof pool type fencing including a self-closing gate.

(h) For all above-ground storages, a warning sign shall be permanently fixed in a prominent location. Examples of signs are shown in Appendix A9.

(i) Above-ground tanks (OSD/OSR rainwater tanks) may only be used for OSD storage for runoff from the roof of a single dwelling **or** secondary dwelling **or** ancillary development or commercial and industrial development where site area is area less than 300 square metres. Above-ground (OSD/OSR) rainwater tanks will not be permitted where it involves the construction of a dwelling house and secondary dwelling on the site simultaneously. The design of above-ground (OSD/OSR) tanks must consider appearance and urban design issues. Above-ground (OSD/OSR) tanks shall comply with the same engineering criteria as below-ground tanks. Particular attention must be given to access for inspection and maintenance and replacement when required. Note the following design requirements applicable to above ground OSD tank storage:

- If the outlet control is to be a choke pipe. The choke pipe is to be as short as practical and is to have a maximum length of 300mm.
- The design is to include an inspection point that allows for cleaning and inspection of the orifice or choke pipe.
- Debris and leaf screens or devices are to be installed on all downpipes and / or all inlets to prevent. The screens are to be designed to be self-cleaning and in a location that is easily accessible to allow cleaning and maintenance.

Additional maximum ponding depth requirements are detailed in Table 4.

Table 4 - Maximum Depth for Above-Ground OSD Storage

OSD Storage Location	**Maximum Depth (mm)**
Driveway and open car park	200
Landscaped areas, private courtyards	450mm – Maximum average depth 500mm – Maximum depth allowable including at the Discharge Control pit
Fenced off storage	1000 (one metre)
Pedestrian areas	50

Note: A design is not permitted to result in any development meeting the definition of a swimming pool under the Swimming Pools Act 1992 and that any development shall not result in inconsistences with the provisions of the Swimming Pools Act 1992.

4.9.1.1 ***Driveway and Open Car Park Areas***

The following design requirements apply for above-ground OSD storage in driveways and open car park areas:

(a) The first 10% or $1m^3$ of the storage volume, whichever is the greater, shall be provided underground or in an area where access is not required and the frequent ponding in minor storms will not create a nuisance.

(b) Any shaping of car parking area or driveways shall ensure that the gradients of vehicle accesses comply with the criteria set out in AS/NZS 2890.1, AS/NZS 2890.2 and / or AS/NZS 2890.6.

(c) Stored water shall not inundate gardens or areas with bare soil, mulch or the like around parking or other hardstand areas. These areas must be above the storage top water level or be protected by concrete kerbing or other robust treatments capable of withstanding vehicle impact. Timber kerbing is not permitted.

(d) For development under State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004, the gradients of vehicle accesses and hardstand areas shall comply with the criteria set by the SEPP; and

(e) Paved areas shall have a minimum grade of 1%.

4.9.1.2 ***Above Ground OSD Storage Basin Areas Adjoining Landscaped Areas***

The following design requirements apply for above-ground OSD storage in landscaped areas:

(a) Above ground OSD storage basins must be within common areas;

(b) The design must be undertaken in consultation with the landscape designer to ensure that the engineering and landscaping plans are not in conflict;

(c) The above ground OSD storage basin shall be located in an area not required for access. Areas of the storage that will be affected by frequent ponding in minor storms are to be designed and located so as to not create a nuisance;

(d) Careful consideration shall be given to types of planting and landscaping treatment within the area of ponding, to ensure that the area can be readily maintained, and the storage volume is not reduced over time;

(e) Landscaping within above ground OSD storage basins shall be designed so as not to generate large amounts of debris or other material likely to cause stormwater pollution or blockage of the system. Treatments such as wood chips / mulch or bare soil and the like shall not be permitted within the area of inundation;

(f) Vertical sides near driveways or pedestrian areas are to be protected with an appropriate treatment such as fencing, kerb, edging or landscaping, to minimise hazard to pedestrians and vehicles;

(g) Suitable access shall be provided for maintenance purposes, which may include ramps or accessible gradients;

(h) Consideration must be given to the likelihood of access by children in rainfall events and the subsequent need for fencing or other controls;

(i) Subsoil drainage shall be installed in above ground OSD storage basin areas to prevent the area remaining saturated during wet weather;

(j) The base of above ground OSD storage basin is to have a minimum 1% fall to the outlet pit;

(k) Any buildings forming the walls of the above-ground storage shall be adequately waterproofed to prevent water entering the sub-floor area;

(l) Above ground OSD storage basin areas shall be defined by separate watertight dwarf walls of masonry or concrete construction.

(m) Batter slopes in landscaped areas shall be generally no greater than 1:6 (vertical: horizontal). Steeper slopes may be permitted subject to the approval of Council's engineers. Any request for steeper slopes must indicate the benefits of this and adequately address safety and maintenance issues.

(n) Large open grassed above ground OSD storage basins may be permitted in commercial or industrial developments. These open basins shall have minimum base dimensions of 5m and shall have 1:6 (vertical: horizontal) internal batters, with the batters to be designed by a suitably qualified and experienced geotechnical engineer. Childproof fencing and a lockable gate may be required.

4.9.2 *Below-Ground OSD Storage*

The following design criteria must be met for below-ground storage tanks:

(a) The underground OSD storage shall be preferably located underneath approved pavements such as service, manoeuvring or parking areas.

(b) Underground OSD storage shall not be located:

- In areas defined as 'deep soil'.
- Within the Tree Protection Zone and / or canopy drip line of any tree.
- Under habitable floors. If no other alternatives exist, OSD may be located in a garage subject to Council approval.
- In any area where site services such as water, sewer, electricity and gas are to be laid.

(c) No modular / cellular type systems that are internally braced and or include an internal matrix are allowed. This is due to the full system not being accessible and to the potential for blockages.

(d) Any underground storage shall be designed to enable the property owner / contractor to carry out routine maintenance. The following shall be incorporated in the design:

- Residents / owners must be able to inspect critical parts of the storage from the surface without having to remove heavy access covers. Concrete covers shall be avoided for this reason.
- A continuous fall on the floor of the storage of at least 1% must be provided to the storage outlet to minimize ponding in the storage.
- To provide suitable maintenance access to the underground storage tank, all access grates to the tank shall be a minimum of 600mm x 900mm and at no more than 6m spacing from another access grate.

- For all grated pits that connect to the OSD system (except overflow pits), the surface level of the pit shall be a minimum 100mm above the top water level in the underground storage tank.
- Step irons shall be provided in the tank in cases where the depth exceeds 900mm. Step irons shall be plastic-coated, galvanised mild steel, textured for grip and must have formed returns on the sides. The installation of the step irons is to be in accordance with AS 1657:2018.
- The minimum clearance depth for tanks shall be 900mm. If this cannot be achieved due to level or other constraints, Council may consider the acceptance of internal heights of the tank absolutely not less than:
  - Commercial/industrial developments: 750mm
  - Residential developments: 600mm

    Provided that:
    - All grates accessing the tank shall be a minimum of 900mm x 900mm, with a maximum lifting weight of 20kg for the access grates.
    - Grates are installed at the extremities of the tank and as necessary to ensure there is a maximum distance of 3 metres from any point in the tank to the edge of the nearest grate. This should allow any point in the tank to be reached with a broom or similar implement without the need to enter the tank.
    - The base of the tank shall be shaped with a 1% cross-fall to a V drain and with a 2% longitudinal slope along the V drain.
    - Tanks less than 750mm high shall be precast to avoid difficulties with removing formwork.

(e) The main access over the orifice must be grated.

(f) All other accesses to the OSD should be grated. Council may allow sealed covers in locations where it is not feasible to install grates.

(g) All surface inlet drains upstream of the Discharge Control Pit (DCP) and the storage must be designed so that there is no overflow from these before the storage is full.

(h) If a sealed OSD storage is approved, the build-up of noxious odours in storages without a grated access can create problems. If the storage is sealed, vents are to be provided.

(i) The storage shall have a sump adjacent to the orifice with a minimum depth of 200mm below the orifice. The sump volume is to not to be included in the storage calculation.

(j) The storage is to be designed and certified to be structurally adequate for all maximum estimated loadings including earth, traffic and hydrostatic loads generated by a full storage.

(k) In accordance with Work Health and Safety requirements, only persons with Confined Space Training shall be permitted to enter below-ground storage tanks for any required maintenance. Council requires that a Confined Space Danger

sign be placed at all access points to the below-ground storage tanks. See Appendix A9 for examples of standard warning signage.

4.10 Discharge Control Pit

The Discharge Control Pit shall comply with the following requirements:

(a) The Discharge Control Pit shall be designed to:

- Minimise the risk of becoming blocked by debris;
- Be located in a suitable position;
- Be readily inspected;
- Be accessed readily for cleaning; and
- Have a minimal risk of being tampered with.

(b) The minimum size of the Discharge Control Pit shall be:

- 600 x 900mm for pits up to 900mm depth.
- 900 x 900mm for pits greater than 1200mm depth.

(c) The Discharge Control Pit shall be a separate compartment to the main storage volume.

(d) The Discharge Control Pit is not to be located within the canopy dripline of existing or proposed trees.

(e) The grates shall be fitted with a childproof J-lock or similar.

(f) The grate shall be hinged and be able to be opened by one person.

(g) Step irons are required for pits greater than 900mm depth. The step irons shall be placed in a wall clear of the flow.

(h) All discharge control pits shall be fitted with orifice plates. Orifice plates shall be:

- Manufactured from a corrosion resistant stainless steel plate with a minimum thickness of 3mm (5mm where the orifice diameter exceeds 150mm), with a central circular hole machined to 0.5mm accuracy; The machined hole shall retain a sharp edge;
- Permanently fixed to the pit wall using four stainless steel bolts at each corner and be epoxy sealed to prevent the entrance of water around the edges; and
- Engraved with the orifice diameter and an identifying mark.

(i) The orifice diameter shall not be less than 35mm.

(j) The centreline of the orifice shall match with the centreline of the outlet pipe.

(k) All discharge control pits shall be fitted with an internal trash screen which shall:

- Be manufactured from galvanised RH3030 Maxi-mesh (or approved equivalent) with a galvanised angle steel frame;
- Screen all pit inflows to the orifice;
- Have a screen area 50 times the orifice area;

- Include handle(s) for easy removal;
- Be located to a minimum distance of 150mm from the outlet orifice; and
- Be positioned as close to vertical as possible. Note: Pits that are 600mm deep should have screens no flatter than 45 degrees. In pits over 600mm deep or in remote positions, this should be increased to 60 degrees.

4.11 Orifice Sizing

The orifice free discharge equation is:

$Q = C\ A\ \sqrt{2gh}$
where Q is the discharge in m^3/s
C is the coefficient of discharge = 0.61
A is the orifice area in m^2
g is the acceleration due to gravity (m/s^2) = 9.80
h is the depth of water above the centre of the orifice (m).

This equation relies on a circular sharp-edged orifice and free discharge from the orifice.

4.12 Freeboard

For above-ground OSD storage, habitable and/or office floor levels shall be fixed so that they are a minimum of 300mm above the top water level (TWL) of the OSD. Non habitable floors including garages shall have floor levels set a minimum of 100mm above the TWL.

Below-ground tank systems do not require freeboard below floor levels subject to the designing engineer certifying that appropriate design measures have been taken to ensure that all buildings including any downstream neighbouring properties are protected from flooding in the case of the OSD system malfunctioning or reaching full capacity. The design of the system is to consider the maximum water level that can be achieved within a below-ground storage before the tank surcharges and ensure that all floor levels are protected.

For all OSD systems a safe overflow route to the receiving stormwater system designed to the 1% AEP storm event is to be provided in case of the orifice becoming blocked or the storage reaching full capacity.

4.13 Drowned Orifices

OSD systems shall be designed wherever possible to allow for the system to be free draining with the invert of the orifice 100mm above the Hydraulic Grade Line (HGL) at the discharge point of the pipe into which the orifice discharges.

The HGL will be determined as:

(a) Top of kerb if discharging to the street gutter.

(b) 300mm above the obvert level of the Council pipe if discharging to Council pit / pipe system.

(c) The 1% AEP flood level at the discharge point as determined by a Council flood study, or to Council's requirement, a local flood study by a Hydraulic Engineer engaged by the applicant.

For below-ground OSD tanks where this is not possible, and it is proposed to have a drowned orifice, it will be required that no more than 30% of the OSD storage volume is below the HGL at the discharge point.

For above-ground OSD the full storage volume must be above the HGL at the discharge point.

4.14 Maintenance Schedule

A Maintenance Schedule for the proposed on-site stormwater management measures is to be prepared and submitted with the Construction Certificate Plans. The Maintenance Schedule shall include details of all of the OSD components, an outline of the required maintenance works, how and when these will be performed, and who will be carrying out these maintenance works.

4.15 Works-As-Executed (WAE) Drawings and Compliance Certificate

For drainage systems that include OSD the works-as–executed drawings must include the following details:

(a) Invert and surface levels of all drainage pits.

(b) Sufficient levels and dimensions to verify the OSD volumes.

(c) Finished levels of the ground floor levels and garages.

(d) Weir dimensions and levels.

(e) Location and finished contour levels on any overland flow paths formed through the site.

(f) Details of any variations or omissions made from the approved plans.

(g) Registered surveyor's details and signature.

The WAE drawings (plan) is to be accompanied by the following a practising qualified Stormwater Engineer for (a) and (b), and a practising qualified Structural/Civil Engineer for (c):

(a) Verification that the orifice plates have been fitted and the diameter of the orifice.

(b) Verification that trash screens have been correctly installed.

(c) The structural adequacy of the OSD system.

The WAE drawings (plan) must be prepared by a registered surveyor and certification provided by a practising qualified Stormwater Engineer.

A Compliance Certificate from the Design Engineer shall certify addressing the following items:

(a) The Works-as-executed works comply with the Development Consent;

(b) The works have been constructed in accordance with the Construction Certificate and approved drawings;

(c) All structural elements including storage tanks and retaining walls are structurally sound and fit for purpose; and

(d) Any variations from the approved design will not impair the performance of the

OSD system.

(e) That a stormwater engineer has verified the installation is as per the approved plans and the structural engineer has verified the structural adequacy of any tanks or walls.

4.16 Restriction to Use of Land and Positive Covenant

In accordance with Section 2.4.8 a Restriction on Use of the Land and Positive Covenant will be required for developments that have stormwater systems that include On-Site Detention.

5. Development Impacting on Council's or Another Regulatory Authorities Drainage Systems

5.1 Introduction

Council has stormwater infrastructure throughout the Local Government Area including within road reserve, parklands, reserves, crown land and private property. This is essential infrastructure and Council has strict requirements in regard to any development and constructions works that may affect the integrity of the stormwater network.

5.2 Potential Impacts on other Regulatory Authorities Drainage Systems

There are instances where developments will be in the vicinity of the infrastructure of other regulatory drainage authorities, for example Sydney Water and Roads & Maritime Services (RMS) infrastructure.

In these instances it will be required that the applicant gains written acknowledgement and approval from the relevant authority. This approval will need to confirm that:

(a) The authority has reviewed the development proposal and that they do not object to its undertaking.

(b) The authority has reviewed and approved any proposed discharge of stormwater from the development directly to the authority's drainage system.

(c) In cases where it is proposed to discharge to an RMS-owned road's street gutter, Council may require that RMS approves the design. This would be generally in cases where the proposal diverts stormwater away from its natural catchment. Note that such an approval does not exclude the possibility that Council may separately refuse such a proposal if it identifies that it will detrimentally affect Council's drainage system and/or cause or aggravate flood conditions.

It is noted that these authorities may enforce requirements that will be in addition to conditions that have been formalised with the development consent.

5.3 Modifications to Council's Drainage System

Any development that proposes a modification including the extension or realignment of Council's stormwater system will be assessed on merit. The applicant will be responsible for providing sufficient information to demonstrate to Council's satisfaction that the proposal is feasible, can be built to current standards and specifications, will allow for suitable and safe access for inspection and maintenance, and will meet the requirements as specified below.

A proposal to modify Council's drainage system will not be approved if it is determined that the modification will negatively impact the system or Council's ability to maintain the system.

Any approval to modify Council's drainage system shall be subject to conditions imposed by Council under Development Consent and a separate Stormwater Drainage application must be lodged as required in accordance with Section 68 of the Local Government Act 1993 and Section 138 of The Roads Act 1993. See Section 5.5 for more information regarding this application process.

Typically a concept design is to be prepared for Council's review and approval prior to development consent. This concept design will include:

- A detailed survey that includes all features including but not limited to property boundaries, kerb and gutter, road pavement, driveways, footpaths, buildings, walls, stairs and other structures, trees, finished ground surface types, the surrounding drainage system, service covers, pits and poles. The alignments and levels of all underground services in the vicinity of the Council stormwater pipe deviation works are also to be plotted on to the survey.
- A peg-out survey of the Council Stormwater pipe of an extent as specified by Council will need to be undertaken. The pipe will need to be physically located by careful excavation or by a professional service locating contractor. The alignment of the pipe, level of the pipe and confirmation of its size will need to be identified and surveyed and a copy of this peg-out survey forwarded to Council. The peg-out is to show the width of the pipe (to scale). It is likely that the applicant may need to engage a professional service-locating contractor in liaison with their surveyor to meet this requirement.
- A full scaled long section of the proposed stormwater pipe, indicating the existing surface levels, design levels of the pipe, surface and invert levels of all pits, location of all stormwater pits and the location and level of all service lines that are in the vicinity of the works. This long section will need to show that the pipe can be installed with adequate clearances from all existing underground service lines. These clearances are to be as specified by the relevant service providers.
- The design alignment of the proposed works and details of proposed pipe material, size and class.
- Locations of all stormwater pits and pit types proposed.
- The minimum pipe size shall be 375mm (Class 4) laid with cover as specified by the manufacturer with a typical allowable minimum depth of:
  - 600mm in road ways, driveways or other areas traversed by vehicles.
  - 400mm in areas that are not traversed by vehicles.

  The minimum pipe slope is to be 1%.
- Location and full dimensioning of existing or proposed easements.

The design shall be in accordance with Council's required performance standards, as detailed in any Council construction specification supplied.

The design will need to be accompanied by a Local Catchment analysis by a qualified Hydraulic Engineer that shows that the system designed will:

(a) Have a capacity greater than the existing system that is being replaced; and

(b) Meet the required design capacity as specified by Council. Council will typically require that the system's capacity meets or exceeds the 5% AEP event.

In locations where high hazard flows will occurs in large storm events the system's capacity may need to be increased above the 5% AEP event. The designer will need to confirm with Council's infrastructure section the design requirement.

(c) Will not increase or concentrate flooding on any private property (including the site being developed) or the road reserve. The supporting evidence is to include details and modelling of any surcharge that will occur at the downstream end of the proposed drainage system in cases where the new system has greater capacity than the existing downstream pipes.

Council will review the concept design as part of the development application process. Note that at Council's discretion additional information including but not limited to the following may be required:

- Flood modelling in accordance with Section 6.11 is to be prepared in conjunction with the concept design.
- Dilapidation (CCTV) reports of the existing stormwater system.
- Extended detailed surveys of the catchment or downstream areas.
- Structural reports with respect to any impacts of the proposal on existing or proposed footings.
- An arborist's report with respect to the impact of the proposed works on all trees in the vicinity of the works. The report may be required to detail work methods and setbacks required. The report will need to be prepared by an AQF5 qualified consulting arborist.
- A full Detailed Stormwater Plan prior to a development consent in cases where a concept design does not satisfy Council regarding the proposal's feasibility and / or suitability.

