infrastructure design manual

Produced and maintained by the

Local Government
Infrastructure Design Association

PO Box 212, GOLDEN SQUARE, 3555
www.designmanual.com.au

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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 now 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, deliver diversity and 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 criteria as much as possible and thus expedite **Council's** engineering reviews.
- 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 as a superscript to the particular clause. For example

> ***Developments*** *that contain more than 200 lots in a development plan 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 Council Approval

Approval in relation to a subdivision has the meaning accorded to the term in Section 15 of the Subdivision Act 1988. In relation to works undertaken entirely on private land and remaining within private ownership, **approval** means that, based on the preparation and submission of engineering plans for review by **Council** or, when agreed by **Council**, the provision by a qualified civil engineer of a certificate of compliance under the Section 238(1)(a) of the Building Act, **Council** believes that the works in question will comply with the relevant permit conditions.

In neither context does **Council** approval absolve the **Design Engineer** and the **Construction Engineer** of ultimate responsibility respectively for the design and the construction of the works in question.

1.7 Variation to IDM Clauses

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 those**.** 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** located 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 providing compelling arguments to justify the granting of the exemption or exemptions requested.

1.8 Township Character

The **Manual** is used at the design phase to ensure there are clear infrastructure design guidelines across municipalities; and that minimum standards and maintenance schedules are achieved.

While the **Manual** sets minimum standards, **Councils** and **developers** may wish to consider adopting alternative standards to achieve residential development outcomes that are more appropriate to the character of a particular rural or regional township.

The **Manual** allows **Councils** to vary the minimum standards to address the local residential character of a particular development, providing the overall objectives of the IDM are met. Any such variations should be considered in the early stages of PSP planning, with their potential implications being clearly articulated, justified and documented so that all stakeholders in the proposed development are informed.

1.9 Innovation and Advances in Technology

1.9.1 General

Councils may consider adopting and approving innovative solutions and using new technologies where they are satisfied that the objectives of the relevant clauses of the **Manual** have been met, although the **Development** does not comply with specific technical provisions of the **Manual**.

1.9.2 Sustainable Infrastructure Guidelines

Sustainable Infrastructure Guidelines were prepared in 2012 by conducting research on design practices and materials in Australia and overseas, reflecting concepts such as Green Infrastructure, Sustainable Development and Low Impact Development. Consultation has been carried out with:

- CCF (Civil Contractors Federation)
- Local Government Victoria (LGV)
- Australian Asphalt Pavement Association (AAPA)
- VicRoads
- Association of Land Development Engineers (ALDE)
- Housing Industry Association (HIA)

The guidelines were reviewed in 2016, to ensure that they reflected ongoing developments in standards and technology, and were in a format suitable for adoption by **Councils** under Clause 3.5 of this **Manual**. References in the **Manual** to the SIG are to be interpreted as references to the most recent edition of the guidelines (issued in 2016 or later).

1.10 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 Council signed TBA
- Wangaratta Rural City Council 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 TBA
- Wellington Shire Council 18 May 2010
- East Gippsland Shire Council 6 June 2014
- Corangamite Shire Council signed TBA
- Central Goldfields Shire Council 26 May 2011
- Baw Baw Shire Council 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 25 November 2013
- Yarriambiack Shire Council TBA
- Southern Grampians Shire Council TBA
- Ararat Rural City Council signed 18 October 2012
- Glenelg Shire Council 27 August 2013.
- Golden Plains Shire Council adopted 16 July 2013.
- Wodonga Rural City Council adopted 15 April 2013.
- Towong Shire Council 5 March 2013
- Indigo Shire Council 19 March 2013
- Swan Hill Rural City Council 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
- Bass Coast Shire Council 21 May 2014 (Greenfield developments only)
- Horsham Rural City Council 14 April 2014
- Moyne Shire Council 16 December 2014
- Latrobe City Council TBA
- Buloke Shire Council TBA
- Loddon Shire Council TBA

1.11 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.

1.12 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 Executive Officer of the LGIDA at info@designmanual.com.au All submissions made in accordance with these provisions will be considered by the LGIDA Technical Committee, which will provide regular reports to the LGIDA Board and, when considered appropriate, recommend changes to be incorporated into the IDM.

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

- Asset Manager
  Shire of Campaspe Council
- Development Engineer
  City of Greater Bendigo Council
- Team Leader Development
  City of Greater Shepparton Council
- Development Assessment Engineering
  Shire of Moira Council
- Infrastructure Development Engineer
  Strathbogie Shire Council
- Senior Civil Engineer
  Mansfield Shire Council
- Senior Subdivisions Engineer
  Greater Geelong City Council
- Asset and Development Coordinator
  Murrindindi Shire Council

- Coordinator – Technical Services
  Wangaratta Rural City Council
- Director Infrastructure Environment and Regulatory Services
  Gannawarra Shire Council
- Development Engineer
  South Gippsland Shire Council
- Senior Development Engineer
  Benalla Rural City Council
- Coordinator Infrastructure Development
  Wellington Shire Council
- Development and Design Coordinator
  East Gippsland Shire Council
- Manager Assets Planning
  Corangamite Shire Council
- General Manager Technical Services
  Central Goldfields Shire Council
- Coordinator Civil Asset Planning
  Baw Baw Shire Council
- Coordinator Design and Development, Ballarat City Council.
- Team Leader Design and Development,
  Warrnambool City Council
- Transport and Development 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 Council.
- 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
- Coordinator Development Engineering, Surf Coast Shire Council
- Team Leader – Engineering, Mount Alexander Shire Council

- Coordinator Infrastructure Planning, Latrobe City Council
- Manager Asset Management, Bass Coast Shire Council
- Manager Engineering Services, Horsham Rural City Council
- Assets Engineer, Moyne 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/or technical services.

Contractor — Is the person, legal identity or company nominated by the **Developer** to carry out the works.

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 review and approve designs and/or 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, where appropriate, 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	Design and Delivery
Bass Coast Shire Council	Asset Management
Baw Baw Shire Council	Assets and Recreation
Benalla Rural City Council	Infrastructure Services
Campaspe Shire Council	Asset Department

COUNCIL	DEPARTMENT
Central Goldfields Shire Council	Engineering Services
Colac Otway Shire Council	Infrastructure and Services
Corangamite Shire Council	Assets and Project Delivery
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 Geelong City Council	Engineering Services
Greater Shepparton City Council	Planning Projects Department
Hepburn Shire Council	Engineering Services
Horsham Rural City Council	Engineering Services
Indigo Shire Council	Infrastructure Services
Latrobe City Council	Infrastructure Development
Macedon Ranges Shire Council	Engineering Infrastructure and Projects Engineering and Infrastructure
Mansfield Shire Council	Engineering Department
Mitchell Shire Council	Engineering and Infrastructure
Moira Shire Council	Construction and Assets
Moorabool Shire Council	Engineering Services
Mount Alexander Shire Council	Infrastructure
Moyne Shire Council	Physical Services Assets Unit
Murrindindi Shire Council	Engineering Services
Pyrenees Shire Council	Assets and Development Services
South Gippsland Shire Council	Infrastructure Department
Southern Grampians Shire Council	Infrastructure Department
Strathbogie Shire Council	Engineering Department
Surf Coast Shire Council	Development Engineering

COUNCIL	DEPARTMENT
Swan Hill Rural City Council	Engineering Services
Towong Shire Council	Department of Infrastructure and Environment.
Wangaratta Rural City Council	Technical Services
Warrnambool City Council	Infrastructure Services
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 undertaking the land 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** will be 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.

Low Density Residential Development — For the definitions of the different types of Low Density Residential Development (LDRZ) see clause 12.2.

Maintenance Period — Is the period of time specified in Section 17(4) of the Subdivision Act 1988, or planning permit or elsewhere in the IDM, whichever is the greater period, that the developer is responsible for maintenance of the completed works in good condition and repair unless otherwise agreed to in writing.

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 I 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**.

WSUD

The integration of urban water cycle management within planning and design is known as Water-Sensitive Urban Design (**WSUD**).

Clause 3 Engineering Information Requirements

3.1 Objectives

The objective of this Clause is to set out the engineering information that **Council** will normally expect **Developers** to provide, at a level of detail appropriate to the relevant stage in the planning approval process, when:

- Applying for a Planning Scheme Amendment
- Submitting a Precinct Structure Plan for review
- Submitting a Development Plan for review
- Applying for a Planning Permit
- Submitting Engineering Plans and Computations

At any stage of the planning approval process, a pre-application meeting will help to ensure that all the engineering information likely to be required by **Council** is identified prior to a formal submission or application. For example, when a **Developer** applies concurrently for a **Planning Scheme Amendment** and a **Planning Permit**, **Council** and the **Developer** can agree upon a single coherent set of information requirements appropriate to the scale and complexity of the proposed development.

As a general principle, plans and calculations submitted to and accepted by **Council** at any stage in the planning approval process should not normally require major adjustments at a later stage, unless there have been significant changes in circumstances during the intervening period.

3.2 General Engineering Information Requirements

For all but the smallest developments, the **Developer** should, where relevant to the proposed development, provide the following engineering information at the earliest practicable stage in the planning approval process:

- plans indicating the scale, location and overall layout of the development; and
- existing surface level contours to Australian Height Datum (AHD) as per Table 1; and
- any existing natural or constructed features that may impact upon the engineering design; and
- the proposed locations and dimensions of reserves and public open space; and
- the proposed road layout and hierarchy.

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 Specific Information Required during the Planning Approval Process

Council recognises that requiring an unduly high level of detailed engineering information at an early stage in the planning approval process may serve both to discourage appropriate development and to limit the potential for innovative solutions to engineering problems to emerge. The following sections give an indication of the nature and extent of the engineering information that **Developers** should normally provide at each stage in the planning approval process.

3.3.1 Planning Scheme Amendment

3.3.1.1 General

Unless the Developer has requested that the **Planning Scheme Amendment** be considered in conjunction with a **Planning Permit** application, **Council** will not normally require that a **Traffic Management Strategy [TMS]** as defined in Clause 9 of this **Manual** or a **Stormwater Management Strategy [SMS]** as defined in Clause 11 of this **Manual** be submitted at this stage in the planning approval process. The information requirements for this stage of the process are set out below.

3.3.1.2 Roads and Traffic

The Developer should, where relevant, engage a **Qualified Engineer** to prepare a preliminary roads and traffic assessment which addresses, at an appropriate level of detail, the impact and management of traffic on the internal and external road networks associated with the planned development. The assessment should consider:

- current and predicted traffic volumes; and
- the proposed internal road hierarchy and functions; and
- the proposed major road layout and major intersection treatments; and
- pre-development agreements required for off-site traffic management; and
- the potential impacts on public transport networks; and
- any proposed road closures.

3.3.1.3 Stormwater

The **Developer** should, where relevant, engage a **Qualified Engineer** to prepare a preliminary stormwater assessment which addresses, at an appropriate level of detail, the arrangements for collecting, conveying, storing, and discharging stormwater from the planned development and achieving water quality improvements consistent with established WSUD principles**.** The assessment should consider:

- the relevant catchment and sub-catchment areas; and
- practicable routes and destinations for the major and minor stormwater networks; and
- pre-development agreements required for offsite stormwater management; and
- the possible scale and location of any stormwater retardation basins; and
- the possible scale and location of WSUD quality treatment facilities; and
- Required design intensities
- AEP of major and minor storm events
- Model selection in line with ARR2019
- Modelling technique in line with ARR2019

3.3.1.4 Flooding

When any substantial proportion of the land in question may be subject to fluvial or pluvial flooding, the **Developer** should engage a **Qualified Engineer** to prepare and submit a Flood Impact Report to satisfy **Council** and any relevant floodplain

authority that the proposed development can be carried out without having any adverse impact on other properties and/or on the natural environment.

The assessment should consider:

- Required design intensities
- AEP of major and minor storm events
- Model selection in line with ARR2019
- Modelling technique in line with ARR2019

3.3.2 Precinct Structure Plan

The engineering information requirements for a **Precinct Structure Plan [PSP]** which will be incorporated into the planning scheme via the **Urban Growth Zone [UGZ],** are specified in the relevant **PSP** guidelines.

Where **Council** policies require that a **Development Contribution Plan [DCP]** be prepared, a functional analysis of the necessary traffic and stormwater management infrastructure and open space provisions, together with an engineering estimate of the associated costs, should be submitted with the application.

3.3.3 Development Plan

3.3.3.1 General

The engineering information requirements for a **Development Plan [DP]** are specified in the relevant Development Plan Overlay Schedule in the Planning Scheme. In the absence of any more detailed guidance from that source, the **Developer** should provide sufficient engineering information to validate the framework in which future **Planning Permit** applications are intended to be considered, having regard to the following sub-clauses.

3.3.3.2 Roads and Traffic

Council will not normally require that a **Traffic Management Strategy [TMS]** as defined in Clause 9 of this **Manual** be submitted at this stage in the planning approval process. The **Developer** should, where relevant, engage a **Qualified Engineer** to prepare a roads and traffic assessment which addresses, at a level of detail appropriate to the objectives of a **Development Plan**, the impact and management of traffic on the internal and external road networks associated with the planned development. The assessment should consider:

- current and predicted traffic volumes; and
- the proposed internal road hierarchy and functions; and
- the proposed major road layout and major intersection treatments; and
- pre-development agreements required for off-site traffic management; and
- requirements for upgrading external roads and intersections; and
- the potential impacts on public transport networks; and
- the potential impacts of staged development; and
- pedestrian and cyclist movements; and
- any proposed road closures.

3.3.3.3 Stormwater

Council will not normally require that a **Stormwater Management Strategy [SMS]** as defined in Clause 11 of this **Manual** be submitted at this stage in the planning approval process. The **Developer** should, where relevant, engage a **Qualified Engineer** to prepare a stormwater assessment which addresses, at a level of detail appropriate to the objectives of a **Development Plan**, the arrangements for collecting, conveying, storing, and discharging stormwater from the planned

development and achieving water quality improvements consistent with established WSUD principles. The assessment should consider:

- the required design rainfall intensities
- the AEP of major and minor storm events
- the relevant catchment and sub-catchment areas; and
- practicable and satisfactory routes for minor and major drainage networks; and
- network outfalls and/or connection points to the external drainage system; and
- pre-development agreements required for offsite stormwater management; and
- appropriate easements and/or drainage reserves wherever necessary; and
- the nature, scale and location of any retardation basins; and
- the nature, scale and location of WSUD treatment facilities; and
- the potential impacts of fluvial or pluvial flooding; and
- any proposed use of grey water; and
- model selection in line with ARR2019; and
- modelling techniques in line with ARR2019

3.3.3.4 Flooding

When any substantial proportion of the land in question may be subject to fluvial or pluvial flooding, the **Developer** should engage a **Qualified Engineer** to prepare and submit a Flood Impact Report in order to satisfy **Council** and any relevant floodplain authority that the proposed development can be carried out without having any adverse impact on other properties and/or on the natural environment.

3.3.4 Planning Permit

3.3.4.1 General

Unless the relevant information has been provided earlier in the planning approval process**,** the **Developer** should identify the approximate size, range, shape and orientation of the allotments, and demonstrate that all allotments will have legal and practical access. Note that carriageway easements are the least preferred option and requires the specific written approval of Council.

3.3.4.2 Roads and Traffic

When any of the circumstances defined in Clause 9 of this **Manual** apply to the proposed development, **Council** may require the **Developer** to engage a **Qualified Engineer** to prepare and submit a **Traffic Management Strategy [TMS]** prior to issuing a **Planning Permit**.

In appropriate cases, **Council** may instead attach conditions to the **Planning Permit** requiring that the reports in question be prepared and submitted prior to the submission of engineering plans and calculations.

When no **TMS** is required, the **Developer** should consider and address the relevant guidelines of this **Manual**. For example, **Council** will expect the **Developer** to demonstrate that the relevant design vehicles can gain access to and from each allotment without detriment to the safe and convenient operation of public roads serving the development.

3.3.4.3 Stormwater

When any of the circumstances defined in Clause 11 of this **Manual** apply to the proposed development, **Council** may require the **Developer** to engage a **Qualified Engineer** to prepare and submit a **Stormwater Management Strategy [SMS]** prior to issuing a **Planning Permit**.

In appropriate cases, **Council** may instead attach conditions to the **Planning Permit** requiring that the reports in question be prepared and submitted prior to the submission of engineering plans and calculations.

When no **SMS** is required, the **Developer** should consider and address the relevant guidelines of this **Manual**. For example, **Council** will expect the **Developer** to demonstrate that safe and convenient arrangements can be made for stormwater collection and conveyance to existing major and minor drainage networks without detriment to the efficient operation of those networks. Achieving this objective may require that the development include significant provision for on-site stormwater detention, as defined in Clause 19 of this **Manual**.

3.3.4.4 Flooding

Unless the relevant information has been provided earlier in the planning approval process**, w**hen any proportion of the land in question may be subject to fluvial or pluvial flooding, the **Developer** should identify suitable building envelopes, located at or above the predicted peak flood levels, and provide sufficient information to satisfy **Council** and any relevant flood-plain authority that these envelopes can be established without detriment to other properties and/or to the natural environment, and without having any significant impact on flood levels and velocities.

3.4 Engineering Plans and Computations

In addition to any specific requirements set out the **Planning Permit** conditions, **Council** will expect the **Developer** to demonstrate that the plans and computations submitted either comply with the technical provisions set out in the relevant clauses of this **Manual**, or that exceptions are being proposed under the provisions in Clause 1.9 of this **Manual** which are designed to accommodate innovative solutions or advances in technology.

Where the proposed systems or materials do not comply with the existing provisions or where relevant, the Sustainable Infrastructure Guidelines referenced in Clause 3.5 of this **Manual,** the **Developer** should provide clear evidence that they will deliver equal or superior performance to established solutions in terms of safety, strength, stability, resilience, durability and appearance. Matters to be considered may include, but need not be limited to:

- The need to respect established neighbourhood character
- Demonstrated compliance with Australian or international standards
- Tests carried out by registered laboratories under replicable conditions
  Record of successful use under similar conditions in other jurisdictions

3.5 Sustainable Infrastructure Guidelines (SIG)

The Councils listed in Selection Table 3.5 have adopted the Sustainable Infrastructure Guidelines.

Selection Table 3.5 Sustainable Infrastructure Guidelines

Councils which have adopted the Sustainable Infrastructure Guidelines
East Gippsland Shire Council
Wangaratta Rural City Council*
Warrnambool City Council

* Formal adoption pending in near future

These **Councils** will expect the **Design Engineer** to complete the Sustainability Checklist provided in Appendix B of the SIG when submitting proposals for Significant Developments within their municipal boundaries. This will provide evidence

demonstrating how, and to what extent, the objectives of the SIG have been considered and implemented in the design process, and assist Councils to assess the overall merits of each development from a sustainability perspective.

For the purposes of this clause, developments will be considered "significant" when they involve EITHER a subdivision (including all stages) greater than 50 lots in size OR infrastructure designed in accordance with the IDM and passing into Council ownership whose estimated cost exceeds $2,000,000 in 2017 dollars.

Where the **Design Engineer** can demonstrate that proposed variations from the **Manual** are consistent with the SIG, the **Councils** listed in Selection Table 3.5 as having adopted the SIG, will normally accept that the objectives of the relevant IDM clauses have been met, although the proposal may not comply with all their technical provisions.

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 accepted Functional Layout Plan.

Clause 4 Fees and Contributions

4.1 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 0.75% for the checking of plans and 2.5% for the supervision of the works. The value of the works to be used in calculating the applicable fees is to be based on the value of works checked and includes such items as:

- Site establishment
- Setout for construction
- Traffic Management
- Environmental management works
- Stripping topsoil and stockpiling
- Excavations for road, footpaths, kerb and channel, vehicle crossings and drainage work, including stormwater treatment
- Earthworks including lotfilling and nature strips
- Laying of pipes, construction of pits, headwalls, outlets and other associated works including house connections
- Installation of GPT's, litter traps etc
- Preparation and treatment of subgrade
- Supply and installation of pavement materials, including compaction testing
- Construction of footpaths and shared paths
- Construction of kerb and channel
- Construction of vehicle crossings, where they are required to be installed.
- Construction of street lighting
- Installation of street signs
- Installation of traffic calming devices and measures, traffic islands, school crossings, pedestrian crossings, traffic lights, splitter islands
- Asphalting and sealing works
- Street trees and landscaping works
- Linemarking
- Street furniture

If more than one construction inspection or **Acceptance of Works** inspection is required (refer Clause 7.5) because the **Council Engineer** has been called before the works are ready for inspection an extra fee of $50.00 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.

