infrastructure design manual

Produced and maintained by the

Local Government Infrastructure Design Association

PO Box 85, TONGALA, 3621
www.designmanual.com.au

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Local Government Infrastructure Design Association

PO Box 85, Tongala, Victoria 3621

TABLE OF CONTENTS GENERAL CLAUSES

TABLE OF CONTENTS APPENDICES

TABLE OF CONTENTS SELECTION TABLES

Clause 1 Introduction

1.1 Background

This Infrastructure Design Manual (**Manual**) was originally prepared by the Cities of Greater Bendigo and Greater Shepparton and the Shire of Campaspe. Their joint initiative was one which recognised the benefits of municipalities working together towards consistent requirements and standards for the design and development of **Infrastructure**.

Since the preparation of the **Manual** many other **Councils** have adopted the **Manual**. These **Councils** have formed the Local Government Infrastructure Design Association (**LGIDA)** which owns and maintains the **Manual**.

The **Manual** can be viewed and downloaded at www.designmanual.com.au.

1.2 Benefits of a Common Manual

- Sharing financial and human resources to produce a **Manual** which will satisfy the requirements of each of the participating municipalities.
- Developing more consistency amongst design requirements for **Consultants** and **Developers** working in the participating municipalities.
- Providing a better point of reference for all parties at the Victorian Civil Appeals Tribunal (VCAT).
- Sharing ideas and practices to help the municipalities to adopt best practice.
- Documenting the requirements of participating **Councils** for the design and development of **Infrastructure**.
- Providing a clear framework to enable new subdivisions and development to respond to and enhance township character and deliver a diversity and of high quality urban outcomes.

1.3 Consultation

This **Manual** has been prepared following consultation and liaison with **Councils**, **Council** staff, **Consultants** and **Developers**. Each **Council** was responsible for its own consultation process. The consultative processes have ensured that the policies, procedures and guidelines in this **Manual** achieve, as far as practicable, the three main aims of appropriate, affordable and equitable **Infrastructure** that serves the community and promotes growth.

1.4 Objectives

This **Manual** is designed to be used within the boundaries of all the municipalities who have adopted this **Manual**. The primary objectives of the **Manual** are:

- To clearly document **Council's** requirements for the design and development of **Infrastructure** that is or will become **Council's Infrastructure**.
- To standardise development submissions as much as possible and thus to expedite **Council's** engineering approvals.
- To ensure that minimum design criteria are met in regard to the design and construction of **Infrastructure** within the municipalities regardless of whether it is constructed by **Council** or a **Developer**.

- To recognise and deal with the various issues currently impacting on the land development industry, in particular sustainability, integrated water cycle management, timeliness and affordability;

When there is a conflict with Standard Drawings or other **Council** policies, the **Manual** will take precedence where the matter relates to **Infrastructure** standards.

1.5 Principles

Several principles have been used to formulate the provisions of the IDM. Where that has occurred the word "principle" is attached a superscript to the particular clause. For example

> ***Developments*** *that contain more than 200 lots in the* ***ODP*** *may be required to establish bicycle routes through the development* PRINCIPLE.

By hovering the mouse above the superscript principle the principle is displayed. Principles are also listed in Appendix J Notes on Engineering Principles.

1.6 Compliance

The **Councils** using this **Manual** will make every endeavour to follow the requirements of this **Manual** unless there are circumstances that exist that make it impractical or unreasonable to follow the requirements of this **Manual.** Examples of such circumstances include:

- Renewing an existing asset which does not comply with the standards specified in this **Manual**.
- Protecting native vegetation or the existing streetscape
- Where adopting the IDM standards would result in detriment to the neighbourhood character of an area.
- **Infrastructure** in a heritage precinct or heritage significant area.
- Infill **Development** where Council wants to maintain the surrounding or abutting standards

In addition **Council** may exempt particular developments from specified requirements of this **Manual** where the **Developer** can demonstrate that the objectives of the IDM have been met. Developers should apply in writing seeking approval for such non-compliance, and providing compelling arguments to justify the granting of the exemption.

1.7 Innovation and Advances in Technology

Councils consider adopting and approving innovative solutions and using new technologies where Council is satisfied that the objectives of the relevant clauses of the **Manual** have been met even though the **Development** does not comply with specific technical provisions of the **Manual**.

1.8 Councils That Have Adopted the Manual

The following have adopted the **Manual**:

- Greater Shepparton City Council signed 2 August 2007
- Greater Bendigo City Council signed 31 October 2007
- Campaspe Shire Council – signed 14 August 2007
- Moira Shire Council signed 18 June 2007
- Greater Geelong City Council signed 18 October 2007

- Gannawarra Shire signed TBA
- Rural City of Wangaratta signed 29 October 2007
- Mansfield Shire Council signed 27 March 2008
- Strathbogie Shire Council signed in December 2009
- Murrindindi Shire Council signed 27/10/2010
- South Gippsland Shire Council joined 17 March 2010
- Benalla Rural City Council
- Wellington Shire Council 18 May 2010
- East Gippsland Shire 6 June 2014
- Corangamite Shire Council signed TBA
- Central Goldfields Shire Council 26 May 2011
- Baw Baw Shire signed 24 August 2011
- Ballarat City Council signed 1/7/2011
- Hepburn Shire Council signed 23/12/2010
- Moorabool Shire Council signed 7/12/ 2011.
- Warrnambool City Council signed 7/9/2015
- Mitchell Shire Council signed TBA
- Yarriambiack Shire Council TBA
- Southern Grampians Shire Council TBA
- Ararat Rural City Council signed 18 October 2012
- Glenelg Shire Council TBA
- Golden Plains Shire Council adopted 16 July 2013.
- City of Wodonga adopted 15 April 2013.
- Towong Shire Council 5 March 2013
- Indigo Shire Council 19 March 2013
- Swan Hill Rural City 16 April 2013

- Macedon Ranges Shire Council TBA
- Pyrenees Shire Council 20 August 2013
- Colac Otway Shire Council 23 October 2013
- Surf Coast Shire Council TBA
- Mt Alexander Shire Council TBA
- Mildura Rural City Council 24 April 2014
- Bass Coast Shire Council 21 May 2014 (Greenfield developments only)
- Horsham Rural City Council 14 April 2014

1.9 Applicable Standards

In the absence of specific information within this Manual, checklists, or standard specifications, Council will expect the relevant standard or authority requirements to be applied.

1.10 Revision

The **Manual** is a living document and may be revised and amended from time to time.

To ensure that everyone has access to the latest version, the **Manual** will only be available electronically on the **LGIDA** website at www.designmanual.com.au.

Suggestions on how this **Manual** can be improved can be forwarded by email to the Team Leader Development, City of Greater Shepparton, at jonathan.griffin@shepparton.vic.gov.au. "All submissions made in accordance with the above provisions will be considered by the IDM Technical Committee which will provide regular reports to the IDM Board of the recommended changes to be incorporated into the IDM."

Engineering queries relating to individual development submissions, status of approvals or further technical direction regarding **Infrastructure** design should be directed to the following people at the relevant municipalities:

- Design and Road Services Manager
  Shire of Campaspe
- Team Leader Development
  City of Greater Shepparton
- Infrastructure Development Engineer
  Strathbogie Shire Council
- Senior Subdivisions Engineer
  City of Greater Geelong
- Development Engineer
  City of Greater Bendigo
- Project Manager Infrastructure Planning
  Shire of Moira
- Senior Civil Engineer
  Mansfield Shire Council
- Asset and Development Coordinator
  Murrindindi Shire Council

- Manager of Technical Services
  Rural City of Wangaratta
- Director Infrastructure Environment and Regulatory Services
  Gannawarra Shire Council
- Manager of Engineering
  South Gippsland Shire Council
- Senior Development Engineer
  Benalla Rural City Council
- Coordinator Infrastructure Development
  Wellington Shire Council
- Development and Design Coordinator
  East Gippsland Shire
- Manager Assets Planning
  Corangamite Shire Council
- General Manager Technical Services
  Central Goldfields Shire Council
- Strategic Infrastructure Coordinator
  Baw Baw Shire
- Coordinator Engineering Development, Ballarat City Council.
- Infrastructure Planning Engineer, Warrnambool City Council
- Engineering Design Coordinator, Mitchell Shire Council.
- Asset Engineer, Yarriambiack Shire Council
- Manager Infrastructure, Southern Grampians Shire Council.
- Design and Project Management Coordinator, Ararat Rural City Council.
- Design and Development Engineer, Glenelg Shire Council.
- Works Manager, Golden Plains Shire Council.
- Senior Development Engineer, Wodonga City.
- Engineering Development Officer, Macedon Ranges Shire Council
- Manager of Assets, Towong Shire Council
- Senior Development Engineer, Moorabool Shire Council
- Manager Infrastructure Services, Indigo Shire Council
- Development Engineer, Hepburn Shire Council
- Senior Design Engineer, Swan Hill Rural City Council.
- Manager Engineering, Waste Operations Contracts, Pyrenees Shire Council
- Development Engineer, Colac Otway Shire Council
- Project Engineer, Surf Coast Shire Council
- Team Leader – Engineering, Mount Alexander Shire Council

- Engineering Team Leader, Mildura Rural City Council
- Manager Infrastructure, Horsham Rural City Council
- Manager Asset Management, Bass Coast Shire Council

Contact can be made with the people listed above via the **LGIDA** website at www.designmanual.com.au.

Clause 2 Definitions

Acceptance of Works — As described in Clause 7.5.

AHD — Australian Height Datum

Annual Exceedance Probability (**AEP**) — The long-term average probability that the defined magnitude will be exceeded in any given year.

Average Recurrence Interval (**ARI**) — The long-term average interval elapsing between successive events of the defined magnitude.

Carriageway — The distance between the inverts of kerbs for roads with kerb and channel and the distance between outer edges of shoulder for roads without kerb and channel.

Clear Zone — An area adjacent to traffic lanes which should be kept free from features that would be potentially hazardous to errant vehicles.

Consultant(s) — A person or company appointed by the developer to provide expert and technical services.

Construction Engineer — Unless otherwise agreed by the **Council**, all road and drainage construction supervision should be undertaken by a **Qualified Engineer** who will hereafter be referred to as the **Construction Engineer**.

Construction Supervision — **Construction Supervision** is the responsibility of the **Developer**, and is to be carried out by the **Construction Engineer** or another person appointed by the **Developer**.

Council — The relevant municipal organisation within whose boundaries the **Infrastructure** is to be constructed.

Council Engineer — A **Qualified Engineer** appointed by **Council** to check and approve designs and/or to inspect works for compliance with the standards set out in this **Manual**.

Council's Planning Department — The department within each **Council** that is responsible for the processing and administration of planning permits.

Council's Engineering Department — The department within each **Council** that is responsible for the review and approval of **Infrastructure** in relation to engineering standards. For the **Councils** within this **Manual** the engineering departments are as follows:

COUNCIL	DEPARTMENT
Ararat Rural City Council	Council Services
Ballarat City Council	Infrastructure Development
Bass Coast Shire Council	Asset Management
Baw Baw Shire Council	Assets and Engineering Services
Benalla Rural City Council	Infrastructure Services
Campaspe Shire	Road Services Department
Central Goldfields Shire Council	Engineering Services
City of Greater Geelong	Engineering Services

COUNCIL	DEPARTMENT
Colac Otway Shire Council	Infrastructure and Services
Corangamite Shire Council	Assets Planning Unit
East Gippsland Shire Council	Development Department
Gannawarra Shire Council	Infrastructure, Environment and Regulatory Services.
Glenelg Shire Council	Assets and Infrastructure
Golden Plains Shire Council	Works Department
Greater Bendigo City Council	Planning and Development
Greater Shepparton City Council	Planning Projects Department
Hepburn Shire Council	Engineering Services
Horsham Rural City Council	Technical Services
Indigo Shire Council	Infrastructure Services
Macedon Ranges Shire Council	Engineering Infrastructure and Projects Engineering and Infrastructure
Mansfield Shire Council	Engineering Department
Mitchell Shire Council	Engineering and Infrastructure
Mildura Rural City Council	Asset Services
Moira Shire Council	Infrastructure Planning
Moorabool Shire Council	Engineering Services
Mount Alexander Shire Council	Infrastructure
Murrindindi Shire Council	Engineering Services
Pyrenees Shire Council	Assets and Development Services
Rural City of Wangaratta	Technical Services
South Gippsland Shire Council	Engineering Department
Southern Grampians Shire Council	Infrastructure Department
Strathbogie Shire Council	Engineering Department
Surf Coast Shire Council	Infrastructure Development
Swan Hill Rural City Council	Engineering Services
Towong Shire Council	Technical Services
Warrnambool City Council	Technical Services

COUNCIL	DEPARTMENT
Wellington Shire Council	Built and Natural Environment
Wodonga City Council	Infrastructure and Sustainability
Yarriambiack Shire Council	Technical Services

Design Engineer or **Designer**	Unless otherwise agreed by **Council**, all road and drainage designs should be completed by a **Qualified Engineer**, who will hereafter be referred to as the **Design Engineer** or **Designer**.
Developer(s)	The person or company that owns the development.
Developer's Representative	The **Developer's Representative** is preferably the **Superintendent** where there is a contract between the Developer and the Contractor for the provision of **Infrastructure** that will be vested in Council. When there is no contract in place for the works the **Developer's Representative** is either the **Construction Engineer** or the **Design Engineer** as required by the context..
Development	Refers to "the carrying out of building, engineering, mining or other operations in, over or under land or the making of any material change in the use of any building or other land".
Infrastructure	Refers to physical works including roads, paths, playground and recreation equipment, landscaping and drainage systems (including retardation and treatment facilities) and ancillary assets such as signs.
Manual	The Infrastructure Design Manual.
MUSIC	The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is a software tool that simulates the behaviour of stormwater in catchments.
Qualified Engineer	A person eligible to be registered as a civil engineer on the National Professional Engineers Register and experienced in the relevant field of practice.
Road Verge	The distance between the invert of kerb and the near road reserve boundary.
Superintendent	The appropriately experienced and qualified person appointed by the **Developer** to carry out the functions of the Superintendent as defined in the *General Conditions of Contract – AS 2124 or AS4000* when there is a contract in place between the **Developer** and the Contractor for the provision of Infrastructure that will be vested in **Council**..
TMAR	Traffic Management Assessment Report as described in Clause 9.2.1.
TIAR	Traffic Impact Assessment Report as described in Clause 9.2.2.
WSUD	The integration of urban water cycle management within planning and design is known as Water-Sensitive Urban Design (**WSUD**).

Clause 3 Subdivisions and Planning Permit Applications

3.1 General

Council planning schemes control the development and use of land, including subdivision of land, within the municipal boundaries. The *Planning and Environment Act 1987* provides the legislative basis for the planning scheme and its administration. The system of planning controls provides for the issue of planning permits, usually subject to conditions, as well as the endorsement of submitted plans where appropriate. Subdivision and development of land sits within a planning hierarchy that comprises a framework of State, regional and local policies that enable decisions about the use and development of land to be made including:

- The State and Local Planning Policy Framework
- Precinct Structure Plans
- Planning Permit Applications

The State Planning Policy Framework (SPPF) within the Victoria Planning Provisions provides overarching policy to guide land use, subdivision and development in Victoria. The Local Planning Policy Framework (LPPF) provides local policy context.

Requirements for the layout and design of residential subdivision are set out in Clause 56 in all municipal planning schemes.

Precinct Structure Plans set the future structure for individual suburbs. The Precinct Structure Plan shows how the objectives of Clause 56 of the local planning scheme will be achieved within the precinct. A permit application under a Precinct Structure Plan must meet particular Objectives set out in Clause 56 and should meet the Standards set out in Clause 56, as appropriate. The Precinct Structure Plan is incorporated into the local planning scheme to guide the use and development of land in the precinct over the long term. The Precinct Structure Plan also outlines how future urban areas are to respond to and enhance township character through streetscape and open space outcomes.

Planning Permits can be issued in response to an application for a planning permit to subdivide, develop or use land. A planning permit must be generally in accordance with the Precinct Structure Plan and meet the requirements set out in the Precinct Structure Plan.

Each **Council** is responsible for ensuring that development and land use occurs in accordance with any issued planning consent, and for enforcing the planning provisions where contravention of the planning scheme takes place.

Any persons considering the development of land or change of land use should ensure that they are fully informed concerning the provisions of the relevant planning scheme. In particular, they should understand the circumstances where a planning permit is required, and the procedures to be followed in gaining the necessary planning consents.

It is recommended that predevelopment meetings be held with **Council** staff prior to preparing a planning permit application for larger developments.

The requirement to be fully informed about the Victorian Planning Provisions extends to applicants, **Consultants**, and to the general public, so that the rights and responsibilities of landowners and citizens are understood. All participants in the planning process are encouraged to consult with **Council** staff, particularly applicants for planning consent, before submitting planning permit applications and where appropriate referral authorities such as VicRoads.

With regard to unauthorised or uncompleted works that have been carried out in the past, **Developers**, **Consultants**, authorities and landowners are encouraged to discuss these matters with **Council** officers. As a general rule, **Council** will expect any existing works to be altered, removed or reconstructed in order to reflect current requirements.

3.2 Information to be Submitted

Applications requiring a planning permit should be submitted on standard forms that are available from the planning department of the relevant **Council**. Proposals that are not generally consistent with a relevant Precinct Structure Plan will not be approved.

Developments may involve the construction of engineering works, and/or may potentially impact upon existing **Council** assets such as roads and/or drainage systems. In these instances, the applicant should also include the following information, as a minimum, to enable engineering review to take place.

- Plans of existing site conditions showing:
  - Existing surface contours at the interval specified in Table 1 and clear identification of both natural and constructed drainage flow-paths.
  - Level information on adjacent sites, where the development proposal involves any lot-filling or construction of structures that may impact upon the overland flow of stormwater.
  - Existing vehicle crossings. Photos may be beneficial to determine the standard of existing features, such as vehicle crossings. If crossings have been constructed after November 1995, reference should be provided regarding the previous *Consent to Undertake Works in a Road Reserve*, or similar **Council** approval.
  - Details of existing house or lot drainage such as pipe layouts, pipe sizes and discharge point.
  - Impervious surfaces.
  - Onsite wastewater management system arrangements.
  - Existing car-parking, footpaths and landscaping where present.
- Conceptual layout of the proposed development.
  - Proposed Public Open Space and linkages.
  - Impervious surfaces.
  - Footpath details.
  - Car-parking details.
  - Landscaping, including proposed vegetation, irrigation and furniture.
  - Street lighting style details.
  - Vehicle wash-down areas for industrial and/or commercial uses.
  - Onsite wastewater management system details.
- A written response to Planning Scheme requirements for any subdivision of land or major development.
- Traffic generation, existing and proposed.
- Drainage Master Plan and computations.
- Cultural Heritage Management Plan.
- Proposed **WSUD** treatments and **MUSIC** analysis including report on **WSUD** design intent, confirming how compliance with **Council** specific requirements will be achieved. Copies of any site assessments, or similar investigation undertaken including but not limited to flora and fauna, cultural heritage, environmental and sanitisation.

Table 1 Contour Intervals

Description	Average Slope of Allotment	Contour Interval
Sites > or = 1000m²	0-1%	100mm
	1-2%	200mm
	2%-5%	300mm
	5% plus	500mm
Sites <1000m²		The minimum number of spot levels required is one on each corner of the allotment and centroid together with arrows showing direction of flow.

3.3 Engineering Referrals

Where further information is required before a formal engineering response can be given, the request for that information must be made within the nominated timeframes at which point the 'clock stops'. The clock starts again when adequate information is received.

The timeframes for dealing with engineering referrals for planning applications are those specified in the *Planning and Environment Act*. **Councils** may have specific performance targets, and contact should be made with **Councils** to determine what their response times are for the various types of engineering referrals.

Standard conditions for planning permits appear in **Appendix A: Typical Standard Conditions for Planning** Permits.

3.4 Engineering Fees

When a development involves construction of engineering works, or may potentially impact upon the existing **Council** roads and drainage systems, a plan checking and supervision fee may apply. Unless otherwise agreed in writing, this fee will be in accordance with the *Subdivision Act* and will be 3.25% of the value of the works to be taken over by **Council**.

If more than one construction inspection or **Acceptance of Works** inspection is required (refer Clause 7.5) because the **Council Engineer** has been called prematurely (i.e. before works are ready/complete) an extra fee of $50.00 per inspection will apply for the first additional inspection, $100.00 for the second additional inspection and $150 for the third additional inspection, unless varied by a previous written agreement.

3.5 Development Contributions

Development Contributions will be generally controlled by the use of predevelopment agreements or other arrangements or Section 173 agreements, planning permit conditions and/or Development Contributions Plans. Development Contributions may be required for road works, drainage, Public Open Space, traffic management works, community development or other works that benefit the **Developer** and/or others.

Where adequate drainage or other **Infrastructure** is not available, other arrangements may need to be in place to allow suitable **Infrastructure** to be provided. **Developers** should access any Council policies relating to drainage levies and/or head-works charges to obtain information as to the amount of any levy or charge applicable in such cases.

Any contribution from **Council** will be made in accordance with their relevant policies, copies of which are available on **Council** web-sites. Because such works will be 'Capital Works' or new assets, **Councils** are required to make provision

for them within their annual budgets. Accordingly **Developers** should submit plans, specifications, cost estimates and other relevant documents detailing any request for a contribution prior to January each year. The allocation of **Council** funding through the budget process cannot be guaranteed for any financial year. The cost estimates should detail the proposed contribution of all benefiting parties and the date or trigger for the contribution sought from **Council**.

3.6 Certification of Plans of Subdivision

Certification of a Plan of Subdivision can only occur if the plan of subdivision is in accordance with the requirements of the planning permit and any approved Functional Layout Plan.

Clause 4 Outline Development Plans

4.1 Objectives

The objectives of the **Outline Development Plan (ODP)** are as follows:

- To ensure compliance with planning scheme requirements, particularly where overlays exist.
- To ensure that adequate information is provided at initial planning stages to allow the orderly review, assessment and approval of land development.
- To ensure that **Developments** provide effective and economical **Infrastructure** that services the area.
- To ensure that staged or multi-**Developer** projects are able to be delivered in a safe, efficient and effective manner.
- To ensure that **Infrastructure** is planned for the full potential of development and that unnecessary duplication or oversizing of **Infrastructure** is avoided.

4.2 General

An **ODP** will generally be required for any of the following **Developments**:

- Where the land is subject to a Development Plan Overlay (DPO) and/or Incorporated Plan Overlay (IPO).
- Multiple-staged subdivision development.
- **Developments** where more than one landowner is potentially involved.
- Single-staged subdivisions with more than 10 allotments.
- Where directed by **Council**.

Details of overlays already incorporated in **Council** planning schemes can be obtained via the Department of Transport, Planning and Local Infrastructure (DTPLI) website, or by contacting the **Council's Planning Department**. Draft Development Plan Overlays may be under consideration by **Council**, and consultation with the planning department is essential.

Unless otherwise agreed by **Council**, the **ODP** should be prepared by an experienced **Consultant** appointed and remunerated by the **Developer**, or by a group of **Developers**. **Council** assistance will be provided where available.

ODPs should be submitted to **Council** for review. In undertaking that review, **Council** will have regard to the provisions in the Planning Scheme (for residential **Developments**), and guidelines contained within this **Manual**. Consideration should also be given to the *Safer Design Guidelines for Victoria* published by DSE, and the draft VicRoads brochure *Safer Urban Environments – Road Safety and Land Use Planning Guide* and to any Healthy Urban Design Guidelines developed by the relevant **Council**.

The submission and review of an **ODP** will normally require a meeting between the **Developer** and planning and engineering staff from the **Council**, with relevant service authorities and other referral authorities such as VicRoads and the Department of Environment, Land and Planning being invited to attend this meeting as appropriate. The **Developer** will be responsible for coordinating the meeting.

4.3 Requirements

Council will expect any **ODP** submitted for their consideration to be prepared in accordance with the planning scheme requirements and, as a minimum, to include or consider the following:

- Existing surface level contours to Australian Height Datum (**AHD**) as per the requirements of Table 1.
- Existing features, adjoining property features that may impact upon the engineering design including the type and standard of trees, historical aspects, topographical features, abnormal or significant features.
- Proposed surface level contours that will enable the development to be self-draining during normal and minor system blockage conditions for up to a 1% **AEP** event.
- A traffic engineering report designating street hierarchy, maximum predicted traffic volumes, traffic control, bus routes, overall road network and intersection concepts and other relevant information as may be requested.
- General layout of allotments, indicating approximate size, range, shape and orientation of allotments.
- Location and approximate size of Public Open Space.
- Consistency with any approved strategy or plan for a particular urban area. This may include, but not be limited to **Council's** cycling strategies, playground strategies or spatial network plans.
- Open space areas and facilities should be provided in locations that maximise accessibilities for all users, including people with poor mobility, such as older adults and people with a physical disability, and parents with prams and strollers.
- Local open space should not be located on major roads. There should be good sight lines into an open area from neighbouring streets, house, schools or other buildings. Isolated pockets of land within a park (i.e. dead spaces) or those areas which cannot be overlooked should be avoided.
- Local parks and playgrounds should have active frontages on at least three sides to provide surveillance, and should avoid bordering rear yards.
- Save in exceptional circumstances, parks should have a minimum area of 0.75 Ha.
- Drainage and flooding provisions, including location and size of drainage reserves, and drainage retardation and treatment systems. This information should also comply with the relevant requirements of Catchment Management Authorities or Melbourne Water where the drainage catchment falls within their jurisdiction.
- Due regard should be had to existing township and local character.
- Legal and practical access should have been assessed as existing for all parcels within the development, having regard to topography, native vegetation cover and existing soil conditions.
- Drainage plans should give practical effect to **WSUD** philosophy.
- Road, cycle, and pedestrian networks within and beyond the subject area, should be interconnected.
- Social and community **Infrastructure** requirements should be addressed.
- Public transport requirements should have been identified and addressed.
- CFA requirements in relation to water supplies and access should have been addressed.
- Due regard should have been given to the 1% **AEP** flood levels supplied by the relevant floodplain authority.
- Any proposed use of recycled water should have been identified and addressed.

The engineering design requirements for an **ODP** proposal are as follows:

- Residential subdivision **Developments** must be designed to meet the provisions of Clause 56 of the planning scheme, except where appropriate alternative design solutions have been provided by this Manual.
- Surface flow paths should have practical and satisfactory destinations, and should not be directed into property easements or piped systems unless the latter systems are designed for the peak flow resulting from a 1% **AEP** storm event, and appropriate precautions have been taken to avoid the possibility of obstruction. Surface flow paths should normally be directed into road reserves or **Council** drainage reserves.
- Arterial, sub-arterial and trunk collector roads should have a design layout which facilitates future connections, or be positioned relative to boundaries such that viable future extensions can be achieved.
- Unless otherwise agreed by Council, cul-de-sacs should be shown with court bowl ends. Hammerhead or 'T' heads are not permitted *PRINCIPLE*. Nooks and extended driveways can be utilised provided they are common property, a drainage pit is provided at the boundary of the common property and the road reserve, and garbage pads are provided on the road reserve.
- The road network layout should demonstrate good traffic circulation and distribution to higher-order streets. The objectives of Clause 56.03 of the planning scheme should be considered when designing and assessing road networks for residential subdivisions. In particular, the proposed network should not overload or detrimentally affect existing or proposed residential streets and intersections.
- The road and intersection design should facilitate the efficient clearance of traffic, particularly at school sites and other public facilities..
- Adequate sight distances should be provided, especially where roads intersect at narrow angles.
- Road layouts should provide natural traffic speed control, appropriate to the street category. The introduction of specific speed control devices should be considered only as a secondary option. Roundabouts may be implemented at intersections. However, care should be taken to provide adequate sized roundabouts and road reservation boundaries should be designed to accommodate the required radius and sightlines.
- Road layouts should be designed for all road users appropriate to the street type, including service vehicles, emergency vehicles, waste collection vehicles and street-sweepers. Bus routes need to be considered when developing road networks, in accordance with the Department of Infrastructure publication entitled *Public Transport Guidelines for Land Use Development.*
- Road reserve widths should be adequate for the intended road type, and comply with Clause 12.3.2. The **ODP** should include a typical cross-section of differing road types, detailing the functions to be accommodated within the reserves, including, for example, bike lanes, drainage, and landscaping.
- Proposed street names should conform with the *Guidelines for Geographic Names Victoria* and any relevant **Council** policies.

The information to be provided on the **ODP** may include, but is not limited to, the following:

- A Traffic Management Strategy addressing the impact and management of traffic relating to the development.
- A Drainage Management Strategy addressing the management of stormwater quantity and quality. This includes stormwater arriving from upstream, passing through, and moving downstream from the **Development**. Where surface flow paths discharge to neighbouring properties, evidence should be provided of a written agreement, approval or clearance from the adjoining owners.

- Approval from all relevant service authorities whose assets or land may be affected by surface or pipe flow discharge. In particular, a *Works on Waterway* permit from the relevant Catchment Management Authority may be required where:
  - There is a direct connection to a waterway.
  - There is a bridge or culvert over a waterway.
  - Floodways are to be constructed, especially if piping of a waterway is proposed.
  - Water quality **Infrastructure** is to be constructed in proximity to a waterway.
  - A retardation basin is to be constructed.
  - Construction or development may be impacted by mainstream or coastal inundation.
  - Works on or near a designated waterway (refer to relevant CMA), including fill in a floodplain.
  - When required by the relevant Catchment Authority
- Approval from the relevant authority for any changes in road status including:
  - Established responsibilities for the construction and maintenance of the road
  - Determination of legal and practical access

Clause 5 Design Requirements

5.1 Objectives

The objectives of these design requirements are as follows:

- To provide **Developers** with clear guidelines regarding the engineering requirements of **Council**.
- To ensure that new and upgraded **Infrastructure** is of consistent standard across the municipalities.
- To ensure that the works are designed such that they will fulfil the purpose for which they are intended.
- To ensure that minimum design standards are achieved and that works meet **Councils'** legislative obligations.
- To ensure that community amenity will be improved through development.
- To ensure that environmental, public and employee risk during and after development is considered.
- To ensure that maintenance requirements are considered at the planning and design stages.
- To ensure all relevant statutory authorities/stakeholders have been consulted and their requirements considered.
- To ensure continuity in township / local character where desired by Council.

5.2 General

Comprehensive design criteria included in the **Manual** convey engineering requirements for the internal or external delivery of design, construction and acceptance of roads and drainage **Infrastructure**, while considering local conditions and the requirements of the **Council**.

For **Developer's Representatives,** the Manual provides the basis for expedient approvals for works built by **Developers** for incorporation into the **Infrastructure** systems controlled by the **Council**. The engineering process for **Developments**, including subdivisions, is outlined as a flowchart included in **Appendix B: Engineering Approval Process for Developments)**. **Council** does not guarantee the accuracy or completeness of any document, regardless of any review undertaken by **Council** and its responsible officers.

Unless otherwise agreed by **Council**, engineering plans and documentation should be submitted at three stages during the design process:

1. Functional Layout Plan
2. Detailed Design Plans
3. Final Design Plans

The Functional Layout Plan process is aimed at improving outcomes and reducing timelines for approvals. It may require more work upfront to ensure that time is saved in the later stages of approvals. While the Functional Layout Plans should be consistent with any relevant Precinct Structure Plan or Outline Development Plan, the process will also ensure that both designers and Council have confidence in proceeding to the development of detailed engineering and landscape designs and plans.

The preparation of Functional Layout Plans is therefore considered to be part of a best practice approach to the documentation of subdivision developments, and as such it is highly recommended in cases where there is no specific requirement on a planning permit. Functional Layout Plan(s) should show all engineering elements which may influence either the dimensions of the plan of subdivision, the functionality of civil infrastructure, the achievement of an acceptable landscaped area or the preservation of prescribed features on the site.

Once Functional Layout Plan(s) are approved, the subdivision layout and the infrastructure shown should be delivered in accordance with the approved plan. However, the approved Functional Layout Plan(s) are not a definitive statement of all construction requirements. Detailed engineering plans provide this information. Approval does not represent either consent to the omission of infrastructure that is not shown on the Functional Layout Plan(s) or final acceptance of items that are incidental to fixing dimensions on the plan of subdivision or drawn only for the purpose of clarity.

5.3 Checklists and Auditing

The detailed checklists appended to this **Manual** provide designers with documentation to demonstrate that the requirements of the **Council** have been satisfied. Designers are required to sign off the relevant checklists, to verify that the specified criteria have been met.

For **Developers**, these checklists form an integral part of each submission of documentation, and provide the basis for fast-tracking approvals. **Councils**, to check authenticity, will randomly undertake audits of submitted checklists. **Consultants** providing reliable checklists will be ranked accordingly and attract less auditing. Others may experience delays in the approval process due to increased rates of auditing.

Where **Developer** submissions are accompanied by completed checklists, **Council's Engineering Department** need not spend time checking quality or minor documentation details, and will therefore be able to review documentation in a significantly shorter time.

Where **Developer** submissions are not accompanied by completed checklists, or where auditing has shown that previous checklists have not been reliably completed, **Council's Engineering Department** will be required to review the submission in greater detail. This may include a check of design details and quality of documentation against the checklists. As a result, responses or approvals of submitted documents may not be able to be fast-tracked.

5.4 Developer's Representatives

It is not the responsibility of the **Council** to design, construct, or supervise the construction of roads and drainage **Infrastructure** for private land development. It is the responsibility of the **Developer** to engage suitably qualified and experienced personnel who will carry out these functions to the satisfaction of the **Council**.

Council will expect the **Developer** to ensure that these persons:

- Possess a professional indemnity insurance policy that covers design, construction and supervision and includes a provision for a maximum possible claim.
- Do not have pecuniary interests with either the **Developer**, or the Contractor, unless independent certification is provided.

Unless otherwise agreed by **Council**, all subdivision road and drainage designs should be undertaken by a **Qualified Engineer**, who will hereafter be referred to as the **Design Engineer** or **Designer.**

Unless otherwise agreed by the **Council**, the **Construction Supervision** of all subdivision road and drainage works should be undertaken by a **Qualified Engineer** who will hereafter be referred to as the **Construction Engineer**.

While it is generally preferred that the **Design Engineer** and the **Construction Engineer** be the same person, the **Developer** may decide not to utilize this arrangement. All parties will be employed at the expense of the **Developer**.

For the purpose of this **Manual**, in all matters relating to the design and design approval of the development roads, drainage and landscaping works, the **Design Engineer** will be deemed to be the **Developer's Representative**.

For the purpose of this **Manual**, in all matters relating to the construction and handover of the development roads, drainage and landscaping works, the **Superintendent** will be deemed to be the **Developer's Representative**.

5.5 Pre-Design Site Inspection

Unless otherwise agreed, a pre-design site inspection should be made prior to any detailed design work commencing.

The **Design Engineer** should plan to conduct a separate pre-design site inspection with a representative from **Council's Engineering Department** to discuss technical issues and requirements for the site and surrounds.

5.6 Coordination of Works by Developers

The **Developer**, or their representative, will be responsible for coordinating the works to be undertaken as part of the development. Works may include roads, drainage, water, fire hydrants, fire plugs, sewerage, power, telecommunications, gas, landscaping, and other works as required by the planning permit. The design, documentation and installation of all **infrastructure** required to service the development should comply with the criteria, specifications and instructions of the relevant authority.

Unless otherwise agreed by **Council**, service alignments in **Developments** should comply with the requirements of the *"Code of Practice - Management of Infrastructure in Road Reserves"*, the *Coordination of Streetworks Code of Practice*, *Victoria* reprinted 1995, and other relevant regulations or codes established in relation to the *Road Management Act*.

Engineering plan approval for the construction of roads and drainage will not be granted until a master services plan has been provided showing the alignments and structures of all services. The **Developer** or their representative will be responsible for providing sufficient information on the master services plan to identify potential clashes of services, and to determine the clearance between these services where they cross. Footpath alignments and kerb crossings should be shown on the master services plan, as should proposed landscaping features such as trees and irrigation systems.

5.7 Variation from Design Guidelines

Any proposal to deviate from the **Manual** guidelines at any stage of the works should be submitted with full supporting reasons and be approved in writing by **Council's Engineering Department** prior to the commencement of the relevant work. The **Design Engineer** will be entirely responsible for the outcomes of any such deviation.

The **Design Engineer** is responsible for reviewing any planning permit conditions, determining whether any engineering approval for design variation requires an amendment to the Planning Permit conditions, and arranging for an application to be lodged with **Council's Planning Department** for planning permit amendment if required.

Note
Variations approved for some subdivisions or **Developments** do not imply approval for other current or future proposals.

5.8 Documents to be Submitted

Unless otherwise agreed by **Council**, engineering plans and documentation should be submitted at three separate stages during the design process, in accordance with the following sections. Where designs are prepared by **Council** staff members, the level of detail provided and any specific requirements should be agreed with **Council** prior to the design commencing, but the design of roads and drainage should comply with the guidelines set out in the following sections.

5.8.1 Approval of Functional Layout Submission

Council will expect the **Design Engineer** to submit preliminary engineering plans to **Council's Engineering Department** for review, and to identify any engineering assumptions specific to the proposed development. This submission can be lodged before or after an application for planning permit is made.

In considering whether to approve any functional layout submissions, **Council** will take into account the requirements of this **Manual,** relevant general engineering principles, the planning permit conditions and all other information collated from the site. **Council** will expect the **Design Engineer** to provide sufficient data on the proposed roads, drainage and parking for the development to enable approval of functional layout to be issued.

Road Design:

The submission should include one hardcopy set (A3 plans) of road layout and parking plans showing:

- Layout of roads and allotments with nominated carriageway widths (between invert of kerbs) and nominated road reserve widths.
- Layout of road hierarchy and estimated traffic volumes.
- Typical road reserve cross-sections.
- Conceptual layout of proposed intersections internal and external to the development.
- Car-parking layout plan in accordance with the requirements of this **Manual** and the Planning Scheme with the **Manual** to take precedence where there is a conflict between the requirements of both documents.
- Vehicle turning movement plan (refer Clause 12.3.8).
- Details of any staging of the development and impact on the road network.

Drainage Design:

The submission should include one hardcopy set (A3 plans) of the overall drainage strategy showing:

- Total catchment area, nominated sub-catchment areas and co-efficient of runoff for each sub-catchment.
- Layout of proposed drainage systems with approximate sizes of trunk drainage (not final pipe sizes).
- Natural surface contour lines to the **AHD**.
- 1% AEP flood levels where applicable.
- Detailed design contour lines to **AHD**.
- Nominated overland flow path for 1% **AEP** storm events.
- Nominated drainage discharge point and any treatment concepts.
- Existing drainage services and proposed connection points to existing and future **Developments**.
- Details of any staging of the development and impact on the drainage network**.**

- Details of **WSUD** sizing and layout.

Many of these requirements may not be applicable to small **Developments**.

The submission seeking approval for the functional layout should be accompanied by a brief report outlining key engineering issues and their proposed treatment, and by a completed checklist as found in **Appendix C: Checklists and Forms for Developer's Representatives**. Connectivity to existing **Infrastructure** should be demonstrated, as should relevant social and community linkages.

If **Council** requires a traffic management strategy it should be submitted with the request for approval of functional layout (refer to Clause 9). The road safety audit team should be nominated to **Council's Engineering Department** at this time for their consideration (refer Clause 10).

On receipt of the approval of functional layout, the **Design Engineer** can proceed to undertake detailed design with confidence that their proposed strategies are acceptable to **Council**.

5.8.2 Detailed Design Submission

Once approval of functional layout has been received, design work should be carried through to a near-to-complete stage and should be submitted to **Council's Engineering Department** for review of the design and documentation, after coordinating with VicRoads where appropriate. Detailed design approval may be granted subject to minor amendments. Should significant amendments be required, documents will be required to be resubmitted for detailed design approval.

In considering whether to approve detailed design documentation, **Council** will take into account the requirements of this **Manual**, relevant general engineering principles, the planning permit conditions and all other information collated from the site, the requirements of any relevant Precinct Structure Plan, the approved Functional Layout Plan(s), service authority requirements and other relevant factors.

Unless otherwise agreed by **Council**, one (1) hardcopy set and one (1) electronic set of draft plans and specifications should be submitted to **Council** for comment, prior to lodging final design plans and specifications for approval. The hard copy set of plans is to be unbound and the copies of the specifications are to be bound. Completed checklists as found in **Appendix C: Checklists and Forms for Developer's Representatives** should accompany this submission.

Documentation should be prepared in accordance **with Appendix D: Information to be Shown on Plans**, and include a master services plan. This plan should, so far as reasonably practicable, show the overall layout of all existing and proposed services within the limit of works. The plan should identify potential clashes of services and demonstrate that appropriate clearances will be achieved. Individual cables for electrical, telecommunication and similar services are not required to be delineated, but may be shown as a single line representing the alignment of trenches. The location of fire hydrants, fire plugs, street lights, sub-stations, pump stations, and similar items should be shown on the master services plan, together with major landscaping features.

Council will expect the **Design Engineer** also to provide copies of hydraulic calculations showing both surface and underground flows into and out of the system for major and minor storm events (refer Clause 16), and of pavement design computations, including relevant Californian Bearing Ratio (CBR) results from laboratory analysis of soil samples.

For infrastructure that will be vested in **Council** or is located adjacent to or abutting **Council** infrastructure, **Council** property or reserve or Public Open Space, a Certificate of Compliance for Design and a Certificate of Compliance for Construction is required for the following infrastructure items constructed as a part of a subdivision development:

- Retaining walls along property boundaries (>1.0m high);
- Entrance structures;
- Gazebos;
- Bridges;

- Boardwalks/elevated walkways/jetties; and
- Other structures as applicable.

In particular circumstances, Building Permits may be required, as well as Certificates of Compliance.

Quality Assurance sections of the specification should, as a minimum, list witness points and hold points as nominated in **Appendix E: List of Council Inspections**. The **Council** may choose to be present for specific hold points that relate to roads and drainage construction and documentation should reflect this.

If **Council** requires a Road Safety Audit report it should be submitted with the request for detailed design approval.

