

PLANNING SCHEME POLICY 5— ENGINEERING DESIGN STANDARDS – ROADS, DRAINAGE AND EARTHWORKS

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1. INTRODUCTION

1.1 Purpose of policy

The purpose of the policy is to communicate Council's position with respect to Standards, Design and Construction of Roads, Drainage and Earthworks works by—

- a) Stating the specifications and standards for design of infrastructure works and earthworks, including those associated with material change of use or reconfiguring a lot applications, which meet the overall outcomes set out in the *Roads and Drainage Code* and the *Earthworks Code*;
- b) Stating the standards for construction of roads and drainage assets throughout the Shire (Parts 2, 3, 4 & 5 of this policy);
- c) Stating the information required for 'as constructed' details (Part 6 of this policy);
- d) Stating details required for plan presentation and documentation. (Part 7 of this policy).

1.2 Application of the policy

- a) The policy functions as part of the Integrated Development Assessment System (IDAS) under the *Integrated Planning Act 1997 (IPA)*.
- b) The policy provides probable solutions for codes within the Noosa Plan and is to be read in conjunction with the Noosa Plan.
- c) The Engineering Standards outlined in this document are general in their application and it is recognised that individual design circumstances will arise where departure from the general standards is required. In these cases the specific outcomes of the codes must be fulfilled by the design solution.
- d) Council encourages innovative design concepts such as those used in Green Street schemes. Submission, by consultants, of alternative designs based on professional experience and sound engineering practice will be assessed on their merits and their ability to meet the relevant performance criteria.
- e) This policy will also be a reference for consultants engaged in the design and construction of road and drainage works for Council, and Council's general civil engineering works.

1.3 Interpretation

- a) Where reference is made to the consultant, the consultant shall be a registered professional Civil Engineer Queensland (RPEQ) experienced in the design, construction and supervision of civil works and services related to reconfiguring a lot and other development works.
- b) Where reference is made to the surveyor, the surveyor shall be a licenced surveyor endorsed in the Register of Surveying Associates, Surveying Graduates, Surveyors - Body Corporate and Surveyors - Individual.

- c) Where general reference is made to 'subdivision' or 'subdivisional works' in this document, this shall be deemed to relate to any works requiring an application to Reconfigure a Lot or any other application made under the *IPA*.

2. GENERAL STANDARDS

2.1 Road Hierarchy and Function

- a) The Road Reserve widths shall be determined in accordance with the function they will perform, anticipated traffic volumes, and the classifications listed below. The general road hierarchy and function is as follows—
 - i **Access and Local Roads**
Roads whose sole function is to provide vehicular access to the lots fronting them;
 - ii **Collector Roads**
Roads that serve internal traffic movements within an area or subdivision, and connect this area with the distributor road system. Collector roads also serve as access roads to the allotments fronting them, with no restriction of access;
 - iii **Distributor Roads**
Roads that provide connection from the neighbourhood to the higher order roads and which are likely to be a bus route. Distributor roads are the highest order of road providing access to allotments fronting them; and
 - iv **Arterial Roads**
Roads that link distributor roads to expressways, highways or major traffic foci. They serve mainly major through traffic, and general access to allotments shall not be permitted. Parking shall be generally prohibited, and access shall be indirect via service roads.
- b) Most subdivisions of reasonable size will require both access and collector roads, but only the largest will require the provision of distributor and arterial roads.

2.2 Classification of Roads

- a) The figures below indicate the traffic capacities of the road classifications expressed in terms of maximum number of allotments within the catchment areas of the road and number of vehicle movements per 24 hour day.

	ROAD TYPE	NUMBER OF LOTS	VEHICLE MOVEMENTS PER DAY (vpd)
Urban	Easements	up to 2 lots	or 20 vpd
	Access Roads	up to 60 lots	or 600 vpd
	Local Roads	up to 200 lots	or 2000 vpd
	Collector Roads	up to 400 lots	or 4000 vpd
	Distributor Roads	up to 700 lots	or 7000 vpd

	ROAD TYPE	NUMBER OF LOTS	VEHICLE MOVEMENTS PER DAY (vpd)
Industrial	Collector Roads	up to 300 lots (30ha max.)	or 3000 vpd
Arterial	Based on traffic flow		
Rural	Easements	up to 2 lots	or 20 vpd
	Access Roads	up to 10 lots (100m length)	or 100 vpd
	Local Roads	up to 30 lots (500m length and no-thru' road)	or 300 vpd
	Collector Roads	up to 100 lots (1km length or thru' road)	or 1000 vpd
	Distributor Roads	>100 lots (1km length)	or >1000 vpd

- b) Where significant medium and/or high density residential and commercial development occurs, road status has to be upgraded accordingly to cater for the increased traffic volumes that will be generated.
- c) Council will require the full road reserve width for the class of road required for the ultimate traffic to be provided.

2.3 Road Reserves and Carriageways

Zone	Road Type	Reserve Width (Minimum Only) (metres)	Carriageway Width (metres)
Residential zones other than Rural Settlement	Easement	4.5	3.0 Concrete
	Battleaxe access	4.5	3.0 Concrete Slab
	Access	15.0	6.0 AC Kerb to Kerb
	Local	17.0	8.0 AC Kerb to Kerb
	Collector	20.0	11.0 AC Kerb to Kerb
	Distributor	25.0	13.0 AC Kerb to Kerb
	Arterial/Sub Arterial Pathway	35.0	25.0 ¹
	Cycle Path Pathway (Collector Road and higher)	6.0 4.0	2.0 AC or Concrete 2.0 AC or Concrete
<i>Commercial zones other than Industry</i>		25.0	13.0 AC Pavement Width
Industry		25.0	13.0 AC Kerb to Kerb

¹ Includes provision for centre median. Service roads require extra road reserve width - See Standard Drawing for details.

<u>Zone</u>	<u>Road Type</u>	<u>Reserve Width (Minimum Only) (metres)</u>	<u>Carriageway Width (metres)</u>
Rural	Easement or Battleaxe Access	10.0	4.0m seal on 4.0m formation with passing lane as required
	Access	20.0	6.0 m seal on 6.0m formation
	Local	20.0	8.0m seal on 8.0m formation
	Collector or Distributor	22.0	9.0m seal on 9.0m formation
Rural Settlement	Easement or Battleaxe Access	10.0	4.0m seal on 4.0m formation with passing lane as required
	Access	20.0	5.5m Kerb to Kerb
	Local	20.0	6.0m Kerb to Kerb
	Collector	22.0	7.0m Kerb to Kerb {Use flush kerb where suitable}
Residential zones or Commercial zones	Service Roads		7.0m AC Kerb to Kerb 7.0m AC Kerb to Kerb

For major earthworks—

For roads where major earthworks are required, wider road reserves are required. Road Reserves are to be 3.0m from top of cut batter and 3.0m from toe of fill batter.

2.4 Long Access Driveways and Access Roads

- a) The services conduits to battleaxe allotments are to be extended up the access strip to the main area of the lot prior to construction of the concrete driveway. Pavement evaluation must be conducted at earthworks stage to determine concrete thickness of access.
- b) For easements with long access roads, a passing lane is to be constructed every 100m. Refer to Council's Standard Drawings for details.

2.5 Road Geometric Cross Section

For footpath-road-footpath geometry for Residential and Rural roads, refer to Council's Standard Drawings for details.

2.6 Pathway - Pedestrian & Bicycle

Provision for pedestrian and bicycle pathways where required by Council in locations to the satisfaction of the Director - Works. Refer to Council's Standard Drawings for details. Kerb ramps are provided at kerb and channel crossings and have grades generally in accordance with Noosa Standard Drawing No. 9006.

2.7 Road Reserve Realignments

Where it is proposed to realign an existing road reserve, preliminary longitudinal road gradings and cross sections for the proposed new route shall be submitted as a proposed plan to enable Council to assess the feasibility of the proposed route and accesses to affected properties.

