MoES – L 2025 (DRAFT)

Lot Scale Engineering

Manual of Engineering Standards

maitland
CITY COUNCIL

Table of Contents

L – Lot Scale Engineering

1. Introduction

This Document L: Lot Scale Engineering is part of the MoES Document suite. Document G: General Requirements serves as the main guide, explaining how this Document fits into the overall suite and providing other valuable information. This manual supports Maitland Development Control Plan (DCP) and should be read in conjunction with it.

This Document covers guidelines for vehicular access, drainage, and other topics for smaller-scale developments. This includes developments requiring vehicle access from a public road or an interallotment drainage system (private). This section also provides detailed guidance for industrial, business, medium-density residential developments, and small-scale subdivisions that do not create public roads or infrastructure. Small-scale subdivisions typically involve creating 2 to 9 lots with direct access from existing road frontage (without the creation of a new road), where the re-subdivision of original residential lots is proposed for development beyond a single dwelling.

Larger subdivisions or major developments that require new or upgraded public infrastructure will need to refer to Document D: Design and Document C: Construction of the Manual.

2. Driveway Crossings

Also known as footway crossings or vehicle crossings, a driveway crossing is the section of the driveway that spans over the road reserve, between the edge of the formed road pavement and the front boundary.

A technical document is provided for driveway crossings, as there are multiple ways a driveway can be applied for and required. These include as part of a Development Application with building construction, Complying Development, or as a standalone driveway application outside these processes.

Additionally, the subdivision of vacant lots must demonstrate that a feasible location for a driveway can be achieved for each lot.

Developers are required to use the Technical Document: Driveways to show that a compliant driveway location is proposed or, in the case of a vacant lot, that a suitable location can be achieved.

3. Driveway Handles

Driveway handles, sometimes referred to as battle-axe handles or access handles, provide lot access. These driveway handles may require a reciprocal right of carriageway or right of access, depending on the nature of the development and the access arrangement.

Council's DCP is the governing document for Development Applications when access easements and handle widths are involved within the property boundaries.

4. Vehicle Access, Parking and Turning

Vehicle access to on-site parking areas shall, as a minimum, comply with Australian Standard AS 2890. The layout and geometry for manoeuvring and parking should be assessed under Council's DCP,

ensuring it accommodates the design vehicle appropriate for the development. Vehicle movement to and from the site must follow best practice design for sight distance, approach angle, pedestrian and cyclist safety, and traffic flow, both for through-traffic and turning-traffic. All traffic must enter and exit the site in a forward direction.

Generally, only single-lot residential access allows traffic to reverse onto a public road. However, in special circumstances, such as high traffic volumes, limited sight distance, or adjacent traffic facilities, reversing onto a public road may decide otherwise at Council's discretion.

4.1. Pavement

4.1.1. Sealed

Off-street vehicle parking facilities 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.

4.1.2. 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.

4.1.3. 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), medium rigid vehicles (MRV) and heavy rigid vehicles (HRV) where required.

4.1.4. 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
- Deceleration lane
- Passing 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". 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 described 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.

5. 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 1993.

5.1. Road, Footway and Drainage

Works may be required through development consent to upgrade the existing road verge, footpath, pavement, and/or drainage system. This is generally limited to the frontage of the development site, although may be required to be extended beyond the property boundary to transition the works.

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.
- Where such works are required under the relevant DCP and other policies.
- 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 designed in accordance with the relevant road hierarchy outlined in this Manual of Engineering Standards, as well as the specifications provided in the attached ‘Appendix D: Pavement Material,’ unless otherwise directed by Council. For pavement reconstruction works, the design shall be consistent with or match the existing adjoining road pavement. Document D: Design outlines the requirements for part-width road construction where necessary.

5.2. Concrete Works

Concrete works, such as footpaths, shared paths, pedestrian pram ramps and kerb gutter shall be designed and constructed in accordance with the Construction Document and Council’s Standard Drawings, with particular attention given to:

- Concrete strength (MPa) and thickness
- Bedding specifications
- Formwork and Reinforcement

- Joints
- Curing
- Testing (where requested by Council)
- Weather Conditions

5.3. Inspection of Works

All works within the road/public reserve are subject to testing, and inspection by Council to ensure compliance with this Standard and/or manufacturer or material supplier specifications where not covered by Council's Manual of Engineering Standards. See also Document C: Construction regarding inspection regime.