After review by the **Council's Engineering Department** one set of plans and specification will be returned to the **Design Engineer**, with mark-ups or comments regarding any required amendments.

5.8.3 Final Design Submission

Once detailed design approval has been received, design work should be carried through to completion ensuring coordination with VicRoads has occurred where appropriate and then submitted to **Council's Engineering Department** for review of the final design documentation.

On completion of the final design plans and specifications, the **Design Engineer** should, unless otherwise specified by **Council**, provide three (3) hardcopies and one (1) electronic copy of these to the **Council's Engineering Department** with a covering letter certifying that these fully comply with the guidelines of this **Manual**, except for approved variations. An additional set of hardcopy plans should be provided if landscaping is to be incorporated into the development. All hard copy sets of plans are to be unbound and all copies of the specification are to be bound.

Prior to issuing the Statement of Compliance for any subdivision, **Council** will expect the **Design Engineer** to submit an estimate of the full cost of all road and drainage construction works, in order to establish the prescribed checking fee.

Council cannot guarantee thorough checking of all calculations and design details. The **Design Engineer** submitting the documents is entirely responsible for ensuring that designs and specifications comply with the **Manual** requirements, relevant Australian standards and relevant local, state and federal government legislation.

Final design approval does not relieve the **Developer** of responsibility for rectifying errors and omissions that become evident during construction. Where the engineering plans and/or calculations have been subject to significant revision following approval of the design, amended drawings should be resubmitted to **Council** for approval. Council will expect all revisions to be documented. This can be achieved through (where appropriate) the use of revision clouds and labelling within the title block, provided clarity can be maintained on the drawings. Where clarity would be compromised, **Council** will consider accepting separate documentation of revisions.

Approval of design drawings is current for two (2) years only from the date of that approval. If the engineering works have not substantially commenced within the two-year period, the **Council's Engineering Department** may require that revised engineering drawings and construction specification be submitted for approval.

Should the Plan of Subdivision be altered after the Final Design approval, the **Design Engineer** will be responsible for resubmitting the Certified Plan (as amended) together with amended engineering drawings to **Council** for approval.

Once final design approval has been granted, one (1) copy of stamped & signed plans and specifications will be returned to the **Design Engineer**. Final design approval should be received before construction commences. Tendering of works prior to the receipt of final design approval will be undertaken solely at the **Developer's** risk.

The issue of a planning permit and approval of Final Design does not constitute consent to undertake works within existing road reserves under the management and responsibility of **Council** or VicRoads.

Clause 6 Documentation

6.1 Objectives

The objectives of these documentation requirements are as follows:

- To provide consistency in the presentation of design information.
- To eliminate duplication of data entry into various record systems.
- To provide an 'as constructed' record of **Councils'** assets.

6.2 General Requirements

Council's Engineering Department will normally arrange for or undertake the registration, storage and maintenance of engineering plans in hardcopy and/or electronic format.

In addition to this, all **Councils** operate electronic data management systems for all correspondence to and from the organisation, including plans. Letters, forms, certificates and minor reports (generally up to 20 pages) that are received are transferred to electronic format by its records department. However, unless otherwise agreed by **Council**, major reports and all plans larger than A3 should normally be submitted in both electronic and hardcopy format.

Council's Engineering Department should be advised of the installation dates of any approved Major Traffic Control Item to enable advice to be forwarded to VicRoads within 30 calendar days of enacting VicRoads delegation.

6.3 Plans

Unless otherwise approved by **Council**, plans should be prepared as outlined in the following sections. Council will expect electronic submissions of plans to be such that normal reproduction from the electronic files will deliver a hardcopy that is an exact duplicate of an equivalent hardcopy submission.

6.3.1 Sheet Size

Council will expect plans to be submitted on A1 or A3 sheets that comply with Australian Standard AS1100 Part 3.

6.3.2 Scales

For general consultation prior to planning permit issue, plans may be submitted as A1 or A3 sheets.

ODPs should generally be submitted on A1 sheets at scale of 1:1000.

When requesting approval of functional layout, plans should be submitted on A3 sheets with the following scales:

Lot Layout	1:1000
Roads Plan	1:1000
Intersection Plans	1:200 or 1:250
Drainage Plans	1:1000

When requesting detailed design approval or final design approval, or providing as constructed information, plans should be submitted on A1 sheets with the following scales:

Layout Plans	1:500
Longitudinal Sections	Horizontal 1:500, Vertical 1:50
Cross Sections	Horizontal 1 in 100, Vertical 1:50 or 1:100
Intersection Plans	1:200 or 1:100
Details	1:10 or 1:25

When submitting whole farm plans for approval, **Council** will expect plans to be submitted on A2 or A1 sheets at a scale of 1:1500.

6.3.3 Datum

Unless otherwise agreed by **Council**, levels should be related to Australian Height Datum (**AHD**). Plans should nominate a minimum of two (2) permanent survey marks (PSM's) and their respective numbers/identification, and any temporary benchmarks (TBM's) relevant to the works. Where it is not possible to nominate two survey marks, **Council** may agree to accept the use of only one survey mark.

In order to comply with the requirements of regulation 11 (3) of the *Surveying (Cadastral Surveys) Regulations 2005,* subdivision plans must nominate all the permanent survey marks created, and their respective numbers/identification.

Road chainages should commence at clearly designated and identifiable locations, nominated on the plans.

6.3.4 Standard Details

All construction details should, so far as reasonably practicable, comply with **Council's** standard drawings. Where special structures or modifications to standard drawings are required, **Council** will expect details of the works to be submitted with the detailed construction plans for detailed design approval.

6.3.5 Drawing Numbers

Plans should generally reference planning permit numbers. This planning permit number should be clearly shown on the cover sheet or face sheet of any drawing set and be contained within the title block of each drawing.

Councils will provide plan numbers for any plans prepared for them if this is required. Plan numbers are not required for subdivision and **Developments**.

6.4 Specifications

Project specifications should ensure that all works are undertaken to meet **Council** requirements, and that there will be no outstanding liabilities when the projects are handed over at completion.

Council will expect specifications for contracted works to include a quality section nominating minimum hold points and witness points, including as a minimum, those inspections nominated in **Appendix E: List of Council Inspections**.

Unless otherwise agreed by **Council**, the specifications for assets should ensure that the design life as listed below can be achieved with industry standard maintenance:

- Concrete structures generally 80 years
- Bridges
  - Concrete 100 years

- Steel 80 years
- Timber 50 years

- Buildings/structures 50 years
- Road pavements See Clause 12.7 of this **Manual.**

6.5 Standard Drawings

Council will expect the **Design Engineer** to adopt details shown on the **Council's** standard drawings, so far as reasonably practicable. However, while standard **Infrastructure** is considered highly desirable across the municipalities, standard drawings should only be used where the item/structure and application is considered standard. The standard drawings are not to be used in lieu of responsibly engineered and detailed structures. Where the standard drawings are not considered appropriate for any particular application, variations from the standard details should be fully documented to the satisfaction of the **Council**. Cross-referencing standard drawings with variations made by note will only be accepted where those variations are considered minor and where the directions are clear.

Standard drawings are available in **Appendix F: Standard Drawings**.

The **Design Engineer** is responsible for ensuring that the standard drawing used is correct for the application and should consult with **Council's Engineering Department** where necessary.

6.6 Information to be shown on Plans

The **Design Engineer** is responsible for ensuring that information on plans is shown in sufficient detail to enable works to be constructed in accordance with the design intent and to the satisfaction of the **Council**. Information shown on plans should include, but is not necessarily limited to, those items listed in **Appendix D: Information to be Shown on Plans.**

Clause 7 Construction Phase

7.1 Objectives

The objectives of these construction requirements are to ensure that:

- the works are constructed such that they fulfil the purpose for which they were intended;
- long-term maintenance requirements are considered;
- there is no detrimental effect on other existing assets in the locality;
- the works are safe, both during and after construction; and
- environmental impacts are minimised, both during and after construction.

7.2 Commencement of Construction for Developers

Construction should not commence until **Council** has granted Final Design approval and, where a subdivision is involved, the Plan of Subdivision has been certified. Any premature commencement of works will be wholly at the **Developer's** risk.

Council will expect the **Construction Engineer** to notify **Council's Engineering Department** of commencement of construction by providing the following documents:

- *Intention to Commence Construction* form.
- Construction Management Plan incorporating the following:
  - Construction Program.
  - Inspection and Test Plans.
  - Traffic Management Plans.
  - Environmental Management provisions including protection of stormwater quality and measures to prevent the spread of noxious weeds.
- Copy of Approved Consent for Works within Road Reserves.
- Copy of relevant insurance certificates.

The *Intention to Commence Construction* form may be found in **Appendix C: Checklists and Forms for Developer's Representatives**.

7.3 Public Liability Insurances

Council will expect contractors engaged on development works within the municipalities to take out Public Liability Insurance to the minimum value of $10 million, and to ensure that the policy specifically indemnifies **Council** from all claims arising from the execution of the works.

7.4 Construction Supervision for Developers

The **Construction Engineer** appointed by the **Developer** will be responsible for supervising the construction of all roads and drains within a **Development** and for ensuring that these items of infrastructure meet the requirements of **Council** and of this **Manual.**. Neither **Council's Engineering Department** nor any member of that department can be responsible for these functions. All correspondence during the defects liability period will be directed to the **Superintendent** or, in the absence of a Superintendent, to the **Construction Engineer**.

Council will expect the "Record of Pre-start Meeting" to be signed all relevant parties, prior to the commencement of works, for all **Developments** involving the construction of **Infrastructure** to be vested in **Council**.

The **Council Engineer** or an officer nominated by the **Council Engineer** will inspect the works at critical milestones and may do so at witness points to ensure that the works are constructed in accordance with **Council** requirements and the approved plan. Council will expect the **Construction Engineer** to contact the **Council's Engineering Department** to arrange for joint inspections at each hold point relating to road and drainage construction to advise of witness points as detailed in **Appendix E: List of Council Inspections,** and to be present at all joint inspections.

Council will expect the **Construction Engineer** to give at least 48 hours' notice when requesting the **Council Engineer** or an officer nominated by the **Council Engineer** to attend a construction inspection at a hold point or witness point, unless noted otherwise within this **Manual**.

While as much guidance and assistance as possible will be provided on site to assist the **Construction Engineer**, **Council** cannot give a Contractor a direct instruction regarding the works.

7.5 Acceptance of Works for Developers

When the works have been completed, the **Construction Engineer** is responsible for arranging for their acceptance by **Council**. Acceptance will be subject to the timely provision of the documentation, and compliance with the procedures, detailed in this **Manual**. **Council** reserves the right not to accept works if other construction activities, such as lot-filling, installation of utility services or provision of street lighting, have not been completed.

The **Construction Engineer** is responsible for arranging for a joint inspection of the works to be made, together with the **Council Engineer** or an officer nominated by the **Council Engineer**, and the Contractor. The **Developer** should be invited to attend. The purpose of the inspection will be to identify any outstanding items or minor defects for recording, and to determine whether the works have been completed to the **Council's** satisfaction so that they may be accepted into **Council's** asset systems. **Council** will expect the **Construction Engineer** to notify them at least one week prior to any **Acceptance of Works** inspection, and to provide detailed operation and maintenance manuals for **Infrastructure** such as pump stations, retardation basins and wetlands at the same time.

Training of **Council** staff responsible for operations and maintenance may be required for specific **Infrastructure**. Such training will be undertaken, at the cost of the **Developer**, during or prior to the **Acceptance of Works** inspection.

The **Construction Engineer** should ensure that all works have been completed in accordance with the approved plans, prior to calling for the joint inspection (refer to **Appendix C: Checklists and Forms for Developer's Representatives**). The whole site should be presented in a tidy manner, including all required reinstatement of existing surfaces, erection of all signs and street lighting. Pump stations may be commissioned during the inspection. Streets should be swept prior to the final inspection.

Subsequent to the **Acceptance of Works** inspection the **Developer's Representative** is responsible for forwarding to the **Council**:

- Certification that the works have been completed in accordance with the documents previously approved by the **Council** (Checklist found in **Appendix C: Checklists and Forms for Developer's Representatives**).
- 'As Constructed' drawings in hardcopy format, in electronic format compatible with **Council's** Asset Management system, and in AutoCAD format.
- Operation and Maintenance (O&M) Manuals for all relevant **Infrastructure**.

- Asset Record Sheets for all asset classes including roads, drainage, lighting, street trees, playgrounds, irrigation systems, structures, landscaping etc.

Following the inspection, and after receipt of the above-mentioned documentation, the **Council** will forward a letter to the **Developer's Representative** advising of **Council's Acceptance of Works**, thus indicating that physical works have been completed and are of sufficient standard that they may be incorporated into the **Council's** asset system. The Letter of Acceptance may include a list of minor defects. **Council** will expect such defects to be corrected within one month of the inspection, or such other period as may be nominated in this letter.

Council's Engineering Department will forward a copy of the Letter of Acceptance to the Planning Department.

Satisfactory site inspection and issue of a Letter of Acceptance is not to be taken as engineering approval for Statement of Compliance to be issued for the development. It is only one step in the Statement of Compliance process, as there may be other engineering conditions on the planning permit to be addressed.

7.6 As Constructed Information

Following the completion of civil works in a subdivision or development, "As Constructed" information should be prepared by a registered surveyor and/or by a **Qualified Engineer**. **Council** will expect these plans to be endorsed by representatives of the **Developer** and the Contractor and submitted to **Council's Engineering Department** prior to lodging a request for Statement of Compliance.

Plans should be prepared in accordance with **Appendix D: Information to be Shown on Plans**.

For works constructed by **Council's** internal works departments, the "As Constructed" Plans should be prepared in accordance with **Appendix D: Information to be Shown on Plans** and signed off by the **Construction Engineer**.

Selection Table 7.6(a) shows those Councils which require drainage "As Constructed" plans to be provided in DSpec Format.

Selection Table 7.6(a) Drainage "As Constructed" Requirements

Councils Requiring "As Constructed" Drainage Information to Be provided in D Spec format
Ballarat City Council
Bass Coast Shire Council
Baw Baw Shire
Campaspe Shire.
Central Goldfields Shire
Colac Otway Shire Council
Glenelg Shire Council
Greater Shepparton City Council.
Macedon Ranges Shire Council
Moorabool Shire Council
Mount Alexander Shire Council

Councils Requiring "As Constructed" Drainage Information to Be provided in D Spec format
Rural City of Wangaratta.
South Gippsland Shire Council.
Southern Grampians Shire Council
Strathbogie Shire Council.
Surf Coast Shire Council
Warrnambool City Council
Yarriambiack Shire Council

The Councils listed in Selection Table 7.6(b) require "As Constructed plans" to be provided in AutoCAD electronic format to GDA 94 spatial coordinates for translation into the Council's GIS.

Selection Table 7.6(b) Specific "As Constructed" Requirements

Councils Requiring AutoCAD electronic format
Ararat Rural City Council
Ballarat City Council (MGA Zone 54)
Bass Coast Shire Council (GDA 94)
Baw Baw Shire
Central Goldfields Shire
Glenelg Shire Council
Golden Plains Shire Council
Horsham Rural City Council
Mildura Rural City Council
Mount Alexander Shire Council
Murrindindi Shire Council.
Pyrenees Shire Council
Southern Grampians Shire Council
Surf Coast Shire Council.
Swan Hill Rural City Council.
Warrnambool City Council.
Wellington Shire Council.

Councils Requiring AutoCAD electronic format
Yarriambiack Shire Council

7.7 Statement of Compliance

The **Construction Engineer** should direct the request for issue of Statement of Compliance to the **Council's Planning Department**, which will in turn request **Council's Engineering Department** to approve the issue of a Statement of Compliance (refer to **Appendix B: Engineering Approval Process for Developments**.)

The signed Defects Liability Agreement should be lodged with, or prior to, the request for Statement of compliance (refer to Clause 8.3).

When satisfied that all engineering conditions on the planning permit have been complied with, **Council's Engineering Department** will advise the **Council's Planning Department** that it has no objection to the issue of Statement of Compliance.

Council's Planning Department will, where appropriate, seek confirmation from VicRoads and other referral authorities that there are no objections to the issue of a statement of compliance.

Prior to consenting to the Statement of Compliance, **Council** will require that the following actions be completed:

- All engineering and landscape works have reached Practical Completion, or **Council** has accepted a bond for the uncompleted works.
- Construction supervision fees in accordance with Clause 5 of the *Subdivision (Permit and Certification Fees) Regulations 2000* (currently to the value of 2.5% of the total estimated cost of constructing the works which are subject to supervision) have been paid.
- Any non-standard public lighting fees required in accordance with the provisions of this **Manual** or the Planning Permit have been paid (where such fees apply, a public lighting plan approved by the current Service Provider should also be submitted).
- "As constructed" survey data and asset information required by the provisions of this **Manual** have been submitted in electronic format, together with other documentation required by the Planning Permit.
- Completed Inspection and Test Plans have been submitted.
- Certificates of Compliance have been provided for any structural works.
- Reports, maintenance plans and other documentation required by the Planning Permit have been submitted.
- Any required maintenance bonds for the infrastructure have been paid.

7.8 Locating Underground Assets

Any person or organisation that owns underground assets including pipes and cables has a responsibility or duty of care to ensure that information about the location of these services is easily available for people intending to undertake excavation activities.

People who represent a company responsible for any excavation work also have a duty of care to locate underground services or assets that are in the vicinity of the dig site, and then find and expose them before excavating near or around them.

The duty of care is:

- To protect workers and the public from serious injury due to the rupture of an underground asset such as a natural gas pipe, high voltage electricity cable, petroleum or industrial gas pipe. Any damage to these assets can cause very serious damage to structures and potential injury to many people.
- To minimise the potential for damage and loss of service due to damage or rupture of such assets. Extensive networks can be closed down for long periods with serious consequences of disruption and incurring penalties. The repair and replacement costs can also be very expensive.

The preferred method of obtaining information about the location of underground assets is the Dial Before You Dig service.

Not all services are covered by the Dial Before You Dig service. In particular, the underground drainage services owned by some Councils may not be covered. In such instances, the **Council** concerned should be contacted for information as to the location of their underground drainage assets.

Features of the Dial Before You Dig service are:

- It is often the only method used by people intending to carry out excavation works when searching for information about the location of underground pipes and cables at a proposed dig site.
- It is referred to in publications from WorkSafe Victoria and Energy Safe Victoria as best practice.
- The service aims to provide all excavators with the best possible access to plans and information direct from asset owners of underground services using a national enquiry service.
- Its overall purpose is to educate and promote the importance of safe digging practices to the excavation community and to develop its membership base to include all asset owners of underground services.
- A request for information can be made by logging on at the web site (www.1100.com.au) or by phoning 1100. Customer details and the proposed area of the dig site will be sent to all asset owners registered with Dial before You Dig in that area and information will be provided directly by the asset owner within two working days for excavation works. This may take up to 10 working days for planning and design requests.

The Dial Before You Dig Service Guidelines for Victoria outline the responsibilities of all underground asset owners to register assets and provide information when requested, and also the responsibilities of people intending to undertake excavation work to obtain information about underground assets in the area and to follow safe work practices. These guidelines can be obtained from:

(http://www.1100.com.au/Aboutus/ServiceGuidelinesforVictoria.aspx)

Clause 8 Defects Liability Period for Developers

8.1 Objectives

The objectives of the Defects Liability Period are to ensure that all **Infrastructure** items to be vested in **Council** have been constructed to **Council's** standards and are suitable for their intended purpose, and that the health and safety of the community and users is not compromised by delays in rectifying works resulting from defects.

8.2 General

A Defects Liability Period will apply to all **Council Infrastructure** constructed by **Developers**, and will cover any fault, deficiency or inadequacy of the works from defective design, workmanship or materials.

During the Defects Liability Period the **Council** will carry out operational maintenance in accordance with its normal practice, unless specified otherwise. The **Developer** will be held responsible for all maintenance costs arising from design error, defective workmanship and/or defective materials.

8.3 Commencement of Defects Liability Period

The Defects Liability Period will commence from the date of **Acceptance of Works** or the issue to **Council** of the title(s) for roads created within the Plan of Subdivision (when **Council** is then deemed to become the Road Manager under the Road Management Act), whichever is the later.

Unless specified otherwise on the planning permit, the Defects Liability Period for all assets, other than landscaping assets, to be vested in **Council** will be 12 months. Landscaping assets will have a Defect Liability Period of 24 months.

If more than 8 weeks have elapsed between the **Acceptance of Works** inspection and the issue of Statement of Compliance, **Council** may request that a formal handover meeting be held prior to commencement of the Defects Liability Period to review and amend any outstanding minor defects and deal with site-specific issues.

Prior to the issue of a Statement of Compliance, **Council** will expect the **Developer** to enter into an agreement with them regarding their respective responsibilities for the maintenance and correction of defects arising from faulty workmanship or materials during this period..

8.4 Guarantee of Work

Council will expect the **Developer** to lodge a Guarantee of Work with **Council** prior to the issue of a Statement of Compliance. The guarantee may take the form of bank guarantee (with no expiry date), cheque or cash and may be used for the rectification of any and all design and construction defects. Where a cheque is lodged, the guarantee will only be considered to be received after the bank has cleared the cheque.

Council will expect the guarantee to be for a minimum of 5% of the total cost of roads, drainage and hard landscaping, with the calculated amount being based on the priced Bill of Quantities, and to be lodged with the **Council** for the term of the Defects Liability Period. If differing periods are nominated for different **Infrastructure**, the **Developer** may choose to lodge individual bank guarantees, or a single bank guarantee for the whole amount in question.

The guarantee for soft landscaping should be a percentage of the replacement cost, as agreed by the parties.

The guarantee will be released at the termination of the Defects Liability Period, subject to the satisfactory completion of defect rectification works required by the Manager of the **Council's Engineering Department**.

The Guarantee of Works as described herein does not pertain to such bonding of minor outstanding works or defects as may be approved by **Council** from time to time.

In the event that damage to infrastructure occurs during the defects period, and the contractor can prove, to the satisfaction of **Council**, that this is not the result of defective workmanship, **Council** will be responsible for the carrying out the repairs at its costs and for recovering the cost from those who caused the damage.

8.5 Bonding of Outstanding Works

Council will normally consider bonding of outstanding works only as a 'last resort' due to the problems experienced with the administration of bonds, the insufficiency of bonds to cover the works and the length of time taken for the works to be completed.

In reviewing the appropriateness of bonding uncompleted landscape works, Council will consider whether:

- it would otherwise be unreasonable to withhold consent to statement of compliance;
- opportunities for growth and development during appropriate planting seasons would be improved;
- deferment of the landscape works would assist in the staging of future development, and/or reduce wear and tear or damage to the landscape works caused by subsequent works, such as housing construction.

Where **Council** agrees to accept an uncompleted landscape works bond, the bond should be lodged following the approval of landscape plans and detailed documentation and before statement of compliance. Uncompleted landscape works bonds will be returned to the developer following the completion of all required landscape works to the satisfaction of Council.

Council will expect the bond to be for $5,000 excluding GST, or 1.5 times the estimated cost of completing the works, whichever is the greater, and to take the form of cash or a bank guarantee with no expiry date.

If the works are not completed within 12 months, unless otherwise agreed in writing, the **Council** may organise the works to be done and pay for those works from the bond including the cost of supervising the works and associated administration.

8.6 Defective Items

Council will refer defects that become apparent during the Defects Liability Period to the **Developer's Representative** for remedial action by the **Developer**. Failure by the **Developer** to comply with such instruction to rectify works will result in forfeiture of the part or all of the guarantee, as required, for the **Council** to undertake remedial/maintenance works required by the order. Similarly if the required works are of an emergency nature, rectification works will be undertaken or arranged by the **Council** at the **Developer's** expense. The Letter of Release referred to in Clause 8.7 will not be issued until payment for such repairs has been received.

During the Defects Liability Period the **Developer** no longer has possession of site, and will be required to obtain a permit from the relevant authority giving *Consent to Work within a Road Reserve* before undertaking any remedial work in the road reserve.

8.7 Release from Defects Liability

Shortly before the end of the Defects Liability Period, the **Developer's Representative** should arrange for a joint inspection of the works to be made, together with the **Council Engineer,** or a person nominated by the **Council Engineer,** and the Contractor. The **Developer** should be invited to attend. The purpose of the visit will be to determine if there are any defective items requiring rectification by the **Developer**. **Council** will expect to receive one week's notice of this inspection. Following this inspection, and after rectification of defective items, the **Council** will forward the Letter of Release to the **Developer's Representative** to release the **Developer** from any further defects liability.

Clause 9 Traffic Management Strategy

9.1 Objectives

The objective of the Traffic Management Strategy within the **Development** and surrounds is to provide efficient traffic flow and a safe road environment for all users.

9.2 General

Where new roads are to be provided, and/or existing roads to be upgraded, in the course of a **Development**, **Council** may require that a Traffic Management Strategy be prepared to identify and assess the impact of the development on the existing road network, and to propose appropriate mitigating works. Some commercial and industrial **Developments** may not create new roads or intersections, but generate sufficient changes in traffic volumes and movements to cause Council to require the preparation of a Traffic Impact Assessment Report, as defined below.

Council will expect the **Developer** to engage a **Qualified Engineer** to prepare a Traffic Management Strategy or a Traffic Impact Assessment Report, and may request additional information concerning the experience of the proposed appointee prior to approving the relevant document.

A Traffic Management Strategy may include one or both of the following components:

- **TMAR** that determines the road layout, road widths, functions and connectivity for all road users.
- **TIAR** that determines the impact on the external road network and identifies appropriate mitigating works.

Where a **TMAR** is required to be prepared as a condition of the Planning Permit, the submitted plans will not receive endorsement until the traffic control requirements are approved in principle by the **Council's Engineering Department**.

The provisions of this section apply equally to **Developments** carried out by **Council**.

9.2.1 Traffic Management Assessment Report

The need for the Traffic Management Assessment Report (TMAR) should be determined at the time of issue of the planning permit, or before, and may be triggered by the following:

- Construction of a new road.
- Construction of a new intersection.
- Potential for further development (may need **ODP** to assess).
- Multiple **Developers** within a specific locality.
- Large industry or retail/commercial development.

9.2.2 Traffic Impact Assessment Report

The need for the **TIAR** should be determined at the time of issue of the planning permit, or before, and may be triggered where **Developments** are expected to increase overall traffic volumes by 10%, or by 100 vehicles per day, whichever is the lesser number.

Where both VicRoads and the **Council** require a **TIAR** one report may be prepared meeting the requirements of both organisations.

9.3 Requirements

Provision for buses should be identified at the functional layout phase. Provision for bicycles and pedestrians should be identified at the detailed design phase. Council will expect Collector roads to include bicycle paths/lanes, and/or shared paths, and to be designed as bus routes. As per Planning Scheme guidelines, pedestrian and bicycle paths should generally be located along streets fronted by dwellings. However, alternative routes may be established through Public Open Space as long as is can be demonstrated that safety and security of path users, local residents and property are maintained. Routes should be planned to achieve linkages to other existing and proposed bus, bicycle and pedestrian routes and be based on the principles found in the Department of Infrastructure publication entitled *Public Transport Guidelines for Land Use Development.*

Developments that contain more than 200 lots in the **ODP** may be required to establish bicycle routes through the development *PRINCIPLE*. Development proposals should complement and enhance the principles of any **Council** Bike Strategy Plans.

Council will expect provision to be made so that no emergency service vehicles, waste and recycling collection vehicles or street-sweepers are required to reverse within the development *PRINCIPLE*. Staging of works does not negate this requirement and temporary turning areas may need to be established between development stages, with carriageway easements as necessary.

Issues to be addressed in the **TMAR** include, but need not be limited to, the following:

- Estimated traffic volumes.
- Major traffic control items.
- Proposed road closures.
- Determination of road function and connectivity.
- Impact of staged development.
- Off street and on street parking.
- Pedestrian and cyclists movements within and outside the development.
- Entry to and egress from the development.
- For large retail commercial and industrial **Developments** loading and unloading of deliveries.
- Traffic calming devices should accord with Clause 12.6 and may include:
    - Roundabouts.
    - Traffic islands.
    - Parallel slow points.
    - Road humps.
    - Bus routes, bus stops, and bus bays.

Issues to be addressed in the **TIAR** include, but need not be limited to, the following:

- Estimated traffic volumes.
- Proposed road closures.
- Impact of staged development.
- Pedestrian and cyclist movements.

- Entry to and egress from the development.
- Recommendations for appropriate mitigating works.

Unless otherwise agreed by **Council's Engineering Department,** traffic generation should be calculated in accordance with Clause 12.3.1 of this **Manual**.

Parking within a **Development** should normally be shown on a separate plan submitted in conjunction with a request by the **Developer** for approval of functional layout. Where **Developments** create new roads (e.g. subdivisions) **Council** will expect a parking plan to be submitted clearly demonstrating that at least one practical space has been provided per two allotments**,** with these provisions being achieved outside of any court bowls.

For larger industrial, commercial and retail **Developments, Council** will expect the traffic management assessment to consider traffic and pedestrian conflict points, location of loading zones and movement of forklifts and other vehicles for loading and unloading, ingress and egress from the site, provision of disabled parking, and parking requirements overall.

Council will expect each **TMAR** and **TIAR** to include clear recommendations. The **Developer** will be responsible for identifying any such recommendations that are not proposed to be implemented and for providing cogent reasons for the omission. Where **Council** accepts those reasons, they may choose to consider the recommendations in the context of their own Capital Works Program. **Council** will also expect a Traffic Management Strategy to address Planning Scheme objectives and standards as outlined in Section 56.03 of the Planning Scheme.

The **Design Engineer** will be responsible for ensuring that, where major Traffic Control Items are proposed to be used, those items are submitted to and approved by **Council** or VicRoads in a timely manner so that they do not impact on the works program.

Clause 10 Road Safety Audits

10.1 Objectives

The objective of a road safety audit is to provide the safest outcome for the project or **Development** concerned.

10.2 General

Road safety should be considered at all stages of road design, upgrade or construction. Conducting road safety audits at the design stage, before construction commences, will normally help to achieve the most cost-effective outcomes.

The provisions of this section also apply to **Development** carried out by **Council**.

10.3 Requirements

Council will expect Road Safety Audits to be undertaken for all development designs that require a Traffic Management Strategy (refer to Clause 9) and to be conducted at the detailed design stage and after construction has been completed.

Council will expect audits to be conducted in accordance with the Austroads *Guide to Road Safety Part 6: Road Safety Audit* and any VicRoads supplement to those guidelines.

The **Design Engineer** will be responsible for selecting an audit team including two or more experienced or qualified people, at least one of whom should be a Senior Road Safety Auditor accredited by VicRoads. The person responsible for designing the roads in question should not be a member of the team. The **Design Engineer** will be responsible for determining that the Senior Road Safety Auditor has suitable experience for the type for works proposed, or that such experience is available elsewhere within the audit team. **Council** will expect the **Design Engineer** to advise them of the audit team membership when requesting approval of functional layout.

The **Design Engineer** will be responsible for proposing actions to be taken in response to the recommendations of the audit report, but consultation with **Council** is encouraged if the recommendations are complicated or require community involvement. **Council** will expect to receive a copy of the road safety audit report, with documented responses to the recommendations, when the detailed design documentation is submitted for approval. The report of the audit conducted after construction has been completed should be submitted to and approved by **Council** prior to the issue of a Statement of Compliance, where relevant, or to the commencement of use.

Clause 11 Drainage Strategy Plans

11.1 Objectives

The objective of the Drainage Strategy Plan is to identify and record how the quantity and quality of stormwater will be managed for any catchment in which development occurs, or drainage **Infrastructure** works take place.

11.2 General

Council will expect the design and management of stormwater runoff to be consistent with any relevant Stormwater Management Plan, details of which can be obtained from the **Council**. In addition to Stormwater Management Plans, **Councils** may have completed additional drainage studies for catchments within their municipalities, and will make relevant reports available to **Developers** on request.

Where the drainage system has not been previously defined in an **ODP** for a proposed subdivision, **Council** may require **Developers** to engage a **Qualified Engineer** to prepare a Drainage Strategy Plan addressing all runoff generated in, or transmitted from upstream catchments through, the development or project area. **Council** will expect the plan to include catchment and sub-catchment plans, conceptual drainage systems, including water quality treatment facilities, and the proposed locations and methods of stormwater discharge from the system. The need for such a plan should be identified before a Planning Permit is issued, and may be triggered when:

- an **ODP** is prepared;
- there is a request to have land rezoned under the planning scheme;
- **Developments** include the construction of one or more new:
  - retardation basins;
  - treatment facilities; or
  - drainage outfalls;
- there is potential for significant further development within the catchment;
- the catchment involves multiple **Developers** within a specific locality;
- more than 5 lots will discharge to a common drainage system; or
- large-scale industrial or commercial use will be involved.

Where a Drainage Strategy Plan is required to be prepared as a condition of the Planning Permit, the submitted plans will not be endorsed until they have been approved in principle by the **Council's Engineering Department**.

11.3 Requirements

Where submission of a Drainage Strategy Plan is required, Council will expect that:

- The catchment area will be established and analysed, and the results submitted to **Council** for review.
- The estimated peak flows will reflect the full potential development of the project and upstream areas, considering both normal flow situations and the potential for overland flows resulting from fluvial (riverine) and pluvial (flash) flooding, and with due regard being given to the impact of pipe and pit blockages and high ground-water levels.
- Where overland floodwater routes, flow rates, and/or flood storage volumes, will be affected by a **Development**, compensatory works will be assessed and implemented.

- Where active floodways, floodplains and/or flow-paths are present, hydraulic modelling and analyses will be undertaken to identify the extent, velocities and depth of overland flood flows on the **Development** and on the catchment external to the development site. The **Developer** may also be required to submit a risk assessment report including details of proposed works to ensure that the potential for loss of life, adverse health impacts, and damage to property is minimised, and to identify how flood conveyance and storage will be achieved.
- Since the function of a floodplain is to convey and store flood waters and thus preserve the inherent values of wetlands, changes to existing wetlands will only be considered after all other options have been exhausted, and after a detailed assessment, reflecting the existing external drainage provisions, has been undertaken to ensure that active and passive flows and seepage can be preserved.
- Proposed outfall conditions including quality objectives will be clearly documented for approval by **Council** and by other authorities where applicable.
- The ongoing operating and maintenance costs of any retarding basins and pump stations will be minimised.

Clause 12 Design of Roads

12.1 Objectives

The objectives of the Design of Roads requirements are to:

- develop a network and alignment that balances the existing and future requirements;
- provide a serviceable pavement for the specified lifetime with minimal maintenance;
- ensure that staged construction methods are planned to meet the immediate, medium term and ultimate pavement and drainage design requirements; and
- provide smooth, safe, trafficable horizontal and vertical alignments, and adequate sight distances, having regard to road classification requirements, road users, emergency services and utilities.

12.2 General

This section sets out the standard design criteria for road works. The provisions are not intended to prohibit any alternative arrangements or approaches. Innovative or non-standard designs may be considered, but not necessarily accepted. **Council** will expect the Design Engineer to submit sufficient data and calculations based on accepted engineering principles to allow **Council's Engineering Department** to assess the merits of any proposed innovative or non-standard design.

Aspects not specifically referred to in this **Manual** should be generally in accordance with the following documents:

- The road cross sections included in any applicable Precinct Structure Plan
- Austroads*: Guide to Road Design*, incorporating *AGRD01* to *AGRD07* and all sub-sections.
- The Standard Drawings associated with this **Manual**.

Council will expect all plans to be prepared in accordance with **Appendix D: Information to be Shown on Plans**.

Council will expect all the required physical works to be completed as part of the **Development**, in accordance with **Council** standards. Where the **Developer** is unable to provide the physical roads and accesses, **Council** may consider accepting a contribution that is equivalent to the total actual cost of preparing plans and specifications and constructing the required **Infrastructure**.

12.3 Urban Roads

Council will expect the design and construction of roads and allotment accesses to meet or exceed the requirements of the Austroads *Guide to Road Design*, the Planning Scheme, this **Manual**, and all relevant Acts, Regulations and Australian Standards.

12.3.1 Road Classification

Council will expect the classification of residential streets within any development to be in accordance with Table 2.

In response to the *Road Management Act*, **Councils** may have established an alternative road hierarchy to determine routine maintenance requirements, as well as establishing the overall management of its road network. The road classification referred to within this **Manual** relate specifically to the design and construction of new or upgraded roads.

Access Lanes as defined in The Planning Scheme are not considered desirable by the **Councils** listed in Selection Table 12.3.1 and should not be provided within **Developments** unless specific approval is obtained from the **Council's Engineering Department** *PRINCIPLE*.

Roads of width and function similar to Access Lanes may be approved as private roads or common property. However, **Council** may require specific treatment such as fencing, paving and drainage. It is recommended that this issue be addressed as early as possible in the planning process.

Selection Table 12.3.1 Access Lanes

Access Lanes Are Not Considered Desirable In These Councils Unless Specific Approval Obtained
Ararat Rural City Council
Ballarat City Council
Baw Baw Shire
Benalla Rural City Council
Campaspe Shire Council
Central Goldfields Shire
City of Greater Geelong
Colac Otway Shire Council
Gannawarra Shire Council
Glenelg Shire Council
Golden Plains Shire Council
Greater Bendigo City Council.
Greater Shepparton City Council
Indigo Shire Council
Macedon Ranges Shire Council
Mansfield Shire Council
Mitchell Shire Council
Mildura Rural City Council
Moorabool Shire Council
Mount Alexander Shire Council
Murrindindi Shire Council
Rural City of Wangaratta
South Gippsland Shire Council
Southern Grampians Shire Council
Strathbogie Shire Council
Swan Hill Rural City Council
Towong Shire Council
Warrnambool City Council
Wellington Shire Council
Yarriambiack Shire Council

Ultimate traffic volumes for road classification and road design should be based upon approved multipliers of existing traffic movements (measured), through traffic, and an estimate of traffic generated by proposed and future development. The estimated traffic volumes for undeveloped areas should normally be based upon the following factors:

- Residential allotments — at least 10 vehicle movements per day per lot.
- Commercial/Industrial — To be determined on a case by case basis utilising the RTA NSW *Guide to Traffic Generating Developments 2002*

Where other traffic generation assumptions are to be adopted in preparing a Traffic Impact Study, **Council** will expect the Design Engineer to submit details of the proposed assumptions to **Council's Engineering Department** for approval prior to commencing work on the study.

Where **Council** holds traffic count data on relevant roads, this information will normally be made available to the **Design Engineer** on request. In some instances, the **Design Engineer** may be asked to undertake additional traffic count data collection on affected roads to ascertain predevelopment traffic volumes and types. This will generally only occur when traffic count data is more than three years old, or when significant development has taken place since traffic count data was last collected. Where traffic volumes and type vary seasonally, Council will expect the **Design Engineer** to use the available data conservatively and to identify any assumptions when lodging a request for approval of functional layout.

12.3.2 Road / Street Characteristics and Road Reserve Widths for Developers

The classification, function and general composition of roads and streets in any **Development** are detailed in Table 2.

Road or street outcomes should be consistent with any Precinct Structure Plan applying to the land. Where a Precinct Structure Plan does not apply to the land, new subdivisions and developments should:

- Reflect or reference streetscape treatments in existing township areas that make a proactive contribution to the township character.
- Provide a diversity of streetscape outcomes. Approximately 30% of local streets (including connector streets) within a subdivision should apply an alternative treatment to the remainder of this type of street within the subdivision. Changes to street tree species between or within streets do not constitute a variation. Examples of acceptable variations may include but are not limited to:
    - varied street tree placement; and/or
    - varied footpath of carriageway placement; and/or
    - introduction of elements to achieve a boulevard effect; and/or
    - varied carriageway or parking bay pavement; and/or
    - differing tree outstand treatments.
- Maintain the road cross-sections outlined in Table 2 so that:
    - the carriageway dimensions are sufficient to ensure:
        - safe and efficient operation of emergency vehicles on all streets; and
        - safe and efficient operation of buses on connector streets; and
    - relevant minimum road reserve widths for each type of street are maintained; and
    - specified performance characteristics for pedestrian and cycle use are maintained.
- Achieve regular street tree planting and interlinking street tree canopy cover (when trees reach maturity) wherever possible.

The specified minimum road reserve widths should be sufficient to accommodate the **Carriageway**, all required services with approved clearances, pedestrian and bicycle access, parking, landscaping, drainage and bus routes. Where the road reserve is also required to accommodate certain types of **WSUD** devices, the reserve width may need to be further increased.

The minimum road reserve widths in urban residential **Developments** are detailed in Table 2 in this **Manual**. *PRINCIPLE* Council may approve a reduction in the normal road reserve width for short industrial cul-de-sacs, provided that turning at the court bowl is not compromised..

Footpath, bus, bicycle and pedestrian provisions are detailed elsewhere in the Manual. **Council** will not approve the use of minimum road reserve widths where that would compromise the standard of provision for these road users.

Road reserve boundaries may be curved around court bowls, but where they are to be fenced as chords, these should not be less than 10 metres in length. Where a number of such chords occur adjacent to each other, they should, as far as possible, be practically equal in length.

Council will expect the road or street outcomes to be consistent with any applicable Precinct Structure Plan.