2.8 Excavation or Filling of Site

- a) Where the site requires cut/fill operations to enable the site to properly drain or keep the site above flood levels, this work is to be completed prior to the construction of roads and other services.
- b) Filling works must be undertaken so that there is a development area, not less than the minimum specified in the following Table, above the 1% AEP (1:100 year ARI) flood level or where modelling is not available, the highest recorded flood level:

Zone	Minimum development area
Detached Housing	450m ²
Semi-attached Housing	450m ²
Attached Housing	100% of the lot
Visitor Mixed Use	100% of the lot
Neighbourhood Centre	100% of the lot
Business Centre	400m ²
Shire Business Centre	Determined as part of development assessment process
Village Mix	800m ²
Community Services	450m ²
Industry	1,000m ²
Rural Settlement	1,000m ² plus sufficient additional area to allow for effluent disposal
Rural	1,000m ² plus sufficient additional area to allow for effluent disposal
Open Space Recreation	The greater of 1,000m ² or 10% of the total site area.
Open Space Conservation	N/a

- c) Excavation or filling works require an Operational Works development permit and this application should include the following information—
 - i A drainage plan for the site indicating proposed drainage patterns, extent and depth of filling works and finished site levels;
 - ii A detailed engineering study of the implication of the filling works in relation to the drainage pattern of adjoining allotments and road reserves and an assessment of the increase, if any, of the flood heights upstream of the subject site. The study should include sufficient survey information external to the site to determine existing drainage flows, in addition to recommended drainage works on the perimeter of the site, to prevent possible drainage problems on adjoining land;
 - iii An Erosion and Sediment Control Plan prepared by an appropriately qualified consultant in accordance with the Institution of Engineers Australia (Queensland Division) *Soil Erosion and Sediment Control - Guidelines for Queensland Construction Sites*. The Plan should address all relevant matters including—
 - The methods proposed to avoid the creation of a dust nuisance around the site or on the lead-in roads; and

- The methods proposed to avoid the transmission of soil onto the surrounding roads which is picked up on the tyres of vehicles and plant working on the site, and carting material to and from the site.
- iv If trees and existing vegetation are to be removed from the site to allow the filling to take place, the application should include plans showing all existing vegetation and pointing out the areas where the vegetation is to be removed and the amounts of fill to be placed on the site. Reasons for the removal of the vegetation should be documented;
 - v Details of any proposed retaining structures including details of materials, heights, proposed drainage and supports.
- d) All development sites must have sediment and erosion control measures in place prior to the commencement of site works. Such measures must be in accordance with the Institution of Engineers Australia (Queensland Division) *Soil Erosion and Sediment Control - Guidelines for Queensland Construction Sites*.
 - e) Approval to proceed with filling of the land is on the basis that it is the Developer's responsibility to notify all adjoining landowners of the work being undertaken, and that all work must not adversely affect the drainage of any adjoining allotments. A detailed survey of drainage patterns on adjoining lots may be required.
 - f) The fill levels for the site shall be fixed so that the finished surface levels drain towards the proposed internal drainage system. The minimum required slope is 1%.
 - g) All filling works are to be supervised by a recognised Geotechnical Engineer at all times and shall be compacted to a 95% relative dry density in accordance with the Department of Transport standard compaction test.
 - h) The Geotechnical Engineer shall certify that all lots have been compacted to the required standard. "As Constructed" details showing the extent and finished levels of the filling works are to be submitted for Council's records.
 - i) Any uncompacted fill, vegetation or other unsuitable material on the site must be removed prior to additional fill being placed. This includes topsoil, tree roots, peat, decomposing material, saturated material, etc. In this regard, the Geotechnical Engineer must test the existing ground conditions prior to additional fill being placed. In the case of filling over flood plain, sand dune and creek areas, the site must have settlement plates installed prior to the placement of the fill and these must be monitored at regular intervals once the fill has been placed.
 - j) Following completion of the filling works, compaction tests across filled areas of the site must be submitted to the Director – Planning and Environment, together with foundation details and classifications for each of the future proposed lots. An appropriate noting shall be placed on Council's rates records to advise prospective purchasers that the site has been filled and that special foundation requirements will apply.

2.9 Staged Development

For staged development, a sealed temporary vehicle turning area suitable for large vehicles, including refuse trucks is provided at the end of each road that may be extended into future stages. The pavement on the temporary turning area must be constructed to the same standard as the other permanent roads.

3. DESIGN AND APPROVAL — ROADS

3.1 Design Speed

The maximum design speed on which the geometric design of each road type is based shall be—

Urban	Access	40 km/hr
	Local	50 km/hr
	Collector	60 km/hr
	Distributor	60 km/hr
Industrial	Collector	60 km/hr
Rural	Access	40 km/hr
	Local	60 km/hr
	Collector	60 km/hr
	Distributor	80 km/hr
Arterial		100 km/hr

3.2 Grades

- a) The grades listed below are to be considered the maximum for extreme cases, and Consultants shall limit grades and the length of steep grades used in their designs with respect to terrain and road safety.
- b) The Director – Planning and Environment may at his discretion give approval to the use of grades steeper than “maximum” values, but such approval will only be given when all other possible alternatives have been fully investigated and proved to be impracticable.

		Normal Maximum	* <u>Absolute Maximum</u>
Urban	Easements	20%	20%
	Access	15%	20%
	Local	10%	15%
	Collector	7%	12%
	Distributor	5%	8%
	Residential Driveways	20%	25%
Industrial	Collector	5%	6%
Rural	Easement	20%	25%
	Access & Local	15%	20%
	Collector	10%	15%
	Distributor	7%	12%
Arterial			6%

* Absolute Maximum is to be used only for less than 20% of road length. Transitions in accordance with Australian Standards are required for all easement accesses. The minimum grade for all roads based on kerb and channel drainage requirements shall be 0.5%.

3.3 Vertical Curves

A vertical curve of parabolic form shall be provided at every change of grade where the algebraic change of grade is more than $30/V$ where V is the design speed of the road.

All vertical curves shall be designed in accordance with Main Roads Department Queensland Urban Road Design Manual and the AUSTRROADS standards.

a) Summit Curves

The length of vertical curves shall generally be determined by sight distance at the design speed for driver eye height of 1.15m to object height of 0.2m and a reaction time of 2.5 seconds. An object height of zero may be required in some instances.

b) Sag Curves

Sag Curves shall generally be designed in accordance with AUSTRROADS Standards using a vertical component of acceleration on 0.05g and giving due consideration to headlight distance in the Rural and Rural/Residential situation. Long flat sections in kerbed roads shall be avoided.

c) Minimum Length for Appearance

The Minimum Length for Appearance of a vertical curve shall be not less than the following—

- i Minor Access Road & Rural Cul-de-sac 25m
- ii Access Road & Rural Local 30m
- iii Collector Road & Rural Standard 35m
- iv Distributor 50m
- v Arterial 70m

d) Vertical Curves at Intersections

- i In the case of a vertical curve in the side road of a “T” intersection where the side road joins the through road, a reduced length of vertical curve can be accepted because of the lower traffic speed in the side road at the intersection.
- ii The minimum length of such a vertical curve, based on riding comfort shall be—
 - On Access & Local Roads $L = 0.7A$
 - On Collector & Distributor Roads $L = 1.25A$

Where: L = Min. length of vertical curve (metres)

A = Algebraic change of grade, between grade of the side road and crossfall of the through road (percent).

- iii Notwithstanding the above, from a consideration of appearance, a vertical curve in the side road at an intersection shall be not less than 10.0m in length;
- iv The minimum vertical curve radius for the side road is to be 80m desirable, and 50m absolute; and
- v The tangent point of a vertical curve in the side road shall be located at, or outside of the kerb line of the through road.

3.4 Pavement Crossfalls

- a) Roads shall be designed with a centre crown and the normal crossfall of pavement and shoulders on straight alignment shall be—
- | | | |
|-----|---------------------------------------|------|
| i | Concrete pavements | 2.0% |
| ii | Asphaltic Concrete surfaces pavements | 3.0% |
| iii | Bituminous Sealed Pavements | 3.0% |
| iv | Unsealed Shoulders | 5.0% |
- b) Where steeper or flatter crossfalls than the normal are required, for example at intersections or turning circles of culs-de-sac, the maximum and minimum permissible pavement crossfalls shall be 6% and 1% respectively.
- c) **Offsetting of the Crown** on a two-way road is permissible, provided that sufficient stormwater capacity is retained in the channel and roadway on the high side of the road.

3.5 Horizontal Alignment

- i Horizontal curve radii shall be designed in accordance with AUSTRROADS Standards.
- ii The minimum deflection angle for which a curve is required is 2°.

3.6 Superelevation

Superelevation shall be provided on all curves on Arterial roads. On Access, Collector and Distributor roads, superelevation is not desirable in urban subdivision. Where curve widening is required, it shall be applied in accordance with Queensland Department of Transport Design Manual.

3.7 Curve Widening

Curve widening is normally required on rural roads.

3.8 Maximum Superelevation

Maximum superelevation on a curve shall generally be 6%.

3.9 Minimum Superelevation

Maximum superelevation shall be as for the normal pavement crossfall, i.e. 3.0% except within superelevation transition lengths.

3.10 Property Accesses

- a) Accesses shall be designed and constructed so that—
- i A driver seated in a standard private motor vehicle, at the entrance to a carriageway, with the front of the vehicle 0.3m clear of the edge of the bitumen, has a clear visibility not less than the Minimum Sight Distance for the Road Design Speed specified AUSTRROADS Guide to Traffic Engineering Practice Part 5 Intersections at Grade, Table 5.3;
- ii The gradient of any access is not in excess of 15% within the road reserve; and

- iii If, in the opinion of the Director - Works, the proposed access is dangerous or hazardous, then an alternative access will be required.

3.11 Minimum Curve Radius

The recommended minimum curve radius appropriate to the above maximum superelevation (i.e. 6%) for each type of road shall be:

Access Roads	45m Refer Clause 3.6(a)
Local Roads	60m Refer Clause 3.6(a)
Collector Roads	100m
Distributor Roads	220m
Arterial Roads	360m

a) Access Road

- i It is impracticable to apply ideal standards of curvature to all access roads, as the limitations of allotment layout often necessitate 90° bends of very small radius which can be negotiated only at speeds well below the normal design speed;
- ii However, as drivers expect such sharp changes in alignment on access roads, traffic safety need not be prejudiced provided that such curves are readily visible. Deflections of 60° or less however, which are less easily recognisable as a potential hazard to an approaching driver, should have curves of appropriate radii, in accordance with the above; and
- iii For a deflection greater than 60° the minimum centreline curve radius shall be 20m (which is consistent with a speed of approximately 20 km/hr without superelevation)

b) Truncations

A truncation of the real property boundary shall be provided at each deflection, such that roadway and verge widths can be maintained at not less than the normal widths at any point on the curve.