All costs associated with this exercise must be borne by the applicant.

5.4 Connections to Council's Trunk Drainage System

In instances where a direct connection to Council's drainage system is proposed this will need to be approved in concept during the development assessment. If the connection is considered appropriate and feasible at the time of development consent an approval for the connection is still required through the Stormwater Drainage application process, See Section 5.5 regarding this application process.

All connections to Council systems must be undertaken in a manner approved by Council's Assets and Infra-structure engineers prior to the determination of a Development Application or Complying Development Consent.

Plans and specifications must be provided to Council. Inspection must be carried out by Council's works representative. Approval for a connection cannot be provided by an external certifier. Council's required performance standards, as detailed in any Council construction specification supplied must be adhered to.

The following requirements for direct connections to Council's drainage system apply:

(a) A connection from a single residential dwelling or dual occupancy may generally be made with a proprietary saddle slope junction to an existing Council pipe.

(b) Any connections from any other multi dwelling residential developments, commercial or industrial developments will require the installation of a new pit to Council's requirements. If a connection is being made at the roadway Council will

typically require the installation of a standard grated kerb inlet pit with a 2.4 metre (overall) lintel.

(c) The invert of the connecting pipe is to be at or above the top third of the Council pipe or culvert, or at a level approved by Council.

(d) For both the above connection types the connecting pipe is to finish flush and not to protrude into the Council pit or pipe.

5.5 Stormwater Drainage Application and Assessment Process

To carry out any works on Council's drainage system a Stormwater Drainage Application will need to be lodged by the applicant and approved by Council. This application is required in accordance with Section 68 of the Local Government Act 1993 and Section 138 of The Roads Act 1993. If the works are required in association with development consent, the Stormwater Drainage Application approval will be required to be obtained prior to the issuing of a Construction Certificate.

A Detailed Plan of the proposed works will need to be lodged with the application. This Detailed Plan will need to include details as per the concept design as listed in Section 5.3 along with additional information including:

- Construction details for all pits within the works.
- Access cover and grate details including load class rating. All accesses within areas that are or may be subject to vehicular loadings will be required to be a minimum Load Class D. For other areas a minimum Load Class B will normally be acceptable.
- Pipe trench and backfill details including compaction.
- The extent and details of any required modifications to above ground or underground service mains.

Along with the Detailed Plan other information that may be required to be submitted for assessment includes but is not limited to:

(a) An arborist's report with respect to the impact of the proposed works on all trees in the vicinity of the works. The report may detail works methods and setbacks required. The report will need to be prepared by an AQF5 qualified consulting arborist.

(b) Correspondence received from public service authorities with regard to the works requiring modification of the authority's assets or being in the vicinity of authority's assets.

(c) Correspondence from other parties including but not limited to Emergency Services and Roads and Maritime Services.

(d) CCTV footage of the existing drainage system.

A Stormwater Drainage bond in case of damage to the Council system and inspection fees are charged. The cost of these is dependent upon the scope of works. CCTV footage will also be required to be undertaken of the new and adjoining drainage system upon completion of works.

5.6 Development over Council Drains or Easements

Council does not permit the construction of any structural features of a development to be built over Council's drainage system or easements. This includes balconies, eaves, roof overhangs and gutters.

If there are severe site constraints due to the alignment of an easement through a property, Council may consider consenting to the installation of a demountable lightweight structure (such as a carport or timber decking) over a limited section of the easement / drainage system subject to the following:

(a) Approval has been granted by Council's Infrastructure Section;

(b) The structure will not obstruct the 1% AEP flood / overland flow path;

(c) A Deed of Indemnity shall be prepared and entered into between Council and the owner of the subject property for the light and demountable structures erected. The deed shall fully indemnify Council and their representative from all claims, demands and liability, which may arise in respect of the removal of structures and any necessary works associated with the structures that are erected within the existing Council stormwater drainage easement. The deed shall specify that the owner shall bear all costs associated with these removals or other necessary works; and

(d) All of the structure's foundations shall extend to at least 150mm below the invert of the existing stormwater system or as certified to be below the zone of influence of the stormwater system as certified by a suitably qualified structural engineer. The footings will typically be required to be clear of the easement as well as having a minimum 300mm horizontal clearance from the nearest edge of Council's system.

No walls, retaining walls, fences, stairs, air conditioning units, rainwater tanks or other structures are to be installed where they encroach into a Council easement or over a Council stormwater system unless written approval has been received from Council's Infrastructure section.

It is suggested that any ground surfaces within easements are limited to turf, soft landscaping or plain concrete. These surfaces must be consistent with what is approved in the development consent. With respect to any ground surfaces that Council or its contractors remove to undertake works on Council's drainage system, Council will attempt to reinstate to the pre-existing condition or similar including installation of standard concrete and readily available basic pavers. Council will not be responsible for the reinstatement of intricate and / or expensive finishes or for not being able to exactly match a surface finish.

5.7 Development Adjacent to Council Drains or Easements

In respect to all footings and other load bearing structures proposed:

(a) They shall be completely outside of any drainage easements either existing or required to be created prior to the finalisation of the development; and

(b) Structural design and certification is to be prepared that certifies that the zone of influence of all footings and other load bearing structures will not impart loading upon the Council stormwater system. Certification to this effect will be required both at the design stage and upon completion of construction.

Note that other requirements including but not limited to the following are enforced by Council. These requirements would typically need to be met prior to the development consent:

(a) A peg-out survey of the Council Stormwater pipe to determine its location for its full extent within the property (or as otherwise specified) will need to be undertaken and prepared by a registered surveyor.

(b) The pipe will need to be physically located by careful excavation or by a professional service locating contractor at the property boundaries and at changes of direction or junctions of the system. The alignment of the pipe, level of the pipe and confirmation of its size will need to be identified and surveyed and a copy of this peg-out survey forwarded to Council. The peg-out is to show the width of the pipe (to scale). This peg-out will need to be plotted onto architectural and stormwater plans. It is likely that the applicant may need to engage a professional service-locating contractor in liaison with their registered surveyor to meet this requirement.

(c) A pre-development dilapidation report is required and will include CCTV footage of the full extent of the Council stormwater pipe within the property (or as otherwise specified). The dilapidation report is to include CCTV footage & condition reporting for the full extent of the pipe within the completed route, and is to include the inspection and notation of all visible defects and joints along the pipe and photographic evidence with drainage pit depths, size etc. An industry based specialised contactor experienced in conducting CCTV reporting/conditioning that can access the pipe and provide suitable quality footage with pdf and electronic files, will need to be engaged.

(d) If deemed necessary by Council a structural report will be required that certifies that the development will not impact upon Council's system or easement and the development will be structurally independent of the easement, ie that all structures within the development could be removed without impacting on the easement and vice versa. The report may also need to include machinery and stockpiling exclusion areas and work procedures statements and plans that allow for the protection of Council's system.

(e) Evidence of the builder / principal contractor having current Product and Public Liability insurance to a minimum 20 million dollars.

(f) A security bond to be lodged with Council for any damage caused to Council's stormwater system. This bond would be typically required prior to the issue of the Construction Certificate and held for duration of all works on site. The bond amount will be determined in accordance with the cost that would be incurred by Council to reconstruct the system.

A post-development dilapidation report to the same specifications as the pre-development report will be required upon completion of all building works. This report would be reviewed and compared to the pre-development report, with any defects or damage that has occurred between the reports deemed to have been caused by the development works.

6. Flooding and Overland Flow

6.1 Introduction

This chapter of the Policy provides Council's requirements for development upon flood liable land within the Georges River Council Local Government Area (LGA).

This chapter should also be read in conjunction with the NSW Government Flood Prone Lands Policy, NSW Flood Risk Management Manual (FRMM;DPE 2023) and relevant Council Development Control Plans which relate to the specific development requirements for specific land uses.

6.2 Land to which this Chapter Applies

This Chapter applies to all floodplains within the Georges River Council LGA.

Flood-affected land and properties are formally identified by Council at the completion and adoption of Flood Risk Management Studies and Plans. This includes that lots are identified as flood-affected upon Section 7.11 Certificates. Council has carried out Flood Risk Management Studies and Plans (FRMS and P) for a number of catchments within the LGA. Copies of these can be provided upon request.

In cases where a FRMS and P have not been adopted, Council may identify a property as flood-affected and require flood related development controls in situations where:

(a) There is reference to the land being potentially flood affected on a Section 7.11 (2) planning certificate.

(b) Council has a Flood Study that has determined that the site is within or in close vicinity to a flood flow path.

(c) Council has knowledge that the site has previously been affected by or impacts upon flooding or a flood flow path.

(d) A Council engineer determines from an assessment of the land topography, the upstream catchment size and any known existing drainage systems that the site is likely to be liable to flooding in heavy storm events.

(e) There is a Council, other regulatory authority, inter-allotment or informal drainage system including overland flow systems, creek or open drains that is within or adjacent to the lot.

Flood mapping is available for catchments that Council has either a FRMS and P or a Flood Study. This is available in the public mapping on Council's website. Council's adopted Flood Studies and Flood Risk Management Plans and associated reports are also available on Council's website.

6.3 Objectives

The key objectives of this Policy with respect to flooding and development controls for flood-affected land are to:

(a) Increase public awareness of the hazard and extent of land affected by all potential floods, including floods greater than the 100 year average recurrence interval (ARI) flood and to ensure essential services and land uses are planned in recognition of all potential floods.

(b) Inform the community of Council's Policy for the use and development of flood prone land.

(c) Avoid significant adverse impacts on flood behaviour and the environment.

(d) Minimise the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods.

(e) Provide detailed controls for the assessment of applications lodged in accordance with the Environmental Planning and Assessment Act 1979 on land affected by potential floods.

(f) Provide controls, for the use and development of land which reflect the probability of the flood occurring and the potential hazards associated.

(g) To control development and activity within the LGA having regard to the characteristics and level of information available for each of the floodplains, in particular the availability of FRMS's and FRMP's prepared in accordance with the FRMM: DPE 2023.

(h) Minimise the potential impact of development and other activity upon the aesthetic, recreational and ecological value of the waterway corridors.

(i) Improve riparian corridors during redevelopment and to ensure the ecological values of the creek systems are enhanced without adverse impact on existing development.

(j) Proposed development should not result in a significant increase in economic or social costs as a result of flooding.

(k) Deal equitably and consistently with applications for development on land affected by potential floods, in accordance with the principles contained in the FRMM.

6.4 Process for Determining Applicable Flood Controls

The criteria for determining the relevant flood controls for a development proposal is structured in recognition that different controls are applicable to different land uses and levels of potential flood inundation and hazard.

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

(a) Identifying the land use category of the development in accordance with Section 6.5 of this Policy.

(b) Identify if the property is identified as flood affected. Note for properties that are not within a catchment that has an adopted Flood Risk Management Study and Plan, the applicant will be required to confirm with Council whether flood controls will apply to development of the land due to situations a), b), c), d) or e) as identified in Section 6.2

(c) Determine the Flood Risk precinct that will apply. Note in cases where a Council Flood Risk Management Plan or Flood Study is not available the applicant will be required to engage a Suitably Qualified Professional Engineer experienced in hydrological and hydraulic analysis for flood risk management practices & guidance in NSW to carry out an assessment to determine the applicable Flood Risk precinct.

(d) Apply the controls as outlined in the relevant flood matrix in Section 6.8.

Note that if deemed necessary, Council will require the applicant has an Overland Flow Path Assessment or Local Flood Study be prepared in accordance with Section 6.11. This requirement may be enforced for any flood affected land including land within a catchment area that has a Council adopted Flood Risk Management Study and Plan or Flood Study in cases where Council considers that the studies and or plans available do not provide sufficient detail. The Overland Flow Path Assessments or Local Flood Study would be required to determine the relevant Risk Precinct, flood levels and flood characteristics through and adjacent to the site.

6.5 Land Use Categories

Eight major land use categories have been adopted in the Flood Planning matrices. These land uses are:

(a) Critical Uses and Facilities

Community facilities including places of public worship may provide an important contribution to the notification or evacuation of the community during flood events; hospitals; and nursing homes.

(b) Sensitive Uses and Facilities

Telecommunication facilities; offensive storage establishments; seniors housing; child care centres; preschools; schools and other educational institutions; correctional centres; liquid fuel depots; public utility undertakings (including generating works) which are essential to evacuation during periods of flood or if affected would unreasonably affect the ability of the community to return to normal activities after flood events; and waste disposal facilities.

(c) Subdivision

Subdivision of land which involves the creation of new allotments, with the potential for further development.

(d) Residential

Buildings used predominantly as a place of residence excluding those development types specified in another land-use category.

Other development within residential lots including but not limited to construction of garages, swimming pools, and the construction of an outbuilding with a floor area that exceeds 30sqm.

Note: An outbuilding with a maximum floor area of 30sqm are defined as concessional development as stated below.

(e) Commercial or Industrial

Business premises; office premises; retail premises or buildings or land used for industrial activity.

(f) Tourist Related Development

Camp sites or caravan parks – short-term sites (1) only.

(1) As defined by the Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005

(g) Recreation or Non–Urban Uses

Animal boarding or training establishments; boatsheds; dams; extractive industries; helipads; jetties; marinas; mines; recreation areas and minor ancillary structures (eg toilet blocks or kiosks/cafes); recreation facilities (indoor and outdoor) other than those categorised as “commercial or industrial” within the Local Environment Plan (LEP); plant nurseries; sanctuaries; and commercial swimming pools.

(h) Concessional Developments

Residential development that involves:

(i) An addition to existing premises of not more than 10% of the floor area of the building footprint which existed at the date of commencement of this Policy;

(ii) Rebuilding of a development which substantially reduces the extent and severity of flood effects to the existing development;

(iii) A change of use which does not increase flood risk having regard to property damage and personal safety;

(iv) Subdivision which does not propose the creation of new allotments with potential for further development.

(v) The construction of an outbuilding with a floor area of no greater than 30m^2.

6.6 Flood Risk Precincts

Each of the floodplains within the Local Government Area can be divided based on different levels of potential flood risk. The relevant Flood Risk Precincts (FRP’s) for each of the floodplains include:

(a) **Flood Risk Precinct 1 – High Flood Risk**

Flood Risk Precinct 1 is the area of land below the 1% annual exceedance probability (AEP) flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties. Most development should be restricted in this precinct as development in high flood risk precinct is associated with higher risk to life and evacuation difficulties during the event of flood. In this precinct, there would be a significant risk of flood damages without compliance with flood related building and planning controls.

(b) **Flood Risk Precinct 2 – Low Flood Risk**

Flood Risk Precinct 2 is land below the 1% AEP flood that is not subject to a high hydraulic hazard and where there are no significant evacuation difficulties. There would still be a significant risk of flood damage in this precinct. However, these damages can be minimised by the application of appropriate development controls.

(c) **Flood Risk Precinct 3 – Outside the 1% AEP flood extents but within the PMF**

Flood Risk Precinct 3 is defined as all other land within the floodplain (within the extent of the probable maximum flood) but not identified within either the High Flood Risk or the Low Flood Risk Precinct. The risk of damages due to flood event in low flood risk precinct is low for most of the land uses.

Notes regarding determination of a site's Flood Risk Precinct:

- If an independent engineering assessment is undertaken to determine the applicable Flood Risk Precinct of a site, hazard level is to be determined as per FRM guideline FB03 ("Flood hazard: flood risk management guideline FB03'; DPE 2023).
- The hydraulic hazard of the site is the highest hazard level within the site.

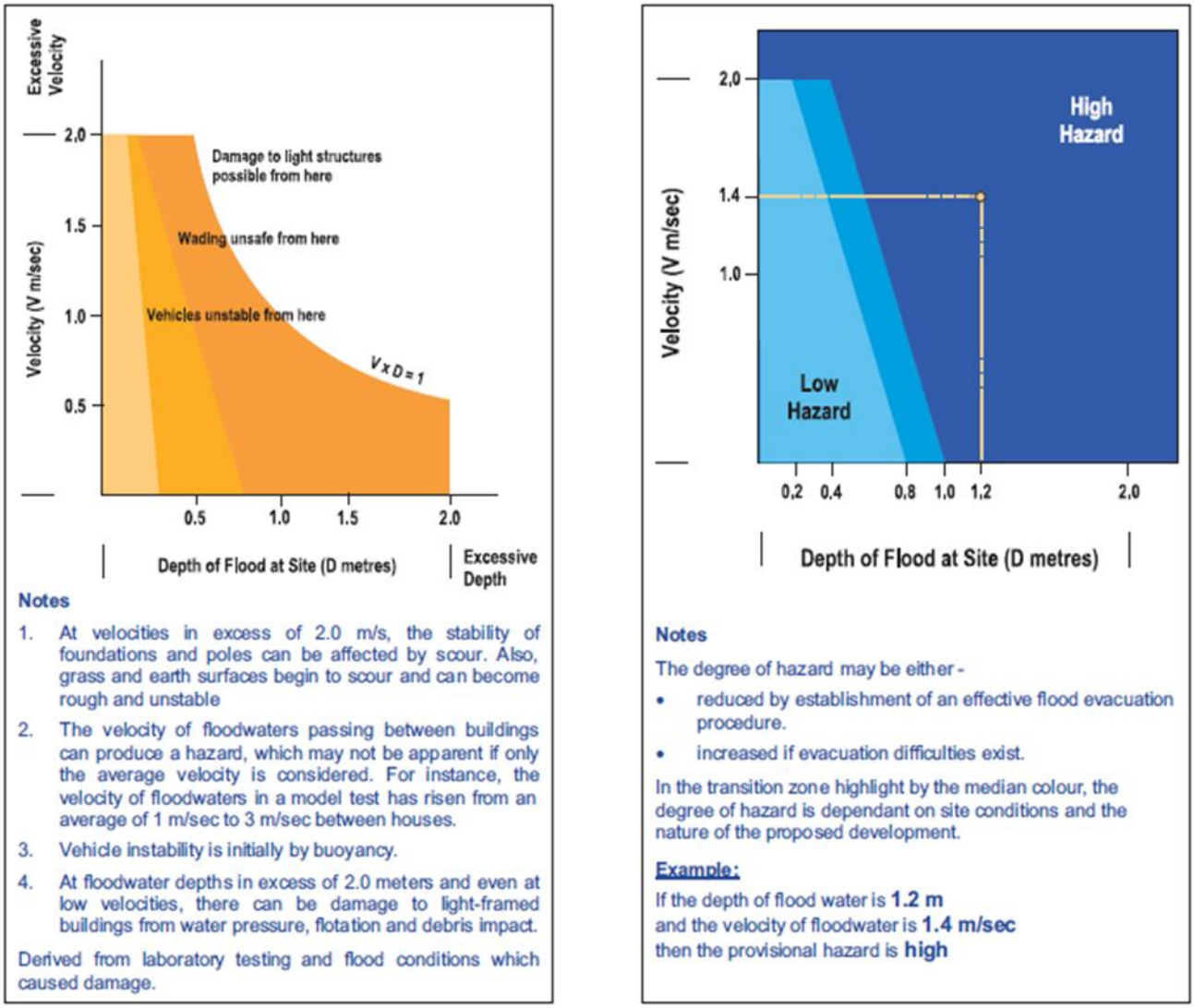


Figure 1 – Provisional Hydraulic Hazard Categories

A combined flood hazard curves presented in Figure 2 below with set hazard thresholds that relate to the vulnerability of the community when interacting with floodwaters which can be used as a general classification of flood hazard on a floodplain.