Table 2 Urban Road / Street Characteristics

Street Type	Indicative Maximum Traffic Volume (vehicles/ day)	Carriageway Width	Minimum Reserve Width See Note 5 & 6	Minimum Verge Width	Parking Provision within Carriageway	Pedestrian / Cycle Provision within Road Reserve See Note 7	Kerbing
Access Lane (second road frontage where permitted under Council Policy)	300	5.5m See Note 6.	As determined by turning movements		Yes one side	No footpath	Nil if concrete road with central drain or SM2 or modified SM2. See Note 3.
Access Place (where permitted under Council policy)	300	6.0m See Note 6.	14.0m	3.5m See Note 2.	Yes (one side)	Footpath both sides. No separate cycle provision	B2, SM2 or modified SM2. See Note 3.
Access Street	1000 - 2500	7.3m	16.0m	3.5m See Note 2.	Yes (both sides)	Footpath both sides. No separate cycle provision	B2, SM2 or modified SM2. See Note 3.
Collector/ Connector Street Level 1	2500 - 6000	11.6m	24.0m	6.0m	Yes (both sides)	Shared path both sides	Barrier B2 Kerb outstands or splitters required at intersections and pedestrian crossing points
Collector/ Connector Street Level 2 (alternatively called trunk collector)	6000-12000	2 x 7.0m + 6.0m median	34.0m	6.0m	Yes (both sides)	Footpath both sides. Shared path both sides.	Barrier B2
Residential Court Bowl	n/a	10.0m radius	28.0m	3.5m See Note 2	n/a	Footpath both sides. No separate cycle provision	SM2 or modified SM2. See Note 3.
Commercial Street	n/a	22.0m	32.3m	5.0m	Yes (both sides)	Footpath both sides. Cycle provision	Barrier B2

Street Type	Indicative Maximum Traffic Volume (vehicles/ day)	Carriageway Width	Minimum Reserve Width See Note 5 & 6	Minimum Verge Width	Parking Provision within Carriageway	Pedestrian / Cycle Provision within Road Reserve See Note 7	Kerbing
						where directed	
Industrial Street	n/a	12.5m See Note 1 below	25.0m	6.0m See Note 4	Yes (both sides)	Footpath both sides	Barrier B2
Industrial Court Bowl	n/a	15.0m radius	37.0m	3.5m See Note 2	n/a	Yes	Barrier B2

Note 1

Higher traffic volumes and other intended use/s of carriageway may require greater **Carriageway** widths.

Note 2

Council will expect the **Design Engineer** to demonstrate that verge widths are sufficient to accommodate all services required to be located there.

Note 3

Selection Table 12.3.20 shows the kerb profiles used by municipalities:

Selection Table 12.3.2 Kerb Profiles

B2	SM2	SM2 Modified
Golden Plains Shire Council	Golden Plains Shire Council	Golden Plains Shire Council
Macedon Ranges Shire Council		Macedon Ranges Shire Council
Mildura Rural City Council	Mildura Rural City Council	Mildura Rural City Council
Mount Alexander Shire Council	Mount Alexander Shire Council (shall consider where justification is demonstrated)	Mount Alexander Shire Council (shall consider where justification is demonstrated)
Pyrenees Shire Council	Pyrenees Shire Council	Pyrenees Shire Council
Surf Coast Shire Council	Ararat Rural City Council	Ballarat City Council
Wellington Shire Council	Ballarat City Council	Bass Coast Shire Council
	Benalla Rural City Council	Baw Baw Shire Council
	Colac Otway Shire Council	Campaspe Shire Council
	Corangamite Shire Council	Central Goldfields Shire Council
	Glenelg Shire Council	City of Greater Bendigo
	Horsham Rural City Council	East Gippsland Shire Council
	Moorabool Shire Council	Indigo Shire Council
	Strathbogie Shire Council	Mansfield Shire Council

B2	SM2	SM2 Modified
	Swan Hill Rural City Council	Mitchell Shire Council
	Warrnambool City Council	Moira Shire Council
	Yarriambiack Shire Council	Rural City of Wangaratta Council
		South Gippsland Shire Council
		Southern Grampians Shire Council
		Towong Shire Council
		Wellington Shire Council
		Wodonga City Council

Note 4

Verge widths may be reduced to 3 metres in the following situations:

- Court bowls less than 100m in length.
- Where access gates are set back from the property boundary by 3 metres.

Note 5

The minimum width of the road reserve cannot be calculated by adding the minimum distances of the components within the road reserve.

Note 6

Council will expect the **Design Engineer** to ensure that the road reserve width adopted complies with the requirements of the following documents and requirements:

- Department of Transport - *Public Transport Guidelines*.
- Any applicable pedestrian and bicycle strategies.
- CFA requirements (the minimum **Carriageway** width to be 7.3m unless parking is restricted to one side).
- Where service vehicles use access lanes the minimum carriageway width will be 6m.

Note 7

Council may require, at its discretion, on-road bicycle lanes in lieu of one of the shared paths required to be provided for the use of commuter cyclists. Where this option is chosen by Council the minimum carriageway width specified in Table 2 will be increased by the width of the bicycle lanes.

Important Notes

Cross sections of the various street types shown in Table 2 appear in Standard Drawings numbered SD600-620.

The width of the **Carriageway** is defined as the distance between the inverts of kerbs for roads with kerb and channel.

The width of the **Road Verge** is defined as the area between the invert of kerb or edge of formation where there is no kerb and the near road reserve boundary.

Table 2 does NOT apply to roads within the Gannawarra Shire Council or City of Ballarat boundaries. Classifications and construction of new roads in these municipalities are to be in accordance with **Council's** Roads Management Plan and Road Asset Management Plan.

12.3.3 Widths and Treatments of Other Reserves

To reduce crime, improve public safety and enhance local amenity , the widths and treatments of other reserves should be based on good urban design principles such as those set out in *Safer Design Guidelines* and *Active by Design* .

Where pedestrian and/or bicycle access reserves are incorporated into **Developments** the minimum reserve width is 10m. The width may need to be increased for reserves deeper than one average allotment (see Clause 24).

Council will expect a vehicle crossing layback and full concrete crossing to title boundary to be provided to all pedestrian and bicycle reserves, and removable bollards to be provided within the reserve, offset by 1m from each adjacent road reserve, in sufficient numbers and spacing to prevent vehicular access. Where mountable kerb and channel is used, the layback may be omitted, but **Council** will expect a sealed crossing to be constructed from the back of kerb to the title boundary.

Council will expect a landscaping and lighting plan for all proposed reserves to be submitted for approval to **Council's Engineering Department**.

Reserves that are required specifically for provision of services other than those for which **Council** is responsible must be vested with the relevant authority.

12.3.4 Road Geometry

Council will expect the geometric design of roads to be in accordance with the Austroads *Guide to Road Design Part 3: Geometrical Design* and any VicRoads supplement to that publication. Where horizontal curves are superelevated, **Council** will expect the **Design Engineer** to demonstrate that any low points in the kerb and channel resulting from the application of superelevation are adequately drained.

Council will expect all roads for which they are responsible to provide sufficient space for emergency service vehicles, waste collection vehicles and street-cleaning vehicles to carry out their functions while travelling in a forward-only direction throughout the **Development**. Unless otherwise agreed by **Council**, cul-de-sacs should be of bowl geometry, and 'T' or 'Y' cul-de-sac heads are not permitted[PRINCIPLE].

Staging of works does not negate this requirement and temporary turning areas may need to be established between development stages including **Carriageway** easements as required. Where temporary turning areas are to be provided on private land and not in the road reserve a Section 173 agreement may need to be provided upon the subject land to provide turning area until such time as the road is extended and/or a permanent turning area is established.

Parking, bicycle and bus requirements may impact upon the minimum carriageway widths, and Council will expect to see evidence at the approval of functional layout stage that the proposed carriageway widths are adequate to accommodate these functions.

12.3.5 Sight Distances

Council will expect the **Design Engineer** to demonstrate that adequate sight distances, have been provided, particularly at street intersections and on crest vertical curves. The following sections of the Austroads *Guide to Road Design* and any applicable VicRoads supplements provide authoritative guidance on these matters:

- General road design – Austroads *Guide to Road Design Part 3: Geometric Design*
- Intersections – Austroads *Guide to Road Design Part 4A: Signalised and Unsignalised Intersections*
- Roundabouts – Austroads *Guide to Road Design Part 4B: Roundabouts*

Council will expect the **Design Engineer** to ensure that landscaping plans, and any plans for estate entrance structures, are prepared with due consideration for sightline requirements, and that plans submitted for approval show all existing and proposed features in sufficient detail to demonstrate that appropriate sight distances have been achieved.

12.3.6 Vertical Alignment and Vertical Curve Requirements

Council will expect the **Design Engineer** to ensure that vertical curves are provided at all changes of grade in road centreline greater than 1.0%, or changes in grade of kerb and channel greater than 0.5 and comply with the design guidelines set out in the Austroads *Guide to Road Design Part3: Geometric Design* and any VicRoads supplement to that publication. In particular, **Council** will expect the **Design Engineer** to demonstrate that the vertical curves on subdivision streets provide stopping sight distances appropriate to the target speeds nominated in Table 3:

Table 3 Stopping Sight Distances

Type of Street	Target Street Speed km/hr
Access Place or Access Street	30
Collector Street Level 1	50
Collector Street Level 2	70

Road design grading should be extended a minimum of 100 metres beyond the end of the street where such street is to be extended in the future. Where new roads meet existing roads, **Council** will expect the **Design Engineer** to check the grading for a distance of 50 metres and to demonstrate that roads match well and that no abrupt change in grade occurs.

12.3.7 Limiting Longitudinal Gradients

Where kerb and channel is installed, **Council** will expect the **Design Engineer** to ensure that all road grades fall within the limits shown in Table 4.

Table 4 Limiting Longitudinal Gradients

Type of Grade	Grade
Desirable **minimum** grade	0.5 % (1 in 200)
Absolute **minimum** grade	0.33 % (1 in 300)
Desirable **maximum** grade	10 % (1 in 10)
Absolute **maximum** grade	20% (1 in 5) or greater with specific **Council** approval.

In extremely flat locations, a grade of 0.25% (1 in 400) may be considered for a limited length.

The kerb and channel grades on curves should be calculated along the outer kerb for minimum grade and along the inner kerb when grades approach maximum limits.

At intersections, each kerb should be graded individually around the return and designed to match the kerb grade of the adjoining street and to follow as closely as possible the vertical curve produced on the pavement by designing to match the through street.

The desirable minimum grade for kerb returns is 0.75% and the absolute minimum is 0.25%.

12.3.8 Vehicle Turning Movements

Council will expect the **Design Engineer** to examine turning movements for design vehicles and check vehicles using the Austroads *Design Vehicle and Turning Path Templates, 2006*. Road space should be provided such that the design vehicle is able to negotiate a left turn from the left lane without crossing adjacent lanes *PRINCIPLE* and without the need to reverse to complete the turning movement. Check vehicles may impinge upon adjacent lanes, since they represent vehicles, such as articulated vehicles delivering building materials in new estates, or furniture-carrying vehicles, which need to access local streets only infrequently.

In intersection design, the 600mm clearance for above ground structures is intended to be applied to the total swept path of the design vehicle, and not just to the wheel path. Vehicle accesses and driveways are NOT to be used for turning movements*PRINCIPLE*. All roadways, rights-of-way and vehicle crossings should be designed to accommodate a standard vehicle (car).

Council will expect the **Design Engineer** to supply the turning movement plans nominated in Table 5 when seeking approval of functional layout from **Council's Engineering Department.**

Table 5 Turning Movement Plans

Intersecting Road Types	Design Vehicle	Checking Vehicle
Access Streets / Access Street *or* Access Streets / Access Place *(residential and commercial for access to loading bays)*	Service Vehicle *(b)* (8.8m) Radius 9m	Single Unit Truck/Bus (12.5m) Radius 9m
Access Streets / Access Street *or* Access Streets / Access Place *(industrial)* *(a)*	Single articulated (19m) Radius 9m	Extended single articulated (25m) Radius 12.5m
Collector Street / Access Street *or* Collector Street / Access Place *(residential)*	Service Vehicle *(b)* (8.8m) Radius 9m	Single Unit Truck / Bus (12.5m) Radius 9m
Collector Street / Collector Street *(residential)*	Single Unit Truck / Bus (12.5m) Radius 12.5m	Single articulated (19m) Radius 12.5m
Collector Street / Collector Street *(industrial)*	Single articulated (19m) Radius 12.5m	Extended single articulated (25m) Radius 15m

(a) Use these for intersections with industrial land use for local/collector intersections.

(b) Service vehicle dimensions and turning should be based on fire appliance rather than a waste vehicle.

12.3.9 Cross Section Profiles

Council will expect cross-sections to be in accordance with relevant **Carriageway** and road reserve widths nominated elsewhere in this **Manual**. Typical cross-sections should be included in the documentation and should nominate:

- Type of kerb and channel.
- Pavement construction including material type and depth.
- Surface details.
- Subsoil drainage, if required.

- Typical footpath offsets.
- Typical service corridors.
- Typical landscaping corridors.
- Cross-falls.

The normal cross-fall on sealed pavements should be 3%. When design speeds require super-elevation of horizontal curves, the cross-fall design should be based on the Austroads *Guide to Road Design Part 3: Geometric Design* and any VicRoads supplement to that document.

Shoulder cross-falls should be 5%. Where shoulder cross-falls greater than 6% are proposed to be used at intersections or horizontal curves, prior approval should be sought from **Council's Engineering Department.**

The relative change in grade of the kerb line and centreline should not exceed 0.5%.

Unless otherwise agreed by **Council,** central spoon drains should be used only where the road pavements concerned are to be incorporated as Common Property. This restriction does not apply to fully concreted pavements with a cross-fall to the centre of the road, and with centrally located grated pits.

Unless otherwise agreed by **Council**:

- footpath cross-falls should preferably be 1:50 and should not exceed 1:40.
- footpath alignments should be offset by no more than 300mm from the property boundary in existing **Developments** and by at least 50mm from the property boundary in new **Developments**.
- verge cross-falls between the footpath and back of kerb should preferably be no more than 1:15, should not exceed 1:10, and should extend into properties at the same grade for a nominal distance of 500mm. Should steeper verges be proposed, Council will expect the **Design Engineer** to demonstrate that safe and convenient car access can be provided to the relevant allotments.

When new kerb and channel or footpath is to be constructed adjacent to existing roadways and/or excessive cross-falls may occur on either the road pavement or nature strip, **Council** will expect the **Design Engineer** to check all vehicle crossings to allotments using standard car templates to ensure that car access can be provided.

Batter slopes should reflect the predominant use of the locality and, within the **Clear Zone,** should preferably be less than 1:6 and should not exceed 1:4. In residential areas, driveway slopes should not exceed 1:10.

Whenever it is impractical to provide batters flatter than the maximum slopes specified, **Council** will expect the **Design Engineer** to provide special infrastructure such as retaining walls within the property and, in areas prone to erosion, to give careful consideration to erosion control measures.

So far as reasonably practicable, road designs should avoid filling on the low side street alignment.

12.3.10 Kerb and Channel

Council will expect all urban streets to be constructed with a sealed pavement and provided with kerb and channel unless **Council** has agreed that a different form of treatment is required to comply with **WSUD** requirements.

Council will expect the **Design Engineer** to demonstrate that the kerb and channel design secures adequate and safe access to each allotment for vehicles, bicycles and pedestrians, and meets drainage needs. Unless otherwise required to maintain township character, kerb and channel variants should be constructed in accordance with **Council's** Standard Drawings as found in **Appendix F: Standard Drawings**.

The following specific matters should be taken into account:

- Modified semi-mountable kerb and channel may be used for urban residential **Developments**. Where barrier kerb and channel is used, laybacks and vehicle crossovers may be provided at the time of development.
- The provisions for vehicular access should comply with Section 12.9 of this manual.
- The transition between differing types of kerb and channel should occur either immediately after a kerb crossing, or over a 3 metre length after a Side Entry Pit (SEP) where the pit has standard/barrier lintel and is located at tangent point of the kerb return.
- Semi-mountable kerb should normally be used adjacent to medians and traffic islands.

Unless otherwise agreed by **Council,** subsoil drainage should be provided below all kerb and channel laid within the boundaries of the **Councils** listed in Selection Table 12.3.10, unless the subgrade is rock or sand, or no drainage network is available to which subsoil drainage could be connected.

Selection Table 12.3.10 Subsoil Drainage

Subsoil Drainage Required Below Kerb and Channel
Ballarat City Council
Bass Coast Shire Council
Baw Baw Shire Council
Benalla Rural City Council
Colac Otway Shire Council
Corangamite Shire Council
East Gippsland Shire Council
Glenelg Shire Council
Golden Plains Shire Council
Horsham Rural City Council
Indigo Shire Council
Macedon Ranges Shire Council
Mitchell Shire
Mildura Rural City Council
Moira Shire
Moorabool Shire Council
Murrindindi Shire Council
Pyrenees Shire Council
Rural City of Wangaratta
South Gippsland Shire Council
Southern Grampians Shire Council
Strathbogie Shire Council
Swan Hill Rural City Council

Subsoil Drainage Required Below Kerb and Channel
Towong Shire Council
Warrnambool City Council
Wellington Shire Council
Wodonga City Council
Yarriambiack Shire Council

Where non-standard kerb profiles are to be matched, the **Design Engineer** should consult with **Council's Engineering Department** to determine the most appropriate kerb to be used.

Developments in areas with heritage characteristics may require heritage style kerb and channel construction. For example, some heritage areas of Echuca and Rushworth may require timber kerb. Heritage style kerb and channel should comply with **Council's** Standard Drawings unless otherwise approved.

Where it is considered impractical to have the **Developer** construct an isolated section of kerb and channel, **Council** may accept a contribution-in-lieu, based on a cost estimate prepared by the **Council's Engineering Department**.

Kerb crossings should be constructed at approved locations and, unless otherwise agreed by **Council**, should comply with **Council's** Standard Drawings as found in **Appendix F: Standard Drawings**.

Kerb crossings near intersections should be located far enough from the intersection to allow each ramp to be fully constructed to height of back of kerb, as per the standard drawings.

Control joints should be constructed as per **Council's** Standard Drawings, refer **Appendix F: Standard Drawings**.

12.4 Rural Roads

The following requirements generally apply to new roads and upgrading of existing roads affected by rural, rural living and low density residential **Developments**.

12.4.1 General

Council will expect the design and construction of all roads and allotment accesses to meet or exceed the requirements of the Austroads *Guide to Road Design* and any applicable VicRoads supplements to that document, this **Manual** and any relevant Acts, Regulations and Australian Standards.

All new and upgraded roads in Rural Living and Low-Density Residential **Developments** should be constructed to the standards set out in this **Manual**. Any contribution by **Council** toward the cost of the road construction will be in accordance with the relevant **Councils'** policy.

Council will expect the **Design Engineer** to ensure that all traffic generated as a result of a Rural Development, Rural Living or Low Density Residential Development is encouraged to use the route identified for access in the submitted documents, and may require that off-site intersections be constructed or upgraded and additional signage be provided.

Where works are to take place within an existing road reserve, a permit providing *Consent to Undertake Works in a Road Reserve* must be obtained from **Council** prior to the commencement of the works.

12.4.2 Road Reserves

Council will expect the **Design Engineer** to ensure that road reserve widths are sufficient to accommodate the specified **Carriageway**, required services with approved clearances, pedestrian and bicycle access where appropriate, parking, drainage and bus routes where appropriate. Should the development design incorporate **WSUD** devices, an increased road reserve width may be required.

The minimum acceptable road reserve width in rural living and low density **Developments** is 20m, but additional reserve width is encouraged to facilitate landscaping and pedestrian/bicycle facilities.

Splays at intersections should normally be in accordance with Clause 12.5.5 of this **Manual**.

Table 6 Rural Road Characteristics

Road Type	Indicative Maximum Traffic Volume (vehicles/day)	Minimum Reserve Width	Minimum Seal Width	Minimum Shoulder Width	Kerbing (see also Clause 12.4.9)
Rural Living Access Road	1000	20.0m	6.2m	1.5m	nil
Rural Living Collector Road	6000	25.0m	6.2m 7.0m for Councils listed below in Selection Table 12.4.2(a).	1.5m	nil
Rural Living or Low Density Residential Court Bowls	n/a	32.0m	9.5m [1] 10.5m [2]	1.5m [1] 0.0 [2]	n/a [1] SM2 [2]
Low Density Residential Access Road	1000.	20.0m	6.2m	1.5m	n/a
Low Density Residential Collector Road	6000	**6.2m and 7m Councils (see Selection Table 12.4.2(a) below)**			
		20.0m	See Selection Table 12.4.2(b) below	1.5m	n/a
Rural Access and Rural Collector	0-50 51-150 over 150	**Standard A Councils (see Selection Tables 12.4.2(a) and 12.4.2(c) below)**			
		20.0m	4.0m gravel 4.0m seal 6.2m seal	1.5m	n/a
	0-50 over 50	**Standard B Councils (see Selection Tables 12.4.2(a) and 12.4.2(c) below)**			
		20.0m	6.0m seal 6.0m seal	Nil 1.5m	n/a

Cross sections for the above road types can be viewed in Standard Drawings numbered SD600 to 625.

IMPORTANT – Table 6 should be read in conjunction with the following notes

Note 1

These seal widths apply within the boundaries of all **Councils**, other than those specified in Note 2, where waste collection vehicles are allowed to travel on the unsealed shoulders of the court bowl, on the condition that the shoulders are constructed with full depth pavement.

Note 2

These seal widths and kerbs where court bowls include kerbing apply within the boundaries of Councils listed below:

Wodonga City Council

Note 3

Table 6 does NOT apply to roads within the Ararat Rural City Council and Gannawarra Shire Council boundaries. Classifications and construction of new roads are to be in accordance with **Council's** Roads Management Plan and Road Asset Management Plan.

Selection Table 12.4.2(a) For Rural Living Collector Roads

7.0m Wide Seal
Bass Coast Shire Council
Baw Baw Shire Council
Horsham Rural City Council
Macedon Ranges Shire Council
Mildura Rural City Council
Mount Alexander Shire Council
Warrnambool City Council
Wodonga City Council

Selection Table 12.4.2(b) For Low Density Residential Collector Roads

6.2m Wide Seal	7.0m Wide Seal
Bass Coast Shire Council	Ballarat City Council
Benalla Rural City Council	Glenelg Shire Council
Campaspe Shire Council	Greater Bendigo City Council
Central Goldfields Shire	Macedon Ranges Shire Council
City of Greater Geelong	Mildura Rural City Council
Colac Otway Shire Council	Mitchell Shire Council
Corangamite Shire Council	Mount Alexander Shire Council
East Gippsland Shire Council	Pyrenees Shire Council
Golden Plains Shire Council	South Gippsland Shire Council
Greater Shepparton City Council	Warrnambool City Council
Indigo Shire Council	Wodonga City Council
Mansfield Shire Council	Yarriambiack Shire Council
Moira Shire	
Moorabool Shire Council	

6.2m Wide Seal	7.0m Wide Seal
Murrindindi Shire Council	
Rural City of Wangaratta	
Southern Grampians Shire Council	
Strathbogie Shire Council	
Surf Coast Shire Council	
Towong Shire Council	
Wellington Shire Council	

Selection Table 12.4.2(c) For Rural Access

Standard A Councils	Standard B Councils
Ararat Rural City Council	Bass Coast Shire Council
Ballarat City Council	Baw Baw Shire Council
Benalla Rural City Council	Horsham Rural City Council
Campaspe Shire	Macedon Ranges Shire Council
Central Goldfields Shire	Mitchell Shire Council
City of Greater Geelong	Warrnambool City Council
Colac Otway Shire Council	Wellington Shire Council
Corangamite Shire Council	Wodonga City Council
East Gippsland Shire Council	
Gannawarra Shire Council	
Glenelg Shire Council	
Golden Plains Shire Council	
Greater Bendigo City Council	
Greater Shepparton City Council	
Indigo Shire Council	
Mansfield Shire Council	
Moira Shire Council	
Moorabool Shire Council	
Mount Alexander Shire Council	
Murrindindi Shire Council	
Rural City of Wangaratta	
South Gippsland Shire Council	
Southern Grampians Shire Council	
Strathbogie Shire Council	
Surf Coast Shire Council	

Standard A Councils	Standard B Councils
Swan Hill Rural City Council	
Towong Shire Council	
Yarriambiack Shire Council	

12.4.3 Road Geometry, Horizontal and Vertical Alignments

Council will expect the geometric design of rural roads, including horizontal and vertical alignments, to be based on the Austroads *Guide to Road Design Part 3: Geometric Design* and any VicRoads supplement to those guidelines, unless otherwise provided within this **Manual**.

Unless otherwise agreed by **Council**, minimum widths should be in accordance with Clause 12.4.7, and road geometry in rural living **Developments** to provide sufficient space for emergency service vehicles and waste collection vehicles to carry out their functions while travelling in a forward-only direction throughout the development. Significant Rural Living and Low-Density Residential **Developments** may also require provision for school buses, and **Council** will expect these vehicles to be able to travel in a forwards direction at all times.

Staging of works does not negate the requirement for forward-only travel, and temporary turning areas may need to be established between development stages, including **Carriageway** easements as required. This may therefore require that temporary table drains be constructed around these turning areas.

Road design grading should be extended for a minimum of 100 metres beyond the end of any street which is to be extended in the future. Where new roads meet existing roads, **Council** will expect the **Design Engineer** to check the grading for a distance of 100 metres, and ensure that roads match well and that no abrupt change in grade occurs.

12.4.4 Sight Distances

Council will expect the **Design Engineer** to demonstrate that adequate horizontal and vertical sight distance has been provided for the design speed, in accordance with the Austroads *Guide to Road Design Part 3: Geometric Design* and any VicRoads supplement to those guidelines. Unless otherwise agreed by **Council**, the design speed adopted for each road should be the legal road speed limit for that road.

Landscaping plans should be prepared with consideration to sight distance requirements, as should any proposal for estate entrance structures. **Council** will expect plans submitted for approval to show all existing and proposed features in sufficient detail to demonstrate that the appropriate sight distances are achieved.

12.4.5 Vertical Curve Requirements

Council will expect vertical curve design to comply with the Austroads *Guide to Road Design Part 3: Geometric Design* and any VicRoads supplement to those guidelines, with vertical curves on rural roads being designed to provide the correct stopping sight distances for the design speed for each road, and to coincide with the horizontal curves wherever practical.

12.4.6 Limiting Longitudinal Gradients

Unless otherwise agreed by **Council**, roads without kerb and channel should have a minimum longitudinal grade of 0.2%, subject to the table drains being independently graded at a minimum of 0.5%. The maximum longitudinal grade for rural roads should be 15%, with that grade being maintained over a distance of no more than 150m, while the maximum longitudinal grade adjacent to intersections should be 10%.

12.4.7 Cross Section Profiles

Council will expect the **Design Engineer** to provide two lanes of traffic in Rural Living and Low Density **Developments**.

Council will expect the **Design Engineer** not to terminate the cross-section design at the property boundaries but to extend the design sufficiently to determine cut and fill requirements and show these on plans.

The normal cross-fall on sealed pavements should be 3%. Should design speeds require super-elevation of horizontal curves, cross-fall design should be based on the Austroads *Guide to Road Design Part 3: Geometric Design* and any VicRoads supplement to those guidelines.

Where cross-falls of greater than 6% at intersections or horizontal curves are proposed, approval should be sought from **Council's Engineering Department**.

Batter slopes should be appropriate for the predominant use of the locality and be designed with consideration to **Clear Zones** as defined in the Austroads *Guide to Road Safety Part 6: Roadside Design, Safety Barriers* and any VicRoads supplement to those guidelines. In areas within the **Clear Zone** batter slopes should preferably be no more than 1:6, and the absolute maximum should be 1:4. Residential driveway slopes should not exceed 1:10.

Council will expect that, where it is impractical to provide batters flatter than the maximum slopes specified, the **Design Engineer** will provide special treatments such as retaining walls within the property and, in areas prone to erosion, give particular consideration to appropriate control measures.

12.4.8 Vehicle Turning Movements

The **Design Engineer** will be responsible for identifying all possible turning movements and making allowance for them in the development design. **Council** will expect turning movements to be shown on the plans submitted for approval by **Council's Engineering Department**.

12.4.9 Kerb and Channel at Cut Embankments

Where steep sections of road are in cut (embankments), **Council** will expect the **Design Engineer** to consider using kerb and channel to prevent the scouring of roadside drains.

12.5 Intersection Design

12.5.1 General

All intersections should be designed and constructed to function in a safe, convenient and appropriate manner for the type of street and Development concerned. **Council** will expect the **Design Engineer** to ensure that they are designed in accordance with the Austroads *Guide to Road Design Part 4A: Non-Signalised and Signalised Intersections* and *Guide to Road Design Part 4B: Roundabouts,* and with any VicRoads supplement to those guidelines.

Council will expect the **Design Engineer** to ensure that any intersections with State rural or urban roads or National Highways are designed, approved and constructed in accordance with VicRoads requirements.

The road network within a **Development** should be designed so that at least 90% of dwellings are within 400m safe walking distance from an existing or proposed bus or tram route and from existing or proposed Public Open Space facilities. **Council** will expect the **Design Engineer** to submit pedestrian path mapping to support the proposed layout.

'T'-junctions should be adopted in preference to four-way intersections. Where four-way intersections, or other cross intersections, are to be constructed, the road centrelines should intersect at an angle between 70 and 110 degrees, and **Council** will expect the **Design Engineer** to specify appropriate traffic control treatment.

Where staggered 'T'-junctions are to be provided in rural areas, the intersecting roads should be located at a minimum separation distance of twice the stopping distance for the travel speed along the through-road (1.5 second reaction time), and the arrangements should preferably be of the 'right to left' type. The **Design Engineer** should note that staggered 'T'-junctions require VicRoads or delegated **Council** approval..

12.5.2 Level of Treatment

The appropriate level of treatment at intersections depends on the characteristics of existing and proposed connecting roads. **Council** will expect the **Design Engineer** to determine the most appropriate level of treatment by reference to the Austroads *Guide to Road Design Part 4A: Non-Signalised and Signalised Intersections* and any VicRoads supplement to those guidelines..

Council will expect the **Design Engineer** to design any roundabouts proposed to be used at intersections in accordance with the Austroads *Guide to Road Design Part 4B: Roundabouts* and any VicRoads supplement to those guidelines. All roundabouts are Major Traffic Control Items requiring VicRoads approval. On municipal roads, VicRoads has delegated authority for such approval to **Councils** under various conditions, including timely reporting back to VicRoads.

12.5.3 Special Considerations

For intersections where the proportion of over-dimensional or large freight or other vehicles is higher than the normal percentage in the traffic stream, the intersection requirements may be more significant. **Council** will expect the Traffic Management Strategy to address this issue and include recommendations regarding these intersections (see Clause 9).

12.5.4 Intersection Spacing

The spacing of intersections should generally comply with the requirements of the Planning Scheme. **Council** will expect intersections to be designed and located so as to provide a safe environment for all road users, and with clear indication of right-of-way priority for pedestrians, cyclists and vehicles.

Intersection spacing on, and access to, declared arterial roads requires VicRoads approval. Access to declared arterial roads will be in accordance with VicRoads requirements, having regard to the Austroads *Guide to Traffic Management Part 5A*, Austroads *Guide to Road Design Part 4A* and the Victorian Planning Provisions. **Developers** are encouraged to discuss access to arterial roads with VicRoads prior to making a planning application for any **Development** that may affect these roads.

12.5.5 Splays

Splays of suitable dimensions should be provided at all corners of all intersections.

At intersections involving at least one collector road the minimum splay on the intersecting roads is 5m x 5m. At intersecting roads of lesser classification the minimum splay is 3m x 3m. Larger splays may be required to secure traffic safety and/or to accommodate the provision of services.

12.5.6 Kerb Returns

At intersections, the minimum kerb return or edge of seal radius is as follows:

- Residential areas 7.5 m
- Collector Street 12.50 m
- Arterial Road 15.00 m
- Industrial / Rural areas 12.0 m

Council will expect the **Design Engineer** to demonstrate that all splays can accommodate the turning movement requirements as detailed in Clause 12.3.8.

12.6 Traffic Calming

Calming devices such as thresholds, slow points, road humps, chicanes and splitter islands should be designed in accordance with the requirements of the Austroads *Guide to Traffic Engineering Management Part 8: Local Area Traffic Management* and any VicRoads supplement to those guidelines.

Some traffic calming devices, such as road humps, are Major Traffic Control Items requiring special approval. The **Design Engineer** will be responsible for securing any necessary approvals, and should refer to Table 2.1 of the *VicRoads Traffic Engineering Manual Volume 1*.

Traffic calming devices also require prior approval by **Council's Engineering Department**, and **Council** will expect the **Design Engineer** to address the following issues in any submission:

- Streetscape
  - Reduce the linearity of the street by segmentation.
  - Avoid continuous long straight lines (e.g. kerb lines).
  - Enhance existing landscape character.
  - Maximise continuity between existing and new landscape areas.
- Location of Devices/Changes
  - Devices other than at intersections should be located to be consistent with streetscape requirements.
  - Existing street lighting, drainage pits, driveways, and services may decide the exact location of devices.
  - Slowing devices are optimally located at spacings of 100-150m *PRINCIPLE*.
- Design Vehicles
  - Emergency vehicles must be able to reach all residences and properties.
  - Where local streets link arterial roads and minor local streets, consideration should be given to designing those streets for an Austroads Design Single Unit Truck/Bus.
  - Where bus routes are involved, buses should be able to pass without mounting kerbs and with minimum discomfort to passengers.
- In newly developing areas where street systems are being developed in line with LATM principles, provision should be made for building construction traffic.
- Control of Vehicle Speeds
  - Maximum vehicle speeds can only be reduced by deviation of the travelled path. Pavement narrowings have only minor effects on average speeds, and usually little or no effect on maximum speeds.
  - Speed reduction can be achieved using devices that shift vehicle paths laterally (slow points, roundabouts, corners) or vertically (humps, platform intersections, platforms pedestrian/school/bicycle crossings).
  - Speed reduction can be helped by creating a visual environment conducive to lower speeds. This can be achieved by segmenting streets into relatively short lengths (less than 300m) using appropriate devices, streetscapes, or street alignment to create short sight lines.
- Visibility Requirements (sight distance)
  - Adequate sight distances, reflecting the likely operating speeds, should be provided to allow evasive action by pedestrians, cyclists and drivers in a potential conflict situation.
  - Sight distances to be considered include those of and for pedestrians and cyclists, as well as for others.

- Night time visibility of street features should be adequate. In particular, speed control devices should be located near existing street lighting if practicable and all street features/furniture should be delineated for night time operation. **Council** will expect additional street lighting to be provided by the **Developer** when proposed new speed control devices are located away from existing street lighting.

- Critical Dimensions
  - Many devices will be designed for the normal use by cars, but with provision (such as mountable kerbs) for large vehicles. Some typical dimensions include:
    - Pavement narrowings:
      - Single lane 3.50m between kerb inverts
      - 3.75m between obstructions
      - Two lanes 5.50m minimum between kerb inverts
    - Bicycle lanes (allowing for adjacent pavement narrowings) should be at least 1.2m wide, but may be reduced to 1.0m in special circumstances in accordance with the Austroads *Guide to Road Design Part 3: Geometric Design (section 4.8)* and any VicRoads supplement to those guidelines.
    - Plateau or performance areas should be 75mm to 150mm high, with 1:15 ramp slope.
    - The clear sight path through slowing devices should be at least 1.0m wide. This represents the width of the portion of **Carriageway** which does not have the line of sight through the device available to drivers and others blocked by streetscape materials, usually vegetation.
    - The dimensions of mountable areas required for the passage of large vehicles should be determined by applying the appropriate turning templates.

12.7 Pavement Design

Council will expect the depth of flexible or rigid pavement required for the proposed pavement structure and materials to be determined by a **Qualified Engineer,** based on geotechnical testing, with the design being submitted to **Council's Engineering Department** for approval. Specific designs should be submitted for rigid pavements that include deep lift asphalt and/or stabilised materials.

12.7.1 Sub-Grade Analyses

Pavement design should be based on the results of sub-grade analysis, including testing for soaked Californian Bearing Ratio (CBR), carried out by a NATA registered testing laboratory. **Council** will expect sub-grade soil samples to be taken at maximum intervals of 200 metres, in the bowls of all courts, at all intersections and at all obvious locations where existing sub-grade material changes suddenly, and core samples to be bored to a minimum depth of 600 mm below final road sub-grade level. The soil sample used for laboratory testing should be taken from the core at sub-grade level. Full details of sub-grade test results and core samples to be submitted to **Council's Engineering Department** with the detailed design plans. When soft sub-grade is encountered, the depth to the next solid layer should be determined by probe.

12.7.2 Flexible Road Pavements

Council will expect the **Design Engineer** to comply with the Austroads *Guide to Pavement Technology, 2010* when preparing flexible pavement designs. **Council** will expect pavement design to be carried out using equivalent standard axle loadings based on an average traffic generation rate of 10 vehicles per day per residential lot and a 20-year minimum design life for both residential and commercial roads. The corresponding figures for industrial roads are an average traffic generation rate of 45 vehicles per day per industrial lot and a 40-year minimum design life. For rural roads and low density **Developments**, pavement design may be based on the Austroads publication *Pavement Design for Light Traffic* published in 2006.

To accommodate the heavy vehicle traffic generated by construction during the development of subdivisions, the Design Traffic computed for flexible pavements, DESA, should be increased by not less than the values outlined below.

Access Lane	5 %
Access Place	4 %
Access Street	3 %

12.7.3 Concrete Street Pavements

The design of concrete street pavements should be based on the Austroads *Guide to Pavement Technology 2010* and the *Guide to Structural Design of Road Pavements 2006*, with a minimum 20-year design life.

12.7.4 Interlocking Pavers

For safety, operational and maintenance reasons, **Councils** usually prefer to avoid using interlocking block pavers as street pavements. When **Council** has approved their use, the pavers should be laid on a mortar bed on a drained, reinforced pavement designed in accordance the Austroads *Guide to Pavement Technology 2010* and the *Guide to Structural Design of Road Pavements 2006*, with a minimum 20-year design life..

12.7.5 Minimum Pavement Thickness –Residential Streets

This section applies only to residential streets, including collector streets where heavy vehicles comprise less than 5% of the overall traffic volume. Roads serving industrial or commercial areas, or collector roads carrying a higher proportion of heavy vehicle traffic, will generally require increased pavement thicknesses, as detailed in Section 12.7.6.

Notwithstanding any of the above requirements, the pavement thickness for residential streets should not be less than that specified in Selection Table 12.7.5 for roads bounded by kerb and channel (or edge strips), 200mm for unkerbed roads (where permitted under Council policy), and 150mm for car parks. The sub-base layer should extend for a minimum of 100mm past the rear face of any kerb and/or guttering.

Selection Table 12.7.5 Minimum Pavement Depth

Minimum Pavement Depth = 250mm	Minimum Pavement Depth = 300mm	Minimum Pavement Depth = 400mm
Ararat Rural City Council	Ballarat City Council	Horsham Rural City Council
Campaspe Shire	Bass Coast Shire Council	
City of Greater Geelong	Baw Baw Shire Council	
Gannawarra Shire Council	Benalla Rural City Council	
Greater Bendigo City Council	Central Goldfields Shire Council	
Greater Shepparton City Council	Colac Otway Shire Council	
Indigo Shire Council	Corangamite Shire Council	
Mansfield Shire Council	East Gippsland Shire Council	
Moira Shire Council	Glenelg Shire Council	
Murrindindi Shire Council	Golden Plains Shire Council	
Strathbogie Shire Council	Macedon Ranges Shire Council	
Towong Shire Council	Mildura Rural City Council	
	Mitchell Shire Council	
	Moorabool Shire Council	

Minimum Pavement Depth = 250mm	Minimum Pavement Depth = 300mm	Minimum Pavement Depth = 400mm
	Mount Alexander Shire Council	
	Pyrenees Shire Council	
	Rural City of Wangaratta	
	South Gippsland Shire Council	
	Southern Grampians Shire Council	
	Surf Coast Shire Council	
	Swan Hill Rural City Council	
	Warrnambool City Council	
	Wellington Shire Council	
	Wodonga City Council	
	Yarriambiack Shire Council	

12.7.6 Minimum Pavement Thickness – Industrial and Commercial Streets

This section applies to industrial and commercial streets, and to residential collector streets where heavy vehicles comprise 5% or more of the overall traffic volume. Particular care should be taken to ensure that the pavement design reflects both the nature of the sub-grade and the lateral and vertical loads imposed by heavy vehicles. The **Design Engineer** should seek advice from **Council's Engineering Department** on pavement profiles that have given satisfactory service under local conditions.

12.7.7 Minimum Pavement Thickness – Intersections

This section applies to intersections controlled by traffic lights or roundabouts, whether located in residential, industrial or commercial **Developments**. The longitudinal loads applied by vehicles when accelerating or braking, and the transverse loads associated with turning movements, combine to place significant demands on the pavement structure, and the **Design Engineer** should seek advice from **Council's Engineering Department** on pavement profiles and types of sub-grade treatment that have given satisfactory service under local conditions.

12.7.8 Minimum Shoulder Thickness

For unkerbed roads, the base layer should extend at least to the nominated width of the shoulder, and have a minimum thickness of 150mm. The **Councils** listed in Selection Table 12.7.8 require the central pavement thickness to extend to the full width of the shoulder in the specified circumstances.

Selection Table 12.7.8 Councils Requiring Extension of Central Pavement

Unkerbed Court Bowls Only	All Unkerbed Roads
Alpine Shire Council	Bass Coast Shire Council
Ararat Rural City Council	Baw Baw Shire Council
Ballarat City Council	Benalla Rural City Council
Buloke Shire Council	Golden Plains Shire Council
Campaspe Shire Council	Horsham Rural City Council
Central Goldfields Shire	Latrobe City Council

Unkerbed Court Bowls Only	All Unkerbed Roads
Colac Otway Shire Council	Moira Shire Council
Corangamite Shire Council	Wellington Shire Council
East Gippsland Shire Council	
Gannawarra Shire Council	
Glenelg Shire Council	
Greater Bendigo City Council	
Greater Geelong City Council	
Greater Shepparton City Council	
Glenelg Shire Council	
Hepburn Shire Council	
Indigo Shire Council	
Loddon Shire Council	
Macedon Ranges Shire Council	
Macedon Ranges Shire Council	
Mansfield Shire Council	
Mildura Rural City Council	
Mitchell Shire Council	
Moorabool Shire Council	
Mount Alexander Shire Council	
Murrindindi Shire Council	
Pyrenees Shire Council	
South Gippsland Shire Council	
Southern Grampians Shire Council	
Strathbogie Shire Council	
Surf Coast Shire Council	
Swan Hill Rural City Council	
Towong Shire Council	
Wangaratta Rural City Council	
Warrnambool City Council	
Wodonga City Council	
Yarriambiack Shire Council	

12.7.9 Compaction Requirements

Depending on traffic volumes and actual pavement design, compaction should be in accordance with *VicRoads Standard Specifications for Roadworks and Bridgeworks* (*Clause 304.07*). A Dynamic Cone Penetrometer may be used to verify compaction of trimmed and prepared subgrade material. Compaction testing of base and sub-base material should be carried out by a NATA approved laboratory or by calibrated nuclear densometer test to the relevant Australian Standard.