4.2 Development Contributions

Development contributions are payments or works-in-kind towards the provision of infrastructure made by the proponents of a new development.

The *Planning and Environment Act 1987* allows for development contributions to be provided through:

- A Development Contributions Plan
- An Infrastructure Contributions Plan

- A Section 173 agreement
- Planning permit conditions.

Development contributions may be required for road works, drainage, public open space, traffic management works, community infrastructure or other works that are required as a result of the development.

4.2.1 Drainage infrastructure

Where the existing drainage infrastructure cannot accommodate further development within a particular area, arrangements must be made to allow suitable infrastructure to be provided. **Developers** should access the policies of the responsible authorities 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.

To request a contribution from the relevant authority to the proposed drainage infrastructure, **Developers** must submit a request in writing, and the associated plans, specifications, cost estimates and other relevant documents, prior to a specified date each year. The request should detail the proposed contribution of all benefiting parties and the date or trigger for the contribution requested. The allocation of funding through the budget process of the authority in question cannot be guaranteed.

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 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 and construction 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 acceptance of 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 Acceptance 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. More work upfront will often help to ensure that time is saved in the later stages. 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 considered to be part of a best practice approach to the documentation of subdivision developments, and is recommended even 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) have been approved, the subdivision layout and infrastructure shown should be delivered in accordance with the approved plans. However, these plan(s) do not constitute 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 Plans or the final approval 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 expected 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 acceptances. **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 review 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 have no option but to review the submission in greater detail prior to approval. This may include a check of design details and quality of documentation against the checklists and requests for further information.

5.4 Developer's Representatives

The **Developer** is responsible for engaging suitably qualified and experienced personnel to design, construct, or supervise the construction of roads and drainage **Infrastructure** for private land **Development** 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 considered adequate by **Council** having regard to the nature and extent of the development in question.
- Do not have pecuniary interests with either the Developer, or the **Contractor**, unless independent certification is provided by a third party acceptable to Council.

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 review 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 designated representative will be responsible for coordinating all works to be undertaken as part of the **Development**. These will typically include roads, drainage, water, fire hydrants, fire plugs, sewerage, power, telecommunications, gas, landscaping, and other items 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"* and other relevant regulations or codes established pursuant to the *Road Management Act*.

In general, Council will expect the clearances between and covers for services located within easements to be the same as those specified in the *"Code of Practice - Management of Infrastructure in Road Reserves"*

Engineering plan acceptance 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 and the location of all street trees. 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 to, and be accepted 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 acceptance 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 accepted for some subdivisions or **Developments** may not be accepted 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. Most **Councils** prefer to have these plans submitted in an acceptable electronic format, but **Councils** may also require that one hardcopy set (A3) plans be provided.

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 review and approval of the functional layout.

Road Design:

The road layout and parking plans should show:

- Layout of roads and allotments, including the road hierarchy and estimated traffic volumes.
- Nominated carriageway widths (measured between kerb inverts) and road reserve widths.
- 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.
- 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 overall drainage strategy plans should show:

- 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.
- 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 conceptual **WSUD** sizing and layout.

Not all of these requirements will be applicable to small **Developments**.

The submission 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: Council Review Checklists** . Connectivity to existing **Infrastructure** should be demonstrated, as should relevant social and community linkages.

Any traffic management strategy required by **Council** 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).

Once the functional layout has been approved, the **Design Engineer** can undertake detailed design with confidence that their proposed strategies are acceptable to **Council**.

5.8.2 Detailed Design Submission

Once the functional layout has been approved, design work should be carried through to a near-to-complete stage, in consultation with VicRoads where appropriate, and the relevant documentation submitted to **Council's Engineering Department** for review. Detailed design approval may be granted subject to minor amendments. If significant amendments are required, the relevant plans and designs will normally have to be resubmitted for 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 accepted Functional Layout Plans, 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 review. 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: Council Review Checklists** should accompany this submission.

Documentation should be prepared in accordance with **Appendix D: Checklists and Forms for Developer's Representatives** 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, streetlights, 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** to provide hydraulic calculations showing both surface and underground flows into and out of the drainage system during major and minor storm events (refer Clause 16), and 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 certain 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 represented at specific hold points that relate to roads and drainage construction and documentation should reflect this.

Any Road Safety Audit required by **Council** should be submitted with the request for detailed design approval.

After review by the **Council's Engineering Department**, one set of plans and specifications 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, in consultation with VicRoads where appropriate, and the final design documentation submitted to **Council's Engineering Department** for review.

The **Design Engineer** should, unless otherwise specified by **Council**, provide three (3) hardcopies and one (1) electronic copy of the final design plans and specifications to the **Council's Engineering Department** with a covering letter certifying that the documentation complies fully with the guidelines of this **Manual**, except for any agreed 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 review. 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 review.

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 review.

Once final design approval has been granted, one (1) copy of stamped and 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 authorised 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 agreed 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.

Development Plans should generally be submitted on A3 sheets as a minimum. **Councils** may require Development Plans to 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

Detailed design or final design plans, and as constructed and 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

Whole farm plans should 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.

Unless, otherwise agreed by Council, coordinates should be related to Geocentric Datum Australia GDA94 or the MGA94 derived from it.

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 the variations are considered minor and 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: Checklists and Forms for Developer's Representatives**

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Clause 7 Construction Phase

7.1 Objectives

The objectives of these construction requirements are to ensure that:

- the works are constructed so 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** at least five working days before construction is scheduled to commence by submitting 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 measures to protect stormwater quality and prevent the spread of noxious weeds.
- Copy of Consent for Works within Road Reserves.
- Copy of relevant insurance certificates.

The *Intention to Commence Construction* form may be found in **Appendix D Design Engineer's Intention to Commence #D4**

7.3 Public Liability Insurances

Council will expect contractors engaged on development works within the municipality 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.** To the extent consistent with those requirements, **Council** will expect infrastructure to comply with any relevant provisions of VicRoads Specifications or Austroads standards.

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 otherwise provided 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, providing detailed operation and maintenance manuals for **Infrastructure** such as pump stations, retardation basins and wetlands so that any questions can be resolved in the course of the inspection.

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: Council Review Checklists**). 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 reviewed and approved by **Council** (Checklist found in **Appendix C: Council Review Checklists**).
- '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 consent for a 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, that details all design information and highlights any deviation from the approved design plans, should be prepared by a registered surveyor and/or 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.

For works constructed by **Council's** internal works departments, the "As Constructed" Plans should be prepared in accordance with **the requirements of the Assets Department** and signed off by the **Construction Engineer**.

Selection Table 7.6(a) shows those Councils which require "As Constructed" plans to be provided in ASpec Format. This format covers roads (R Spec), drainage (D Spec), buildings (B Spec), open space (O Spec)

Selection Table 7.6(a) A Spec "As Constructed" Requirements

Councils Requiring "As Constructed" Drainage Information to Be provided in A Spec format
Ballarat City Council
Bass Coast Shire Council
Baw Baw Shire Council
Campaspe Shire Council
Central Goldfields Shire
Colac Otway Shire Council
Glenelg Shire Council
Greater Shepparton City Council.
Hepburn Shire Council
Horsham Rural City Council
Latrobe City Council

Councils Requiring "As Constructed" Drainage Information to Be provided in A Spec format
Macedon Ranges Shire Council
Mitchell Shire Council
Moira Shire Council
Moorabool Shire Council
Mount Alexander Shire Council
Rural City of Wangaratta Council.
South Gippsland Shire Council.
Southern Grampians Shire Council
Strathbogie Shire Council.
Surf Coast Shire Council
Wangaratta Rural City Council
Warrnambool City Council
Wodonga 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 Council
Campaspe Shire Council (GDA 94)
Central Goldfields Shire Council
Colac Otway Shire Council
Glenelg Shire Council
Greater Geelong City Council
Golden Plains Shire Council

Councils Requiring AutoCAD electronic format
Hepburn Shire Council
Horsham Rural City Council
Latrobe City Council (MGA94 Zone 55)
Moira Shire Council
Mount Alexander Shire Council
Moyne 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.
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** for advice (refer to **Appendix B: Engineering Acceptance Process for Developments**.)

Where required 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 **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's Engineering Department** 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 and assets belonging to some service authorities** may not be covered. In such instances, the **Council and service authorities** concerned should be contacted for information as to the location of their underground 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)

7.9 CCTV Verification of Underground Drainage Assets

7.9.1 General Requirements

Recent CCTV verifications of newly constructed stormwater drains have identified unacceptable defects and features that can shorten the life of the asset and/or lead to operational problems and high on-going maintenance costs.

The **Councils** listed in Selection Table 7.9.1 will expect the **Developer** to arrange for CCTV verification of all underground drainage assets to be handed over to them, and to supply the results of that verification to **Council** at the time specified in that Selection Table and in the format specified in Appendix H.

Selection Table 7.9.1 Councils Requiring CCTV Verification of Underground Drainage Assets

Prior to Asphalting of Pavement	Prior to the Statement of Compliance Being Issued
Bass Coast Shire Council	Ballarat City Council
Baw Baw Shire Council	Glenelg Shire Council.
Campaspe Shire Council	Greater Bendigo City Council
Colac Otway Shire Council	Hepburn Shire Council
Greater Geelong City Council	Wangaratta Rural City Council
Greater Shepparton City Council	Warrnambool City Council
Hepburn Shire Council	Wodonga City Council
Horsham Rural City Council	
Latrobe City Council	
Mitchell Shire Council	
Surf Coast Shire Council	

Council will expect the cost of CCTV verification to be borne by the **Developer**.

7.9.2 Technical Requirements

Council will expect all underground drainage lines to be clear of debris and sediment prior to CCTV inspections being undertaken, and CCTV verification conducted in accordance with the current *Conduit Inspection Reporting Code of Australia WSA05* published by the Water Services Association of Australia (WSAA).

Council will expect CCTV inspectors to have obtained at least a Statement of Attainment in *NWP331A Perform conduit condition evaluation based on WSA05*, together with recognised qualifications in:

- occupational health and safety; and
- traffic control; and
- confined space entry.

Council will expect the camera and scanner to meet the requirements of WSA05, and defects found during the verification to be scored in accordance with Appendix D of WSA05: *Storing of Defects and the Preliminary Grading of Apparent Condition of Stormwater Drains*. Confirmation that the specified pipe material, size and class has been used, and that all components have been correctly aligned and connected, is an essential part of the acceptance of works based on CCTV inspections.

Problems that have been identified in the past include pipes cracked due to excessive compaction loadings during the laying process, damaged pipe ends due to poor handling, poorly jointed segments with inordinate gaps and/or misplaced rubber rings and damage at the lifting holes or unplugged lifting holes. Inspections of new or recently installed work should look for any evidence of such defects and ensure that, even when not attracting a formal defect score, they are noted and brought to the attention of **Council's Engineering Department**.

Council will normally accept transfer only of sections with a structural grading of 1 and a service grading of 1, and defective sections will require replacement or repair by techniques acceptable to **Councils Engineering Department**. Acceptable repair techniques may include patching, lining, sleeving or bonding using a range of proprietary systems.

Acceptance Criteria

A table of typical structural defects in rigid and flexible pipes appears in Appendix H.

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 and WSUD 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** may require 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 **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 accepted 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 cost and for recovering the cost from those who caused the damage.

8.5 Bonding of Outstanding Works

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

Where consent is given to lodge a bond for outstanding works, Council will normally expect separate security bonds to be lodged for civil and landscaping works.

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 bonded works are not completed within 12 months, unless otherwise agreed in writing, the **Council** may arrange for the works to be carried out and meet all costs, including those of supervising and administering the works, from the bond.

However, in the case of bonds for 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 a bond for uncompleted landscape works, the bond should be lodged following the approval of landscape plans and detailed documentation and before statement of compliance and will be returned to the developer following the completion of all required landscape works to the satisfaction of Council.

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 an instruction to rectify works will result in forfeiture of the part or all of the guarantee, as required, for the **Council** to undertake the works in question. If the required works are of an emergency nature, rectification works may be carried out by the **Council** at the **Developer's** expense, and the Letter of Release referred to in Clause 8.7 will not be issued until payment 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 an efficient road network that moves people in a variety of transport modes including vehicles, pedestrians, cyclists and public transport while minimising the impact on surrounding environment.

9.2 General

As explained in Clause 3 of this **Manual**, where new roads are to be provided, and/or existing roads are to be upgraded, in the course of a **Development**, **Council** may require that a **Traffic Management Strategy** be prepared to identify and address the impact of the development on the existing road network, and to establish the key features of the internal road network. The **Traffic Management Strategy** will normally recommend:

- appropriate mitigating works to address impacts on the existing road network; and/or
- the appropriate internal road layout, road widths, functions and connectivity for all road users.

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

While some commercial and industrial **Developments** may not create new roads or intersections, they may generate sufficient changes in traffic volumes and movements to cause **Council** to require the preparation of a **TMS**, as defined above.

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

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

9.3 Procedures and Criteria for a Traffic Management Strategy

The need for the **TMS** should be determined at or before the time of issue of the planning permit, and will normally be triggered where **Developments:**

- are expected to increase overall traffic volumes by 10%, or by 100 vehicles per day; and/or involve construction of a new road; and/or
- involve construction of a new intersection; and/or
- are expected to facilitate significant further development; and/or
- involve multiple **Developers** within a specific locality; and/or
- constitute large industrial or retail/commercial developments.

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

9.3.1 Traffic Management Assessment Report

The need for a **TMS** 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 Development Plan to assess).
- Multiple **Developers** within a specific locality.
- Large industry or retail/commercial development.

9.4 Detailed 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 it can be demonstrated that the safety, security and amenity of path users, local residents and property will be 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 a Development Plan 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 **TMS** 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;
- road layout, function and connectivity;
- bus routes, bus stops, and bus bays;
- access for emergency and service vehicles;
- off-street and on-street parking;
- major traffic control items; and
- traffic calming devices including:
    - roundabouts; and/or
    - traffic islands; and/or
    - parallel slow points; and/or
    - road humps.; and
- for major industrial and/or commercial developments, appropriate provisions for the safe and convenient loading and unloading of heavy vehicles; and
- 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 strategy 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 **TMS** to include clear recommendations. The **Developer** will be responsible for identifying any 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 **TMS** 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 achieve 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 conducted in accordance with the Austroads *Guide to Road Safety Part 6: Road Safety Audit* and any VicRoads supplement to those guidelines for all development designs that require a Traffic Management Strategy (refer to Clause 9). The guidelines specify that audits should be carried out at the detailed design stage and after construction has been completed.

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 accepted by **Council** prior to the issue of a Statement of Compliance, where relevant, or to the commencement of use.

Clause 11 Stormwater Management Strategy

11.1 Objectives

The objective of a **Stormwater Management Strategy [SMS]** is to establish how the quantity and quality of stormwater arising from or passing through any proposed development during certain defined rainfall and/or flood events will be managed so as to avoid adverse impacts on people, property and the natural environment within and beyond the development.

11.2 General

As explained in Clause 3 of this **Manual**, Council will normally expect a comprehensive **SMS** to and assess**:**

- stormwater impacts on the surrounding properties, floodways, flood plains, flood storage and Council infrastructure; and
- appropriate measures for the collection, conveyance and treatment of stormwater originating from and passing through the development.

Unless otherwise agreed, **Council** will expect the subsequent stormwater management framework and drainage infrastructure design to be consistent with the recommendations of any approved **SMS**.

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

11.3 Procedures and Criteria

When considering whether a **SMS** should be required at any point in the planning approval process, **Council** will have regard to the scale and complexity of the development in question and will, so far as reasonably practicable, require only those reports considered to be essential for **Council's Engineering Department** to make an informed decision on the merits of the relevant application.

An **SMS** will normally be required when:

- a proposed d**evelopment** will include the construction of one or more new:
  - retardation basins; or
  - WSUD quality treatment facilities; or
  - drainage outfalls; or
- there is potential for significant further development within the catchment; or
- the catchment involves multiple **Developers** within a specific locality; or
- more than 5 lots will discharge to a common drainage system; or
- large-scale industrial or commercial use will be involved.

11.4 Detailed Requirements

Where an **SMS** is required, **Council** will expect that, to an extent commensurate with the level of information reasonably available at the relevant stage in the planning approval process:

- The catchment area will be established and analysed.
- The estimated peak flows will reflect the full potential development of the proposed development and upstream areas, and take into account both normal flow situations and overland flows resulting from fluvial (riverine) and pluvial (flash) flooding.
- The impacts of pipe and pit blockages and high ground-water levels will be taken into account.
- Where overland floodwater routes, flow rates, and/or available flood storage volumes will be affected by a **Development**, compensatory works will be assessed, and appropriate provisions made in the project design.

- Where active floodways, floodplains and/or flow-paths are present, hydraulic modelling and analyses will be undertaken to determine the extent, velocity and depth of overland flood flows within and beyond the planned **development**. 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 safe and convenient flood conveyance and storage achieved.
- Since a primary function of a floodplain is to convey and store flood waters, thus preserving 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.
- The proposed outfall conditions, including water quality objectives, will be clearly documented.
- 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: Checklists and Forms for Developer's Representatives**.

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**.

The road and drainage requirements for developments in Low Density Residential Zones will vary according to the characteristic lot size. Developments in which most lots already have, or could soon be expected to gain, access to a piped sewerage network, and minimum lot areas could be reduced to 2000m^2, are considered to be urban in character, and Council will expect the infrastructure provisions of Clause 12.3 to be satisfied. For the purposes of Clause 12.3 and Clause 12.9, these developments are designated by the abbreviation LDRZ-U.

Developments in which minimum lot areas will be at least 4000m^2, either because subdivision will be limited by planning mechanisms, or because access to a piped sewerage network is unlikely to become available in the foreseeable future, are considered to be rural in character, and Council will expect the infrastructure provisions of Clause 12.4 to be satisfied. For the purposes of Clause 12.4 and Clause 12.9, these developments are designated by the abbreviation LDRZ-R.

12.3 Urban Roads

This section applies to roads in urban zones and in LDRZ(U) developments. The design and construction of all relevant roads, streets and allotment accesses should meet or exceed the requirements of VicRoads, the Planning Scheme, this **Manual** and any relevant Acts, Regulations and Australian Standards.

12.3.1 Road Classification

The classification of residential streets within any development should be in accordance with Table 2 in Clause 12.3.2.

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 agreement is obtained from **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 Agreement Obtained
Ararat Rural City Council
Ballarat City Council
Baw Baw Shire Council
Benalla Rural City Council
Campaspe Shire Council
Central Goldfields Shire
Colac Otway Shire Council
Gannawarra Shire Council
Glenelg Shire Council
Golden Plains Shire Council
Greater Bendigo City Council.
Greater Geelong City Council
Greater Shepparton City Council
Hepburn Shire Council
Horsham Rural City Council
Indigo Shire Council
Latrobe City Council
Macedon Ranges Shire Council

Access Lanes Are Not Considered Desirable in These Councils Unless Specific Agreement Obtained
Mansfield Shire Council
Mitchell Shire Council
Moorabool Shire Council
Mount Alexander Shire Council
Moyne 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 accepted 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 acceptance 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 urban and LDRZ(U) developments are detailed in Table 2. Council will expect all these roads and streets to be constructed with a sealed pavement and provided with kerb and channel unless an alternative treatment is integral to a **WSUD** treatment solution, and **Council** has given prior agreement in writing for the use of that particular solution.

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.