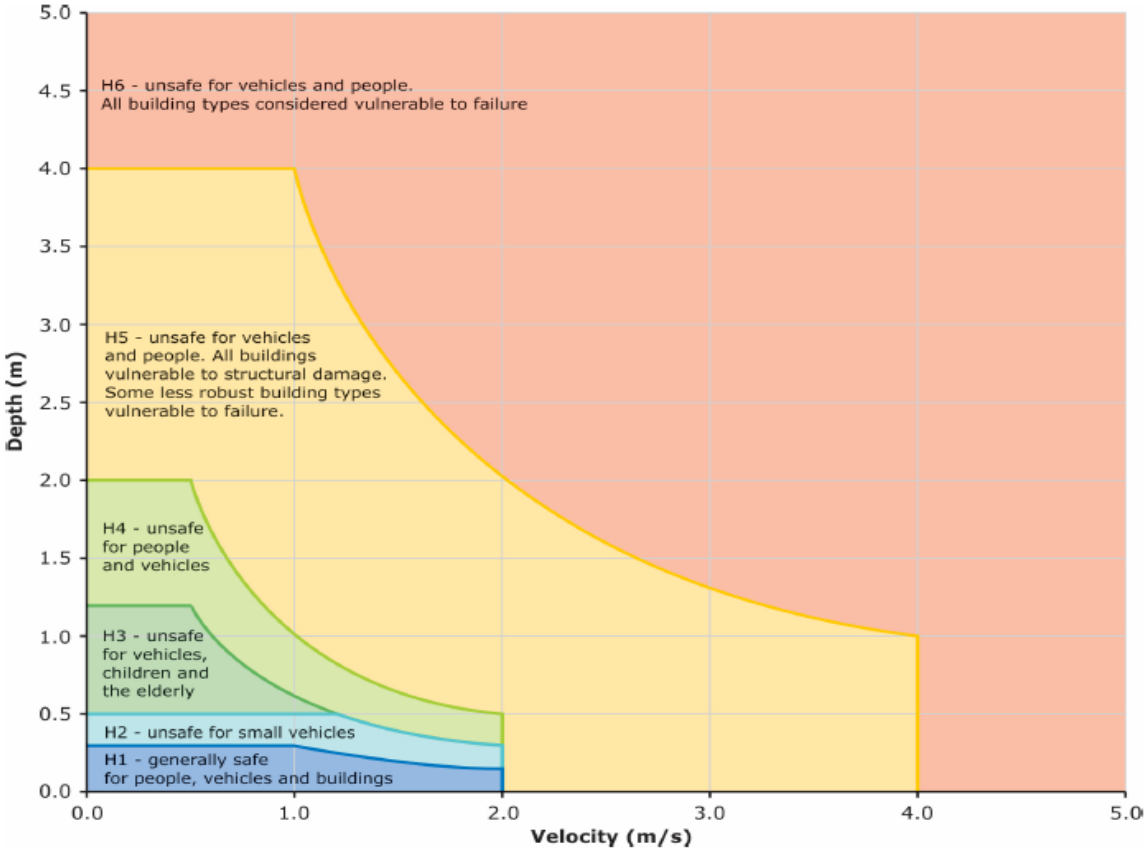


Figure 2 – Combined Flood Hazard Curves from Figure 6.7.9.as from ARR2019 Guidelines

6.7 Flood Levels at the Georges River and Salt Pan Creek

Estimated riverine flood levels along Georges River and Salt Pan Creek are indicated on Figures 2, 3 and 4.

The levels on Figures 2, 3 and 4 are provided for reference purposes only. Note that the levels given do not include allowance for climate change and associated projected sea level rise.

The scope of this Policy does not and is not intended to specify controls including but not limited to minimum floor levels along foreshore areas.

Any proposed development on land vulnerable to sea level rise will need to be designed and assessed in accordance with requirements for Coastal Hazards and Risks within Council's LEP.

The flood control matrices and related controls listed in Section 6.8 are not applicable for potential flooding related to tidal inundation and the effects of projected sea level rise.

Figure 3 - PMF Flood Levels along Salt Pan Creek and Georges River

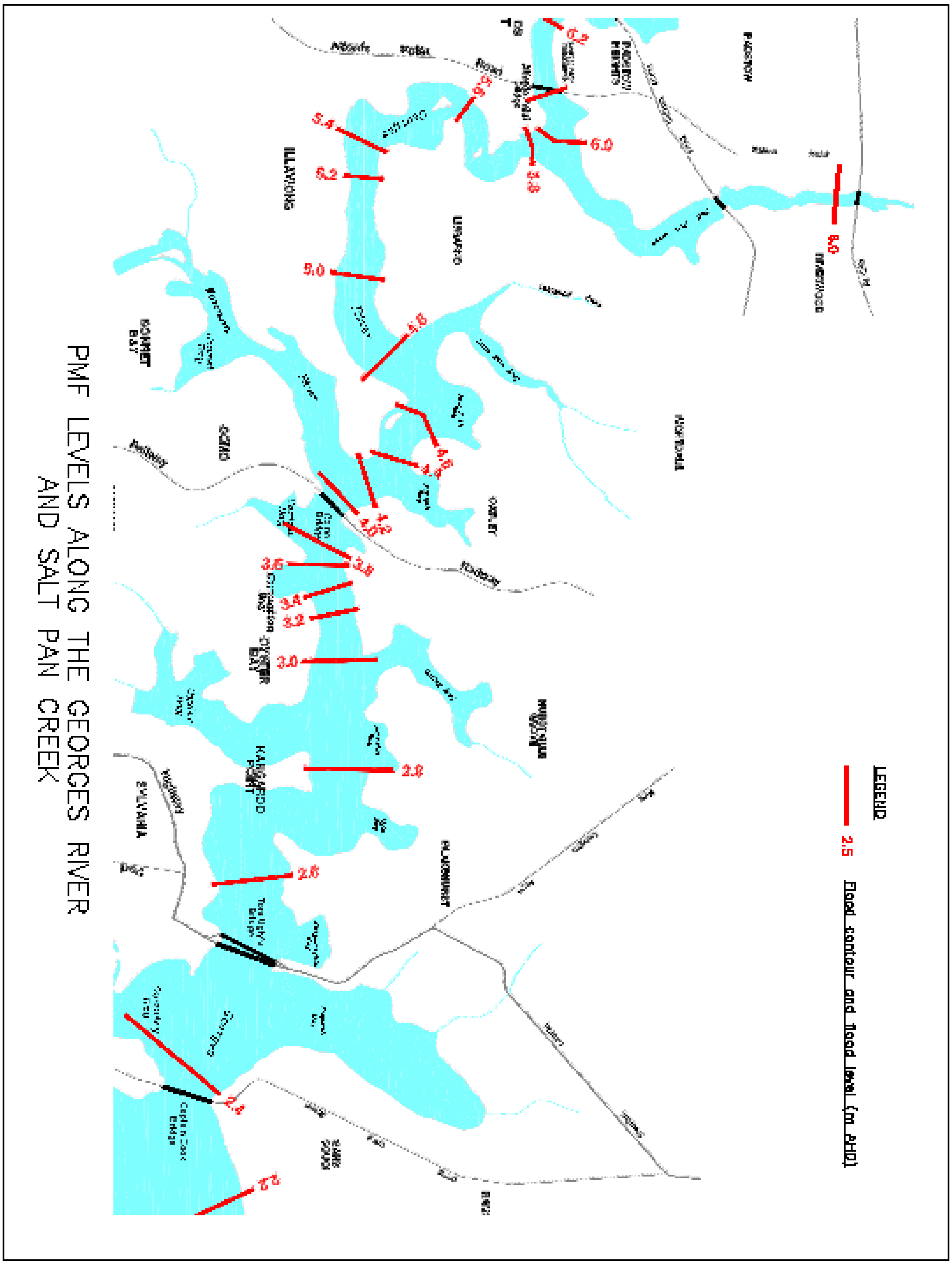


Figure 4 - 100 year Flood Levels along Salt Pan Creek and Georges River

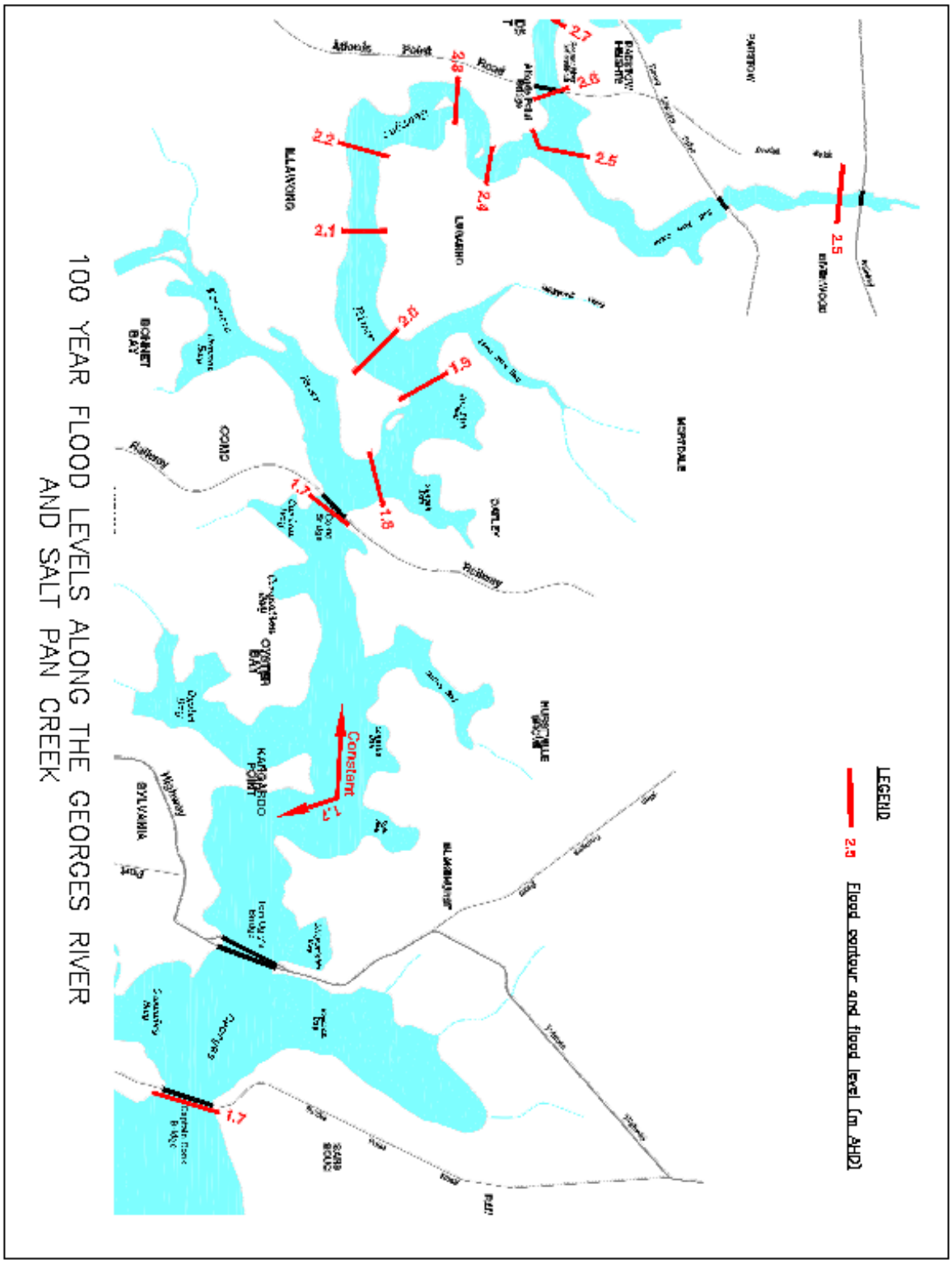
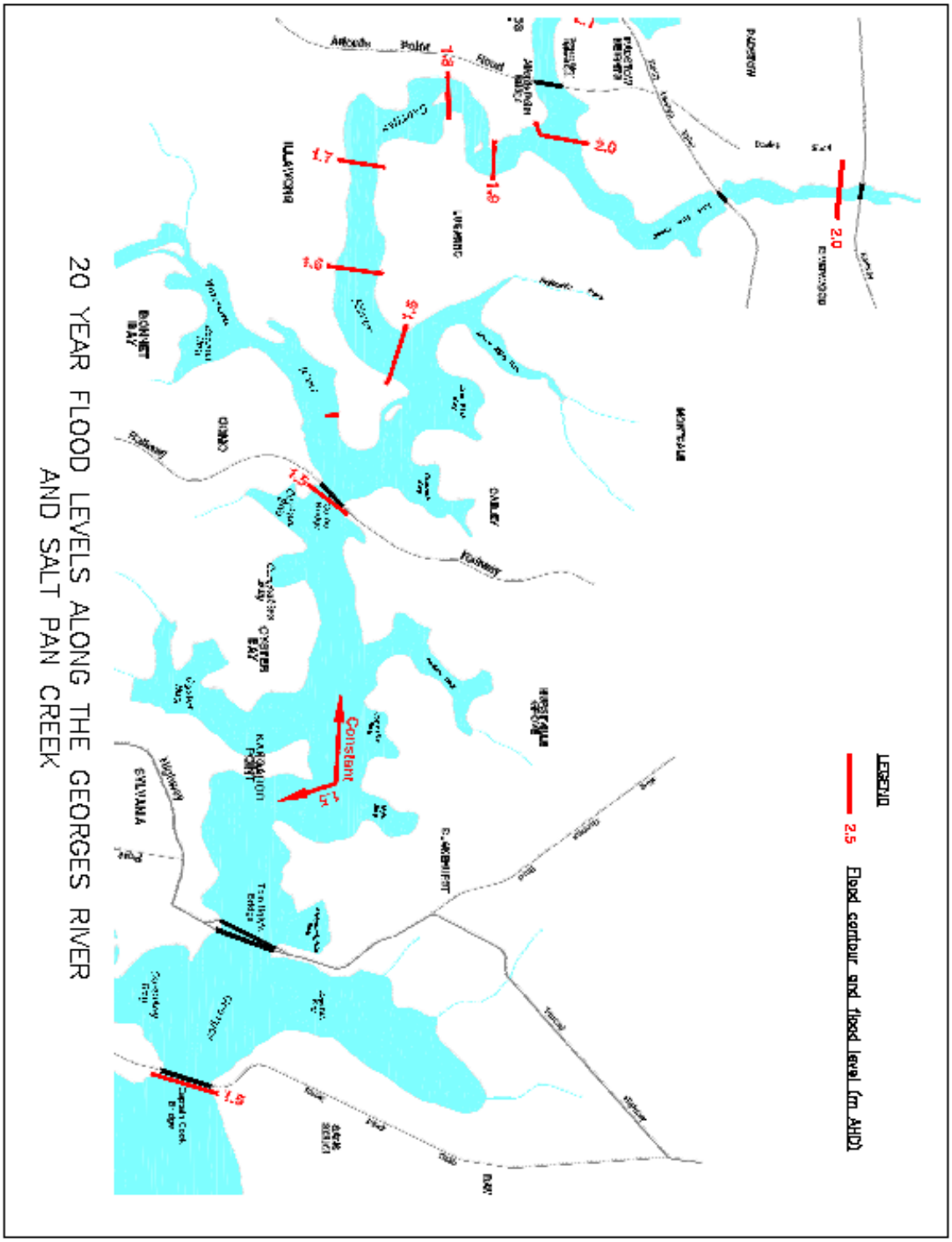


Figure 5 - 20 Year Flood Levels along Salt Pan Creek and Georges River



6.8 The Georges River Council Flood Control Matrices

6.8.1 *Matrices*

The Georges River Flood Control Matrices identify specific flood control requirements that are dependent upon both the proposed land use and the Flood precinct that the land is determined to be within. The matrices also identify land uses that are potentially unsuitable due to their location within the floodplain. Refer to Section 6.6 for flood risk precinct definitions.

The numbers in the cells of the matrices refer to conditions that will be place on the proposed development. These conditions are set out in Section 6.8.2. For example, a residential development in a Low Risk Flood Precinct (Matrix 2) would be subject to Flood Effects Conditions 1 and 4 in Section 6.8.2.

Matrix 1 – Flood Risk Precinct 1 – High Flood Risk

Flood Precinct	High Risk							
Land Use	Critical uses and facilities	Sensitive uses and facilities	Subdivision	Residential	Commercial or industrial	Tourist related development	Recreation or non-urban uses	Concessional development
Floor level							4, 6	5, 6
Building Components							1	1
Structural Soundness							3	4
Flood Effects							1, 4	1, 4
Parking and Driveway Access							2, 4, 6, 7	1, 5
Evacuation							1, 4	3, 4, 6
Management and Design							2, 3, 4	2, 3, 4

= Potentially Unsuitable Land Use

= Not relevant

Matrix 2 – Flood Risk Precinct 2 – Low Flood Risk

Flood Precinct	Low Risk							
Land Use	Critical uses and facilities	Sensitive uses and facilities	Subdivision	Residential	Commercial or industrial	Tourist related development	Recreation or non-urban uses	Concessional development
Floor level				1, 2, 6	1, 2, 6	1, 2, 6	4, 6	5, 6
Building Components				1	1	1	1	1
Structural Soundness				1	1	1	2	1
Flood Effects			3, 4	1, 4	1, 4	1, 4	1, 4	1, 4
Parking and Driveway Access			8	1, 3 ,5, 6, 7	1, 3 ,5, 6, 7	1, 3 ,5, 6, 7	2, 4, 6, 7	1, 5
Evacuation			3, 4, 5	3, 4, 6	3, 4, 6	3, 4, 6	1, 4	3, 6
Management and Design			1	2, 3, 4	2, 3, 4	2, 3, 4	2, 3, 4	2, 3, 4

= Potentially Unsuitable Land Use

= Not relevant

Matrix 3 – Flood Risk Precinct 3 – Outside the 1 in 100 Year Flood Extents but within the PMF

Flood Precinct	Outside 1 in 100 year flood extents but within the PMF							
Land Use	Critical uses and facilities	Sensitive uses and facilities	Subdivision	Residential	Commercial or industrial	Tourist related development	Recreation or non-urban uses	Concessional development
Floor level		3		1, 2, 6	1, 2, 6	1, 2, 6		
Building Components		2						
Structural Soundness		5						
Flood Effects		2, 4	2, 4	2, 4	2, 4	2, 4		
Parking and Driveway Access		1, 3 ,5, 6	8	1, 3 ,5, 6	1, 3 ,5, 6	1, 3 ,5, 6	2, 4, 6, 7	
Evacuation		2, 4, 6	5	3, 4	4	4		
Management and Design		2, 3, 4	1					

= Potentially Unsuitable Land Use

= Not relevant

Georges River Council Flood Control Matrices - General Notes

1. Freeboard equals an additional height of 500mm unless otherwise specified in the Georges River Council Flood Control Matrices – Specific Controls
2. The relevant environmental planning instrument (generally the LEP) identifies development permissible with consent in various zones in Georges River Council. However, constraints specific to individual sites may preclude Council granting consent for development on all or part of a site, whether or not there is compliance with this Policy, and whether or not the use is permissible under the LEP. The above matrices identify where certain development types will be considered unsuitable due to flood related risks. If development consent is granted, compliance with the controls in this Policy may also lead to design constraints that could reduce the development yield for the site.
3. Uses identified as "potentially unsuitable" will generally not be considered as a result of their overall incompatibility with flood risk. Such uses may however be considered where they show compliance with the key objectives of this chapter of the Policy. In such cases, these uses will also need to comply with controls as specified by Council.
4. Any filling of a site that is affected by flooding (if acceptable to Council) may change the flood risk precinct, and the associated development controls that apply to development on the site.
5. Development controls relate to the flood risk precinct identified for the site. Where a site has two or more flood risk categories the relevant sets of controls apply.
6. Refer to Section 6.9 for controls for a development involving only the erection of a fence. Any fencing that forms part of a proposed development is subject to the relevant flood effect and structural soundness considerations of the relevant category.
7. Council may have undertaken mapping showing "overland flow paths" (see definitions) in some areas. This mapping is not exhaustive, and in some cases a site specific flood study may be necessary to determine the presence of overland flow paths. Council may require that these flow paths remain undeveloped completely or partially, to provide for the conveyance of floodwaters.

