

DEVELOPMENTS

1. INTRODUCTION

This section provides guidelines regarding vehicular access and drainage for developments other than major subdivision (being the subject of other sections within this Manual). In general terms this includes all development requiring vehicle access to property from a public road. Specifically, this section provides extended detail for industrial, business, medium density residential developments, small-scale subdivision without creation of a public road, (generally applying to the creation of up to 4 lots) and where re-subdivision of original residential lots is proposed for purposes of development over and above a single dwelling on the land.

2. RESPONSIBILITIES

Particular attention is drawn to relevant responsibilities and requirements of developers and consultants within Chapters 1, 2, & 3 of this Manual.

2.1. INSURANCE

The applicant/contractor/land owner should ensure that he/she has sufficient and current insurance cover for Public Liability and Workers Compensation particularly in respect to works on the public road, in relation to this Manual. A Householder's Policy may not be adequate for works on a road reserve.

2.2. PUBLIC UTILITIES

It is the applicant's responsibility to check whether the proposed works affects any Public Utility mains installation or any proposal for new mains. Council cannot guarantee that future "openings" within the road reserve for the installation of mains, will not be required.

Where underground works within the road reserve are required or necessary for supply of services to the development site (such as water, sewer, electricity, gas), further consent for a "Road Opening" must be obtained from Council.

Contact:

"DIAL BEFORE YOU DIG"
(for telephone, gas, electricity, water and sewer locations)

2.3. SAFETY OF WORKS

For works within the road reserve, the applicant or contractor, or land owner is responsible to erect and maintain approved standard safety devices such as fencing, barricades, signs and where necessary, lights in accordance with Council's standards and requirements. The work-site shall be kept in a tidy condition, and maintained safe for pedestrian access for the duration of the work.



Upon completion of works and removal of formwork, barricades, etc, the adjacent footway shall be filled or trimmed along the edges of the works to an even grade with a maximum slope of 1 in 8 (i.e. a 100mm rise or fall over a distance of 800mm).

2.4. REMOVAL OF DEFECTIVE WORKS

Council retains the right to alter, repair or in some cases, remove and replace any work on public reserve/land for which approval has not been obtained, or that has not been carried out in accordance with this Manual, or is considered unsound or unsafe, or is of poor workmanship. The work would be undertaken by Council at the full cost of the responsible person, recoverable in accordance with the Roads Act.

3. DRIVEWAYS (AND ASSOCIATED WORKS WITHIN THE ROAD RESERVE)

The objective of this part is to ensure that development has a safe, practical and a durable vehicular access between the property boundary and the public roadway, and that the driveway within the property satisfactorily caters for vehicle loads and manoeuvring with acceptable gradients. Driveway design must take into account safety for all road users maximising sight distances based on design guidelines detailed in Austroads standards Part 3 (particularly relevant to a rural environment), and in Australian Standards 2890 for access driveway locations and exits, (being particularly relevant to an urban environment). (See also section 5 as follows and the topic *Intersections*)

Works within the road reserve must not commence until an approval is gained from Council through the "Application to Construct Works on Footway" form which is available on the Council web-site.

3.1. DRIVEWAY SPECIFICATIONS

3.1.1. Width

For residential development a "single" driveway slab pavement width of 2.7 metres is a desirable minimum. Tapered splays up to generally maximum overall width of 3.5m at the roadway are desirable to assist vehicle approach entry to the property. A "double" driveway servicing a dwelling may generally be up to 6.0m wide. Where drive-strips are installed their width should taper to cater for vehicle turning wheel paths (see SD015).

For business & industrial developments the driveway shall cater for the expected design vehicle turning paths determined by AS 2890.

For rural access the width shall be sufficient to cater for the expected usage and be a minimum of 5.0m, with additional width for splays at the junction with the edge of the road.

3.1.2. Construction Specifications

For urban residential developments the driveway, incorporating the gutter crossing, shall be provided in accordance with Council's Standard Drawings SD007, SD008, SD009, SD010, SD011 & SD012 as either, reinforced concrete, segmental pavers on a concrete base, or bitumen/asphalt seal on a compacted gravel pavement.

For heritage areas vehicular driveways shall comply with standard drawings SD014 & SD015. Concrete colour should be employed in accordance with Council's requirements for heritage areas.

For business & industrial developments, the driveway, incorporating the gutter crossing, shall be provided in accordance with Council's Standard Drawings SD007, SD008, SD010 & SD012, as "Commercial/Industrial Driveway" concrete construction, or as designed by an engineer to cater for the expected (heavy) vehicle loads.