Where possible, tests should be taken at two-thirds of the pavement depth. **Council** will expect the **Design Engineer** to submit copies of all geotechnical results for consideration by **Council's Engineering Department**.

Unless otherwise agreed by **Council**, compaction testing and proof-rolling should be undertaken on the same day.

12.7.10 Sub-Grade

The subgrade should be compacted to 98% of the average modified maximum dry density [MMDD] with all building sites compacted to 95% MMDD, or in accordance with the Construction Specification and/or AS 3798.

12.7.11 Sub-Base

The typical flexible pavement sub-base consisting of fine crushed rock should be compacted to the (MMDD) as shown below:

Collector street or road	98%
Access street or road	97%

The number of tests to be undertaken is as specified in 0.

Compaction testing of the sub-base is only required in areas of fill.

12.7.12 Base

The typical flexible pavement base should be compacted to the MMDD specified below with test locations to be approximately one metre offset from the kerb or edge of seal and measurements taken at two-thirds of the depth of the layer.

Collector street or road	100%
Access street or road	98%

The number of tests to be undertaken is as specified in Table 7.

Table 7 Location and Number of Compaction Tests

Location	All Roads
Court bowls	3 No
Intersections	2 No
Straights	1 per 500 m^2

Unless otherwise agreed by the **Council**, tests should be taken on alternate sides of the road and be evenly spaced.

12.7.13 Proof-Rolling

Proof-rolling of the sub-base and base will be undertaken at the expense of the Contractor, in accordance with *AS 3798* and in accordance with the requirements of Section 173 and Section 204.12 of the VicRoads specifications. These specify that subgrade should not deflect more than 2 mm vertically within 300 mm of the test roller in isolated locations. If deflection of the subgrade is found in more than 20% of the project area, Council will expect the total area to be reworked. There should be no visible deformation or cracking of the pavement during a sub-base or base proof-roll. The Contractor will be responsible for rectifying areas that fail a proof-roll test. In accordance with Clause 7.4, adequate notice should be given

to allow the **Council Engineer** or a person nominated by the **Council Engineer** to attend proof-rolling inspections. If a proof-roll test fails, a further **Council** inspection will be required, and appropriate notice should be given.

12.7.14 Soft Areas in Pavements

Council will expect the contractor promptly to rectify any unsuitable material that exists or develops during construction to the satisfaction of the **Council's Engineering Department**. Possible treatment methods include cement and/or lime stabilisation, replacement of the underlying material with pavement, the use of geotextiles and/or the lowering of sub-surface drainage to below the level of the area to be rectified. Council will expect rectified pavements to achieve the levels of compaction specified above**,** and the "as-constructed" drawings submitted by the **Design Engineer** to identify the extent of all reworked soft areas and any form of treatment applied.

12.7.15 Pavement Wearing Course

Council will expect pavements to be proof-rolled and density-tested, at the expense of the contractor, immediately prior to priming. Council will expect the number of density tests to be in accordance with *AS 3798* and *AS 1289 Geotechnical Testing*, unless otherwise specified. Pavements should be trimmed to shape, swept and have a surface consistency suitable for priming. Adequate protection against over-spray during priming or tack coating should be provided for signs, concrete edgings, and traffic control devices.

The preferred road surface for all urban residential roads is a minimum of 30mm Type N Asphaltic Concrete. The surface of the final wearing course should be between 5-10 mm above the concrete edging and detailed on the construction plans for each edging type. To eliminate any trip hazard, **Council** will expect the wearing course to be flush with the lip of the kerb and channel at all footpath kerb crossings.

Unless otherwise agreed by **Council**, all new and upgraded roads, including widened roads, located in or adjacent to commercial or industrial **Developments,** and any residential collector streets where heavy vehicles comprise 5% or more of the overall traffic**,** should be sealed with Type H Asphaltic Concrete of suitable thickness for the expected traffic loading, with a minimum thickness of 40mm.

Unless otherwise agreed by **Council**, all new and upgraded intersections or roundabouts should be sealed with a Type H Asphaltic Concrete of suitable thickness for the expected traffic loading, with a minimum thickness of 50mm. The **Design Engineer** should seek advice from **Council's Engineering Department** on specific sub-grade treatments and/or pavement profiles that have given satisfactory service under local conditions.

A two-coat bitumen seal may be considered as an alternative in some residential **Developments**, such as those located in heritage areas, subject to the approval of **Council**. New and upgraded roads constructed in areas with heritage characteristics may require specific colours of gravel to be used. Liaison with **Council's Engineering Department** and **Council's Planning Department** will be required in these instances.

Where a dispute arises concerning the finished surface texture or construction methods, wearing course core samples and compaction testing may be required. The **Design Engineer** should, prior to construction, specify all relevant design information, including mix design, aggregate size and any additives e.g. colour additives.

For all new and upgraded roads, including widened roads, located in or adjacent to Rural, Rural Living and Low Density Residential **Developments**, the minimum required wearing surface should be a two-coat seal. The first coat should use a 10mm aggregate with the second coat using 7mm aggregate. Where there are significant turning movements by heavy vehicles, the first coat should use a 14mm aggregate with the second coat using 7mm aggregate

Where **Council** considers that particular roadways under this section may be subject to turning movements that would cause stone loss from a spray seal finish, **Developers** may be required to provide an asphalt wearing course or overlay.

12.8 Traffic Control Devices

Council will expect the **Design Engineer** to identify any required traffic control devices in accordance with the Austroads *Guide to Traffic Management Part 8: Local Area Traffic Management* and any VicRoads supplement to those guidelines and with VicRoads *Traffic Engineering Manuals Volumes 1 & 2*. The supply and installation of traffic control devices should comply with *AS1742 Parts 1-15 Manual of Uniform Traffic Control Devices*.

Many major traffic control Items will require VicRoads approval. The **Design Engineer** will be responsible for obtaining all the necessary approvals, and should refer to Table 2.1 of the VicRoads *Traffic Engineering Manual Volume 1.*

12.8.1 Signposting and Pavement Marking

Council will expect signposting and pavement marking to be provided for roads, intersections, traffic control devices, cycleways and car parks in accordance with *AS1742 Parts 1 – 15* and the VicRoads *Traffic Engineering Manual Volumes 1 and 2*. Street name plates should be a standard type throughout each **Council**, unless otherwise approved in writing, and the styles for signposting should comply with any Style Guide developed by **Council**.

12.8.2 Guard Fence

Where there is a warrant, such as an identified hazard in the **Clear Zone**, **Council** will expect a guard fence to be installed in accordance with the VicRoads specification, where shown on the approved engineering plan or as directed by **Council's Engineering Department**.

12.9 Vehicular Access

Council will expect vehicular access to each and every allotment within a subdivision development to be provided at the time of development. Vehicle crossings are not generally required to be constructed at the time of development where mountable or semi mountable kerb and channel is used, as these may be constructed during later building works when the final preferred location is known. The exceptions to this are the **Councils** listed in Selection Table 12.90 where vehicle crossings are to be constructed and the **Councils** within which vehicle crossings are not required for any kerb profile.

Selection Table 12.9 Vehicle Crossings

Vehicle crossings are to be provided for all kerb profiles	Vehicle crossings are not required for any kerb profile.
Bass Coast Shire Council	Ballarat City Council*
Benalla Rural City Council	Baw Baw Shire Council
Central Goldfields Shire Council	City of Greater Bendigo
Corangamite Shire Council	Colac Otway Shire Council
East Gippsland Shire Council.	Glenelg Shire Council
Golden Plains Shire Council	Wellington Shire Council
Greater Shepparton City Council	Wodonga City Council
Horsham Rural City Council	
Macedon Ranges Shire Council	
Mansfield Shire Council	
Mildura Rural City Council	
Mitchell Shire Council	
Murrindindi Shire Council	

Vehicle crossings are to be provided for all kerb profiles	Vehicle crossings are not required for any kerb profile.
Pyrenees Shire Council	
Strathbogie Shire Council	
Swan Hill Rural City Council	
Warrnambool City Council	
Yarriambiack Shire Council	

*Note City of Ballarat will enforce if a developer nominates vehicle crossings as part of their development.

Unless otherwise agreed by **Council**, where **Developments** include construction of barrier kerb and channel or SM2 kerb and channel, a vehicle crossing and layback section in the kerb and channel constructed in accordance with the Standard Drawings should be provided to each allotment frontage at the time of development.

12.9.1 Urban Vehicle Crossings

This section applies to urban areas regardless of whether there is kerb and channel.

Driveways and direct vehicle access to trunk collector streets should be designed to allow forward entry and exit from properties. The maximum number of vehicle crossings to residential properties is two (2) crossings, neither of which exceeds 3.5m in width. Where two crossings are provided, the minimum distance between them should be 9m. Unless otherwise agreed by **Council**, the maximum width of a single crossing should be 6.0m, and crossings should be constructed in accordance with the requirements of Standard Drawing Numbers 235 and 240.

Crossings to adjacent properties should either be fully combined, with a maximum width of 6.0m, or have a minimum separation of 9m.

Vehicle crossings to residential corner allotments should be located at least 6m from the intersection of road reserves and 2m clear of pedestrian kerb crossings.

Council will expect that section of each crossing contained within the road reserve to be constructed with an all-weather surface. **Council** will expect the section of crossing passing through the footpath zone to conform to the requirements of *Australian Standard AS1428.1 2009 – Design for Access and Mobility*. A surface that matches the texture and colour of the adjacent footpaths is preferred, but alternative surfaces may be approved by **Council** provided that they comply with *Australian Standard AS1428.1 2009 – Design for Access and Mobility*. However, patterns creating surface irregularities more than 5mm high are prohibited, and coloured edge strips will only be permitted when adjacent and parallel to the alignment of footpaths. Feature edge strips are not permitted to cross the path of travel along the footpath.

In accordance with the requirements of Clause 12.3.9, where grades through vehicle crossings exceed 1:10, **Council** will expect the **Design Engineer** to demonstrate using standard car templates that safe and convenient car access can be provided to the relevant allotments.

12.9.2 Rural Vehicle Crossings

Roads should be located and designed such that vehicular access can be readily obtained at every allotment of a subdivision. Where the natural surface slopes steeply to or from the road, the access to each lot should be given special consideration. The locating of an access onto a vertical curve along the road is to be avoided where there is inadequate sight distance for safe entry and exit from the property.

Council will expect all rural vehicle access crossings to include a culvert unless they are located at an obvious high point. The minimum width of culvert is 4.88m (refer to **Appendix D: Information to be Shown on Plans),** and that all culverts

are equipped with an end-wall at each end of the pipe. Trafficable end-walls should be used when the culvert is located within the **Clear Zone** (refer to Standard Drawings).

The minimum pipe size varies according to the slope of the terrain. In flat terrain the minimum pipe size is ∅375mm in rural and rural living zones, and pipes should be laid with the pipe invert 150mm below the invert of the table drain. In steeper terrain the risk of silting and blockage is reduced, and the minimum pipe size is ∅300mm.

The minimum pipe size is ∅300mm in low density residential zones where table drain batters are flat enough to allow mowing. In these instances, the pipes should be laid with the pipe invert matching the table drain invert.

Reinforced concrete swale crossings can be used where the depth of the table drain is less than 350mm and the product of the depth and the peak flow velocity is less than 0.35, provided that **Council's Engineering Department** is satisfied that the crossing can be safely and conveniently negotiated by standard cars. At existing entrances with either a ∅300mm or ∅375mm culvert, new end-walls may be added to the existing culvert as long as the existing pipes are in good condition, are laid at the correct level, and are demonstrated to have sufficient hydraulic capacity.

Council will expect culverts to be designed with the following hydraulic capacity:

- 18% **AEP** capacity before property culvert overtops.
- 2% **AEP** capacity before the overtopping depth reaches 300mm.
- No water may encroach on the edge of shoulder on sealed roads, or edge of gravel on gravel roads.

Council will expect rural vehicle crossings to be upgraded to meet current standards whenever rural land is subdivided, unless the location of the access is at an obvious high point. Where a planning permit relates to boundary realignment only, there will generally be no engineering requirement for upgrade to accesses, unless the proposed realignment would see a significant change in the use of such access.

12.10 Requirement for Dust Suppression Works

Dust suppression works may be required where a proposed new house or an existing dwelling is likely to experience significant detrimental impacts arising from dust generated by existing traffic or that from a proposed **Development.**The requirement for dust suppression works will vary from **Council** to **Council** due to variation in road making materials used and the annual rainfall expected. Those **Councils** that require dust suppression works are listed in Columns 1 and 3 in Selection Table 12.10. Contact should be made with those **Councils** to determine their specific requirements.

Selection Table 12.10 Dust Suppression

Dust Suppression Works Required	Councils – Council Funds Dust Suppression Works	Councils – Where Dust Suppression Works are Determined on a Case by Case Basis
Campaspe Shire	Greater Shepparton City Council	Ararat Rural City Council
Horsham Rural City Council		Ballarat City Council
Macedon Ranges Shire Council		Bass Coast Shire Council
Moira Shire Council		Baw Baw Shire Council
		Benalla Rural City Council
		Central Goldfields Shire Council
		Colac Otway Shire Council
		Corangamite Shire Council
		Glenelg Shire Council
		Golden Plains Shire Council
		Greater Bendigo City Council
		Indigo Shire Council
		Mildura Rural City Council
		Mitchell Shire Council
		Moorabool Shire Council
		Murrindindi Shire Council
		Rural City of Wangaratta
		Southern Grampians Shire Council
		Strathbogie Shire Council
		Swan Hill Rural City Council
		Towong Shire Council
		Warrnambool City Council
		Wellington Shire Council
		Wodonga City Council
		Yarriambiack Shire Council

Clause 13 Mobility and Access Provisions

13.1 Objectives

The objectives of these mobility and access provisions are to promote:

- walking and cycling to daily activities;
- universal access within the community; and
- community health and wellbeing associated with increased physical activity.

13.2 General

Council will expect the **Developer** to provide continuous footpaths for all property frontages and sideages in urban residential and commercial **Developments** *PRINCIPLE*. In accordance with Table 2 , **Developers** may also be required to establish connective links to existing footpaths where demand is directly related to the development. Connective links are generally required from commercial **Developments** to off-site car-parking related to the development.

13.3 Requirements

The following requirements apply to footpaths and pedestrian accesses:

- Footpaths are to be constructed at the time of development in accordance with **Appendix E: List of Council Inspections and Inspection Checklists**.
- Footpath alignments are to be offset by no more than 300mm from property boundaries in existing areas and by no more than 50mm from property boundaries in new **Developments**.
- The minimum footpath width should be 1.5m in residential areas and 2.0m in commercial areas.
- Footpaths of 75mm thickness are acceptable only in well-established areas where the risk of site construction damage is negligible. On greenfield sites, or where there is significant scope for further development, the depth of the footpath should be 125mm throughout.
- The desirable maximum cross-fall on footpaths is 1:50 and the absolute maximum cross-fall is 1:40, including kerb crossings. Kerb crossings are to be provided in accordance with *Australian Standard AS/NZS1428.4, 2009 Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators* at locations identified in consultation with **Council's Engineering Department**.
- **Council** will expect footpaths to be constructed of concrete or asphalt, and to comply with Australian Standard *AS/NZS1428.4, 2009 Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators* for surface finish. Tactile Ground Surface Indicators should be provided in accordance with *AS/NZS 1428.4*, with the VicRoads *Traffic Engineering Manual Volume 1 – Section 4.9* and with **Appendix B: Engineering Approval Process for Developments**. **Councils** listed in Selection Table 13.3 only require these indicators to be installed in the central commercial area of urban centres.

Selection Table 13.3 Tactile Ground Surface Indicators

TGSI's Requirements For Central Commercial Areas of Urban Areas Only
Benalla Rural City Council
East Gippsland Shire Council
Golden Plains Shire Council
Greater Shepparton City Council
Indigo Shire Council
Macedon Ranges Shire Council
Mansfield Shire Council
Mount Alexander Shire Council
South Gippsland Shire Council
Towong Shire Council
Wellington Shire Council
Yarriambiack Shire Council

- Footpaths should slope away from the property boundary, and be elevated above the adjacent nature strip. In general, reverse fall on nature strips is undesirable and will only be approved where no practical alternative is available.
- **Council** will expect the **Design Engineer** to provide details of service pits to be located within the footpath or pedestrian areas to **Council's Engineering Department** when requesting approval of the detailed design.
- **Council** will expect the **Design Engineer** to seek specific approval of the **Council's Engineering Department** before specifying patterned finishes to footpaths or pedestrian accesses.
- Shared paths should be designed and constructed in accordance with the Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths, 2010* and any VicRoads supplement to those guidelines, and be at least 2.5m wide. Where a shared path crosses a pedestrian bridge, a minimum lateral clearance of 0.5m on both sides of the shared path should be provided where the speed of cyclists is less than 20km/hr. Where higher speeds are likely a minimum lateral clearance of 1m should be provided on both sides of the shared path.
- Footpaths should not abut kerbs, unless approved in writing by **Council's Engineering Department** *PRINCIPLE*. Where indented parking is proposed in the street a minimum of 1.0m clearance should be provided from all footpaths and bicycle paths.

Clause 14 Car Parking

14.1 Objectives

To ensure that car-parking is provided in sufficient quantity and quality to service residents, visitors, staff, customers, delivery vehicles and other users.

14.2 General

The number of parking spaces to be provided for any development should be in accordance with the **Council's** Planning Scheme or with an approved Traffic Impact Assessment Report. Council will expect all required physical works to be constructed as part of the **Development**, in accordance with approved plans and specifications and to the satisfaction of **Council's Engineering Department**. The design should ensure that parked vehicles do not obstruct the passage of vehicles, do not create traffic hazards or undue pedestrian hazards and do not detract from the streetscape amenity.

If the **Developer** is unable to provide the required number of on-site car-parking spaces for residents, staff and visitors, and **Council** has not identified and addressed an existing or future need in the vicinity of the development, then the **Development** may not be approved. The **Development** may be permitted to proceed where the **Design Engineer** can satisfy **Council** that alternative car-parking can be provided which meets the requirements set out in Clause 14.3.

Where **Council** has a Parking Strategy that identifies existing or proposed parking within 100m of the **Development**, the **Developer** may be required to contribute to the actual costs of providing additional off-site vehicle spaces, and to enter into a Section 173 Agreement with **Council** to that effect.

14.3 Requirements

The following parking requirements apply to all **Developments**:

- The parking required for normal levels of activity associated with any land use should be accommodated on-site and should be located and should have dimensions that permit safe and convenient access and use.
- Unless **Council** has agreed to an alternative treatment, all parking, both on and off site, should be finished with an all-weather seal and line marked.
- The layout and access arrangements for all parking areas should comply with the Austroads *Guide to Traffic Management: Part 11 Parking* or Australian Standard *AS2890.1 – 2004 Off Street Parking, AS2890.2 – 2002 Off Street Commercial Vehicle Parking, AS2890.3 Bicycle Parking Facilities, Australian Standard AS2890.5 -1993.On Street Parking* and *AS2890.6 Off Street Parking for People with Disabilities.*
- The number of on-site parking and off-site parking spaces to be provided for non-residential land uses should comply with the standards specified on the planning permit, where applicable, or with **Council's** relevant Parking Strategies.
- Lighting should be provided to the satisfaction of **Council's Engineering Department**.
- Loading/unloading requirements should consider forklift/pedestrian conflicts and other movements on the site.

In addition to the above, the following parking requirements apply to all residential **Developments**:

- Sufficient parking should be available to minimise the possibility of driveway access being obstructed by cars parked on the opposite side of the street.
- Where a particular dwelling may generate a high demand for parking, the **Developer** may provide adequate additional parking within the road reserve for visitors, service vehicles and any excess resident parking. Such parking should be convenient to dwellings.

- All verge spaces and indented parking should be constructed of concrete, interlocking pavers, bitumen or asphalt with crushed rock pavement base, and be designed to withstand the loads and manoeuvring stresses of vehicles expected to use those spaces.
- **Council** will expect the **Developer** to identify the measures proposed to set aside resident parking and ensure that casual visitor access is limited to people proposing to use the **Development.**

In addition to the general requirements, the following parking requirements apply to all on-site parking:

- **Council** will expect the **Design Engineer**, when designing the pavement, to make specific allowance for traffic load concentrations at areas within the car park such as entrances and exits.
- Unless otherwise agreed by the **Council**, all loading and unloading zones should be constructed of concrete pavement or concrete segmental pavers to resist damage from diesel and fuel spills. Paving should be mottled to mask spills.

Where parking is to be provided through a contribution to **Council** in accordance with an identified Parking Strategy, the following requirements will apply:

- Customer parking spaces should be located within 100m of the development site.
- Dedicated permanent staff parking spaces can be provided within 500m of the site at the **Developer's** cost.
- There is a direct pedestrian linkage with the Development, or one will be provided by the **Developer**.
- Disabled parking spaces are provided in accordance with the requirements of the *Disability and Discrimination Act* and relevant Australian Standards.
- Lighting is provided to the satisfaction of **Council's Engineering Department**.
- The car park design includes retention of significant existing vegetation, proposed landscaping, the selection of colours and materials for any structures on the site.
- The status of each element within the proposed car park, including common property, **Council** reserves, indented road reserves, and parking spaces, has been confirmed in writing by **Council's Engineering Department**.
- Agreement has been reached regarding public indemnity for the carpark.
- Access and availability to Public Transport systems have been considered.
- The proposal accommodates existing or future location of non-residential uses such as schools, commercial and industrial premises and local shops located, or likely to be developed, in the area.
- The effect of on-street parking works is to slow vehicle speeds and enhance the pedestrian environment.

Clause 15 Earthworks and Lotfilling

15.1 Objectives

Typical earthworks may include lotfilling and/or the construction of a dams, open channel drainage systems, levee banks, access tracks, flood protection devices, overland flow paths and vegetation removal.

The objectives of the earthworks and lotfilling requirements are as follows:

- To ensure that the **Development** does not cause or aggravate the flooding of other properties and that, in particular, existing runoff storage areas and/or flow paths are not filled unless the Relevant Authority has consented to the proposed action, and the necessary permits have been obtained.
- To ensure that buildings are located on a natural surface or on approved filled ground above the 1% **AEP** flood level to comply with *Regulation 6.2 of the Building Regulations 1994* and with the *Health Act*.
- To ensure that earthworks and lotfilling activities do not result in the spread of noxious weeds, as specified in Section 70A and 71 of the *Catchment and Land Protection Act 1994*;.
- To ensure compliance with the recommendations of Catchment Management Authorities and any other relevant agencies or organisations.
- To ensure that earthworks and lotfilling works do not result in erosion dust, mud or debris being released from the site.
- To maintain the privacy and security of adjacent landowners.

15.2 General

Approval of engineering plans by **Council's Engineering Department** relates only to the capacity of earthworks to accommodate road and drainage systems to the satisfaction of **Council**, and does not negate the need for planning approval of such earthworks. The **Design Engineer** will be responsible for ensuring that a planning permit is obtained where required for any earthworks. Where works are to be staged, the permit should, wherever possible, be obtained for the entire site, rather than for each individual stage in turn.

Where roads, footpaths or shared paths are constructed over filled areas, **Council** will expect the pavement materials, structure and geometry to be designed by a **Qualified Engineer**, with the drawings, calculations, and geotechnical data being submitted to **Council's Engineering Department** for approval.

Where driveway gradients exceed 1:10, vehicle clearances should be checked in accordance with the Austroads *Guide to Road Design: Part 3: Geometric Design (Section 8.2.5)*. **Council** will expect the **Design Engineer** to restrict batter slopes to 1:4 unless special treatments, such as retaining walls, and appropriate erosion control measures, are applied.

15.3 Requirements

The following earthworks and lot filling requirements apply to all **Developments**:

- All work should be undertaken in accordance with *AS 3798-2007 Guidelines on Earthworks for Commercial and Residential Developments.*
- Particular care should be taken to ensure that earthworks in an area liable to flooding have no adverse impact on the floodplain characteristics. Existing depressions cannot be filled, either temporarily or permanently, unless the consent of the Relevant Authority is given in writing and any relevant permits have been obtained.
- Where works are undertaken in a floodway, all spoil should be removed to an area above the 1% **AEP** flood level.

- Council will expect all new urban subdivision allotments to be graded, cut or filled, so that a minimum grade of 1:200 is achieved along the low side of the allotment toward the drainage outlet.
- The finished floor surface level of buildings must be at least 300mm above the 1% **AEP** flood level.
- The finished surface of lotfilling must be at or above the 1% **AEP** flood level.
- The extent and depth of all proposed lotfilling should be denoted on the construction plans. Where depths of fill on allotments exceed 300 mm, those areas are to be clearly differentiated from areas where the depths of fill are less than 300 mm.
- **Council** will expect full records to be kept of all areas filled and the information to be recorded on the 'as constructed' plans.
- Where the depth of fill exceeds 300mm, **Council** will expect the fill to be compacted in accordance with the requirements of *Table 204.131 Compaction Requirements Scale C* of *VicRoads Specification* and trimmed and shaped to match existing site levels, except in areas nominated for soft landscaping. **Council** will expect the geotechnical test results to be submitted to **Council's Engineering Department** for approval.
- The requirements for backfilling drainage trenches are specified in the Standard Drawing.
- Where earthworks abut structures, **Council** will expect the **Design Engineer** to demonstrate the continued safety and integrity of those structures to the satisfaction of **Council's Engineering Department**.
- The desirable maximum depth of fill allowable against fencing (where a plinth has been provided at the base of the fencing) is 200mm.
- Council will expect retaining walls to be provided when the depth of fill exceeds 200mm or the maximum batter slopes are exceeded.
- No water may be directed to flow into adjoining properties.
- Ideally no fill should be imported onto any **Development** site. Where fill is imported onto any site Council will expect written records to be provided to **Council's Engineering Department** to indicate the source of the fill and to provide evidence that the soil is not contaminated.
- **Council** will expect all reasonable precautions to be taken to prevent the spread of noxious weeds from or to the worksite. (Refer also Clause 22.7).
- **Council** will expect all reasonable precautions to be taken to prevent mud and debris from leaving any site during and after construction (refer also Clause 22.3).
- The topsoil should be stripped and stockpiled from all areas where earthworks are to be conducted.. Before completing the site works, topsoil should be placed and rehabilitated to replicate the predevelopment depths over all the areas in question.
- Sites that may have been subject to biological or chemical contamination require special consideration. **Council**, the EPA or other Relevant Authorities may require a full analysis of any potentially effected sites and will, in some circumstances, require an Environmental Impact Statement.

15.4 Treatments to Minimise Driveway Excavation

Excavation of Driveways and garage sites, on lots on the high side of the road, may be considered.

15.4.1 Offsetting the Crown or One-Way Cross-fall

When the natural cross slope of the existing terrain will lead to unreasonably high cut batters, offsetting the crown or imposing a one-way cross-fall may be considered. **Council** will approve offsetting the crown on a two-way road when the **Design Engineer** can demonstrate that sufficient stormwater capacity will be retained in the channel and

roadway on the high side of the road. The required capacity will depend on the catchment, and the spacing of storm water entry pits.

Offset crown widths should be sufficient to ensure that the crown can be laid with normal asphalt machinery. **Council** will approve the use of a one-way cross-fall only when the **Design Engineer** can demonstrate that all drainage requirements will be met.

15.4.2 Reverse Cross-fall

Council may approve the use of a reverse cross-fall on the uphill lane of a divided road provided that the **Design Engineer** can demonstrate that sufficient drainage capacity is available in the uphill median channel, and that precautions have been taken to intercept the flow at median openings.

15.4.3 Median Cross-fall

The median cross-fall on divided roads should preferably not exceed 16%, with 33% as an absolute maximum, unless a retaining wall is provided and there are no proposed median breaks. At median openings however, the pavement cross -fall should not exceed 5%.

15.4.4 Modified Footpath Cross-fall

Council will approve modification of the footpath cross-fall only in extreme circumstances. This approach tends to increase the catchment area discharging stormwater into downhill lots, and should be avoided where possible. **Council** will also be reluctant to approve reverse fall (away from kerb) nature strips, with a spoon drain, as this approach results in higher maintenance costs without significant access benefits.

15.4.5 Split-Level Road

Council will not normally approve modified road sections designed to accommodate a split level road.

Clause 16 Urban Drainage

16.1 Objectives

The general objectives of urban drainage are to:

- collect and control all stormwater generated within the subdivision or development;
- collect and control all stormwater entering a subdivision from catchments outside the subdivision;
- provide an effective outlet for all collected stormwater to a natural watercourse or approved outfall; and
- achieve these objectives without detriment to the environment generally, surface and subsurface water quality, groundwater infiltration characteristics, adjoining landowners and landowners in the vicinity of the drainage outlet, and watercourses either upstream or downstream of the subdivision.

16.2 General

Council will expect the **Design Engineer** to design the drainage system in accordance with the relevant provisions of *Australian Rainfall and Runoff – Flood Analysis and Design 2001, Water Sensitive Urban Design Engineering Procedures* published by Melbourne Water, *Urban Stormwater Best Practice Environmental Management Guidelines 2006*, published by the CSIRO and, where relevant, *Australian Standard AS3500.3 Stormwater Drainage.*

These standards and guidelines require that the complete drainage catchment be taken into account, not just the area included in the subdivision or **Development**. **Council** will expect the **Design Engineer** to base the calculated peak flow on the full potential development of the project and the upstream areas for normal flow situations, and to consider the overland flooding caused by pipe blockages, general flooding and high water levels. Staged upgrading of the system can only be undertaken with the approval of **Council**.

Prior to commencing detailed design, the **Design Engineer** should determine the possible ultimate zoning of all external catchment areas contributing to the drainage system within the **Development**. This may require consultation with the **Council's Engineering Department** and **Council's Planning Department**.

16.3 Major and Minor Drainage Systems

Council will expect the **Design Engineer** to adopt the 'major/minor' approach to urban drainage systems as outlined in *Chapter 14* of *Australian Rainfall and Runoff – Flood Analysis and Design 2001*.

The minor system typically comprises a pipeline network with sufficient capacity to collect and convey stormwater flows from nominated design storm events (see Clause 16.7). These pipelines prevent stormwater damage to properties and limit the frequency and quantity of surface water to a level acceptable to the community. The pipelines do not always follow the natural drainage paths and are usually aligned along property boundaries and the roadway kerb and channels.

The major drainage system caters for the runoff from storms of higher intensity than those for which the minor drainage system has been designed. The major drainage system is designed to handle flows resulting from storms with a 1% **AEP**. These flows should follow a designated overland flow path, which will normally be a road reserve if the catchment area is small and/or a drainage reserve when it is impractical for unsafe for a road reserve to carry the excess flows.

Council will expect the finished floor level of buildings to be at least 300mm above the 1% **AEP** flood level.

16.4 Hydrology

Council will expect the **Design Engineer** to prepare a catchment plan showing the total catchment area and sub-areas that form the basis of the design, and to submit this for approval by **Council's Engineering Department**, together with a drainage computations sheet.

Partial areas should be considered when determining peak flow sites, particularly when a catchment contains sub-areas, such as reserves, that may have relatively large time of concentration in conjunction with a small coefficient of runoff. In some instances a partial area design discharge may result in runoff that is less (or the same) than a discharge calculated at some upstream point. Careful checking of the partial area flows may be required to determine the largest flow, which **Council** will expect to be used for the design of the stormwater system downstream of the connection point.

In assessing the major drainage system, the **Design Engineer** should consider using a Unit Hydrograph or Non-Linear Run-Off Routing model. The **Design Engineer** will be responsible for determining the most appropriate methodology for each application. Various drainage tools, programs and construction methods are available to the **Design Engineer** to achieve the objectives of the drainage system. Regardless of the technique or method used, **Council** will expect detailed documentation to be submitted for design approval.

Two separate recognised runoff estimation methods, in addition to the Rational Method, should be used for catchment areas greater than 50 hectares.

16.5 Rainfall Data

Two methods have commonly been used to describe the probability that rainfall or flood events of a defined magnitude will be experienced in the lifetime of a stormwater drainage network. These are the **Annual Exceedance Probability** and the **Average Recurrence Interval**.

Both methods are probabilistic in nature, but that fact can become obscured when the **ARI** is used to set a design event. Many people believe that, once an event with a 100-year **ARI** has occurred, no further event of that magnitude can be expected to occur for 100 years. This is not true, and the real situation is much better captured by describing the event as having a 1% **AEP** in any year. The **AEP** terminology recommended by *Australian Rainfall and Runoff* has therefore been adopted in this manual to describe events with an ARI greater than or equal to one year.

The **AEP** is related to the **ARI** by the equation: $AEP=1-(1/\exp(1/ARI))$ where ARI is in years.

The return interval method can also be misleading for events whose average return interval is less than one year, since seasonality can become important (for example, events may be clustered in a wet season). The **EY** (events per year) terminology recommended by *Australian Rainfall and Runoff* has therefore been adopted to describe such events.

The following table summarises the relationship between the return interval descriptors and those now used within the manual, with **AEP** values rounded to the nearest percentage point.

ARI (years)	AEP	EY
0.25	95%	4
0.50	86%	2
1	63%	1
2	39%	
5	18%	

ARI (years)	AEP	EY
10	10%	
20	5%	
50	2%	
100	1%	

Intensity/Frequency/Duration curves (IFD) are available from the Bureau of Meteorology Website:
http://www.bom.gov.au/cgi-bin/hydro/has/CDIRSWebBasic

Online resources allow curves to be established for any Australian location based on its latitude and longitude.

16.6 Annual Exceedance Probability

Council will expect the design of the minor drainage system to be based on the **AEP**s shown in Table 8:

Table 8 Annual Exceedance Probabilities for Minor Drainage in Urban Areas

Drainage System	Capacity
Urban Residential Areas	18% **AEP**
Commercial centres of 10 shops or less	10% **AEP**
Industrial areas or where surcharge would seriously affect private property	10% **AEP**
Drainage through Private Industrial Property	5% **AEP**
Commercial areas	5% **AEP**

The initial time of concentration from building to property boundary can normally be assumed to be six (6) minutes in urban residential areas. Special consideration may be necessary for other areas and/or circumstances.

Council will expect the **Design Engineer** to identify all overland flow pathways to be activated in 1% **AEP** events, and to demonstrate that these pathways (normally including road reserves in urban areas) have sufficient capacity to convey all excess runoff once the available capacity of the minor drainage system has been fully mobilised. Care should be taken to ensure that any adjacent properties will not suffer adverse consequences from the mobilisation of those paths .These requirements may not be applicable when pipes discharge to retarding basins, as provided for in Clause 18.5.

16.7 Runoff Coefficients

Table 9 specifies the minimum runoff coefficients to be used in the design of drainage systems:

Table 9 Runoff Coefficients

Catchment Type	Runoff Coefficient (applies to all **AEP** for most Councils)	Runoff Coefficient (applies to 18% **AEP** for those Councils listed in Selection Table 16.7)
Low density residential areas – lot areas >2000 m^2 to 4000 m^2	0.40 See notes 1 and 2	0.35
Residential areas – lot areas >1000 m^2 to 2000 m^2	0.50 See notes 1 and 2	0.40
Residential areas – lot areas >600 m^2 to 1,000 m^2	0.70 See notes 1 and 2	0.55
Residential areas – lot areas >450 m^2 to 600 m^2	0.75	0.60
Residential areas – lot areas >300 m^2 to 450m^2	0.80	0.65
Residential areas – lot areas <300 m^2	0.80	0.80
Residential areas (medium density, i.e. Units, including potential unit development sites)	0.90	
Commercial zones	0.90	
Industrial zones	0.90	
Residential road reserves	0.75	
Landscaped areas	0.25	
Public Open Space	0.35	
Paved areas	0.95	

Note 1

The runoff coefficients shown in Table 9 for residential lots greater than 600m^2 in area do not include an allowance for the road reserves within these subdivisions.

Note 2

Where there is a likelihood of further subdivision occurring of allotments in new subdivisions an allowance of 10% should be added to the coefficients to avoid the need for on-site detention to be provided for these further subdivisions.

Note 3

The **Councils** listed in Selection Table 16.7 have differing coefficients of runoff for 18% **AEP** and 1% **AEP**. All other **Councils** use the coefficients listed in the first column of Table 9.

Selection Table 16.7 Differing Coefficients Of Runoff

Councils That Use Differing Coefficients of Runoff for 18% AEP and 1% AEP
Greater Bendigo City Council
Greater Geelong City Council
Horsham Rural City Council
Macedon Ranges Shire Council
Wellington Shire Council
Yarriambiack Shire Council

In all cases the runoff coefficient should be checked against *Australian Rainfall and Runoff – Flood Analysis and Design 2001.* For areas of special use such as schools, community centres, and sporting developments, **Council** will expect the **Design Engineer** to carry out a more detailed study of the characteristics of the area, establish the actual proportions of pervious and impervious areas, and consider the likelihood of soil permeability reducing progressively during prolonged rainfall events, in order to determine appropriate runoff coefficients.

16.8 Hydraulic Design

Council will expect the **Design Engineer** to use hydraulic grade line (HGL) analysis based on appropriate pipe friction and drainage structure head loss coefficients. The HGL should remain more than 150mm below the invert of the kerb for minor flows, and be less than 350mm above the invert of the kerb for major flows.

The HGL in pipes running partially full may be assumed to follow the pipe obvert. However, the velocities within the pipe under such circumstances should be checked.

Pipe designs should reflect appropriate pipe parameters for either the Colebrook – White formula or Manning's formula as shown in Table 10.

Table 10 Pipe Roughness Values

Pipe Material	N	K
Spun precast concrete	0.013	0.6
UPVC	0.009	0.06
Ribbed HDPE/Polypropylene	0.010	0.25

Where **Council** has agreed that other pipe materials may be used, the manufacturer's recommendations should be adopted.

16.8.1 Pipe Velocities

The design pipe velocities should normally be:

- Minimum – pipe running half-full or more – 0.75 m/s
- Minimum – pipe running less than half-full - 1.00 m/s
- Maximum – 5.00 m/s

16.8.2 Minimum Pipe Grades

The preferred minimum grade of a stormwater pipe is listed in Selection Table 16.8.2. **Council** may approve flatter grades where the **Design Engineer** can demonstrate that the velocities will exceed those listed in the headings of the table.

Selection Table 16.8.2 Minimum Pipe Grades

Minimum Grade of Stormwater Pipe to be 1 in 500 subject to a Minimum Velocity of 0.7m/sec	Minimum Grade of Stormwater Pipe to be 1 in 300 subject to a Minimum Velocity of 1.0m/sec
Benalla Rural City Council	Ararat Rural City Council
Campaspe Shire Council	Ballarat City Council
Colac Otway Shire Council	Bass Coast Shire Council
Gannawarra Shire Council	Baw Baw Shire Council
Greater Shepparton City Council	Central Goldfields Shire Council
Horsham Rural City Council	City of Greater Geelong
Mansfield Shire Council	Corangamite Shire Council
Moira Shire Council	East Gippsland Shire Council.
Wellington Shire Council	Glenelg Shire Council
Yarriambiack Shire Council	Golden Plains Shire Council
	Greater Bendigo City Council
	Indigo Shire Council
	Macedon Ranges Shire Council
	Mitchell Shire Council
	Moorabool Shire Council
	Murrindindi Shire Council (minimum grade 1 in 200)

Minimum Grade of Stormwater Pipe to be 1 in 500 subject to a Minimum Velocity of 0.7m/sec	Minimum Grade of Stormwater Pipe to be 1 in 300 subject to a Minimum Velocity of 1.0m/sec
	Pyrenees Shire Council
	Rural City of Wangaratta
	South Gippsland Shire Council
	Southern Grampians Shire Council
	Strathbogie Shire Council
	Surf Coast Shire Council
	Swan Hill Rural City Council
	Towong Shire Council
	Warrnambool City Council
	Wodonga City Council

16.8.3 Minimum Pipe Cover

The minimum cover should be in accordance with the manufacturer's recommendations. Additional cover should be provided wherever crossings with large sized services are anticipated, and pipe classes should be determined having regard to the proposed cover.

When an external area contributes to the system, the drain should be located at a depth sufficient to serve the total upstream area.

The **Design Engineer** should discuss any proposed exceptions to the minimum cover requirements with **Council's Engineering Department** prior to submitting documents for approval of the functional layout.

16.8.4 Curved Pipelines

Curved pipelines are permitted only where they are of constant radius in the horizontal plane only, and are in accordance with the pipe manufacturer's specifications.

16.8.5 Pipe Alignments at Pits

The following considerations apply to the alignment of pipes at pits:

- Generally, when designing the pipe system under pressure, the pipe obverts should coincide at junctions, but in flat terrain, the inverts may coincide.
- Where practical, the pipes at junctions should be aligned so that the projected area of the upstream pipe is wholly contained within the downstream pipe.

Generally, side entry pits should be spaced so that the pits are able to deliver the design flows into the pipes. **Council** will expect the **Design Engineer** to consult inlet capacity charts or undertake specific design where any doubt exists that this criterion can be satisfied.

16.8.6 Pit Losses

Pit losses can be calculated on the basis of:

$$K \frac{V_O^2}{2g}$$ Where Vo is the outlet velocity calculated from $$\frac{Q_O}{A_O}$$

where K is a head loss coefficient.

Values of K for various pit configurations are given in Austroads *Road Design Guidelines - Part 5 General and Hydrology Considerations* and any VicRoads Supplement to those guidelines.

16.8.7 Pit Locations

Generally side entry pits should be spaced so that the length of flow in channels does not exceed 80 metres.