   Some overland flow paths are protected by an easement, and in these cases, development would not be permitted over the easement. Refer to Council to determine whether these areas have been mapped for particular catchments and / or properties.
8. Regarding the floor level control for commercial and industrial uses, it is generally expected that the habitable floor level should be at the 100-year flood level plus freeboard. A lower floor level could be considered where compliance with this standard would result in complications with designing and operating the development, as well as any significant inconsistencies with the floor levels of existing developments.

6.8.2 *Georges River Council Flood Control Matrices – Specific Controls Floor Level*

1. Non-habitable floor levels should be no lower than 300mm above the 1% AEP (annual exceedance probability) flood level.
2. All habitable floor levels to be equal to or greater than the 1% AEP flood level plus freeboard.
3. All floor levels to be 1% AEP plus free board, or equal to or greater than the PMF level plus freeboard, whichever is the greater.
4. All floor levels to be equal to or greater than the 5% AEP (1 in 20 year) flood level plus freeboard.
5. All floor levels to be equal to or greater than the 1% AEP flood level plus freeboard. Where this is not practical due to compatibility with the height of adjacent buildings, or with the floor level of existing buildings, or the need for access by persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical. When undertaking alterations or additions, the floor level is to be no lower than the existing floor level. However in all cases, any storage of dangerous goods, plant etc. is to be above the 1% AEP or 100-year flood level plus freeboard, whichever is the greater.
6. If a qualified stormwater engineer provides evidence to the satisfaction of Council's development engineers that in the 1% AEP flood the maximum depth of flooding does not exceed 150mm, and the hydraulic hazard determined in accordance with Figure 1 is low:
   (i) Habitable floor levels are to be equal to or greater than the 1% AEP flood level plus 300mm freeboard; and
   (ii) Non-habitable floor levels should be no lower than 150mm above the 1% AEP flood level.

Building Components

1. All structures to have flood compatible building components below the 1% AEP flood level plus *freeboard*.
2. All structures to have flood compatible building components below the PMF.

Structural Soundness

1. Applicant to demonstrate that the structure can withstand the forces of floodwater, debris, and buoyancy up to and including a 1% AEP flood plus *freeboard*, or up to the probable maximum flood (PMF) if required to satisfy the evacuation requirement (see below); an engineer's report may be required.
2. Applicant to demonstrate that the structure can withstand the forces of floodwater, debris, and buoyancy up to and including a 1% AEP flood plus *freeboard*. An engineer's report may be required.
3. Engineer's report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 1% AEP flood plus *freeboard*.
4. Engineer's report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 1% AEP

flood plus *freeboard*, or up to the PMF if required to satisfy the evacuation requirement (see below).

5. Engineer's report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the PMF.

Flood Effects

1. The applicant is to demonstrate to Council (by way of an Overland Flow Path Assessment or Local Flood Study as per Section 6.11 of this Policy if requested) that the development will not increase flood affectation elsewhere having regard to:

   (i) Loss of flood storage;

   (ii) Changes in flood levels, flows and velocities caused by alterations to flood flows; and

   (iii) The cumulative impacts of multiple potential developments in the vicinity.

2. The impact of the development on flooding elsewhere is to be considered having regard to the three factors listed in No.1 above.

3. The applicant is to demonstrate to Council (by way of an Overland Flow Path Assessment or Local Flood Study as per Section 6.11 of this Policy if requested) that the development resulting from the subdivision will not increase flood affectation elsewhere having regard to:

   (i) Loss of flood storage;
   (ii) Changes in flood levels, flows and velocities caused by alterations to flood flows; and
   (iii) The cumulative impacts of multiple potential developments in the vicinity.

4. Council may require the creation of an easement, or that a Positive Covenant and Restriction on the use of the land be placed on the Title Certificate identifying the location of "overland flow paths", "flood storage" or locations of significant backwater flooding. This may include any sub-floor areas under buildings or other structures that are required to be of an "open structure" to allow for the passage of stormwater flow.

Parking and Driveway Access

1. The minimum surface level of open car parking spaces or carports shall be as high as practical, but no lower than 300mm below the 1% AEP flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 1% AEP flood level.

2. The minimum surface level of open car parking spaces or carports shall be as high as practical, but no lower than 300mm above the 5% AEP flood level.

3. Garages capable of accommodating more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods to a level no lower than 500mm above the 1% AEP flood level. Basement ramp crest entry levels are to be set as follows:

   i. Residential dwelling – 1% AEP plus 500mm

ii. Mixed use/apartments etc. – 1% AEP plus 500mm including a Flood Gate to rarer flood events

Garages that accommodate no more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods to a level no lower than 1% AEP flood level.

Any garage or car parking that includes the provision of a lift must be protected from inundation by floods to a level no lower than 500mm above the 1% AEP flood level.

4. The driveway providing access between the road and parking spaces shall be as high as practical and generally rising in the egress direction.

5. The level of the driveway providing access between the road and the parking spaces should be as high as practical, and not lower than 0.3 metres below the 1% AEP flood level. However, Council may consider a lower level for the driveway in the following circumstances, where risk to human life is not compromised.

   (i) Where the road is lower than the parking space, no part of the driveway should be inundated to a greater depth than the roadway.

   (ii) Where the car parking space is lower than the road, the depth of inundation over the driveway must not be greater than the car park inundation depth, and the driveway must rise continuously in an egress direction.

   (iii) Where the car parking space and road are both below the 1% AEP flood level, the depth of inundation over the driveway must not be greater than the depth at either the car parking space or the road. Where feasible, the driveway should rise continuously in the egress direction.

6. Enclosed car parking and car park areas accommodating more than 3 motor vehicles, with a floor level below the 1% AEP flood level, shall have adequate warning systems, signage, exits and evacuation routes.

7. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 1% AEP flood.

8. Applicant to show that car parking and driveway access for any development resulting from the subdivision can be provided in accordance with this Policy.

Evacuation

1. Reliable access for pedestrians required during a 5% AEP flood.

2. Reliable access for pedestrians or vehicles is required from the building, commencing at a minimum level equal to the lowest habitable floor level to an area of refuge above the PMF. Such a refuge may comprise a minimum of 20% of the gross floor area of the dwelling being above the PMF level. An engineer's report may be required.

3. Reliable access for pedestrians or vehicles is required. An engineer's report may be needed to address this matter and should consider access for pedestrians or vehicles to a publicly accessible location above the PMF level. Where feasible, an area of refuge within the building or development site that is above the PMF level, and which is equal to 20% of the gross floor area of

the development, or such other area capable of accommodating the number of people likely to require evacuation;

4. The evacuation requirements of the development are to be considered. An engineer's report will be required if circumstances are possible that the evacuation of persons may not be achieved within the effective warning time. The development is to be consistent with any flood evacuation strategy, flood plan or similar strategy that has been adopted by Council.
5. Applicant to show that evacuation for development resulting from the subdivision can be provided in accordance with this Policy.
6. An evacuation strategy to be considered and proposals made for improving the evacuation arrangements to the site in relation to the present situation where possible. Adequate flood warning should be available to allow safe and orderly evacuation without undue reliance on the SES or other authorised emergency personnel. Options could include the provision of access for pedestrians or vehicles to a publicly accessible location, or an area of refuge equal to at least 20% of the gross floor area, or such other area capable of accommodating the number of people likely to require evacuation that is above the PMF level.

Management and Design

1. Applicant to demonstrate that development resulting from the subdivision can be undertaken in accordance with this Policy and any relevant Flood Study or Flood Risk Management Study and Plan.
2. A Site Emergency Response Flood Plan is required where the site is affected by the 1% AEP flood level.
3. Applicant to demonstrate that there is an available area above the 1% AEP flood level plus freeboard to store goods;
4. No storage of materials below the prescribed floor level which may cause pollution or be potentially hazardous during floods.

6.9 Fencing

Fencing is not to be permitted to be installed in flood affected areas if it will cause the undesirable obstruction of the free flow of floodwaters. Fencing must also not become unsafe during floods and potentially become moving debris which threatens the integrity of structures or the safety of people.

Any fencing within a High Flood Risk Precinct and all fencing in other risk precinct that obstructs flood flow will require a development application.

The applicant will need to demonstrate to Council's satisfaction that the fence (new or replacement fence) would create no impediment to the flow of floodwaters. Fences that will be found to be suitable will typically be:

- An open collapsible hinged fence structure or pool type fence, or louver fencing; and
- Other than a brick or other masonry type fence (which will generally not be permitted); and

- Restricted to alignments and locations as instructed or agreed to by Council.

At Council's request, it will be necessary that certification is received by a suitably qualified engineer, 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.

6.10 Filling of Flood Liable land

The following controls apply with respect to the proposed filling of flood liable land:

(a) Unless a Floodplain Risk Management Plan for the catchment has been adopted, which allows filling to occur, filling in flood prone areas is not permitted unless an Overland Flow Path Assessment or Local Flood Study prepared in accordance with Section 6.11 is submitted and approved by Council that certifies that the development will not increase flood affectation elsewhere.

(b) Filling of individual sites in isolation, without consideration of the cumulative effects is not permitted. The NSW Government's Flood Risk Management Manual considers a case by case decision making approach cannot take into account the cumulative impact of flooding behaviour, and associated risks, caused by individual developments. Any proposal to fill a site must be accompanied by an analysis of the effect on flood levels of similar filling of developable sites in the area which demonstrates a no worsening scenario with regards flood behaviour.

6.11 Overland Flow Path Assessments and Local Flood Studies

If an assessment of the flood characteristics within a site is required:

- An overland flow path assessment is to be undertaken for sites with upstream catchments with a total area of up to 5 hectares.
- A local flood study is to be undertaken for sites with upstream catchments with a total area of greater than 5 hectares.

The requirements for Overland Flow Path Assessments and Local Flood Studies are detailed below:

Overland Flow Path Assessments

For sites with upstream catchments with a total area of up to 5 hectares, a detailed overland flow path assessment in accordance with the current version of Australian Rainfall and Runoff (ARR) and the NSW Flood Risk Management Manual shall be submitted to Council to determine the critical flow characteristics (eg hazard, flood levels, flood extent) of the overland flow path and its impact on the proposed development and surroundings.

The assessment shall be prepared by an appropriately qualified civil engineer and must have experience and advanced skills in catchment hydrology, floodplain hydraulics, good knowledge of FRM practices and guidance in NSW towards the preparation of flood studies. The assessment shall include the following information:

(i) A Catchment plan highlighting the full upstream catchment area that generates the overland flow;

(ii) A pre-construction (existing conditions) and post-construction (proposed development) detailed hydraulic analysis based on the 1% Annual Exceedance Probability (AEP) for the upstream catchment area;

(iii) Note: A 50% blockage factor shall always apply to the hydraulic analysis of the underground drainage system. Unless otherwise advised by Council it will be acceptable to assume that Council's system has a capacity up to the 20% AEP year storm event.

(iv) A scaled plan view showing the existing 1% AEP overland flow path extent and levels on the subject property;

(v) A longitudinal section (at the vertical scale 1:50, horizontal scale to that of plan view) of the drainage system showing existing and proposed surface levels, 1% AEP floodwater levels, hydraulic data and all changes in grade;

(vi) Scale 1: 50 cross-section details taken perpendicular to the overland flow path with a maximum spacing of every five metres. Cross sections will also be required in the following locations:

- Immediately at the upstream and downstream property boundaries;
- Sections extending to a minimum of twenty metres past the property boundaries in both the upstream and downstream directions;
- At all significant changes in the topography and obstructions within the flow path; and
- Other cross-sections as required where the flow path and/or drainage system will be affected.

Note: Cross-sections must show the existing and proposed ground levels, pre- and post development top water levels, hydraulic data and flood extents.

(vii) The Design Rainfall Intensity-Frequency-Duration data used in all calculations are to be as detailed in Appendix A8.

In addition, the following issues will be complied with:

(i) Impact to the frequency and intensity of the storms from Climate Change in accordance with NSW Sea Level Rise Policy Statement shall be considered;

(ii) All levels shown on assessment drawings and details shall be to the Australian Height Datum (AHD);

(iii) The overland flow path assessment must demonstrate that the proposed development will not impede the passage of floodwater to cause a flood effect as defined in Section 6.8.2. It is required that the assessment satisfies Council that the proposed development will not increase the quantity of flow, concentrate, direct flow or otherwise aggravate stormwater overland flow characteristics on another property, roadway or other land;

(iv) No structures and or fillings are permitted over the 1% AEP overland flow path unless suitable flood mitigation measures are to be implemented. These measures will require assessment and approval from Council;

(v) The proposed finished floor levels of habitable buildings/structures and non-habitable buildings/structures (including garages, ramps to the basement car

parking area) shall be a minimum of 500mm and 300mm above the 1% AEP year flood levels respectively;

(vi) If the velocity - depth product of the overland flow path exceeds 0.4m^2/s, suitable open type fencing or other appropriate measures shall be used to restrict access to such areas affected by hazardous overland flows;

(vii) In cases where a flow path is proposed to pass under a building or other structure a minimum unobstructed clear height of 250mm is required between the finished ground level and the underside of the structure above. This minimum height is required to reduce the potential for the flow path to become blocked and to allow for maintenance of the flow path to be feasibly undertaken.

(viii) Any fencing within the estimated extent of the overland flow path must be replaced with open type fencing to allow unimpeded passage of overland floodwater; and

(ix) The overland flow path assessment must be signed by an engineer declaring that the study has been undertaken in accordance with Australian Rainfall and Runoff and the NSW Floodplain Development Manual.

Local Flood Studies

For sites with upstream catchments with a total area of greater than 5 hectares, a detailed flood study in accordance with the current version of Australian Rainfall and Runoff (AR&R) and the NSW Flood risk Management Manual shall be submitted to Council.

The assessment shall be prepared by a qualified civil engineer experienced in preparation of flood modelling and shall address and comply with the following:

(i) The flood study will include:

- Flood model of the 1% Annual Exceedance Probability (AEP) design storm events and Probable Maximum Flood (PMF) with the predicted impacts of Climate Change;
- If Council considers that a one-dimensional (1D) model will not adequately define the flood behaviour and impacts of the proposal, a two-dimensional (2D) flood model (such as TUFLOW) shall be required to be used. The applicant should consult with Council's Development Engineers with respect to this.
- Scaled maps, including 0.2 m contour lines that show the full upstream extents of the catchment area;
- Scaled maps showing the flood extent, flood contour, flood depth and velocity of pre-development and post-development 1% AEP and PMF flood; and
- Detailed scaled plan view showing the pre-development and post-development 1% AEP and PMF flood extent and levels on the subject property.
- At the discretion of Council's assessing development engineer any requirements that have been defined for an overland flow path assessment.

(ii) A 50% blockage factor shall always apply to the underground drainage system in flood modelling.

(iii) A sensitively analysis on flooding impact when the stormwater drainage system is 100% blocked shall be considered in the modelling.

(iv) All levels shown on flood study shall be referenced to Australian Height Datum (AHD).

(v) The flood study must demonstrate that the proposed development will not impede the passage of floodwater to cause a flood effect as defined in Section 6.8.2. It is required that the assessment satisfies Council that the proposed development will not increase the quantity of flow, concentrate, direct flow or otherwise aggravate stormwater overland flow characteristics on another property, roadway or other land;

(vi) The proposed finished floor levels of habitable buildings/structures and non-habitable buildings/structures (including garage, ramps to the basement car parking area etc.) shall be a minimum 500mm and 300mm above the 1% AEP flood levels respectively.

(vii) Flood storage within the site shall be maintained before and after the development.

(viii) Structures/filling shall not be placed within the flood extent unless suitably and adequate mitigation measures have been proposed and implemented. These measures will require approval from Council.

(ix) The boundary fence over the estimated flood extent must be replaced with open type fencing to allow unimpeded passage of overland floodwater.

(x) A Flood Evacuation Plan in PMF storm events shall be submitted for assessment.

(xi) If the velocity - depth product of the overland flow path exceeds $0.4m^2/s$, suitable open type fencing or other appropriate measures shall be used to restrict access to such areas affected by hazardous overland flows.

(xii) In cases where a flow path is proposed to pass under a building or other structure the minimum unobstructed clear height of 250mm is required between the finished ground level and the underside of the structure above. This minimum height is required to reduce the potential for the flow path to become blocked and to allow for maintenance of the flow path to be feasibly undertaken.

(xiii) The flood study must be signed by an engineer declaring that the study has been undertaken in accordance with Australian Rainfall and Runoff and the NSW Flood Risk Management Manual.

6.12 Flood Gates

6.12.1 *Purpose*

Flood affected development requires flood protection for events up to and including the 1% AEP with flood related development controls, namely the raised habitable floor levels and raised basement car park entry levels to flood planning level (FPL).

However as basement car parks levels are situated lower than habitable floor levels and below the flood planning level, these may become flooded in rarer flood events. Thus, there is a need for further protection of basement areas against inundation of the basement car parking area by the provision of a flood gate located across the driveway ramp in certain circumstances.

The rationale behind flood gate requirement is to provide a means by which floodwater can be prevented from reaching the basement in rarer but possible flood scenarios leading up to the PMF.

Where proposed and required, the gate is to be permanently fitted at the driveway entrance to ensure that response time is minimal. The use of a flood gate is to be used to minimise flood damage to both the basement and parked vehicles in the basement from flood water inundation. A robust on-going operation and maintenance plan is required to be in place and must be implemented throughout the development life cycle.

6.12.2 *Requirements*

Where basement ramps are proposed within areas affected by 1% AEP and PMF flood events, or are in close proximity of overland flow systems, a creek or an open drain, protection of basement areas from inundation is not always possible through the use of basement ramp crest heights.

To manage the risk for floods above the 1% AEP level in such circumstances, a flood gate may be installed subject to the following requirements to ensure appropriate protection of people and property from flood water inundation:

1. The Flood gate should be installed across the driveway for the basement ramp.
2. The ramp crest must be set at the FPL (Flood Planning Level)
3. The flood gate is to have a minimum gate height of 1200mm.
4. The Flood Gate is to be operable 24 hrs/365 days a year.
5. Flood Gate design details, including an operation and maintenance plan prepared by a qualified Civil/hydraulic Engineer must be submitted accompanying applications proposing a flood gate.
6. Sufficient flood warning systems including signages are to be provided at noticeable locations.
7. The flood gate must be installed across the driveway and must be located within the property boundary to prevent direct entry of floodwater into the basement levels.

Following concept approval of a flood gate installation at Development Application stage, full installation and design details will be required to be submitted at Construction Certificate stage.

Certification of installation and the details of the installation, design, and operation and maintenance plan will be required to be provided to Council for record keeping prior to the release of an Occupation Certificate.

6.13 DRAINS Model Requirements

DRAINS models are to be utilised to undertake drainage investigation and design. It is a public domain modelling tool and requires minimal data entry and is consistent with Council's drainage database.