6. Stormwater Drainage

6.1. Aims and Objectives

The following development standards should be used to provide:

- Best practice 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 caters for any relevant upstream stormwater 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 private (interallotment) 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 effects 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, which 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.

6.2. Design Plans, Standards and Calculations

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 shall 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 objects 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.

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 in Council's Manual of Engineering Standards Document D: Design. 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% Annual Exceedance Probability (AEP) storm event, whilst the minor system shall be capable of conveying runoff from minor storm events within underground pipes.

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 2000m^2, although a range of 5 to 10 minutes may be justified in certain circumstances.

6.3. Discharge from the Site

6.3.1. 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 in the road kerb, by coring (refer to Council's DCP and the Morpeth Management Plan), or

- By pipe to the existing kerb outlet provided in the kerb, 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 provided for the property, or
- By pipe to the defined watercourse (a drainage easement may be required if the legal point of discharge is located on a neighbouring property).

Discharging concentrated stormwater at the adjoining private property is not permitted. This also applies to adjoining large residential or rural properties. Public land and legal points of discharge may be considered if legal point of discharge, velocity, safety, scouring and maintenance impacts area acceptable to council .

6.3.2. Charged Pressure Head

Charged pressure head systems are permitted when gravity system options are not available, such as in cases where an existing lot does not slope toward the street and lacks an existing drainage easement. These systems will only be supported for single dwellings (i.e., no increase in density). Note: Proposals aimed at increasing the density of dwellings or land use will require appropriate easements.

The following criteria must be met for charged systems:

- A minimum of 1 metre 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.

6.3.3. 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 underground carparking areas and associated driveway ramps.

6.3.4. 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 Council's Standard Drawing.

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.

6.4. Inter-Allotment Drainage (IAD)

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

6.4.1. Pipes

The pipe system shall be designed to accept runoff from all existing and future lands for 10% AEP storm event, without surcharge, and be based on impervious fractions nominated in Document D: Design. 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 a single lot (with only one dwelling roof). 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.

The interallotment drainage system shall be connected to the street stormwater pit. Subject to hydraulic design, the following pipe sizes may be used as a minimum guide:

Inter-allotment Drainage Line Pipe Sizes

NO. OF DWELLINGS SERVED	PIPE DIAMETER
Up to 2	150mm
3 to 6	225mm
7 to 10	300mm

6.4.2. 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 SD043, or in accordance with AS 3500.3. Pits within the easement shall be concrete, of minimum size of 450mm x 450mm, with a galvanised steel grate. The pit shall be depressed below the surrounding surface by 100mm (min) to enhance entry flows.

The interallotment pit shall include a capped stub for the dwelling connection. Interallotment drainage pits must be a maximum of 1.2 metres deep to ensure reasonable access and maintenance by lot owners, without requiring excessive excavation for pipe replacement.

A minimum 3 metres long subsoil drain "lead-in" shall be installed in the inter-allotment drainage (IAD) line at every second pit upstream along the IAD pipeline, as well as at any location where there is a change in the direction of the pipe. This ensures proper drainage flow and minimises potential blockages or disruptions within the system.

6.4.3. Easements

When an agreement regarding the stormwater drainage easement is reached, a signed copy of the owner's agreement and an easement plan shall be submitted as evidence of the agreement at the DA stage. The easement shall either be registered prior to the determination of the development consent,

otherwise, the affected lot(s) must be included in the application before the DA determination. Following the determination, the easement shall be submitted for registration and registered prior to the issue of any Construction Certificate or Subdivision Certificate in accordance with the development consent, as applicable.

Easements shall be provided over pipe systems and overland flow paths (where necessary). The minimum width of easements shall be the greater of 1.5 metres or [(2.0 metres × trench depth) + pipe diameter]. Interallotment drainage lines must be located centrally within the easement and are limited to a maximum depth of 1.2 metre. The width of overland flow paths may require the easement to be wider. For subdivisions with single-dwelling allotments, an easement width of 0.9 meters may be accepted, where the pipe can run at a shallow depth (less than or equal to 600mm) and there is an existing structure along the proposed easement line to restrict the need for a greater width.