3.12 Culs-de-Sac

- a) The length of a cul-de-sac should not exceed the maximum length of 200m in residential and 500m in rural subdivisions. Certain situations may need special consideration.
- b) A turning circle shall be provided at the end of a cul-de-sac. The minimum radius for Residential or Rural Settlement Subdivision - 9m radius.
- c) The footpath width shall be not less than 4.0m at any pointing the turning circle, or in the approach to the turning circle. Refer Council's Standard Drawing for details.

3.13 **Intersections**

a) **Types of Intersections & Applications (Rural Roads)**

- i All intersections of access, collector and distributor roads shall be of the three-way or "T" type. Details of the intersection types are shown on Council's Standard Drawings.

Type 1

Property Driveways
 Access onto Access Roads
 Access onto Local Roads

Type 1 (With Bitumen Seal)

Local onto Local Roads
 Access onto Collector Roads

Type 2

Local onto Collector Roads
 Access onto Distributor Roads

Type 2 (Modified)

Collector onto Collector Roads
 Local onto Distributor Roads

- ii Intersections not mentioned shall be designed to AUSTRROADS Standards taking into account traffic volumes. Four-way intersections shall be designed only at the junctions where roundabouts are being included in the design; and
- iii Visibility requirements for intersections and property entrances shall be designed in accordance with the Queensland Department of Transport Design Manual and Section 3.5 e).

b) **Channelisation**

Warrants for the provisions of channelisation at intersections will be based on traffic volumes and intersection layout.

c) **Roundabout Design**

The design of roundabouts shall be carried out in accordance with AUSTRROADS Standards and cater for on road cyclists where either speeds are greater than 30 km/h or volumes are 3000 vpd.

d) **Intersection Angle**

The angle between the centreline of intersecting roads shall be as close as possible to 90° and shall in no case be less than 80°.

e) **Location of Intersections**

- i Intersections onto a curve on the through road should be avoided. Where they are unavoidable, the angle between the centreline of the side road, and a tangent to the centreline of the through road at the point of intersection shall be 90°;
- ii An intersection shall not be located on the inside of a curve on the through road. In cases where this is not possible and the sight distance requirements cannot be met, Type 2 modified intersection will be the minimum requirement;

iii The spacing between two intersections measured along the centreline of the through road between the centrelines of the side roads, should be not less than the following—

- Side roads on opposite sides of the through road—

Access Roads	40m
Local Roads	45m
Collector Roads	75m
Distributor Roads	200m (Unless median is broken)
Arterial Roads	200m (Unless median is broken)

- Side roads on the same side of the through road—

Access Roads	75m
Local Roads	75m
Collector Roads	75m
Distributor Roads	200m
Arterial Roads	200m

iv In any case intersections shall be designed to facilitate safe and efficient traffic flows; and

v The minimum length of straight alignment measured along the centreline of the side road from the adjacent kerb line of the through road to the tangent point of a curve on the side road should be—

Access Roads	10m
Local Roads	30m
Collector Roads	60m
Distributor Roads	100m
Arterial Roads	100m

f) Kerb Radii

The minimum radius of the face of the kerb at an intersection shall be—

Access or Minor Access road to Collector	10m
Collector to Collector or Distributor	10m
Distributor or Arterial to Arterial	15m

g) Truncations

The minimum truncation of the real property boundary at all intersections shall be—

Residential Roads	6m by 3 chord
Industrial Roads	10m by 3 chord

3.14 Pathways

a) Pathway Location

- i Pathways shall be provided in areas of high pedestrian activity, e.g. commercial areas, parks and access to parks;
- ii Pathway shall be provided on the alignment nominated or as shown on the typical cross-section shown on Council's Standard Drawing.

b) Pathway Dimensions

Concrete pathway paving shall be in accordance with Council's adopted Pathway Hierarchy. In the absence of a Hierarchy, concrete pathway paving shall be 2m minimum width. Paving shall be 100mm thick, reinforced with F72 Mesh as shown in Council's Standard Drawings.

c) Footpath Reserve Crossfalls

The normal crossfall shall be 2%. The minimum crossfall allowed is 1% and the maximum crossfall is 2.5%. Footpaths should always be drained towards the roadway for urban roads. Footpath reserve shall be in accordance with Council's Standard Drawings.

d) Kerb Ramps

Kerb ramps are to be provided in urban and commercial areas, at all intersections and at the end of constructed concrete footpaths/bikeways. At intersections, the ramps are generally to be located as close as possible to the tangent points. Grades of the ramps are in accordance with Council's Standard Drawing No. 9006.

e) Grassing

- i 75mm compacted thickness of approved topsoil shall be placed over cut and fill areas on all footpaths and parks. For subdivisions, these areas are then to be seeded and the grass is to be properly established and maintained during the maintenance period. Council may consider other forms of grassing from time to time, e.g. runners, turfing etc.; and
- ii For development works including frontage works, the turfing of footpaths is required.

f) Location of Services on Footpaths

The standard allocation in the footpath cross-section for the various services and utilities is shown in Council's Standard Drawing.

g) Design Requirements for Disabled Persons

The design of pathways and footpaths shall take into account the needs of disabled persons, such as persons using wheelchairs. Ramps are constructed in accordance with Australian Standard AS1428.2.

3.15 Kerb & Channel

- a) Concrete kerb and channel shall be provided in accordance with current Council policies on both sides of road pavements on all urban roads and on rural roads when grades are in excess of 10%. For soils which are easily eroded, kerb and channel will be required when the grades of rural roads are greater than 7%.
- b) Barrier kerb and channel shall be used where road pavement width is 12m or more. Layback kerb and channel shall be used where road widths are less than 12m, except at local areas traffic management devices (i.e. chicanes).
- c) The minimum grade for kerb and channel shall be 0.5%.
- d) When conduits are placed under roadways for services, then at all locations where the conduits cross the kerb and channel, a brass plaque is to be placed in the kerb indicating the utility contained within the conduit, e.g. Water - "W", Electricity - "E", Telstra - "T".

- e) Refer to Council's Standard Drawings for details of kerb and channel types.

3.16 Table Drains

Table drains are turfed with rock barriers in suitable wire baskets for grades steeper than 7%. Table drains are turfed in all other situations.

3.17 Off Street Parking Design

The design of off street parking facilities should be in accordance with Council's Standard Drawings and AS 2890.

3.18 Subsoil Drains

Subsoil drains shall be provided with all kerb and channel, flush kerb and kerb construction. Subsoil drains are "socked" sleeved and backfilled with appropriate screenings

3.19 Pavement Design

The total required pavement thickness shall be based on the Queensland Department of Transport's Design Manual using soaked CBR tests of the subgrade.

a) Flexible Pavements

Pavements shall be designed as flexible pavement. The design pavement thickness shall be submitted to the Director – Planning and Environment for approval prior to the placement of the gravel pavement.

b) Subgrade Testing

- i The existing subgrade shall be sampled at intervals of not more than 100m (except in areas of uniform subgrade materials where the spacing shall be not more than 300m) and at any obvious change of the nature of the material at approximately the design level of the future road subgrade;
- ii Details of the location at which samples were taken, the test results and the proposed design pavement thicknesses shall be submitted for approval;
- iii All materials testing shall be carried out by a N.A.T.A. Registered Laboratory endorsed for the appropriate tests using the procedures described in the following manuals—
 - Queensland Department of Transport design manual.
 - Australian Standards.

c) Design Life and Minimum Pavement Thickness

A minimum design life of 20 years shall be used. The minimum pavement thickness shall be 250mm for roads in urban areas and 200mm for roads in rural areas. For rural easements, the minimum pavement depth shall be 150mm. For construction of roads on sand subgrade, the minimum thickness is a 150mm sub base gravel layer (which includes the blanket layer) and a 100mm base gravel layer.

d) Design Traffic Loading

The minimum number of design Equivalent Standard Axles (ESAs 80 KN axle load passes) for the various road categories used in pavement design shall be as follows—

Road Type – Industrial/commercial development	ESA's
Local Roads	5.0 x 10 ⁶
Collector Roads	5.0 x 10 ⁶
Distributor Roads	5.0 x 10 ⁶
Arterial Roads	To be approved by the Director – Planning and Environment
 Road Type – other	
Access Roads	5.0 x 10 ⁵
Local Roads	2.0 x 10 ⁵
Collector Roads	3.0 x 10 ⁵
Distributor Roads	1.0 x 10 ⁶
Arterial Roads	To be approved by the Director – Planning and Environment

e) Material Specifications

All materials used in construction of the road pavement shall conform to the requirements of the Queensland Department of Transport or AUSPEC specifications.

f) Design Pavement Thickness Approval

The design pavement thicknesses, together with CBR test results, shall be submitted to the Manager-Land Development for approval prior to placement of pavement material.

g) Bitumen Surfacing

- i The minimum bitumen surface requirements are given on Council's Standard Drawings. For urban roads Asphaltic Concrete (AC) surfacing is required;
- ii All roads surfaced with AC, shall have a minimum compacted thickness of 30mm. For collector and distributor roads, this is to be increased to a compacted thickness of 40mm. Prior to the placement of the layer of AC, the surface is to be primed with AMCO Prime at a rate of 1.0 litres/m².

h) Joining to Existing Pavement

Where new work joins to existing sealed pavement, a saw cut edge is to be made 300mm. into the existing pavement to enable a smooth joint to be made.