The following are the minimum requirements for DRAINS Modelling:

(a) Use the latest version of DRAINS model software.
(b) DRAINS model is to be run in the standard hydraulic mode with all required storm events and durations.
(c) Apply Council's blockage policy for inlet pits. Blockage factors of 0.5 and 0.2 are to be applied for sag pits and on-grade pits respectively.
(d) Standard Drains pit inlet capacity curves shall be used wherever appropriate. For non-standard pit, inlet capacities should be derived based on pit lintel and grate openings outlining the calculation and justification for the adopted inlet capacities.
(e) The time of concentration (Tc) can be calculated using the kinematic wave equation from AR&R (1987) with suitable surface resistance coefficients.
(f) The flow path length, L is the distance from the furthest point of the site to the exit to Council's stormwater drainage system. This length may be modified by the development either by piping, paving, or redirecting.
(g) The minimum time of concentration should not be less than 5 minutes for the total flow travel time from any catchment to its point of entry into the drainage network. The maximum time of concentration in urban areas shall be 20 minutes unless sufficient evidence is provided to justify a greater time.
(h) Fraction impervious value for existing residential development is to be considered 70% as minimum.
(i) Pipe Roughness/Friction - A default value of 0.6mm, for old (existing) pipes, is to be adopted within the DRAINS model. A Colebrook-White value of 0.3mm should be used when modelling new pipes during the concept design phase.
(j) Pit Pressure Loss Coefficients –Queensland Urban Drainage Manual (QUDM) methods can be utilised, as automated in DRAINS. However, Council's understanding is that the QUDM method is not always appropriate in the assessment of existing urban drainage systems. Accordingly, should the QUDM method be adopted, sensitivity checks at locations where the networks are sensitive to head-loss must be undertaken.
(k) Where Ku values are greater than 4 in the DRAINS model, sensitivity checks are to be undertaken and the use of a higher Ku value justified to Council; Council's preferred method of sensitivity assessment is to refer to the "Missouri Charts".
(l) Downstream model boundary should be extended sufficiently downstream of the study area boundary so that backwater effects from the boundary condition have minimal impacts on hydraulic grade line.
(m) Sensitivity analyses shall be carried out to assess how much influence the model parameter values have on the results. The principal parameters are rainfall losses, catchment storage and lag, friction, energy losses and pipe roughness. The sensitivity of the model results to downstream boundary conditions shall also be tested.
(n) DRAINS runs are to be carried out for a range of storms durations sufficient to identify the critical duration depending on the AEP of the drainage system.
(o) DRAINS model parameters recommended for use are as follows:
    - Use of values other than those listed here requires Councils prior approval.
    - Where a range of values is given, use of the value selected needs to be justified.
    - Where there is any possibility of variation in values, multiple runs to test sensitivity will be required.

Table 5 – DRAINS Model Parameters

PARAMETER DESCRIPTION	VALUE
Soil type - normal	2.5
Paved (impervious) area depression storage	1 mm
Grassed (pervious) area depression storage	5 mm
Antecedent moisture conditions for all ARIs	3
Sag Pit blockage factor (major systems)	50%
On grade pit blockage factor	20%
Inlet pit capacity	Max 100l/s for on grade pits
Minimum pit freeboard	150 mm

(p) Catchment plan outlined shall be used as a background with the modelled drainage network elements schematised in their true positions on the plan

(q) The stormwater network shall be schematised in the model at full scale and in its actual position on the background plan

6.14 TUFLOW Model Requirements

Following are the minimum requirements for TUFLOW 1D/2D Fixed Grid Hydraulic Modelling application in Urban Areas:

1. TUFLOW Version
   The latest version of TUFLOW model to be used (current version 2020);

2. Digital Elevation Model (DEM)
   Study area DEM for the study area to be developed using ALS data and/or site survey data;

3. Grid Size
   Model gird size is to represent the flow behavior to be modelled in an urban environment, with the consideration of narrow overland flow paths, such as between building and permanent obstructions. One meter grid size is recommended to achieve appropriate results (unless a larger grid size justified);

4. Flow path Obstructions and Constrictions
   Obstructions across a flow path, such as buildings, sheds, fences and road embankments etc. are to be satisfactorily incorporated in the model with reference to the recent physical modelling undertaken as part of Australian Rainfall & Runoff - Revision Projects and Document Updating Project 15 - Two-Dimensional (2D) Modelling in Urban Areas.

5. Modelling Fences

Standard approach to be used in modelling Fences located within flow paths. Refer to TUFLOW User Manual for further information.

6. Downstream Boundary
   Downstream boundary conditions in TUFLOW model may be defined using one of flowing approaches:
   a) Assigning a water level versus flow curve (HQ Curve); or
   b) Assigning a water level versus time curve (HT Curve);

   The available hydraulic models from previous studies may be used to obtain these relationships for the drainage catchments.

   Model boundary should be extended sufficiently downstream of the study area boundary so that backwater effects from the boundary condition have minimal impacts on predicted flooding behaviour. A sensibility analysis is required for the model to be acceptable.

7. Upstream Flow Boundary
   For single lot developments hydrograph generated using standard procedure at the downstream site boundary has to be applied as upstream flow boundary.

8. Initial Water Level (IWL)
   A constant water level can be set up as the lWL. Allocated IWL is to be commensurate with the starting water level of downstream water level boundaries.

9. Critical Duration
   Developed model shall be run for a range of storm durations sufficient to identify the critical duration.

10. Design Events
    Minimum 1% and 5% AEP design storm event results for existing and developed conditions are run and satisfactorily documented in a report. Any recommended flood management measures identified are also to be modelled and comparison of results in terms of flood impacts shall be reported.

11. Cumulative Mass Error
    It is to be demonstrated that the TUFLOW model is fit for purpose through the assessment of the allowable mass balance error percentage values as follows;
    (a) All three Cumulative Mass Error percentage values such as for the overall model, for all the 2D domains and for any 1D domains should be within a ±3% to ±5% limit. The model will not be accepted by Council where the Mass Error is outside the above specified range.

12. Modelling Results and Flood/Overland Flow Path Mapping:
    (a) Cut off depth of 0.1m to be used for mapping flood extents.
    (b) At least 0.2m contour intervals to be used in flood level and flood depth mapping.
    (c) Existing and developed scenario flood contours and flood levels (mAHD) must be clearly presented in a more readable format.

13. TUFLOW Input and Output Files Requirements

TUFLOW input files and folders could be corrupted or missed while manually compiled and copied on USB. In the interest of copying the complete set of input and output files without any corruption it is recommended that following procedure is followed:

(a) All the model files be copied using the in-built 'copy' function in TUFLOW, as described under TUFLOW Manual. This ensures that all input files that are necessary to run the model are copied into one folder;
(b) Any files that are read in as 'mid' rather than 'mi' or 'mif', the 'mif' file corresponding to that ‘mid’ file will also need to be manually copied into the folder;
(c) Any file read as binary XF file corresponding original input data file need to be manually copied into the folder;
(d) In addition to the input files, a complete set of output files are to be provided for all the scenarios/options run to ensure that the same results are produced when the files are rerun;

14. TUFLOW Modelling Quality Assurance Log

(a) The consultant is to use a modelling log to maintain the records of model development, traceability and quality assurance. The format of the modelling log is at the consultant’s discretion. However, a spreadsheet should be developed for use as a modelling log;
(b) Typical details to be entered into the log are:
(c) Names of TUFLOW simulation control files;
(d) Date of simulation;
(e) Details of the event modelled (duration, recurrence interval, etc.);
(f) Modelling log is to be submitted with the final model.

7. Stormwater Quality Requirements

7.1 Introduction

Council is committed to and has endorsed the following Water Sensitive Urban Design Principles:

(a) Protection and enhancement of natural watercourses and their associated ecosystems and ecological processes.

(b) To maintain, protect and/or rehabilitate modified watercourses and their associated ecosystems and ecological processes towards a natural state.

(c) Minimise potable water demand and wastewater generation.

(d) Match the post development runoff to the pre development or natural water runoff regime as closely as possible.

(e) Mitigate the impacts of development on water quality and quantity.

(f) Mitigate the impacts of development on groundwater, particularly in saline groundwater environments.

(g) Ensure any changes to the existing groundwater regime do not adversely impact upon adjoining properties.

(h) Integrate water cycle management measures into the landscape and urban design to maximise amenity.

(i) Minimise the potential impacts of development and other associated activities on the aesthetic, recreational and ecological values of receiving waters.

(j) Minimise soil erosion and sedimentation resulting from site disturbing activities.

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

Developments that are required to incorporate Water Sensitive Urban Design to meet Design Excellence requirements under the Georges River Local Environmental Plan are required to show that they have implemented design measures to address the applicable principles as listed above.

Designers implementing Water Sensitive Urban Design should refer to documents including the Water Sensitive Urban Design – Greater Adelaide Region Technical Manual – December 2010 for technical information and design guidelines.

7.2 General Stormwater Quality Requirements for all Sites

For development of sites that are less than 2000m2 a silt arrestor pit is required to be installed downstream of all collection points within the site‘s drainage system and prior to discharge of the stormwater from the site. Silt arresting measures are to be designed for all pits within the site that collect ground surface water.

A silt arrestor pit is also required to be installed directly upstream of any absorption system.

A proprietary oil separator is required for any site that:

- Is an industrial development that has a site area of greater than 1000m^2.

- Includes an outdoor uncovered parking area that caters for greater than 20 vehicles.

The oil separator is to be installed at a location within the system to allow for it to treat the runoff from the full extent of all areas subject to vehicular movements. The oil separator is to be sized to cater for the full catchment area that it is to treat.

7.3 Stormwater Quality Requirements for Sites of Area Greater than 2000 Square Metres

For sites of area greater than 2000m2 Stormwater Quality Improvement Devices (SQIDs) are to be installed that will ensure that stormwater discharge from the site meets the following performance criteria:

- All general requirements as specified in Section 7.2.
- Achieve a minimum of 80% retention of the Suspended Solids (SS) average annual load.
- Achieve a minimum of 40% retention of the Total Phosphorus (TP) average annual load.
- Achieve a minimum of 40% retention of the Total Nitrogen (TN) average annual load.
- Achieve a total retention of litter and organic matter greater than 50mm for storm events of up to exceedances per year (EY) (1 in 3 months) frequency.
- Achieve a total retention of oil and grease for storm events of up to EY.

A variety of SQIDs can be implemented to achieve the above objectives and performance criteria such as:

- Rainwater and stormwater tanks
- Porous paving
- Bio-retention systems
- Infiltration devices

A MUSIC model (or similar) will be required to be lodged at the time of the development submission that shows that the measures designed into the drainage system will achieve the above performance criteria.

The following design requirements are to be met:

- Where trash racks are installed, the gaps between the bars shall be 60mm.
- Where litter booms are installed, they are to be placed only where normal flow velocities are low and must incorporate a trap where they are used in tidal waterways.
- Where stormwater pit litter baskets are installed, they shall not exacerbate flooding and must incorporate a bypass.
- Where sand filters are used they shall be restricted to urbanised catchments smaller than 2 hectares. The entry of sediment and oil to the filtration media shall be controlled and a sediment trap provided upstream for pre-treatment. A suitable grain size, which maintains percolation rates, shall be used. Sand replacement schedules shall be included in the maintenance schedule.

- Sand filters should not be used for Developments with large concentrations of oil and litter, which could potentially block the sand filter.
- Provision must be made for convenient and safe regular inspection and periodic cleaning of water quality control measures. The maintenance schedule for the site's stormwater system is to include required inspections and maintenance of all stormwater quality measures.

Version control and change history

Version	Amendment Details	Policy Owner	Period Active
1.0	New Georges River Council Stormwater Management Policy Approved by Council (CCL048-20). Public Exhibition Period - 1 February 2020 to 13 March 2020	Manager Development and Building	27/07/2020 – 8/04/2021
1.1	Updates to DA Stormwater and OSD Documentation Checklist (Appendix A1) to provide clarity for users of the form.	Manager Development and Building	8/04/2021 – 25/05/2023
1.2	Housekeeping updates of policy based upon review.	Manager Development and Building	25/05/2023 – 13/06/2023
2.0	Housekeeping updates Approved by Council meeting held on 13/6/23	Manager Development and Building	13/06/2023 – 11/12/2023
3.0	Minor amendments to the policy after the Council meeting held on 13/06/23 and public exhibition held between 10 July 2023 to 7 August 2023	Manager Development and Building	18/12/2023 – on going

APPENDIX A1 - DA Stormwater and OSD Documentation Checklist

DA – Stormwater & OSD Documentation Checklist

Advisory Notes:
a) This form is to be completed by a Qualified and Practising Engineer on the National Engineer Register (NER) in Civil Engineering, specialising in stormwater modelling and design. **b) This form will ensure a more amenable and cost effective design is submitted to Council to avoid delays in the assessment and approval of applications.** **c) The Qualified and Practising stormwater design engineer must complete and sign this checklist as any inaccurate or incomplete documentation will result in assessment delay or application being returned.** **d) Stormwater Design and Documents must be prepared taking into consideration Council's Stormwater Management Policy - 2020 (SMP) and other relevant Policies.** **e) Notwithstanding (a) above a project designer can complete this checklist if:** - **The works comprise alterations and additions to residential development &** - **OSD is not required (Ref – Section 4.4 of SMP) &** - **The site is not flood affected &** - **No absorption or charged drainage system proposed &** - **Connection is to an existing system (with details submitted) or the site drains by gravity to the street** For advice please contact Customer Service on (02) 9330 6400 (8.30am-5.00pm Monday to Friday).

Part 1 - Property Details		
Unit No.:	House No.:	
Street Name:	Suburb	Postcode:
Lot No:	DP/SP:	
DA Number:		

Part 2 – Registered and Qualified Stormwater Design Engineer's Details
Company name & ABN: ……
Registered Stormwater Design Engineer's Current Accreditation Number (NER): ……
Is the Engineer accredited to carry out Design of Stormwater and OSD Systems: Yes No
Full Given Name(s):
E-mail address:
Contact No.:

Address:				
Part 3 – Stormwater & OSD Design Plans Checklist				
No.	**Items**	**Yes (✓)**	**No (✓)**	**N/A (✓)**
1.	**Plan Preparation (Ref. – Section 2 of SMP)**			
1.1	Stormwater Design Preparation and Documents have been prepared in compliance with Council's Stormwater Management Policy – 2020 (SMP) and other relevant Policies.			
1.2	Name, Signature and NER number of the Stormwater Engineer are clearly indicated on all submitted drawings, certificates, documents and reports.			
1.3	Site inspection undertaken in preparation of the stormwater system design.			
1.4	The stormwater plans: • Are based on a Survey Plan prepared by a Registered Surveyor. • Provide spot and contour levels (to m AHD). • Provide location of any existing easements. • Provide location of any existing trees and structures. • Include north point, date and scale.			
1.5	Does the development require OSD? **(Ref. – Section 4.3 & 4.4 of SMP)** **If Yes:** Submit site impervious area calculation form (A7).			
1.6	Has the stormwater system or OSD system been designed in accordance with: • Georges River Council's requirements. **(Ref – Section 4 of SMP)**			
1.7	Stormwater concept plans correspond and consistent with: • Architectural Plans. • Landscape Plans (no conflict between stormwater infrastructure, trees to be retained or planted and landscaped areas including deep soil).			
1.8	Construction of new Stormwater Infrastructure If construction of new stormwater infrastructure within the road network or public space is proposed, design details including pipeline long – sections to be provided.			

2	**Flood Affected**			
2.1	Is the site (whole or partly) affected by flood as per the 1% AEP flood maps? **If Yes:** a. Submit Flood Impact Assessment Report for 1% AEP storm events and input/output read files. **(Must only be prepared by a registered NER Engineer experienced in flood modelling and noted in the report)** b. Design complies with the flood control matrix requirements of Section 6.8 of the SMP.			
3.	**Stormwater System**			
3.1	Is there a Council stormwater pipe traversing the site or within close proximity to the site? **If Yes:** • Submit an Overland Flow Assessment Report for 1% AEP storm events. **(Must only be prepared by a registered NER Engineer experienced in flood modelling and noted in the report)**			
3.2	Can the stormwater system drain by gravity to the street frontage of the site? **(Ref. Section 3.3 of SMP)**			
3.3	Is a charged system proposed? **(Ref. Section 3.4.2 of SMP)** **If Yes:** a. Is there a gravity discharge from the property boundary to the street kerb and gutter? b. Is it draining to the natural sub catchment?			
3.4	Are absorption trenches proposed? **(Ref. Section 3.4.4 of SMP)** **If Yes:** a. Is the site located in a suburb as prescribed in Section 3.4.4.1 of the Stormwater Management Policy? b. Is the design supported by a geotechnical report?			

3.5	Is connection to an existing drainage system on site proposed? **(Ref. Section 3.4.5 of SMP)** **If Yes:** Have the full details of the existing drainage system been provided?			
3.6	Is an easement over downstream property or properties required to drain the site by gravity? **(Ref. Section 3.4.5.3 of SMP)** **If Yes:** 1. This is indicated on submitted Plan No …… 2. Has the permission of downstream property owners been obtained for any easements? If yes, this approval must be lodged with the stormwater plans / documentation. 3. If the site already benefits from an existing drainage easement, has a recent Title Search been provided?			

Part 4 – Registered and Qualified Stormwater Engineers' Declaration	
Declaration	**I confirm that as the NER Registered Stormwater Design Engineer responsible for designing the stormwater system associated with this development proposal that I have done so with a full understanding of the relevant Council requirements and have read, understood and completed this checklist accurately.** _____ Registered Stormwater Design Engineer's Signature Date____/____/____

Part 5 – Project Designer's Declaration	
Declaration **(*Applicable only when advisory note (e) has been fully achieved)***	**I confirm that as the Project Designer responsible for designing the stormwater system associated with this development proposal that I have done so with a full understanding of the relevant Council requirements and have read, understood and completed this checklist accurately.** _____ Project Designer's Signature Date____/____/____
Full Given Name(s):	
E-mail address:	
Contact No.:	
Address:	

APPENDIX A2 - Stormwater Concept Plan (SCP) Preparation Flow Chart

NOTE: This flow chart is intended to be a guideline only and is not applicable to all applications

Site Inspection

- Any external flows entering the site?
- Potential discharge points
- Potential storage areas
- Opportunities / requirements for water reuse and water quality treatment

↓

Site Survey and Contour Plan by a Registered Surveyor

- Sufficient levels with contour plan covering adjacent properties and front road including all utility services
- Existing building, trees, paved and green areas
- Drainage through site , services and inter-allotment drainage etc.