Council will expect all road reserve widths to be sufficient to accommodate the **Carriageway**, the required services with all necessary clearances, pedestrian and bicycle access, parking, landscaping, drainage and bus routes. Should the development design incorporate certain **WSUD** devices, increased road reserve widths may be required.

The minimum road reserve widths in residential and low density residential **Developments** are detailed in Table 2 *PRINCIPLE* Lesser width industrial road reserves may be permitted for short industrial cul-de-sacs, provided that turning at the court bowl will not be compromised.

Footpath, bus, bicycle and pedestrian provisions are detailed elsewhere in the **Manual**. **Council** will not accept 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 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)	0 - 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)	0 - 300	6.0m See Note 6.	14.0m	3.5m See Note 2.	Yes (one side)	Footpath both sides except for LDRZ(U) see Note 8 No separate cycle provision	B2, SM2 or modified SM2. See Note 3.
Access Street (includes two-way frontage streets and service lanes)	0 - 2500	7.3m	16.0m	3.5m See Note 2.	Yes (both sides)	Footpath both sides except for LDRZ(U) see Note 8 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) unless exempted from kerb and channel. See Note 9	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.

Street Type	Indicative 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
Commercial Street	n/a	22.0m	32.3m	5.0m	Yes (both sides)	Footpath both sides. Cycle provision where directed	Barrier B2
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 12.3.2 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
Greater Geelong City Council		
Greater Shepparton City Council	Greater Shepparton City Council	Greater Shepparton City Council
Latrobe City Council	Latrobe City Council	Latrobe City Council
Macedon Ranges Shire Council		Macedon Ranges Shire Council
Mount Alexander Shire Council	Mount Alexander Shire Council (will consider where justification is demonstrated)	Mount Alexander Shire Council (will consider where justification is demonstrated)
Moyne Shire Council	Moyne Shire Council	Moyne Shire Council
Pyrenees Shire Council	Pyrenees Shire Council	Pyrenees Shire Council
	Ballarat City Council	Ballarat City Council
Surf Coast Shire Council	Ararat Rural City Council	Bass Coast Shire Council
Wellington Shire Council	Benalla Rural City Council	Baw Baw Shire Council

B2	SM2	SM2 Modified
	Corangamite Shire Council	Campaspe Shire Council
	Glenelg Shire Council	Central Goldfields Shire Council
	Hepburn Shire Council	City of Greater Bendigo
	Horsham Rural City Council	Colac Otway Shire Council
	Moorabool Shire Council	East Gippsland Shire Council
	Strathbogie Shire Council	Indigo Shire Council
	Surf Coast Shire Council	Mansfield Shire Council
	Swan Hill Rural City Council	Mitchell Shire Council
	Warrnambool City Council	Moira Shire Council
	Yarriambiack Shire Council	Rural City of Wangaratta Council
Warrnambool City Council		Warrnambool City 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

Where a **Council** has a bicycle strategy/policy/plan that requires on-road bicycle lanes then the **Council** may agree to reduce the number of shared paths required from two to one, to reflect the provision of those lanes. In such cases, the minimum pavement width for each relevant carriageway will be increased by 1.0m.

Note 8

No separate provision for cycle traffic is required in Access Places and Access Streets. In LDRZ(U) developments, Council will expect a footpath or a shared path to be provided on at least one side of each category of street to which this note applies save in exceptional circumstances.

Note 9

Where Council has agreed that a Residential Collector Road can be exempted from kerb-and-channel installation in order to accommodate specific WSUD devices, the minimum sealed carriageway width will be as defined in Selection Table 12.4.2(a).

Note 10

The above standards will apply unless otherwise agreed in writing or otherwise specified in the planning permit conditions.

Note 11

The road reserve width for frontage streets may be reduced where it can be demonstrated that services can be accommodated within the frontage road reserve or the abutting road or other reserve

Other 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 roadside 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 prior to the approval of functional layout 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

Type of Street	Target Street Speed km/hr
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** agreement.

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 12.5m
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.

(c) Turning circles are invert of kerb to invert of kerb

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 agreement 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 in writing**,** the **Councils** listed in Selection Table 12.3.10, require subsoil drainage to be provided below all kerb and channel laid, 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
Greater Geelong City Council
Horsham Rural City Council
Indigo Shire Council
Latrobe City Council
Macedon Ranges Shire Council
Mitchell Shire
Moira Shire
Moorabool Shire Council
Moyne Shire Council
Murrindindi Shire Council
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
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 agreed.

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 appropriate 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 or Rural Living developments or by Low-Density Residential LDRZ(R)

12.4.1 General

The design and construction of roads and allotment accesses should meet or exceed the requirements of the Austroads *Guide to Road Design*, this **Manual** and any relevant Acts, Regulations and Australian Standards.

Council will expect all new and upgraded roads in Rural Living and relevant Low-Density Residential **Developments** to be to full road construction standards. Any contribution by **Council** toward the cost of such road construction will be in accordance with the policies of the **Council** concerned.

Traffic generated as a result of any relevant **Development** should be encouraged to use the route identified for access in the submitted documents. **Council** may require that all off-site intersections be constructed or upgraded and that additional signage be provided.

Before any works are undertaken in an existing road reserve, a permit must be obtained from Council granting *Consent to Work within a Road Reserve*.

12.4.2 Road Reserves

Council will expect the **Design Engineer** to ensure that road reserve widths are sufficient to accommodate the specified **Carriageway**, the required services with the necessary clearances and provision for 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.

Council will expect the minimum road reserve width in Rural Living and relevant Low-Density Residential **Developments** to be 20 metres. However, 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 620.

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, Gannawarra Shire Council and Latrobe City 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
Latrobe City Council
Macedon Ranges Shire 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	Baw Baw Shire Council
Campaspe Shire Council	Glenelg Shire Council
Central Goldfields Shire	Greater Bendigo City Council
Colac Otway Shire Council	Latrobe City Council
Corangamite Shire Council	Macedon Ranges Shire Council
East Gippsland Shire Council	Mitchell Shire Council
Golden Plains Shire Council	Mount Alexander Shire Council
Greater Geelong City Council	South Gippsland Shire Council
Greater Shepparton City Council	Warrnambool City Council
Hepburn Shire Council	Wodonga City Council
Indigo Shire Council	Yarriambiack Shire Council
Mansfield Shire Council	
Moira Shire	
Moorabool Shire Council	
Moyne Shire Council	
Murrindindi Shire Council	
Pyrenees Shire Council	

6.2m Wide Seal	7.0m Wide Seal
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	Latrobe City Council
Central Goldfields Shire	Macedon Ranges Shire Council
Colac Otway Shire Council	Warrnambool City Council
Corangamite Shire Council	Wellington Shire Council
East Gippsland Shire Council	Wodonga City Council
Gannawarra Shire Council	
Glenelg Shire Council	
Golden Plains Shire Council	
Greater Bendigo City Council	
Greater Geelong City Council	
Greater Shepparton City Council	
Hepburn Shire Council	
Indigo Shire Council	
Mansfield Shire Council	
Mitchell Shire Council	
Moira Shire Council	
Moorabool Shire Council	
Moyne Shire Council	
Mount Alexander Shire Council	
Murrindindi Shire Council	
Rural City of Wangaratta	
South Gippsland Shire Council	
Southern Grampians Shire Council	

Standard A Councils	Standard B Councils
Strathbogie Shire Council	
Surf Coast Shire Council	
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 that publication, unless otherwise noted in this **Manual**.

Council will expect road widths to be in accordance with Clause 12.4.7, and road geometry in Rural Living and relevant Low-Density Residential **Developments** to provide sufficient space for emergency service vehicles and waste collection vehicles to carry out their functions while travelling in a forwards-only direction throughout the development. Significant **Developments** may require provision for school buses, and **Council** will expect all relevant roads to be so designed that these vehicles do not need to reverse.

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 all roads in Rural Living and relevant Low-Density Residential **Developments** to provide for two lanes of traffic.

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%. Where 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 the Design Engineer proposes to use cross-falls of greater than 6% at intersections or horizontal curves, specific prior agreement 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 batters cannot reasonably be restricted to the maximum specified slopes, 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 and making allowance for all possible turning movements within the road design. **Council** will expect these movements to be shown on the plans submitted for approval.

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 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.

Tee-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 Tee-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 Tee-junctions require VicRoads or specific 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 authorisation. 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 authorisation. Access to these 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 relevant **Development**.

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 authorisation. The **Design Engineer** will be responsible for securing any necessary approvals and should refer to Part 2.2 of the *VicRoads Traffic Engineering Manual Volume 3*.

Council will expect the **Design Engineer** to seek specific prior agreement for the installation or construction of traffic calming devices, and to address the following issues in the relevant 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 narrowing has 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 narrowing:
      - 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 narrowing) 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 **Design Engineer** to determine the depth of flexible or rigid pavement required for the proposed pavement structure and materials, based on geotechnical testing, and to submit the design to **Council's Engineering Department** for approval, unless a **Council** has determined default pavement depths for the various soil types in their municipality see Selection Table 12.7 Default Pavement Design. Specific designs should be submitted for rigid pavements that include deep lift asphalt and/or stabilised materials.

Selection Table 12.7 Default Pavement Design

Councils with Default Pavement Designs
Latrobe City Council

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 flexible road pavement designs to be undertaken in accordance with the Austroads *Guide to Pavement Technology, 2010*. Pavement design should 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 design life for residential and commercial roads. Pavement design for industrial roads should be based on an average traffic generation rate of 45 vehicles per day per industrial lot and a 40 year design life. For rural roads and Rural Living **Developments**, it may be appropriate to use the Austroads publication *Pavement Design for Light Traffic 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 %

VicRoads Standard Specification 820 – Crushed Concrete for Pavement Sub Base and Light Duty Base provides details of materials that can be substituted for conventional Class 2,3 & 4 Crushed Rock. Materials complying with Specification 820 may also be used as bedding under footpaths, slabs and kerbs and similar applications.

12.7.3 Permeable Pavement

Council will expect the design procedure for permeable pavements to have due regard to stormwater management as well as structural integrity, and for the final pavement structure and depth to meet both sets of criteria.

The software package PERMPAVE, developed by the Concrete Masonry Association of Australia, based on a design storm approach can be used to analyse stormwater quality outcomes, and to explore harvesting or reuse options.

Council will expect the **Design Engineer** to use mechanistic methods for the structural design of permeable pavements. Suitable software packages include LOCKPAVE, also developed by the Concrete Masonry Association of Australia, and CIRCLY.

The **Design Engineer** should refer to the ARRB report Design of Permeable Pavements for Australian Conditions, which outlines a more detailed methodology for designing permeable pavements. Interpave also provides technical documents, including standard cross-sections for the design of such pavements.

12.7.4 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.

12.7.5 Interlocking Pavers

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

12.7.6 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 12.7.6 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 12.7.6 Minimum Pavement Depth

Minimum Pavement Depth = 250mm	Minimum Pavement Depth = 300mm	Minimum Pavement Depth = 400mm
Ararat Rural City Council	Ballarat City Council	Glenelg Shire Council
Campaspe Shire	Bass Coast Shire Council	Horsham Rural City Council
Gannawarra Shire Council	Baw Baw Shire Council	
Greater Bendigo City Council	Benalla Rural City Council	
Greater Geelong 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	Golden Plains Shire Council	
Murrindindi Shire Council	Hepburn Shire Council	
Strathbogie Shire Council	Latrobe City Council	
Towong Shire Council	Macedon Ranges Shire Council	
	Mitchell Shire Council	
	Moorabool Shire Council	
	Mount Alexander Shire Council	
	Moyne 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	

12.7.7 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.

12.7.8 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.

12.7.9 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 12.7.9 require the central pavement thickness to extend to the full width of the shoulder in the specified circumstances.

Selection Table 12.7.9 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
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	
Mitchell Shire Council	
Moorabool Shire Council	
Mount Alexander Shire Council	
Murrindindi Shire Council	

Unkerbed Court Bowls Only	All Unkerbed Roads
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	

12.7.10 Compaction Requirements

Compaction should reflect traffic volumes and pavement design in accordance with the *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 registered 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 should be undertaken within 48 hours of a successful proof roll.

12.7.11 Sub-Grade

Proof rolling of the subgrade, in accordance with Clause 12.7.14 Proof Rolling, must be undertaken prior to the placement of subbase material

Compaction testing of the subgrade will be required when imported or site-won material is used to raise the existing surface to finished subgrade level and/or when approved subgrade treatments (including the addition of granular material) extend more than 200 mm below the finished subgrade level. When such testing is required, the subgrade material must be compacted to 98% of the standard dry density [STDDD] or in accordance with the Construction Specification and/or AS 3798.

12.7.12 Sub-Base

The typical flexible pavement sub-base consisting of fine crushed rock should be compacted as follows:

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

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

12.7.13 Base

The typical flexible pavement base should be compacted as 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% MMDD
Access street or road	98% MMDD

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.

12.7.14 Proof-Rolling

The subgrade should not deflect more than 2 mm vertically within 300 mm of the test roller in isolated locations during the proof rolling of the subgrade. If deflection of the subgrade is found in more than 20% of the project area, **Council** will expect the total area to be reworked.

Council will expect that proof-rolling of the subgrade, sub-base and base will be undertaken in accordance with the requirements of *AS 3798* and Section 173 of the VicRoads specifications.

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.

All proof rolling will be undertaken at the expense of the **Contractor.**

12.7.15 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.

12.7.16 Pavement Wearing Course

Council will expect pavements to be proof-rolled and density-tested, at the expense of the **Contractor**, immediately prior to priming. The number of density tests should be in accordance with *AS 3798* and *AS 1289 Geotechnical Testing*, unless otherwise agreed by **Council**. 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.

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 significant turning movements by heavy vehicles are expected, the first coat should use a 14mm aggregate, with the second coat using 7mm aggregate.

12.7.17 Alternative Treatments

The performance of warm-mix asphalt is generally considered to be equivalent to that of conventional hot-mix under the relatively low traffic volumes applicable to most **Council** roads. Current testing being undertaken by AAPA, ARRB and VicRoads is exploring the performance of warm-mix asphalt at traffic volumes up to 24,000 vehicles per day.

Current VicRoads Specifications allow between 10% and 40% of recycled asphalt to be included in new mixes depending on the particular mix type (Refer VicRoads Standard Specification 407). A combination of warm-mix asphalt and recycled asphalt, providing even greater environmental benefits, appears to have no adverse impact on pavement performance on typical lower-volume **Council** roads.

Emulsion binders can be used as an alternative to hot bitumen, particularly under cool and/or damp conditions. Austroads *Guide to Pavement Technology Part 4F: Bituminous Binders* states that:

> Emulsions can be used in sprayed seals for many of the applications of hot bitumen. The advantages include less heating, reduced use of cutter oils in cool conditions and improved adhesion to damp surfaces in some circumstances. The disadvantages include a higher cost due to the cost of emulsification and a slower rate of strength gain that increases the time before seals can be trafficked, particularly in cooler conditions.

VicRoads *Technical Note TN 107 – Use of Recycled Materials for Road Construction* provides further information on the availability and use of alternative pavement materials.

A two-coat bitumen seal may be considered as an alternative in some residential **Developments**, such as those located in heritage areas, subject to prior agreement by **Council's Engineering Department**. 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.

Council will expect the **Design Engineer** to specify all relevant design information, including mix design, aggregate size and any colour or other additives, prior to construction. Where disputes arise concerning the finished surface texture or integrity, core samples and compaction testing, undertaken at the cost of the **Developer**, may be required.

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 authorisation. The **Design Engineer** will be responsible for obtaining any necessary authorisations, 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, cycle-ways 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 agreed in writing, and the signposting design 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 appropriate VicRoads specification.

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 or modified 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 12.9 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	Warrnambool City Council
Greater Shepparton City Council	Wellington Shire Council
Hepburn Shire Council	Wodonga City Council
Horsham Rural City Council	
Macedon Ranges Shire Council	
Mansfield Shire Council	

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

*Note Ballarat City Council 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.

Where Council has permitted swale drains to be used in LDRZ(U) or LDRZ(R) developments as part of an integrated WSUD treatment system, the minimum pipe diameter will be 300mm, and the pipes should be laid so that the pipe invert matches the table drain invert.

12.9.1 Urban Vehicle Crossings

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

12.9.1.1 Entry/Exit

Driveways and direct vehicle access to collector streets Level 2 should be designed to allow forward entry and exit from properties.

12.9.1.2 Location of Crossings

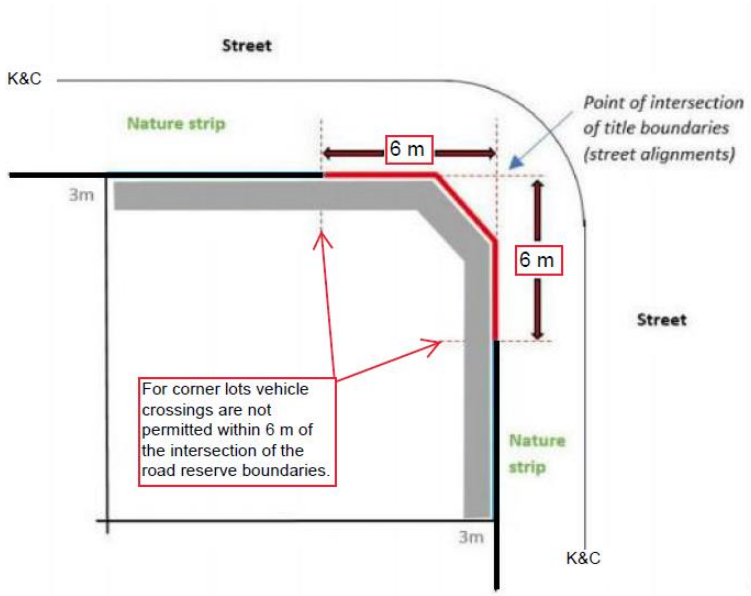
Crossings should be located to avoid damage to any pits, power poles or other above ground assets. Contact should be made with the relevant service authority to determine their minimum clearances. In the case of Council assets such as stormwater pits the minimum clearance is 1m unless otherwise agreed by the relevant Council.

Note where a crossing is approved by Council to be constructed over an existing drainage pit the pit must be modified to comply with SD 496 Modified Existing Pit to Grated Pit in Vehicle Crossing / Layback.

Crossings should be located at least 2.5m from the trunk of the street tree.

Crossings should be located so as not to reduce traffic safety by ensuring that vehicular movements associated with new or modified crossings do not conflict with street traffic flow and the pedestrian, cyclist and motorist visibility. This can be achieved by

a. a minimum clearance from the property boundary of 6m from any intersection to reduce confusion at intersections and reduce the number of conflict points as shown in the figure below:



b. Crossings not located closer than 2m to any pedestrian or pram crossing.

c. Crossings not located in line with a traffic control item such as a speed hump, other speed reducing feature or to any school crossing unless those items have been specifically designed for these.

d. Crossings should generally align with internal driveways and garages as this will make for safer entry and exit of vehicles.

e. A minimum distance of 1m from the end of any parking bays.

Council will expect greater clearances to be applied when crossings provide access to and from Collector streets and may require the **Design Engineer** to demonstrate that vehicles can enter and leave the roadway while travelling in a forward direction at all times.

Crossings should generally be spaced along the street to provide a space for a street tree to be planted (minimum 5m) and for the servicing of properties including properties on the opposite side of the street.

12.9.1.3 Number of Crossings per allotment

Council will expect the number of locations where a vehicle is required to cross a footpath into private property to be minimised so that pedestrian safety is enhanced. For that reason, the Developer should not assume that Council will permit more than one crossing to be constructed to serve each such property.

12.9.1.4 Construction and Design Standards

Construction should be in accordance with the requirements of the relevant Standard Drawings:

- SD 235 Retrofit Residential Vehicle Crossing Detail
- SD 240 New Residential Single Vehicle Crossing Detail
- SD 245 New Residential Shared / Double Vehicle Crossing Detail for Adjacent Properties.
- SD 250 New Industrial Vehicle Crossing Detail

Crossings should be located in a position where the grades on the crossings will not be excessive and prevent or hinder ingress and egress of vehicles from the property.