3.20 Council Standard Specification

- a) All works shall be in accordance with Council's Standard Specifications. For roadworks and drainage, Council has adopted the Queensland Department of Transport specifications. Where no Council Standard Specification exists for a particular type of work AUSPEC or other recognised standards may be used. Any variation to Council's standard specifications are to be highlighted in the Operational Works application.

- b) Full specifications covering all aspects of the proposed works shall be included in the documents and shall be submitted for approval.

3.21 Council's Standard Drawings

Civil designs are to use Council's Standard Drawings for the construction of operational works where applicable. Applicants shall prepare and submit for approval necessary detail drawings for all works not covered by Council's Standard Drawings.

3.22 Street Names, Road Signs and Road Markings

- a) All roads and intersections etc. should generally be signed in accordance with—
 - i the current edition of the Manual of Uniform Traffic Control Devices Queensland;
 - ii the Noosa Council Corporate Signage Guidelines; and
 - iii signage manual for the Noosa Trail Network.
- b) For details of type and materials to be used for signs refer to Council's Standard Drawings.

3.23 Trees, Vegetation

- a) The developer shall preserve the natural vegetation. The extent of clearing work allowed will be as given as part of development approval.
- b) The engineering design is to take into account existing vegetation to ensure the removal of significant vegetation is kept to a minimum. Approval may be required for the removal of any trees under the Noosa Plan or Council's Local Law No10 – Vegetation Management.

3.24 Public Utility Services

- a) **Existing Public Utilities**
 - i Where it is necessary to alter existing public utilities including lines or poles, the developer shall make all necessary arrangements with the appropriate Authorities and shall bear the full cost of such alterations; and
 - ii For allocation of space for public utility services in footpaths, refer to Council's Standard Drawings.
- b) **Electricity Supply**
 - i It is the responsibility of the developer to obtain a Certificate of Electricity Supply; and
 - ii Council may require the supply of electricity to each separate allotment within any new subdivision to be underground.
- c) **Street Lighting**
 - i Street lighting and intersection lighting plans approved by ENERGEX are to be submitted to Council prior to approval of engineering documents being issued;

- ii The design of street lighting is to be undertaken in accordance with Australian Standard for Street Lighting AS 1158, SAA - Public Lighting Code Parts 1-4". ; and
- iii All pathways are to be appropriately lit.

4. DESIGN AND APPROVAL – DRAINAGE²

4.1 Determination of Run-Off

a) General

- i Run-off calculations are to be based on the Rational Method using the approach and concepts outlined in Australian Rainfall and Runoff 2001 and/or SR 34 and formula

$$Q = \frac{FCIA}{360} \text{ or } Q = \frac{CIA}{360}$$
 Where—
 Q = discharge in cubic metres/sec (m³/sec)
 C = co-efficient of runoff
 I = rainfall intensity (mm/hr)
 A = catchment area (ha)
 F = factor of portionality (0.00278);
- ii The values adopted for all design variables are to be based on the ultimate development of the area, as indicated by the zoning of the area under the Noosa Plan; and
- iii As a general rule, tangent checks are to be carried out for catchments over 20 hectares, and the peak discharge adjusted accordingly. For irregular shaped sub-catchments it should be checked by inspection that maximum run-off does in fact occur when the whole area is contributing.

b) Catchment Areas

Boundaries of catchment areas and sub areas shall be determined from contour maps and field inspection. Some realistic allowance should be made for future road patterns which may cause diversion of the natural route of stormwater and allowance should also be made, particularly in industrial and commercial areas, for probable diversion of run-off from large roofed areas. In residential areas, observations should be made to determine the effect fences, roof runoff and hard surface areas will have to catchment areas, e.g. some properties may slope away from the road but the roofwater is drained to the kerb channel.

c) Time of Concentration

- i In determining the time of concentration in urban areas, it is to be assumed that the area will be fully developed, with kerbed and sealed roads, and that pipe drains will be provided where gutter flows are exceeded;

² Advisory Guidelines for drainage calculations are provided on Council's Standard Drawings 9238-9241.

- ii Time of overland flow shall be determined from Drawing No. 9229. The following 'n' values are to be used in conjunction with that drawing—

Open space	n = 0.045
Residential areas	n = 0.035
Multi-unit or commercial areas	n = 0.0275
Fully paved areas	n = 0.015

 - In calculating the time of overland flow when the slope of the terrain is varied, the sum of the individual times of flow for varying slopes should not be used. The average slope of the stream path for the section under consideration should be determined from a weighted average slope diagram, or where insufficient information is available to plot such a diagram, then $\frac{3}{4}$ of the difference in heights between upper and lower points should be taken, divided by the length of the stream path to obtain an average grade.
 - In very flat terrain the factor $\frac{3}{4}$ should be omitted.
- iii Time of Gutter Flow is to be determined from Drawing No. 9230; and
- iv Minimum time of concentration shall be six minutes.

d) **Co-efficient of Run-off**

All drainage design shall be in accordance with Tables 5.04.1, 5.04.2 and 5.04.3 of QUDM.

e) **Recurrence Interval**

- i The recurrence interval for the various categories of land use and road types:-

Open Space	1 in 5 year frequency
Detached Housing	1 in 5 year frequency
Semi-attached and Attached Housing	1 in 10 year frequency
Collector, Distributor Arterial & Sub-Arterial Rds	1 in 10 year frequency (minimum)
Business Centres	1 in 10 year frequency
Industrial	1 in 10 year frequency
Rural Culverts	1 in 5 year frequency
- ii The recurrence interval for other uses and zones shall be nominated by the Manager –Land Development and will be dependent upon the particular use of the area;
- iii All Arterial Roads shall be designed as per Queensland Department of Transport Manual Design Manual;
- iv Prior to finalisation of the proposed drainage scheme, a “1 in 100 year storm” is to be passed through the system and the extent of surcharge and overland flow determined. In areas where overland flow from a surcharged 1 in 100 year storm cannot be contained within a road reserve, park, pathway, drainage reserve, the piped drainage system should be increased in size to enable the total storm flow to be handled by both the underground and overland drainage system; and

- v Overland flow will not be permitted through a drainage easement.

f) **Rainfall Intensity**

Council Standard Drawing Nos. 9231, 9232, 9233 show Rainfall Intensity - Frequency - Duration Curves prepared by Bureau of Meteorology for:-

- i Coastal areas - below the escarpment including Kin Kin;
- ii Tableland - Tinbeerwah to Black Mountain including Cooroy; and
- iii Inland - including Ridgewood, Pomona and Cooran.

4.2 **Surface Drainage Control**

a) **Kerb and Channel Flow**

Flow widths and velocity are designed in accordance with QUDM.

b) **Gully Pits**

- i Standard Gully Pits without Grates are to be provided in roadways to meet the limits of gutter flow specified in QUDM. Inlet capacities of Gully Pits can be determined from Drawings Nos. 9236 and 9237;
- ii Side inlets and trough systems are an acceptable alternative to standard catch pits;
- iii Spaced gullies shall be generally separated by 2.4m of pipe, but not more than 7.2m;
- iv The maximum allowable by-pass of any inlet structure shall be .04m³/sec. and the quantity of water by-passed shall be considered in the design of gully pits downstream;
- v The minimum clearance from channel invert to design water level in gullies shall be 150mm;
- vi For maximum capacities of catch pits refer to the inlet capacity charts;
- vii The maximum pipe length of any manhole to gully connection shall be 30m; and
- viii Gully pits are to be constructed in accordance with Council's Drawing No. 9223, and must not be located on kerb turnouts.

4.3 **Design Control**

a) **Drainline Design**

- i Drainage design must provide for gravity drainage and not rely on pumps;
- ii Pipes shall generally be designed to run full but under minimum head, preferably the hydraulic grade line shall not be more than 300mm above the overt of the pipe for the design frequency specified;
- iii The minimum invert level at Noosa River or other tidal outfalls shall be R.L. -0.2 AHD, however, the level may be raised at outlets prone to silting;
- iv Water level at outlets for Hydraulic Gradient purpose at Noosa River and other tidal outlets is to be R.L 0.50 AHD;

- v At all other outlets, the level for Hydraulic Grading purposes for pipes designed to run full is to be the obvert level of the outlet pipe; and.
- vi All outlets other than those of Noosa River, inverts of the outlets are to be above natural surface, no ponded water is permitted.

b) Design Charts and Co-efficient of Roughness

Manning's Charts are to be normally used with the following co-efficients of roughness.

- i Reinforced concrete pipes and box culverts (new designs) $n = 0.013$
- ii Reinforced concrete pipes and box culverts (analysing old systems) $n = 0.015$
- iii Concrete lined open channels $n = 0.015$
- iv Fibre reinforced concrete pipes $n = 0.013$
- v Upvc pipes $n = 0.011$
- vi Other channel surfaces - Refer Tables 10-2020 and 10-2350 Department of Transport, Urban Drainage Manual.