↓

Discuss the Draft SCP with the Architect / Developer

- Determine if OSD is required. If applicable calculate the required SSR and PSD in accordance with Appendix A7 and Table 3 of Council's Stormwater Management Policy
- Assess the need for an overland flow path and its layout.
- Negotiate with adjacent owner(s) for any inter-allotment drainage
- Identification of any Water Senstive Urban Design (WSUD)

↓

Prepare Stormwater Concept Plan

- Ensure OSD location is appropriate for the subject site
- Determine bypass flow areas and show on plans
- Show stormwater layout and pits with levels, surface flow direction, cross sections of OSD with sufficient levels, habitable and non-habitable floor levels, silt arrestor pit details, emergency spillway details etc.
- Overland flow path and fence opening details
- Prepare stormwater check list

↓

The Architect and Landscape Architect Review the SCP

- Any conflicts with architectural and landscape plans
- Revise the SCP if required

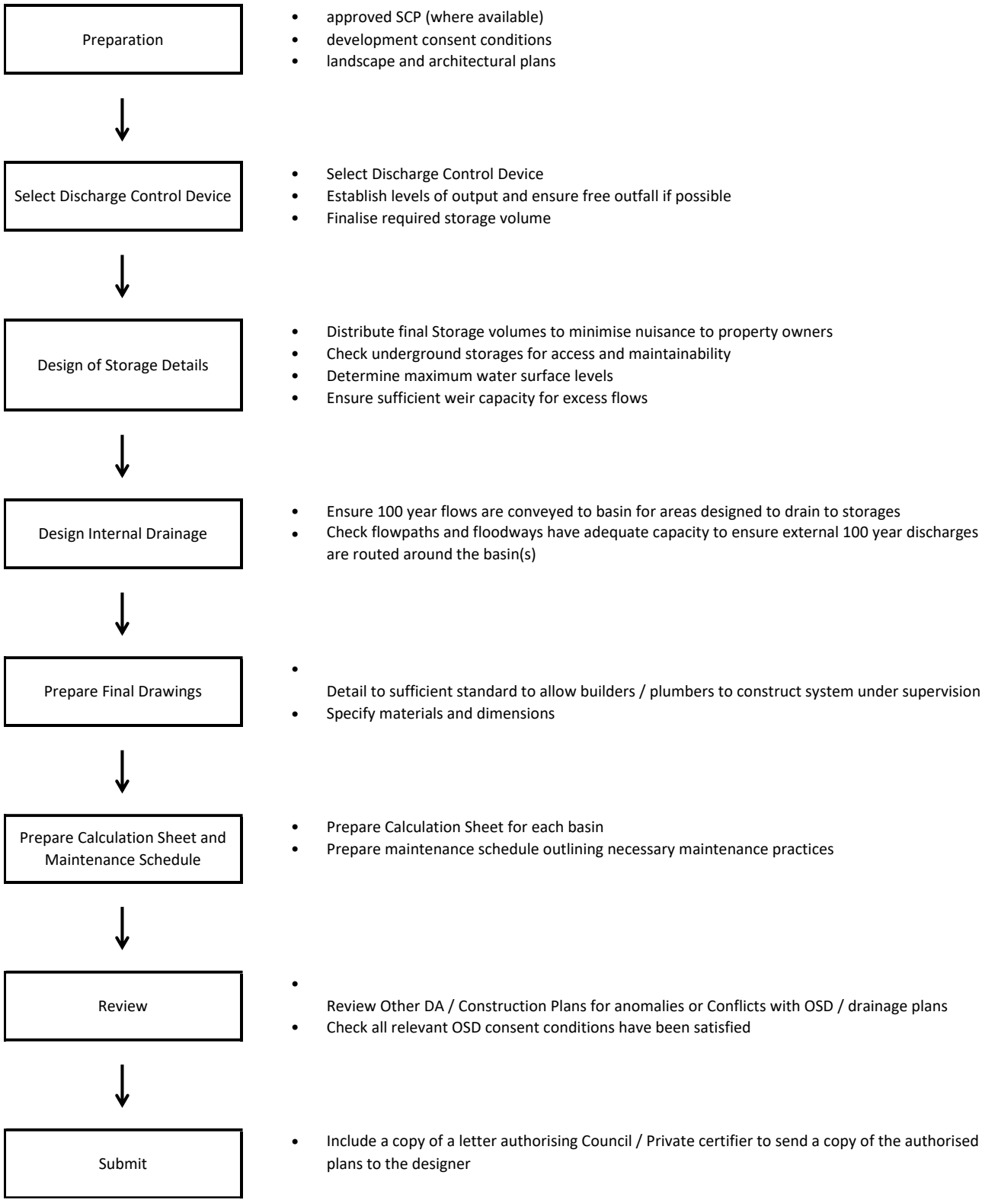
↓

Finalise the SCP and Submit with the DA

- Carry out the final check and submit the SCP plans and the stormwater check list to the Architect

APPENDIX A3 - Stormwater Detailed Plan (SDP) Preparation Flow Chart

NOTE: This flow chart is intended to be a guideline only and is not applicable to all applications



APPENDIX A4 - Certificate of Stormwater Compliance for On-Site Stormwater Management System

Job Address: _____

DA/CC No.:_____

Project:_____

Designed by:_____

Certified by:_____

Qualifications:_____

Address and telephone:_____

1. **Works constructed in accordance with design (delete if not applicable)**

   I_____ of _____ am a Chartered Professional Civil Engineer, competent in the field of stormwater management design have inspected the above on-site stormwater management system, examined the Works-as-Executed plans prepared by _____dated_____ and certify that the works have been constructed in accordance with the approved design details for the above project.
   Signature:_____ Date:_____

2. **Works constructed in accordance with design (delete if not applicable)**

   I_____ of _____ am a Chartered Professional Civil Engineer, competent in the field of stormwater management design have inspected the above on-site stormwater management system, examined the Works-as-Executed plans prepared by _____dated_____ and certify that the works have been constructed in accordance with the approved design details for the above project, except for the variations listed below which do not affect the performance of the system, subject to satisfactory maintenance.

Variations:

_____
_____
_____
_____
_____
_____
_____

Signature: _____ Date: _____

APPENDIX A5 - Standard wording for Restriction to Use of Land and Positive Covenant for On-Site Stormwater Management System

A Restriction on Use of the Land and Positive Covenant shall be created and registered on the title of the property, which places the responsibility for the maintenance of the on-site stormwater management system on the owners of the land. The terms of the instrument are to be in accordance with Council's standard terms and restrictions which are as follows:

Restrictions on Use of Land

The registered proprietor shall not make or permit or suffer the making of any alterations to any on-site stormwater management system which is, or shall be, constructed on the lot(s) burdened without the prior consent in writing of ***Georges River Council.*** *The expression "on-site stormwater management system" shall include all ancillary gutters, pipes, drains, walls, kerbs, pits, grates, tanks, chambers, basins and surfaces designed to manage stormwater quantity or quality including the temporary detention or permanent retention of stormwater storages. Any on-site stormwater management system constructed on the lot(s) burdened is hereafter referred to as "the system".*

Name of Authority having the power to release, vary or modify the Restriction referred to is **Georges River Council.**

Positive Covenants

1. The registered proprietor of the lot(s) hereby burdened will in respect of the system:

a) Keep the system clean and free from silt, rubbish and debris

b) Maintain and repair at the sole expense of the registered proprietors the whole of the system so that it functions in a safe and efficient manner.

c) Permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at any time and without notice in the case of an emergency) to enter and inspect the land for the compliance with the requirements of this covenant.

d) Comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2. Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with the said notice referred to in part 1(d) above

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(i) any expense reasonably incurred by it in exercising its powers under subparagraph (a) hereof. Such expense shall include reasonable wages for the Council's employees engaged in effecting the work referred to in (a) above, supervising and administering the said work together with costs, reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work.

(ii) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act or providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act. Name of Authority having the power to release vary or modify the Positive Covenant referred to is Georges River Council.

APPENDIX A6 - Standard wording for Restriction to Use of Land and Positive Covenant for Overland Flow Path

A Restriction on Use of the Land and Positive Covenant shall be created and registered on the title of the property, which places the responsibility for the maintenance of the overland flow path on the owners of the land. The terms of the instrument are to be in accordance with Council's standard terms and restrictions which are as follows;

Restriction on Use of Land

The registered proprietor(s) shall not make or permit or suffer the making of any alterations to the overland flow path, which is on the lot(s) burdened and identified in the report, prepared and certified by ……., Reference No. ……., dated …….. and approved under Development Consent No……., without the prior consent in writing of ***Georges River Council.***

The expression "overland flow path" shall include all ancillary pipes, drains, walls, kerbs, pits, grates and surfaces designed to convey the overland flow path through the site.

Any overland flow path on the lot(s) burdened is hereafter referred to as "the overland flow path".

Name of Authority having the power to release, vary or modify the Restriction on Use of Land referred to is **Georges River Council.**

Positive Covenants for Overland Flow Path

1. The registered proprietor of the lot(s) hereby burdened will in respect of the overland flow path:

a) Keep the overland flow path free from rubbish and debris;
b) Maintain the overland flow path clear from any obstructions at the sole expense of the registered
Proprietors so that it functions in a safe and efficient manner;
c) Permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at
any time and without notice in the case of an emergency) to enter and inspect the land for the compliance with the requirements of this covenant; and
d) Comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2. Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above, the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with the said notice referred to in part 1(d) above; and

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(i) any expense reasonably incurred by it in exercising its powers under sub-paragraph (a) hereof. Such expense shall include reasonable wages for the Council's employees engaged in effecting the work referred to in (a) above, supervising and administering the said work together with costs, reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work

(ii) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act or providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act. Name of Authority having the power to release, vary or modify the Positive Covenant referred to is Georges River Council.

APPENDIX A7 - Calculating % impervious area of a site for determination of OSD Storage requirements

The percentage of impervious areas on the site is a measure of the extent to which the site will be covered by impermeable surfaces following completion of the proposed development.

Impermeable surfaces are surfaces that do not allow natural infiltration of rainfall to the underlying soil, thereby increasing the volume and peak flow rate of surface runoff.

Examples of impermeable surfaces include roofs, roads and conventional (non-porous) paved surfaces.

To calculate the % impervious areas of the site, follow these steps;

STEP 1 - Calculate impermeable area of a site

The impermeable site area is the total area of impermeable surfaces within the site following completion of the development as calculated in accordance with the details and rules provided in Table 5 within this Appendix.

This calculation involves adding up the area (in square metres) for each different type of ground surface that does not allow natural infiltration of rainwater. As some types of surfaces are only partially impermeable, it is necessary to multiply the area of the surface with an appropriate 'impermeability factor', as per the Table. The calculation also requires that all areas of less than 1.5 metres clearance between the outer wall of a building and the nearest adjacent property boundary are considered to be a minimum 50% impervious. This excludes the area under a roof eave overhang that is to be considered 100% impervious.

Table 6 – Impermeability factors

Surface type	Material	Impermeability factor
All areas of less than 1.5 metres clearance between the outer wall of a building and the nearest adjacent property boundary (excludes the area under a roof eave overhang that is to be included as a roof surface)	Various	0.50
Roof surfaces	Various including metal, concrete, terracotta, slate.	1.00
	Green roofs' where there is a minimum 300mm depth soil medium	0.50 If soil medium is less than 300mm depth impermeability factor of 1.00 to be used.
Ground surfaces	Concrete / tiles / paving / permeable paving (2)	1.00
	Gravel / Pebbles	0.75
Timber Deck (over natural ground)	Timber (over natural ground)	0.5
	Timber (over paved concrete or other impervious ground surface)	1.00
Swimming pools (Water surface)	Water Surface	0.50
Swimming pool	Coping and surrounds constructed in concrete / tiles /	1.00

	paving or other impermeable material	

Notes with respect to Table 6:

(1) In setback areas as detailed of less than 1.5 metres it is often impractical for turf / soft landscaping to be installed due to issues including suitable access, installation of air conditioning units, rainwater tanks and other structures. It is also noted that roof overhangs often cover a proportion of these areas also. As such Council requires that these areas are considered as 50% impervious.

(2) Permeable, Grid and similar type paving is considered as 100% impervious as Council considers that variability in factors including the method of installation undertaken, proximity of adjacent structures and their foundations, potential for clogging of the paving over time and existing subsurface ground conditions including shallow rock make the effective permeability of the paving unpredictable and unreliable.

(3) The surface used for the calculation is to be the highest surface at each specific location within the site. For example in an area where a roof overhangs the ground surface the roof is to be used as the surface at this location.

STEP 2 - Determine total site area

The total site area corresponds to the allotment area, as shown on the registered plan for the site.

STEP 3 - Calculate percentage of impervious areas on your site

The percentage of impervious areas on your site is equal to the impermeable site area as calculated in accordance with this appendix as expressed as a proportion of the total site area.

Worked example

It is proposed to erect a detached dwelling-house (200 square metres site coverage) on a 550 square metre allotment. Associated with the dwelling will be paths, deck, driveway and a swimming pool. Each of these ground surfaces is shown in the following table.

Table 7 – Worked example Impermeable Factors

Surface Type	**Area** (Column 2)	**Impermeable factor** (Column 3)	**Impermeable area** (Column 2 x Column 3)
Roof	200sqm	1.00	200sqm
Driveway (concrete)	35sqm	1.00	35sqm

Deck (timber) over natural ground	50sqm	0.50	25sqm
Swimming pool	30sqm	0.50	15sqm
Setback areas less than 1.5 metres clearance between the outer wall of a building and the nearest adjacent property boundary excluding any roof eave overhang	$80m^2$	0.50	40sqm
Pool coping, Hard paved pool surrounds and concrete pathways	30sqm	1.00	30sqm
Total Impermeable site area			**345sqm**

The impermeable area for roofs, driveways and other surface types is calculated by multiplying their area (Column 2) with the appropriate impermeability factor (Column 3).

These amounts are then added together, giving a total impermeable site area of 345sqm. The percentage of impervious areas on the site is then obtained by dividing the impermeable site area (345sqm) by the total site area (550sqm): 345sqm /550sqm = 0.63 (or 63% expressed as a percentage).

APPENDIX A8 - Design Rainfall Data

The IFD Design Rainfall Depth and Intensity tables listed below have been downloaded from the Bureau of Meteorology (BOM) website and are the data derived for a location at MacMahon Street Hurstville from the Australian Rainfall & Runoff 2019. Council will accept this data as valid for any catchment within the Local Government Area. Alternatively the engineer may download the site specific rainfall and intensity tables from the BOM website.

Table 8 - Georges River Council IFD Design Rainfall Depth (mm)

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	2.33	2.58	3.35	3.86	4.36	5.00	5.49
2 min	3.88	4.26	5.44	6.25	7.04	8.09	8.88
3 min	5.38	5.91	7.58	8.72	9.82	11.3	12.4
4 min	6.73	7.42	9.56	11.0	12.4	14.3	15.7
5 min	7.94	8.77	11.3	13.1	14.7	16.9	18.6
10 min	12.5	13.9	18.1	20.9	23.5	27.0	29.6
15 min	15.6	17.3	22.5	26.0	29.4	33.7	36.9
20 min	17.9	19.8	25.8	29.8	33.7	38.6	42.3
25 min	19.7	21.9	28.5	32.8	37.0	42.5	46.6
30 min	21.3	23.6	30.6	35.3	39.9	45.8	50.2
45 min	24.9	27.5	35.6	41.1	46.4	53.3	58.6
1 hour	27.6	30.5	39.5	45.5	51.4	59.2	65.1
1.5 hour	31.9	35.2	45.5	52.5	59.5	68.7	75.8
2 hour	35.4	39.0	50.5	58.4	66.2	76.7	84.8
3 hour	41.1	45.4	59.0	68.5	77.9	90.6	101
4.5 hour	48.2	53.3	69.8	81.4	93.0	109	121
6 hour	54.1	60.0	79.3	92.8	106	125	140
9 hour	64.0	71.5	95.7	113	130	153	172
12 hour	72.2	81.1	110	130	150	178	200
18 hour	85.5	96.8	133	159	184	220	247
24 hour	96.0	109	152	182	212	253	285
30 hour	105	120	168	201	235	281	316
36 hour	112	128	181	217	254	304	342
48 hour	123	142	202	243	283	339	382
72 hour	139	161	229	276	321	383	430
96 hour	150	173	246	295	342	406	455
120 hour	157	182	257	307	354	418	467
144 hour	163	188	264	314	361	424	472
168 hour	168	193	269	318	365	425	473

Table 9 - Georges River Council IFD Design Rainfall Intensity (mm/h)

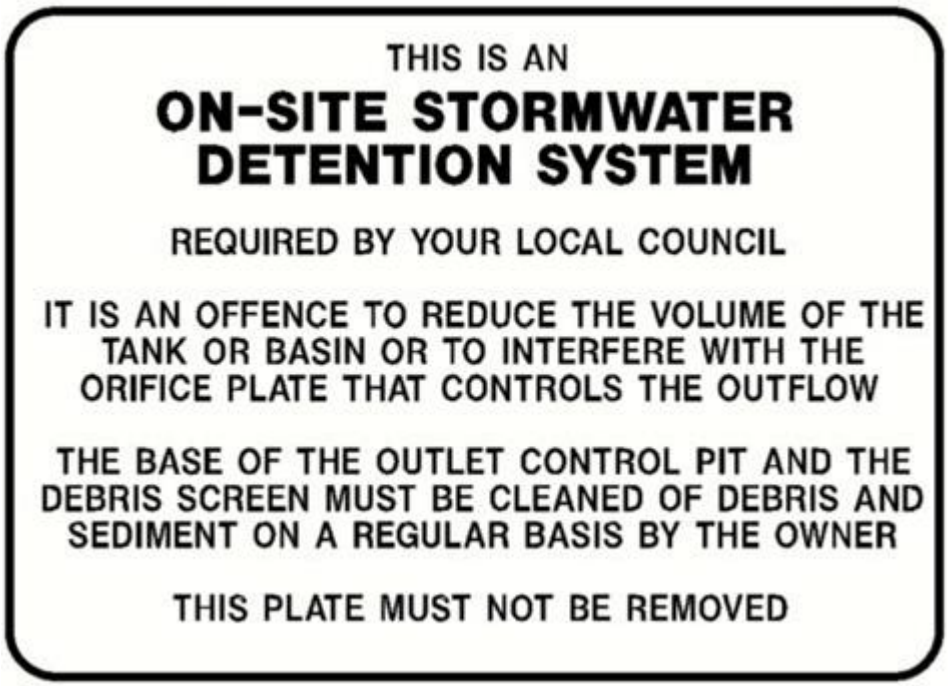
	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	140	155	201	232	262	300	329
2 min	116	128	163	187	211	243	266
3 min	108	118	152	174	196	226	248
4 min	101	111	143	165	186	214	235
5 min	95.3	105	136	157	177	203	223
10 min	75.0	83.2	108	125	141	162	178
15 min	62.3	69.2	90.2	104	117	135	148
20 min	53.6	59.5	77.5	89.5	101	116	127
25 min	47.3	52.5	68.3	78.8	88.9	102	112
30 min	42.5	47.1	61.3	70.7	79.7	91.5	100
45 min	33.2	36.7	47.5	54.8	61.8	71.1	78.1
1 hour	27.6	30.5	39.5	45.5	51.4	59.2	65.1
1.5 hour	21.3	23.5	30.3	35.0	39.6	45.8	50.5
2 hour	17.7	19.5	25.3	29.2	33.1	38.4	42.4
3 hour	13.7	15.1	19.7	22.8	26.0	30.2	33.5
4.5 hour	10.7	11.8	15.5	18.1	20.7	24.2	26.9
6 hour	9.01	10.0	13.2	15.5	17.7	20.8	23.3
9 hour	7.11	7.94	10.6	12.5	14.4	17.0	19.1
12 hour	6.02	6.76	9.15	10.8	12.5	14.8	16.7
18 hour	4.75	5.38	7.40	8.82	10.2	12.2	13.7
24 hour	4.00	4.56	6.34	7.58	8.83	10.5	11.9
30 hour	3.49	3.99	5.59	6.71	7.82	9.36	10.5
36 hour	3.10	3.56	5.03	6.04	7.04	8.43	9.51
48 hour	2.57	2.96	4.20	5.06	5.90	7.07	7.96
72 hour	1.93	2.24	3.19	3.83	4.46	5.32	5.98
96 hour	1.56	1.80	2.56	3.07	3.56	4.23	4.74
120 hour	1.31	1.51	2.14	2.56	2.95	3.49	3.89
144 hour	1.13	1.31	1.83	2.18	2.51	2.94	3.28
168 hour	0.999	1.15	1.60	1.89	2.17	2.53	2.82

APPENDIX A9 - Typical Warning Signs

This appendix provides typical warning signs that may be required to be installed.