Channel flow approaching an intersection is to be collected before the tangent point, unless the **Design Engineer** can demonstrate that adequate capacity is available in the kerb and channel to carry water around the return.

Side Entry Pits should be clear of radials, kerb crossings and driveways.

Double side entry pits should be used where approach grades to intersections are in excess of 6% and at all low points in roads, unless the **Design Engineer** can satisfy **Council's Engineering Department** that a single side entry pit will provide sufficient inlet capacity for the pipes to operate at their required capacity.

In all cases, the **Design Engineer** should give careful consideration to pit location and pit inlet capacities.

16.9 Main Drains

Pipes of ∅750mm or greater should be designed as main drains, and large direction changes through standard pits should be avoided. Consideration should be given to using special manholes, or introducing additional pits and/or bends at significant changes of direction.

The **Design Engineer** should discuss the design criteria for main drains with **Council's Engineering Department** at the earliest possible stage in the design process.

16.10 Pipes

16.10.1 Pipe Type

Reinforced Concrete Pipes

Reinforced concrete pipes with spigot-and-socket profile and rubber ring joints, manufactured to meet the requirements of AS/NZS 4058-2007 Precast concrete pipe (pressure and non-pressure), and designed and installed in accordance with Clause 16.10.3, are approved for use by all Councils. Flush-jointed reinforced concrete pipes with external bands, manufactured, designed and installed to the above standards may be used for culverts and other specific applications, subject to the prior approval of **Council's Engineering Department**.

Ribbed Polypropylene or High-Density Polyethylene Stormwater Pipes

Ribbed polypropylene or high-density polyethylene stormwater pipes, designed and installed in compliance with Clause 16.10.3, may be used as an alternative to reinforced concrete pipes where a Council has indicated its approval for such use in Selection Table 16.10.1 Ribbed Polypropylene or High Density Polyethylene Stormwater Pipes.

Selection Table 16.10.1 Ribbed Polypropylene or High Density Polyethylene Stormwater Pipes

Approved for use	Approved for use except under road pavements
Baw Baw Shire Council	Ballarat City Council

Approved for use	Approved for use except under road pavements
East Gippsland Shire Council	Baw Baw Shire Council
Greater Geelong City Council	Campaspe Shire Council
Surf Coast Shire Council	Colac Otway Shire Council
Wangaratta Rural City Council	Glenelg Shire Council
Warrnambool City Council	Golden Plains Shire Council
	Greater Bendigo City Council
	Greater Bendigo City Council
	Horsham Rural City Council
	Indigo Shire Council
	Macedon Ranges Shire Council
	Murrundindi Shire Council
	Wellington Shire Council
	Yarriambiack Shire Council

Other Profiles and/or Materials

Prior approval in writing from **Council's Engineering Department** is required for all other pipe profiles and/or materials. These include ribbed polypropylene or high density polyethylene stormwater pipes for those Councils not listed in Selection Table 16 Ribbed Polypropylene or High Density Polyethylene Stormwater Pipes.

Council will expect any application for the approval of other profiles and/or materials to include:

- details of any Australian or overseas Standards covering the design and installation of the pipeline;
- the manufacturer's recommendations for type, class , loading, cover, and installation procedures;
- details of where, by whom, and for what purposes similar pipes have previously been approved;
- details of testing and inspection proposed to be undertaken; and
- other details as required by the Council

16.10.2 Pipe Diameters

The minimum pipe diameter is generally 100mm UPVC for property inlets serving a single dwelling and 150mm UPVC for property inlets serving two dwellings. **Councils** may require larger diameter property inlets where the runoff being generated from the property so dictates.

Pipes that are or will become **Council** assets, and are not required to convey runoff from a road or street, should have a minimum diameter of 225mm. Pipes that that are or will become Council assets, and do convey runoff from a road or street, should have a minimum diameter of 375mm, to reduce the risk of blockage.

The **Design Engineer** may apply in writing to **Council's Engineering Department** for approval to vary the above minimum sizes. Such applications should be accompanied by computations to show that the required minimum flow velocities have been achieved, and the pipe capacities are adequate for the intended purpose. The application should explain how blockages are to be avoided when the pipes in question are required to convey runoff from a road or street.

16.10.3 Standards for the Design and Installation of Pipes

16.10.3.1 General

Council will only accept pipes which have been manufactured designed and installed according to the relevant Australian Standards. When selecting the type and class of pipe to be used, due regard should be had to the external loading, the pipe characteristics and the construction techniques to be used. The pipe embedment materials and procedures should comply with any specific recommendations published by the pipe manufacturer, and all relevant controls should be applied to plant and compaction techniques when required for a particular type and class of pipe.

Where live loads become a significant factor, particularly for pipes under roads or otherwise likely to be subject to regular heavy traffic loads, **Council** will expect the **Design Engineer** explicitly to consider these loads in selecting the type and class of pipe to be specified.

Where any departures from these provisions are proposed, **Council** will expect the **Design Engineer** to seek approval for those departures at the earliest possible stage in the design process, and to provide detailed justification for their proposals.

16.10.3.2 Reinforced Concrete Pipes

Reinforced concrete pipes, as specified in Clause 16.10.1, should be designed and installed in accordance with AS/NZS 3725-2007 Design for the installation of buried concrete pipes and with the guidelines published by the Concrete Pipe Association of Australasia at: http://www.cpaa.asn.au/General/technical-publications.html.

16.10.3.3 Ribbed Polypropylene or High Density Polyethylene Stormwater Pipes

Ribbed Polypropylene or High Density Polyethylene Stormwater Pipes, as specified in Clause 16.10.1, should:

- be designed to comply with AS/NZS 2566.1-1998 Buried Flexible Pipes – Structural Design;
- be installed as required by AS/NZS 2566.2-2002 Buried Flexible Pipes – Installation;
- comply fully with any additional technical recommendations provided by the manufacturer;
- when installed behind mountable or semi-mountable kerb, have a cover of at least 750mm;
- when installed in easements subject to occasional traffic, have a cover of at least 600mm; and
- when installed within a Bushfire Management Overlay, have a cover of at least 450mm.

16.11 Structures

16.11.1 Drainage Structures

Council will expect drainage structures to comply with the applicable standard drawings. Where modifications are required or special structures are to be constructed or installed, the **Design Engineer** should submit full details with the detailed design documentation. Normal good practice should be observed in determining the pit layouts, and shallow intersection angles between drainage lines at pits will not be permitted.

Murrindindi Shire Council requires floors of pits shown in the Standard Drawings in **Appendix F: Standard Drawings** to be shaped to suit the pipe radius and change of pipe lower inverts, unless otherwise approved by the **Council**.

Junction pits at the back of kerb within intersections should be avoided wherever possible.

16.11.2 Minimum Drops at Pits

Minimum drops at pits are required to provide sufficient slope along the pit inverts to clear debris, and to provide tolerance in setting pipe invert levels. Generally the minimum drop through pits is 20mm. However, in circumstances where changes in direction occur, a number of pipes enter the one pit, large inlet and outlet velocity differences exist or grated or side-entry pits are used, hydraulic losses become significant and should be carefully considered in the analysis and design of the network.

16.11.3 Maximum Drops at Pits

Where drop pits are proposed, with a level difference greater than 2m between any incoming pipe and the pit outlet, **Council** will expect the **Design Engineer** to design the pits in accordance with the Austroads *Road Design Guidelines - Part 5 – General and Hydrology Considerations* and any VicRoads Supplement to those guidelines.

16.11.4 Side Entry Pits and Grated Pits

Pit functions and capacities should be in accordance with Austroads *Road Design Guidelines - Part 5A Drainage – Road Surfaces, Networks, Basins and Subsurface* and any VicRoads Supplement to those guidelines. Unless otherwise agreed by **Council**, pit construction or installation should be in accordance with the relevant Standard Drawings, and with the manufacturer's recommendations where appropriate.

Prefabricated pits may be used subject to approval by **Council's Engineering Department**. Technical details including material, specification, dimensions, product data sheet, any advantages or disadvantages and the location should be submitted prior to approval. **Council's Engineering Department** may require that a certificate be provided by a **Qualified Engineer** to confirm the structural integrity of the pits in the proposed application.

16.11.5 Pit Covers

Pit covers should have a clear opening of sufficient dimension and orientation to comply with OH&S and confined space entry requirements. Heavy duty lids or plastic lock-down lids may be required in high risk areas such as Public Open Spaces, recreation reserves, school areas etc. Elsewhere, covers should be installed with class rating in accordance with potential traffic loadings.

Trafficable gatic, or approved equivalent, load bearing covers should be provided on all side entry pits located in exposed kerb areas, e.g. at intersections, and on all pits located in industrial **Developments**. The drainage network should be designed to locate pits away from exposed kerb areas wherever possible

16.12 Litter Collection Pits

Council will expect the Design Engineer to provide approved litter collection pits towards the end of any drainage line that discharges to a watercourse and/or drainage basin, located so that comfortable access by maintenance vehicles is achieved. Where the pit is located in a road reserve, drainage reserve or other area with public access, vehicle travel should be in a forward-only direction.

For design purposes, the default period for the cleaning of litter collection pits should be assumed to be 6 months.

16.13 Outfall Structures and Energy Dissipators

Council will expect outfall structures or discharge points for floodways at receiving waters to be designed in accordance with the requirements of the responsible authorities for the relevant land and receiving waters. Energy dissipaters for pipes should normally be of the impact type.

16.14 Pump Stations

Small pumped systems, serving catchments up to 2,000m^2 in area in cases where stormwater cannot be conveyed by gravity to a legal point of discharge, may be designed to comply with Section 9 of AS/NZS 3500.3. With that exception, Council will expect all pumped systems to be designed by a **Qualified Engineer**, having regard to the principles that all pump stations should be:

- constructed above the 1% AEP flood level;
- screened so as to minimise the likelihood of blockage by sediment and debris;
- configured so that failure of a single pump will not result in failure of the system;
- provided with sufficient storage capacity to accommodate power supply outages;
- capable of being quickly and effectively isolated from the drainage network;
- designed so that all major components can readily be removed and replaced;
- designed so that emergency power supplies can readily be connected;
- equipped with suitable telemetry, including warning and remote control systems; and
- supplied with detailed operation and maintenance manuals.

Further guidance can be found in *Hydraulic Engineering Circulars 22 (Urban Drainage Design)* and *24 (Stormwater Pump Station Design)* published by the US Department of Transportation. A typical specification for a conventional stormwater pump station appears at Appendix "X".

16.15 Subsoil Drainage

Council will expect the **Design Engineer** to provide appropriate sub-surface drainage where groundwater or overland flows may adversely affect the performance of areas set aside as Public Open Space or Reserves. All sub-surface drainage should be installed in accordance with Section 702 of the *Vic Roads Standard Specifications for Road Works and Bridge Works* and include flushing points at the remote end from the outlet pit.

The desirable minimum grade for sub-surface drainage for pavements is 1: 250 with an absolute minimum of 1:300.

Typically, circular 100mm rigid wall or flexible UPVC Class 1000 slotted pipe, including geotextile sock where required, is installed under each concrete pavement edging to a minimum depth of subgrade level.

Council will expect the **Design Engineer** to submit details of all sub-surface drainage to be used in the **Development** to **Council's Engineering Department** for approval.

16.16 Property Drains

In a green-fields development, no property drainage may discharge to kerb and channel without the written approval of **Council's Engineering Department**. Connection should be made directly to a stormwater pit unless there is an existing pipe in the road reserve adjoining the property to which the property drain can be connected using a standard 'jump up' as shown in the **Council's** Standard Drawings. Where these requirements cannot be met but there is an existing barrier kerb, then the connection may be made to the barrier kerb.

In in-fill urban residential and commercial **Developments** where connection to underground drains is impractical, two (2) kerb adaptors per 20m of frontage should be provided at the time of development. Unless otherwise agreed by Council, kerb adaptors should be located clear of all driveway crossings and at least 1m from kerb crossings.

Generally galvanised steel or UPVC adaptors are approved for use unless there is a specific **Council** requirement as detailed in Selection Table 16.16.

Selection Table 16.16 Kerb Adaptors

Galvanised Steel Kerb Adaptors	UPVC Kerb Adaptors
Baw Baw Shire Council	Bass Coast Shire Council
Campaspe Shire Council	Ballarat City Council
Colac Otway Shire Council	City of Greater Bendigo
Glenelg Shire Council	Wellington Shire Council
Golden Plains Shire Council	Yarriambiack Shire Council
Horsham Rural City Council	
Macedon Ranges Shire Council	
Mildura Rural City Council	Mildura Rural City Council
Mount Alexander Shire Council	
Surf Coast Shire Council	
Swan Hill Rural City Council	

Council will expect the **Design Engineer** to provide easement drains to all allotments that fall to the rear, and to ensure that such drains are deep enough to serve the entire allotment. A property inlet, as per **Council's** Standard Drawings, should normally be constructed at the low corner of each allotment. The minimum fall towards the underground drainage outlet along the low side of allotments should be 1:200.

16.17 Major Drainage Requirements

Council will expect the **Design Engineer** to ensure that the major drainage system has sufficient capacity to collect the excess runoff from a catchment in a 1% **AEP** rainfall event once the available capacity of the minor drainage system has been fully mobilised, and to convey that runoff to the receiving waters with minimal nuisance, danger or damage. The major drainage system should be so designed and constructed as to ensure a reasonable level of safety and access for pedestrian and vehicular traffic, limit flooding of private and public property and minimise the inflow of pollutants to the receiving waters. The design of major drainage systems should take into account the potential use of wetlands, gross pollutant traps and sediment interception ponds, particularly immediately downstream of urban areas.

Major drainage in railway reserves should be limited to cross track drainage rather than longitudinal drainage. **Council** will expect the **Design Engineer** to obtain approval from the relevant authority for all **Infrastructure** proposed to be located in railway reserves before seeking detailed design approval from **Council's Engineering Department**. The **Developer**

will be required to pay all associated costs for such drainage works, including the licence fees (for a period of at least 10 years) specified by the relevant authority.

The normal minimum requirements of the major drainage system are as follows:

- **Council** will expect the design of major drainage systems to be based on the critical 1% **AEP** storm with some consideration being given to the impact of a rarer storm event. Best practice requires that the critical storm be determined by routing storms of varying duration until the peak flows are identified. **Council** will expect two recognised flow estimation methods (runoff routing computer models) in addition to the Rational Method to be used for comparative purposes when urban catchments or sub-catchments are greater than 50 Ha in area.

- Hydraulic Grade Line analysis should be used for the design of floodways, low-flow pipes and retarding basins. **Council** will expect the **Design Engineer** to demonstrate that the dimensions of major floodways are sufficient both to meet hydraulic requirements and to facilitate maintenance (including mowing), and that street drainage in urban areas will not be directed into easement drains.

- The depth of overland flows in urban areas should be controlled by freeboard to properties or by the upper limits of surface flow depth/velocity consistent with public safety, as detailed in Austroads *Road Design Guidelines Part 5A Drainage – Road Surfaces, Networks, Basins and Subsurface* and any VicRoads supplement to those guidelines.

16.18 Floodways

Major floodways generally comprise engineered open waterways, and often involve roadways, trapezoidal channels and sometimes sheet flow through open spaces. Major floodways are generally located within road reserves, drainage reserves or Public Open Space. **Council** will not accept major floodways through easements on private land in urban situations, and will expect the computed peak discharge to be contained entirely within reserves.

Where a **Development** will have a significant impact on overland flows or flood-storage, **Council** will expect the **Design Engineer** to design and construct appropriate compensatory works.

Where active floodways are present **Council** will not approve development without hydraulic modelling and analysis. The **Design Engineer** may also be requested to submit a risk assessment report including details of the measures proposed to be taken to ensure that the potential for loss of life, risk to health and damage to property is minimised, and flood conveyance or storage accommodated.

Council will expect hydraulic modelling to be undertaken by a suitably qualified person or organisation, to identify works that will ensure that adjacent landholders are not detrimentally affected, and to identify the extent, velocities and depth of overland flood flows through the development and downstream.

Council will generally view alteration to existing wetlands as a last resort, to be considered only after all other options have been reviewed and found wanting. The function of a floodplain is to convey and store flood water and preserve the inherent values of wetlands.

The minimum requirements that apply to design and treatment of floodways, and open unlined drains, are as follows:

- The depth of floodways should be kept to a minimum (generally less than 1.2m).
- The desirable maximum batter slope is 1:8; the absolute maximum slope is 1:5.
- The desirable minimum cross-fall for inverts is 1:40, and the minimum bed width 2.5m.
- The maximum permissible longitudinal grades for major floodways will be governed by the need to minimise flow velocities in order to avoid scour and secure public safety.

- The desirable minimum longitudinal grade for major floodways is 1:200 to minimise the likelihood of ponding and siltation. The absolute minimum grade is 1:300.
- Flexible structures, utilising rock gabions, rock mattresses and geotextile fabric are preferred for grade control structures, minor energy dissipaters and major erosion/scour protection measures.
- Floodways utilising a low-flow pipeline should be sized to convey the entire 1% **AEP** design flow based on the assumption that the low-flow pipeline is fully blocked during major storms. Low-flow pipes should be designed in accordance with the following:
    - The desirable minimum cover for low-flow pipes is 450mm and the absolute minimum cover is 350mm. Appropriate pipe classes should be adopted with due consideration being given to construction and maintenance loads.
    - Low-flow pipes providing outlet drainage for retarding basins should be designed with invert levels of adequate depth to command the pipes located within the basin.
    - Low-flow pipes should be designed to convey the runoff associated with a 95% AEP rainfall event.
    - The minimum grade of low-flow pipes should be sufficient to generate self-cleansing velocities.
    - The minimum size of low-flow pipes should be ∅375mm.
    - The maximum spacing of pits on straight sections of low-flow pipes should be 80m.
    - Low-flow pipelines, including pits and other structures, should be designed to minimise hydraulic losses unless there is a specific need to incorporate energy dissipaters such as drop pits.
- Major floodways that cannot accommodate a low-flow pipeline due to flat longitudinal grades or level constraints should have a low-flow invert or trickle-flow channel. Subsurface drainage should be provided where feasible.
- Pipes discharging into major floodways should be connected to the low-flow pipeline, with surcharge pits being provided as necessary.

16.19 Drainage Reserves

Drainage reserves incorporated into **Developments** should be at least 10m wide. Reserve widths should be sufficient to accommodate a drain able to convey the runoff associated with a 1% **AEP** rainfall event. All-weather access tracks may be required on both sides of the drains where batter slopes exceed 1:8. Pump stations, electrical supplies, and water-quality treatment **Infrastructure** should be sited so as to provide sufficient room for construction and maintenance vehicle to turn at an appropriate location, refer to Clause 18.4.8.

Wherever possible drainage reserves should be sited to abut Public Open Space, but will only contribute to the provision of Public Open Space in accordance with requirements of Clause 18.2. **Council** will expect the **Design Engineer** to consider increasing the reserve width for conservation and landscaping purposes.

Where drainage **Infrastructure** within the drainage reserve does not comply with the standards for public access, the reserve should be fenced to prohibit public access. **Council** will expect the **Design Engineer** to submit a landscaping plan and fencing details for approval, with all fencing and landscaping being completed at the full cost of the **Developer**.

16.20 Building Over Council Drainage Easements

Consent from **Council** is required to construct a building/structure over a **Council** drain.

16.21 Urban Drainage Easements

In urban areas, easements for drainage only should be at least 2m wide. Easements intended to accommodate drainage and sewerage should be at least 3m wide. Where practicable, easements should be matched and aligned with those

existing on adjacent properties to provide continuity for utility services and to ensure that the proposed use for which the easement is created can be achieved.

Clause 17 Rural Drainage

17.1 Objectives

The general objectives of rural drainage are to:

- collect and control all stormwater generated in or transferred through the **Development** or subdivision and ensure that it is discharged from the site without detriment to any upstream or downstream property;
- ensure that any **Developments** or subdivisions that would otherwise increase the rate and quantity of stormwater runoff retard outflows to rural runoff rates where applicable;
- provide an effective outlet to an approved outfall;
- ensure that culverts and waterways are designed so the safe passage of vehicles is maintained at all times;
- restrict stormwater flows to natural drainage lines and avoid crossing drainage catchment boundaries;
- comply with the objectives and requirements of any relevant Floodplain Authority;
- ensure that there are no detrimental effects on:
    - the environment generally;
    - surface and subsurface water quality;
    - groundwater infiltration characteristics;
    - adjoining landowners and other landowners in the vicinity of the drainage outlet; and
    - water-courses either upstream or downstream of the **Development** or subdivision.

17.2 General

Council will expect the **Design Engineer** to consider the complete drainage catchment, not just the area included in any individual **Development** or subdivision and to comply with the provisions of the Austroads *Road Design Guidelines Part 5 Drainage – General and Hydrology Considerations* and any VicRoads Supplement to those guidelines.

The **Design Engineer** should therefore take into account upstream developments, overland flow paths, natural drainage lines, the possible removal of unnatural drainage obstructions, the depth of flooding that may occur on roads and private property and other factors which may impact on or be affected by the design of any rural drainage system.

The **Design Engineer** will be responsible for ensuring that their design complies with the requirements of s16 of the Water Act 1989 and s199 of the Local Government Act 1989. In particular, under S16 of the Water Act 1989, **Council** is considered a landowner/manager of local roads. The construction and maintenance of such roads must not cause water to flow from the road reserve in an unreasonable manner or prevent the natural flow of water across or along a local road reserve from occurring in a reasonable manner. In addition, under S199 of the Local Government Act 1989, **Council** must give notice of its intention to divert or concentrate the drainage flowing onto a road or discharge it or permit it to flow onto, into or through any land. Any persons may make a submission to **Council** under section 223 of the Act. In practice this means that **Council** must give notice of its intention before any new culverts are placed under a road.

17.3 Requirements

Council will expect the **Design Engineer** to base stormwater runoff estimation for rural catchments (undeveloped areas) on the hydrological methods and data contained within the latest issue of Austroads *Road Design Guidelines Part 5 Drainage – General and Hydrology Considerations* and any VicRoads Supplement to those guidelines, unless otherwise provided within this **Manual**.

These guidelines specify that two recognised flow estimation methods (runoff routing computer models) should be used for comparative purposes when dealing with rural farming catchments or sub-catchments greater than 50ha in area.

17.4 Minor Drainage

In addition to the relevant sections of Clause 16.3, minor drainage systems in rural living, low density and rural areas should comply with the following guidelines:

- The minimum pipe size for road cross-culverts should be ∅375mm to facilitate maintenance.
- The minimum slope of earth drains should be as listed in Selection Table 17.4:

Selection Table 17.4 Minimum Slope of Earth Drains

Minimum Slope of Earth Drain 1 in 2000	Minimum Slope of Earth Drain 1 in 500
Benalla Rural City Council	Ararat Rural City Council
Campaspe Shire Council	Ballarat City Council
Gannawarra Shire Council	Bass Coast Shire Council
Greater Shepparton City Council	Baw Baw Shire Council
Horsham Rural City Council	Central Goldfields Shire Council
Mildura Rural City Council	City of Greater Geelong
Swan Hill Rural City Council	Colac Otway Shire Council
Yarriambiack Shire Council	East Gippsland Shire Council
	Glenelg Shire Council
	Golden Plains Shire Council
	Greater Bendigo City Council
	Indigo Shire Council
	Macedon Ranges Shire Council
	Mansfield Shire Council
	Mitchell Shire Council
	Moorabool Shire Council
	Mount Alexander Shire Council
	Murrindindi Shire Council
	Pyrenees Shire Council
	Rural City of Wangaratta
	South Gippsland Shire Council
	Strathbogie Shire Council
	Surf Coast Shire Council
	Towong Shire Council
	Warrnambool City Council
	Wellington Shire Council
	Wodonga City Council

- Unless otherwise agreed by **Council**, the minimum bed width of the drain should be 1m.
- The desirable maximum batter slope of earth drains within the **Clear Zone** is 1:6, with the absolute maximum slope being 1:4. Where the drain is located outside the **Clear Zone** the maximum batter slope is 1:1.5.
- **Council** will expect driveable end-walls complying with VicRoads Standard Drawing SD1991 to be provided for all culverts that are parallel to the traffic flow and located within the **Clear Zone**.
- Where possible, cross-culverts should be extended to terminate outside of the **Clear Zone**. **Council** will expect end-walls complying with the relevant VicRoads standard drawings to be provided for cross-culverts terminating within the **Clear Zone**.
- The discharge of any roadside table drain into a Drainage Authority drain requires approval from that Authority and the structure should be constructed in accordance with their requirements.
- Section 199 of *Local Government Act 1989* requires **Council** to give notice to all affected landowners for any drainage works that will divert or concentrate drainage waters.

Unless otherwise agreed by **Council,** property connections in low density residential **Developments** should discharge through the side of the end-wall and not directly into the table drain. **Council** will expect the Design Engineers to design culverts to accommodate peak runoff associated with the following rainfall events:

Table 11 Annual Exceedance Probabilities For Rural Drainage

Drainage System	Capacity
Rural road culverts	10% **AEP**
Major rural culverts	1% **AEP**

Council will expect the **Design Engineer** to ensure that flows exceeding the capacity of a culvert are so conveyed as to avoid flooding by, for example, incorporating a floodway with the culvert installation.

17.5 Major Drainage

Council will expect the **Design Engineer** to demonstrate that the major drainage system will collect all runoff from a catchment during a major storm, in excess of any residual capacity of the minor drainage system, and convey this runoff to the receiving waters with minimal nuisance, danger or damage. The major drainage system should be designed and constructed to ensure a reasonable level of vehicular traffic safety and accessibility, limit flooding of private and public property and minimise pollutant inflows to receiving waters.

The **Design Engineer** should consider incorporating wetlands, gross pollutant traps and/or sediment interception ponds within the major drainage system.

Major drainage within railway reserves should be limited to cross track drainage rather than longitudinal drainage and Council will expect the **Design Engineer** to obtain approval from the relevant authority for all such **Infrastructure** before seeking detailed design approval from **Council's Engineering Department.** The **Developer** will be responsible for meeting all the associated costs for such drainage works including licence fees (for a period of 10 years) specified by the relevant authority.

Where no practicable options are available, **Council** will consider proposals for major floodways through easements in private land in rural living **Developments**.

The minimum requirements of the major drainage system in rural areas are as follows:

- The design of major drainage systems should be based on the critical 1% **AEP** storm with some consideration given to the impact of less probable storm events. The critical storm should be determined by routing storms of varying duration until the peak flows are identified.
- Hydraulic Grade Line analysis should be used for the design of floodways, low-flow pipes and retarding basins. The dimensions of major floodways should be sufficient both to meet hydraulic requirements and to facilitate maintenance (including mowing).
- The depth of overland flows should be controlled so as to maintain public safety and avoid damage to properties, based on the criteria in Austroads *Road Design Guidelines Part 5 – General and Hydrology Considerations* and any VicRoads Supplement to those guidelines.
- Road drainage in Low Density Residential and Rural Living areas may be directed into easement drains.
- The normal minimum width of easements for open drains in rural areas is 5m.

Clause 18 Retardation Basins

18.1 Objectives

- To protect the public from injury or death, and reduce flood damage to property and **Infrastructure**, by storing excess runoff during extreme rainfall events and releasing the stored water over time in a controlled manner.
- To ensure that standalone retardation basins drain completely within a reasonable time after each rainfall event.
- To ensure that, wherever practicable, retardation basins are designed and constructed so that the area can also be used for passive or active recreation, or for other public purposes, such as car-parking.
- To protect existing stormwater drainage assets from being overloaded as a result of new **Developments**.
- To incorporate water quality treatment based on **WSUD** principles into retardation basin design.
- To limit the number of retardation basins serving an area, and reduce future maintenance expenditure.
- To standardise the type and operation of pumping systems and outfalls associated with retardation basins.
- To ensure that retardation basins are so designed and constructed as to:
    - be aesthetically pleasing;
    - have regard to the area in which they will be located; and
    - avoid any adverse impact on amenity in the surrounding areas.

18.2 The Use of Drainage Basins for Public Open Space Purposes

Developers and **Design Engineers** will be responsible for complying with the requirements of clause 56.05-2 of the relevant planning scheme and, in particular, Standard C13. The provision of Public Open Space should include:

- Active open space of at least 8 hectares in area within 1km of 95% of all dwellings that is:
    - Suitably dimensioned and designed to accommodate the intended uses, including buffer areas around sporting fields and passive open space.
    - Able to incorporate two football/cricket ovals.
    - Appropriate for the intended use in terms of quality and orientation.
    - Located on flat land (or land which can be cost-effectively graded).
    - Located with access to, or making provision for, a recycled or sustainable water supply.
    - Where practical, adjacent to schools and other community facilities.
    - Designed to achieve sharing of space between sports.
- Linear parks and trails along waterways, vegetation corridors and road reserves within 1km of 95 % of all dwellings

- Local parks within 400m safe walking distance of at least 95% of all dwellings. Where not designed to include active open space, local parks should be generally 1ha in area and be suitably dimensioned and designed to provide for their intended use and to allow easy adaptation in response to changing community preferences

In order to be accepted as Public Open Space, the relevant portion of any proposed retardation basin should, in addition to satisfying the above conditions:

- be at least 10m wide; and
- facilitate the construction of shared walkways; and
- have a cross-fall within a 10m wide corridor around any path; and
- be linked to other public open space being provided in the area; and
- not be inundated during any event up to and including a 18% **AEP** event; and
- unless otherwise agreed by **Council**, not be inundated during a 1% **AEP** event.

18.3 General

Council will expect the detailed design and documentation of retardation basins and associated facilities to be carried out by a **Qualified Engineer**, and to be consistent with the requirements of **Council**, the local Catchment Management Authority (CMA) and Local Irrigation and Drainage Authority. In particular, **Council** will expect retardation basins with an outfall to relevant authority drains to be designed for a 1% **AEP** event of 24 hours duration, with a no-outfall condition, and with the maximum discharge rate to the drainage system limited to 1.2 litres/sec/ha.

Council will expect the **ODP** to show how any required stormwater retardation or detention systems will be integrated into the drainage system, and to confirm that the proposed location is in accordance with an approved **ODP** or **Relevant Council Strategy** or **Stormwater Management Plan**. Where an **ODP** has not been prepared and approved for the subject land, **Council** will expect the **Developer** to apply for approval for the siting of retarding basins, and to support the application with appropriate technical information. Drainage catchment boundaries may be increased if written approval is obtained from the relevant drainage authority.

Council will only accept responsibility for maintaining existing or proposed stormwater retardation basins when the land set aside to accommodate the basins and associated access routes and equipment appears on a Plan of Subdivision as a Municipal Reserve for drainage purposes, vested in the **Council**.

Where retardation basins will not be maintained by **Council,** and are located on land that is common property, **Council** will require that a Section 173 Agreement be placed on each benefiting allotment to ensure that **Council** drainage is not compromised by any act, or failure to act, by the body corporate.

When a retardation basin is required for any development, the basin and any overland flow paths should be constructed as part of the first stage of the works. Where the **Design Engineer** considers that the retardation basin is not required to service that stage, they will be expected to submit plans, computations, and approvals from the relevant authorities to **Council's Engineering Department**, in order to demonstrate that satisfactory alternative provisions can be made for storage and outfall.

18.4 Retardation Basin Design Requirements

18.4.1 Location

Retardation basins cannot be located in areas zoned as Urban Floodway Zone, or on land affected by a Flood Overlay. Locating basins within an area affected by a Land Subject to Inundation Overlay will require specific prior approval from **Council** and all other relevant authorities.

Retardation basins may need to be protected from unrelated overland flows entering the basin and therefore, apart from the above limitations, should not be located in an area designated on the floodplain maps maintained by the Department of Environment, Land and Planning as an active floodway. Council will expect appropriate works to be carried out to minimise erosion and maintenance resulting from overland flows entering the basin.

The location of retardation basins should have regard to:

- The physical dimensions required for storage.
- Access for maintenance to the bed and batters.
- Pre-development catchments.
- Existing developed catchments.
- Existing drainage including piped, swale drains, or flow paths.
- Existing and proposed drainage easements.
- Ground water depth and seasonal fluctuations.
- Subsoil characteristics.
- Location and point of discharge.
- Soil type and seepage rate.
- Land uses and zoning.
- Effect of overland flows external to the catchment.
- Potential risk or effect on people, fauna and flora.
- Amenity of the area.
- Benefiting landholder issues.
- Provision of a suitable discharge method based on:
    - Pump station and related equipment situated in public view and/or with appropriate telemetry.
    - Gravity.
    - A combination of gravity and a pumped outfall.
- Availability of mains electricity, and provision for emergency power supply.
- Maintenance issues and all weather access.
- Water quality.
- Whether or not the retarding basin is proposed to be used or included in the calculation for Public Open Space.
- The location of overland flows into the basin and the treatment(s) to minimise erosion.
- Inlet velocity and the need to install energy dissipation structures.
- 1% flood level or highest recorded flood level information.

18.4.2 Design Criteria

Unless otherwise agreed by **Council** and other relevant authorities, retarding basins should be designed for the critical 1% **AEP** storm. Retarding basins with established areas downstream, and with no secure and safe overland flow paths, should be designed for the critical 1% **AEP** storm with consideration being given to less probable storm events.

Where the **Design Engineer** can demonstrate that a 1% **AEP** storm event will be irrelevant due to cross-catchment storm flows and overland flows swamping the catchment and/or the basin, a design based on a more probable storm event and with reduced storage capacity may be considered by **Council**.

Council will expect the **Design Engineer** to demonstrate that the minimum freeboard in a 1% **AEP** event, under no-outfall conditions, will be 300mm for earth structures and 200mm for hard structures, and that the peak basin water level will not exceed the lowest kerb invert level in the catchment area. In addition, **Council** will expect the **Design Engineer** to demonstrate that:

- the top water level in the retarding basin resulting from the minor drainage storm event as detailed in Table 11 will be no higher than the invert of the lowest inlet pipe discharging into the basin; and
- the overland flow path for a major storm has been designed on the basis that the inlet pipe is blocked; and
- storage in pits and pipes within the minor system has not been included in storage volume calculations.

18.4.3 Inlet Structures

Any inlet to a basin should have an approved inlet drainage structure and may have a low-flow pipe, where practicable, connected to the pump station, and capable of a flow (not under head) equal to the maximum pump discharge rate. The inlet pipe should be fitted with a headwall and an approved structure that will allow debris to escape and impede the entry of children. All headwalls should have an approved post and rail barrier to prevent falls and to identify their location.

18.4.4 Low-Flow Pipes

Retardation basins should incorporate a low-flow pipe system with a minimum pipe diameter of 300mm. The low-flow pipe system should be designed to match the outflow capacity when this is less than a 18% **AEP** storm event.

18.4.5 Overflow Systems

Council will expect an overflow system to be provided to cater for less probable storm events than the 1% **AEP** event for which the basin will normally be designed. The overflow system should provide for blockages, and should direct all excess stormwater flows away from buildings, adjoining properties and associated **Infrastructure**.

Council will expect the **Design Engineer** to demonstrate that the minimum depth of overland flow is at least 300mm below the lowest finished floor level of any dwelling impacted by the overflow.

18.4.6 Depth of Retardation Basins

Significant areas of municipalities listed in Selection Table 18.4.6 are subject to shallow ground water tables and as a result it is desirable that all excavations are limited to 0.5m above the water table. Groundwater may be able to be extracted and used, subject to the requirements of the relevant authority.

Selection Table 18.4.6 Shallow Groundwater Tables

Municipalities Affected by Shallow Groundwater Tables
Bass Coast Shire Council
Campaspe Shire Council
East Gippsland Shire Council
Gannawarra Shire Council
Glenelg Shire Council
Greater Shepparton City Council

Municipalities Affected by Shallow Groundwater Tables
Horsham Rural City Council
Warrnambool City Council
Wellington Shire Council

Retardation basins may require an impervious lining, or other treatment approved by **Council,** to prevent the ingress of groundwater. **Council** will expect any structure penetrating the groundwater zone, including foundations and drainage lines, to be appropriately treated to prevent possible damage caused by contact with the groundwater.

If the use of the land changes from that of agricultural production, any former grants for subsoil/groundwater pumps may be required to be refunded. Any development that does not retain an irrigation right will be required to finalise any outstanding debts or annual maintenance charges for ground water pumps. **Council** will not accept any future charges in this regard unless prior written approval has been obtained

Council will expect the **Design Engineer** to determine the depth of all retardation basins with public access having regard to the safety of persons who may fall into or enter the basin during times of operation. To allow for this possibility, inside batters should have a maximum slope of 1:8, which will determine the maximum depth of many basins.

18.4.7 Batter Slopes in Earthen Basins

Where public access is to be provided, the desirable maximum batter slope for retardation basins is 1:8 for both cut and fill situations. The absolute maximum batter is 1:5 in both situations, and prior **Council** approval will be required where such steep slopes are proposed. The desirable minimum bed cross-fall is 1:400, graded to the outlet point.

The batter slopes for retardation basins that are securely fenced should be designed with due consideration to soil type, erosion, maintenance and, in particular, public safety and risk minimisation.

18.4.8 Access Requirements

Council will expect all-weather access to be available to the retardation basin and any associated structures and pumps to enable maintenance to be carried out. The access should be designed so that there is no need for service vehicles to reverse at any time. To ensure that maintenance of any part of the basin and its associated works can be safely carried out, **Council** will expect a 5m wide reserve to be provided around the perimeter of any retardation basin, unless other arrangements have been designed and approved.

18.4.9 Risk Analysis

Council will expect the **Design Engineer** to prepare a detailed risk assessment for all drainage structures, including retardation basins and associated structures. The assessment should be undertaken in accordance with the principles of *AS/NZS 31000, 2009 Risk Management.*

The **Design Engineer** is responsible for deciding on the action required in response to the risk assessment report and its recommendations. However, consultation with **Council** is encouraged if recommendations are complicated, require community involvement, or would have significant maintenance implications. Council will expect a copy of the report and recommendations to be provided to **Council's Engineering Department** with the detailed design documentation.

18.4.10 Fencing and Security

Council will expect retardation basins which are not accessible to the public to be fenced and secured against casual entrance. Where batters are steeper than those specified in Clause 18.5.2 a full risk assessment should be submitted to the **Council's Engineering Department** for consideration.

Where the risk assessment determines that the retardation basin complex should be securely fenced, a 1.8m high chain-mesh fence should be installed around the entire perimeter, with access for maintenance purposes being provided via lockable gates.

18.4.11 Landscaping

Council will expect the **Design Engineer** to submit a detailed landscape plan for all retardation basins for approval.

18.4.12 Maintenance

Council will expect a heavy duty grate or cover to be provided for each pit located in the wheel path of vehicles. In other circumstances, light duty grates and covers may be sufficient. Access covers and grates should be designed such as to facilitate the use of a lifting system approved by **Council**.

Council will expect any large pipe inlets into the basin to be grated in a satisfactory manner to prevent entry. The grates should be designed so that they can easily be maintained and will not cause blockages during storm events. Pits, pipes and screens that require regular cleaning and maintenance should be readily accessible, with all openings of suitable geometry to allow for cleaning and removal of debris and silt accumulations.

Clause 19 On-site Detention Systems

19.1 Objectives

The objectives of on-site detention systems are to:

- ensure that the capacity of existing drainage **Infrastructure** is not exceeded as a result of **Developments** that increase the volumes and peak rates of stormwater runoff beyond the capacities for which the **Infrastructure was** originally designed;
- ensure that the cumulative impact of future **Developments** will not exceed the capacity of the existing drainage system.
- reduce total stormwater volumes and peak flows from urban and rural **Developments** into receiving waters
- minimise the development costs of drainage **Infrastructure** by reducing peak outflows.
- ensure that on-site detention systems can be effectively maintained by landowners and provide a cost effective method of meeting the other objectives of this section.

19.2 General

19.2.1 Types of Developments requiring on-site detention

The following types of development typically require on-site detention:

- Multi-unit development in newer residential areas where no specific provision for such development has been made in the design of the drainage system for these areas.
- Multi-unit development in older residential areas where the drainage system was designed to handle a peak discharge significantly lower than that predicted by applying the runoff coefficients defined in Clause 16 to a 18% **AEP** event.
- Industrial development in areas where the drainage system was designed to handle a peak discharge significantly lower than that that predicted by applying the runoff coefficients defined in Clause 16 to a 10% **AEP** event
- Commercial development in areas where the drainage system was designed to handle a peak discharge significantly lower than that predicted by applying the runoff coefficients defined in Clause 16 to a 5% **AEP** event**.**
- Low-density residential development in rural or urban fringe areas.

19.2.2 Methodology

This **Manual** provides a simplified method for **Design Engineers**, builders and owners to estimate the requirements for on-site detention to limit discharges into the existing drainage system to the actual capacity of that system. Note that specific calculations carried out by a **Qualified Engineer** will be required when the peak discharge rates nominated by **Council's Engineering Department** differ significantly from those assumed in the simplified method.

The primary objective of this section is to ensure that existing minor drainage networks continue to meet current needs and expectations as more intensive development takes place. Situations will, however, arise in which the impact of a proposed development on major drainage networks should also be considered. Unless flooding problems are already evident, the principle should be to limit the peak outflow from any site in a 1% **AEP** rainfall event to pre-development levels. The volume of on-site storage required to achieve that outcome may be greater than that required to ensure that the capacity of the minor drainage network is not exceeded. **Council** will expect the relevant designs and calculations to be prepared by a **Qualified Civil Engineer** and approved by **Council's Engineering Department**.

19.3 Requirements

19.3.1 General Requirements

Where on-site detention is required in order to discharge into the existing drainage system, **Council** will expect the **Design Engineer** to provide computations that demonstrate how the permissible rate of discharge and the volume of on-site detention required have been determined and show that the existing drainage system will not be adversely impacted by the **Development**. Unless otherwise agreed by **Council**, or specified in this **Manual**, the maximum permissible discharge from a site should reflect the design capacity of the receiving pipe rather than the pre-development discharge

19.3.2 Design Parameters

When the **Development** location so requires, or the existing drainage infrastructure is known to be unable to accept the peak discharge flows estimated by the rational or modified rational method, **Council's Engineering Department** may specify the permissible site discharge and require the **Design Engineer** to carry out site-specific calculations to establish the appropriate storage volume for any **Development**.