If the Manning's Charts are not available then the Colebrook/White charts can be used—

- i K values-
 - normal concrete pipes and box culverts 0.60
 - new design 0.60
 - old systems 1.5

c) Velocity and Grading Limits

Velocity and grading limits must be designed in accordance with QUDM.

d) Outlets

- i The outlets of all pipes and box culverts shall be provided with standard concrete or grouted rock headwalls. Canal and river outlets are to end at the revetment wall and are to be provided with a standard concrete apron to low water level, and for canal estates at least across the beach area;.
- ii Where scouring at outlets may be likely, due either to high outlet velocities or nature of the soil, outlet protection must be provided by stone pitching, velocity dissipators, gabions or other similar means. Dissipaters are to be free flowing;
- iii At inlets and outlets of open-ended piped stormwater drains in excess of 600mm, a childproof safety grill with horizontal spacing not exceeding 150mm must be provided. See Council's Standard Drawing for details;
- iv The extent of the pipe drain on associated easement shall be considered in each situation. However, the discharge point should desirably be located in a natural watercourse or depression in a manner to minimise scour problems. This applies especially to rural residential subdivisions; and
- v Drainage outlets on unsewered lots shall be extended so that they are at least 30m clear of existing or proposed effluent disposal areas.

e) **Pipe Classes and Cover**

- i Permissible depths of fill in relationship to classes of pipe shall be strictly in accordance with the recommended practice as laid down in Australian Standard AS3725 – Loads on Buried Concrete Pipes;
- ii Minimum depths of cover to pipes to be adopted shall be—

Catchpit Connections in roadways	450mm at lip of channel
Drainlines in roadways and parks	600mm
Drainlines in private property	300mm
- iii Pipe classes shall be generally Class “2” for drainlines in all cases when the requirements for cover in (ii) above can be satisfied. When these requirements cannot be met then pipe classes as specified in AS3725 shall be adopted;
- iv Rubber ring jointed pipes are to be specified for all pipes;
- v The minimum size drainage pipe to be used shall be 300mm diameter; and.
- vi Saltwater cover pipes are to be used in tidal areas.

f) **Manholes**

- i Standard manholes shall be provided in drainlines at all changes in grade, level or direction, and at all pipe junctions;
- ii To keep manholes out of driving lanes and driveways, catchpit to catchpit connections may be used at the head of the catchment and they are to be designed so that there is no surcharge. At other locations, manholes are to be located so that they are not located in driving lanes or driveways;
- iii Pipe junctions where deflection of the angle of flow is 90° should be avoided, and should preferably be not more than 45°;
- iv Deflections of more than 90° will not be permitted;
- v Actual pipe grading across manholes should provide for drops of not less than the designed head loss, with the minimum drop for pipes of the same diameter to be 30mm. Pipes of increasing diameter should be graded obvert to obvert;
- vi For single drainlines, a downstream pipe of smaller diameter than the upstream pipe is not acceptable;
- vii The minimum clearance from the top of the manhole to design water level in the manhole shall be 300mm. If this cannot be achieved then “bolt down” lids are to be provided;
- viii Special drawings must be included for manholes with pipe diameters exceeding those shown on standard drawing No. 9210, or where the manhole has many pipes connecting at similar levels; and
- ix Where pipes are designed to run full at self-cleansing velocity (0.90m/sec or greater), the maximum spacing of manholes shall be as follows—
 - 100m for pipes up to and including 600mm dia.
 - 135m for pipes from 625mm dia. to 1050mm dia.
 - 225m for pipes larger than 1200mm dia.

g) **Head Losses in Manholes and Gullies**

In determining hydraulic gradients, the following values (or realistic interpolation of same) are to be adopted for Head Losses through manholes and entry losses at gullies—

Pipe and box culvert flow	Straight through	$\frac{0.2v^2}{2g}$
	Through 45°	$\frac{0.5v^2}{2g}$
	Through 90°	$\frac{1.0v^2}{2g}$
Large culvert flow (waterway area exceeding 2.0m ²)	Straight through	$\frac{0.1v^2}{2g}$
	Through 45°	$\frac{0.3v^2}{2g}$
	Through 90°	$\frac{0.5v^2}{2g}$
Entry loss at gullies. Where—		$\frac{1.0v^2}{2g}$
v = outfall pipe velocity in m/sec.		
G = 9.81 m/sec ²		
2g = 19.62		

For headlosses across manholes when the outlet flows only part full, the headloss shall be determined from the segmental velocity of the outlet pipe, and the level for hydraulic gradient purposes shall be—

$$\frac{1.5v^2}{2g} \quad \text{where } v = \text{segmental velocity.}$$

h) **Drainage Alignments**

- i Drainage alignments of drainlines within the road reserve shall generally be as shown on Standard Drawing No. 9007; and
- ii For multiple cell drain lines or where deep excavation may cause damage to or require relocation of existing services, alignments other than those shown on Standard Drawing No. 9007 may be adopted, but with the approval of the Director - Works.

i) **Surcharges**

Surcharge levels must be kept below the top of kerb, if this is exceeded, the route, velocities and quantity of overland flows must be assessed for a higher frequency storm passing through the drainage system. Remedial works such as bunding the adjacent footpath etc. can only be done with the approval of the Director - Works.

j) **Easements**

- i Easement widths shall not be less than the 4m. If the pipe or box culvert width exceeds 4m then the easement width is to be the external width of the conduits plus 0.6m either side of the conduit; and
- ii Easement widths may be reduced to a minimum of 3m if constraints, e.g. buildings, walls, etc. do not allow 4m width to be achieved.

k) **Overland Flow Paths**

- i Overland flow paths through allotments are not appropriate. The allotment layout is to be reviewed so that this overland flowpath is contained within either a drainage reserve/pathway between the allotments or within road reserve; and

- ii Overland flow paths shall be shaped so as to contain the flow within the designated boundary at a non-scouring velocity but in any case not exceeding 1.2m/sec. Turfing of the overland flowpath is required. If velocities exceed the above figures, then a concrete base shall be constructed.

l) Downstream Drainage

- i The consultant is required to investigate the effect of the increased stormwater discharge produced as a result of the proposed development. If the downstream system or any property downstream will be adversely affected, the consultant is required to assess what additional drainage or mitigation works need to be constructed to cater for the additional discharge produced by the development; and
- ii If the existing underground drainage systems will be undersized according to current standards as a result of the development, the developer shall be responsible for augmenting or replacing the drainage system so it is capable of accommodating any additional discharge generated by the development. To remove any doubt, the drainage system must accommodate the designated design frequency up to and including the 1 in 100 year Average Recurrence Interval (ARI) storm event when checking the overland flow situation.

m) Interallotment Drainage Systems

- i Where the finished levels of a proposed allotment are such that stormwater runoff from the allotment (or part of it) discharges towards the rear boundary, an underground drainage line shall be provided to discharge the runoff from the rear of the allotment. In general, the discharge point will be an existing or proposed stormwater manhole or gully pit;
- ii Each property served by an interallotment drainage line shall be provided with a grated inlet structure at the lowest point on the rear boundary and a connection for future roof runoff;
- iii The design of main drainage lines shall take into account all runoff carried via interallotment drainage lines to the main drainage system;
- iv The size of the pipe can be determined from either Table 1.1 or by calculation of discharge by the 'Rational Method' where the interallotment drain line time of concentration may control the design of the downstream main drainage line. Where interallotment drainage lines are required for allotments in excess of 1000m² in area, pipe sizes must be determined by the 'Rational Method';
- v The minimum size of pipe to be provided for interallotment stormwater drainage lines shall be in accordance with the table below;

Table 1.1 Minimum Pipe Diameters

No. of Lots	GRADE %									
	PIPE DIAMETER (mm)									
	1	2	3	4	5	6	7	8	9	10
1	150	150	150	150	150	150	150	150	150	150
2	225	225	225	150	150	150	150	150	150	150
4	225	225	225	225	225	225	225	150	150	150
6	300	300	300	225	225	225	225	225	225	225
8	300	300	300	300	300	300	300	225	225	225
10	375	375	375	300	300	300	300	300	300	300
12	375	375	375	375	375	375	375	300	300	300
14	375	375	375	375	375	375	375	375	375	375

- vi Minimum pipe diameter in single detached residential situations is generally 150mm PVC pipe. Pipes with diameter 300mm and greater are to be rubber ring jointed RCP or FRC pipes. In the case of driveways and carparks for unit or commercial developments, the minimum size pipe is 250mm dia. PVC;
- vii For PVC pipes, Class 6 can be used under normal conditions. In locations where pipes do not have sufficient cover, e.g. less than 600mm, then the Class 9 pipe is to be used;
- viii Interallotment drainage lines shall be placed in the higher rather than the lower property. Care shall be taken to ensure there is no conflict with sewerage pipes;
- ix 1.5m wide easements over all interallotment drainage lines shall be granted in favour of Council. Pipes shall be located centrally within the easement; and
- x Council will not accept responsibility for the maintenance of interallotment drainage lines.

n) **General Design Standards**

- i All exposed steelwork shall be hot dipped galvanised. All grates shall be designed in accordance with AS 3996 so as to not present a hazard to cyclists;
- ii All stormwater drainage through parks and reserves must be piped underground, with pipes of adequate capacity to carry the required design storm;
- iii Where retention basins are used in parks or reserves, a low flow pipe system is required. Special analysis must be provided to support this method of drainage;
- iv The applicant is responsible for providing an adequate free-flowing outlet to all catchments of the drainage system, and the designer must supply catchment details and hydraulic calculations;
- v Approval of engineering details will not be granted unless and until written evidence from adjoining property owners permitting disposal of stormwater on their property is received. In such instances, registered easements in Council's favour will also be required;
- vi Unless the Director - Works has specifically approved an alternative scheme, all drainage lines must be taken to the boundary of the development and a satisfactory outlet constructed at the adjoining property boundary;
- vii Where filling is placed on a development and the natural stormwater flow of upstream existing properties is restricted, the developer provides a separate field inlet, at the low point of each property, connecting to a drainage pipe located in the new development and contained within a pathway, road reserve etc., but not within an easement. The drainage calculations and pipe design must allow for no pondage on the existing properties in a 1 in 20 year storm; and
- viii Where filling is placed for a new development, and the natural stormwater flow is impeded, causing water to be ponded on adjoining properties, the developer is to provide a spoon drain or underground drain within the developed property, to drain the affected properties. This drainage is to be connected to a Council underground system. The Consultant must supply design details for this drainage.