Standard Warning OSD Signage

OSD Signage



Absorption System Signage

Confined Space Signage

APPENDIX A10 - Flood Compatible Materials

Building Component	Flood Compatible Material
Flooring and Sub-floor Structure	concrete slab-on-ground monolith construction suspended reinforced concrete slab
Floor Covering	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 Structure	solid brickwork blockwork reinforced, concrete or mass concrete.
Roofing Structure (for Situations Where the Relevant Flood Level is Above the Ceiling**)**	reinforced concrete construction galvanised metal construction
Doors	solid panel with water proof adhesives flush door with marine ply filled with closed cell foam painted metal construction aluminium or galvanised steel frame
Wall and Ceiling Linings	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 glastic sheeting or wall with waterproof adhesive
Insulation Windows	foam (closed cell types) aluminium frame with stainless steel rollers or similar corrosion and water resistant material

Nails, Bolts, Hinges and Fittings · brass, nylon or stainless steel
removable pin hinges
hot dipped galvanised steel wire nails or similar

Electrical and Mechanical Equipment

For dwellings constructed on land to which this chapter applies, the electrical and mechanical materials, equipment and installation should conform to the following requirements. ·

Main power supply

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. ·

Wiring

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 leakage 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. ·

Equipment

All equipment installed below or partially below the relevant flood level should be capable of disconnection by a single plug and socket assembly. · 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.

Heating and Air Conditioning Systems

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 minimise the damage caused by submersion according to the following guidelines. ·

Fuel

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.

Installation

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. ·

Ducting

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.

APPENDIX A11 - Procedure for Stormwater Drainage from Low Level Properties

1. Purpose

This Appendix is to provide guidance and interpretation of Council DCP requirements for owners of properties when submitting an Application for Development, to determine an appropriate drainage system for low level properties.

In this Policy, a low level property is defined as a property:

(a) That naturally falls away from the frontage street,

and / or

(b) At which the ground levels at the property boundary at the street frontage are typically lower than the adjacent street kerb level.

2. Principles

This procedural document applies to all types of developments and land uses where these properties fall naturally away from the street. The requirements for stormwater disposal are dependent on the type of proposed development or proposed land use for the property.

For Zone R2 Low Density Residential Dwelling Houses, Dual Occupancies, Secondary Dwellings, alterations and additions to existing dwellings, Ancillary Outbuildings (such as sheds, carports and garages), the property owner or developer is required to manage stormwater drainage according to the sequence of steps outlined in Sections 2.1 and 2.2 of this document.

For all other land uses the property owner or developer is required to manage stormwater drainage in accordance with Section 2.3 of the procedure outlined in this document.

With respect to sections 2.2 to 2.3, Council is to be satisfied that all avenues of the first or preceding step have been exhaustively investigated and considers these avenues to be impractical or unviable, prior to allowing the applicant to progress to the next step.

2.1 **Low Density Residential Development including: Dwelling Houses, Secondary Dwellings, Ancillary Outbuildings (for alteration and additions to existing structures) where on-site stormwater detention is not required as per Section 4.4 of Council's Stormwater Management Policy.**

An Application for the applicable development under this section where an on-site stormwater detention (OSD) system is not required for the low level property will require stormwater disposal from the site in accordance with the following steps:

STEP 1

Connection of stormwater to the existing stormwater disposal system will be permitted under the following circumstances, as applicable:

(i) Connection into an existing inter- allotment stormwater pipeline or Council's stormwater pipeline subject to the pipeline having sufficient capacity and the applicant having formal drainage easement(s) created over the above pipeline within the downstream property or properties, and where applicable, the beneficiaries' maintenance obligations for the pipeline are clarified;

Or

(ii) The existing drainage system was previously approved by Council and its performance is proven to be fully functional and fully meet the requirements of the current Stormwater Management Policy,

In addition, there must be no valid objections regarding overland flow and groundwater / seepage-related damage or issues and associated inconvenience to downstream property owners.

STEP 2

Charged lines will be generally permitted for the discharge of roof runoff from single occupancy residential developments, dual occupancy developments and commercial / industrial sites of up to 750 square metres when associated with rainwater tanks as per the BASIX requirements for the site.

Where the means of disposal in Step 1 is not available, the use of a charged stormwater line will be permitted for the above development types subject to all of the following conditions:

(i) Stormwater is discharged into the same catchment (or sub-catchment) that it currently drains into, following the natural fall of the land to the rear of the subject site.

(ii) A consulting hydraulic engineer demonstrates to Council's Development Engineer's satisfaction that all the following requirements have been met:
- The kerb and gutter, including any low level driveways, and any existing Council drainage system fronting the street, has sufficient capacity to cater for 1% annual exceedance probability (AEP) storm events from the full extent of the upstream catchment
- This capacity is met for the full extent of the discharge path from the proposed point of discharge from the property to a location to the rear of the property where it would have drained to naturally by gravity.
- The upstream catchment calculated is to include allowance for the roof runoff from all similar low level properties fronting the roadway(s).
- Connection to the street gutter must be in accordance with Section 3.3 of the Stormwater Management Policy.

NOTES:

1. The connection to the Council drainage system is to be by a consistent minimum 1% gravity fall from the property boundary to the discharge connection point.

2. An on-site absorption system will be required to collect stormwater from impervious areas of the development that cannot drain by gravity to the kerb and gutter system. The on-site absorption system must be designed and proven to comply with the requirements of Section 3.4.4 of Council's Stormwater Management Policy.
3. The on-site absorption system shall require the creation of a Positive Covenant and Restriction on Use of Land over the system on an as-needs basis as determined by Council.
4. The charged system has a sufficient head pressure to charge roof water to the street gutter and complies with all requirements of Section 3.4.2 of Council's Stormwater Management Policy.

STEP 3

Where the means of disposal in Steps 1 and 2 are not available, the use of an on-site absorption system will be permitted subject to strict compliance with all the requirements of Section 3.4.4 of Council's Stormwater Management Policy which relates to absorption systems in the suburbs of Connells Point, Kyle Bay, Blakehurst, Hurstville Grove, San Souci, Carss Park and Kogarah Bay.

Absorption systems are not allowed as the primary method of draining a development site in all other locations within the LGA.

Requirements include that:

(i) The on-site absorption system is designed by a suitably experienced and qualified civil engineer.
(ii) The on-site absorption system will not have an adverse impact upon adjoining and / or downstream properties by the redirection or concentration of stormwater on those properties.
(iii) Soil absorption characteristics and other physical constraints prove that the on-site absorption system is appropriate for the development.
(iv) Absorption trenches are to be designed based on a geotechnical investigation in accordance with Council's requirements and the geotechnical report is to be provided, for the consideration of Council's development engineering staff.
(v) The on-site absorption system shall require the creation of a Positive Covenant and Restriction on Use of Land over the system.

STEP 4

Where the means of disposal in Steps 1, 2 and 3 are not available, the use of a level spreader will be permitted subject to the following circumstances:

(i) Compliance with all the requirements of Section 3.4.3 of Council's Stormwater Management Policy.
(ii) The subject site is backing on to a creek, bay, bushland area, or Council reserve (subject to approval by the relevant Council Assets Manager).
(iii) The level spreader design allows for minimal impact upon adjoining bushland reserves and parks.
(iv) Compliance with the requirements of all affected downstream property owners being met.

(v) The level spreader is completely contained within the property.
(vi) The discharge from the level spreader will not run further downstream to cause damage and or inconvenience to any other private property.
(vii) In the case of runoff onto a Government-Authority managed property, that authority needs to be consulted and approval given before such a device is utilised.

STEP 5

Where the means of disposal in Steps 1, 2, 3 and 4 are not available, stormwater disposal from the site shall be via a gravity fed pipeline. This will require an easement to drain stormwater to Council's drainage infrastructure through the downstream property(s).

The applicant is to approach the adjoining downstream property owner(s) to request an easement be granted for the purpose of draining stormwater to Council's drainage system (See sample letter, Appendix A13). If the applicant is unable to attain any written responses from the adjacent downstream property owner(s), the applicant may seek legal advice to formalise an easement via a section 88K of the Conveyancing Act 1919 through the appropriate NSW Courts.

2.2 Low Density Residential Development including Dwelling Houses, Dual Occupancy, Secondary Dwellings, Ancillary Outbuildings (for all new dwelling houses or alteration and additions to existing dwelling houses) where on-site stormwater detention is required, as required under Section 4 of Council's Stormwater Management Policy.

In all cases the on-site stormwater detention provided is to be in accordance with the requirements of Section 4 of Council's Stormwater Management Policy.

An Application for the applicable development under this section where an on-site stormwater detention system is required will require stormwater disposal from the site to be in accordance with the following steps:

STEP 1

Option 1 – Connection of stormwater to an existing Council stormwater drainage line located within the subject site, subject to the drainage line having sufficient capacity.

OR

Option 2 – Connection of stormwater to an existing inter- allotment drainage easement and pipeline subject to

(i) A qualified hydraulic engineer demonstrating that the inter- allotment pipeline has sufficient capacity, and
(ii) The applicant having a formal drainage easement created over the inter- allotment pipeline within the downstream property(s), with written clarification regarding the respective beneficiaries' drainage system maintenance obligations.

For both of the above scenarios it is required that the stormwater system, including the OSD components, can drain by gravity to the existing pipeline.

STEP 2

Charged lines will be generally permitted for the discharge of roof runoff from single occupancy residential developments, dual occupancy developments and commercial / industrial sites of up to 750 square metres when associated with rainwater tanks as per the BASIX requirements for the site.

Where the means of disposal in Step 1 is not available, the use of a charged stormwater line into an OSD system will be permitted for the above development types subject to all of the following conditions:

Option 1 – The use of a charged line to drain roof runoff into an OSD system and then drain by gravity to the kerb and gutter system fronting the site will be acceptable provided:

(i) Stormwater is discharged into the same catchment (or sub-catchment), following the natural fall of the land to the rear of the subject site; and
(ii) The property owner demonstrates that the kerb and gutter system, including any low level driveways fronting the street, has sufficient capacity to cater for the 1% AEP storm event from roof runoff from all applicable properties fronting the same road; and
(iii) this capacity is met for the full extent of the discharge path from the proposed point of discharge from the property to a location to the rear of the property where it would have drained to naturally by gravity; and as consistent with requirement in Sect 2.1.
(iv) The upstream catchment calculated is to include allowance for the roof runoff from all similar low level properties fronting the roadway(s); and as consistent with requirement in Sect 2.1.
(v) A satisfactory hydraulic grade line analysis of the charged line system is to be provided to Council.
(vi) The design allows for the inclusion of a suitable on-site stormwater detention system; and
(vii) An on-site absorption system will be required to collect stormwater from impervious areas such as driveways and pavement runoff of the development that cannot drain by gravity to the kerb and gutter system, (Absorption system is to be design and constructed in accordance with section 3.4.4 of the Stormwater Management policy); and
(viii) A maximum of 20% of the site area on site may bypass the OSD system. (OSD system is to be designed and constructed in accordance with Section 4 of the Stormwater Management Policy); and
(ix) The connection to the street gutter must be in accordance with Section 3.3 of Council's Stormwater Management Policy; and
(x) It will be required to create a Positive Covenant and Restriction on Use of Land over the site's drainage system.

Option 2 – The use of a charged line to drain roof runoff into an OSD system and drain by gravity to a Kerb Inlet Pit directly in front of the property will be acceptable provided:

(i) Stormwater is discharged into the same catchment (or sub-catchment), following the natural fall of the land to the rear of the subject site; and
(ii) The property owner demonstrates that the existing Council (or other authorities) piped system has sufficient capacity to cater for the 1% annual exceedance probability (AEP) storm event from the full extent of the upstream catchment.
(iii) this capacity is met for the full extent of the discharge path from the proposed point of discharge from the property to a location to the rear of the property where it would have drained to naturally by gravity; and
(iv) The upstream catchment calculated is to include allowance for the roof runoff from all similar low level properties fronting the roadway(s); and
(v) A satisfactory hydraulic grade line analysis of the charged line system is to be provided to Council; and
(vi) The design allows for the inclusion of a suitable on-site stormwater detention system; and
(vii) A maximum of 20% of the site area on site may bypass the OSD system. (OSD system is to be designed and constructed in accordance with Section 4 of the Stormwater Management policy.); and
(viii) An on-site absorption system will be required to collect stormwater from impervious areas such as driveways and pavements of developments that cannot drain by gravity to the kerb and gutter system, absorption system is to be design in accordance with section 3.4.4 of Council's Stormwater Management policy; and
(ix) The connection to the Council system must be in accordance with Section 3.3 of Council's Stormwater Management Policy
(x) The connection and any proposal to extend the Council drainage system would need to be applied for through the Stormwater Drainage Application process.
(xi) It will be required to create a Positive Covenant and Restriction on Use of Land over the site's drainage system.

STEP 3

Where the means of disposal in Steps 1 and 2 are not available, the following option can be considered:

The use of a level spreader to discharge stormwater will be acceptable to Council subject to the following conditions:

(i) Compliance with all the requirements of Section 3.4.3 of Council's Stormwater Management policy.
(ii) The subject site is backing on to a bushland area, Council reserve (subject to approval by the relevant Council Assets Manager).
(iii) The level spreader design allows for minimal impact upon adjoining bushland reserves and parks.
(iv) Compliance with any requirements of all affected downstream property owners.
(v) The level spreader is completely contained within the property.
(vi) The discharges from the level spreader will not run further downstream to cause damage and or inconvenience to any other private property.

(vii) In the case of runoff onto a Government-Authority managed property, that authority needs to be consulted and approval given before such a device is utilised.

Note - In the case of discharge directly to a Council reserve or bushland area the applicant will be required to contact Council to determine if the proposal will require an On-site Detention system.

STEP 4

Where the means of disposal in Steps 1, 2, 3 and 4 are not available, stormwater disposal from the site shall be via a gravity fed pipeline. This will require an easement to drain stormwater to Council's drainage infrastructure through the downstream property(s).

The applicant is to approach the adjoining downstream property owner(s) to request an easement be granted for the purpose of draining stormwater to Council's drainage system (See sample letter, Appendix A13). If the applicant is unable to attain any written responses from the adjacent downstream property owners, the applicant should seek legal opportunities via. Section 88K of the Conveyancing Act.

2.3 All Other Land uses / Developments not covered in Sections 2.1 and 2.2 of this procedure

An application for development / land use other than Zone R2 Low Density Residential Dwelling Houses, ie Subdivision Developments, Multi House and Unit Complex Developments, Commercial Developments, Industrial Development and Mixed Commercial/Industrial/Residential etc. will require stormwater disposal via a gravity fed pipeline where these properties fall naturally away from the street.

This will require an easement to drain stormwater to Council's drainage infrastructure through the downstream property or properties.

An application under Section 88K of the Conveyancing Act 1919 can be made through the appropriate NSW Court to consider making an order to impose an easement over land if the easement is reasonably necessary for the effective use or development of other land that will have the benefit of the easement.

2.4 Pump-Out Systems

Council will only permit pump-out systems for draining sub-surface seepage flows from underground areas, such as basement garages where the seepage flows are minor and intermittent, and for the collection and discharge of runoff from driveways.

If the site is to have an OSD system, the pump-out water must be discharged to the OSD.

Unless otherwise approved by Council, the pump-out water is to be discharged from the site by gravity.

The pump-out system is to meet all requirements as specified in both Sections 3.3 and 3.6 of Council's Stormwater Management Policy including that:

- A direct connection of a pump out discharge line is only to be connected to a Council stormwater gully pit and not to the kerb and gutter.
- If there is no available street drainage system, the connection to the kerb and gutter across the Council footway is to be made by gravity.

Council will not accept stormwater disposal from roof and pavement surfaces to the public road fronting the low level property by employing pump-out systems for the following reasons:

(i) The public road drainage system fronting the low level property was not designed to adequately cope with the additional stormwater flows from these pump-out systems.
(ii) Potential failure of the pump-out system and consequent stormwater-related damage to the property and adjacent properties.
(iii) Diverting flows from one catchment (or sub-catchment) to another catchment (or sub-catchment) burdening that catchment (or sub-catchment) with additional stormwater flows that may cause nuisance flooding or exacerbate existing flooding problems.
(iv) Noise issues for neighbours.

3. Definition of Terms

Term	Meaning
Zone R2 Low Density Residential Dwelling Houses	Land use as referred to in the Kogarah / Hurstville LEP 2012.
Low Level Property	A property: (a) that naturally falls away from the frontage street, and / or (b) at which the ground levels at the property boundary at the street frontage are typically lower than the adjacent street kerb level.
Level Spreader	A device that allows for the even distribution of flows across the land.
Downstream Catchment	The direct sub-catchment a low level property would drain to via gravity.
State of Nature	The undeveloped condition of a property, that is, the property is grassed or turfed.

On-Site Stormwater Detention System	A stormwater drainage device to restrict the amount of stormwater discharge to a specified rate. The device is to be constructed on the subject property. Refer to Council's On-Site Stormwater Detention Technical Specification and On-Site Stormwater Detention (OSD) checklist for more information.

APPENDIX A12 - Design Guide for Charged Drainage Systems

The design of a charged drainage system must be completed in full with the Development Application Submission.

The following information is provided to assist in preparing this design and ALL parts must be completed.

1. **Prerequisite Information**
   This type of system:
   - Is ONLY permissible for single occupancy and alterations and additions.
   - Will only be considered as a last resort and letters from adjoining property owners indicating a refusal to grant a drainage easement MUST accompany the application. The letter must indicate that a reasonable amount of compensation has been offered for a drainage easement.
   - Must have a minimum of 1.8 metres between the roof gutters and the front boundary of the site.
   - Must have a fall from the front boundary to the kerb line.
   - Will only be permitted if there are no drainage problems downstream from the site.