For rural developments, the driveway shall be provided in accordance with Council's Standard Drawing SD013. Driveways crossing roadside table drains should be installed as a dished crossing. Where the depth of the drain renders a dish impractical, a 5m long, 375mm diameter (min) concrete class 4 pipe (or equivalent Fibre Reinforced Concrete pipe) with headwalls, shall be provided. The table drain shall be diverted so that the pipe is located a minimum of 2m from the edge of the road bitumen. The pipe size shall provide sufficient capacity for the 10-year ARI storm event for the contributing catchment area with larger overflows being contained by the road pavement/reserve. The crossing shall be of compacted gravelled (200mm minimum thickness), with a 2-coat or asphaltic bitumen seal from the edge of the existing road seal to the property boundary or as shown on Council's standard drawing SD013.

3.1.3. Profiles

Driveway profiles shall be designed and drawn showing levels for both the design surface and the existing surface, complying with the specifications for high/low level driveway construction indicated on Council's Standard drawing SD008.

The designer/builder should endeavour to match the existing surface levels as close as possible whilst complying with the standard profile. Minor cuts and fills of up to 120mm may be acceptable in a footway provided 14:1 slopes are achievable as transitions to the adjoining existing surface levels. The slope across the driveway must follow the same grade of the kerb and gutter up to a point 3.2m from the kerb face, from which point the slope may be varied to suit property/garage levels. Where requested by Council, provision of a 1.5m wide section within the driveway crossing, with a grade of 2.5%, for a future footpath, shall be applied. See standard drawings examples SD058 & SD059.

The designer/builder should ensure that, for a property on the low side of a road, the potential for major stormwater flow within the road pavement/gutter to enter the property via the driveway, is avoided. The purpose of the design profile is to contain flows in the roadway.

3.1.4. Clearance

Driveways should provide an absolute minimum of 300mm (desirable minimum, 500mm) clearance from the edge of obstacles such as trees, poles etc. The minimum clearance to stormwater drainage lintels/grates shall be 600mm (layback transition).

3.1.5. Table Drain Crossings

Where driveways cross a roadside table drain, a concrete dish crossing is the preferred option of crossing within the table drain in accordance with Council's Standard Drawing SD004. To achieve this, re-grading the surface by cutting within the verge and into the property may be necessary to avoid "scraping" of the vehicle.

3.1.6. Public Laneways (Existing)

Where permitted by consent, access within an existing public laneway (or unformed or informal "paper road") to property development is subject to an assessment of the existing road pavement (if any) and include construction or rehabilitation of the laneway to Council's standards, which shall be with either a bitumen sealed gravel or a reinforced concrete pavement, unless justified otherwise. Works shall be constructed in accordance with this Manual and the pavement shall be a minimum width of 3.0m. Pavement width may vary depending on type and ultimate volume of traffic usage, passing opportunity, length of works, sight distances, etc.

3.1.7. Driveway Crossings over Paths

Where an existing concrete path crosses the driveway, the path shall be retained such that the path appears continuous.

3.1.8. Removal of Paths

Where path removal is necessary, due to damage, added strength or level adjustment or for drainage pipes, the path shall be removed to the nearest existing joint and reinstated to match the existing path appearance (usually plain concrete) dowelled to existing concrete and constructed in accordance with Council's Manual of Engineering Standards.

3.1.9. Verge Damage

Damage to any existing verge or path, due to building construction activity, should be avoided. Restriction of access to the building site should be made to confine potential damage to a single point. Any necessary reinstatement of the verge (with full turf cover) or path (with new reinforced concrete) must be made prior to "Occupation" of the development, and be in accordance with Council's requirements.

3.1.10. Redundant Laybacks

Redundant laybacks shall be removed and reinstated with integral kerb and gutter, and footways and road surfaces restored to match existing surfaces.



3.1.11. Lintel & Grate Adjustments

Council will only permit adjustments to street drainage pits, whereby extended kerb inlet lintels are replaced with heavy duty “V” grates, if the designer can demonstrate that the stormwater inlet capacity of the street drainage system is not compromised. Otherwise the applicant must construct a replacement pit with an EKI lintel to Council’s standards. The surplus lintel and/or grate shall be delivered to Council’s depot in good condition.

4. DRIVEWAY HANDLES (WITHIN THE PROPERTY)

Driveway access handles should be designed to achieve:

- Opportunity for landscaping to avoid the “gun-barrel” effect (particularly for Residential areas)
- Reduced impervious surfaces, and to introduce a “soft” appearance such as utilising driveway wheel-strips (for Residential only)
- Opportunity for passing and storage of vehicles with adequate pavement width at the end of the handle adjacent to the road reserve (or in long or angled handles, part-way where adequate sight-lines are available) for vehicle storage/passing within the handle. In residential areas, typically passing areas adjacent to the public road should be a minimum of 5.5m wide for a length of 8m from the road boundary, with splays at the edge of the roadway to an overall width of 9m.
- Provision for services to properties within and along the full length of each individual access handle
- Avoidance of concentrated stormwater runoff onto adjoining properties

Rights-Of-Carriageway, in lieu of “handles” may be acceptable, but only due to site constraints, such as an existing dwelling where building setback distance may be problematic.