4.4 Design Of Low Flow Pipe Systems

- a) The purpose of the low flow drainage system is to convey seepage flows and very low intensity generated runoff in an underground system parallel to the main open channel drainage system for an area. This will ensure that for all but actual storm events, the open channel will not have to convey runoff and may therefore be reasonably developed and used as public open space. An obvious advantage of this system is the minimum disturbance to the existing vegetation.
- b) The basic premise is that the low flow drainage system should convey runoff up to that rainfall intensity which is exceeded only for 100 hours per year. At this point in time, this has been assumed to be 3mm/hour. Experience has shown that there must also be either a limiting catchment or discharge since even at an intensity as low as this, discharges can become extremely high. This can be achieved by the following pipe sizes. The minimum diameter allowed is 375mm and the maximum is 600mm.
- c) Another important feature of this system is that by directly connecting the underground system for the area (based on say Q_2 or Q_5), flushing out of the low flow system will occur regularly. This normally will be required. The grade of the low flow pipe shall be at least that required to provide self-cleansing when the pipe is flowing full.
- d) The invert of the flow system may need to be just below the invert of the open channel except at the main outfall where the low flow system enters the fully developed creek. This would allow subsoil drainage of the open space either via mitre drains or via seepage intakes in obvious seepage ponds in the original open channel bed.
- e) The low flow pipe can also be used when the open channel itself is flatter than normally permitted but can be adequately drained to the grated manholes on the low flow pipe system.

4.5 Stormwater Drainage Associated With Improvements To Commercial, Industrial And Multi-Unit Sites.

For determination of rainfall runoff from buildings to be constructed on commercial, industrial and multi-unit sites, the following design criteria should be adopted—

a) Co-efficient of Runoff

- i The coefficient of runoff for all roofed areas shall be 1.0;
- ii The coefficient of runoff for all paths, driveways, court-yards, service areas, parking areas, etc., constructed from generally impervious materials shall be 1.0; and
- iii The minimum coefficient of runoff for grassed areas on natural ground shall be 0.7.

b) Time of Concentration

In arriving at the time of concentration within the site, the time of flow in gutters and downpipes is to be ignored, and the time of flow for paved and landscaped areas can be determined from Drawing No. 9229. The minimum time of concentration shall be 6 minutes.

c) Calculation of Stormwater Discharge

- i When calculating stormwater discharge from the site, some realistic attempt should be made to define sub-catchment boundaries, particularly from flat

roofed buildings and where discharge into the street system is to be at more than one point; and

- ii Rainfall intensity and design storm frequency shall be determined from the method described in Section 4.1e) and f).

d) Pipe Sizes and Outlets

- i Where discharge from the site is to be to the invert of kerb and channel in the roadway, outlets to the face of kerb shall be PVC adaptor for single residential roofwater pipe. For multiple pipes from commercial, units, industrial etc. the adaptor shall be fabricated from galvanised steel with a vertical dimension of 100mm, and if so directed, the drainage pipes shall be protected by a concrete overlay across the footpath alignment;
- ii Related development approvals may direct that stormwater drainage from the site be carried via underground drains to Council's existing or proposed drainage system, by reason of volume of discharge from the site, location of the site, proximity of an existing or proposed drainage system. The minimum size pipe within a road reserve shall be 300mm diameter;
- iii All drainlines constructed onto road reserves shall be in accordance with the requirements of this Stormwater Drainage Policy; and
- iv For sites not discharging onto road reserves or drainage reserves, the developer is required to design a drainage scheme that passes through any adjoining properties to discharge into an existing council drainage scheme. The developer is to provide all necessary easements and drainage reserves for the drainage scheme.

4.6 Design Recurrence Intervals

- a) In general, underground piped stormwater drainage is to be provided in all subdivisions. The designs are to cater for flows resulting from the following recurrence intervals—

Urban Residential Areas	5 years
Urban Collector & Distributor Roads	10 years
Commercial Development	10 years
Industrial Development	5 years
Rural Development	5 years

- b) Flows resulting from the 100 year storm shall be checked and catered for in overland flow paths. The flows are not to encroach onto allotments for urban development. For industrial developments the flow can be based on the 50 year storm. All overland flow paths are to be located in road reserves, drainage reserves or parks.

4.7 Design Method

Drainage calculations shall be submitted along with design plans. Council's standard form for drainage design is available for use if required.

4.8 Minimum Pipe Sizes And Standards

- a) Reinforced concrete pipes 300mm diameter.
- b) Reinforced concrete box culverts 225mm deep.

- c) All pipes are to be rubber ring jointed Class 2 or better, and in salt water conditions, salt water cover is required.

4.9 Allotment Draining

- a) All allotments shall have a minimum grade of 1% to ensure adequate drainage. Those required to be regraded to achieve this requirement shall be indicated on the plans. In reclamation areas, all allotments shall be constructed to fall generally towards the kerb and channel and not towards adjoining properties.
- b) In Noosaville these requirements are dictated by the Noosaville Master Drainage Report.
- c) Property drains shall be provided at the rear of allotments falling away from the road to cater for the discharge of roofwater and surface runoff from the allotment.

4.10 Stormwater Manholes

Stormwater manholes are to be constructed in accordance with Council's Standard Drawing. Step irons are not to be included unless specifically requested by the Director - Works.

4.11 Stormwater Drainage Easements

- a) For all normal stormwater drainage placed through allotments, an easement is required to be created in favour of Council. The minimum width of these easements is 4m but the actual size shall depend on the size, depth of pipes and type of soil.
- b) In the case of property drains, the easement can be reduced to 1.5m width.
- c) Further, the extent of the pipe drain on associated easement shall be considered in each situation. However, the discharge point should desirably be located in a natural watercourse or depression in a manner to minimise scour problems.

4.12 Stormwater Drainage Reserves

Where it is proposed for overland flow to pass through allotments, the area required to contain the flow shall be dedicated to Council as drainage reserve. This requires a minimum 4m wide reserve, but the actual width is to be determined by the amount of overland flow.

4.13 Development Sites

Development shall be designed to ensure that stormwater does not flow out to the road via the driveway. The internal layout shall provide inlet pits and a stormwater system to drain the site, carparks and driveways to Council's existing drainage system.

4.14 Discharge Outlets

Wherever stormwater lines discharge into public parks, national parks, creeks, rivers, lakes and other sensitive areas, requires the installation of dissipaters, silt traps, wet basins or other appropriate measures to reduce the impact of the development onto the natural environment.

4.15 House Downpipe Kerb Outlets

For each allotment two PVC kerb and channel adaptors are to be installed in the kerb 1m away from both side boundaries.

5. CONSTRUCTION PHASE

5.1 Council Fees

The appropriate fee for the checking of engineering documents and the inspection of works as determined by Council by resolution from time to time, shall be paid at the time of submitting engineering plans for approval.

5.2 Sediment and Erosion Control

All development sites must have sediment and erosion control measures in place prior to the commencement of site works. Such measures shall be in accordance with *Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites – IEA Queensland*.

5.3 Supervision and Certification By Subdivider’s Engineer

- a) The developer shall engage a Consultant Engineer to supervise construction of the operational works to development sites.
- b) The name of the proposed contractor who is to carry out the work shall be submitted to Council for approval before construction works commence.
- c) On completion of the construction of the work the developer’s Consultant shall certify that the works have been carried out properly and in accordance with the approved construction plans and specifications and any conditions of approval in relation to construction.
- d) Where soil testing for the project is not carried out by Council, the tests shall be carried out by a NATA Registered Laboratory endorsed for the appropriate tests.
- e) The developer shall lodge with Council maintenance bonds for 5% of the contract price for roadworks, stormwater drainage and landscaping.
- f) The developer shall lodge a certificate signed by a Consulting Surveyor stating that after the completion of all works associated with the development, survey marks were reinstated where necessary and all survey marks are in their correct position in accordance with the plan or survey as of a particular date.
- g) The developer’s Consulting Surveyor shall submit Bench Mark details in relation to all newly created Bench Marks associated with the development to the satisfaction of Council’s Director - Works. See Section 6.6 and 6.7 for details.
- h) These certificates and documents are to be submitted prior to the work being placed “on maintenance”.