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 accepted 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.

12.9.1.5 Liability for Cost of the Relocation of Infrastructure and Services

Any change to infrastructure or services required as a result of crossing location will be at the expense of the landowner and not the Council.

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 4.8m**,** and all culverts should be equipped with an end-wall at each end of the pipe. Council will expect trafficable end-walls to 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.

Where **Council** has permitted swale drains to be used in LDRZ as part of an integrated WSUD treatment system, the minimum pipe size will be ∅300mm, and the pipes should be laid so that the pipe invert matches 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:

- 20% **AEP** capacity before the 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 the 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

Where existing dwellings, or dwellings for which planning permits are in force, are likely to experience an increased intensity and/or frequency of dust exposure arising from traffic related to a proposed **Development**, **Council** may require the **Developer** to undertake appropriate dust suppression works at the relevant locations. These works may be permanent in nature, or may comprise an acceptable seasonal treatment regime extending over a defined period. The requirements will vary from **Council** to **Council**, reflecting differences in road-making materials and annual rainfall patterns. **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
Moyne 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
		Greater Geelong City Council
		Hepburn Shire Council
		Indigo Shire Council
		Latrobe City Council
		Mitchell Shire Council
		Moorabool Shire Council
		Murrindindi Shire Council
		Rural City of Wangaratta
		Southern Grampians Shire Council
		Strathbogie Shire Council
		Surf Coast Shire Council
		Swan Hill Rural City Council
		Towong Shire Council
		Warrnambool City Council
		Wellington Shire Council

Dust Suppression Works Required	Councils – Council Funds Dust Suppression Works	Councils – Where Dust Suppression Works are Determined on a Case by Case Basis
		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;
- community health and wellbeing associated with increased physical activity, and
- to develop layouts that allow for access in all directions, link to public transport, reduce dependence on cars and provide walkways and cycle-ways that are continuous and linked to each other.

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.

The Austroads publication *Cycling Aspects of Austroads Guides (2014)* provides comprehensive information on planning, design and traffic management of cycling facilities.

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 3 – Part 2.19 Accessibility DDA Guidelines* and with **Appendix B: Engineering Acceptance Process for Developments**. 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 accepted 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 acceptance of the detailed design.
- **Council** will expect the **Design Engineer** to seek specific agreement from 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 agreed 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.
- Designers should provide minimum sight lines for pedestrian safety in keeping with the principles stated in Fig 3.3 in AS 2890.1 Parking Facilities – Part 1 Offstreet Carparking

13.4 Unsealed Paths

Unsealed paths are not permitted to be used unless otherwise stated in Selection Table 13.4 which provides details of the location and other criteria under which Councils will be prepared to consider accepting gravel paths

The minimum width of the paths should be 2.8 metres. Batter slopes from the path should not be greater than 1 in 6 to ensure ease of maintenance when mowing.

Consideration of the path location is vital with respect to drainage and potential property access and ensure a minimum life of ten (10) years. Where possible, the path should have a uniform grade in steeper terrain where there is a potential for scouring of the gravel surface.

Where a path must cross a natural surface drainage line, the path surface should either be raised above the surrounding ground level to allow a culvert to be installed or follow the natural contour of the land.

Culverts should be equipped with low-profile headwalls and, when the pipe diameter exceeds 225mm, with guard rails on each side of the path. The path width should be maintained across the culverts, and the overall formation width increased accordingly.

If the preferred option is to follow the natural contour of the land, and allow stormwater to flow over the path, the section liable to inundation should be sealed with;

- reinforced concrete constructed to the same specification as a residential footpath; or
- an asphalt layer at least 30 mm thick, with protective concrete edge strips.

The typical cross-fall for gravel paths should be as follows:

- Crown along centre of path, 1:25 fall from the centre.
- One way cross-fall, minimum of 1:50.

Typical physical properties of the gravel should meet the following criteria:

- All passing sieve size 13.2 mm
- Liquid Limit (max) 30%
- Plasticity Index max 15

Typical Grading requirements for gravel.

Sieve Size – AS sieve (mm)						
Sieve Size	13.2	9.50	4.75	2.36	0.425	0.075
% passing	100	60-90	42-76	28-61	14-29	6-14

Permitted Range of Gradings

Sieve Size AS (mm)	Permitted Range of Grading ± (%, by mass)
13.2, 9.50, 4.75, 2.36	15
0.425	10
0.075	5

In appropriate cases, the path may incorporate a wearing course comprising 50mm of stabilised granitic sand or crushed limestone.

Selection Table 13.4 Unsealed Paths

Permitted in Open Space Areas	Permitted in Low Density Residential Developments	Permitted for Shared Paths
East Gippsland Shire Council	East Gippsland Shire Council	East Gippsland Shire Council
Mansfield Shire Council		
Wellington Shire Council	Wellington Shire Council	Wellington Shire Council
Yarriambiack Shire Council	Yarriambiack Shire Council	

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 the accepted Traffic Impact Assessment Report. **Council** will expect all required physical works to be constructed as part of the **Development**, in accordance with accepted 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 permitted to proceed unless the **Design Engineer** can satisfy **Council** that alternative car-parking can be provided which meets the requirements set out in Clause 14.3. In particular, where **Council** has a Parking Strategy that identifies existing or proposed parking within 100m of the **Development**, Council may require the **Developer** 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 acceptable 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 works do not damage, obstruct safe access to, or compromise minimum cover requirements for existing service infrastructure, or reduce the capacity of that infrastructure to service the land on which the earthworks are conducted.
- To ensure that earthworks and lotfilling works do not result in erosion.
- To avoid the release of dust, mud or debris from the site.
- To maintain the privacy and security of adjacent landowners.
- To minimise removal of material from the site and hence disposal of material to landfill.
- To ensure that all the above issues are considered and addressed at the design stage.

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 consent for 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.

Earthworks may adversely affect the ability of lots to be serviced by gravity sewerage and may require alterations to existing maintenance structures and fittings to match finished surface levels. **Council** will expect the **Design Engineer** to consult with the relevant service authority before submitting engineering plans for approval.

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.

Where possible a design that achieves a balance of cut and fill should be targeted. More importantly the **Designer** should determine the most sustainable outcome considering options for a balanced cut and fill, retention of surplus materials on site, possible reuse of materials elsewhere, and as a last resort disposal of materials as waste. Where material has to be removed from site, the designer should consider possible uses and destinations for the material.

The following considerations apply to better managing earthworks at the design stage:

- Minimise the amount of topsoil that is disturbed and removed
- Explore options for the reuse of excavated materials elsewhere on the site
- Incorporate surplus excavated materials into site features such as landscaping
- Configure lot layouts to minimise re-grading and earthworks

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. The **Design Engineer** should check with the relevant authority to ensure that the construction of such walls will not impact on existing underground services (which may be in unregistered easements).
- No water may be directed to flow into adjoining properties.

- Ideally no fill should be imported onto any **Development** site. Council will expect the **Construction Engineer** to indicate the source of any imported 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, debris and dust from leaving any site during and after construction (refer also Clause 22.3 and 22.4).
- 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 as appropriate.
- 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 accept 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 accept 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 accept 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 accept 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 accept 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 accept 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 acceptable 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 - A Guide to Flood Estimation 2019, 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 prior agreement 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 3.5 of Book 9 *Australian Rainfall and Runoff – A Guide to Flood Estimation 2019*.

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 kerbs 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 review and 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** (exceedances per year) terminology recommended by *Australian Rainfall and Runoff* has therefore been adopted to describe such events.

Table 8 summarises the relationship between the return interval descriptors and those now used within the manual, with **AEP** values rounded to the nearest percentage point.

Table 8 AEP and ARI Values

ARR/BOM 1987	ARR/BOM 2016	
ARI (years)	**AEP/EY**	**ARI (years)**
0.25	4EY	0.25
0.50	2EY	0.50
1	1EY	1
2	50%	1.44

ARR/BOM 1987	ARR/BOM 2016	
ARI (years)	AEP/EY	ARI (years)
5	20%	4.48
10	10%	9.49
20	5%	20
50	2%	50
100	1%	100

Intensity/Frequency/Duration curves (IFD) are available from the Bureau of Meteorology Website: http://www.bom.gov.au/water/designRainfalls/revised-ifd/

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 9.

Table 9 Annual Exceedance Probabilities for Minor Drainage in Urban Areas

Drainage System	Capacity
Urban Residential Areas	20% **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

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.

Table 10 specifies the minimum runoff coefficients to be used in the design of drainage systems:

Table 10 Runoff Coefficients

Catchment Type	**Runoff Coefficient** (applies to all **AEP** for most Councils)	**Runoff Coefficient** (applies to 20% **AEP** for those Councils listed in Selection Table 16.7)
LDRZ – lot areas > 2 ha	0.30 See notes 1, 2 and 3	0.30
LDRZ - >1 ha to 2 ha	0.35 See notes 1, 2 and 3	0.30
LDRZ – lot areas >4000 m^2 to 1 ha	0.40 See notes 1, 2 and 3	0.35
LDRZ – lot areas >2000 m^2 to 4000 m^2	0.45 See notes 1, 2 and 3	0.35
Residential areas – lot areas >1000 m^2 to 2000 m^2	0.50 See notes 1, 2 and 3	0.40
Residential areas – lot areas >600 m^2 to 1,000 m^2	0.70 See notes 1, 2 and 3	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 10 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 20% **AEP** and 1% **AEP**. All other **Councils** use the coefficients listed in the first column of Table 10.

Selection Table 16.7 Differing Coefficients of Runoff

Councils That Use Differing Coefficients of Runoff for 20% AEP and 1% AEP
Greater Bendigo City Council
Greater Geelong City Council
Horsham Rural City Council
Wellington Shire Council
Yarriambiack Shire Council

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.

When an external area contributes stormwater to the system, the drain should be located at a depth sufficient to serve the total upstream area, and due consideration should be given to any possible upstream backwater effects.

The HGL in pipes running partially full may be assumed to follow the pipe obvert. However, the actual 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 11.

Table 11 Pipe Roughness Values

Pipe Material	N	K (mm)
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, having due regard to the potential for pipe roughness to increase over the service life of the system.

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 accept 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
Gannawarra Shire Council	Bass Coast Shire Council
Greater Shepparton City Council	Baw Baw Shire Council
Horsham Rural City Council	Central Goldfields Shire Council
Mansfield Shire Council	Colac Otway Shire Council
Moira Shire Council	Corangamite Shire Council
Wellington Shire Council	East Gippsland Shire Council.
Yarriambiack Shire Council	Glenelg Shire Council
	Golden Plains Shire Council
	Greater Bendigo City Council
	Greater Geelong City Council
	Hepburn Shire Council
	Indigo Shire Council
	Latrobe City Council
	Macedon Ranges Shire Council
	Mitchell Shire Council
	Moorabool Shire Council
	Moyne Shire Council
	Murrindindi Shire Council (minimum grade 1 in 200)
	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

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
	Warrnambool City Council
	Wodonga City Council

16.8.3 Minimum Pipe Cover

The minimum cover should be in accordance with the manufacturer's recommendations, unless otherwise provided for in Clause 16.10. 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 and to the anticipated live loads.

Minimum cover to and clearances between utility services can be obtained from VicRoads Code of Practice for the Management of Infrastructure Within Road Reserves.

Where sizes of future utility services are not known contact the Council to determine what minimum cover should be provided for.

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.

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

Side entry pits should be spaced so that the pits are able to deliver the design flows into the pipes, and the length of the flow channels should not exceed 80 metres. **Council** will expect the **Design Engineer** to consult inlet capacity charts or undertake specific design where any doubt exists that these criteria can be satisfied.

Side entry pits should be clear of radials, kerb crossings and driveways. Channel flow approaching an intersection should 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.

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.

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 pit geometries, and/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

16.10.1.1 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 accepted 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 agreement from **Council's Engineering Department**.

16.10.1.2 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 acceptance of 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

Accepted for use	Accepted for use except under road pavements
East Gippsland Shire Council	Ballarat City Council
Greater Geelong City Council	Baw Baw Shire Council
Greater Shepparton 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

Accepted for use	Accepted for use except under road pavements
	Greater Bendigo City Council
	Hepburn Shire Council
	Horsham Rural City Council
	Indigo Shire Council
	Macedon Ranges Shire Council
	Murrindindi Shire Council
	Wellington Shire Council
	Yarriambiack Shire Council

16.10.1.3 Other Profiles and/or Materials

Prior agreement 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 16.10.1 Ribbed Polypropylene or High Density Polyethylene Stormwater Pipes.

Council recognises that sustainable material alternatives, including recycled plastics and concretes containing recycled aggregates or fibre reinforced concretes, can demonstrate similar hydraulic performance to that of conventional materials, but will require that the **Design Engineer** provides additional evidence on the structural integrity and durability of proposed pipe profiles and materials. The information provided should 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 accepted;
- 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 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 agreement 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.

Pipeline designs should consider both dead and live loads. In addition to the live loads imposed by normal traffic movements, **Council** will expect the **Design Engineer** to have regard to the transient live loads associated with construction equipment, heavy service vehicles and emergency vehicles.

When pipelines are located within road reserves or public spaces, or may otherwise be subjected to significant live loads, **Council** may require the **Design Engineer** to provide specific calculations, based on the live loads specified in *AS 5100.2 Bridge design*, to confirm the adequacy of the proposed type and class of pipe, rather than relying on generic recommendations by manufacturers.

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

Note: *The **Design Engineer** should ensure that any commercially available software package relied upon in performing such calculations uses the live load distribution ratios specified in Clause 6.2 of AS 5100.2.*

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 installation of buried concrete pipes*. The **Design Engineer** should have regard to the recommendations in *AS/NZS 3725-2007 Supplement 1 (Commentary),* particularly in situations where a buried pipeline may be required to carry significant live loads.

Note: *Table B2 of AS 3725-2007 does not reflect the live load distribution ratios specified in Clause 6.2 of AS 5100.2, and should not be relied upon when submitting specific calculations for pipelines to be located within road reserves or public spaces.*

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.

When particular pipe materials and/or systems are not specifically covered in AS/NZS 2566.1-1998, Council may require the Design Engineer to provide evidence that the testing and quality control regimes applied, and the design parameters recommended, by the manufacturer are equivalent to, or more stringent, than those specified in the standard.

16.10.3.4 Alternative Bedding and Backfill Materials

Aggregate specifications for these purposes depend on the pipeline material, the depth of embedment, and the nature of the overlying infrastructure. **Council** will expect the material being considered to meet grading, plasticity and other criteria outlined in the relevant specifications. **Council** recognises that recycled materials may provide a sustainable alternative to natural gravels and sands or crushed rock, but will normally expect the **Design Engineer** to provide evidence that such materials will meet consistent performance standards, equivalent to those of conventional materials, and have been used successfully in comparable situations elsewhere in Australia. Where such evidence is not readily available, advice may be sought from the manufacturer of the pipe units as to the suitability of the proposed alternative material.

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 to be shaped to suit the pipe radius and change of pipe lower inverts, unless otherwise agreed by the **Council**.

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

Council may request catch basins, also known as sumped drainage pits, in locations where a drainage system is tributary to a receiving water which is vulnerable to siltation, such as a constructed wetland. For efficiency of future maintenance, these structures have the effect of settling out solids during low-flow storm events and storing the solids for subsequent collection by vacuum truck, and can assist to minimise the frequency of dredging sediments from the receiving water body

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, several pipes enter 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

Council will expect the **Design Engineer** to design drop pits with a level difference greater than 2m between an incoming pipe and the pit outlet pipe 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.

Council may accept the use of prefabricated pits, but may require the **Design Engineer** or **Construction Engineer** to provide full technical details of the proposed pits, including material, specification, dimensions, and product data sheet, and to give careful consideration to any advantages or disadvantages of using such pits in the proposed location. **Council** may also require that a certificate be provided by a **Qualified Engineer** to confirm the structural integrity of the pits in the specific application, having regard to the nature of the pipes to be used and the dead and live loads to be sustained.

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 covers or plastic lock-down covers 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.

Approved trafficable load-bearing covers should be provided on all side entry pits in exposed kerb areas, particularly at intersections, and on all pits located within 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 acceptable gross pollutant traps 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, all 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 dissipators 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.**

These larger systems will usually fall into one of two distinct categories:

- Low-head, high-volume pumps are normally used behind a levee bank when a watercourse is at or above minor flood level and backflow into the urban drainage system must be prevented. When the required discharge rates exceed the capacity of portable pumps, permanent pump stations should be constructed. In either case, the pump platforms should be above the 1% AEP flood level, with the pumps drawing water by suction from a sump. The maximum practicable sump depth will then be between 5m and 6m.
- Higher-head, lower-volume pumps are normally used to transfer water from a retardation basin or wetland to the receiving watercourse. They are generally submersible pumps in permanent installations, designed to operate whenever a local rainfall event occurs. Good practice then requires that there be two separate pumps, one being on duty at any given time while the other remains on standby. The pumps should rotate automatically from duty to standby status after each rainfall event.

Pump station components which have not been designed to operate safely when fully immersed should be installed above the relevant 1% AEP flood level, and ready access should be available for maintenance crews during such events. So far as practicable, the control cabinets and warning lights should be clearly visible from a public road.

All pump stations should be:

- screened in order to reduce the likelihood of blockage by sediment and debris; and
- configured so that failure of a single pump will not result in failure of the overall system; and
- provided with enough upstream retardation capacity to accommodate projected outages; and
- capable of being quickly and effectively isolated from the adjacent drainage networks; and
- designed so that all major operating components can readily be removed and replaced; and

- designed so that emergency power supplies can readily be accessed and connected; and
- equipped with suitable telemetry, including warning and remote-control systems; and
- handed over formally with detailed operation and maintenance manuals.

In principle, for each station, the pump motor and impeller should be selected to ensure that peak energy efficiency coincides with the duty point (where the capacity and head intersect on the performance graphs provided by the manufacturer). In practice, given the high level of uncertainty associated with stormwater computations, this may not always be the key design factor, and some measure of compromise may have to be accepted. In particular, so far as possible under Council purchasing policies and procedures, every effort should be made to limit the range of pump types and capacities deployed across a municipality, thus reducing the need to hold extensive spare part inventories and to train maintenance crews to handle varying pump issues and responses.

Further information can be found in the most recent version of the *Guide for Development Engineers* published by the Local Government Infrastructure Design Association and freely available from www.designmanual.com.au.

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 400 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, including groundwater discharge systems from sewerage trenches,** to **Council's Engineering Department** for approval.

16.16 Property Drains

In a greenfield development, no property drainage may discharge to kerb and channel without the written agreement 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 acceptable 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

Galvanised Steel Kerb Adaptors	UPVC Kerb Adaptors
Campaspe Shire Council	Ballarat City Council
Colac Otway Shire Council	Greater Bendigo City Council
Glenelg Shire Council	South Gippsland Shire Council
Golden Plains Shire Council	Wellington Shire Council
Greater Geelong City Council	Yarriambiack Shire Council
Greater Shepparton City Council	
Hepburn Shire Council	
Horsham Rural City Council	
Macedon Ranges Shire Council	
Mitchell Shire Council	
Mount Alexander Shire Council	
Surf Coast Shire Council	
Swan Hill Rural City Council	
Wangaratta Rural City Council	
Warrnambool 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 written consent 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 accept 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 or 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. The easement width may be further increased by the relevant authority having

regard to the depths at which sewer pipes are to be installed. 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 acceptable 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
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
	Greater Geelong City Council
	Hepburn Shire Council
	Indigo Shire Council
	Latrobe City Council
	Macedon Ranges Shire Council
	Mansfield Shire Council
	Mitchell Shire Council
	Moira Shire Council
	Moorabool Shire Council
	Mount Alexander Shire Council
	Moyne Shire Council
	Murrindindi Shire Council
	Pyrenees Shire Council
	Rural City of Wangaratta
	South Gippsland Shire Council
	Strathbogie Shire Council
	Surf Coast Shire Council

Minimum Slope of Earth Drain 1 in 2000	Minimum Slope of Earth Drain 1 in 500
	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 consent 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 12 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 consent 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 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 property and **Infrastructure** from flooding occurring from a nominated rainfall event by the provision of retardation basins.
- To limit, as much as possible, the number of retardation basins servicing an area in order to reduce **Council's** future maintenance expenditure.
- To ensure that standalone retardation basins drain completely within a reasonable time following each rainfall event and, wherever practicable, are constructed so that the area can be used for passive or active recreation or other uses such as car parks as determined by **Council**.
- To incorporate stormwater treatment and litter traps into the retardation basin design where practical and required by **Council**.
- To protect existing stormwater drainage assets, owned by Council or by other drainage authorities, from overloading as a result of works carried out by **Council** or **Developers** that are or will become the property of **Council**.
- To protect the public from risk of injury or death.
- To standardise the type and operation of pumping systems and outfalls associated with retardation basins.
- To improve the quality of stormwater runoff being discharged from a particular development using **WSUD** principles.
- 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,
    - 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** need to satisfy the requirements of clause 56.05-2 of the relevant planning scheme and in particular Standard C13. The provision of Public Open Space should be:

- Suitably dimensioned and designed to for the intended use, buffer areas around sporting fields and passive open space.
- 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.
- Adjoin schools and other community facilities where practical.