4.1. DRIVEWAY CORRIDOR WIDTH

In the absence of any approved corridor widths under development consent, see section 4.5 in this Manual. The table of widths is reproduced below.

HANDLE WIDTH (M)

ZONING ¹	SINGLE HANDLE ²	DUAL HANDLES ³	PAVEMENT WIDTH ⁴
Residential (R1)	3.5	3.0 ^{5,6}	2.7 ⁷
Residential (R5-V & X)	3.5	3.0	2.7
Residential (R5-Y)	4.5	3.0	2.7
Residential (R5-Z)	6.0	3.0	2.7
Business (B) & Industrial (IN1)	6.0 ⁸	4.0	3.3 min ⁹
Rural (RU)	6.0	4.0	3.5

Notes:

- (1) For zoning criteria see chapter 2.
- (2) For a single allotment.
- (3) Each handle width for two adjoining lot handles, with a single driveway covered by a full-width reciprocal ROC.
- (4) For single lane.
- (5) Three metres (x2) permits vehicle passing within o/a 6m width for each residential zone. It is assumed regular conflict is unlikely and "give-way" will apply in residential zones.
- (6) Where lots are >600m² (excluding handle), having potential for further subdivision, adopt 3.5m.
- (7) Where lots have potential for high density development with regular traffic movements, adopt 4.8m, preferably as two carriageways with a 400mm grassed separation.
- (8) Increase to 8m where regular two-way conflict is likely.
- (9) Generally for one-way or minor two-way movements with "give-way". For two-way movements with regular traffic conflict 6.0m min should be provided.

4.2. DRIVEWAY SPECIFICATIONS

4.2.1. Width

A driveway pavement width of 2.7 metres is desirable, with a general maximum of 3.0m. A "double" driveway shall be 5.0m to 6.0m wide subject to the type of vehicle usage.

4.2.2. Construction Specifications

Driveways for residential land-use shall be constructed in reinforced concrete, segmental pavers, bitumen or asphalt on a suitable depth of compacted road-base materials. "Shared" driveways covered by a Reciprocal Right of Carriageway, Common/Community Property, etc and driveways for business and industrial land-use shall be reinforced concrete. All driveways shall be constructed in accordance with Council's standard drawing SD012.

4.2.3. Grade

The recommended maximum driveway grade is 4 Hor : 1 Vert (25%). Refer to standard drawing SD008. Wherever possible, driveways within the property should be graded to evenly shed water runoff to adjacent landscape/grassed areas within the property, such that runoff is not directed as concentrated flow directly onto adjoining property. Stone/sand-filled trenches adjacent to drives are desirable to enhance infiltration, providing a subsoil outlet is available at the low-point in the trench-line. Otherwise, stormwater collected from the driveway should be piped to the on-site, or street, drainage system.



5. VEHICLE ACCESS, PARKING AND TURNING

Vehicle access to on-site parking areas shall comply, as a minimum requirement, with Australian Standard AS 2890. Layout geometry for manoeuvring and parking should in the first instance be assessed under Council's Citywide DCP, catering for the design vehicle appropriate for the development. Vehicle movement to and from the site shall conform with best practice design for sight distance, approach angle, pedestrian and cyclist safety, convenience and safety for traffic for through-traffic and turning-traffic flow, and must be executed in a forward direction for exiting traffic. Generally, only for single-lot residential access may traffic reverse onto a public road, although special circumstances such as high traffic volumes, sight distance, adjacent, traffic facilities, etc may dictate otherwise, at Council's discretion.

5.1. PAVEMENT

5.1.1. Sealed

Off-street vehicle parking shall comprise of a wearing surface of either a 2 coat bitumen seal, asphaltic concrete, rigid concrete, or segmental block pavement on a constructed foundation (pavement), designed by an engineer. Heavy-vehicle loading and manoeuvring areas should be rigid pavements.

5.1.2. Unsealed

Where pavement "hardstand" is intended to be un-sealed for purposes of storage of materials or similar use, it is essential that silt controls are put in place. Controls should be implemented by means of surface flow with perimeter (or internal) grass swales (instead of an internal pipe system) and a depressed grassed silt trap retention area incorporating a pit-trap at/near the point of discharge from the site (usually within a landscaped area). The built-in detention features provided may be quantified for the hardstand catchment area only. The hardstand material shall be stabilised with lime or cement depending on the sourced material.

5.2. TURNING PATHS

Vehicle manoeuvring templates, in accordance with Austroads or Australian Standards shall be employed for each appropriate vehicle type for the nominated land-use.

Turning paths shall be applied for the appropriate vehicle to maintain unobstructed "free-flow" conditions within the site for service vehicles such as small rigid vehicles (SRV) and heavy rigid vehicles (HRV) where required.