Where new lots (or development) adjoin existing properties, minor and major flows from those properties shall be catered for with a pit and pipe system and a 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 or Subdivision Certificate.

6.4.4. 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 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.

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.

6.5. On Site Detention (OSD) of Stormwater

On-site stormwater detention shall be provided for all developments. This requirement generally applies in cases where:

- The development exceeds site coverage requirements,
- The surrounding drainage network is outdated and undersized, or
- Provision has not been made for the development within the public drainage system.

Despite the provisions of this section, development consent may specify different requirements if the site-specific catchment or individual proposal warrants a higher or different standard.

Depending on the nature and scale of the development, on-site detention (OSD) systems can be categorized into (3) three levels for "small-scale" systems:

- Detention with "BASIX" Rainwater Harvesting
- Deemed-To-Comply tables
- Pre-Developed to Post-Developed Calculations

Determining the Detention Method to use

TYPE	DETENTION METHOD	DEVELOPMENT TYPES
Level 1	OSD in Basix rainwater Harvesting Tank *(Use Level 2 if not using Basix tanks)*	Residential buildings less than 1000m^2 in site area Minor additions (include secondary dwellings), single dwellings and dual occupancies
Level 2 Residential	Deemed to Comply Table - Residential (less than or equal to 3000m^2)	Building construction and Subdivision of vacant lots
Level 2 Industrial Business	Deemed to Comply Table - Industrial and Business (less than or equal to 3000m^2)	Building construction and subdivision of vacant lots
Level 3	Pre-Developed to Post-Developed Calculations	Greater than 3000m^2 – all development types

- In support of the implementation of Water Sensitive Urban Design (WSUD), the basic principles of water reuse (retention), "slow" release discharge (detention), and in-ground infiltration of runoff are required and considered part of the WSUD principles for Level 1 and Level 2. Therefore, despite alternative methods of calculation, a drainage design is deemed satisfactory for Level 1 and Level 2 if the guidelines (parameters) are adopted in the drainage system.
- Note: In-ground infiltration storage is not supported as a solution for detention in clay soils due to the extremely poor infiltration rates of the local soils. A sediment sump with a minimum depth of 300mm shall be installed within the property at the boundary before stormwater is discharged.

6.5.1. Level 1 - OSD in Basix Rainwater Harvesting Tank (less than 1000m^2)

Level 1 applies to single dwelling construction up to and including dual occupancy developments with a site area of less than 1,000m^2. This does not include the creation of vacant lots.

OSD principles can be satisfied with a minimum detention volume of 2.5m^3 per dwelling. Note: This volume is in addition to the BASIX volume requirements. At least 90% of roof areas must be connected to the rainwater tanks.

The designer should reference the 'BASIX requirements' for the development to ensure an adequate tank size for both water re-use and detention storage volumes.

All roof water runoff (with some exceptions for small patio covers) must be collected, and the tank must be plumbed into the household water supply. A slow-release outlet in the tank at the necessary height must be provided (see SD052).

SD052 provides an option where part of the volume is within a rubble infiltration trench. Sites with clay soils must provide 100% of the volume in the rainwater tank. Only two or three locations in the Maitland LGA, such as some parts of Lorn and Horseshoe Bend, contain sandy river soils suitable for infiltration.

- Offset requirements apply to trenches in relation to boundaries, slabs, and structures. The infiltration trench must be designed based on a site test report from a geotechnical engineer, confirming the soil type for trenches longer than 3 metre. The trench must be offset by a minimum of 2 metres from boundaries and 3 metres from buildings or structures, as confirmed by the design engineer. Additional offsets may be necessary to ensure the adequacy of footings and foundations near the trenches.

6.5.2. Level 2 - Deemed to Comply Table – Residential (less than or equal to 3000m2)

Stormwater detention for residential development applies to new developments where an additional dwelling or an existing dwelling creates impervious surfaces beyond those of an average single dwelling and does not comply with Level 1 OSD standards. This principle also includes the subsequent development of a subdivision from an original "parent" allotment within residential areas, where the density of the nominal parent allotment is increased as a result.