- Where not designed to include active open space, local parks should be generally be greater than 1 hectare in area and be suitable dimensioned and designed to provide for their intended use and to allow easy adaption in response to changing community preferences

In addition to satisfying the conditions of Clause 56.05-2 of the relevant planning scheme and, in particular, Standard C13, in order to be accepted as Public Open Space the relevant portion of any proposed retardation basin should:

- be at least 10m wide; and
- incorporate 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 20% **AEP** event; and
- unless otherwise agreed by **Council**, not be inundated during a 1% **AEP** event.

The design events for various kinds of POS proposed for use as a retardation basin should be:

- Regional Parks and Sports Fields 2% AEP
- Local Parks 5% AEP
- Linear Parks 10% AEP

18.3 General

Council will expect the detailed design and documentation of drainage basins and/or similar detention facilities to be carried out by a **Qualified Engineer**, and to demonstrate that any required storm water retardation or detention systems can be integrated into the drainage system.

The facility should normally be located and designed in accordance with a relevant **Development Plan, Council Strategy,** or **Stormwater Management Strategy**. Where the necessary policy framework is not in place, **Council** will expect the **Design Engineer** to seek specific agreement for the siting of any proposed retardation basins prior to proceeding with the design of the minor and major drainage system. Catchment boundaries may be increased only if written consent is obtained from the relevant drainage authority.

Council will expect any design to be consistent with this **Manual**, and to meet all the requirements of the local Catchment Management Authority (CMA) and Irrigation and Drainage Authority. For example, retarding basins with outfall to relevant authority drains are required to be designed for the 1% **AEP** storm event of 24-hour duration, with a no-outfall condition, and with a maximum discharge rate to the drainage system as specified by the authority (typically 1.2 lit/sec/ha).

Land that has been identified for storm water retardation basins to be maintained by **Council**, whether existing or proposed, must be shown on a Plan of Subdivision as a Municipal Reserve for drainage purposes and be vested in the **Council**. In circumstances where retarding basins are not to be maintained by **Council** and are located within land that is common property, **Council** is unlikely to be a member of the Owners Corporation corporate. In such instances, **Council** will expect a Section 173 Agreement to be placed on each benefiting allotment to ensure that **Council** drainage networks are not compromised by any act, or omission by the Owners Corporation.

When a retardation basin is required for any **development**, the basin and any overland flow paths should normally 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, **Council** will expect them to submit plans, computations, and approvals from the relevant authorities demonstrating that satisfactory temporary 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 agreement from **Council** and all other relevant authorities.

Council will expect that where a retardation basin poses potential risk to lives, buildings or infrastructure downstream its design will comply with the Australian National Committee on Large Dams (ANCOLD) guidelines.

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. The location of 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:
    - a pump station with appropriate telemetry situated in public view; or
    - gravity; or
    - 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

Council will expect retarding basins to be designed for the critical 1% **AEP** storm, and those with established areas downstream, and no clear and safe overland flow paths, to be designed with due consideration to less probable 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, **Council** may consider a design based on a more probable storm event and with reduced storage capacity.

Council will expect the minimum freeboard within the basin following a 1% **AEP** event, under no outfall conditions, to be 300 mm for earth structures and 200 mm for hard structures, and peak basin water level to be lower than the lowest kerb invert level in the catchment area. **Council** will also expect the **Design Engineer** to ensure that:

- the peak water level in the retarding basin resulting from the minor drainage storm event detailed in Table 12 remain below the invert of the lowest inlet pipe discharging to the basin; and
- the overland flow path for a major storm has been designed with no minor system contribution to flow capacity; and
- for storage calculations, the volume of storage in pits and pipes in the minor system has been ignored.

18.4.3 Inlet Structures

Council will expect any inlet to a basin to have an acceptable inlet drainage structure with 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.

Council will expect any inlet pipe to the basin to be fitted with a headwall designed to allow debris to escape and to impede the entry of children or animals, and all headwalls to be fitted with an acceptable 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 20% **AEP** storm event.

18.4.5 Overflow Systems

A suitable overflow system must be provided to cater for rarer storm events than what the system has been designed for and to provide for a blockage in the system. All overflows are to be directed away from buildings, adjoining properties and associated **Infrastructure**. The overflow system must be designed to cater with a 1% AEP storm event.

The minimum depth of overland flow must be designed so that it is no higher than 300mm below the lowest 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 **Councils** will expect excavations to be limited to 0.5m above the water table.

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
Horsham Rural City Council
Moyne Shire Council
Warrnambool City Council
Wellington Shire Council

In such circumstances, **Council** will expect the **Design Engineer** to ensure that retardation basins have an impervious lining, or other acceptable treatment**,** to prevent the ingress of groundwater, and that any structures which penetrate the groundwater zone, such as footings and drainage lines, are appropriately treated to prevent possible damage caused by extended contact with groundwater.

Groundwater may be able to be extracted and used, subject to the requirements of the relevant authority.

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 agreement has been obtained

The depth of all retardation basins with public access will be determined 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 practicable 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** consent will be required where such steep slopes are proposed. The desirable minimum bed cross-fall is 1:400, graded to the outlet point.

Council will expect the **Design Engineer** to determine the batter slopes for securely fenced retardation basins having due regard to the following factors:

- soil type.
- erosion.
- maintenance.
- safety and minimisation of risk.

18.4.8 Access Requirements

Council will expect all weather access to be provided to the retarding basin and any associated structures and pumps to enable maintenance to be carried out, with the access being designed so that maintenance vehicles do not need to reverse at any time.

To ensure that maintenance of any portion of the basin and its associated works can be safely carried out, a 5m wide reserve should be provided around the perimeter of any retardation basin, unless the **Council** has given prior written consent for alternative arrangements.

18.4.9 Risk Analysis

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

Additionally, if the retardation basin poses a high risk when assessed using the Australian National Committee on Large Dams (ANCOLD) guidelines then Council will expect that the structure will be designed, and the construction to be supervised and approved, by a qualified engineer with specific expertise in the field.

The **Design Engineer** will be responsible for deciding on the action required in response to the risk assessment report and its recommendations, but should consult with **Council** if the recommendations are complicated, require community involvement, or may involve significant ongoing maintenance issues.

Council will expect the **Design Engineer** to include a copy of the risk assessment report, with recommendations and associated works, when submitting the detailed design documentation for review and approval.

18.4.10 Fencing and Security

Council will expect the **Design Engineer** to ensure that retardation basins which are not accessible to the public are fenced and secured against casual entrance, unless prior written consent has been obtained from the **Council**.

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

18.4.11 Landscaping

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

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 to facilitate the use of a lifting system acceptable to **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 the geometry of openings allowing for cleaning and removal of debris and silt accumulations.

Clause 19 On-site Detention Systems

19.1 Objectives

The objectives of small on-site detention systems are as follows:

- 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;
- To ensure that the cumulative impact of future **Developments** will not exceed the capacity of the existing drainage system;
- To reduce total stormwater volumes and peak flows from urban and rural **Developments** into receiving waters;
- To minimise the development costs of drainage **Infrastructure** by reducing peak outflows
- To 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 was 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 20% **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
- Major 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 within or adjacent to urban or rural township areas.
- On-site detention will not usually be required in rural locations when lot sizes exceed 2ha, unless specific measures are required to protect streams or constructed waterways from erosion associated with increased peak flow rates.

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 Civil Engineer** will be required when the peak discharge rates nominated by **Council** 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 also arise in which the impact of a proposed development on major drainage networks should be considered. Unless flooding problems are already evident, the basic 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 submitted for review 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**.

19.3.2 Basic Principles and Limitations

Where the development site in question discharges to an established minor drainage network, **Council** will expect the permissible site discharge [PSD] to be based on the actual network design capacity rather than the peak discharge prior to development.

The basic principle behind on-site detention is that, unless there are particular reasons to believe the contrary to be the case, and **Council** has declared a specific PSD for the development, the original drainage network design should be assumed by the **Designer** to have been carried out properly by the standards of the time. Where, as is often the case in established urban areas, the site and the upstream catchment are relatively small in extent and uniform in character, the rational method should be used to calculate a site PSD based on the rainfall intensity at the design recurrence interval and the concentration time (Tc) for the upstream catchment. The reason for using the catchment, rather than site, concentration time is that the former time would have governed the original site discharge on which the network design was based.

Most methods for determining the storage volume needed to achieve a calculated or specified PSD assume that the relevant rainfall event can be represented by a symmetrical triangular (trapezoidal when the event duration exceeds double the concentration time) site discharge hydrograph. The modified rational method allows for the discharge fall time to exceed the initial rise time, and delivers a somewhat more conservative assessment of required storage.

Under the Boyd Method, when a storage device is drained under gravity via a control mechanism, the outflow is assumed to increase in a linear manner from zero at the start of the event until the discharge entering the device, after reaching and passing the peak value, decreases to the PSD. The required storage is then taken to be equal to the difference between the overall volumes flowing into and out of the device during that period. Similar considerations apply to pump drawdown, save that the outflow remains constant over the time interval between the inflow initially reaching the PSD and then, after reaching and passing the peak, decreasing again to the PSD.

With certain adjustments, methods based on these assumptions are appropriate for developments up to ~5ha in area, and upstream catchments to ~50ha in area. Beyond these limits, volumetric runoff-routing methods should be used. Within the above limits, however, the main errors in the procedure arise from the assumption that the storage drawdown rates under gravity increase linearly with time. The actual relationships between head and discharge, and between head and device capacity, are markedly nonlinear. When a linear response has been assumed, a better estimate of the required storage volume is achieved by reducing the nominal PSD by 25% for storage in tanks or basins whose plan shape is basically constant with increasing depth, or 40% for storage in pipes or horizontal cylindrical tanks. A better approach, however, is to use the Swinburne Method, which makes soundly-based adjustments to compensate for both the above nonlinearities.

19.3.3 Design Parameters

When the development location so requires, or when 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/or may require that the **Design Engineer** carry out specific calculations to establish the appropriate storage volume for any **Development**.

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

- The original design event should be assumed to have been based on a 1EY (1-year) event.
- Annual exceedance probability for the current design event — see Section 16.6 of this Manual
- Coefficients of runoff — see Section 16.7 of this Manual

For the reasons set out in Clause 16.5 of this Manual, the **AEP** terminology recommended by *Australian Rainfall and Runoff* has been adopted to describe events with an average return period greater than or equal to one year, and reference should be had to Table 8 as required to confirm the equivalence between these measures.

19.3.4 Simplified Design Method for Small Developments

The provisions of this sub-clause only apply to residential, industrial or commercial developments where the total site area does not exceed ~1ha, and where the permissible site discharge has not been specified by Council.

Table 13 provides guidance on the allowable discharge rates and storage volumes for the most common types of small **Developments** within the ambit of this sub-clause taking place within municipalities across regional Victoria.

Table 13 Storage Volumes and Discharge Rates for Small Detention Systems

TYPE OF DEVELOPMENT	ORIGINAL AND REQUIRED DESIGN PARAMETERS	ALLOWABLE DISCHARGE RATE (litres/sec/ha)	STORAGE REQUIRED (litres/ m^2)	
			VERTICAL (Tank/ Basin)	HORIZONTAL (Pipe)
Multi-unit development (newer residential areas)	C=0.5 for a 20% **AEP** to C=0.8 for a 20% **AEP**	65	8	10
Multi-unit development (older residential areas)	C=0.5 for a 1EY event to C=0.8 for a 20% **AEP**	37	12	14
Industrial development (older areas)	C=0.5 for a 1EY event to C=0.9 for a 10% **AEP**	37	16	18
Industrial development (newer areas)	C=0.9 for a 1EY event to C=0.9 for a 10% **AEP**	65	12	14
Commercial development	C=0.9 for a 1EY event to C=0.9 for a 5% **AEP**	65	15	17

The storage requirements in any given case should be calculated having regard to the proportion of the stormwater runoff from the developed site to be directed to each category of storage device. For example, for a multi-unit development on a 750m^2 site in an older area, if 60% of the total runoff can be directed to conventional rainwater tanks and 40% has to be directed to underground pipes, the table would require that the following storage volumes be provided:

Rainwater Tanks 0.6 x 750 x 12 = 5,400 litres

Underground Pipes	0.4 x 750 x 14 = 4,200litres

The allowable discharge rates set out above have been calculated based on a concentration time of 20 minutes for the upstream catchment served by the relevant minor drainage network, and reflecting the rainfall intensity assumed when the latter network was originally designed. The Swinburne Method has been applied to determine the required on-site storage volume.

Council's Engineering Department may waive the requirement for on-site detention where it can be shown that there are no adverse impacts resulting from the increased rate and volume of stormwater from the development and that the level of service adopted by the **Council** will not be compromised.

19.3.5 Specific Design Requirements

A suitable overflow system should be provided to cater for **AEP** events, up to and including 1% **AEP** events, less frequent than those which the system has been designed to handle, and appropriate provision must be made for network blockages during such events.

Where stormwater discharge is to be controlled by an orifice or tube located on the downstream face of a pit, **Council** will expect the **Design Engineer** to consider and address the consequences of device blockage in a design storm. Options might include providing a safe overland route conveying surplus flows from the location where the detention system will surcharge to an acceptable destination, installing sufficient storage to retain the flows on-site, or using dual-chamber pits with the controlled flow passing through an internal weir wall.

Any overflows should be directed away from buildings, adjoining properties and associated **Infrastructure**, and **Council** will expect the **Design Engineer** to demonstrate that the maximum water surface level will remain at least 300mm below the lowest floor level of any residence within the overflow zone.

Council will expect the **Design Engineer** to ensure that all pipes conveying water within a detention system are at least 90mm in diameter, unless they form part of a proprietary system acceptable to **Council**, or contribute directly to the restriction required to achieve the design PSD.

When specific calculations are carried out, **Council** will expect the **Design Engineer** to estimate the concentration times for the relevant catchment and from the top of the catchment to the development site using recognised methods, and to submit the following additional information for review and approval:

- Plans showing the invert levels of all pipes at or above 100mm in diameter.
- Plans showing the designed finished surface level of all driveways, car parking areas, landscaping areas and lawns.
- Plans showing the floor levels of all buildings, existing or proposed.
- Plans showing the locations of storage devices, pipes and pits, pervious and impervious areas, buildings, driveways and other relevant infrastructure.
- Evidence that, when the detention system relies on surface storage, all floor levels in habitable buildings will be at least 300 mm above the peak water level in the storage area at design capacity.
- Evidence that, where depressed driveways are used to provide storage, they are bounded by kerbs not less than 100 mm in width, cast integrally with the main slab unless otherwise agreed by **Council**.
- Cross-sections of each storage device or devices.
- Existing surface levels on at least a 10 metre grid in the subject property and adjoining properties.
- One copy of the drainage computations.
- One copy of the structural computations for any underground storage tanks.

- Three copies of the final engineering plans.

19.3.5.1 Acceptable Systems

The most commonly acceptable systems are as follows:

- Conventional rainwater storage tanks.
- Driveways bounded by kerbs of not less than 100 mm in width.
- Underground pipes and tanks of various configurations.
- Underground pipes and tanks with pumped outfalls.
- Lined, in-ground storage basins with pumped outfalls.
- Excavated earthen dams with gravity outfalls (in low-density residential Developments).

Typical outflow control arrangements are for gravity drawdown to take place through a pipe (with no provision to vary the flow capacity), an orifice plate, or a proprietary multi-cell unit. When a site is located below street level, and no network drainage is available along the rear boundary, pumping may become the only viable option.

19.3.5.2 Maintenance of On-Site Detention Systems

Council will require to inspect on-site detention systems from time to time to ensure that landowners are operating and maintaining the relevant devices in accordance with **Council** specifications, and that the systems remain effective.

Council and the **Developer** may therefore enter a Section 173 Agreement binding future landowners to maintain their on-site detention systems in satisfactory working condition, and to provide reasonable access to enable authorised Council officers to inspect the systems. The Agreement may also require landowners to pay an annual inspection fee as set by **Council** from time to time.

Clause 20 Stormwater Treatment

20.1 Objectives

- To ensure that stormwater discharged to natural watercourses and drainage networks belonging to other drainage authorities meets 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).
- 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, while 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** is responsible for the maintenance of all completed water sensitive urban design (WSUD) works for a period of two (2) years unless otherwise agreed in writing or specified in the planning permit. The maintenance period shall commence on the date of Council's **Acceptance of Works** for the WSUD works. A record of the inspection and maintenance works undertaken are to be provided to **Council** on a regular basis to the satisfaction of **Council.**.

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 South Eastern Councils 2011* prepared by Melbourne Water.

The storm-water treatment methods which may be considered, subject to **Council** agreement, 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.

The **Design Engineer** may be required by **Council** to demonstrate to Council that the proposed method of treatment is the most cost-effective and sustainable for **Council** having regard to the whole of life costs of the treatment elements. Melbourne Water publication "Water Sensitive Urban Design Life Cycle Costing Data" can assist the **Design Engineer** to determine the maintenance and renewal costs of the various elements of stormwater treatment.

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 a 50%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 review and approval by **Council's Engineering Department** demonstrating 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 those estates 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 review and approval by **Council's Engineering Department**.
- **Council** will expect the **Developer's Representative** to submit comprehensive operational documentation and manuals for treatment sites prior to the commencement of Defects Liability Period.
- Where constructed wetlands are being provided to serve a staged development the Developer will be expected to maintain the wetlands at his cost until the defects liability period is completed for the last stage of the development.

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:
    - 4EY design flow typically has a hydraulic effectiveness exceeding 97%
    - 2EY design flow typically has a hydraulic effectiveness exceeding 98.5%

- 1EY 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 that associated with a 4EY event. **Council** will expect the **Design Engineer** to provide all-weather access to all treatment sites, permitting 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 review and approval.