5.3. INTERSECTIONS

Where determined by Council, and generally for developments that generate high/heavy-vehicle traffic movements an access intersection treatment may be required at the junction with the public road. An example of an absolute minimum intersection treatment (catering for basic right and left turns) is shown on Council's Standard Drawing SD031 and incorporates treatment for one or more of the following aspects:

- Access entry/exit
- Passing lane
- Deceleration lane

Council's preferred treatment for access to such developments is for intersections that comply with the "Warrants for Basic, Auxiliary, and Channelised Turn Treatment" types as set-out in Austroads Standards (Part 4A). Guidelines for intersection/driveway demand may be determined from Section 3 of AS2890.1 whereby the "Access Facility Category" for categories 3, 4 & 5, in the first instance be assessed as "intersections" rather than "driveways" (See section 3.2.3). Despite such warrants and demands, particular consideration shall be given to providing a protected right-turn and a separated left-turn capability. Left-turn treatments should allow generous turning paths to facilitate continuous free-flow manoeuvres. Such features as describe above may include road reserve and road pavement widening.

Intersections for access shall cater for Articulated Vehicle (AV) turning paths, including "B-Double" where required (and approved) by the type of the development.

6. ANCILLARY OFF-SITE WORKS

All works within the road/public reserve shall be designed and constructed in accordance with this Manual. Road works cannot commence without consent under the Roads Act.

6.1. ROAD, FOOTWAY AND DRAINAGE

Works may be required through development consent, to up-grade the existing road verge and/or pavement, and/or drainage system, generally limited to the frontage of the development site, although may be extended beyond the property frontage to connect to existing infrastructure.



Warrants for such works may be:

- continuation of existing adjoining, or nearby, infrastructure to cater for the additional usage needs created by the development and to enhance the streetscape
- where works coincide with Council's *Management Plan*.
- where pedestrian, cycle and vehicle traffic movements/parking are significant or where "desire-lines" of travel result from the development activity.

Typically, works that may be required are:

- Re-shaping and turfing of footway
- Concrete paths
- Concrete dish drain or integral kerb and gutter
- Road shoulder pavement including a bitumen wearing surface
- Pipe and pit drainage

Materials for new pavement works shall be consistent with or similar to the existing adjoining road pavement in accordance with the specifications of this 'Manual'.

6.2. CONCRETE WORKS

Concrete works, such as paths, shall be designed and constructed in accordance with this Manual, with particular attention given to:

- Depth and Strength
- Formwork and Reinforcing
- Joints
- Curing
- Testing (where requested by Council)
- Weather Conditions

6.3. INSPECTION OF WORKS

All works within the road/public reserve are subject to testing, and inspection by Council to ensure compliance with this Manual and/or manufacturer or material supplier specifications where not covered by this Manual. Refer to chapter 7 regarding the inspection regime.



7. STORMWATER DRAINAGE

7.1. AIMS AND OBJECTIVES

The following development standards should be used to provide

- best practise hydraulic engineering designs for development sites and,
- to provide a sensitive approach to the environment by the employment of Water Sensitive Urban Design (WSUD) principles.

The objectives of this section are to ensure that:

- the wider community is not disadvantaged by any one individual development
- the development site caters for stormwaters discharging onto the site
- stormwater discharging from the development site satisfies any Council planning scheme and water quality objectives for overall public drainage systems within the wider area.
- the redirection and concentration of stormwater runoff onto adjoining properties, is avoided.

The outcomes of these objectives are to ensure that :

- collected stormwater is discharged in an appropriate manner to a servient drainage system or public drainage system
- development which generates increased flow rates from stormwater runoff (greater than the site's "pre-developed" rate) from impervious areas such as driveways, paths and roofs, adequately addresses potential adverse affects on downstream properties.
- stormwater runoff entering the site from an adjoining upstream catchment, satisfactorily passes through the site without adversely affecting the development site by means of inter-allotment drainage benefitting the appropriate adjoining property(s).
- development sustainably manages the water cycle with sensitively designed, constructed and maintained systems, that may include,
 - rainwater collection for use within dwellings and on landscaping
 - minimising impervious surfaces
 - water retention within landscaping
 - underground stormwater infiltration
 - treatment of stormwater leaving each site, to a satisfactory level of quality
 - construction sites that are adequately protected to prevent the movement of litter, sediment, nutrients and hydrocarbons from the site during wet weather.

7.2. DESIGN PLANS

Design plans should be prepared by a suitably qualified person and should reflect the following principles:

- All developments that generate stormwater runoff from impervious surfaces, and where landscaping, filling/cutting or contouring reshapes or alters flow paths, must be detailed on a stormwater drainage plan. The plan should be consistent with the landscaping design, but should be provided as a separate drawing.
- The design should address potential impacts, such as erosion and downstream discharge effects.
- The stormwater drainage plan should be submitted with the development application, and should include details of; natural and design surface levels, building floor levels, driveway layout, down-pipes and underground pipes and their sizes, overland flow paths, easements (if any), on-site detention tank (if required), pits and any relevant object that may affect drainage, such as gardens, kerbs, retaining walls etc.
- The plan, whilst not necessarily adequate for construction purposes should be prepared by a person who is qualified and competent in drainage design principles, and upon approval, will subsequently be the basis for a Construction Certificate prepared and certified by a qualified person showing full construction details.