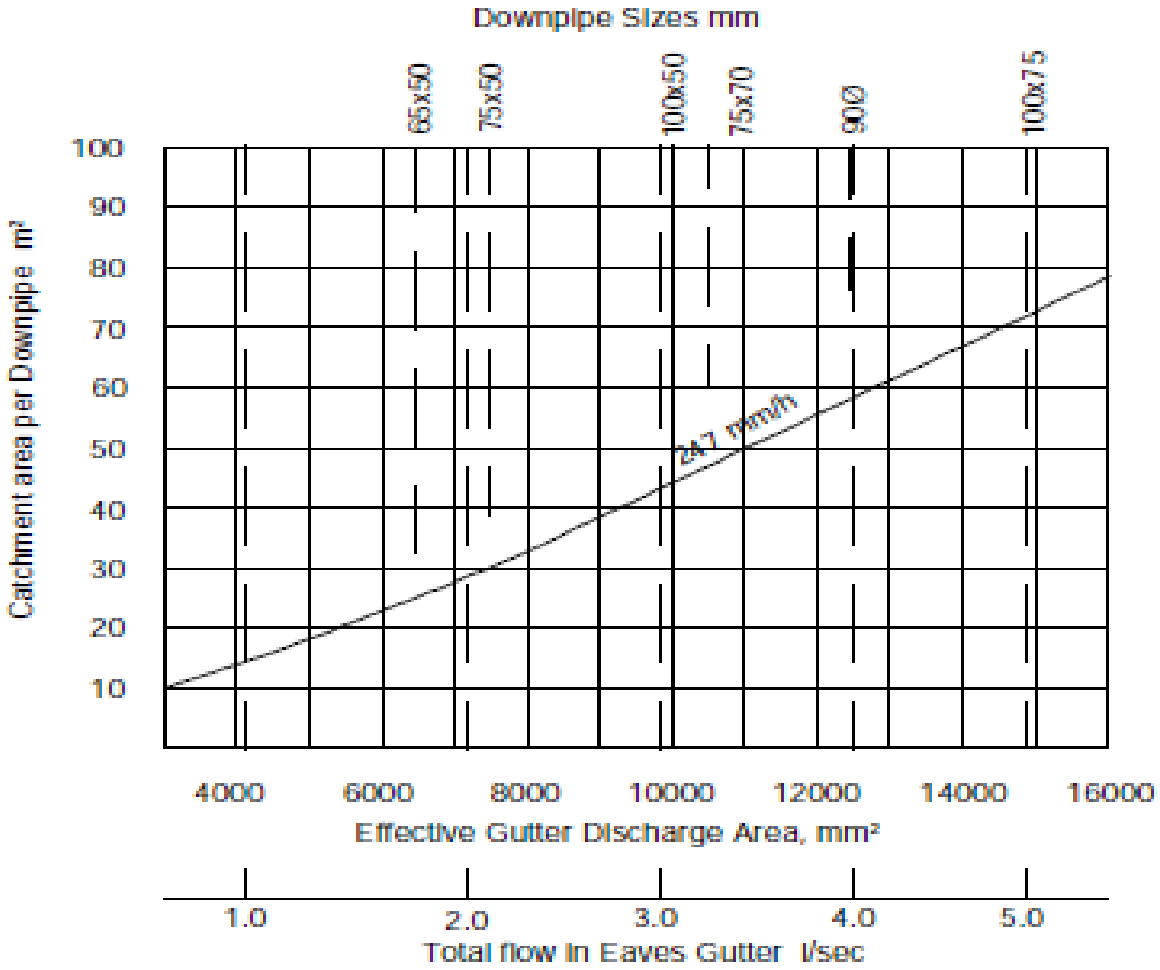
   This MUST be checked with the Council before proceeding and may require an analysis of the downstream kerb capacity to be undertaken.

2. **Submission:**
   The following information is required to be provided on or with the application and must be prepared by a suitably qualified Hydraulic Engineer.
   - All plans must be to mAHD levels.
   - A roof/site plan clearly showing catchment areas, direction of flows in gutters, and the location and sizes of all downpipes, pipes, pits, and discharge point.
   - Details of the gutter type, capacity, and gutter guard system to be used.
   - Calculations for: gutter sizing, Downpipe sizing, Pipeline sizing including hydraulic losses on pipe system
   - A longitudinal section of the pipe system showing
     ⇒ Gutter levels
     ⇒ Cleaning eye / pit levels
     ⇒ Isolation pit at boundary with invert and surface levels
     ⇒ Location and levels of any services in footpath
     ⇒ Discharge point
     ⇒ Pipe sizes, capacity, and design flows in each section.
   - Calculations for any on site disposal system that may be required to drain paved areas that cannot be directed to the charged system.
   - Detail drawings of pits, gutters, and dispersal system if included.
     NOTE: A Positive Covenant will be required to be registered against the property title to ensure the ongoing maintenance of the system. This will be required prior to the issue of the Occupation Certificate.

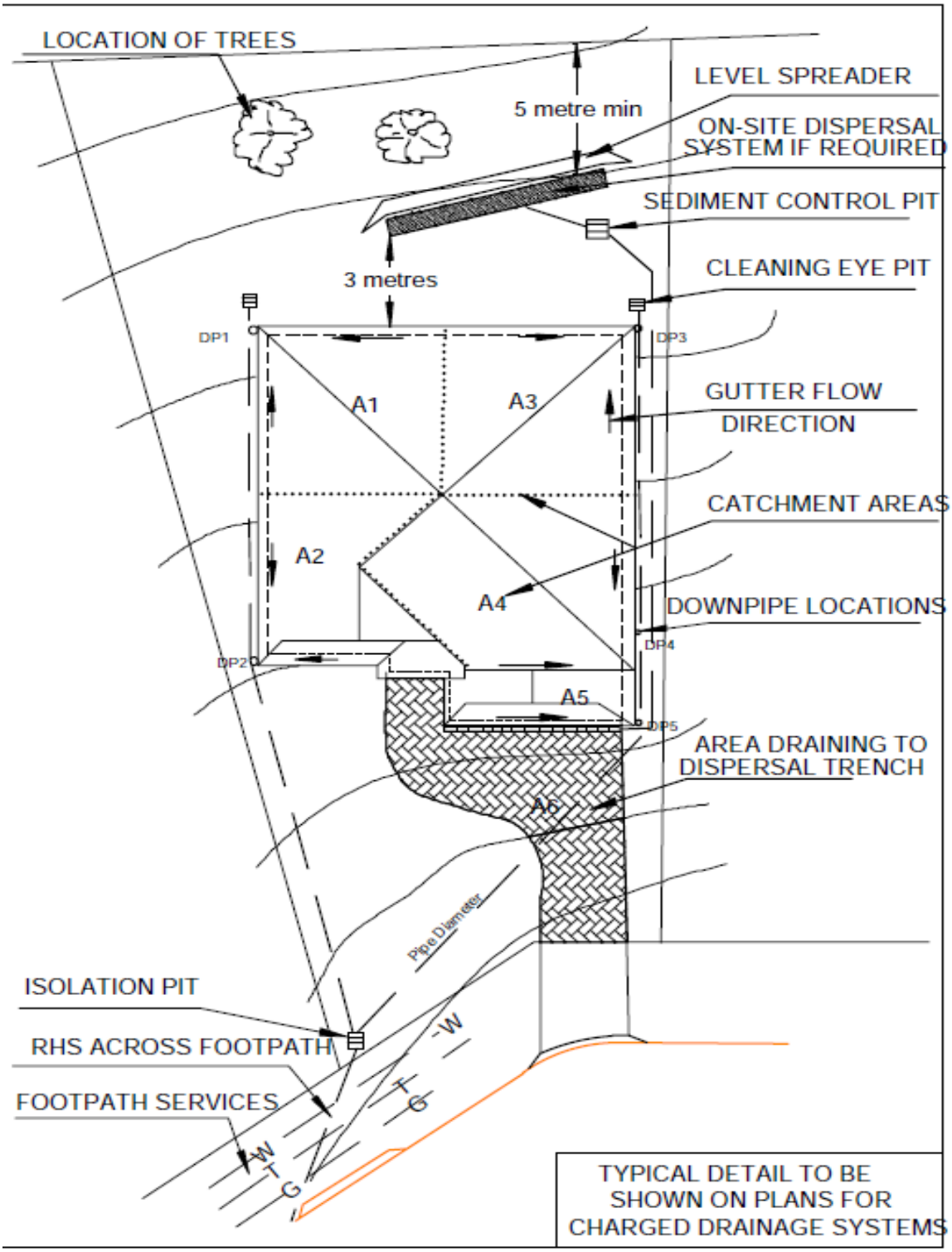
3. Checklist for Charged Drainage System submissions to the Georges River Council

1. Letter(s) from adjoining owners (see sample letter from APPENDIX A13 below)
2. Hydraulic calculations submitted
3. Catchment areas detailed.
4. Gutters designed for 1 in 100-year storm event.
5. Downpipes sized
6. Details of gutter guard system included
7. Detail of cleaning pit included
8. Detail of isolation pit included
9. Services in footpath located and shown on plans
10. Detail of any on site dispersal shown.
11. Details of any on-site stormwater detention system if applicable
12. Details longitudinal sectional information with pipeline chainage, ground surface/invert/HGL levels in the charged line up to street gutter connection where a gravity drainage is required from the boundary pit. DRAINS model output long section is not acceptable. The plan and longitudinal section must document very clearly and legibly existing ground levels and finished ground levels within frontage areas as well as pipe alignment up to boundary pit then leading to street gutter connection. Note: these levels are critical information to be presented in the plan and must be consistent with the survey, drainage and architectural plans which need to be demonstrated.

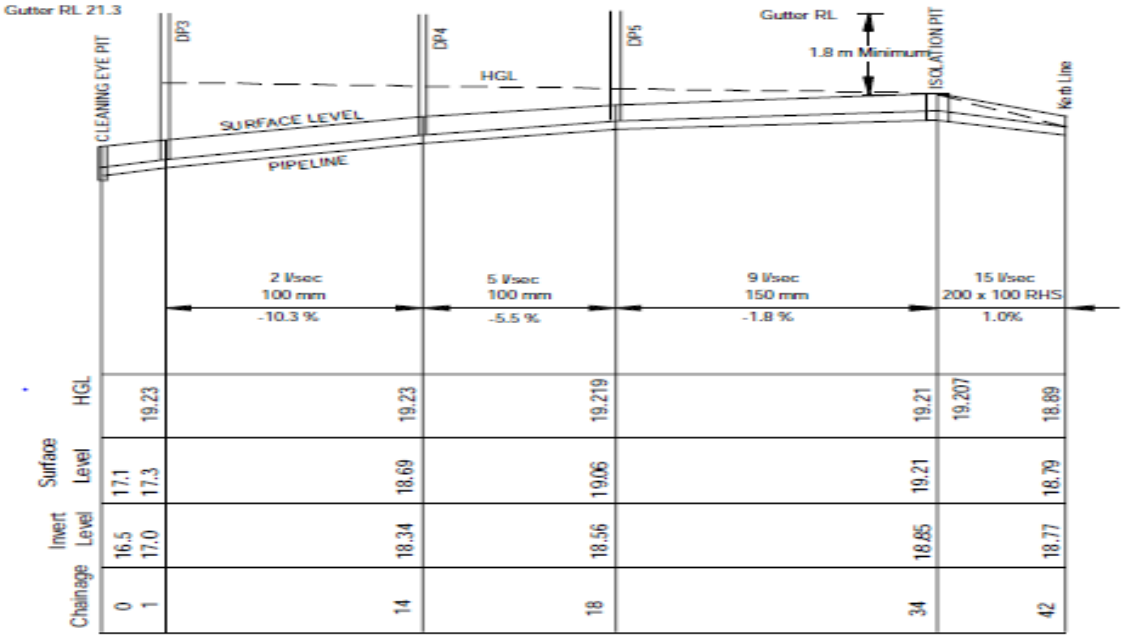
Eave Gutter and Downpipe Sizing Chart (As per Figure 5.1 of AS 2180 – 1986)



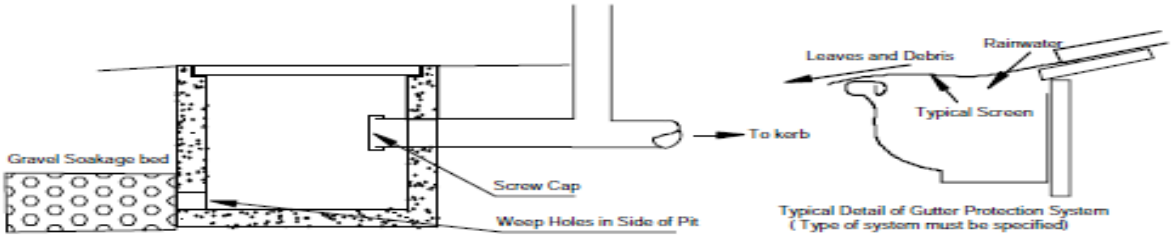
4. Typical Details are Presented Below:



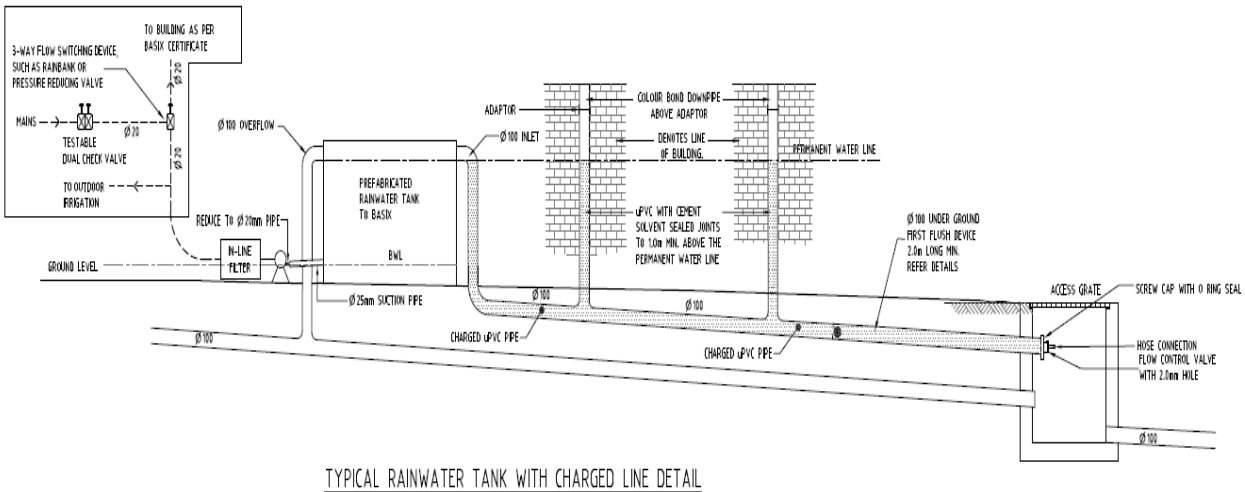
Note for Above: Charged system with gravity drainage flow from the isolation/boundary silt arrestor pit to the street gutter is required



TYPICAL LONGITUDINAL SECTION DETAIL



TYPIAL DETAIL OF CLEANING EYE PIT



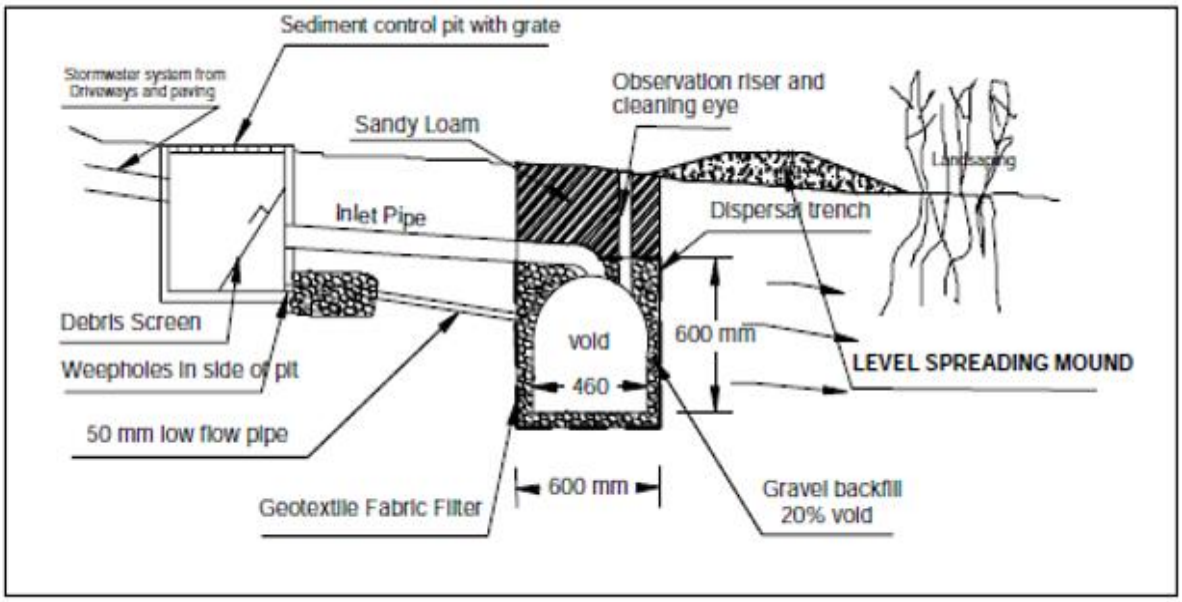
TYPICAL RAINWATER TANK WITH CHARGED LINE DETAIL

N.T.S.

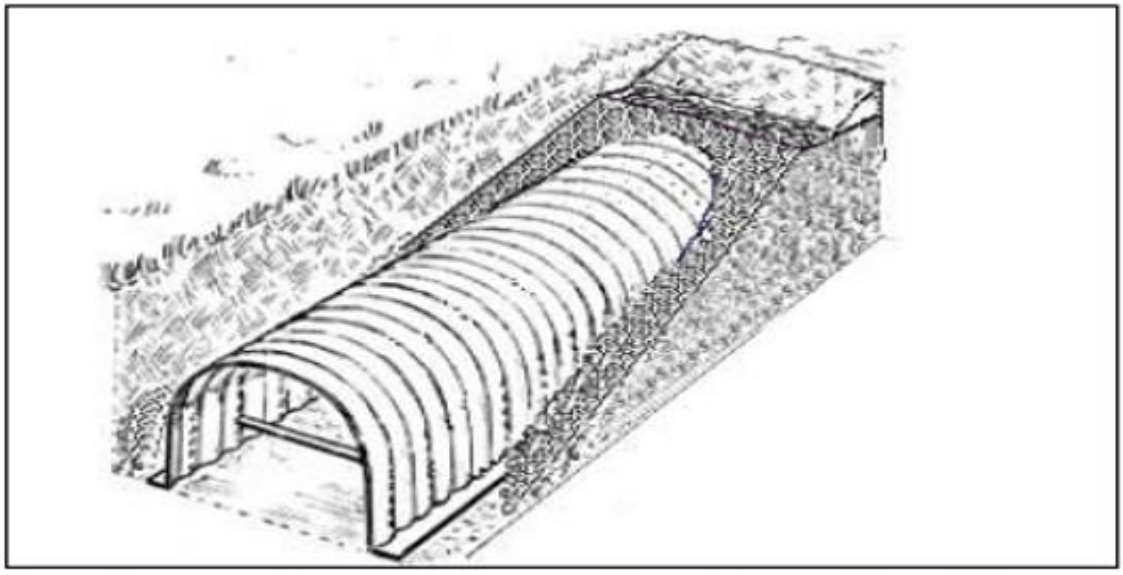
CHARGED LINE CLEAN-OUT PIT DETAIL

N.T.S.

Note for Above: Examples of Charged System



Typical detail of dispersal trench sediment control and level spreader



View of method of installation of trench dome and gravel backfill

Note for Above: Examples of Absorption System

APPENDIX A13 – TEMPLATE LETTER FOR REQUESTING AN EASEMENT THROUGH A DOWN STREAM PROPERTY

Dear _____

I/we _____

are proposing to redevelop our property at _____

Before we can proceed with this proposal Council has advised us that we have two options for the drainage of stormwater, the first, which is Council's preferred method, is to obtain a drainage easement to convey the stormwater runoff from our property to the nearest public stormwater drainage infrastructure or Council approved discharge point, being _____

This will require you to grant me/us a drainage easement through your property with all legal and survey costs for the creation of the easement being borne by us, together with any consideration for the use of your property as determined by an independent valuation or agreement. (Attach independent valuation or agreement to this form).

The other alternative is to install an underground absorption system or level spreader (if appropriate for this site) to spread and disperse the stormwater flow. As the runoff and seepage from this system may flow towards your property because of the slope of the land, the best solution would be to have a drainage system that will convey our stormwater via an inter- allotment drainage pipe to _____

You are advised that if Council determines that the only way for the drainage of stormwater is via an easement through your property, I/we may have to use Section 88K of the Conveyancing Act 1919 to request an appropriate Court to grant me/us the drainage easement. This will probably result in legal expenses and time spent for both you and me/us.

Could you please indicate your position regarding this matter so that we can advise Council to enable our application to progress?

YES I / we are willing to grant you a drainage easement.

Name _____ Address _____

NO I / we are not willing to grant you a drainage easement.

Name _____ Address _____