The **Design Engineer** may use any recognised method, appropriate to the nature and scale of the development and the upstream catchment, approved by **Council's Engineering Department**. Unless the **Design Engineer** can demonstrate that other values would be more appropriate, the calculations should be based on the following parameters:

- **AEP** for original design event 63%
- **AEP** for current design event see Section 16.8 of this Manual
- Runoff coefficients see Section 16.7 of this Manual

19.3.3 Design Methodology for Small Developments

The provisions of this clause do not apply to major residential, industrial or commercial **Developments**.

The **Developer** may use Table 13 for determining storage volumes and allowable discharge rates for various types of small **Developments** within the municipalities, provided that the catchment in which the development is located has broadly similar rainfall intensity characteristics to those shown in Table 12.

Table 12 Rainfall Intensities Used To Calculate Storage Volumes and Discharge Rates

ANNUAL EXCEEDANCE PROBABILITY	INTENSITY FOR 21 MINUTE STORM MM/HR
63% **AEP**	27.0
18% **AEP**	47.2
10% **AEP**	55.0
5% **AEP**	64.0

When used as intended (that is, to establish both the allowable discharge rate and the storage volume required to hold the site discharge to that level) the values recommended in Table 13 are relatively insensitive to the variations in peak rainfall intensity that occur in urban centres and townships across rural and regional Victoria. When a **Development** is to

be located in an area with very different rainfall characteristics from those set out in Table 12, site-specific calculations should be carried out by a **Qualified Civil Engineer.**

Table 13 Storage Volumes and Discharge Rates For Small On-site Detention Systems

TYPE OF DEVELOPMENT	ORIGINAL AND CURRENT DESIGN PARAMETERS	STORAGE VOLUME REQUIRED	ALLOWABLE DISCHARGE RATE
Multi-unit development in new areas (e.g. greenfield site or recently developed area)	C=0.5 for a 18% **AEP** to C=0.8 for a 18% **AEP**	5 litres of storage for every square metre of lot area	65 litres/sec/ha
Multi-unit development in older residential areas (infill)	C=0.5 for a 63% **AEP** to C=0.8 for a 18% **AEP**	9 litres of storage for every square metre of lot area	37 litres/sec/ha
Industrial development *	C=0.5 for 63% **AEP** to C=0.9 for 10% **AEP**	13 litres of storage for every square metre of lot area	30 litres/sec/ha
Industrial development*	C=0.9 for 63% **AEP** to C=0.9 for 10% **AEP**	9 litres of storage for every square metre of lot area	64 litres/sec/ha
Commercial development	C=0.9 for 63% **AEP** to C=0.9 for 5% **AEP**	11 litres of storage for every square metre of lot area	64 litres/sec/ha

The figures contained in the Table 13 have been calculated using a simplified rational method. The permissible site discharge rate from the on-site detention system has been based on a time of concentration of 21 minutes (for the whole catchment of the existing minor drainage network) for the original exceedance probability used in designing the network that receives the outflow from the on-site detention system.

An average concentration time of 21 minutes is considered reasonable for most mid-catchment locations within an urban setting. However, when the development location so requires, or when the existing drainage infrastructure is known to be unable to accept the peak discharge flows predicted by Table 13, **Council's Engineering Department** may specify the maximum permissible site discharge, and require the **Design Engineer** to carry out site-specific calculations to establish the appropriate storage volume for any **Development**.

Council's Engineering Department may waive the requirement for on-site detention where the **Design Engineer** can demonstrate that an increased rate and volume of stormwater from the **Development** will have no adverse impacts, and that the level of service adopted by the **Council** will not be compromised.

19.3.4 Specific Design Requirements

No part of the pipe system that conveys water within a detention system may be less than 90 mm in diameter unless it is part of an approved manufactured system or of the mechanism used to achieve to design flow rate (for example, orifice plates or pipes discharging from an above-ground tank).

A suitable overflow system should be provided to cater for storm events with a lower **AEP** than that for which the system has been designed, up to and including a 1% **AEP** event**,** and to provide for blockages in the detention system. **Council** will expect all overflows to be directed away from buildings, adjoining properties and associated **Infrastructure**, and to be designed so that the maximum depth of overland flow is at least 300mm below the lowest floor level of any dwelling that might reasonably be expected to be affected by the overflow.

Where on-site detention is to be achieved, in whole or in part, by surface storage (for example, in a recessed section of a concrete driveway) the maximum possible surface water level will be at least 300mm below the lowest finished floor level of any dwelling that might reasonably be expected to be affected by the storage. **Council** will expect driveway sections used for this purpose to be bounded by kerbs at least 100mm wide, cast integrally with the main slab.

19.3.4.1 Required Design Information

Council will expect the **Design Engineer** to determine the time of concentration for the whole catchment, and from the top of the catchment downstream to the site, and to include the following information in calculations and plans submitted to **Council** for approval:

- The invert levels of all pipes 100mm or more in diameter.
- The designed finished surface level of all driveways, car-parking areas, landscaping areas and lawns.
- The floor levels of all buildings, whether existing or proposed.
- The cross section of the outflow control device.
- Existing surface levels, at intervals not exceeding 10m, for the subject property and adjoining properties.
- Location of all pipes and pits and detention devices, pervious and impervious areas, buildings and driveways.
- One copy of drainage computations.
- One copy of structural computations where underground storage tanks are used for stormwater detention.

19.3.4.2 Approved Systems

On-site detention systems that have been approved for use include:

- Above-ground water storage tanks.
- Recessed driveway sections discharging by gravity through a multi-cell unit or orifice plate.
- Underground tanks discharging by gravity through a multi-cell unit or orifice plate.
- Underground tanks with pumped outfalls.
- Lined, in-ground storage basins with pumped outfalls.
- Excavated earthen dams with gravity outfalls (in low density residential **Developments)**.

19.3.4.3 Maintenance of On-Site Detention Systems

To ensure that on-site detention systems remain effective, **Council** may require that a Section 173 agreement, binding the landowner to regularly maintain their on-site detention systems and to pay **Council** an annual inspection fee as set by **Council** from time to time, be registered over the title of the subject property.

Clause 20 Stormwater Treatment

20.1 Objectives

- To ensure that all stormwater discharged to natural watercourses and other drainage authority's drains meet the requirements of the *Environment Protection Act 1970* and the water quality performance objectives for individual drainage catchments as provided in the State Environment Protection Policies (SEPP's).
- To implement the design requirements of the **Council's** Stormwater Management Plan.
- To ensure that all designs incorporate consistent best practice **WSUD** measures and principles.
- To ensure that treatment methods and **Infrastructure** are cost effective from a maintenance and operational perspective and that the risk to the public is minimised as far as practicable.
- To protect and enhance natural water systems within urban environments.
- To integrate stormwater treatment into the landscape, maximizing the visual and recreational amenity of **Developments**.
- To improve the quality of water draining from urban **Developments** into receiving environments.

20.2 General

Council will expect all **Developers** to make provision for the improvement of water quality leaving the **Development** site by works located close to the nominated point of discharge for the **Development**. The **Developer** will be responsible for maintaining these works, to the satisfaction of the **Council**, until the end of the maintenance period.

All urban **Developments** should meet the requirements of the *Urban Stormwater Best Practice Environmental Management Guidelines 1999*, the *Water Sensitive Urban Design Engineering Procedures 2005* and the *Water Sensitive Urban Design Guidelines January 200* prepared for various Victorian municipalities and Melbourne Water.

The storm-water treatment methods which may be considered, subject to **Council** approval, include:

- Bioretention swales.
- Bioretention basins.
- Vegetated swales.
- Underground sand filters.
- Sedimentation basins.
- Constructed wetlands.
- Pond system with edge vegetation.
- Water tanks.
- Gross pollutant traps.
- Litter traps.

Council will expect the **Design Engineer** to develop appropriate strategies for addressing these goals, and may require that land be set aside and works constructed within a **Development** or subdivision for the specific purpose of treating stormwater to ensure appropriate water quality at the point of discharge into the receiving waters.

20.3 Requirements

20.3.1 General Requirements

The following are general requirements for the provision of stormwater treatment:

- **Developments** should comply with principles and recommendations of *Water Sensitive Urban Design Guidelines 2009, Urban Stormwater – Best Practice Environmental Management Guidelines* and **Council's** Stormwater Management Plans to achieve the following water quality standards:
  - 80% retention of the typical urban annual load for Total Suspended Solids (TSS).
  - 45% retention of the typical urban annual load for Total Phosphorus (TP).
  - 45% retention of the typical urban annual load for Total Nitrogen (TN).
  - 70% retention of the typical urban annual load for gross pollutants (litter).
- Discharges for an average 63% **AEP** should be maintained at pre-development levels for stormwater treatments.
- **Council** will expect the **Design Engineer** to select the most suitable treatment types for the **Development**, and to submit designs for approval by **Council's Engineering Department**, which demonstrate that **Council** standards for maintenance, ongoing costs, and stormwater quality can be achieved.
- Where **Council** has constructed whole-of-catchment treatment facilities**, Developers** of industrial estates within such catchments will be required to contribute to treatment costs within those facilities, and may also need to install pre-treatment facilities in the proposed **Development** in accordance with the requirements of **Council's** Stormwater Management Plan. Where whole-of-catchment treatment is not available, **Council** will expect **Developers** to provide separate treatment facilities within the **Development**.
- **Council** will expect the **Design Engineer** to consider the staging and construction of **Developments**. Treatment facilities should normally be commissioned only when sufficient runoff is available to keep plants alive, and **Council** may bond the value of the plantings in preference to have planting proceed at an inappropriate time.
- **Council** will expect the **Design Engineer** to ensure that cleaning and maintenance of structures and equipment associated with stormwater treatment can be achieved without manual handling, and that routine maintenance does not require access to confined spaces.
- **Council** will expect the **Design Engineer** to undertake a full risk assessment for all treatment sites, taking into account fencing, grates across drains, wetlands, retarding basins, pumping stations, and other structures, and to submit the assessment and recommendations for approval by **Council's Engineering Department**.
- **Council** will expect the **Developer's Representative** to submit comprehensive operational documentation and manuals prior to the commencement of Defects Liability Period.

20.3.2 Gross Pollutant Traps

Council will expect the **Design Engineer** to apply the following criteria in designing gross pollutant traps [GPT]:

- The following design flows should be used, depending upon the degree of hydraulic effectiveness required:
  - 95% AEP design flow typically has a hydraulic effectiveness exceeding 97%
  - 86% AEP design flow typically has a hydraulic effectiveness exceeding 98.5%
  - 63% AEP design flow typically has a hydraulic effectiveness exceeding 99%
- Selecting a design flow rate will require the **Design Engineer** to balance the cost and space requirements of the device (a higher design flow will usually require a larger facility with additional costs) and the volume of water that could bypass the unit and avoid treatment. The minimum design flow should be 95% **AEP**. **Council** will expect the **Design Engineer** to provide all-weather access to all treatment sites, and to allow for crane access to GPT

units which should be assumed to require cleaning every six months. In new **Developments** or public areas, **Council** will expect maintenance vehicles to be able to travel in a forward direction at all times.

- **Council** will expect the **Design Engineer** to ensure that the quality of the water being discharged will meet the requirements of the relevant drainage authority, and to submit supporting evidence to **Council's Engineering Department** for approval.

20.3.3 Bioretention Swales

Bioretention swales are not approved for use in any municipality unless **Council** has provided specific written approval for their use in that municipality. The design requirements for such swales are as follows:

- Bioretention swales are best suited to situations where longitudinal grades are between 1% and 4% or velocities during major storm events do not exceed 2m/s. Where steeper grades are identified as a constraint, check dams may have to be introduced to reduce velocities to the above level.
- Water ponding at entry points to the swale should not occur for longer than 1 hour after the cessation of rainfall, as prescribed in Clause 56.07-4 of the VPP.
- Grassed swales requiring mowing should have batter slopes less than 1:4.
- The design details should otherwise be in accordance with the guidelines set out in Chapter 5 (Clause 5.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.4 Bioretention Basins and Rain Gardens

The design requirements for Bioretention basins and rain gardens are as follows:

- Water ponding at entry points to the swale should not occur for longer than 1 hour after the cessation of rainfall, as prescribed in Clause 56.07-4 of the VPP.
- The design details should otherwise be in accordance with the guidelines set out in Chapter 6 (Clause 6.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*
- Selection Table 20.3.4 provides details of the location and other criteria under which **Councils** will be prepared to consider accepting Bioretention basins and rain gardens as part of the stormwater treatment systems within the municipalities concerned.

Selection Table 20.3.4 Bioretention Basins and Rain Gardens

Permitted in Private Property and Drainage Reserves	Permitted in Nature Strips	Permitted Except in Unsuitable Locations for Access, Permanent Subsurface Flow Conditions, Etc.	Not Permitted Under Any Circumstances
Ararat Rural City Council	Murrundindi Shire Council	Ballarat City Council	Horsham Rural City Council
Baw Baw Shire Council		Bass Coast Shire Council	Pyrenees Shire Council
Benalla Rural City Council		Baw Baw Shire Council	
Buloke Shire Council		City of Greater Bendigo	
Campaspe Shire Council		Corangamite Shire Council	
Mansfield Shire Council		Glenelg Shire Council	
Moira Shire Council		Golden Plains Shire Council	
Mount Alexander Shire Council	Mount Alexander Shire Council	Indigo Shire Council	
Rural City Of Wangaratta		Macedon Ranges Shire Council	
Strathbogie Shire Council		Mildura Rural City Council	
Towong Shire Council		Mitchell Shire Council	
Wodonga City Council	Wodonga City Council	Moorabool Shire Council	
		South Gippsland Shire Council	
		Southern Grampians Shire Council	
		Swan Hill Rural City Council	
		Warrnambool City Council	
		Wellington Shire Council	
		Yarriambiack Shire Council	

20.3.5 Vegetated Swales, Grassed Swales, and Buffer Strips

The design requirements for vegetated swales, grassed swales and buffer strips are as follows:

- Swales are most efficient when longitudinal grades are between 1% and 4%. Flatter grades tend to cause swales to become waterlogged and/or have stagnant pooling, while steeper grades may lead to high velocities, with potential risks of erosion and damage to vegetation. Check banks (small porous walls) may be constructed to distribute flows evenly across the swale..

- Batter slopes are typically 1:9. Grassed swales requiring mowing should have batter slopes less than 1:4.

- The design details should otherwise be in accordance with the guidelines set out in Chapter 8 (Clause 8.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)*.

- Subject to road reserve width and service locations, **Councils** other than those identified in Selection Table 20.3.5 will consider approving vegetated swales, grassed swales and buffer strips for use in open space reserves within normal or low-density residential zones and/or in central median strips on roads.

- Selection Table 20.3.5 also provides details of the circumstances under which **Councils** will be prepared to consider accepting vegetated swales, grassed swales and buffer strips located within nature strips as part of the stormwater treatment systems within the municipalities concerned.

Selection Table 20.3.5 Vegetated Swales / Grass Swales / Buffer Strips

PERMITTED ON NARROW NATURE STRIPS ONLY AS PART OF AN OVERALL DESIGN STRATEGY INCORPORATING CONCRETE EDGE STRIPS, ENTRANCE CULVERTS AND SUPPORTING TREATMENTS.	NOT PERMITTED UNDER ANY CIRCUMSTANCES
Ararat Rural City Council	Greater Bendigo City Council
Ballarat City Council	Horsham Rural City Council
Bass Coast Shire Council	Mitchell Shire Council
Baw Baw Shire Council	Moorabool Shire Council
Benalla Rural City Council	
Colac Otway Shire Council	
Corangamite Shire Council	
Greater Bendigo City Council	
Macedon Ranges Shire Council	
Mildura Rural City Council	
Pyrenees Shire Council	
Rural City of Wangaratta	
Strathbogie Shire Council	
Towong Shire Council	
Wellington Shire Council	
Wodonga City Council	
Yarriambiack Shire Council	

20.3.6 Sand Filters

Sand filters should be designed in accordance with the guidelines set out in Chapter 7 (Clause 7.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.7 Sedimentation Basins

Council will not normally approve the use of sedimentation basins on steep land, or as a permanent treatment facility when no regular maintenance regime can be implemented. In other circumstances, the design requirements for such basins are as follows:

- The design operation discharge for the basin should be a minimum of 63% **AEP** peak discharge.
- Flow bypass of downstream macrophyte zones and wetlands should be activated in events up to 1% **AEP**.
- The basin should be designed to remove 95% of the particles less than 125 µm in a 63% **AEP** event.
- External batter slopes should be no steeper than 1:5. All internal batter slopes should have safety benches at least 1.5m wide measured from the edge of the normal top water level, and with a maximum slope of 1:8, a transition zone at least 0.5m wide with a maximum slope of 1:5, and a maximum slope of 1:3 thereafter.
- **Council** will expect the **Design Engineer** to arrange for an independent safety audit for each design and to submit the results of that audit to **Council's Engineering Department** for consideration.
- **Council** will expect the **Design Engineer** to ensure that sufficient hard stand areas, at least 3m wide and able to support 20 tonne excavation plant, are provided, with appropriate access ramps and tracks. Multiple hard stand areas should be considered where the basin is more than 7m wide
- .**Council** will expect the **Design Engineer** to install a rock layer in the base of each basin, above the clay liner, to indicate the limit of sediment and to reduce the risk of damage to the liner during future maintenance activities.
- **Council** will expect the **Design Engineer** to provide access for maintenance vehicles along both edges of basins up to 14m wide. Larger basins should be equipped with full draw-down facilities, and vehicular access should be provided to the base of the facility.
- The design details should otherwise be in accordance with the guidelines set out in Chapter 4 (Clause 4.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.8 Constructed Wetlands

The design requirements for constructed wetlands are as follows:

- **Council** will expect the **Design Engineer** to arrange for a geotechnical investigation prior to design to determine the soil profiles and infiltration rates, and to submit the relevant report and recommendations to **Council's Engineering Department** for approval. Hydrogeological investigations may also be required in areas where there is a likelihood of groundwater discharge or high seasonal water tables.
- **Council** will not normally approve the use of constructed wetlands on steep sites.
- **Council** will expect the **Design Engineer** to ensure that the wetland design meets safety requirements and to implement reasonable safety measures, such as fencing, safety barriers, signage and benching.
- The constructed wetland should treat at least 90% of Mean Annual Runoff (MAR) through the use of a stored event volume above the normal standing water level of the wetland. A minimum of a 300mm freeboard on the embankment is required. A high-flow bypass should be provided to convey flows in excess of the design flows, which will typically be those associated with a 63% **AEP** event.
- **Council** will expect the **Design Engineer** to arrange for an independent safety audit for each design and to submit the results of that audit to **Council's Engineering Department** for consideration.
- External batter slopes should be no steeper than 1:5. All internal batter slopes should have safety benches at least 1.5m wide measured from the edge of the normal top water level, and with a maximum slope of 1:8, a transition zone at least 0.5m wide with a maximum slope of 1:5, and a maximum slope of 1:3 thereafter.
- **Council** will expect the **Design Engineer** to ensure that a hard stand area, at least 3m wide, and able to support 20 tonne excavation plant, is provided adjacent to the inlet zone, with appropriate access ramps and tracks..

- **Council** will expect the **Design Engineer** to ensure that the riser outlet pipe is designed to act as an emergency overflow with a capacity equivalent to the peak discharge in a design event.
- **Council** will expect the **Design Engineer** to optimise hydraulic efficiency when defining the macrophyte layout. So far as reasonably practicable, the hydraulic efficiency for constructed wetlands should be between 50% and 70%. The **Design Engineer** should refer to Section 9.3.3 and figure 9.6 in *the Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)*.
- The wetland should normally be divided into four macrophyte zones, an open water zone and a littoral zone. The **Design Engineer** should have regard to the recommendations in table 9.2, Section 9.6.3 of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)*. Suitable plant species are listed in the addendum to the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)*.The design details should otherwise be in accordance with the guidelines set out in Chapter 9 (Section 9.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.9 Ponds and Shallow Lake Systems

Council will not normally approve the use of ponds and shallow lake systems on steep sites. The design requirements for such systems are as follows:

- **Council** will expect the **Design Engineer** to arrange for an independent safety audit for each design and to submit the results of that audit to **Council's Engineering Department** for consideration.
- **Council** will expect the **Design Engineer** to optimise hydraulic efficiency when defining the macrophyte layout. So far as reasonably practicable, the hydraulic efficiency for ponds and shallow lake systems should be between 50% and 70%. The **Design Engineer** should refer to Section 9.3.3 and figure 9.6 in the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*
- The design details should otherwise be in accordance with the guidelines set out in Chapter 10 (Section 10.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.10 Rainwater Tanks

- The design requirements for rainwater tanks are as follows:**Council** will expect the **Design Engineer** to size rainwater tanks based on appropriate engineering principles and data. Reference curves for each region can be found in Section 12.4.2 of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*
- **Council** will expect the **Design Engineer** to perform continual water balance assessments using **MUSIC** to determine how much runoff volume and associated pollutant loads the tanks are removing from the catchment, and to submit the results of these assessments to **Council's Engineering Department** for approval.
- The design details should otherwise be in accordance with the guidelines set out in Chapter 12 (Section 12.2 and 12.4) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

Clause 21 Stormwater Discharge Points

21.1 Objectives

Council will identify appropriate stormwater discharge points and legal points of discharge for all **Developments,** including subdivisions, industrial, commercial and residential **Developments**, with the following objectives:

- To avoid the capacity of the existing drainage **Infrastructure** being exceeded as a result of **Developments** that increase the volume and peak discharge rate of stormwater runoff beyond the levels which the **Infrastructure** was originally designed to accommodate, and to require that on-site detention be provided where necessary to protect the existing drainage system capacity for the uses and areas for which it was originally designed.
- To ensure that stormwater from each **Development** is treated to reduce sediment and other pollutants, and that neither the resultant discharge nor the treatment process have an adverse impact on the environment and on surrounding properties.
- To limit the stormwater flow generated by the **Development** as a percentage of that generated by the whole catchment, so that similar future **Developments** will not overload the existing or planned drainage systems.
- To achieve the best balance between cost and effectiveness in conveying discharges from the **Development** to each drainage system capable of accepting such discharge.
- To ensure that all new drains are assessed from the perspective of serving future **Developments** and avoiding duplication, and to establish equitable cost sharing principles where capacities are increased to allow drains to service other properties in the future.

Council will expect the **Design Engineer** to ensure that the low point of every lot, including reserves and balance lots, is drained to the drainage connection point nominated by **Council**, and typically located either in the adjoining street drainage or in a drainage easement.

21.2 General

Since drainage systems have been designed to different design standards and **Developments** have taken place that have increased the volume and rate of stormwater runoff beyond the levels for which the existing drainage networks were designed, the impact of new **Developments** on the existing drainage systems should be assessed prior to allowing them to discharge directly into these networks.

Council will be concerned to ensure that more frequent flooding does not occur and that existing drainage problems are not increased as a result of new **Developments**.

Council may need to determine the impact of new **Developments** on existing drainage systems prior to determining the legal point of discharge. The impact will need to be assessed from both volumetric and rate of flow perspectives.

Where a **Development** is likely to cause increased flooding frequency or extent, **Council** will determine what works are necessary for a particular point in a drainage system to be the nominated point of discharge.

21.3 Requirements

Council will expect the **Design Engineer** to obtain drainage rights and/or easements from all downstream owners who may be affected by the discharge of stormwater wherever the point of discharge is not to either a **Council**-owned drain or a natural watercourse.

Applications for nomination of point of discharge for dwellings should include the following information:

- Plan showing the proposed development including the pervious and impervious areas.
- Existing and proposed surface levels at an interval not exceeding 10m.
- Location and size of existing drains and easements within and adjacent to the site.

Applications for nomination of point of discharge for other **Developments** should include the following information:

- Plan showing the proposed development including the pervious and impervious areas.
- Existing and proposed surface levels at an interval not exceeding 10m.
- Description of the proposed development.
- Locality plan showing the development location and catchment boundaries.
- Location and size of existing drains and easements and reserves within and adjacent to the development.

Where **Council** determines that a **Development** is likely to adversely impact the existing drainage system, **Council** will expect the **Design Engineer** to provide further plans and computations to identify the works necessary to minimise the impact of the **Development** on the existing drainage system, and to submit these plans to **Council's Engineering Department** for approval. The works may include providing on-site detention designed in accordance with the provisions of Clause 19 of this **Manual.**

Clause 22 Environment Management during Construction

22.1 Objectives

The general objectives of environment management are to ensure that:

- All waste created is removed from the **Development** and disposed of in accordance with the relevant Australian Standards, Acts, Regulations, Guidelines and Codes of Practice in such a way as to avoid nuisance, pollution or loss of amenity to the surrounding area. Waste materials should not be disposed by burning unless with prior approval from **Council**.
- Construction sites are managed in a way to minimise the impact of construction works on the environment.
- The relevant provisions of **Council's** Stormwater Management Plan are complied with during construction.
- Existing vegetation which is not to be removed is adequately protected during construction.
- Stormwater discharged from the **Development** during construction does not contaminate or degrade the quality of the receiving waters.
- No crushed rock, debris or mud is carried from the **Development** onto public roads or footpaths.
- Declared noxious weeds (or parts thereof), are not transported to or from the worksite, either on vehicles or machinery or within soil or materials.
- Motorists are not put at risk as a result of dust reducing visibility when construction works are carried out on or adjacent to roadways and streets that are open to the traffic.
- Landowners and residents within the vicinity of construction approved by **Council** are not adversely impacted by the construction works.
- All works are conducted in accordance with the requirements of any regulation or guideline or Code of Practice of the Environment Protection Authority.

22.2 General

Council will expect the **Construction Engineer** and Contractors engaged by the **Developer** to ensure that all practical steps are taken during the construction of works to minimise any detrimental impact on the environment.

Council will expect all earthworks to be undertaken in accordance with the provisions of Australian Standard *AS3798-2007 Guidelines on Earthworks for Commercial and Residential Developments.*

22.3 Erosion Control and Sediment Discharge

Council will expect the **Construction Engineer** to ensure that dust, mud and debris are prevented from leaving any **Development** site during and after construction, and to have regard to the recommendations in Austroads *Road Design Guidelines Part 5 – General and Hydrology Considerations* and any VicRoads Supplement to those guidelines, and in the EPA Publication 960 *Do it Right on Site - Chapter 4 Erosion and Sediment.*

Erosion and sediment discharge control measures during construction may include the following:

- Cut-off drains should be installed to intercept surface water before it reaches the areas of disturbed earth.
- Approved silt control measures should be installed immediately upstream of each drain entrance.

- Typical measures to ensure that all silt is retained within the site may include:
    - Settlement ponds.
    - Fence filters.
    - Gravel sausages made from a geo-textile sleeve for placement at kerbside drainage pits.
    - Straw bales on open, cut-off or diversions drains.
    - Temporary sumps in selected and approved drainage pits.
    - Landscaping or the promotion of vegetation downstream of the works but still within the site.

Subdivision access points should to be kept to a minimum to minimize the number of areas required for stabilization and vehicle cleaning, and sections of road targeted for cleaning in the event that mud is accidentally conveyed from the site.

Soil movement at subdivision access and exit points should be controlled using a rumble grid or by requiring vehicles to travel the length of a stabilised access track. All machinery should be prevented from accessing non-essential parts of the site.

In accordance with EPA Publication 960, batter slopes should be no steeper than 2:1, be finished as soon as possible with at least 75mm of weed-free topsoil, topped with either weed mat or mulch, or hydro-mulched, to establish vegetation such as suitable grass species to ensure that erosion is minimised.

All boundaries between the **Development** and public land should be protected and maintained with adequate sediment control measures as soon as is practicable upon completion of works.

22.4 Dust During Construction

Council will expect the **Construction Engineer** to ensure that dust suppression is achieved through constant water spraying or the application of other naturally-based proprietary dust suppressants, and that the dust caused by vehicles travelling on roads to and within the **Development** does not cause a nuisance to surrounding properties.

22.5 Pollution

Council will expect the **Design Engineer** to prepare Environmental Management Plans addressing all possible sources of pollution and methods of control, and to submit these plans to **Council's Engineering Department** for approval.

22.6 Noise

Council will expect the **Construction Engineer** to ensure that noise emitted from the site remains at all times within the specified limits set by the EPA for the relevant activity.

The current EPA policies and guidelines applicable are as follows:

- *SEPP (Control of Noise from Commerce, Industry and Trade) No N-1*.
- *Noise Control Guidelines TG 302/92*.

These guidelines specify maximum noise levels during the operational phase of the development, as follows:

- Day time – 45 dB(A).
- Evening – 37 dB(A).
- Night – 32dB(A).

Should **Council** receive a complaint from the public relating to noise generated from the site, **Council** will expect the **Construction Engineer** immediately to arrange for independent noise testing to be undertaken, and to submit the results of that testing to **Council's Engineering Department** for consideration.

Depending on the nature of the development and the location of the site, **Council** may require the **Construction Engineer** to silence or replace particular items of equipment, install noise attenuation buffers or barriers, and/or create a buffer zone, before construction works resume.

22.7 Weed Importation and Transportation

Council will expect the **Construction Engineer** to ensure that earthworks activities do not deposit noxious weeds or the seeds of noxious weeds onto land. Ideally, no fill should be imported onto any development site. Areas that are to involve earthworks should have the topsoil stripped and stockpiled for reuse. Where insufficient material can be won from the site, material should be imported from a reputable supplier or from a site that is known to be free of weeds, and data concerning the nature and source of the material provided to **Council's Engineering Department** for approval.

The key legislation relating to weed spread in Victoria is the *Catchment and Land Protection Act 1994*. Many of the provisions relating to weed spread are found in Section 70A and 71 of that Act. Among the provisions, this Act provides offences relating to the precautions to be taken when transporting soil, sand, gravel or stone that may be infested with noxious weeds. **Council** will expect appropriate measures to be implemented in accordance with the requirements of the approved construction plan (refer to Clause 7.2) to ensure that weeds are not transported on earthworks equipment or in soil or material leaving or entering the worksite.

22.8 Incident Reporting

The **Developer**, Contractor, **Superintendent or,** where not also serving as the **Superintendent**, the **Construction Engineer** are individually and severally responsible for informing the **Council** and the EPA of any incidents relating to environmental management, of which they become aware, as soon as practicable after the incident.

Clause 23 Whole Farm Plans

23.1 Objectives

The objectives of **Council's** engineering assessment of whole farm plans (WFP's) are follows:

- That **Council Infrastructure** is not adversely impacted by the implementation of the whole farm plan.
- That property accesses are provided at appropriate locations and to the correct standard.

It should be noted that **Council's Planning Departments** have much broader objectives for whole farm plans to ensure that the certification of WFP's are appropriate. This will include referral to other authorities whose requirements are included in the application form.

23.2 Requirements

The requirements for Whole Farms Plans are as follows:

- The application for Certification of a Whole Farm Plan is complete. Multiple accesses to roads, and road crossings, have been minimised; and
- All accesses and crossings comply with section 12.9.2 of this **Manual**.

Clause 24 Landscaping and Road Furniture

24.1 Objectives

The general objectives for landscaping requirements are as follows:

- All landscaping is suitable for the proposed use of the land on which it is located.
- The development of quality landscapes is encouraged.
- The landscaping is able to be effectively and economically maintained.
- The landscaping is compatible with the character of the area and with any structure plans, **ODP**s and urban design guidelines.
- The standard of **Infrastructure** to be provided for landscape works is clearly specified.
- The risk to the public from any landscaping on public lands or lands maintained by **Council** is minimised.
- All landscaping complies with the requirements of Disability and Discrimination legislation.
- Open space is provided which will encourage usage by providing a relaxing, aesthetically enjoyable environment.
- All landscaping incorporates best practice design and environmental principles.
- A selection of plant species is identified for planting in landscapes having regard to indigenous species where practical.

24.2 General

Where any of the following types of **Development** are concerned, Council will expect the **Design Engineer** to prepare landscape plans and submit them to Council's Engineering Department for approval:

- Land vested in **Council**, including road reserves, Public Open Space, and drainage reserves.
- All multi-unit **Developments**.
- Commercial **Developments** incorporating a Car-park.
- Industrial **Developments**.
- Other types of development as per the requirements of any planning permit issued for that development.
- **ODP**s for an area. (Concept plans only).

Landscaping works should not commence until plans documenting all relevant design, construction and maintenance issues have been submitted to and approved in writing by **Council**. The time for approving plans is as per the requirements of the *Subdivision Act*.

The definitions for local, large and district parks are found in section 56.05-2 of The Planning Scheme.

Council will expect playgrounds to be provided in Public Open Space as per the requirements of the Planning Scheme and in accordance with any relevant playground strategy. Contact should be made with **Councils** to determine their requirements in relation to this section. Indicative sizes of the various types of parks appear in Clause 56 of the Planning Scheme.

All landscaping areas including playgrounds must be designed to comply with the requirements of Disability and Discrimination Legislation.

Guidelines to inform the design and provision of Public Open Space in residential areas include:

- Large shade trees or planting for future provision of shade trees.
- Seat/s.
- Litter bin/s.
- No linear open space reserves provided to carry a path should be less than 10m wide, and where practical locate paths along routes where clear sightlines are possible to assist navigation, to enhance security, and to provide visibility of potential hazards (i.e. people and cars).
- Dense shrubbery along linear paths should be avoided and plantings set well back from path edge.
- Linear paths should primarily be provided to add to and or link to strategic paths that connect residential areas with community facilities, shopping and commercial areas, other residential areas and or other key destinations or attractions.

All landscaped areas are to be graded to ensure appropriate drainage and the design should incorporate possible retention for irrigation purposes.

In determining whether approval is to be granted, **Council** will have regard to the estimated ongoing maintenance costs to be incurred by **Council** resulting from the proposed landscape development and whether the proposed level of service is sustainable in the long term.

In order to determine, maintenance costs, **Council** will expect the **Developer** to define the level of service required for the landscape items provided, including details, where applicable, of:

- Irrigation details – manufacturer details, model numbers, degree of automation etc.
- Recommended watering frequencies.
- Recommended mowing frequencies.
- Types of grasses to be sowed.
- Recommended maintenance of rain gardens.
- Type of furniture.
- Lighting details.
- Playground equipment details.

Council will expect the **Developer** to submit an independent playground audit certification before issuing a Statement of Compliance. All playground equipment is to be maintained by the **Developer** until the end of the maintenance period.

All landscaped areas should be graded to ensure appropriate drainage and the design should incorporate possible retention for irrigation purposes, considering public risk.

At practical completion **Council** will expect the **Developer** to provide an asset list identifying the nature, quantities, dimensions and other parameters relevant to each asset and the costs of constructing those assets.

24.3 Requirements

24.3.1 Information to be Provided

Appendix D: Information to be Shown on Plans specifies the requirements of the landscaping information to be shown on the plans submitted to **Council** for approval.

24.3.2 Respect for Surrounding Environment

A design and development that respects the individual site, the local context and the regional characteristics is encouraged. This includes, but is not limited to, to the following:

- The retention of existing high quality vegetation (trees, understorey and grasses).
- Removal and/or control of weed species such as Willows (*Salix sp*) and identified native weeds close to water ways.
- The use of indigenous plants in close proximity (i.e. 20m or other distance as determined on a case by case basis) to a Nature or Bushland Reserve including National Park, Regional Park and State Forest.
- The use of locally indigenous species close to waterways and streams.
- The preservation and integration of heritage elements with a landscape design.

The respect for the location and the enhancement of our natural environment will help to develop fauna and flora habitat through the Municipality.

24.3.3 Environmentally Sustainable Landscape Design

Council is committed to an environmentally sustainable municipality. It encourages innovative landscape solutions to conserve water and energy and reduce waste in all private gardens. Measures for energy conservation in private gardens include:

- Use of materials produced from renewable resources.
- Use of recycled materials.
- Use of plants and planting patterns that contribute to the solar efficiency of the building.
- Use of mulch to improve water efficiency and reduce weed competition.
- Use of 'best practice' in water sensitive design.

24.3.4 Protection of Existing Vegetation

Healthy, pre-existing vegetation can be a significant asset. Healthy native vegetation can be home to a host of native fauna, especially if large trees include natural hollows etc. The **Council** encourages the retention of significant vegetation on site and advises that under native vegetation legislation the removal of native vegetation is to be avoided and if this cannot be achieved, minimized. The removal of both native and non-native trees may require a planning permit and must comply with any requirements of the relevant planning scheme.

The following points are **Council's** requirements for protecting vegetation on development sites.

24.3.4.1 Trees

The drip line of a tree canopy delineates the zone from which all works including storage and parking should be excluded. All trees determined by **Council** to be protected should be fenced off at the canopy drip line with substantial exclusion zone fencing for (at least) the duration of construction (see Figure 1) and perhaps longer.

The Department of Environment, Land, Water and Planning may have different requirements. Where those requirements set higher standards than those established by **Council,** the DELWP requirements will prevail.

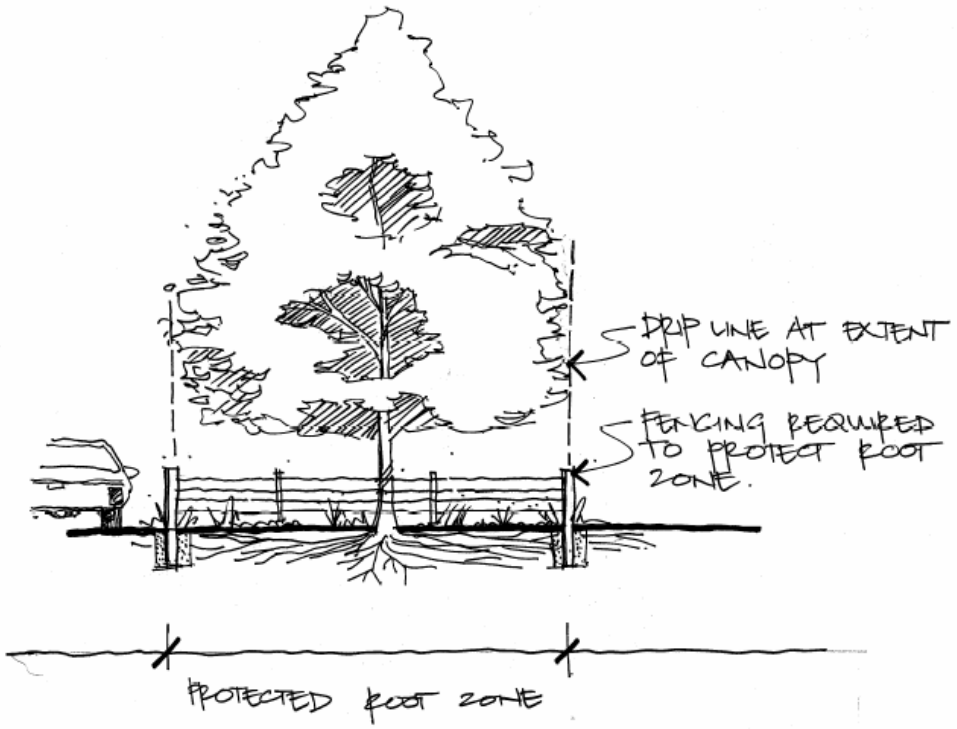

Figure 1 - Existing Tree and Other Vegetation Protection

24.3.4.2 Shrubs and Groundcover Plants

An established layer of shrubs and groundcovers in undisturbed soil provides the benefits of resisting weed invasion, preserving habitat values and broader landscape aesthetic values.

Vegetation of this nature deemed by the **Council** to be protected is to be fenced during construction. (See Figure 1). As a minimum, fencing of vegetation to be retained should encompass the area designated on the approved plans and consist of at least:

- Treated pine strainer posts.
- Star picket intermediate posts.
- Four strands of 12-gauge fencing wire.

The overall design and planning of the site should ensure all spaces are useable, adequately proportioned and maximize planting opportunities.

Council will expect the **Developer** to:

- Ensure type and size of planting, especially trees, is appropriate to the space available.
- Use small trees and shrubs to effectively screen service areas and block unwanted views Use Small trees and shrubs to reduce the visual impact of traffic along driveways and adjoining streets.
- Ensure that the location and mature size of plantings do not conflict with structures and services.
- Locate lawn areas only where they provide functional or visual benefit.

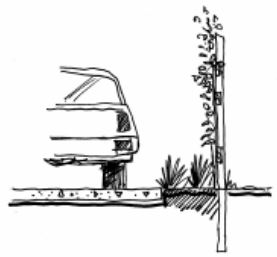

Fig 2 - Small spaces: small shrubs & climbers

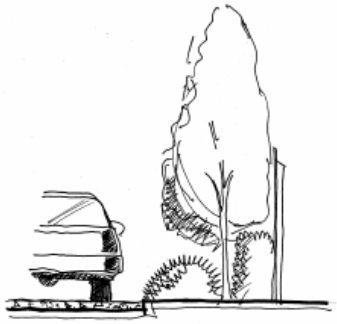

Fig 3 - Medium spaces: small trees, medium-small shrubs

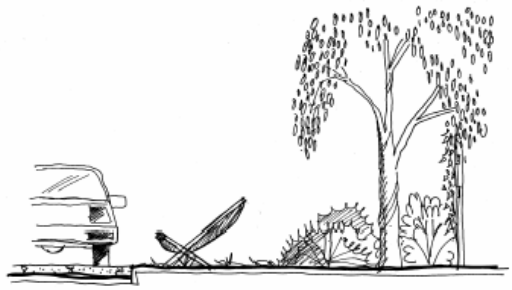

Fig 4 - Large spaces: trees, shrubs, ground covers, grasses

Where trees are planted in car parks the minimum distance around the tree to be without pavement or seal is defined by the drip of the mature tree to be planted unless otherwise approved by **Council**.

24.3.5 Plant Selection

Tree selection should be in accordance with **Council's** Street Tree Policy or equivalent unless otherwise approved by **Council**.

When selecting trees and tall shrubs it is essential that the mature height and trunk diameter is appropriate for the location. Care should be taken to avoid potential damage to structures and services by planting trees away from buildings and services, including sewers, drains, gas and electricity services.