7.3. DESIGN STANDARDS

Drainage design shall adopt the principles of major/minor drainage system in accordance with the publication Australian Rainfall and Runoff (AR&R) and as detailed at chapter 6 of this Manual. All calculations shall be carried out by persons competent, qualified and experienced in hydrologic and hydraulic design, utilising drainage models that are accepted as current industry standards.

The major system shall provide safe overland flow conveyance for the 1% AEP storm event, whilst the minor system shall be capable of conveying runoff from minor storm events within underground pipes.

7.4. CALCULATIONS

Calculations (if required by Council) shall show all adopted coefficients to determine peak flows in accordance with Australian Rainfall and Runoff and this Manual.

The adopted time of concentration shall be for the ultimate developed catchment. The general maximum time of concentration shall be 5 minutes for catchments up to 2000m², although a range of 5 to 10 minutes may be justified in certain circumstances.

7.5. DISCHARGE FROM THE SITE

7.5.1. Gravity Pipe Flow

Final discharge of collected stormwater runoff from development sites shall be directed:

- by pipe to the roadside table drain or drainage channel with a concrete headwall/outlet protective structure or,
- by pipe to the street kerb and gutter with a kerb adapter in accordance with Council's Standard Drawing SD036 or, if Heritage Stone Kerb is located in the road kerb, by coring (refer to Maitland City Wide DCP and the Morpeth Management Plan) or
- by pipe to the kerb outlet provided in the existing kerb or
- to the existing pipe provided at the property boundary or
- by pipe to the rear of the existing drainage pit in the street with a flush-mortared finish or
- to an Inter Allotment Drainage line junction point provided for the property.

In the absence of inter-allotment drainage, points of discharge of concentrated stormwater onto an adjoining property, is not permitted without the written approval of the affected property owner(s). This scenario may apply to adjoining large residential or rural properties.

7.5.2. Charged Pressure Head

Charged pressure head systems are permitted where options for a gravity system are not available. The following criteria should be satisfied:

- a minimum of 1m of head, subject to design requirements
- a completely sealed system to the property boundary
- metal or high-grade plastic downpipes (90mm PVC pipe not permitted)
- 100mm stormwater grade underground pipes (90mm PVC pipe not permitted)
- A cleaning flush-point into a soakage pit/well
- Gravity flow from the boundary to the drainage system

7.5.3. Pumping

Collection of stormwater runoff for pumping to a high-level discharge point is not desirable and may only be permitted by Council in special circumstances, such as carparking areas and associated driveway ramps.

7.5.4. Footway Crossing

The minimum conduit treatment for the footway crossings shall be with 100mm diameter sewer grade PVC pipe. In some situations where there is potential for pipe damage due to heavy loads, galvanised rectangular hollow section (RHS) steel may be desirable/required.

Where a pipe is to pass under a concrete path, and it is necessary to remove the path, a complete jointed section must be removed and replaced with a similar dowel-jointed slab section in accordance with this Manual. (See SD012).

Contractors should inquire regarding the possibility of the presence of an existing discharge point provided at the property boundary. Where a pipe exists the contractor must check that the pipe is not damaged and is operating satisfactorily. Damages must be repaired.

7.6. INTER – ALLOTMENT DRAINAGE (IAD)

Within a subdivision or development, where inter-allotment drainage is necessary the following applies:

7.6.1. Pipes

The pipe system shall be designed to accept concentrated flows from buildings and paved areas on each lot for 10 year ARI storm event, without surcharge, and be based on impervious fractions nominated in chapter 6 of this Manual. Careful design should ensure that surface flows are directed into the new drainage system.

For the conveyance of flows from a subdivision for single dwelling allotment to the public drainage system (typically through an easement on an adjoining property or along a battle-axe handle) the minimum requirements shall provide for a 100mm stormwater grade PVC pipe at a minimum grade of 1%. Such a pipe may only be utilised for the single lot. Where other stormwater discharge is necessary for an adjoining development, the pipe must be upgraded to the appropriate size (typically 150mm for two dwellings) or be an independently piped system. Pipes shall have minimum cover of 300mm where concentrated surface loads are not present. The absolute minimum grade shall be 0.5% and is subject to design to ensure adequate capacity. Where more than one pipe occurs at the property boundary a grated surcharge pit shall be installed within the property and a single pipe in accordance with this Manual, provided across the footway.

7.6.2. Pits

Pits shall be provided generally to the lowest point of the lot served, and shall be provided for maintenance access, change in pipe direction, grade or size of pipe and at multiple pipeline junctions. As a guide, pit dimensions may be adopted similar to those shown in chapter 6 of this Manual. Pits within the easement shall be concrete, of minimum size of 450mm x 450mm, with a galvanised steel grate. The pit should be depressed below the surrounding surface by 100mm (min) to enhance entry flows.