For vacant sites, the development must provide detention as specified in this section. Detention is however not required for existing roof areas that are retained. If the footprint is completely redeveloped, the existing footprint will not be credited, and the development must comply with the full storage requirements.

Rainwater tanks can contribute a maximum of 20% of the total required detention volume. The remaining capacity (a minimum of 80%) must be provided by the centralised detention system. For the rainwater tank detention capacity, the designer should rationalise the detention, apportion the areas of the dwelling, and apply detention on a pro-rata basis. Each dwelling and/or unit must be provided with a rainwater detention tank.

Residential Detention Parameters (less than or equal to 3000m²)

OSD minimum (per 1000m² Site AREA)	PSD(A) MAXIMUM (PER 1000M² SITE AREA)
$7m^3$ (B)	15 Litres / Second

(A) Permissible Site Discharge (PSD)

(B) Apportion volume to each dwelling on a pro rata basis.

For the creation of impervious ground surfaces, up to 50m² of runoff from impervious areas may discharge from the site without detention. Detention is required for additional impervious areas exceeding 50m², such as long driveways and large vehicle-turning areas. The detention must be provided at an equivalent rate of 1.8m³ per 100m², with a peak discharge rate (PSD) of 1.5L/s per 100m². This detention calculation must include the total impervious ground-surface area, including the first 50m².

Also refer to Clause 6.10 General Detention Requirements.

6.6. Level 2 - Deemed to Comply Table - Industrial and Business (less than or equal to 3000m2)

For industrial and business development sites located in areas with major downstream detention facilities, detention is generally not required. However, note that water quality treatment may still be necessary even when detention is not required.

In areas without public facility detention or where downstream facilities are undersized, Council may require the following parameters:

Industrial / Business Detention Parameters (less than or equal to 3000m²)

INDUSTRIAL AND BUSINESS DEVELOPMENTS	OSD MINIMUM (PER 1000M² SITE AREA)	PSD MAXIMUM (PER 1000M² SITE AREA)
Undersized public detention &/or WQ system Includes: Rutherford Industrial area (bounded by Racecourse Rd, Shipley Dr & Bradmill Ave)	12m³	12 Litres / Second
No public detention &/or Water Quality System	19m³	9 Litres / Second
Public System adequate but development exceeding site coverage	Council will determine one of the above scenarios to apply dependant on the exceedance.	

Also refer to Clause 6.10 General Detention Requirements.

6.7. Level 3 - Pre-Developed to Post-Developed Calculations – Residential, Industrial and Business (greater than 3000m2)

For development sites greater than 3,000m², 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 the current Australian Rainfall & Runoff version. Onsite detention is determined by analysing pre-developed (natural site) and post-developed flows using computer modelling. The post-developed runoff shall be equal or less than the pre-developed flow for all events up to and including the 1% AEP event.
- Calculations shall be submitted to Council.

Also Refer to Clause 6.10 General Detention Requirements and Clause 7 Water Quality

6.8. General Detention Requirements (Generally excluding Level 1 Systems)

a. 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.

b. OSD systems shall be calculated for the entire site area and apportioned between the OSD structures based on their contributing surface catchment areas. Development that includes residual sections of land, or staging or similar scenarios, shall consider a system appropriate for the combined area.

c. Where development may be subject to future Torrens Title subdivision, each dwelling and/or unit shall be provided with an independent detention system. If shared systems are already provided, strata or community title will need to be utilised, or the system must be removed and replaced with individually systems.

d. 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.

e. When Council provides drainage plan certification and inspection for construction compliance, a fee, as per Council's Schedule of Fees and Charges will apply.

f. Gross pollution traps/mesh screen shall be installed in commercial, business, industrial, and residential developments (residential sites greater than 1000m^2), before discharging into the receiving downstream system e.g. 300mm deep sediment sump, Lysaght RH3030 trash screen,

g. Industrial developments and large driveway areas shall be provided with hydrocarbon filters (pit insert).