As a general rule local indigenous plant species are to be considered as the first choice for plants. These are plant species that would have occurred in the region prior to European settlement.

In some situations indigenous plantings do not meet the functional, horticultural, or heritage requirements and either other Australian natives, or exotic plants may be considered.

Points to consider when choosing plant species.

- Select drought tolerant species.
- Plants that have similar water requirements can be grouped together to reduce the water demands of a landscape.
- Limit high water demanding plants to small focal areas.

- Flowering local trees and shrubs should be included in the design where appropriate as they provide food for many native bird species.

- Match species growing requirements to site conditions to ensure successful growth e.g. sun-loving plants in shaded locations will perform poorly.

- Selection to include some plants that will grow quickly to achieve an immediate effect and some that take longer to achieve a desired form and are longer lived.

24.3.6 Timing of Tree Planting

Tree planting should ideally occur between the months of April to September inclusive. If trees are planted outside this period by **Developers, Council** will expect supplementary watering to be provided by the **Developer** as necessary at their cost. Where this work is undertaken outside of the Statement of Compliance period to meet the requirements of this clause, an agreement should be entered into between the **Council** and the **Developer** to ensure that this work is undertaken and maintained in accordance with **Council's** requirements.

24.3.7 Planting Principles

Tree planting guidelines are based on the urban design concept that a strong visual effect can be obtained by using a bold and simple layout without complicated and numerous variations in style and materials. The following tree planting principles have been developed to address the various site conditions found in our streetscapes.

- Symmetrical planting- similar tree species on both sides of the road. This is the preferred layout but is not always possible because of site constraints.

- Asymmetrical planting- different sized species and/or form on either side of the road. This layout is appropriate where powerlines occupy one side of a road, or where a narrow street allows planting on one side only.

- Formal planting- a formal streetscape is created where the roadway forms a grid pattern, usually at right angles to each other. Formal planting should be symmetrical and use a single tree species at regular spacing intervals.

- Informal planting- random placement of trees. Appropriate in some urban road settings where street locations have a direct or visual relationship to a natural environment, such as a river or bushland.

- Single tree species per street- generally a single street tree species is desirable, and should be pursued unless restricted by site constraints. Feature specimen planting may be considered at key intersections, central business zones, pedestrian crossings and the like.

- Solar orientation in certain situations street planting can be designed to provide shade and also allow winter sun.

24.3.8 Vehicular Access

Vehicle access to land vested in **Council** for Public Open Space should be restricted except for maintenance purposes by appropriate fencing and bollards (refer to Council Urban Style Guide for styles). Locks are to be provided as per **Council's** standard key system.

24.3.9 Clear Zones

The design of all landscaped areas should ensure the following concerns are adequately addressed:

- Safety of employees maintaining these areas.

- Safety of motorists within the vicinity of these areas.

- **Clear Zones** appropriate to the speed of vehicles are maintained where landscaping areas are adjacent to roads.

All **Councils**, other than those listed in Selection Table 24.3.9, require as a minimum requirement that a 600mm impervious clear area is to be maintained from the edge of seal or invert of kerb or edge of gravel. In this area approved paving or similar materials will be used so that no regular maintenance of these areas will be required.

Selection Table 24.3.9 Clear Zones

Councils Requiring A Minimum of 1200mm Impervious Clear Area
Campaspe Shire Council
City of Greater Bendigo
Glenelg Shire Council
Pyrenees Shire Council
Wellington Shire Council
Yarriambiack Shire Council

Where traffic volumes on the abutting road exceed 500 vpd or the speed is greater than 50kph **Council** will expect the **Design Engineer** to arrange for an independent risk assessment to be completed to determine the appropriate **Clear Zone** and establish the risks to, and the safety requirements of, employees maintaining these areas, and to submit the assessment report and recommendations to **Council's Engineering Department** for approval.

24.3.10 Entrance Features

All entrance features are to be located on property owned by the **Developer** and be maintained by the **Developer**. **Council** will not give permission for entrance features to be located on **Council** road reserves or other land vested in **Council**.

24.3.11 Maintenance Responsibility

At the time of practical completion for the development a defects period of 12 months will commence and **Council** will be responsible for the maintenance of the landscaping works. The **Developer** will provide **Council** with all documentation on pumps, controllers, playgrounds and any other document that will assist in the maintenance of landscaped areas.

Note that tree planting can be carried out after the time of practical completion and statement of compliance with the approval of **Council** as per the requirements of 24.3.7.

24.3.12 Irrigation Systems

Council will expect any irrigation system to be of an approved type, to function automatically, and to be fully operational before the use commences.

Council will expect the **Design Engineer** to prepare appropriate design and submit the relevant plans and specifications to **Council's Engineering Department** for approval prior to the commencement of any work on site.

The design should consider the following factors:

- Pump design and location.
- **Council** will expect any required back flow devices and meters to be of an approved type and manufacture, and to be located below ground but with ready access for inspection and maintenance.
- Minimum diameter of irrigation line for areas with greater than 8 stations is to be 32mm.
- Moisture sensors to be included if required by **Council**.

All materials used in the construction of the irrigation system are to be commercial quality. Unless agreed otherwise the following should be used or their equivalent:

- ICC Controllers.
- Hunter sprinkler heads on articulated risers.
- Class 9 min material to solenoids.
- Controllers are to be placed within a secure lockable box.
- Sprinklers are to be set so that when in operation they extend above the natural surface by 100mm.
- Solar Powered irrigation systems may be considered by **Councils** where the **Developer** can demonstrate adequate robustness. This will require an application in writing to be made for a variation to the **Manual** to use solar powered irrigation systems...

24.3.13 Referred Documents

Designers Engineers and **Developers** are advised that **Council** has specific policies and requirements in relation to landscape designs and contact should be made with the relevant **Council** to obtain the details of their specific requirements.

24.3.14 Landscaping on Existing Road Reserves

No landscaping other than lawn will be permitted on nature strips and **Council's** reserves without the approval of **Council** and in accordance with any Local Law governing development on road reserves. To obtain approval for landscaping other than lawn **Council** will expect the **Developer** to demonstrate that the material can meet the following performance criteria:

- There will be no increase to public risk (e.g. stones on footpaths increase tripping hazard).
- The nature strip can be able to be used safely by pedestrians.
- The product or material should not be able to be easily removed or used for nuisance purposes.
- There should be a consistent neighbourhood landscaping approach.

24.3.15 Soft Landscaping

Minimum 100mm (imported) approved top soil is to be used.

Existing vegetation is to be treated to remove weeds.

Grass species should be approved by **Council** prior to placement. Design should generally allow for a maximum of 50% of the area to be irrigated to minimise water use, unless approved otherwise (such as on site retention for re-use).

Planting of garden beds is to contain native species as approved by **Council**.

Garden beds to have an approved weed mat placed between the top soil and mulch.

Mulch is to be one of the following:

- An approved first grade clean chipped bark material 75mm min in depth and average diameter of 20mm.
- Crushed brick, stone or inorganic material, if approved.
- Other materials approved by **Council**.

24.3.16 Hard Landscaping

Footpaths and shared paths widths are to be in accordance with Clause 13 of this **Manual**.

When approval has been given for the use of granitic sand, **Council** will expect the material to be at least 100mm in depth when compacted to 95% of MMDD.

Paths constructed from materials other than concrete should be edged so that material does not spill into adjacent areas. Timber edging may be used only when the design and construction have been approved by **Council**.

24.3.17 Furniture

Furniture used in landscaped areas is to be in accordance with the relevant **Council's** Urban Style Guide, or as approved by **Council**.

The **Manual** is to be used to identify the styles of furniture to be used and include seats, barbeques, bins, dog bins, bollards, post and rail fences, bus stops etc relevant to the location. If no information is available for the site, approval will be required from **Council** on a case by case basis. Susceptibility to vandalism will be considered by **Council** before giving approval for any furniture.

Consideration should be given to the context in which furniture is to be installed. Relevant matters may, for example, include bus stop capacity, proximity to hospitals, and the proportion of senior citizens wishing to access the area concerned.

24.3.18 Other Matters

Urban art and information boards should be provided to encourage use of the Public Open Space. **Council** will expect urban art located on a nature strip to satisfy the **Clear Zone** requirements under the road design sections of this **Manual**.

Park name boards are to be in accordance with **Council's** standard drawing (where available). Urban art and information boards are to be approved by **Council** prior to installation.

Clause 25 Associated Infrastructure

25.1 Objectives

The objectives of associated **Infrastructure** are as follows:

- All associated **Infrastructure** vested in the **Council** meets **Council's** requirements and standards as set out in this **Manual**.
- In approving associated **Infrastructure**, **Council** will have regard to any future maintenance and operating costs, the likely availability of replacement parts and conformity with any **Council** policy or strategy for example, in relation to greenhouse emissions.
- The urban character and amenity of a locality, neighbourhood or development should not be adversely impacted by the proposed associated in **Infrastructure**.
- The location of the proposed associated **Infrastructure** should not conflict with other existing or proposed services and **Council Infrastructure**.
- Council will consider the requirements of all servicing authorities before giving approval for any particular service.
- The requirements of any relevant Codes of Practice, Australian Standard, regulation or act of parliament will be considered by **Council** before approving the type and location of any associated **Infrastructure**.

25.2 General

The design, documentation and installation of all related **Infrastructure** required to service the development should be in accordance with the relevant Authority's criteria, specifications and instructions.

25.3 Telecommunications

The design, documentation and installation of all related **Infrastructure** required to service the development should be in accordance with the relevant Authority's criteria, specifications and instructions.

Council will expect the **Design Engineer** to liaise with the authority responsible for telecommunications, and coordinate design and construction of the required **Infrastructure**, in association with other works required for the **Development**.

25.4 Gas

The design, documentation and installation of all related **Infrastructure** required to service the development should be in accordance with the relevant Authority criteria, specifications and instructions.

Council will expect the **Design Engineer** to liaise with the Authority responsible for gas **Infrastructure**, and coordinate design and construction of the required **Infrastructure**, in association with other works required for the **Development**.

25.5 Water & Sewer

The design, documentation and installation of all related **Infrastructure** required to service the development should be in accordance with the relevant Authority's criteria, specifications and instructions.

Council will expect the **Design Engineer** to liaise with the authority responsible for water and sewerage **Infrastructure**, and coordinate the design and construction of the required **Infrastructure**, in association with other works required for the **Development**.

Council will expect the **Design Engineer** to ensure that the location and spacing of fire hydrants and fire plugs should be in accordance with the Country Fire Authority's publication "Requirements for water supplies and access for subdivisions in Residential 1 and 2 and Township Zones" (October 9, 2006) or as amended; and the marking of fire hydrants and fire plugs should be in accordance with Fire Service Guidelines on "Identification of Street Hydrants for Firefighting Purposes".

25.6 Electrical

The design, documentation and installation of all electrical **Infrastructure** required to service the development should be in accordance with the Authority responsible for electrical, specifications and instructions.

Council will expect a power supply plan to be provided documenting the supply standard for each lot within Commercial and Industrial **Developments**.

The power supply within any newly constructed road is to be provided in underground conduits. No overhead power is to be constructed in a new road without the written consent of the Council.

Detailed requirements for public lighting are presented in Clause 26 of this **Manual**.

25.7 Emergency Services Telecommunications Authority – Emergency Markers

Council will expect the **Design Engineer** to be responsible for the provision of emergency markers in accordance with the provisions of the Emergency Marker Signage Guidelines.

Emergency Markers can be located, but not be restricted to the following locations:

- Locations with a history of emergency events or known incident sites;
- Locations offering higher risk activities to the visitor, e.g. mountain bike riding, rock climbing, abseiling etc:
- Walking trails and shared paths – Emergency Markers should be located at major trail heads, significant features, or intersections. Emergency Markers on linear trails should be placed approximately every 500m;
- Water bodies, swimming holes, and beach, river or lake access & egress points;
- Piers and Jetties should have a marker at the beginning and end of the infrastructure. Emergency Markers may be placed at intervals of 250 - 500m if the length of the asset warrants;
- Remote areas that act as a thoroughfare or receive significant visitation;
- Recreational playgrounds with no verifiable address points or visible naming convention e.g., a person could not see the signage, describe with certainty the unique feature or the open space was that of a linear path, or large recreation facility with multiple recreations uses, such as more than one oval, bbq area, playgrounds.

Clause 26 Public Lighting

26.1 Objectives

The objective of this section is to ensure the consistent, equitable and environmentally responsible provision of public lighting and to provide public lighting to the appropriate standards that considers the safety and security of all sectors of the community.

26.2 Provision for Public Lighting

Council will expect the **Design Engineer** to ensure that all roads within the new subdivision are provided with public lighting in accordance with the requirements of the relevant Australian Standards. New lighting should be located outside the **Clear Zones** wherever possible, and meet the standards for Category V or Category P lighting, as appropriate.

Category V lighting is applicable on roads where the visual requirements of motorists are dominant, such as sub-arterial roads. Category P lighting is applicable on roads (and other public outdoor areas) where the visual requirements of pedestrians are dominant. These include local roads and outdoor shopping precincts.

Council will expect all public lighting to incorporate the use of energy efficient globes (eg.T5, CF42).

26.3 Lighting Design

Lighting design should be in accordance with the relevant Australian Standards, including the current issue of *AS/ANZ 1158 – Lighting for Roads and Public Spaces.*

Lighting installations for declared State Arterial Roads and associated intersections are reviewed and approved by VicRoads as the responsible coordinating road authority. Copies of drawings should be forwarded to **Council** for assessment after which advice will be forwarded to VicRoads prior to approval..

Allowance for pole locations should be made in all road reserves and offsets should be shown in 'Service Location Tables' on FLP's and Road Construction Plans.

A minimum 800mm offset should be provided from back of kerb to pole for all roads with P category lighting, including laneways and shared zones where kerbing is provided.

A minimum 1000mm clearance is required from face of pole to:

- Edge of **Carriageway** in laneways, shared zones and extended driveways where no kerbing is provided. Kerb outstands may be requested for pole protection in some circumstances.
- Edge of pram crossings and private vehicle crossings within naturestrips.

'Easy Fit' pole bases/foundations are required where maintenance access is restricted (e.g. in laneways, 'paper roads' and shared driveways).

With the exception of lighting in speed zones of 50 km/hr or less, frangible poles should be adopted for roads with V category lighting in accordance with *AS 1158 – Lighting for Roads and Public Places*. The specific pole type (impact absorbing or slip base) should be determined according to VicRoads standards and be nominated on the drawings.

Public lighting is required for all principal footpaths and bike paths within parks and reserves of any development. All cabling for this purpose should be from a metered point of supply at the reserve boundary and **Council** will accept responsibility for the tariff. Bollard lighting is acceptable only in reserves where vertical illumination is not required for the relevant lighting category.

Lighting obstructions (e.g. from existing large trees) should be taken into account when locating poles and assessing luminance requirements.

In rural areas , low density and rural living **Developments** should, as a minimum, provide one light at intersections and one at the end of the court bowl *PRINCIPLE*. This provision may be reduced for short cul-de-sacs where the **Design Engineer** can demonstrate that lesser lighting provision will be sufficient.

The amount and type of lighting, including recommended light technical parameters, in any external public area, is driven by three main considerations:

- The type and quantity of pedestrian and vehicular traffic in the area (to facilitate safe movement).
- The security risk of the area (to discourage illegal acts).
- The need to enhance the amenity of the area (to increase aesthetic appeal).

26.4 Decorative (Non-Standard) Lighting

Council approval is required to use decorative (non-standard) lighting in any area.

Council may determine the boundaries of a street lighting precinct within its urban area so as to have a consistent lighting standard within that precinct.

The manufacture, type and model of the Decorative (non-standard) lighting should be determined after consultation with the **Developers**/landowners within the boundaries of the precinct at the time the precinct boundaries are being determined. The precincts that have been adopted are shown in **Appendix H: Street Lighting**.

Decorative (non-standard) lighting will only be approved in identified precincts. **Council** will not approve the use of decorative (non-standard) lighting in industrial estates.

Decorative or non-standard lighting, lamps and luminaries should comply with the Public Lighting Service Provider's technical requirements and be approved by **Council**.

Council will consider approving use of decorative (non-standard) lighting when subdivisions have a minimum of 50 allotments and when the **Developer** has obtained written agreement from an approved Public Lighting Service Provider for:

- The street lighting design.
- The type of the decorative lighting **Infrastructure** and fittings.
- The applicability of the standard street lighting tariff.

The Public Lighting Services Provider will energise public lighting within the estate only after receiving written notification from the **Council** that the proposed design has been approved.

Unless otherwise specified, all new standard street lighting will be supplied from an underground supply. Overhead supply will only be installed under exceptional circumstances and on a case by case basis, and will require specific approval by the Public Lighting Service Provider.

26.4.1 Decorative (Non-Standard Lighting Fees)

Under the Victorian Electricity Supply Industry guidelines, the **Council**, or the **Developer**, remains responsible for the ongoing supply and replacement of decorative (non-standard) poles and fittings.

In order to compensate the **Council** for additional costs incurred for future maintenance and replacement of decorative (non-standard) fittings, **Council** will expect the **Developer** to:

- Supply all initial stock of poles, lamps, photo electric cells and other fittings.
- Arrange for and meet the cost of all installation to the satisfaction of the **Council** and the Public Lighting Service Provider.
- Accept responsibility for all maintenance and replacement costs of poles and lanterns until the expiry of the defects liability period where decorative lighting is erected.

Council will expect **Developers** to supply replacement damaged or non-operational poles or fittings within 48 hours from notice given by **Council** to allow the Public Lighting Service Provider to arrange the required maintenance and replacement works. After the defects liability period has concluded, the **Developer** may either continue to accept responsibility for providing replacement poles and light fittings as required, or make a cash contribution to **Council** to cover the future replacement and maintenance of the assets. The unit value of any such cash contribution will be based on the purchase price of the poles and lanterns, including ballast, where applicable, applying at the date on which the Statement of Compliance is issued. The total contribution will be based on the value of the number of lights and lanterns as shown in Table 14:

Table 14 Decorative Lighting Contributions

Location	Number of Street Lights in Subdivision	Number if Street Lights Used to Determine Cash Contribution	Number if Lanterns to be Used to Determine Cash Contribution
Within Street Lighting Precinct	0-10	1	2
	11-20	10% of the total number of lights provided in the subdivision.	20% of the total number of lights provided in the subdivision.
	21-50	7.5% of the total number of lights provided in the subdivision.	15% of the total number of lights provided in the subdivision.
	51 plus	5% of the total number of lights provided in the subdivision.	10% of the total number of lights provided in the subdivision.
Not within a Street Lighting Precinct	0-10	1	2
	11 plus	10% of the total number of street lights provided in the subdivision.	20% of the total number of street lights provided in the subdivision.

26.5 Pre-Submission Requirements

Council will expect that, prior to the submission of Public Lighting Plans, a functional layout plan has been endorsed in accordance with the planning permit, and the Design Engineer has confirmed the following matters with Council:

- Lighting design categories for all roads and pathways.
- Locations of all principal pathways in parks/reserves outside road reserves.
- Locations and type of other items/structures that may require public lighting.

For any lighting type not previously accepted by **Council,** the **Design Engineer** should provide full information on the proposed pole and lantern together with details of the current supply and delivery cost of a single unit and likely availability into the future. **Council** will not normally accept items from a limited production line.

APPENDIX A: TYPICAL STANDARD CONDITIONS FOR PLANNING PERMITS

appendices**IDM** standard conditions.doc

APPENDIX B: ENGINEERING APPROVAL PROCESS FOR DEVELOPMENTS

Appendix B approval process.pdf

APPENDIX C: CHECKLISTS AND FORMS FOR DEVELOPER'S REPRESENTATIVES

DESIGN ENGINEER'S CHECKLIST #D1 – TO BE SUBMITTED WITH REQUEST FOR APPROVAL OF FUNCTIONAL LAYOUT

DEVELOPMENT TITLE **STAGE**_____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE**_____

CONSULTANT'S REPRESENTATIVE **NUMBER OF PLANS IN SET** _____

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General		
The design is in accordance with the planning permit conditions and the endorsed plan.		
Do other planning permits affect this development? (if yes, list permit numbers)		
The design in accordance with the ODP.		
The functional design is in accordance with Council's Infrastructure Design Manual.		
Consultation has taken place with all relevant authorities, as listed: (attach separate list if necessary).		
Consultation has taken place with all relevant landowners and affected persons, as listed: (attach separate list if necessary).		
The Design Engineer has inspected the site.		
A detailed field survey has been undertaken of the site.		
Environmental values of the site have been identified.		
Protection of native vegetation and habitat has been considered and is reflected in lot layout and overall design.		
Revegetation requirements have been considered and are documented.		
Protection of water bodies and waterways has been considered.		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Service location plans have been obtained for ALL services.		
Plans clearly show allotment layout, with allotments numbered and dimensioned, reserves clearly identified and proposed easements shown.		
Road Layout Plans		
Street names are nominated.		
Plans show Road Hierarchy.		
Estimated traffic volumes are shown on plans (for each stage of any staged developments).		
Road widths between inverts of kerbs are nominated.		
Road reserve widths are clearly nominated on plans.		
Kerb profiles are nominated.		
Public transport, including DOT, requirements have been reflected in the road widths.		
Local area traffic management has been considered and reflected in proposed designs.		
Intersections internal to the development are shown in sufficient detail to support proposed design, including proposed kerb radii.		
Intersections external to the development are shown in sufficient detail to support proposed design.		
Critical vehicle turning movements are shown on separate plans, including turning at intersections and cul-de-sacs.		
Plans show traffic implications of staged development if relevant.		
Carpark Layout Plans		
Carpark layout plan shows on-street, off-street and disabled parking as required.		
Drainage Layout Plans		
The total catchment area has been identified and is shown for review.		
Plans show Natural Surface Contour Lines to AHD.		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
100 year **ARI** flood levels are identified on plans.		
Plans show approximate Design Contour Lines to AHD.		
Proposed sub-catchment boundaries are shown on drainage layout plan.		
Plans show the co-efficient of runoff for each sub-catchment.		
Plans shown layout of proposed drainage systems with approximate sizes.		
Pipe materials are nominated.		
Overland flow path is nominated and approximate depth of flow is shown.		
Drainage discharge point is shown.		
Proposed treatment shown in sufficient detail to support approval of functional layout.		
Existing drainage services are confirmed on plans and proposed connection points shown.		
Plans show drainage implications of staged development if relevant.		
Associated Documents		
A Traffic Management Report was prepared and accompanies this submission.		
Note any deviations between the proposed design and the recommendations within the Traffic Management Report.		
The need for Developer contributions or headworks charges has been identified and a preliminary cost-sharing proposal to Council for early consideration.		

The plans provided with this submission for approval of functional layout have been prepared in accordance with the relevant sections of the Council's Manual. All of the above checklist items have been initialled as correct and complete, or marked N/A (not applicable) as appropriate.

Signed _____ Dated _____

DESIGN ENGINEER'S CHECKLIST #D2 – REQUEST FOR DETAILED DESIGN APPROVAL

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE** _____

CONSULTANT'S REPRESENTATIVE **NUMBER OF PLANS IN SET** _____

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General Design Requirements		
The detailed design is in accordance with the planning permit conditions and the endorsed plan, and physical design features incorporated on construction plans.		
Plan of subdivision has been certified at the time of this submission?		
The detailed design is in accordance with the plan for certification?		
Easement locations and widths are in accordance with certified plan?		
The detailed design is in accordance with Council's Infrastructure Design Manual.		
Environmental protection during development construction has been considered and requirements are documented (e.g. erosion protection, silt migration etc.)		
Revegetation requirements have been considered and are documented.		
Protection of water bodies and waterways has been considered and requirements are documented.		
List approvals already received from other service authorities.		
General Plan Requirements		
Drawing list is presented.		
Council-nominated drawings numbers are shown.		
Locality plan is presented.		
North arrow is shown on all layout plans and detailed plans (should be shown up or to left).		
All plans have correct scales shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
All plans have comprehensive legends.		
Do plans include standard notes? Are they applicable and clear?		
Plans clearly show allotment layout, with allotments numbered and dimensioned, and reserves and easements are clearly identified.		
Limit of works is shown on all layout plans in set.		
Dams, wells, depressions and watercourses are identified and fill requirements identified.		
Existing fill areas are shown.		
Existing features and structures are shown.		
Existing service locations and poles are shown.		
Existing trees are shown. Does design attempt to retain trees?		
Existing native vegetation is shown and suitably specified? Does design attempt to retain significant native vegetation?		
Road Layout Plans		
Datum shown to AHD.		
Scales are in accordance with the Manual requirements.		
PSM's and TBM's marked on plans.		
Proposed service locations and offsets are tabulated.		
All required service conduit locations are indicated on the plans.		
Footpaths minimum width of 1.5 m, and located at correct offset.		
Shared paths minimum width of 2.5 m, and location clearly shown.		
Kerb crossings are at appropriate locations and are fully documented.		
Vehicle crossings are shown on plans.		
All vehicle crossings cater for standard car.		
Are any crossings located over easements?		
Are any crossings located closer than 9m to the intersection?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
All turning movements have been checked in accordance with Manual, and intersections designed accordingly.		
Street names are shown on plans and have been approved by Council.		
Road widths between inverts of kerbs are nominated.		
Kerb profiles are nominated.		
Road chainages are shown.		
Street Name Signage, Linemarking, and Traffic Control Plans		
Locations and type of all new signage is shown on plans, and comply with Australian Standards.		
Any existing signage to be removed or relocated is shown on plans.		
Locations and type of all linemarking is shown on plans, and comply with Australian Standards.		
Any existing linemarking to be removed is shown on plans.		
Traffic calming devices are designed and documented in accordance with Austroads "*Guide to Road Design"* and any VicRoads supplement to those guidelines and the Manual, and as per approval of functional layout.		
Limit of works of roads include temporary turning area if required. 'No Road' signage or hazard markers to be provided unless otherwise agreed with Council.		
Road Longitudinal Sections		
Road names are shown on longitudinal sections.		
Scales are in accordance with the Manual requirements.		
Datum RL to AHD shown.		
Natural surface profile and levels shown at crown.		
Design surface profile and levels shown at crown.		
Levels have been checked by Design Engineer and (i) comply with Manual, and (ii) match into existing.		
Depth of cut/fill to crown is shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Design surface profile and levels shown at left and right back of kerb (including high and low points).		
Gradings as + or – percent to two (2) decimal places shown in direction of chainages.		
Grades have been checked by Design Engineer and (i) comply with Manual, and (ii) match into existing. Min. grade = % Max. grade = % Match existing?		
All vertical curve lengths and I.P values are shown.		
Vertical curve levels are shown at maximum intervals of 10 metres.		
Minimum kerb grades are achieved.		
Levels and grades given on long sections have been checked by the Design Engineer.		
Check levels and grades match into existing abutting roadworks.		
Minimum length of vertical curve for >1% grade change to be 15 m (except on kerb returns).		
External road grading for future stages to extend a minimum of 100 metres.		
Vertical curves and longitudinal grades provide satisfactory sight distances for standard roads, particularly at intersections.		
Coordination of vertical and horizontal curves has desirable design outcome? Is vertical curve entirely within or outside horizontal curve?		
Road Cross-Sections		
Design Engineer has checked that cross-sections agree with longitudinal sections.		
Datum is shown on every cross-section.		
Scales comply with Manual.		
Road names and chainage references are shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Natural and design levels are given at: • Back of kerb. • Lip of kerb. • Crown. • Property lines. • Front of footpath. • Table drain inverts (where applicable). • Top and toe of batters (where applicable).		
All crossfalls are in accordance with the Manual: - pavements - nature strips - footpaths – batters.		
Typical Cross-Sections and Traffic/Road Details		
Typical cross-sections are presented in accordance with the 'Information to be Shown on Plans' requirements of the Manual.		
Typical cross-sections note road name and chainage references, if applicable.		
Profile and geometry of design surface grades are shown as % or 1 in X and comply with Manual requirements.		
Details of road pavement construction, including materials, compaction and type of seal are shown.		
Details of footpath construction, including materials, compaction and seal are shown, or standard drawing noted.		
Typical alignment of services, subsoil drainage and landscaping are shown.		
Kerb and channel types are nominated.		
Kerb and channel construction is detailed or standard drawings noted.		
Intersection, Court and Curve Details		
Road names are shown.		
Road chainages are shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Intersection details are shown at correct scales in accordance with Manual.		
At least four kerb levels are given on every kerb radial.		
Tangent point levels and chainages align with longitudinal and cross sections.		
Set-out details are shown including angle, radii and tangent points.		
Design Surface contours are shown to AHD at 50 mm maximum intervals.		
Back of kerb levels are shown to AHD.		
Footpath levels are shown.		
Locations of low points are shown.		
Services (inc drainage) are shown in detail.		
Landscaping is shown in detail.		
Footpath and kerb crossings are shown in detail.		
Drainage Layout Plans		
Design Engineer has checked that drainage design in accordance with AR&R.		
Datum shown to AHD.		
Scales are in accordance with the Manual requirements.		
PSM's and TBM's marked on plans to AHD.		
Finished surface levels are shown where the natural surface is altered.		
Plans clearly show allotment layout, with allotments numbered and reserves and easements are clearly identified.		
1 in 100 year flood levels shown.		
Road names are shown.		
Plans shown layout of proposed drainage systems with offset from property boundaries.		
Pipe materials and diameters are shown.		
Concrete pipes are to be RRJ only.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Non-concrete pipes have Council approval.		
Non-concrete pipes to bed, lay and joint and backfill in accordance with manufacturer's specifications.		
Overland flow path is shown and outfall has Council approval.		
Kerb and channel and footpath is depressed where overland flow path leaves road pavement.		
Subsurface drains, house drains and property inlets are shown.		
Pits are at appropriate locations (e.g. away from kerb returns, vehicle crossings, kerb crossings etc.).		
Pit spacing is 80m maximum.		
Pit capacity checked by Design Engineer.		
Double SEP's at confined low points only.		
Change in angle is not greater than 90°.		
Pits/headwalls are numbered.		
Set-out point of pits is clearly shown on legend.		
Footpath spoon drains have adequate outfall.		
Back of kerb drainage (e.g. roundabout kerbs) has adequate outfall.		
All existing fences, buildings, trees etc shown in path of overland flows.		
All proposed fences, buildings, trees etc shown in path of overland flows.		
Existing or proposed open earth drains, dams, watercourses, boreholes, sink holes, wells and springs within the area are shown.		
Extent of required erosion protection is shown at headwalls and other structures.		
Drop structures are shown.		
All properties have identified drainage discharge points (to underground drainage systems for industrial and commercial developments, and residential wherever possible).		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Drainage Longitudinal Sections		
Longitudinal sections are prepared for all legs of drainage, and for open drains, and nominated overland flow paths.		
Scales are in accordance with the Manual requirements.		
Comprehensive legend is shown.		
Datum RL to AHD shown.		
Drainage line numbers names are shown on longitudinal sections.		
Drainage line chainages are shown on longitudinal sections.		
Lengths of drainage sections do not exceed 80 metres.		
Pipe diameter, class and grade are shown for all legs of drainage.		
Pipe classes have been determined with consideration to construction loads, not just final cover. Cross-check compaction requirements in documentation.		
Pipes with steep grades are documented to include anchor blocks.		
Pit number and pit type is shown.		
Pit type matches capacity requirements.		
Any special pits are fully documented.		
Internal pit dimensions are shown.		
Pit inlet and outlet levels are shown.		
Depths of pits to invert levels are shown.		
Finished top of pit levels and finished surface level adjacent to pits are shown.		
Pit lid type and class are shown.		
Origin/destination pits for inlet and outlets.		
Junction line numbers are noted.		
Design pipes are plotted on longitudinal section.		
Hydraulic grade line is plotted and levels given.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Check that maximum depth in roadway is 500mm (i.e. at invert).		
Check that depth x flow factor is acceptable.		
Required 150mm freeboard to kerb invert is achieved for minor storms.		
Energy losses in drainage system are accounted for.		
Crosses with other services are plotted and clearances nominated (street names should be referred to identify crossings).		
Design flows are shown (litres/second).		
Design velocities are shown (metres/second) and comply with Manual.		
FCR backfill is specified under road pavements, footpaths, crossovers and building lines.		
The location and type of special backfill requirements are noted (e.g. to prevent piping of backfill material).		
Design is in accordance with AS3725 and its commentary.		
Open Drains		
Shape of drain is suitable for maintenance.		
Drain is accessible from both sides and all-weather tracks provided.		
Depth of floodways is shown on cross-sections and less than 1.5 metres.		
Scour velocities and siltation were both checked in determining longitudinal grades.		
Grade control / drop structures are fully documented.		
Low-flow pipe has been provided in accordance with the Manual.		
Outfall structures are provided and energy dissipators provided if needed.		
300mm minimum freeboard is achieved.		
Detail Plans		
Non-standard drainage structures are fully detailed for construction - headwalls - drop structures - erosion protection at outlet structures - erosion protection for batters where needed.		
Non-standard pits are fully documented including reinforcement and pit lid details.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Structural details of all retaining walls are shown, as well as details of natural surface levels and design surface levels, foundation requirements, drainage requirements, and type of finish.		
Details of street furniture.		
Drainage pump stations fully documented.		
Layout and details of power installation documented.		
Details of any estate entrance structures, including structural details, location details and method of finish.		
Traffic calming devices are fully detailed to ensure construction is in accordance with design requirements (e.g. splitter islands, chicanes, speed humps, roundabout construction).		
Lotfilling Plans		
Natural surface contours are shown with 50 mm maximum intervals.		
Design surface contours are shown with 50 mm maximum intervals.		
Finished surface levels are shown and all allotments have minimum 1 in 200 grade toward low point.		
1 in 100 year flood levels to be shown on plans and all lots to be filled to above these levels.		
Proposed fill in excess of 300mm is clearly denoted on plans.		
Material and compaction requirements are fully documented to relevant Australian Standard in either plans or specification.		
Extent of lotfilling, top and toe of batters and retaining walls all noted.		
Drainage Retardation and Treatment		
Computations are provided to verify the volume of the basin.		
Erosion protection is fully documented.		
Inlet structures are fully documented.		
Overflow is identified and appropriate.		
Freeboard is achieved.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Wetland plantings have alternative source of water for establishing plants and for periodic dry spells.		
Master Services Plans		
Plans show numbered allotments, road reserves and road carriageways.		
Street light types are nominated for approval.		
ALL underground service alignments are shown, including non-essential services such as gas, raw water and irrigation lines and also includes fire hydrants and fire plugs.		
ALL major aboveground features are shown such as street lights, power supply pillars, fencing, landscaping etc.		
Landscaping Plans		
Detailed irrigation layout plans is provided showing valves, controllers, pipe material and sizes, alignments, nozzle details, and backflow devices.		
Planting schedule is included, including size of plants.		
Location of major plantings is clearly shown.		
Planting requirements are documented including dimension of hole, root barrier, backfill, mulch, stakes, tree grates, tree guards, and stakes are details.		
Street furniture is detailed including type, colour, location and installation.		
Associated Documents		
If required, a TMAR was prepared and accompanies this submission.		
If required, a TIAR was prepared and accompanies this submission.		
If required, a Road Safety Audit Report was prepared and accompanies this submission.		
Note any deviations between the proposed design and the recommendations within the Road Safety Audit report.		
Hydrological calculations are provided for whole of catchment and partial areas if relevant, and 100yr ARI design flows calculated at critical points. (Method nominated and assumptions clearly stated ARI's in accordance with Manual.)		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Hydraulic calculations are provided for above and underground drainage, for major and minor storm events. (Method nominated and assumptions clearly stated. Roughness coefficients nominated).		
Copy of geotechnical reports are provided with submission.		
Road pavement design is provided with submission.		
Quality assurance sections are included in specification.		
Risk assessment report is provided for drainage retardation and treatment Infrastructure.		
Operation and maintenance (O&M) manuals are provided with this submission?		
Structural computations are provided, where applicable, with this submission?		

The plans, specifications and associated documents provided with this submission for detailed design approval have been prepared in accordance with the relevant sections of the Council's Manual. All of the above checklist items have been initialled as correct and complete, or marked N/A (not applicable) as appropriate.

Signed_____ Dated _____

DESIGN ENGINEER'S CHECKLIST #D3 – REQUEST FOR FINAL DESIGN APPROVAL

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE** _____

Consultant's Representative **Number of Plans in set** _____

CHECKLIST #D3		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
GENERAL		
Detailed design approval was received from Council – note date.		
The final design is in accordance with the planning permit conditions and the endorsed plan, and physical design features incorporated on construction plans.		
Plan of subdivision has been certified at the time of this submission?		
List approvals already received from other service authorities. 25.3 25.4 25.5		
Plans		
Final plans reflect amendments required by Council under previous reviews?		
Other		
Engineer's estimate is provided with this submission?		
Are separate streetscaping/landscaping plans included?		

The plans, specifications and associated documents provided with this submission for detailed design approval have been prepared in accordance with the relevant sections of the Council's Manual. All of the above checklist items have been initialled as correct and complete, or marked N/A (not applicable) as appropriate.

Signed_____ Dated_____

DESIGN ENGINEER'S FORM #D4 – INTENTION TO COMMENCE CONSTRUCTION

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE** _____

DESIGNER

Works within Road Reserve Permit Number

We hereby advise the (Insert the name of the relevant **Council**) that construction of the above-mentioned development is due to commence. The following information is provided:

1. The Developer's Representative during construction is _____ (for formal notices as required)
2. The Construction Engineer during construction is _____ (for daily liaison on engineering matters)
3. The Contractor appointed to carry out construction _____
4. The Contractor's nominated representative on site is _____
5. Other related parties include _____
6. The proposed date of the commencement of works is _____

The following documentation accompanies this notice:

- Construction Program.
- Inspection and Test Plans.

Signed_____ Dated_____

CONSTRUCTION ENGINEER'S CHECKLIST #D5 – REQUEST FOR ACCEPTANCE OF WORKS INSPECTION

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REPRESENTATIVE** _____

CHECKLIST #D5		
THE FOLLOWING ITEMS HAVE BEEN COMPLETED	**Y / N / NA OR COMMENT**	**CONSTRUCTION ENGINEER'S INITIALS**
All road construction works are complete.		
Signs are in place in accordance with the approval plans.		
Linemarking is complete.		
All drainage works are complete, clean and ready for inspection.		
Fencing works are complete if required.		
Pump stations have been commissioned or are ready to be commissioned at the Acceptance of Works inspection (note that O&M manuals are to be provided one week prior to commissioning, draft manuals are acceptable).		
Footpaths and kerb crossings are complete.		
Nature strips are reinstated and in a tidy manner.		
Earthworks at the site have been completed.		
Fire hydrants and fire plugs have been installed and marked in accordance with fire authority's requirements.		
Erosion protection works are complete.		
Litter traps are complete.		
Street lighting is complete.		
Landscaping is complete.		
Streets have been swept.		
Installation dates for any major traffic control items have been provided to Council.		

All construction works should be complete prior to calling for an Acceptance of Works inspection. Any outstanding works should be noted below:

An Acceptance of Works inspection is requested of Council. Proposed date and time: _____

Signed _____ Dated _____

APPENDIX D: INFORMATION TO BE SHOWN ON PLANS

MINIMUM REQUIREMENTS FOR ALL PLANS

The following information should be shown on all plans submitted to Council:

- Development or Project Title, including stage if applicable.
- Planning Permit reference if applicable.
- Scales.
- Plan No. and Sheet No.
- Schedule and date of amendments.
- Signed Design Certification, by a **Qualified Engineer.**
- Signed Checking Certification, by a **Qualified Engineer.**

ROAD LAYOUT PLANS

Road layout plans should as a minimum show the following:

- North arrows and appropriate scale bars.
- Limit of Works to be constructed including ALL connections to existing work.
- All proposed allotments and reserves within the development.
- Allotment numbers and dimensions.
- All easements and land acquisitions.
- All streets to be constructed, including proposed street names.
- Existing and proposed PSM's and TBM's.
- Chainages on traverse lines at all tangent points and cross-sections (at intervals of not more than 20 metres, along the centre line of roads).
- Kerb radii (to back of kerb) and kerb type and offsets.
- Footpaths, bicycle paths, and/or shared paths, and all pedestrian kerb crossings to concord with the Disability Discrimination Act. Levels should be sufficiently documented to demonstrate compliance with requirements of Australian Standard AS1428 'Design for Access and Mobility'.
- Service conduit positions, including water, stormwater, telephone and electricity conduits where required (locations to be marked on footpaths or kerbs during construction).
- Locations of all existing driveways, drains, pits, services (existing and proposed) and poles.
- Street name signs at all intersections.
- All existing and proposed fill areas and depths of fill.

- All probable or known slip areas and unstable area.
- Set out detail for all horizontal curves.
- Locations and description of roadside furniture and regulatory warning and guide signs where required.
- Linemarking.
- Extent of sight benching.
- Locations of culvert crossings and hard-standing areas for vehicle access into allotments.

ROAD LONGITUDINAL PLANS

Road Longitudinal Section plans should as a minimum show the following:

- Centreline chainage.
- Street name.
- Centreline and top of kerb levels required at lease every 20 metres on straight grades and a maximum distance of 10 metres on vertical curves, at all tangent points, changes of grade, low points and at each end of vertical curves.
- Plot of each proposed top of kerb, back of path and existing surface level on title boundaries.
- Length of vertical curves and intersection points.
- Kerb and centreline grades.
- Grading on rural roads to include a grading of table drains on the same section.
- Location of intersecting streets and court bowls, including temporary court bowls for streets that are constructed in stages.
- Road grading a minimum distance of 100 metres beyond the end of works.
- Kerb levels shown on returns at quarter points in addition to tangent points. This may be tabulated as an alternative.
- Kerb returns grading showing the grading into the adjoining street. Note this is not required if detailed contours are provided.
- In courts, grading of the kerb around the court bowl.
- Level and location of all existing services to be in conflict with proposed works.
- Datum RL.
- Low points indicated.