7.6.3. Easements

Where an agreement is reached regarding stormwater drainage, inclusive of an easement, a letter and a plan of the easement shall be signed and submitted as evidence of the agreement, prior to issue of development consent and the easement be registered, or lodged for registration, prior to issue of any Occupation Certificate.

Easements shall be provided over pipe systems and overland flow paths (where necessary). The general minimum width of easements shall be 1.5m. Overland flowpath widths may determine that the easement be a greater width. For single dwelling drainage an easement width of 0.9 is acceptable. Refer to chapter 6. Also from Chapter 6: "Where new lots (or development) adjoin existing properties, minor/major flows from those properties shall be catered for with a pipe/pit/flowpath system, covered by benefiting easements."

Where an existing drainage line traversing a development site does not have a covering easement, that pipeline shall be covered by an easement registered onto the title of the property prior to issue of any Occupation Certificate.

7.6.4. Structures / Easement Relationship

Generally, building of a structure over a drainage easement is prohibited due to possible restriction to accessibility. Exceptions may be considered by Council where the structure is relatively light and readily removable, such as a carport or garden shed.

For any concrete slabs extend over an easement, the slab shall be dowel-jointed on the line of the easement. Segmental pavers are acceptable.

Where an overland flow path exists within an easement, obstructions (such as kerbs, gardens, sheds etc) and structures are not permitted. Correctly shaped concrete slabs, such as for a driveway are permitted.

7.7. FREEBOARD

Habitable floor levels adjacent to a flow path or surface detention area shall have a minimum freeboard of 300mm. Non-habitable floor levels, such as garages, shall have a minimum of 150mm freeboard.

7.8. ON SITE DETENTION (OSD) OF STORMWATER

In principle, on-site stormwater detention shall be provided for industrial, business and residential developments where provision has not been made for those developments within the public drainage system. Despite the provisions of this section development consent may nominate specific details of Council's requirements.

In support of the implementation of Water Sensitive Urban Design (WSUD), the basic principles of water reuse, "slow" release discharge and in-ground infiltration of runoff, are required, and are considered part of the detention principles. Therefore, despite alternative methods of calculation, a drainage design is deemed to be satisfactory if the following guidelines (parameters) are adopted in the drainage system.

7.8.1. Industrial & Business

For industrial and business development sites that are located in areas that contain major downstream detention facilities consistent with chapter 6 of this Manual, OSD is not required.

("Retention" of stormwater runoff for pollution control and to achieve WSUD treatments may be necessary, independent of OSD requirements - see Section 8)

Otherwise, in areas without public-facility detention, or where due to particular downstream constraints detention is considered by Council as necessary, the following parameters apply:

INDUSTRIAL/BUSINESS DETENTION PARAMETERS

OSD MINIMUM (PER 1000m ² SITE AREA)	PSD MAXIMUM (PER 1000m ² SITE AREA)
19m ³	9 Litres / Second

In areas where downstream detention is provided, but is limited and may not conform to chapter 6 of this Manual, the above parameters may be apportioned appropriately.

(In particular, the Rutherford Industrial area bounded by Racecourse Rd, Shipley Dr & Bradmill Ave, an OSD volume of 12m³ per 1000m² and a PSD of 12 litres /second per 1000m² may be adopted)

7.8.2. Residential

Stormwater detention for residential development applies to new development where an additional dwelling (or dwellings) creates impervious surfaces beyond that of an average single dwelling. This principle includes subsequent development of a subdivision of an original “parent” allotment within residential areas where site density of the nominal parent allotment is increased as a result.

Within a vacant site the development as a whole provides detention as specified under this section. Where the new development is on a site with an existing dwelling, only that part that is new provides the specified detention - detention is not required for the existing dwelling.

Where the development footprint creates small amounts of impervious areas (such as for one or two bedroom units) the designer should rationalise the site and apportion the areas against an average dwelling, and apply detention on a pro-rata basis.

Refer also to “General Requirements” below.

7.8.3. Detention with “BASIX” rainwater harvesting

For the usual residential development sites, OSD principles can be satisfied with a minimum detention volume of 2.5m³ per dwelling. Note that this amount is in addition to BASIX requirements.

For purposes of achieving Water Sensitive Urban Design (WSUD) principles, the nominated 2.5m³ should be apportioned between the tank and in-ground infiltration/storage, with (not less than) 1.5m³ within the tank, and (subject to section 8 below), not less than 4.5 lineal metres of underground “Infiltration Trench” achieving the principles of standard drawings SD052 & SD053. The first flush by-pass from the roof drainage (for cleansing purposes), and the tank overflow pipe, should be connected to the infiltration trench.

The designer should reference ‘BASIX requirements’ for the development in order to provide adequate tank size for both water re-use and for detention storage volumes.