5.4 Council’s Inspections

- a) The Council’s Inspectors shall inspect and approve the works at hold points in accordance with Council’s Land Development Construction Compliance Record and the developer’s Consultant Engineer shall liaise with the Council Inspector on these matters. Inspection requirements will be supplied at the time of receiving approval of engineering documents.
- b) Extra inspections may be carried out at any time throughout the construction period.

5.5 Maintenance Period

The maintenance period shall be a minimum of 52 weeks for roadworks, stormwater drainage and frontage works.

5.6 Quality Testing

Where the Consultant undertakes soil testing with a Professional Geotechnical Consultant, satisfactory certified tests results must be supplied to Council prior to the works being placed “on maintenance”.

5.7 Maintenance Bonds

- a) It is the developer’s responsibility to maintain all development works which are to be handed over to Council (including open space areas) and access easement works, for a minimum period of 12 months or as otherwise advised by Council. This period shall commence from the formal acceptance of the development “on maintenance”.
- b) Council requires the developer to submit a Maintenance Bond to Council to ensure the above works are maintained during this period.
- c) The maintenance bond shall be:-
 - i 5% of the agreed value of the development obligations; or
 - ii \$1500, whichever is the greater amount.
- d) Development obligations refers to all conditions of approval relative to the development permit. This includes, but is not limited to, Civil Works (includes water and sewer), Park improvements, provision of “As Constructed” information, test certificates, revegetation, sediment and erosion control.

6. AS CONSTRUCTED REQUIREMENTS

After the development works have been completed to the satisfaction of the Director - Works and prior to the works being placed “on maintenance”, the following is required—

6.1 General

- a) Council requires as constructed information for roadworks and drainage to be submitted in two formats—

- i Part A - A3 size paper drawings at a scale of 1:500

The hardcopy “As Constructed” drawings (A3 size) for all roadworks and drainage are to be signed and certified by the developer’s consultant Engineer for lodgement to Council’s Land Development Section.

Note: Normally, A3 size paper is submitted for checking prior to submission of digital format.

“As Constructed” A3 paper drawings for all roadworks and drainage works are to be lodged with Council prior to acceptance “On Maintenance”.

- ii Part B - Digital format using *ADAC* (Asset Design & As Constructed) routine as supplied by Council.

- b) Appendix 1 provides samples of Roadworks and Drainage - As Constructed Drawings.

6.2 Part A - Paper drawings for engineering compliance check

- a) As- Constructed

The linetypes representing as-constructed works shall to be prominent and at least one or two thicknesses greater than lines for property boundaries and the like.

For multi-stage developments, Council requires copies of plans at every stage of development.

- b) Roadworks & Drainage As Constructed

Paper on A3 sheets at 1:500 are required of plan view only.

- c) Requirements for Roadworks & Drainage As Constructed

- i Street names and Lot numbers;
- ii Drainage easements detailing setback distances;
- iii “As Constructed” contours at a suitable contour interval (generally 1m), or on level sites, i.e. where crossfall on the allotment is less than 600mm), RLs at each corner of allotment and building setbacks;
- iv Adjoining plan numbers should be noted on each side of the plan;
- v Scale Bar, North Point;
- vi Title block should detail—

- Name of Subdivision (Development Name and Stage)
- Name of Consultant
- Name of Surveyor
- Date of Construction

vii Datum (AHD with all level information shown relating to this datum); and.

viii Data supplied to Council must be on the GDA co-ordinate datum.

If Consultants use the **ADAC** Data Utilities (Section 6.3) for the presentation of design data on the construction drawings and there is no additional “As Constructed” information due to construction being within tolerance (verified by Survey), then the information would be acceptable for “As Constructed” submission.

However, as well as the digital data, Council still requires the submitted hardcopy drawings to be marked “As Constructed” and signed and certified by the developer’s consultant.

6.3 Part B – Digital format

a) Data Format

The “As Constructed” data is to be submitted on 3½” floppy disk, CD-ROM, or emailed in to Council’s Technical Officer, Land Development at email address tod3@noosa.qld.gov.au.

The digital format shall be *DWG*. Information stored in such files shall be compiled using the *ADAC Data Utilities* in accordance with the *ADAC User Guidelines* which are available from the ADAC website.

b) ADAC Data Utilities

Council has adopted the use of the *ADAC Data Utilities* for the generation of digital as constructed asset plans in partnership with other regional Local Authorities (Maroochy and Caboolture Shire Councils and Caloundra and Brisbane City Councils). This partnership intends to achieve a uniform standard for the submission of digital data across the region.

The ADAC Data Utilities and User Guidelines are available to all consultants free of charge and can be downloaded from the ADAC website, <http://www.adac.com.au/>. Any party downloading the utilities and/or guidelines will be registered for software licensing control and for ease of provision of upgrades.

The ADAC Data Utilities are primarily AutoCAD based with modules to cater for the input of Roads, Stormwater Drainage, Water Supply, Sewerage, and Cadastral information. The ADAC data utilities automate the process of linking textural attribute information to the graphical asset features created during design or gathered with field survey.

6.4 Specific requirements (Items not currently covered by the ADAC data model)

a) Road Furniture

Locations of permanent signs, guideposts, guardrails, retaining wall, boardwalks, bridges etc. are also to be shown on the plan. These features shall also be detailed within the digital drawing data file and should be segregated into separate layers for ease of interpretation.

- b) Parks Infrastructure
Locations of all permanent infrastructure must also be shown on the plan. This includes all playground toys and equipment, picnic tables, chairs, shelters, barbecues, taps, fences, etc. These features shall also be detailed within the digital drawing data file and should be segregated into a separate layer for ease of interpretation.

As above, provided certification can be given that such appurtenances have been placed in accordance with the approved design plans, those plans may be lodged both hard copy and digitally. However, these items must be clearly marked and labeled on the plan lodged and certified as 'As Constructed' for ease of capture into Council's GIS and Asset Management Systems.

6.5 Location & Type Of Survey Marks

- a) All bench marks shall be tied to Australian Height Datum and shall be brass plaques.
- b) At each newly created junction of roads, at least one kerb return shall be marked by a bridge spike inserted in the top of the kerb, surrounded by a circle and with the letters "BM" engraved in the concrete. The exact location and level value of each such mark shall be shown on the "as constructed" plan.
- c) At least one Standard Permanent Survey Mark shall be provided for each 30 lots of urban size, or for each 3 hectares of part thereof. There shall be at least two of such PSMs where the number of lots exceeds 60, or the area exceeds 4 hectares or where the layout of a subdivision of a smaller size would need more than one mark for practical purposes. Rural lots shall be determined on merit.
- d) The locations of PSMs shall be chosen:
 - i To provide best and longest lines of sight;
 - ii To make vertical access possible at all times and allow and easy photo identification;
 - iii Within the road reserve, normally between the actually formed road surface and the fence line, clear of all likely future work and sited to minimise potential interference and damage;
 - iv To form part of a grid system; and
 - v As may be directed by the Director - Works.
- e) Standard Brass Plugs shall be set into a substantial concrete base in accordance with the patterns and practices required by the Surveyor-General. Any mark found to be at variance with this requirement will be replaced at the subdivider's cost.
- f) Standard Marker Posts will be issued by the Liaison Officer and shall be placed in such a manner as to prevent removal or turning and shall be located not nearer to a PSM than 0.5m in positions most useful as finder posts without creating an obstruction. Where the distance between PSM and post is more than 1m, such actual distance shall be shown on the post.
- g) A locality sketch for each PSM is to be submitted, showing measurements from the PSM to as many nearby survey marks, buildings, fence posts, kerbs and similar features as practicable (No less than three measurements are acceptable).

6.6 **“As Constructed” Level Survey**

- a) A Level Survey shall be carried out to co-ordinate Temporary Bench Marks, kerb spikes and PSM's within the subdivision with double-runs in opposite directions and horizontal distances measured, with about equal intervals adopted for both forward and return run.
- b) The two levellings of a section shall not differ more than $12K^5$ mm., where K is the distance in kilometres between marks measured along the levelling route. Circuit closures shall not exceed this same limit.

7. PLAN PRESENTATION AND DOCUMENTATION

7.1 **Details Of Construction Documents**

The Construction Documents shall include, but shall not be limited to the following:

- a) Construction Plans, containing relevant Council Standard Drawings;
- b) Specifications for construction of the works;
- c) Drainage computations including catchment plans; and
- d) Drainage Discharge Approvals where applicable.

7.2 **Construction Plans**

- a) The Construction Plans drawn in accordance with AS 1100 shall be prepared and signed by the Consultant and shall be submitted for all roadworks, associated stormwater drainage, allotment improvement works, sewerage reticulation, sewer pump stations and water supply reticulation works.
- b) The Construction Plans generally shall contain sufficient information to allow adequate checking of the plans and for the construction of works. This means the plans should normally incorporate the following:
 - i Title Block;
 - ii Locality Plan;
 - iii Layout and Stage Plan;
 - iv Plan of each new road;
 - v Longitudinal Section of each road drawn under respective road plan;
 - vi Detail Plan of each Intersection;
 - vii Typical Cross Sections;
 - viii Cross Sections of each road;
 - ix Longitudinal Section of each drainline;
 - x Traffic Control Plan;
 - xi Composite plan of proposed sewer reticulation showing overall layout;

- xii Plan of Existing Vegetation; and
- xiii Landscape plan.