Road Cross-Section Plans

Cross-section should be drawn for chainages at 20 metres on straight grades and a maximum of 10 metres on vertical curves Cross-sections should also be shown at all tangent points and at extreme changes in existing surface conditions. Road cross-section plans should as a minimum show the following:

- Levels of existing surface for the full width of the road reserve.
- Street name.
- Design levels for kerb, footpaths and road pavement for urban works.
- Position and level of crown of road.
- Extent of batters and open drains.
- Existing buildings on adjacent allotments abutting streets including floor levels.
- Location and level of existing services (level where there is to be a conflict with proposed works).
- Road chainage of cross-section.
- Datum RL.
- Pavement boxing profile indicated.
- Road reserve boundary and details at title boundaries.

Typical Road Cross-Sections

Typical cross-sections should be included in documentation where applicable and should show the nature and location of the following:

- Profile and geometry of finished surface.
- Location of subsoil drainage and conduits for services.
- Details of footpath and road pavement profile.
- Cut/fill batter slopes.
- Kerb and channel type.
- Kerb and channel offsets from title boundaries.
- Drainage location.
- Service Infrastructure location and typical details.
- Pavement materials, compaction requirements and nominated seal.
- Road reserve width.
- Road **Carriageway** width (between kerb inverts).

Intersection and Court Details

Details should include:

- All kerb types, driveways, crossings, footpaths and kerb crossings.
- Street Names.
- Grades and vertical curves.
- Contours on all finished road pavements indicating surface drainage flow.
- Road chainages.
- Proposed top of kerb and footpath levels.
- Location of low points.
- Levels at all tangent points, along crown of road and crown/high point in court bowl.
- Radii sizes and tangents points.
- Set out details for all horizontal curves.
- A minimum of four kerb levels around kerb returns.
- Location of all stormwater pipes and pits.
- Land acquisitions and easements.
- Scale Bar.
- Other Services.

Drainage Layout Plans

Drainage layout Plans should as a minimum show the following:

- Limit of Works to be constructed including all connections to existing work.
- All proposed allotments (numbered), reserves and easements within the development
- All streets to be constructed, including proposed street names.
- Existing and proposed PSM's and TBM's.
- All drains to be constructed, including stormwater treatment structures and outfall drains.
- Existing surface levels at the corners of all allotments and all significant changes of grade within the allotment, or alternatively contour information of sufficient detail to show same.
- Flood levels where applicable.
- Drainage Pipe diameters and offsets from property boundaries to pipe centreline.

- Drainage Pit numbers.
- Subsurface drains, house drains and property inlets.
- All existing fences, buildings, trees, etc on the street alignment or land through which drains or flow paths are intended to pass.
- Existing or proposed open earth drains, dams, watercourses, bore holes, sink holes, wells and springs within the area.
- Existing dams and water course, boreholes, sink holes, wells and springs within the area.

Drainage Longitudinal Sections

A drainage longitudinal section for each leg of drainage should be plotted regardless of the length of the leg. Drainage longitudinal sections should as a minimum show the following:

- Centreline chainage.
- Existing and finished surface levels at 20m spacing maximum, and at all grade changes.
- Invert level of pipe at the inlet and outlet to pits.
- Datum level.
- Pit description.
- Depth to invert of pits from finished surface.
- Pipe size, grade, class and material.
- Actual velocities, actual discharge and pipe capacity.
- Plot of design pipe.
- Plot of hydraulic grade lines and levels.
- Pit numbers (as allocated by Engineering Design Services).
- All existing services on the section where the designed pipe crosses.
- A pit schedule detailing:
    - Pit number.
    - Pit type.
    - Internal dimension of pits.
    - Inlet and outlet levels.
    - Pipe sizes.
    - Finished top of pit level.

- Depth of pit.
- Pit lid details.
- Comments specific to pit.

- The location of the pipe (i.e. Street name, reserve, lot number) on the longitudinal section.
- The location and type of special backfill in trenches.
- Street names relevant to road crossings.

Drainage Retardation and Treatment Drawings

On-Site detention and drainage retardation drawings should as a minimum show the following:

- Limit of Works to be constructed including all connections to existing and proposed work.
- Property boundaries and easements within the limit of works.
- Areas of fill greater than 300mm depth.
- Existing and proposed PSM's and TBM's.
- Flood levels where applicable.
- Drainage Pipe diameters and grades.
- Drainage Pit numbers.
- All existing or proposed fences, buildings, trees, Public Open Space features in the vicinity of the works.
- Invert levels of all inlet and outfall structures including pipes and open drains.
- Surface levels and freeboard.
- Batter slopes and grades of basin floor.
- Orifice plate details or similar for on-site detention systems.
- Top Water Levels during both the minor storm event and 100 ARI storm event.
- The hydraulic grade line in the inlet pipe/drain for both the minor storm event and the 100 ARI storm event.
- Invert levels and cover levels of associated pits and litter traps.
- Design catchment and storage volume requirements.
- Planting schedules for wetlands including quantity and species of all plantings.

Detail Drawings

Detail drawings should as a minimum show the following:

- Structural details of retaining walls.
- All special drainage structures.
- Method of downstream erosion control at endwalls.
- Method of erosion control for batters in areas susceptible to erosion.
- Structural pits, switching mechanisms, operating levels and pump details for pump stations.
- Structural details of any Estate entrance structures.
- Details of street furniture.

Landscape Drawings

Landscape plans should as a minimum show the following:

- Planting schedules and any specific planting requirements such as size of hole, root barriers, fertiliser etc.
- Location and spacing of all trees, shrubs and plants etc.
- Location and details of any trees or vegetation to be removed.
- Irrigation details including metering, backflow prevention devices, pipe diameter and materials, valve details.
- Path, bollard and fencing construction details.
- Street furniture and signage details including type, location and fixing requirements.
- Lighting details.
- Supply and installation details of playground equipment.
- Open water bodies to cross reference to other retardation basin or drainage plans.
- Details of services within landscaped areas.

Master Services Plans

Master Services Plans should as a minimum show the following:

- Drainage, treated/potable water, fire hydrants, fire plugs, raw water, sewer, Telstra, gas, electrical, private works.
- Trench alignments of all services within the limit of works (single line representation for shared trench).
- All pits to scale and street lighting to be shown.
- Any structural or mechanical protection if applicable.
- Kerb alignments and kerb crossings.
- Clear identification of incidents where minimum vertical or horizontal clearances are not achieved and detail of actual clearance.

As Constructed Drawings

As Constructed plans should detail all design information and highlight any deviation from the approved design plans.

Council will expect As Constructed drawings to be provided in pdf format as a minimum.

APPENDIX E: LIST OF COUNCIL INSPECTIONS AND INSPECTION CHECKLISTS

The following represents the minimum number of Council inspections and are considered hold points:

- Pre-start for civil works.
- Pre-start for landscaping works.
- Prior to covers being placed in pits.
- Prior to placement of kerb and channel.
- Prior to pouring footpath (excluding City of Greater Bendigo, Wellington Shire, Central Goldfields Shire, Baw Baw Shire, Moira Shire and Pyrenees Shire Council see witness points below).
- At proof-rolling of sub-grade.
- Prior to placement of each pavement course.
- Prior to placement of the primer coat.
- Prior to the placement of first asphalt course or sealing.
- Prior to pouring concrete on large reinforced concrete structures.
- Prior to placement of GPT's, litter traps, precast pumpstations.
- Prior to planting out wetlands.
- Prior to removal of native vegetation and other existing vegetation.
- Prior to planting (landscaping).

The following are witness points (Council are made aware of the works but works are not held up awaiting inspection).

- Prior to backfilling stormwater drains.
- Prior to backfilling subsoil drains.
- Prior to pouring footpath (For Greater Bendigo City Council, Wellington Shire, Central Goldfields, Shire Moira Shire and Pyrenees Shire Council only).

PRE-START MEETING CHECKLIST - LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Contact details between superintendent, Council and contractor been exchanged?	☐	☐	☐	
Has MOU for supervision responsibility been signed?	☐	☐	☐	
Copy of Council approved construction plans available for viewing	☐	☐	☐	
Check whether there is an approved environmental management plan and checked requirements?	☐	☐	☐	
Copy of works program been viewed by Council to plan inspections?	☐	☐	☐	
Are any works proposed in existing road reserve?	☐	☐	☐	
If yes to above, has contractors public liability certificate of currency been sighted and traffic management plan approved?	☐	☐	☐	
Any special design requirements considered?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRIOR TO PLANTING – LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Weeds removed?	☐	☐	☐	
Topsoiling in place?	☐	☐	☐	
Mulching in place?	☐	☐	☐	
Watering system in?	☐	☐	☐	
Civil Works Complete (i.e. outfall to wetlands, footpaths through parks etc)	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRELIMINARY ACCEPTANCE INSPECTION-LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Watering system turned on and demonstrated to operations?	☐	☐	☐	
Plantings in place and alive?	☐	☐	☐	
Mulching in place?	☐	☐	☐	
Trees staked and tied and minimum offset from kerb	☐	☐	☐	
Traffic islands and nature strips don't have rutting from vehicle traffic?	☐	☐	☐	
All required structures are in place and completed? (i.e. Playground, footpaths, bollards etc)	☐	☐	☐	
Batters are stable and are not scouring?	☐	☐	☐	
Access is provided and bollards restricting access are in place?	☐	☐	☐	
Provision of maintenance instructions?	☐	☐	☐	
Provided asset list for handover?	☐	☐	☐	
Has Council's maintenance staff been notified?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

FINAL ACCEPTANCE INSPECTION – LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	Yes	No	Not Required	Comments
Plants alive and in place?	☐	☐	☐	
Trees staked and tied	☐	☐	☐	
Islands and nature strips don't have rutting from traffic?	☐	☐	☐	
Mulching in place?	☐	☐	☐	
Top soil has not subsided?	☐	☐	☐	
Batters are stable and are not scouring?	☐	☐	☐	
Access is provided and bollards restricting access are in place?	☐	☐	☐	
Final Acceptance Issued	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRE-START MEETING CHECKLIST – CIVIL WORKS

SUBDIVISION FILE NO. _____

PLANNING PERMIT NUMBER _____ **DATE OF MEETING:** _____

NAME OF DEVELOPMENT AND STAGE: _____

LOCATION: _____

PERSONS PRESENT AT THE MEETING

Principal (Developer) _____

Principal (Developer's) Representative _____

Superintendent / Consultant _____

Construction Engineer _____

Council Representative _____

Principal Contractor _____

CONTACT DETAILS (INCLUDE MOBILE PHONE AND EMAIL DETAILS)

Principal _____

Principal's Representative _____

Superintendent / Consultant _____

Construction Engineer _____

Council Representative _____

Principal Contractor _____

DESCRIPTION OF WORK TO BE CARRIED OUT

Principal Contractor 1 _____

_____

_____

Contractor 2 _____

_____

_____

Contractor 3 _____

_____

GENERAL MATTERS

1. Construction Works should commence before (refer to contract and planning requirements); date.....
2. Time for the Works to be Completed (refer to contract).....month/year
3. Defects Liability Period (refer to the contract)
    a. Roads and Drainage Works .....months/years
    b. Landscaping Works .....months/years
    c. Others as listed below:

    .....
    .....
    .....

4. Specific Maintenance Periods Identified (refer to the contract):
    a. Roads and Drainage Works .....months/years
    b. Landscaping Works .....months/years
    c. Others as listed below:

    .....
    .....
    .....
    .....

5. Guarantee Amount for Soft Landscaping ..... %

HOLD POINTS AND WITNESS POINTS

1. Hold points (delete any that are not required) as specified in Clause 7.4 of the IDM and listed in Appendix E of the IDM
    a. Pre-start for Civil Works
        i. Prior to pouring concrete on large reinforced concrete structures and footings.
        ii. Prior to placement of GPT's, litter traps, precast pumpstations.
        iii. At proof rolling of subgrade
        iv. Prior to the placement of each pavement course
        v. Prior to placement of kerb and channel
        vi. Prior to pouring of footpaths and driveways
        vii. Prior to the placement of the primer coat
        viii. Prior to the placement of first asphalt course or sealing.
        ix. Prior to covers being placed on pits
        x. Prior to placement of each fill layer
        xi. Prior to construction of table drains
        xii. Prior to construction of retaining walls
    b. Pre-start for Landscaping Works
        i. Prior to planting out wetlands.
        ii. Prior to removal of native vegetation and other existing vegetation.
        iii. Prior to planting (landscaping).
2. Witness Points (delete any that are not required) as required by Clause 7.4 of the IDM and as listed in Appendix E of the IDM

a. Prior to the backfilling of stormwater drains
b. Prior to backfilling subsoil drains
c. Prior to pouring of footpaths and driveways (when not a hold point)
d. Prior to connection of house and property connections to stormwater drains

3. Other Inspections (delete any that are not required)
   a. Acceptance of Works
   b. Release From Defects Liability
   c. Others as listed below:

_____
_____
_____
_____
_____

INFORMATION TO BE PROVIDED AND APPROVED BEFORE WORKS COMMENCE

Construction Management Plan	Provided	Approved	Comments
Inspection and Test Plans	Provided		
Environmental Management Plan	Provided	Approved	Comments
Traffic Management Plan	Provided	Approved	Comments
Works Program	Provided	Approved	Comments
Works Within Road Reserves Permit	Provided	Approved	Comments
Relevant Insurance Certificates	Provided		
Site Induction	Provided		
Nominated Working Hours	Provided		
Source of Pavement Materials	Provided		
Quality Plan	Provided		
Health and Safety Plan	Provided		
Coordination Plan	Provided		

Have the requirements of any planning permit conditions which include the words “prior to works commencing” been satisfied? Yes No

ROLES AND RESPONSIBILITIES

All Parties

1. Objective is to provide economical, fit for purpose infrastructure to meet the requirements of Council as generally specified in the IDM.

2. Must meet their obligations under law, common law and regulations.

Principal (Developer)

1. Is responsible for appointing the following persons as appropriate to the size of the development:
    a. Superintendent when there is a contract for the works (will be appointed where there is a contract between the developer and the contractor)
    b. Consultant (appointed at the discretion of the developer) – (Clause 2 of IDM)
    c. Construction Engineer (will be appointed unless otherwise approved in writing by the Council – (Clause 2 of IDM)

    The Principal will nominate which of these parties will be appointed as the Principal's representative noting that the Superintendent is the preferred nominee where there is a contract in place to deliver the works.

2. Is responsible for delivering the development in accordance with the Council approved plans.
3. Lodge a Guarantee of Work with Council prior to the issue of the Statement of Compliance. The guarantee may be in the form of bank guarantee, cheque, surety bonds (where approved by Council) or cash and may be used for rectification of any and all design and construction defects. Bank guarantees shall have no expiry date noted on the guarantee. Where a cheque is lodged, the guarantee shall only be considered received after the bank has cleared the cheque.

    The guarantee shall be to the minimum value of 5% of the total cost of roads, drainage and hard landscaping, and the calculated amount shall be based on the priced Bill of Quantities. The guarantee shall be lodged with the Council for the term of the Defects Liability Period. If differing periods are nominated for different Infrastructure, the Developer may choose to lodge individual bank guarantees, or a single bank guarantee for the whole amount to be held.

4. The Principal shall ensure that at all times there is a Superintendent, who acts in accordance with the requirements of AS2124/AS4000 where there is a contract signed for the delivery of the works.
5. Ensuring that all necessary and other permissions to undertake the Work are obtained, prior to the start of works.
6. Ensure that a video or photographic survey of the constructed assets to be vested in Council prior to the time of the Acceptance of Works so that any damage that occurs during the Defects Liability Period can be assessed to determine whether the damage is a result of faulty workmanship or the result of actions outside the control of the Contractor.
7. Ensure that any testing required by the Council (as already defined in the IDM), as listed this record, to enable Council to ascertain whether the assets that are to be vested in Council meet the standards of Council. The time when the testing is required to undertaken is also listed in this record.

Consultant

1. Ensure that the Principal is aware of the requirements of the General Conditions of Contract, usually AS2124 or AS4000.
2. Providing the Principal and the Superintendent with a copy of the Final Design Approval and evidence that the Plan of Subdivision has been certified.
3. Ensuring that all necessary and other permissions required under the Contract are obtained by the contractor, i.e. road opening, traffic management and SEMP.

4. Ensuring that any request to apply material change to the approved design that occurs during construction, is approved by the Council Engineer, within 48 hours, or otherwise agreed, prior to providing written instruction the Superintendent.
5. Provide Council with "As Constructed" plans which have been prepared by a registered surveyor or qualified engineer and endorsed by the Clerk of Works (Construction Engineer). The "As Constructed" Plans shall be prepared in accordance with Appendix D: Information to be Shown of Plans of the IDM. The format of the "As Constructed" plans is as listed in this record**.**

Construction Engineer

1 Supervision of the works on a daily basis to ensure that the Principal's requirements as specified in the Council approved plans are satisfied.
2 Liaising with the Contractor to ensure that all of Council's preconstruction requirements have been submitted and approved.
3 Liaising with the Contractor to ensure that the works to be inspected are ready to be inspected and generally provide a minimum of 48 hours' notice to the Council Engineer and Superintendent to arrange a joint inspection at each hold point, Acceptance of Works inspection, Release from Defects Liability inspection and other inspections as listed in this record.
4 Generally providing a minimum of 48 hours' notice advising of witness points
5 Ensuring that any request to change to the design that occurs during construction, is forwarded forthwith to the Superintendent for review and approval within 1 working day, or otherwise agreed. If the Superintendent identifies that a material change is required, refer to the Consultant role.
6 If there is no superintendent appointed by the developer- undertake the roles of the superintendent in relation to works being constructed

Superintendent

1. The Superintendent is a person named in a contract by the two parties to that contract (the Developer and the Contractor) and is required to undertake certain functions under that contract by those two parties. The Superintendent is not a party to the contract.

   The Superintendent is required:-

   a. to assess quality of materials and workmanship in accordance with the contract documents;
   b. to assess progress claims and issue of progress certificates;
   c. to assess claims for extra payment for variations to the contract;
   d. to assess claims for extra payment (such as claims under the latent conditions provisions) under the contract; and
   e. to assess claims for extension of time.
2. The Superintendent shall effect these requirements by the periodic inspection and attendance on site and attending, where appropriate, meetings with contractors, suppliers and other parties as required to progress and finalise the works. The Superintendent is not required to provide continuous nor detailed supervision, nor act as a clerk of works nor as an inspector.
3. The Proprietor is to ensure that the Superintendent acts fairly at all times.

Contractor/s

1. Undertaking the Work in accordance with the provisions of the Contract including the Council approved plans OR where there is no contract in accordance with the provisions of the Council approved plans and specifications.
2. Complying with any written instruction issued by the Superintendent or Construction Engineer where there is no contract in place.
3. Not making any changes to the approved design without the written instruction from the Superintendent or Construction Engineer where there is contract in place.
4. As required by Council, produce a video or photographic survey of the assets to be vested in Council prior to the time of the Acceptance of Works so that any damage that occurs during the Defects Liability Period can be assessed to determine whether the damage is a result of faulty workmanship or the result of actions outside the control of the Contractor.
5. As required by Council undertaking any testing required by the Council (as already defined in the IDM), as listed this record, to enable Council to ascertain whether the assets that are to be vested in Council meet the standards of Council. The time when the testing is required to undertaken is also listed in this record.

Council

1 Nominating the Council Engineer who will be responsible for approvals, inspections and issuing written notices of non-conformance to the approved plans to the Superintendent.
2 Liaising with the Developer's representative for any Council required changes outside the scope of work covered by the Council approved plans.
3 Review and approval of preconstruction requirements which satisfy Council's requirements, within 1 working week of receipt, unless otherwise agreed.
4 Will undertake joint inspections with the Superintendent and or Construction Engineer and Contractor as listed in this record providing 48 hours' notice in writing requesting the inspection has been received.
5 Advising the Developer's representative in writing, including details of the non–conformance, within 24 hours of when Council's Engineer becomes aware of any non-conformance with the requirements of the Council in relation to the Works.
6 Ensure Council's Engineer responds to queries and request for information from the Developer's representative within 48 hours, unless otherwise agreed.
7 Ensure Council's Engineer advises the Developer's Representative of the results of any inspection within one working day, unless otherwise agreed, of the following:
   - approval, with or without conditions; OR
   - non-approval and steps to be taken to secure the council's requirements; AND
   - process for securing a further inspection where there is non-approval.

OTHER MATTERS DISCUSSED

_____
_____
_____
_____
_____
_____
_____

SIGNATURE OF ALL PARTIES AT THE MEETING THAT THIS IS A TRUE AND ACCURATE RECORD OF THE ITEMS DISCUSSED AT THE MEETING (PRINT NAME AND SIGN AND DATE ON THE LINE PROVIDED)

Developer _____

Developer's Representative _____

Superintendent / Consultant

_____

Construction Engineer _____

Council Representative _____

Contractor _____

Approval to proceed to construction is granted **Yes** **No**

Signed Council Representative _____ **Date** _____

DRAINAGE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

	CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
General	Have hold points and witness points been complied with?	☐	☐	☐	
Trenching					
	Shoring and access in place	☐	☐	☐	
Pipes					
	Bedding of sufficient depth & compacted	☐	☐	☐	
	Pipes not sitting on collars causing 'beaming'?	☐	☐	☐	
	Vertical/horizontal alignment checked and satisfactory?	☐	☐	☐	
	Direction of laying satisfactory? (i.e. collar on upstream end?)	☐	☐	☐	
	Rubber ring jointing is satisfactory?	☐	☐	☐	
	If butt jointed pipes approved, rubber bands should be used at the joints.	☐	☐	☐	
	House drain connected to top of pipe with approved connection?	☐	☐	☐	
	Check that pipes are sound i.e. not cracked.	☐	☐	☐	
	Lifting hole bungs in place.	☐	☐	☐	
	Size of pipes, bedding materials etc conform to design. Has evidence been provided where applicable?	☐	☐	☐	
Back Filling					
	Haunching and backfill material as specified and compacted?	☐	☐	☐	
	Any biofiltration backfill as specified?	☐	☐	☐	

	CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Pits					
	Base material is placed and compacted?	☐	☐	☐	
	Inner & outer formworks and reinforcement are in place?	☐	☐	☐	
	No collars are incorporated within the pits walls?	☐	☐	☐	
	Precast pits have been supplied and installed as per plan?	☐	☐	☐	
	Holes are mortared up for precast pits.	☐	☐	☐	
	The strength of concrete used to construct pits meets Manual requirements?	☐	☐	☐	
Approval to proceed to next stage		☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

SUBGRADE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Level pegs are to be established at adequate intervals with TOK level marked.	☐	☐	☐	
Shape is in accordance with endorsed plans and FSL checked with string line	☐	☐	☐	
Proof roll passed with no soft spots?	☐	☐	☐	
Subgrade is free from oversize floaters (more than 75mm) and surface rock.	☐	☐	☐	
Subgrade is free from roots and other foreign material?	☐	☐	☐	
All fill below road pavements has been compacted to 98% standard. And results presented to Council?	☐	☐	☐	
Service and drainage trenches backfilled with class 3 crushed rock and compacted satisfactorily?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

SUB BASE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Proof roll passed with no soft spots?	☐	☐	☐	
Compaction test results submitted to Council?	☐	☐	☐	
Depth of layer as per design?	☐	☐	☐	
Shape is in accordance with endorsed plans and FSL checked with string line	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

KERB & CHANNEL PRE-POUR INSPECTION - CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION

_____

_____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Where matching with existing kerb & channel check and rectify level, alignment and condition	☐	☐	☐	
Construction platform (part of sub base as per the design) placed over subgrade?	☐	☐	☐	
Kerb and channel to be placed on compacted sub base pavement or compacted min 75mm thick class 3 FCR bedding whichever is the greater. (if sub base is in fill, sub base compaction test results are to be submitted to Council. 98% Modified as per the Manual Section 12.7.9)	☐	☐	☐	
Uniform grade on kerb and channel and alignment?	☐	☐	☐	
Laybacks identified placed min. 75mm thick class 3 FCR compacted bedding and boxing completed?	☐	☐	☐	
Check subsoil drain connections.	☐	☐	☐	
Check pits are in the correct location.	☐	☐	☐	
Transition identified and base prepared for transition between kerb profiles?	☐	☐	☐	
Is the width of bedding behind the kerb and channels at driveways adequate?	☐	☐	☐	
Underground services identified for kerb stamping.	☐	☐	☐	
Line of kerb identified and provides correct road width.	☐	☐	☐	
Throat transitions at SEP's?	☐	☐	☐	
Any special design requirements considered?	☐	☐	☐	

Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

FOOTPATH PRE-POUR INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Where matching with existing footpath check and rectify level, alignment and condition.	☐	☐	☐	
Boxing in place and at correct level?	☐	☐	☐	
Bedding is compacted and to thickness as specified in the endorsed plan?	☐	☐	☐	
Re-enforcement is in and sitting on chairs?	☐	☐	☐	
Expansion joints located, prepared and dowelled satisfactorily?	☐	☐	☐	
House drain, services and required conduits are in place?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

KERB AND CHANNEL OR FOOTPATH POUR – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Construction/expansion joints at correct spacing	☐	☐	☐	
Depth of construction joints sufficient?	☐	☐	☐	
Dowelling included?	☐	☐	☐	
Expansion joints are dowelled and greased and reinforcement cut?	☐	☐	☐	
Check that service pits are at the correct levels?	☐	☐	☐	
Check that tactile markers have been installed. Note some Council's only require these in central commercial areas.	☐	☐	☐	
Check expansion joints are provided in accordance with the relevant standard drawing.	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

BASE INSPECTION (PRIOR TO PRIMING) – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Proof roll passed with no soft spots?	☐	☐	☐	
Compaction test results submitted to Council? (100% modified as per the Manual Clause 12.7.9)	☐	☐	☐	
Depth of layer as per pavement design?	☐	☐	☐	
Shape is in accordance with endorsed plans and checked with string line?	☐	☐	☐	
Surface condition is clean, isn't coarse or fatty and papering is down?	☐	☐	☐	
Check papering is down?	☐	☐	☐	
Is a uniform surface provided?				
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRIOR TO WEARING COURSE BEING PLACED – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Where matching with existing asphalt check and rectify level, alignment and joint	☐	☐	☐	
Prime is down in sufficient quantity and evenness?	☐	☐	☐	
Surface is clean of mud?	☐	☐	☐	
Tack coat being placed between asphalt layers?	☐	☐	☐	
Check papering is down?	☐	☐	☐	
If on site check temperature of asphalt.	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRACTICAL COMPLETION (PRELIMINARY) INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
All construction works are completed as per the approved plans or can be issued once the outstanding works are bonded.	☐	☐	☐	
Site is generally tidy (i.e. no rubbish, wheel ruts have been removed etc)	☐	☐	☐	
Cracking/surface of road pavement and concreting is satisfactory?	☐	☐	☐	
Pit openings located over pit?	☐	☐	☐	
Pit lids (inserts) are off, pits are clean?	☐	☐	☐	
Pit walls are vertical?	☐	☐	☐	
All house drains and property inlets are installed and house drain riser is in place.	☐	☐	☐	
Easy access through pit opening	☐	☐	☐	
Kerb and channel is stamped indicating location of conduits and house drains?	☐	☐	☐	
Line marking, signs and street plates are in place?	☐	☐	☐	
Light and sign poles are vertical?	☐	☐	☐	
Temporary turning facilities, including **Carriageway** easement as required, with hazard chevrons in place?	☐	☐	☐	
Pit lid levels are flush with FSL?	☐	☐	☐	
Pit lid levels and FSL provide detention as specified in bioretention areas	☐	☐	☐	
Number of plants as specified in bioretention areas	☐	☐	☐	
Pit lid (frames) are sitting on all sides.	☐	☐	☐	
Pit lids are off and pits are clean?	☐	☐	☐	
Lot levels and grading is satisfactory?	☐	☐	☐	
Top soil is in place?	☐	☐	☐	

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Naturestrips free of debris	☐	☐	☐	
No subsidence has been identified?	☐	☐	☐	
Fire hydrants and fire plugs in place and marked in accordance with Fire Service Guidelines published by the fire authority and are at the correct level?	☐	☐	☐	
Service Authority assets are at the correct level?	☐	☐	☐	
Outfalls have grates to prevent entry and are locked with an approved Council key?	☐	☐	☐	
Are EMP provisions in position?	☐	☐	☐	
Pump station is OK and operational manuals have been handed over.	☐	☐	☐	
Defects list has been agreed to?	☐	☐	☐	
Asset statement and as constructed plans have been provided?	☐	☐		
Certificate of Practical Completion has been issued?	☐	☐		
Were maintenance staff at the meeting or is a separate handover meeting required?	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

FINAL ACCEPTANCE INSPECTION (END OF DEFECTS PERIOD) – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Site is generally tidy (i.e. no rubbish, wheel ruts have been removed etc)	☐	☐	☐	
Cracking/surface of road pavement and concreting is satisfactory?	☐	☐	☐	
No subsidence has been identified?	☐	☐	☐	
Electronic surveillance of all pipe drains was carried out at the end of the maintenance period and information provided to Council?	☐	☐	☐	
Light and sign poles are vertical?	☐	☐	☐	
No subsidence has been identified?	☐	☐	☐	
No failure of infrastructure has been identified?	☐	☐	☐	
Omissions have been completed as per omissions and defects list?	☐	☐	☐	
Final Acceptance	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

APPENDIX F: STANDARD DRAWINGS

IDM standard drawings.pdf

APPENDIX G: STANDARD S173 AGREEMENT

STANDARD S173 AGREEMENT FOR ON-SITE DETENTION

Councils will prepare and lodge S173 agreements for on-site detention at the cost of the Developer.

The following is an extract of the typical wording of the 'Covenants of the Owner'.

The Owner covenants with the **Council** that:

1. The on-site detention for stormwater for the specified lots will each be designed by a **Qualified Engineer** and be approved by the **Council** prior to construction. A copy of each of the approved plans will be held by **Council** for future reference.

2. Each on-site detention stormwater system will be constructed either prior to, or currently with, the construction of any dwelling on the specified lots. Each on-site detention stormwater system on the specified lots will be completed prior to connection to **Council's** drainage system. The Owner will notify the **Council** when on-site detention works commence on the specified lots and request an inspection from the **Council** at the completion of works.

3. They will maintain, and not modify without prior **Council** written approval, each on-site detention system and will allow each on-site stormwater detention system to be inspected by a duly appointed officer of the **Council** at mutually agreed times.

4. The Owner will pay for all the costs associated with the construction and maintenance of each on-site detention system.

5. The **Council** will register this Agreement at the Lands Title Office at the cost of the Owner on the title or titles for the land.

APPENDIX H: STREET LIGHTING

appendices\Public_Lighting_Non_Std_FA051-Nov-05.pdf

APPENDIX I: COUNCIL REVIEW CHECKLISTS

COUNCIL CHECKLIST #C1 – DEVELOPMENT PLANS SUBMITTED FOR APPROVAL OF FUNCTIONAL LAYOUT

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference _____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
General		
Has submission been accompanied by completed checklist as per Manual requirements?		
Has an ODP been prepared?		
Is the submission consistent with ODP?		
Is the submission consistent with endorsed plan?		
Is the submission consistent with planning permit conditions?		
Is the proposed staging of the development appropriate? (e.g. is the impact of staging works on traffic routes and intersections appropriate, and are there drainage consequences of staging?)		
Is a lot layout provided with lots numbered and dimensioned, and reserves clearly identified.		
Has Council's 5 year Capital Works program been reviewed?		
Is there any interface or overlap between the development and proposed Capital Works program?		
Is the Public Open Space provided in correct area? (should have been identified at planning stage but re-check)		
Is access to Public Open Space appropriate? Request information if not shown.		
Are linkages to adjoining developments appropriate? Request information if not shown.		

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Road Layout Plans		
Street names are nominated. (Check with Planning Dept. and Asset Mgt Dept. whether names okay and advise Design Engineer if no approved)		
Plans show Road Hierarchy.		
Estimated traffic volumes are shown on plans (check consistency with road hierarchy?)		
Nominate road widths between inverts of kerbs are satisfactory?		
Nominated kerb types satisfactory?		
Intersections internal to the development are shown in sufficient detail to support proposed design, including proposed kerb radii.		
Intersections external to the development are shown in sufficient detail to support proposed design.		
Critical vehicle turning movements are shown at intersections and cul-de-sacs and satisfactory.		
Drainage Layout Plans		
Plans show Natural Surface Contour Lines to AHD.		
Plans show the total catchment area, nominated sub-catchment areas and co-efficient of runoff for each sub-catchment, including allowance for connection of adjoining properties outside development.		
Plans shown layout of proposed drainage systems with approximate sizes.		
Overland flow path is nominated and satisfactory.		
Drainage discharge point is shown and proposed treatment shown in sufficient detail to support approval of functional layout.		
Drainage treatment strategy is provided and appears satisfactory		
Existing drainage services are confirmed on plans and proposed connection points shown.		
Associated Documents		
Was a Traffic Management Report required?		

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Is the Traffic Management Report satisfactory?		
Does the design reflect recommendations within the Traffic Management Report?		
Has the need for Developer contributions or headworks charges been identified? Has Developer's Representative provided preliminary proposal regarding cost-sharing arrangements with Council/others? Is it satisfactory?		

The following further information is required to be submitted:

_____

_____

_____

_____

_____

_____

Drawing numbers allocated to this project are _____through to _____ as required

Approval of functional layout IS / IS NOT granted for the proposed development.

Signed_____ Dated _____

COUNCIL CHECKLIST #C2 – PLANS SUBMITTED FOR DETAILED DESIGN APPROVAL

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference _____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Was approval of functional layout granted?		Date?
Has submission been accompanied by completed checklist as per Manual requirements?		
Has the subdivision plan been certified?		
Plans to state that datum to AHD (all layout plans)		
Plans show north point correctly (all plans)		
Suitable TBM's shown clearly on plans (all layout plans)		
Relevant PSM's shown clearly on plans and protected from works (all layout plans)		
Natural Surface Levels are shown at all lot corners and major changes of grade within the lots (all layout plans). Check minimum grade across lot of 1 in 200 is achieved. Check each lot has discharge point nominated.		
Was a Traffic Management Report provided?		
Does the detailed design reflect recommendations within the Traffic Management Strategy TMAR or TIAR documents?		
Was a Road Safety Audit required?		
Is the Road Safety Audit satisfactory?		
Has Council responded to the Road Safety Audit? (Design Services Manager to respond)		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Does the design reflect recommendations within the Road Safety Audit that were accepted by the Design Services Manager?		
Do plans show Council's nominated drawing numbers?		
Do plans show planning permit numbers?		
Is the methodology of the geotechnical report and pavement design satisfactory?		
Does design and documentation reflect recommendations within the geotechnical/pavement design report?		
Should garbage pads provided for areas where service vehicles cannot achieve reasonable access?		
Are indented parking bays to be provided, and are they adequately designed and documented?		
Are other services compatible with Council's engineering requirements?		
Is the location and type of street lighting clearly documented and compatible with engineering requirements?		
Is the Master Services Plan provided, and clashes identified?		
Are clearances between services (plan and vertical) achieved adequately?		
Do intersection designs drain properly?		
Are temporary provision for turnarounds and **Carriageway** easements as required, provided where future stage to be constructed?		
Are environmental protection requirements clearly documented?		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Have public risk issues been identified and Risk Report provided? Does design reflect recommendations? Does Council need to take further actions? Some issues to consider include: • Manholes in footpaths. • Changes in levels greater than 200mm. • Accessible headwalls. • Electrical substations. • Gantries. • Basin/wetland slopes greater than 1 in 5. Overland flow issues. Slopes away from footpath edges. Other potential risks arising from development.		
Are landscaping plans provided with this submission? If yes, forward to Parks & Gardens ASAP and arrange meeting with P&G staff if issues to be resolved.		
Is the landscaping design compatible with engineering requirements?		
Are street furniture details provided, and satisfactory to **Council**?		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Are hydrological and hydraulic calculations provided? • Methodology nominated? (check Manual if second model needed) • Assumptions reasonable? • Coefficients in accordance with Manual requirements? • Have external areas been provided for? Developed or undeveloped? Okay? Q_A Q_F • Check hydraulic grade line. • Pump selection okay?		
Are stormwater treatment facilities satisfactory with regard to: • Location. • Design. • Litter traps. • Erosion protection. • Independent watering systems. • Pump stations, controls and telemetry. • Consistency with design Manual requirements.		
Are copies of approvals to discharge to natural waterways or relevant authority drains provided?		
Are cost-sharing arrangements for Developer contributions or headworks charges resolved? Does this take into account arrangements for areas outside of development?		

The following further information is required to be submitted:

Detailed design approval IS / IS NOT granted for the proposed development.

Signed _____ Dated _____

COUNCIL CHECKLIST #C3 – PLANS SUBMITTED FOR FINAL DESIGN APPROVAL

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference _____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

COUNCIL CHECKLIST #C3		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
General		
Was detailed design approval granted? (Record date)		
Has submission been accompanied by completed checklist as required by Manual?		
Have planning permits been reviewed and design appears to comply?		
Has the subdivision plan been certified and design is consistent?		
Have all amendments requested at detailed design stage been implemented?		
Was additional information provided, if applicable?		
Does additional information satisfy queries/requirements or is further information still needed?		
Was an estimate provided? Appear reasonable?		
Have all outstanding matters (cost sharing, etc) been finalised to Council's satisfaction?		

Final Design approval IS / IS NOT granted for the proposed development.

If construction has not commenced within two years of the approval date below, the approval expires and final design plans should be resubmitted for consideration by Council.

Signed _____ Dated _____

COUNCIL CHECKLIST #C4 – ISSUE OF STATEMENT OF COMPLIANCE

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference _____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

General		
Have ALL planning permit conditions been adhered to?		
Does the 'As Constructed' development comply with the approved design plans?		
Have any changes been approved?		
Are drains and kerb and channel clean?		
Has an Acceptance of Works inspection been undertaken with satisfactory outcome?		
Has 'As Constructed' information been provided to Council?		
Have 'Operation and Maintenance' manuals, where applicable, been provided for pumps, and other drainage features?		
Has training of Council staff been undertaken, if applicable?		
Is the drainage overland flow path for 100 year **ARI** flows free of obstruction?		
Are landscaping systems fit for take over?		

Engineering Design Services OBJECTS / HAS NO OBJECTION to the issue of Statement of Compliance.

Signed _____ Dated _____

APPENDIX J: NOTES ON COUNCIL'S ENGINEERING PRINCIPLES

PRINCIPLE	Clause 9.3	This principle provides additional requirements to that of The Planning Scheme, and relates to developments that do not necessarily include collector streets, but may still warrant establishing bicycle links through the development. Council will review and determine at planning permit stage the need for these facilities.
PRINCIPLE	Clause 9.3	The Planning Scheme allows three-point turning of service vehicles in developments. Council have adopted an engineering principle that no waste vehicle, emergency service vehicle or street-sweeper should need to reverse in developments. This is in response to recommendations made by the Coroner in relation to fatalities resulting from these types of vehicle movements. In addition to the Coroner's recommendation Council believes that cul-de-sacs are beneficial to the amenity of the residents living in the cul-de-sac because of footpath connectivity and safer environments for children.
PRINCIPLE	Clause 9.3	This principle provides additional requirements to that of The Planning Scheme, and relates to developments that do not necessarily include collector streets, but may still warrant establishing bicycle links through the development. Council will review and determine at planning permit stage the need for these facilities.
PRINCIPLE	Clause 9.3	The Planning Scheme allows three-point turning of service vehicles in developments. Council have adopted an engineering principle that no waste vehicle, emergency service vehicle or street-sweeper should need to reverse in developments. This is in response to recommendations made by the Coroner in relation to fatalities resulting from these types of vehicle movements. In addition to the Coroner's recommendation Council believes that cul-de-sacs are beneficial to the amenity of the residents living in the cul-de-sac because of footpath connectivity and safer environments for children.
PRINCIPLE	Clause 12.3.1	The Planning Scheme standards discuss Access Lanes. These are considered to be socially undesirable as they provide out-of-sight places where undesirable behaviour often takes place. Where they are approved, specific conditions may be imposed by Council such as open fencing to adjacent properties, planting restrictions etc to create more open and visible environment...
PRINCIPLE	Clause 12.3.2	These differ from The Planning Scheme standards, and are based upon reserve widths needed to accommodate desirable **Carriageway** widths and verge widths as outlined within the manual. Negative feedback has been received by Council regarding previous developments with lesser widths of road reserve, and those proposed herein are more in line with community expectations in areas outside of metropolitan areas.
PRINCIPLE	Clause 12.3.4 *	As discussed above.

PRINCIPLE	Clause 12.3.8	The Planning Scheme allows the use of any part of the pavement for turning movements in some street types. Council has adopted an engineering principle that vehicles should always use the correct side of the pavement for turning due to safety concerns. ARRB have issued draft user guide to Austroads turning templates consistent with Council's principle of using the correct lanes when turning.
PRINCIPLE	Clause 12.3.8	The Planning Scheme allows use of driveways for three-point turning of vehicles in developments. Council have adopted an engineering principle about not using driveways or vehicle accesses for turning around due to safety concerns.
PRINCIPLE	Clause 12.6	This differs from The Planning Scheme standards. This principle is based upon experience outside of the metropolitan area. This is also more in line with Austroads principles and consistent with advice to Council from experienced traffic engineers.
PRINCIPLE	Clause 13.2	The Planning Scheme requires footpaths for both sides of streets for Access Streets, or higher order streets, but not Access Places. Council requires footpaths are required for all frontages, including fully around court to in accordance with the principles of the Disability Discrimination Act 1992. This principle has also been determined through consultation with access impaired representatives of the community.
PRINCIPLE	Clause 13.3	The Planning Scheme allows footpaths to abut kerbs. Council principle is that they should be separated to avoid conflict between pedestrians and doors of parked cars and to provide a buffer between children and moving vehicles.
PRINCIPLE	Clause 26.2.1.1	Council has received numerous requests to address street lighting in these developments. This principle has been adopted to cover the gap in the various standards and to meet community expectations.