Within such a system all roof water runoff (some exceptions may include small patio covers) should be collected and the tank must be plumbed into the household water supply. A slow release outlet in the tank at the necessary height shall be provided (see SD052).

7.8.4. Detention without “BASIX” rainwater harvesting

For residential development where rainwater tank detention as part of the BASIX system is not employed, whether in existing (older) or in new subdivision areas, the following guidelines for OSD apply:

INDUSTRIAL/BUSINESS DETENTION PARAMETERS

OSD MINIMUM (PER 1000m ² SITE AREA)	PSD ^(A) MAXIMUM (PER 1000m ² SITE AREA)
7m ³ ^(b)	15 Litres / Second

Notes:

- (1) Permissible Site Discharge (PSD)
- (2) Up to a maximum of 3.5 m³ per dwelling

For purposes of detention of impervious ground surfaces, up to 50m² of runoff from those areas may discharge from the site, un-detained.

Detention of impervious areas exceeding 50m² such as long driveways and large vehicle-turning areas, shall be provided at an equivalent rate of 1.8m³ per 100m² with a PSD of 1.5l/s per 100m². This detention calculation must be based on the total impervious ground-surface area, including the first 50m².

7.8.5. General Requirements

Stormwater detention may be provided either as under-ground, surface depression or above-ground storage, or by a combination of any of those methods, providing the site PSD is maintained.

In recognition of physical constraints, Council will consider alternative site-specific designs.

Where a medium density development is proposed, OSD systems shall be calculated for the whole-site area and should be apportioned between the structures, relative to their contributing surface areas.

Where medium density development may be subject to future subdivision, Torrens or Strata, each dwelling/unit should be provided with an independent detention system. If independence is not achievable, drainage easements may be necessary.

At locations deemed by Council to be subject to special circumstances due to downstream drainage problems or for other reasons, the above requirements may be altered by Council to suit those circumstances.



When Council provides drainage plan certification and inspection for construction compliance, a fee, as per Council's Schedule of Fees and Charges, must be paid to Council prior to issue of the Construction Certificate. The fee applies to single development sites as approved under development consent.

Where development sites are greater than 3000m², the following requirements apply:

- Design plans and calculations shall be certified by a suitably experienced civil engineer, a registered surveyor, or other persons with acceptable competency and experience in Hydraulic and Hydrological design.
- Storage volumes shall be calculated in accordance with the principle set out in Australian Rainfall & Runoff. Large storage volumes shall be based on modelling using time area hydrograph methods.
- Calculations shall be submitted to Council.

In all cases where OSD is employed, the following matters shall be addressed:

- Drainage detention and storage devices shall be designed in accordance with Australian Standard for Plumbing and Drainage AS3500.3
- All metal components shall be hot dipped galvanised steel (after fabrication), aluminium or stainless steel, and fastened using 10mm (min) stainless steel fasteners.
- Maximum depth of ponding shall be 200mm in driveway/parking areas and 300mm (desirable maximum) in accessible landscaped areas.
- The volumes of hydraulically independent (with different surface ponding levels) detention areas shall be calculated separately and shall have separate outlet controls.
- The detention area shall be designed such that the major storm event (100-year) can safely overtop the area with no adverse impacts on the immediate surrounds, buildings and adjoining properties. An overland flow path must be incorporated in the design.
- Detention outlet design shall assume maximum pressure head.

As the development site requires, OSD designs may need to address the following matters:

- A hydraulic grade line assessment based on outlet control operating at the major flood level
- Potential for backwater pressure from the street drainage system to enter the detention system
- A "staged" pit-controlled discharge other than an outlet choke/conduit arrangement providing a tamper-proof orifice such as a buried pipe reducer (see SD052). Minimum orifice choke size shall be 25mm. An outlet less than 90mm diameter shall be screened using a mesh screen.

7.9. CERTIFICATION & WORKS AS EXECUTED DRAWINGS

Stormwater drainage, involving On Site Detention (OSD), shall be certified in construction, by a suitably qualified person. Works-As-Executed drawings may be required by the Principal Certifying Authority to verify works, in particular, finished surface levels and storage volumes. The certification and/or WAE drawings shall verify:

- finished surface levels
- the pipe/pit system
- storage volumes
- discharge control devise(s)
- overland flowpaths

8. STORMWATER QUALITY

Developments that generate stormwater runoff from areas that may be a source of pollutants shall provide a means of “polishing” of the runoff prior to its discharge from the site. Of particular importance are sealed car-park areas servicing industrial and business complexes. For unsealed pavements see “Pavement” section above).