7.3 **Details To Be Included On Construction Plans**

Without limitation, the following information should be included in each of the above depending on the size and layout of the subdivision.

a) **Title Block**

- i Estate Name (if any);
- ii Real Property Description;
- iii Locality;
- iv Developer's Name;
- v Scales;
- vi Plan Number and Sheet Number;
- vii Schedule and Date of Amendments;
- viii Signed checked and approved by the Consultant;
- ix Survey datum & identification of Survey Mark used in the design; and
- x North Point when appropriate.

b) **Locality Plan**

Location of the subdivision in relation to adjacent towns, main roads, major street, etc.

c) **Layout and Stage Plan**

- i For large subdivisions, the layout plan should show the relationship of all new roads to each other, and to existing roads adjoining the subdivision. Where development is to be carried out by stages, the boundaries of proposed Stages should be shown on this plan, and the stages identified by numbering;
- ii All site cut/fill earthworks including existing and finished surface contours shall be shown on the layout plan;
- iii Drainline locations, pipe diameters and stormwater pit locations can also be shown on the layout plan; and
- iv For small subdivisions, where all new roads can be shown on one detailed plan, the layout plan may be omitted.

d) **Plan & Longitudinal Section of Roads**

The plan and longitudinal sections of roads shall appear on the one sheet and shall include—

- i Road Reserve boundaries;
- ii Allotment boundaries; both existing and proposed at the road reserve boundary;
- iii Centre-line, or other construction line;

- iv Bearings of the centreline or construction line;
- v Offsets, if the construction line is not the centreline;
- vi Tangent point chainages of each horizontal curve;
- vii Deflection angle, radius, arc length, tangent length and secant distance of each horizontal curve;
- viii Road reserve boundaries, centreline and bearing of each intersecting road;
- ix Chainage of the Intersection Point of road centrelines;
- x Kerb lines, kerb radii, and chainage of all tangent points of the kerb line;
- xi Edge of pavement, where no kerb is to be constructed;
- xii Dimensioned road reserve, footpath, and pavement widths, where these differ from the typical cross-section;
- xiii Location and details of signs, and roadmarkings to be provided;
- xiv Location and levels of existing utilities or other existing works within the site;
- xv Location and levels of Bench Marks and reference pegs;
- xvi North point;
- xvii Existing surface;
- xviii Design road centreline levels;
- xix Design grades;
- xx Chainage and levels of grade intersection points;
- xxi Chainage of tangent points of vertical curves;
- xxii Lengths and/or radius of vertical curves;
- xxiii Sections on control lines on superelevated curves (i.e. pavement edges, kerb or land edges), curve widening and superelevation diagram;
- xxiv Location of allotment accesses where obvious or mandatory, e.g. cul-de-sac allotments, existing driveways; and
- xxv Services and conduits across pavements.

e) **Detailed Plan of Intersections**

Intersection detail plans shall include chainages of intersecting roads and kerb levels at not less than quarter points, on all kerb returns, pavement contours and levels, channelisation works, drainage details, and kerb ramps.

f) **Typical Cross Sections**

A typical dimensioned cross section shall be shown for each type of road including—

- i Road reserve width;
- ii Pavement widths including medians;

- iii Shoulder widths;
- iv Footpath widths;
- v Pathway widths;
- vi Crossfalls of pavement, footpaths and pathways;
- vii Pavement and shoulder depth;
- viii Type of kerb and channel;
- ix Type of pavement surfacing; and
- x Service locations are to be included, i.e. both existing and proposed.

g) Cross Sections of Roads

A cross section shall be shown for each pegged chainage at maximum spacing of 20m on straights and curves for each road, except in flat country where all cross sections conform to the typical cross section. Where roads are in steep terrain cross sections may be required at closer intervals.

Cross sections shall show:

- i Road reserve boundaries;
- ii Pavement centreline (or other construction line);
- iii Natural surface;
- iv Design cross section;
- v Crossfall of pavement and footpath, pavement and footpath widths, and pavement depths wherever these differ from the standard crosssection, e.g. Superelevation and Curve Widening;
- vi Chainage of cross section; and
- vii Datum reduces level.

h) Longitudinal Sections of Stormwater Drainage

A longitudinal section of each shall be shown including—

- Chainages;
- Existing surface levels;
- Design invert levels;
- Manhole chainages, and type of structure;
- Distances between manholes;
- Grade of each pipe in %;
- Diameter of each pipe reach;
- Class and type of joint of each pipe reach; and
- Location of all other services, existing and proposed - e.g. Telstra, Sewer, Water, showing sizes and levels.

i) Traffic Control Plan (Pavement Markings & Traffic Signs)

All necessary signage shall be provided in accordance with the current edition of "Manual of Uniform Traffic Control Devices - Main Roads Department, Queensland", or where a standard is not available, AS 1742 parts 1 to 13.

Further, such signage is to conform with Australian Standards AS 1743, AS 1744, AS 1906, AS 1906.1, AS 1906.2 and AS 2342.

The following shall be provided—

- i Street name signs at each intersection. The colours shall be retro-reflective class I, white background with black lettering;
- ii Warning signs, at the approach to all hazards;
- iii “Keep Left” signs at the approach end of the first island at all channelised intersections, and at all median openings;
- iv Separation lines on distributor roads;
- v Double unbroken centrelines at all locations on two-way roads where the sight distance available is less than the desirable minimum;
- vi At a temporary termination of road construction, such as a subdivision or stage boundary, adequate reflectorised guide posts shall be erected;
- vii Warning signs on distributor roads at locations where bicycle ways enter the road reserve; and
- viii Other traffic control devices necessary for effective traffic control.

For small subdivisions where the above relevant information can be clearly shown on intersection or layout drawings, the Traffic Control Plan may be omitted.

j) Water Supply & Sewerage Construction Plans

- i Drawings submitted to Council for approval shall be similar to the Noosa Council Sample Drawing at a Scale of 1:1000. These sample drawings are included with Council’s Standard Drawings; and
- ii Notes detailing standard Noosa Council requirements shall be included as indicated on Council’s Standard Drawings.

k) Plans of Existing Vegetation and Landscape Plans

- i For all development plans and subdivision projects, plans of existing vegetation are required. These are to show all stands of significant trees larger than 160mm in diameter. For those areas where removal of trees is required, all trees to be removed are to be indicated on the plans and reasons are to be given as to why removal of the trees cannot be avoided; and
- ii For development projects, landscape plans are to be submitted for approval. These plans are to be drawn up in accordance with Noosa Council guidelines, which are available from Council’s Land Use Section.

7.4 Sheet Sizes

- a) All engineering plans shall be drawn on standard size sheets the following sheet sizes only being acceptable:

Size	Overall Dimensions
A1	841mm x 594mm
A3	420mm x 297mm

- b) Working plans are to be reduced to A3 format for ease of handling, however must be readable when reduced from the original A1 format above.

7.5 Scales

- a) Scales used for all plans shall be those recommended by the Standards Association and N.A.A.S.R.A. namely:

1:1, 1:2, 1:2.5 and 1:5 and multiples of 10 of these scales.

- b) The following scales shall be used in the preparation of roadworks and stormwater drainage plans:

Plan	1:1000 or 1:500
Longitudinal Section	
Horizontal	1:1000 or 1:500
Vertical	1:100 or 1:50
Intersection Details	1:200 or 1:250
Cross Sections	1:100
Other Details	As appropriate

- c) Where plans are reduced from A1 to A3 format bar scales shall be used on the A1 drawing.

7.6 Dimensioning on Plans

Linear dimensions on all roadworks plans will be in metres, with the exception of some detail plans of small structures (e.g. manholes) and some standard plans (e.g. kerb & channel), which may be in millimetres.

7.7 Chainage

Chainage on plans shall be expressed to 0.01m.

7.8 **Levelling**

All levels shall be to Australian Height Datum, and indicated on the plans. In general, all levels on plans shall be expressed to two decimal places of a metre. Reduced levels of Bench Marks and Reference Pegs shall be expressed to 0.001m.

7.9 **Approval of Construction Documents**

- a) Initial submissions of Construction documents to Council for approval shall comprise two sets of relevant documents listed in Section 7.1 and detailed in Section 7.2 including a list shown on the drawings of Noosa Council Standard Drawings and Specifications to be used for specifying the works.
- b) Once Engineering Documents are considered satisfactory by Council, two complete sets of Construction Documents, containing A3 half size plans, shall be lodged with Council for Council's records and for used by Council's Inspectors.
- c) In approving documents for construction, Council does not accept any responsibility for the correctness and/or accuracy etc. of the documents and it shall be the total responsibility of the Consultant to ensure that the designs detailed in the documents are workable.

7.10 **Construction of the Development Works**

Construction shall not commence prior to receipt of Council's approval. The Consultant shall give Council's Inspector 7 days' notice of intention to commence construction and the name of the successful tenderer shall be submitted to Council for approval.

POLICY HISTORY

- PSP05 was adopted by Council 3 November 2005 and effective 3 February 2006