20.3.3 Bioretention Swales

Bioretention swales are not accepted for use in any municipality unless the relevant **Council** has provided specific written consent for their use. 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	Murrindindi Shire Council	Ballarat City Council	Horsham Rural City Council
Baw Baw Shire Council		Bass Coast Shire Council	Latrobe City Council
Benalla Rural City Council		Colac Otway Shire	Pyrenees Shire Council
Buloke Shire Council		Corangamite Shire Council	
Campaspe Shire Council		Glenelg Shire Council	
Mansfield Shire Council		Golden Plains Shire Council	
Moira Shire Council		Greater Bendigo City Council	
Mount Alexander Shire Council	Mount Alexander Shire Council	Greater Geelong City Council	
Wangaratta Rural City Council		Greater Shepparton City Council	
Strathbogie Shire Council		Indigo Shire Council	
Towong Shire Council		Macedon Ranges Shire Council	
Wodonga City Council	Wodonga City Council	Mitchell Shire 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	Greater Shepparton City Council
Bass Coast Shire Council	Horsham Rural City Council
Baw Baw Shire Council	Moorabool Shire Council
Benalla Rural City Council	
Colac Otway Shire Council	
Corangamite Shire Council	
Greater Geelong City Council	
Latrobe City Council	
Macedon Ranges Shire Council	
Pyrenees Shire Council	
Rural City of Wangaratta	
Strathbogie Shire Council	
Surf Coast 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 accept the use of sedimentation basins on steep land, or as a permanent treatment facility in locations 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 1EY peak discharge.
- Flow bypass of downstream macrophyte zones and wetlands should be activated in events in more intense events.
- The basin should be designed to remove 95% of the particles less than 125 µm in a 1EY 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 review and 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 accept 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 1EY 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 accept 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

- **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 water balance assessments using **MUSIC** to determine how much runoff volume and associated pollutant loads the tanks can be expected to remove from the catchment, and to submit the results of these assessments to **Council's Engineering Department** for review and 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 location within a drainage network to become 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 network, and to submit these plans to **Council's Engineering Department** for review and approval. The works may include 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 consent 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 close to the **Development** 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 do not leave 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 cut-off drains to intercept surface water before it reaches the areas of disturbed earth and acceptable silt control measures 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 acceptable 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 by 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, either topped with weed mat or mulch or hydro-seeded, to establish vegetation such as suitable grass species and 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 review and 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 applicable EPA policies and guidelines are available from the EPA website.

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 review and 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 to ensure that:

- **Council Infrastructure** is not adversely impacted by the implementation of the whole farm plan; and
- property accesses are provided at appropriate locations and constructed to appropriate standards; and
- appropriate stormwater management measures are in place to avoid adverse impacts on other properties.

Council's Planning Departments are obliged to ensure that any certification of Whole Farm Plans is appropriate, and will therefore refer applications to other relevant authorities, whose requirements are included in the application form.

23.2 Requirements

The requirements for Whole Farm Plans are that:

- the application for Certification of a Whole Farm Plan is complete; and
- 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 Public Open Space

24.1 Objectives

Urban landscapes are expected to meet a multiplicity of needs, but should first and foremost be sustainable,

The general objectives of this clause are to:

- Encourage the development of quality, sustainable landscapes that make a positive contribution to the liveability of communities
- Construct landscapes that reflect the urban character of the area, and comply with any structure plans, development plans and/or urban design requirements
- Comply with Supportive Environments for Physical Activity (SEPA) guidelines, now also Active by Design and Healthy by Design http://www.heartfoundation.org.au/victoria-healthy-design
- Comply with Crime Prevention Through Environmental Design (CPTED) guidelines http://www.police.vic.gov.au/
- Ensure that the social, economic and environmental principles of sustainable development are applied
- Specify design standards for landscape works
- Encourage good design, thus avoiding the creation of unacceptable levels of risk
- Ensure that landscaping complies with the Federal Disability Discrimination Act 1992
- Demonstrate relevance to the provisions of Victorian Planning Scheme, Clause 56.05 URBAN LANDSCAPE
- Ensure general compliance with the Parks and Leisure Australia *Open Space Planning and Design Guide*.
- Comply with the *Code of Practice for the Management of Infrastructure in Road Reserves*
- Achieve regular street tree planting and where possible plant for potential interlinking street tree canopy.

24.2 General

Council expects the **Developer** to prepare landscape plans and submit them to the relevant Council Department for review and approval for the following types of **Developments**:

- Land vested in **Council**, including road reserves, Public Open Space, and drainage reserves.
- Multi-unit **Developments,** Commercial **Developments,** Industrial **Developments** and other types of development as per the requirements of any planning permit issued for that development.
- Development Plans for an area. (Concept plans only).

Landscaping plans should reference applicable Structure Plans, Open Space Strategies and Play Space Strategies.

Council expects that landscaping works will not commence until full landscaping plans, documenting and addressing design, construction and maintenance issues, have been submitted to and approved by **Council Department**.

The definitions for local, large and district parks are found in section 56.05-2 of The Planning Scheme.

Council will expect Public Open Space as per the requirements of the Planning Scheme and in accordance with any relevant Public Open Space / Playground Strategy and to be consulted to determine their specific requirements in relation to this section. Landscaping Plans should normally be submitted with Engineering Plans for the relevant stage.

Playgrounds should be provided in Public Open Space as per the requirements of individual **Council** strategic plans.

24.2.1 Councils Landscaping Design Manuals

The following **Councils** have specific Landscape Design Manuals that take precedence over these guidelines.

- Ballarat City Council — Landscape Design Manual
- Greater Geelong City Council — Landscape Standard Manual
- Wodonga City Council — Landscape Guidelines

24.3 Specific Requirements

24.3.1 Residential developments

The submitted landscape plan is to address the matters listed in Table 14 Residential Developments Design Requirements

Table 14 Residential Developments Design Requirements:

Element	Design Requirements	Comments
Reserves (General)	DDA (Federal Disability Discrimination Act 1992) compliant CPTED guidelines (Crime Prevention Through Environmental Design) • http://www.police.vic.gov.au/ SEPA (Supportive Environments for Physical Activity) guidelines. Now also Active by Design and Healthy by Design • http://www.heartfoundation.org.au/victoria-healthy-design	Land parcels to be at least 2000m² in size unless linked to existing open space Linear reserves to be at least 10m wide
Shade	SEPA guidelines • http://www.heartfoundation.org.au/victoria-healthy-design	
Park Furniture	Shelters Litter bins Fencing Lighting Barbeques Signage Seating	Park signs are expected to comply with **Council's** standard drawings (where available), to be accepted by **Council** and, where relevant, comply with the *Guidelines for Geographic Names Victoria*. Council approval is required for the installation of furniture items such as barbeques, bins, dog bins, bollards, or post and rail fences in landscaped areas. All such items should be of robust construction, be manufactured in accordance with the relevant

Element	Design Requirements	Comments
		standards and have a high resistance to vandalism.
Play Opportunities	Structured and unstructured Playground to comply to standards AS 4685 Pts. 1-6 Playground equipment and surfacing and AS 4422 Playground Surfacing – Specifications, requirements and test methods The Good Play Space Guide "I can play too" http://www.playaustralia.org.au/	Play spaces should facilitate imaginative opportunities for physical, cognitive and social play
Toilets	DDA compliant (Federal Disability Discrimination Act 1992) CPTED guidelines • http://www.police.vic.gov.au/	
Irrigation	Use of 'best practice' in water sensitive urban design (WSUD) http://wsud.melbournewater.com.au/ • http://www.wsud.org/	**Council** will expect the **Design Engineer** to consider storm water retention for irrigation purposes, and to submit the design plans for irrigation systems to **Council** for review and approval.
Landscape	CPTED guidelines • http://www.police.vic.gov.au/ SEPA (Supportive Environments for Physical Activity) guidelines. Now also Active by Design and Healthy by Design http://www.heartfoundation.org.au/victoria-healthy-design Sustainable Principles The use of locally indigenous species close to natural waterways	**Council** encourages innovative landscape solutions to conserve water and energy and reduce waste **Designers** and **Developers** are reminded that **Council** may have specific policies and requirements in relation to landscape designs and contact should be made with the relevant **Council** to obtain the details of such requirements.
Trees (park and street)	Tree selection should consider • Scale • Longevity • Neighbourhood character • Soil type and available volume • Existing or proposed nearby infrastructure	The location of street trees should be in accordance with the *Code of Practice – Management of Infrastructure in Road Reserves*. To avoid future conflicts and to allow servicing, consideration

Element	Design Requirements	Comments
	• Maintenance requirements • Biodiversity • Climate change impact	should be given to planting distances from other infrastructure. This will depend on species, soils and other factors. Suggested distances from typical infrastructure are: • Fire hydrant – 3m • Crossover – 3m • Tee- intersection – 8m from kerb line • Power or light pole – 6m • Pruning height above paths 2.4m • Pruning height above roadway 4.5m • Stormwater pit – 2m • Gas/water valve or utility laterals – 3m As a broad guideline, trees should not be planted closer than 3x the mature trunk diameter from footpaths, e.g. a tree with an expected DBH of 300mm should not be closer than 900mm from the footpath Tree planting should ideally occur between the months of April to September to minimise watering requirements.
Heritage	The preservation and integration of heritage elements	Design and development that respects the individual site, the local context and the regional characteristics are encouraged
Remnant Vegetation	The retention of existing high quality vegetation The use of indigenous plants in close proximity to a Nature or Bush land Reserve	A management plan for any remnant vegetation should be developed as part of any development

Element	Design Requirements	Comments
Public art	Any proposal for the installation of public art must comply with relevant Council policies	**Council** will expect a clear prior agreement to be in place on the ownership of and maintenance responsibilities for this art.
Paths	Material Construction standard	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.

24.3.2 Multi-Unit Developments, Commercial Developments, Industrial Developments and Other developments, subject to Planning Permit conditions.

The submitted landscape plan is to address the matters listed in Table 15 Other Developments Design Requirements

Table 15 Other Developments Design Requirements

Element	Design Requirements	Comments
Landscape	CPTED guidelines • http://www.police.vic.gov.au/ SEPA (Supportive Environments for Physical Activity) guidelines. Now also Active by Design and Healthy by Design http://www.heartfoundation.org.au/victoria-healthy-design Sustainable Principles The use of locally indigenous species close to natural waterways	**Council** encourages innovative landscape solutions to conserve water and energy and reduce waste **Designers** and Developers are advised that **Council** may have specific policies and requirements in relation to landscape designs, and contact should be made with the relevant **Council** to obtain the details of their requirements.
Heritage	The preservation and integration of heritage elements	Design and development that respects the individual site, the local context and the regional characteristics are encouraged.

24.3.3 Development Plans for an area. (Concept plans only).

The submitted landscape plan is to address the requirements for the relevant type of Development as described in Clause 24.3.1 or 24.3.2.

24.3.4 Public Open Space Provision (Residential Development)

There are various potential triggers for **Developers** wishing to subdivide to provide Public Open Space. In particular:

- In most cases, where land will be subdivided into more than 16 lots, the development will be required to meet the objectives and standards set out in Clause 56 of the Planning Scheme, and the provision of open space may be required to exceed 5% of the total developed area.

- **Council** will expect any requirements specified in the schedule to Clause 52.01 to be satisfied. If no such requirements are specified, the requirements of the Subdivision Act 1988 will apply.

Council will require **Developers** to satisfy the requirements of clause 56.05-2 of the relevant planning scheme and in particular Standard C13. The provision of Public Open Space should thus, at a minimum, include:

- Active open space of at least 8 hectares in area within 1 kilometre of 95% of all dwellings that is:
    - suitably dimensioned and designed to provide for the intended use, together with buffer areas around sporting fields and passive open space; and
    - able to incorporate two football/cricket ovals; and
    - appropriate for the intended use in terms of quality and orientation; and
    - located on flat land (which can be cost-effectively graded); and
    - has access to, or can make provision for, a recycled or sustainable water supply; and
    - adjoins schools and other community facilities where practical; and
    - designed to achieve sharing of space between sports.

- Linear parks and trails along waterways, vegetation corridors and road reserves should be located within 1 kilometre of 95% of all dwellings

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

For the purposes of this section, **Council** will expect the **Developer**, as part of an application for a planning permit or a development plan, to prepare and submit a Public Open Space plan to **Council** for review and approval, together with a report showing how the provisions of clause 56 of the relevant planning scheme and the specific requirements of this **Manual** are to be satisfied.

The development plan should, as a minimum, show:

- The location of existing Public Open Space within 2 kilometres of the proposed development and the area of such Public Open Space.

- How the proposed Public Open Space and any existing Public Open Space are linked.

- Any drainage basins or reserves that are to be assessed as satisfying the requirements for the provision of Public Open Space.
- How the distance requirements of clause 56 for large and local parks are satisfied for properties to be developed.
- Details of landscaping.

Council will expect the report to show how the objectives and specific requirements for Public Open Space are satisfied, and to include the specific landscaping specifications and details that are to be applied to the Public Open Space. This will enable **Council** to estimate the future maintenance costs of the Public Open Space.

Where a contribution or amount of land is specified in the schedule to clause 52.01 of the relevant planning scheme, which applies to residential, industrial or commercial **Developments**, **Council** will expect **Developers** to comply with these requirements. When considerable areas of Public Open Space are being provided and developed as required by clause 56, **Council** may determine, in its sole discretion, that any Public Open Space requirement under clause 52.01 is satisfied.

If no contribution or amount of land is specified in the schedule to clause 52.01 of the relevant planning scheme, a Public Open Space contribution may still be required under Section 18 of the *Subdivision Act 1988*. The *Subdivision Act* specifies criteria for assessing whether Public Open Space may be required. A requirement under the *Subdivision Act* will generally be relevant in circumstances where Public Open Space is not being provided as part of the subdivision pursuant to clause 56 of the relevant planning scheme.

24.3.5 Fencing of Public Reserves

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** prior to the issue of a Statement of Compliance.

24.4 General Requirements

24.4.1 Information to be provided

Prior to construction, **Council** will expect the **Developer** to prepare and submit landscaping plans for review and approval. These plans should provide the following information:

- Plant selection, layout and planting density.
- Landscaping design intent.
- Preliminary irrigation design, if appropriate
- Plans prepared in accordance with Appendix I, Landscape Drawings

Prior to the **Acceptance of Works**, **Council** will expect the **Developer** to provide the following information**:**

- As-constructed Landscaping drawings including all service locations.
- Management plans as required covering, for example, control of weeds and vermin for the site during the **Maintenance Period**, and nominating the responsible contact person.
- Final irrigation design, including a detailed listing of all components and details of suppliers.
- Detailed plant listing including details of suppliers.

- Detailed listing of materials used, including details of suppliers.
- Detailed listing of hard landscaping materials and equipment such as shelters, bin surrounds, seating, and barbeques. including details of suppliers.
- Operations manuals and installation certificates for plumbing works, electrical installations, and similar works.

24.4.2 Maintenance Period

Maintenance is defined as the general maintenance that is undertaken on a regular interval to establish and maintain the amenity of a landscape, appropriate to the type of landscaping being provided in the relevant municipality.

Elements in the approved landscape plan are to be maintained to an agreed standard by the **Developer** for a minimum period of 24 months, including 2 summers, from **Acceptance of Works**, or other agreed period. Prior to the **Acceptance of Works**, **Council** will expect the **Developer** to provide an asset list identifying manufacturers, models or style numbers.

Hard landscaping elements in the approved landscape plan are to be maintained to an agreed standard by the **Developer** for a minimum period of 12 months.

24.4.3 Defect Liability Period

A defect is defined as the failure (other than by vandalism) of any hard landscaping, equipment or structures provided as part of the approved landscaping plan.

The Defect Liability Period commences from the date of **Acceptance of Works** and extend for a minimum period of 24 months, including 2 summers, or other agreed period. **Acceptance of Works** for landscaping may not coincide with the acceptance of civil works, and inspections will not be undertaken during the period from 30th November to 1st March in the following year.

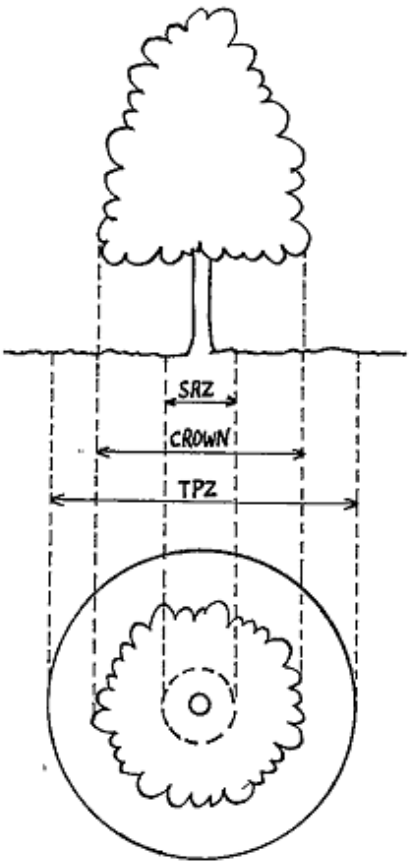
24.4.4 Protection of Existing Vegetation

Healthy, pre-existing vegetation can be a significant asset, providing home to a host of native fauna, especially if large trees include natural hollows etc. **Council** will expect **Developers** to comply with relevant Native Vegetation and Heritage legislation and **Council** Policies.

24.4.4.1 Tree Protection

Protection from damage of existing vegetation, particularly trees is critical to the successful retention of such vegetation. Trees should be assessed and protected as per *AS 4970-2009 - Protection of trees on development sites* and is the key in guiding Council's decision regarding protection or removal of trees, Council tree assets and development sites. The removal of Council tree assets should not necessarily be assumed to be automatically approved. Each tree is assessed on its own merits by Council's arborist.

It requires protection zones be used to safeguard trees during the construction phase of Development. The figure below shows indicative protection zones.



SRZ – Structural Root Zone

TPZ – Tree Protection Zone

The following table is an **indicative guide only**, but can be used in assisting in the early design phase of the development.

Trunk Diameter - mm (measured 1.4m above ground)	Tree Protection Zone (TPZ)	Structural Root Zone (SRZ) (Approx.)
200	2.4m	1.7m
400	4.8m	2.2m
600	7.2m	2.7m
800	9.6m	3.0m
1000	12m	3.4m

The Structural Root Zone (SRZ) is a 'No Go Zone' and works that encroach into the SRZ will not be allowed. Sometimes, Council does allow works to encroach into the Tree Protection Zone (TPZ), although this is dependent upon site specific factors.

Where trees are proposed to be retained, Council will expect that the works proposed will not affect the long-term health of the tree. In situations where Council does agree to the removal of a tree, offset replanting and the care of the newly

planted trees for two years. The number of replacement trees is based on the size, age, and type of tree being removed. All works will normally be undertaken by Council or its approved contractors on the applicant's behalf.

24.4.4.2 Shrubs and Groundcover Plant Protection

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. Fencing should be as detailed in *AS 4970-2009 Protection of trees on development sites*

24.4.5 Vehicular Access

If vehicle access to land vested in **Council** for Public Open Space needs to be restricted, the proposed fencing and bollard styles will be subject to **Council** acceptance. **Council** will expect any necessary locks to comply with their standard key system. Unless otherwise agreed by Council, the construction of a vehicle crossover should cater for heavy vehicles. Location of the access point should normally be agreed between **Council** and the **Developer**.

24.4.6 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.

Generally, a 1200mm clear area should be maintained from the edge of seal or invert of kerb or edge of gravel. The treatment for this area can be grass, groundcovers, or pavement, with selection being subject to **Council** agreement. Where traffic volumes on the abutting road exceed 200vpd or the speed is greater than 50kph, **Council** will expect a detailed risk assessment to be carried out to determine the appropriate clear zone and the risks to and the safety requirements of employees maintaining these areas.

References for undertaking risk assessments include the Road Management Act 2004 *Code of Practice Worksite Safety – Traffic Management* and AS1742.3 *Manual of Uniform Traffic Control Devices Part 3: Traffic Control for Works on Roads*.

24.4.7 Entrance Features

Any proposed entrance feature will be sited on private land. **Council** will expect the **Developer** to submit plans detailing the location, maintenance requirements and estimated longevity of the feature for review and approval.

24.4.8 Street Tree Planting Requirements

Council will expect the location of street trees to comply with the *Code of Practice for Management of Infrastructure in Road Reserves*, with trees being planted at one tree per lot. Council may choose from either of the two following options:

1. **Developers** will supply, plant and maintain street trees, with the tree size and species being specified by **Council**, and maintain the trees for 2 years, or until the **Developer** can demonstrate that the plantings have become established.

2. **Council** may elect to supply, plant and maintain trees and accept defects responsibility for them, charging the **Developer** a fee per tree.

Selection Table 24.4.8 Provision of Street Trees indicates the option for the provision of street trees selected by individual Councils.