h. Drainage detention and storage devices shall be designed in accordance with Australian Standard for Plumbing and Drainage AS3500.3 unless otherwise stated within this section.

i. All metal components shall be hot dipped galvanised steel (after fabrication), aluminium or stainless steel, and fastened using 10mm (min) stainless steel fasteners.

j. Maximum depth of surface ponding shall be 200mm in driveways, parking areas and 300mm (desirable maximum) in accessible landscaped areas. In landscape areas, subsoil drains shall be provided around the outlets to prevent the ground from becoming saturated during prolonged wet weather.

k. The volumes of hydraulically independent (with different surface ponding levels) detention areas shall be calculated separately and shall have separate outlet controls.

l. The detention area shall be designed such that the major storm event (1% AEP storm) 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.

m. Detention outlet design shall assume maximum pressure head. A hydraulic grade line assessment must be based on outlet control operating at the major flood level. The analysis shall also consider potential for backwater pressure from the street drainage system to enter the detention system, in case of connection to Council's underground drainage.

n. An orifice plate shall be machined to the required dimensions as calculated and may be made of 3 to 5 mm thick stainless steel with a circular hole of the required diameter, machined to 0.5 mm accuracy. The minimum orifice choke size shall be 25 mm. An orifice outlet with a diameter less than 90 mm shall be screened using a mesh screen. A stainless steel or galvanized mesh screen with a minimum area of 50 times the orifice area shall be latched over the orifice plate. A Maxi Mesh RH3030 or equivalent with the maximum aperture size, and a handle attached to the screen, is recommended. Alternatively, the designer may consider a "staged" pit-controlled discharge providing a tamper-proof orifice such as a buried pipe reducer (see SD052).

o. Any cellular on-site detention system must include pits at both the entry and exit points to facilitate flushing and maintenance. It can only be used exclusively under grass or landscaped areas. The design must prevent stormwater from bypassing the system, ensuring that water flows in at one end and exits through the other, with the controlled discharge pit located at the outlet of the storage system. To minimise issues related to identification and ongoing upkeep, the system should be clearly marked on the surface and incorporate features for easy access and maintenance. This type of system is intended for individual lot developments only and is not suitable for subdivision-scale projects or shared systems. Additionally. It must not be located under areas designated for vehicle traffic.

p. For below ground concrete detention systems:

- An additional access grate diagonally opposite the outlet shall be provided for ventilation and cleaning purposes. The minimum size of the access grate shall be 600mm by 900mm.
- Where the depth of the tank exceeds 1.2 m, a ladder and/or step iron in accordance with the requirements of Australian Standards shall be installed.
- The storage system shall be designed to fill without causing overflow in upstream conduits from backwater effects.
- A spillway with an overland flow path shall be provided in the event of a storm exceeding the design storm or if the OSD device malfunctions. The path shall be capable of carrying the 1% AEP event, assuming the orifice (outlet) is fully blocked.
- Shall be designed in accordance with Australian Standard for Plumbing and Drainage AS3500.3 unless otherwise stated within this section.

6.9. Certifications and Works-As-Executed Drawings

Works-As-Executed drawings (WAE) may be required by the Principal Certifying Authority and/or Council to verify works, particularly for the finished levels and storage volumes. The WAE drawings must be prepared by a suitable qualified surveyor. The following items along with any additional requirements specified by the conditions of consent shall be verified on the WAE plans:

- Finished surface levels.
- The pipe/pit system
- Storage volumes
- Discharge control device(s)
- Overland flowpaths

Where engineering certification is required for the constructed on-site detention system, it shall be prepared and signed by a suitably qualified engineer, typically holding a CPEng qualification.

7. Stormwater Quality and Maintenance

Developments that generate stormwater runoff from areas that may be a source of pollutants shall provide a means of “polishing” off the runoff prior to its discharge from the site. Of particular importance are sealed car-park areas servicing industrial and business complexes. Level 1 and 2 systems are deemed to meet water quality requirements if they fully comply with the specifications in Section 6. "Business, Industrial, and Large Car Park and Manoeuvring Areas" using Level 1 and 2 systems must include hydrocarbon treatment measures.