8.1. MAINTENANCE OF DEVICES

The stormwater drainage systems incorporating runoff quality control treatments must be inspected on a regular basis and maintained in working order. A “Stormwater Maintenance Plan” for on-going execution by the owner/operator of the site shall be included in the stormwater design for the site, nominating an inspection and cleaning/replacing regime for all drainage components. The following items (but not limited to) should be included:

- pits, with filter materials, silt traps in the base, orifice plates and litter grates, ensuring satisfactory operation
- detention tanks, ensuring clean and satisfactory operation
- pipes, ensuring clean and free-flowing
- surface swales and silt-trap basins, ensure mowed and removal of collected silt
- open discharge points, ensuring clear of debris and satisfactory scour protection
- non-return valves, ensuring satisfactory operation
- overland flow paths, ensuring free from obstruction

8.2. WATER SENSITIVE URBAN DESIGN (WSUD)

8.2.1. General Requirements

All developments covered by this chapter are required to incorporate Water Sensitive Urban Design (WSUD) principles regarding the treatment and discharge of stormwater runoff. Developments will generally require a combination of a number of treatments to be provided which is known as a “treatment train”. Such treatments may include:

- Rainwater Tanks
- Gross Pollutant Traps (GPT)
- Bio-retention Beds – Surface vegetated depressed area underlaid by a bio-retention filter layer and subsoil pipe, which do not generally involve flow conveyance but have an overflow to the drainage system. Refer to SD047.
- Infiltration Systems –Underground storage in voids, combined with a filtering sandy soil depression (where possible), for infiltration into the surrounding soil. This method does not involve surface-flow conveyance, but has an overflow to the drainage system. (Refer to SD053 which provides for slow release of stored water via a socked subsoil pipe where infiltration into saturated surrounding soil becomes ineffective). Refer also to the publication Australian Runoff Quality section 11 regarding trench locations in various soil types.
- Wet Basins
- Dry Basins
- Vegetated Filter Strips
- Sand Filters
- Contour banks/berms
- porous paving
- Constructed Wetlands



In order to achieve an effective WSUD “treatment train” is suggested:

- Drainage System to collect and deliver stormwater from impervious areas to the treatment train, eg roof gutters, downpipes, paths and driveways, etc.
- Pre-treatment system, eg leaf guards, first flush device, where leaves and dust may be prevalent.
- Rainwater tank for non potable reuse including toilet flushing, washing machines and site irrigation.
- On site detention (OSD). Note OSD for small medium density developments may be provided by a combination of upsizing and reconfiguring the rainwater tank and by providing additional storage and water quality in an underground infiltration trench. Refer to this chapter above and SD052 and SD053.
- Rain Garden.
- Vegetated Filter Strip.
- Mulching
- Garden Bed or Contour Bank.
- Porous Paving.
- Turf.

Regarding underground infiltration (SD053) the system should:

- not be trafficked unless specifically designed so.
- be located such that structural foundations and adjoining properties are not adversely affected.
- be provided with a subsoil drain relief pipe in clay soils.

8.2.2. Erosion & Sediment Control (ESC)

Pollutants carried in stormwater runoff, generated from building activity, vehicle parking, manoeuvring, and hardstand areas should be assessed for the potential adverse effects of sediment movement (by wind, water and wheel-tracking), and vehicle-sourced hydrocarbon pollution. Appropriate measures must be taken to contain pollutants, both during construction and as long term permanent treatments. Reference should be made to Landcom/Department of Housing guidelines “Managing Urban Stormwater”. An ESC Plan should be prepared as part of the drainage design for the site.

9. DRAINAGE EXTERNAL TO THE SITE

Stormwater runoff either entering or leaving the development site must be adequately addressed as part of a drainage design. Adjoining land should be investigated regarding natural surface flows and any existing piped discharge points. Where discharge of stormwater involves works on a public road reserve (other than that permitted in this chapter) such as adjustment of existing pits, new pits, extended pipelines beyond the immediate vicinity of the property, Council approval under the Roads Act must be obtained prior to commencement of works. Development consent under the EP&A Act does not apply for this purpose.

9.1. DISCHARGE FROM UPSTREAM

Where stormwater discharges onto the development site from adjoining properties that discharge must be catered for. Allowance should be made for discharge from a fully developed upstream catchment, (consistent with designated zoning), with provision made for major and minor storm events.

9.2. DISCHARGE DOWNSTREAM

Where stormwater discharges from the development site is at a level that prohibits discharge at the surface, consideration shall be given to the provision of standard underground street drainage (see chapter 6) to the closest point of discharge, such as an existing pit, pipe or channel. All pipes entering Council's existing piped drainage system from private property shall be connected at or with a concrete pit constructed in accordance with this Manual, or as a "saddle pit" over the existing pipe in accordance with an engineer's design.

Piped discharge shall be (for example, in large-lot and rural development) to a suitable watercourse and shall extend a minimum of 10 metres past a building or building envelope.

9.3. DOWNSTREAM DRAINAGE UPGRADE

The existing downstream drainage system may require investigation for its adequacy to accept stormwater runoff from the development site. Works may be required to provide an up-graded pipe system, being either a new pipe system where none exists, or an open channel, to an existing approved discharge point.