Selection Table 24.4.8 Provision of Street Trees

Councils that require Developers to supply and maintain Street Trees and lodge maintenance bonds	Councils that charge Developers for the supply and maintenance of Street Trees.	Councils that will negotiate with Developers for either option
Bass Coast Shire Council	Horsham Rural City Council	Latrobe City Council
Baw Baw Shire Council	Wellington Shire Council	South Gippsland Shire Council
Colac Otway Shire Council		Warrnambool City Council
East Gippsland Shire Council		
Greater Bendigo City Council		
Greater Geelong City Council		
Hepburn Shire Council		
Mitchell Shire Council		
Moira Shire Council		
Surf Coast Shire Council		

Where the **Developer** is required to undertake street tree planting, **Council** may agree to such planting being carried out after the Acceptance of Civil Works and issue of the Statement of Compliance. Trees should not be planted during the period from 30th November to 1st March in the following year.

Street trees should be provided on both sides of all roads and streets (excluding laneways) at regular intervals appropriate to tree size at maturity in accordance with the guidance provided in Table 16 Street Tree Spacing unless otherwise agreed by the Responsible Authority.

Table 16 Street Tree Spacing

Average Interval	Tree Size (Canopy size)
8-10 metres	Small tree (less than 10 metre canopy)
10-12 metres	Medium Trees (10 – 15 metre canopy)
12+ metres	Large Trees (Canopy larger than 15 metres

Council will expect species selection to ensure that, at maturity, the clear zone requirements, vertical and horizontal, will comply with their adopted Road Management Plan.

24.4.9 Landscaping on Road Reserves

No landscaping other than lawn is permitted on nature strips without **Council** consent. **Council** will expect the **Developer**, when applying for such consent, to demonstrate that the product or material will:

- not result in increased public risk (e.g. stones on footpaths increase tripping hazard); and
- leave the nature strip in a state able to be used safely by pedestrians; and
- not be able to be easily removed or used for nuisance purposes; and
- contribute to a consistent neighbourhood landscaping approach; and
- be appropriate for the environment and be sustainable and easily maintained.

24.4.10 Soft Landscaping (refer to the Table 14 in clause 24.3.1 for further detail)

- sites to have a minimum of 100mm suitable topsoil (acceptable to Council if imported);
- noxious weeds must be removed from the site;
- known and potential environmental weeds should not be planted or retained without reference to the applicable DSE Advisory List of Invasive Plants in Victorian Bioregions, which can be obtained from: http://www.dse.vic.gov.au/plants-and-animals/invasive-species/invasive-plants;
- new lawn areas shall use drought tolerant species;
- the depth and composition of mulch, which may include organic or inorganic material, is to be agreed by Council.

24.4.11 Hard Landscaping

Council will expect footpaths and shared paths widths to be in accordance with Clause 13 of this **Manual**. When Council has accepted the use of gravels or granitic sands, they are to be at least 125mm thick and compacted to 95% of MMDD. Testing must be conducted in accordance with the requirements of AS1289.

If edges to paths are required, **Council** will expect the **Developer** to seek prior approval for the design and materials of the proposed edging system.

24.4.12 Use of Public Open Space for Stormwater Detention

Where Public Open Space is proposed to be used for stormwater detention, the design of the facility is to be in accordance with Clause 18 – Retardation Basins.

24.4.13 Other Matters

Additional Vic Roads Guidelines that may be used as reference documents are:

- Roadside Handbook – An Environmental Guide for Road Construction and Maintenance 2006
- Environmental Management
- Cultural Heritage
- Biodiversity

Clause 25 Associated Infrastructure

25.1 Objectives

The objectives of associated **Infrastructure** are as follows:

- All associated **Infrastructure** vested in the **Council** meets their requirements and standards as set out in this **Manual**.
- In accepting 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/or with **Council Infrastructure**.
- Council will consider the requirements of all servicing authorities before accepting any particular infrastructure item.
- The requirements of any relevant Codes of Practice, Australian Standard, regulation or act of parliament will be considered by **Council** before accepting 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, processes, 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, such as mountain bike riding, rock climbing, or abseiling;
- 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, barbeque 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 luminaires. Energy-efficient fluorescent-tube devices, such as T5 units, have been widely used for this purpose, but many Councils now consider that LED units represent a more cost-effective and environmentally responsible option.

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 subject to review and approved by VicRoads as the responsible coordinating road authority. Copies of drawings should be submitted to **Council** for assessment, with advice being 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 nature strips.

'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 consent 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.

Decorative (non-standard) lighting will only be accepted in identified precincts. **Council** will not accept the use of decorative (non-standard) lighting in industrial estates.

Decorative or non-standard lighting, lamps and luminaires should comply with the Public Lighting Service Provider's technical requirements and be acceptable to **Council**.

Council will consider giving consent for the use of decorative (non-standard) lighting when subdivisions have a minimum of 50 allotments and when the **Developer** has obtained written agreement from the relevant 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 accepted.

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 in Table 17:

Table 17 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: MODEL CONDITIONS FOR PLANNING PERMITS

The following link provides access to a set of model planning permit conditions that have been developed for the MPA. The LGIDA believes that these are a useful guide for Councils using the IDM. It should be noted that the model conditions do not cover all types of development applications. Further resources can be accessed, by members of the LGIDA, on the "Resources" page of members section of the LGIDA's website.

https://vpa-web.s3.amazonaws.com/wp-content/uploads/2016/07/GAA-Model-Permit-Conditions-Manual-FINAL-November-2011.pdf

APPENDIX B: ENGINEERING ACCEPTANCE PROCESS FOR DEVELOPMENTS

Appendix B approval process.pdf

APPENDIX C: COUNCIL REVIEW CHECKLISTS

LIST OF CHECKLISTS FOR COUNCIL REVIEW INCLUDED
Checklist #C1 Plans Submitted For Functional Layout Approval
Checklist #C2 Plans Submitted For Detailed Design Approval
Checklist #C3 Plans Submitted For Final Design Approval
Checklist #C4 Issue of Statement of Compliance
Checklist #C5 Application for Planning Scheme Amendment
Checklist #C6 Stormwater Management Plans for Small Developments

COUNCIL CHECKLIST #C1 –PLANS SUBMITTED FOR FUNCTIONAL LAYOUT 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 #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
General		
Has submission been accompanied by completed checklist as per Manual requirements?		
Has a Development Plan been prepared?		
Is the submission consistent with the Development Plan?		
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 five 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)		

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Is access to Public Open Space appropriate? Request information if not shown.		
Are linkages to adjoining developments appropriate? Request information if not shown.		
Road Layout Plans		
Street names are nominated. (Check with Planning Dept. and Asset Mgt Dept. whether names okay and advise Design Engineer if not acceptable)		
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 identified and proposed treatment shown in sufficient detail to support approval of functional layout plans.		
Drainage treatment strategy is provided and appears satisfactory		

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Existing drainage services are confirmed on plans and proposed connection points shown.		
Associated Documents		
Was a Traffic Management Report required?		
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

Is approval of functional layout 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 the 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 A discharge point nominated.		
Was a Traffic Management Report provided?		
Does the detailed design reflect recommendations from the Traffic Management Strategy TMS documents?		
Was a Road Safety Audit required?		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Is the Road Safety Audit satisfactory?		
Has Council responded to the Road Safety Audit? (Design Services Manager to respond)		
Does the design reflect recommendations within the Road Safety Audit that were accepted by the Council?		
Do plans show Council's nominated drawing numbers?		
Do plans show the planning permit number?		
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 be 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 are 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 is 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 are 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 any consents or letters of agreement 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?		
Has a street lighting plan designed by a suitably qualified person in accordance with the provisions of AS/ANZ 1158 been submitted?		
Does it nominate whether it is Cat P or V lighting and is it appropriate?		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Have the appropriate energy efficient lanterns been nominated?		
Is decorative street lighting proposed? If yes, does it comply with your Council policy or strategy requirements?		
Is it in keeping with surrounding lighting for the area or previous stages of works?		
If decorative lighting has been approved, have the appropriate fees or hardware been provided?		
Have the minimum clearances from the face of the pole been achieved: 800mm to back of kerb 1000mm from pram crossings and vehicle crossings 2500mm from a tree (preferably 4000mm) 300mm to any other asset At least 5000mm from a side/front joint boundary if driveway position not fixed		
Have lights been provided at the required locations: < 40% of the standard spacing of a street light from the end of a court bowl Within 10m of an intersection So that the line of sight between poles is within the road reserve At the end of median strips and traffic islands at an intersection Start and end of walkways For rural, low density and rural living: • Every intersection • End of every court bowl		
Have spacing tables been provided for the poles and lamps proposed to be used?		
Have frangible poles been used where the traffic speed limit is greater than 50km/hr?		
Are there any conflicts with street sign blades? If so, consider having these affixed to street light poles so as sign blades can be viewed from all directions.		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Have the streetlights been shown on the Road Cross-Section plans and checked for other service conflicts including sufficient allowance for street trees and pram crossing points?		
Local roads should be designed in accordance category P and designed using either category P4 and P5 lighting and should cover: ○ Pathways for pedestrians or cyclists (i.e. footpaths) ○ Public activity areas primarily for pedestrian use ○ Connecting elements (i.e. steps, stairways, ramps, footbridges, pedestrian ways, subways including associated ramps and stairways) ○ Outdoor car parks (i.e. parking spaces, aisles and circulation roadways, including designated spaces for people with disabilities or for prams).		
Note 1: For an illustration of the road and area types involving all the public lighting categories (both P and V), refer Figure 1.1 of AS/NZS 1158.3.1		
Note 2: Check Public Lighting Presentation in resource section of members section of website.		

The following further information is required to be submitted:

Is detailed design approval 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? Does it appear reasonable?		
Have all outstanding matters such as cost sharing, etc been finalised to the satisfaction of Council?		

Is final design approval 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**	

ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
General		
Have ALL planning permit conditions been complied with?		
Does the 'As Constructed' development comply with the approved design plans?		
Have any changes been accepted by Council?		
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 obstructions?		
Are landscaping systems fit for take over?		

Is there any objection to the issue of Statement of Compliance? _____

Signed _____ Dated _____

COUNCIL CHECKLIST #C5 – ENGINEERING REVIEW OF APPLICATION FOR PLANNING SCHEME AMENDMENT OR PRECINCT STRUCTURE PLAN OR DEVELOPMENT PLAN

Commentary.

This checklist is to assist in making sure that the proposed concept –

- Provides the infrastructure to achieve Clause 56 and IDM requirements
- Includes appropriate provision for community infrastructure and that sufficient land/reserves are set aside for that infrastructure
- Ensures that access to and from the development can cope with the likely traffic
- Provide appropriate water management for the development
- Fits within the existing physical constraints of the site
- Is in line with Councils/community predetermined plans for the area
- Considers impacts on adjacent land use and eliminates/minimises any negative impacts

Historical and Existing Information

Check to see what background information is available and review the critical elements. Does Council have a plan for this area? Check -

- The Planning Scheme
- Structure Plans
- Residential Character Studies
- Council strategies
- Flood Studies
- For areas of protected flora and/or fauna impact that may impact on planned infrastructure
- For any watercourses, wetlands etc within and downstream of the development
- For cultural heritage – within 200m of watercourses - etc
- Old Aerial photos
- Previous Planning Permits
- Previous land use - Are there any old contaminated areas within the site – landfills, factories, fuel depots, old agricultural or mining stockpile sites etc.
- History in Document Management System

Build a picture of what constraints there are to development

Get a plan(s) to scale from GIS that shows

- Contours
- Flood Prone layer
- Environment Layer
- Planning zones and overlays
- Aerial Photos
- Abutting land use
- Access to the site
- Existing infrastructure, Water also Gas, Electricity and Telecom if possible / practical.
- Existing watercourses

Add Councils plans for the area.

Write a brief summary of the site putting the proposed development in context.

Transport and Movement

Roads

Hierarchy

Does the proposed hierarchy fit with the abutting road system?

Is appropriate provision made for access, through the proposal, to provide appropriate, legal access to abutting land (cannot land lock abutting land)

Intersections

General

- Garbage trucks / Emergency Vehicles
  - continue in a forward motion – court bowls etc
  - pavement strength sufficient
- Are there plans for swale drains – check for Council's requirements on swales?
- Make sure that the local area traffic management fits in with the landscaping and the street lighting. Tree/shrubs don't impair sight distances or shadow crossings etc

Footpaths, Cycle Ways & Shared paths

- Check linkages to major destinations – reserves, shopping centres, sporting areas etc

Car parking

Provision for utilities

- What major service conduits are there and where do they go –are they through public open space?
- Check where utilities cross each other and roads or drains – will levels be an issue?

Water – Recycled Water

Sewerage

Power

Telecommunications – including NBN

Gas

Check access to the site (beyond the development boundaries) – is it adequate.

- Check existing bridges – are they adequate for the proposed traffic (Expected traffic loadings, widths - including bike lane and footpaths)
- Check existing Intersections – are they adequate for proposed traffic

Check traffic generators within the proposed development

Landscape & Streetscape

Water Management

- Does it need any of the Site Stormwater Management Plan (SSMP) reports – see checklist C5 Most will require at least the Drainage Feasibility Report, may need Water Quality and Flooding reports.

Upstream Catchments

- Are the catchments depicted realistic/accurate?
- Do adjacent catchments flow into this area during flood events (cross-pollination)?

Downstream of the Development

Infrastructure

- Will existing downstream infrastructure cope with the new flood?
- Check the time of inundation – has it increased substantially – what's the effect of flooding downstream for longer
- Can work in this development help alleviate flooding in adjacent/downstream areas?

Wetlands and Water Bodies

- Are there any sensitive areas downstream – what effect has the changed flood regime on them? Check flow rates and times of inundation.
- Are they protected in any way?

Within the development

Flood regime/modelling

- Is the model accurate and assumptions reasonable
- Will the proposal achieve Cl 56 requirements – SSMP?

Has enough land been allowed for drainage infrastructure?

- Include batters for wetlands and basins
- Make sure mowed batters are no steeper than 1in 4.
- Shared paths through drainage reserves to be out of the flood area
- Will there be a need to acquire land

Existing waterways within the development

- Check with the relevant CMA re their plans/requirements for the waterway
- What access is there to be to the waterway for recreation – what needs to be provided for those types of recreation?
- What in–stream works are required – erosion control, safety, drainage outlets etc
- Can the waterway be developed further for recreation?

Sport, Recreation & Open Space

- Confirm the nexus between the drainage/environment issues and recreation facilities. Make sure good use made of drainage reserves to provide pedestrian/cycling access to these facilities.
- Can the drainage reserves act as greenways?
- Are the facilities evenly distributed around the site?
- Is access adequate – vehicle pedestrian, cycling

Social & Community Facilities

- Are the facilities evenly distributed around the site?
- Is access adequate – vehicle, pedestrian, cycling

Biodiversity & Conservation areas

- Are there any nearby/adjacent B&C areas. Should we try to create links between like areas
- What treatment for any contaminated land?

Construction / Staging issues –

Provide a clear staging plan

- Identify estimated sizes and timeframes for each stage
- Is the staging logical?
- Identify works within stages that impact on other stages
- Identify the triggers that initiate the construction of community facilities that –
    - Have an interim construction stage – e.g. major intersections
    - Ensure the interim measures are properly designed and constructed and not just a poor temporary "quick-fix" – standards need to be met.
    - Are to be provided after a trigger point is reached – e.g. population size
    - Other major works e.g. streamside works

Ensure that a current stage is viable in the long term – whether or not future stages are developed

- Where it is necessary to use land in a future stage to make a current stage practical, ensure that Council has rights over that land required - e.g.
    - Turnarounds in future stages may need temporary easements
    - Drainage discharges into future stages may need easements
- What happens if the developer "pulls-out"? Can what's left operate in the short to medium term

Adjacent development

- Are there any adjacent developments. If so –
  - do they impact on one another?
  - can they work together for a better result e.g. shared drainage reserves?
  - does infrastructure from one need to go through the other?

Write a report to the Planning Unit summarising the findings of the assessment under each of the above headings and concluding the report with the statement that the Engineering Design Services OBJECTS / HAS NO OBJECTION to the proposed Planning Scheme Amendment.

COUNCIL CHECKLIST #C5 – ENGINEERING REVIEW OF PLANNING SCHEME AMENDMENT OR PRECINCT STRUCTURE PLAN OR DEVELOPMENT PLAN APPLICATION

DEVELOPMENT TITLE		**DESIGNER**	
DESIGN UNIT REFERENCE		**STAGE**	
DATE RECEIVED		**CONSULTANTS REFERENCE**	
CHECKED BY		**DATE CHECKED**	
NUMBER OF PLANS IN SET			

Information Provided	**Required**	**Provided/ Comment**
Amendment or Development Plan or PSP showing • the existing and proposed road networks and proposed road hierarchy • existing and proposed footpaths, cycleways and shared paths • existing and proposed bus routes • existing and proposed public open space and recreation facilities • drainage catchments, waterways and location of major drainage infrastructure proposed • proposed community infrastructure		
Traffic Management Strategy and Traffic Impact Assessment Report		
Stormwater Management Strategy – including drainage, stormwater treatment, assessment of downstream impacts, assessments of how upstream flows are dealt with, computations, flood modelling, areas of land required for drainage infrastructure. Have the following matters been included? • Drainage feasibility report • Water quality impact report • Flood impact report • Drainage design report • Water quality design report • Flood management design report		

Details of the proposed cross section of the various types of roads proposed.		
Write a summary statement on the adequacy of the information provided and identify any additional information requirements.		

Assessment of Transport and Movement	**Comment**
Does the proposed hierarchy fit with the abutting road system?	
Is appropriate provision made for access, through the proposal, to provide appropriate, legal access to abutting land (cannot land lock abutting land)	
Are the proposed cross sections of the various types of roads consistent with the IDM?	
Are the assumptions for traffic generation and estimated flows reasonable?	
Are the proposed intersection treatments reasonable?	
Has VicRoads been consulted in relation to any arterial roads and of so have their concerns been addressed?	
Has emergency services vehicles and service vehicles needs been adequately addressed?	
Has the adequacy of the existing road network and associated infrastructure been considered for the proposed increase in traffic? Existing bridges – are they adequate for the proposed traffic (Expected traffic loadings, widths - including bike lane and footpaths)? Existing Intersections – are they adequate for proposed traffic? Existing Roads – are they adequate in width, surface type and capacity? List any upgrade works required below:	

Assessment of Transport and Movement	Comment
If the existing road network and associated infrastructure need to be upgraded has the issue of who pays for the works been adequately and fairly addressed?	
Provision for utilities – can the proposed road cross sections accommodate all the services required to service the development? Has the provision of street trees been adequately considered in relation to the proposed service locations?	
Check footway, cycleways and shared paths linkages to major destinations – reserves, shopping centres, sporting areas etc. Check that proposed footpaths, cycleways and shared paths are consistent with relevant Council strategies and plans.	
Check the impact of staging on the existing roads, pedestrian and cycling networks.	
Write a summary statement on the assessment of traffic and movement.	

Assessment of Stormwater Management (Drainage and Flooding)	Comment
What is the current drainage regime a) Natural features - Watercourses, drainage lines, swamps, wetlands, catchment boundaries, flow from the discharge point to the nearest large water body b) Existing flows – directions, volumes, flow rates (including downstream from the proposed development), sediment and litter (logs and vegetation) loads. c) Are there some particular features of the existing system that need to be protected e.g. significant breeding/feeding habitats, recognised/protected areas (RAMSAR wetlands)?	