A Water Quality Modelling Assessment (MUSIC) demonstrating water quality reduction targets shall be submitted to Council, consistent with Council's Manual of Engineering Standards, Document D: Design. Water quality systems must incorporate multiple treatment devices, such as gross pollutant traps, bioretention rain gardens, bioretention swales, and sand filters, as appropriate, to ensure that water entering waterways meets quality standards. The following table shall be used as a target for pollutant retention:

Post Construction Stormwater Management Targets

Note - Copy from Document D: Design

POLLUTANT	RETENTION CRITERIA
Suspended Solids	80% of average annual load
Total Phosphorus	60% of average annual load
Total Nitrogen	45% of average annual load
Gross Pollutants > 5mm	70% of average annual load
Litter > 50mm	Retention up to the 4EY (3-month flow)
Oil and Grease	90% of average annual load

The above retention criteria relate to the "reduction of average annual load" of stormwater pollutants that may be expected from a fully developed catchment or site.

Note: The table is a copy from Document D: Design.

7.1. 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 and/or the operator of the site shall be included in the stormwater design for the site, nominating an inspection, cleaning schedule, and 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.

7.2. Water Sensitive Urban Design (WSUD)

All developments covered by this manual 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 treatments to be provided, 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 – Note: The majority of the Maitland LGA is on dense clay that does not support infiltration suitable for volume controls. Limited locations on river silts, such as in Horseshoe Bend and Lorn, may be suitable. Underground storage in voids, combined with sandy soil media depression (where possible), facilitates infiltration into the surrounding soil. This method does not involve surface-flow conveyance but includes an overflow to the drainage system. A socked subsoil pipe shall be provided for the slow release of stored water where infiltration into saturated surrounding soil becomes ineffective. This method must be consulted with Council prior to design and implementation.
- Wet Basins.
- Dry Basins.
- Vegetated Filter Strips.
- Sand Filters.
- Contour banks/berms.
- Constructed Wetlands.

To achieve an effective WSUD “treatment train”, discharge controls may be selected from a combination of the following measures:

- Drainage system that collects and delivers stormwater from impervious areas to the treatment train, e.g., roof gutters, downpipes, paths, and driveways, etc.
- Pre-treatment system, e.g., 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).
- Rainwater Garden.
- Vegetated Filter Strip.
- Mulching.
- Garden Bed or Contour Bank.
- Turf.
- Underground Infiltration.

Regarding underground infiltration (SD052) 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.

7.3. Erosion and Sediment Control (ESC)

Pollutants carried in stormwater runoff from building activities, vehicle parking, manoeuvring, and hardstand areas should be assessed for their potential adverse effects, including sediment movement (due to wind, water, and wheel tracking) and hydrocarbon pollution from vehicles. Appropriate measures must be implemented to contain these pollutants both during construction and as part of long-term permanent treatments. Reference should be made to Landcom Department of Housing guidelines, "Managing Urban Stormwater."

- Where the area of soil disturbance is less than 2,500m², an Erosion and Sediment Control Plan (ESCP) must be prepared and submitted in accordance with Council's requirements as part of the drainage design for the site.
- Where the area of soil disturbance exceeds 2,500m², a Soil and Water Management Plan (SWMP) must be developed and certified by a suitably qualified and experienced professional in erosion and sediment control. This plan shall identify erosion prevention and detailed sediment control measures.

Appropriate erosion and sediment control measures must be installed and maintained to prevent pollutants from entering watercourses and/or downstream drainage until 70% ground cover is achieved.

8. Drainage External to Site

Stormwater runoff either entering or leaving the development site must be adequately addressed as part of a drainage design. Adjoining land shall 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 manual) such as adjustment of existing pits, new pits, extended pipelines beyond the immediate vicinity of the property, Council approval relevant to Section 138 Roads Act (S138) or S68 Local Government Act (S68) must be obtained prior to commencement of works. Development consent under the EP&A Act does not apply for this purpose when works are outside the development site.

8.1. Discharge from Upstream

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

8.2. Discharge to 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 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 Council's Manual of Engineering Standards - Stormwater, 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.

8.3. 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.