Assessment of Stormwater Management (Drainage and Flooding)	Comment

Does the concept layout of the proposed drainage scheme show
• Main drainage lines
• Any significant elements (show footprint including batters etc)–
  ○ Wetlands
  ○ Basins
  ○ Outlet(s) at discharge point(s)	

Are the catchments shown real and accurate?	
In times of flooding do other catchments overtop and flow into the upstream catchment?	
Will the existing downstream infrastructure cope with the new flows?	
What effects are there, downstream of the development • Water quality – minimise gross pollutants, nutrients levels as per EPA, etc • Water quantity - Discharge flow rates, volumes, can existing elements, downstream of the development, cope with the increased volumes • Effects on significant areas within, and downstream, of the development. • Are there areas, downstream of the development, which currently have flooding problems that may be able to be reduced through actions within the proposed development? What are the actions? • Assessment of the proposed discharge area	
What constraints are there on the construction of the proposal a) Significant areas to be avoided or impacts minimised such as - i) Protected flora and/or fauna (see FFG Act or EPBC Act etc) ii) Heritage iii) Cultural heritage (Self-assessment at Cultural Heritage Management Plans at DPCD website) b) Soil types/structure i) Acid Sulphate soils (1) will they be disturbed during construction (2) will watertables be lowered and expose them ii) Other soil type and/or structure constraints c) Are the levels of pipe or open drain inverts constrained where proposed drainage crosses existing infrastructure e.g. do proposed pipes or drains have to go over or under existing underground services d) What interaction will there be between the drainage elements and other infrastructure? 25 July 2012 i) Shared path construction. The through lengths of shared paths are to be above the 100 year flow path ii) Does there need to be links to adjacent/nearby shared paths, bike lanes, major reserves iii) Bridges, boardwalks	

Assessment of Stormwater Management (Drainage and Flooding)	Comment
iv) Where are the proposed 100 year flow paths (1) what roads/paths/reserves are being used (2) how do they link with existing external 100 year flow paths e) Can each stage act independently (from a water management viewpoint) - i.e. if the development stops, can the constructed areas still manage stormwater flows appropriately. (1) No outlets to adjacent privately owned land without an easement.	
Is the drainage feasibility report adequate? Does it show the conceptual proposed major drainage elements i) Conceptual drainage main drains and major elements such as basins and wetlands ii) Conceptual runoff coefficients iii) Waterway corridors iv) Overland flow path(s) v) Discharge point(s) vi) Proposed cost sharing arrangements for any major drainage infrastructure to be shared amongst multiple land owners Are the recommendations reasonable and have all matters been addressed?	
Is the Water Quality Impact Report adequate? Does it include MUSIC modelling or equivalent? Are the recommendations reasonable and have all matters been addressed?	
Is the flood impact report adequate? Does it include a full hydrologic and hydraulic analysis of external and internal catchments for rainfall events up to and including 1% AEP as specified in the IDM? Are the recommendations reasonable and have all matters been addressed?	
Is the drainage design report adequate? Does it provide drainage design, computations, sizing of water treatment elements and retardation basins and other major drainage features? Are the recommendations reasonable and have all matters been addressed?	
Is the Water Quality Design Report adequate? **Council** will expect the WQDR to: 1. contain an analysis of the discharge from the drainage system as defined in the DDR and the construction drawings 2. confirm all the assumptions made in the WQIR or clearly document what changes have been made 3. provide detailed numerical analysis of the quality of the stormwater discharged from the development to the nominated Legal Point of Discharge	

Assessment of Stormwater Management (Drainage and Flooding)	Comment
Are the recommendations reasonable and have all matters been addressed?	
Is the Flood Management Design Report adequate? Are the recommendations reasonable and have all matters been addressed?	
Write a summary statement on the assessment of water management.	

Assessment of Landscape and Streetscape	Comment
Are the landscaping and streetscaping proposals for the development reasonable?	
Does the proposal show the location and spacing of street trees and how does this impact on the provision of utility services?	
Write a summary statement on the assessment of landscape and streetscape.	

Assessment of Landscape and Streetscape	Comment

Assessment of Staging of Development	Comment
Is the staging logical?	
Identify works within stages that impact on other stages and check whether this has been addressed.	
Write a summary statement on the assessment of staging of the proposed development.	

Summary of Assessment

Is there an objection to the proposed Planning Scheme Amendment? _____

Signed _____ Dated _____

COUNCIL CHECKLIST #C6 – STORMWATER MANAGEMENT PLANS FOR SMALL DEVELOPMENTS

PLANNING PERMIT NUMBER		**DESIGNER**	
DEVELOPMENT TITLE		**CONSULTANTS REFERENCE**	
COUNCIL REFERENCE NUMBER		**DATE CHECKED**	
DATE RECEIVED		**NUMBER OF PLANS IN SET**	
CHECKED BY			

COUNCIL CHECKLIST #C6		
ITEM	**SATISFACTORY Y / N / NA**	**REMARKS**
Has evidence been provided that Council has supplied the Legal Point of Discharge?		
Has evidence been provided that Council advised where the connection point to Council drainage system is located (note this is different to the Legal Point of Discharge)?		
Has evidence been provided that the person carrying out the drainage design is qualified to do so in accordance with the provisions of the IDM?		
Has evidence been provided that Council advised what AEP the drainage network servicing the development has been designed for?		
Do the plans show surface levels to AHD and finished floor levels and proposed driveways?		
Do the plans show any relevant easements, boundaries locations of pervious and impervious surfaces?		
Do the plans show the Council drainage network servicing the property?		
What PSD been calculated for the development site?		
Is this based on calculation or using Table 13 of the IDM?		
What method has been used to calculate the storage volume: • Table 13 • OSD4W/ Swinburne • Boyd • Other		
If OSWD4/Swinburne was used did Council supply the Tc and Tcs times used in the computations?		

COUNCIL CHECKLIST #C6		
ITEM	**SATISFACTORY Y / N / NA**	**REMARKS**
Have computations been included with the plans submitted for approval?		
What detention volume was calculated? _____		
Is detention storage distributed proportionally between pipes, pits and tanks in accordance with where the flow is generated from e.g. roof, driveways, gardens?		
Is there any unretarded flows discharging from the property? If so, is it reasonable?		
Has the orifice size been calculated? Is it reasonable?		
In the case of rainwater tanks is the outlet size reasonable or could it be made larger by reducing the height of the tank and increase its width?		
Does the drainage design include devices to reduce blockages in orifice?		
Do all drainage pits have a minimum size of 450x450mm (Aus. Standards)?		
Have bike safe grated pit lids been specified for all pits in trafficable areas?		
Have pits for surface water collection been provided in the backyard and other low areas of proposed new development site?		
Do the plans include a note stating that all pits and pipes must be in accordance with the IDM and any relevant Australian Standards?		
Have silt control measures been shown on the plan/s?		
Have internal overland flow paths for a 1% AEP storm event shown on plan? Are they acceptable?		
Has Music model or Melbourne Water Storm report calculations been provided when stormwater treatment is required for the development?		

Do the plans and computations submitted satisfy the relevant planning permit condition? _____

Signed _____ Date _____

APPENDIX D: CHECKLISTS AND FORMS FOR DEVELOPER'S REPRESENTATIVES

LIST OF CHECKLISTS AND FORMS FOR DEVELOPER'S REPRESENTATIVE INCLUDED
Checklist #D1 Request For Functional Layout Approval
Checklist #D2 Request For Detailed Design Approval
Checklist #D3 Request For Final Design Approval
Form #D4 Intention To Commence Construction Form
Construction Engineer #D5 Request For Acceptance Of Works Inspection

DESIGN ENGINEER'S CHECKLIST #D1 –REQUEST FOR FUNCTIONAL LAYOUT APPROVAL

DEVELOPMENT TITLE		**STAGE**	
PLANNING PERMIT NUMBER		**CONSULTANT'S REFERENCE**	
DEVELOPER'S REPRESENTATIVE		**NUMBER OF PLANS IN SET**	

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General		
Is 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)		
Is the design in accordance with the Development Plan?		
Is the functional design is in accordance with Council's Infrastructure Design Manual?		
Has consultation taken place with all relevant authorities? If yes, list the authorities below.(attach separate list if necessary).		
Has consultation has taken place with all relevant landowners and affected persons? List those consulted below (attach separate list if necessary).		
Has the Design Engineer has inspected the site?		
Has a detailed field survey has been undertaken of the site?		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Does the survey show: Building/property lines, fences and gates Title pegs, reference marks, permanent survey marks, TBM's Footpaths, kerb and channel, table drains, vehicle crossings, perambulator crossings, edge of pavement, edge of seal, edge of formation, shoulders, centre of bitumen/formation/pavement, line of crown, line and lane markings. Stormwater pits and pipes including invert levels of existing pits and invert levels of inlet and outlet pipes, pipe sizes. Culverts, end-walls, wing walls, property inlets, house drains, outfall structures, watercourses, dams, ponds, lakes, high and low water marks (shore lines). Tops and toes of banks, changes of grade, batters. Trees, shrubs, other significant vegetation. Road furniture, signs, guide posts, bollards, letterboxes, guard rails. Buildings, bridges, retaining walls, bus shelters, bike racks, seats. Service poles, guys, pits, covers, manholes, hydrants, valves, conduits, cable. Railway lines and fixtures		
Has the environmental values of the site have been identified?		
Has protection of native vegetation and habitat been considered and is it reflected in lot layout and overall design?		
Has revegetation requirements been considered and documented?		
Has protection of water bodies and waterways been considered?		
Have service location plans been obtained for ALL services?		
Do the plans clearly show allotment layout, with allotments numbered and dimensioned, reserves clearly identified and proposed easements shown?		
Road Layout Plans		
Are street names are nominated?		
Do plans show road hierarchy?		
Are estimated traffic volumes shown on plans (for each stage of any staged developments).		
Have road widths between inverts of kerbs are nominated?		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are road reserve widths clearly nominated on plans?		
Are kerb profiles are nominated?		
Have public transport, including DOT, requirements been reflected in the road widths?		
Has local area traffic management 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.		
Are intersections external to the development shown in sufficient detail to support proposed design?		
Are critical vehicle turning movements shown on separate plans, including turning at intersections and cul-de-sacs?		
Do plans show traffic implications of staged development if relevant?		
Carpark Layout Plans		
Do carpark layout plan show on-street, off-street and disabled parking as required?		
Drainage Layout Plans		
Has the total catchment area has been identified and shown?		
Do the plans show Natural Surface Contour Lines to AHD?		
Are 100 year **ARI** flood levels identified on plans?		
Do plans show approximate Design Contour Lines to AHD?		
Are proposed sub-catchment boundaries shown on drainage layout plan?		
Do plans show the co-efficient of runoff for each sub-catchment?		
Do plans shown layout and approximate sizes of the proposed drainage systems?		
Are pipe materials nominated?		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Has the overland flow path/s been nominated and approximate depth of flow shown?		
Is the drainage discharge point shown?		
Is the proposed treatment shown in sufficient detail to support approval of the functional layout?		
Are existing drainage services confirmed on plans and proposed connection points shown?		
If relevant, do plans show drainage implications of staged development?		
Associated Documents		
Has a Traffic Management Report been prepared and does it accompany this submission?		
Has any deviations between the proposed design and the recommendations within the Traffic Management Report been noted on the plan?		
Has the need for Developer contributions or headworks charges been identified and a preliminary cost-sharing proposal to Council for early consideration been supplied?		

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**	
DEVELOPER'S REPRESENTATIVE		**NUMBER OF PLANS IN SET**	

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General Design Requirements		
Is the detailed design in accordance with the planning permit conditions and the endorsed plan, and has the physical design features been incorporated on construction plans.		
Has the Plan of Subdivision has been certified at the time of this submission?		
Is the detailed design in accordance with the plan for certification?		
Are the easement locations and widths in accordance with certified plan?		
Is the detailed design in accordance with Council's Infrastructure Design Manual?		
Has environmental protection during development construction been considered and requirements are documented (e.g. erosion protection, silt migration etc.)?		
Have revegetation requirements been considered and are documented?		
Has protection of water bodies and waterways been considered and requirements are documented?		
Have the necessary consents been obtained from other service authorities? List consents received below:		
General Plan Requirements		
Is the drawing list included?		
Are Council-nominated drawings numbers shown?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Is there a locality plan included?		
Is the north arrow shown on all layout plans and detailed plans (should be shown up or to left).		
Do all plans have correct scales shown?		
Do all plans have comprehensive legends?		
Do plans include standard notes? Are they applicable and clear?		
Do plans clearly show allotment layout, numbered allotments, all dimensions, reserves and easements?		
Is the limit of works shown on all layout plans?		
Are all dams, wells, depressions and watercourses and fill requirements identified?		
Are existing fill areas shown?		
Are existing features and structures shown?		
Are existing service locations and poles shown?		
Are existing trees shown? Does the design attempt to retain trees?		
Is existing native vegetation shown and suitably specified? Does design attempt to retain significant native vegetation?		
Road Layout Plans		
Is the datum shown to AHD?		
Are scales in accordance with the Manual requirements?		
Are PSM's and TBM's marked on the plans?		
Are proposed service locations and offsets tabulated?		
Are all required service conduit locations are indicated on the plans?		
Are footpaths a minimum width of 1.5 m and located at correct offset?		
Are shared paths minimum width of 2.5 m, and is their location clearly shown?		
Are kerb crossings at appropriate locations and fully documented?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are vehicle crossings shown on plans?		
Do all vehicle crossings cater for a standard car?		
Are any crossings located over easements?		
Are any crossings located closer than 9m to the intersection?		
Have all turning movements been checked and intersections designed accordingly?		
Are street names acceptable to Council shown on plans?		
Are road widths between inverts of kerbs nominated?		
Are kerb profiles nominated?		
Are road chainages shown?		
Street Name Signage, Linemarking, and Traffic Control Plans		
Are the locations and type of all new signage complying with the Australian Standards shown on plans?.		
Is any existing signage to be removed or relocated shown on plans?		
Are the locations and type of all linemarking complying with Australian Standards shown on plans?		
Is any existing linemarking to be removed shown on plans?		
Are traffic calming devices designed and documented in accordance with AustRoads "*Guide to Road Design"* and any VicRoads supplement to those guidelines, with the Manual, and with the accepted functional layout plan?		
Does the limit of works of roads include temporary turning area if required?		
Has the necessary 'No Road' signage or hazard markers been provided?		
Road Longitudinal Sections		
Are road names shown on longitudinal sections?		
Are scales in accordance with the Manual requirements?		
Is the Datum RL to AHD shown?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are natural surface profile and levels shown at crown?		
Are design surface profile and levels shown at crown?		
Have levels been checked by Design Engineer, do they comply with Manual, and match into existing surfaces?		
Is depth of cut/fill to crown shown?		
Are design surface profile and levels shown at left and right back of kerb (including high and low points)?		
Are grades as + or – percent to two (2) decimal places shown in direction of chainages?		
Have grades been checked by Design Engineer, and do they comply with Manual, and match into existing grades. Min. grade = % Max. grade = % Match existing?		
Are all vertical curve lengths and I.P values shown?		
Are vertical curve levels shown at maximum intervals of 10 metres?		
Are minimum kerb grades achieved?		
Have levels and grades given on long sections been checked by the Design Engineer?		
Do levels and grades match into existing abutting roadworks?		
Is the minimum length of vertical curve for >1% grade change, 15 m (except on kerb returns).		
Does the external road grading for future stages extend a minimum of 100 metres beyond the limit of works?		
Does the vertical curves and longitudinal grades provide satisfactory sight distances for standard roads, particularly at intersections?		
Has the coordination of vertical and horizontal curves provided a desirable design outcome?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Road Cross-Sections		
Has the Design Engineer checked that cross-sections agree with longitudinal sections?		
Is the datum is shown on every cross-section?		
Do scales comply with the Manual?		
Are road names and chainage references shown?		
Are natural and design levels 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)?		
Are all pavement, nature strip, footpath and batter crossfalls in accordance with the Manual?		
Typical Cross-Sections and Traffic/Road Details		
Are typical cross-sections presented in accordance with the 'Information to be Shown on Plans' requirements of the Manual?		
Are road name and chainage references noted, if applicable?		
Are profile and geometry of design surface grades shown as % or 1 in X and comply with Manual requirements?		
Are details of road pavement construction, including materials, compaction and type of seal shown?		
Are details of footpath construction, including materials, compaction and seal shown, or is the relevant standard drawing noted?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are typical alignment of services, subsoil drainage and landscaping shown?		
Are kerb and channel types are nominated?		
Is kerb and channel construction detailed or standard drawings noted?		
Intersection, Court and Curve Details		
Are road names shown?		
Are road chainages shown?		
Are intersection details shown at correct scales in accordance with Manual?		
Are at least four kerb levels given on every kerb radial?		
Do tangent point levels and chainages align with longitudinal and cross sections?		
Are set-out details shown including angle, radii and tangent points?		
Are design Surface contours shown to AHD at 50 mm maximum intervals?		
Are back of kerb levels shown to AHD?		
Are footpath levels shown?		
Are locations of low points shown?		
Are services (including drainage) shown in detail?		
Is landscaping shown in detail?		
Are footpath and kerb crossings shown in detail?		
Drainage Layout Plans		
Has the Design Engineer checked that drainage design in accordance with AR&R?		
Is the datum shown to AHD?		
Are scales in accordance with the Manual requirements?		
Are PSM's and TBM's marked on plans to AHD?		
Are finished surface levels shown where the natural surface is altered?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Do plans clearly show allotment layout, numbered allotments, reserves and easements?		
Are 1 in 100 year flood levels shown?		
Are road names shown?		
Do plans show layout of proposed drainage systems with offset from property boundaries?		
Are pipe materials and diameters shown?		
Are all concrete pipes RRJ only?		
Do all non-concrete pipes have Council acceptance?		
For all non-concrete pipes is there a note on the plan stating that all bedding, laying, jointing and backfilling is to be in accordance with manufacturer's specifications?		
Is the overland flow path accepted by Council shown?		
Is the kerb and channel and footpath depressed where the overland flow path leaves the road pavement?		
Are subsurface drains, house drains and property inlets shown?		
Are pits at appropriate locations (e.g. away from kerb returns, vehicle crossings, kerb crossings etc.)?		
Is the maximum pit spacing 80m?		
Has the pit capacity checked by the Design Engineer?		
Are double SEP's confined to low points only?		
Are all changes in angle not greater than 90°?		
Are all pits/headwalls numbered?		
Is the set-out point of pits clearly shown on legend?		
Do footpath spoon drains have adequate outfall?		
Has back of kerb drainage (e.g. roundabout kerbs) adequate outfall?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are existing fences, buildings, trees and obstructions shown in path of overland flows?		
Are all proposed fences, buildings, trees and obstructions shown in path of overland flows?		
Are existing or proposed open earth drains, dams, watercourses, boreholes, sink holes, wells and springs within the area shown?		
Is the extent of required erosion protection at headwalls and other structures shown?		
Are the details of all drop structures required shown?		
Do all properties have identified drainage discharge points (to underground drainage systems for industrial and commercial developments, and residential wherever possible)?		
Drainage Longitudinal Sections		
Have longitudinal sections been prepared for all legs of drainage, open drains, and nominated overland flow paths?		
Are scales in accordance with the Manual requirements?		
Is there a comprehensive legend shown?		
Is datum RL to AHD shown?		
Are drainage line numbers names shown on longitudinal sections?		
Are drainage line chainages shown on longitudinal sections?		
Do any lengths of drainage sections exceed the maximum permitted of 80 metres?		
Is the pipe diameter, class and grade shown for all legs of drainage?		
Have pipe classes been determined with consideration to construction loads and final cover?		
Has a cross-check with compaction requirements in documentation been carried out?		
Do pipes with steep grades include anchor blocks?		
Is pit number and pit type shown?		
Do pit type match capacity requirements?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are any special pits fully documented?		
Are internal pit dimensions shown?		
Are pit inlet and outlet levels shown?		
Are depths of pits to invert levels shown?		
Are finished top of pit levels and finished surface level adjacent to pits shown?		
Are pit lid type and class shown?		
Are origin/destination pits for inlet and outlets shown?		
Are junction line numbers noted?		
Are design pipes plotted on longitudinal section?		
Is the hydraulic grade line plotted and levels given?		
Is the depth x flow factor acceptable?		
Has the minimum 150mm freeboard to kerb invert been achieved for minor storms?		
Have all the energy losses in drainage system been accounted for?		
Has all crosses with other services been plotted and clearances nominated (street names should be referred to identify crossings)?		
Are design flows shown in litres/second?		
Are design velocities, complying with the manual shown (metres/second)?		
Is FCR backfill specified under road pavements, footpaths, crossovers and building lines?		
Has the location and type of special backfill requirements been noted (e.g. to prevent piping of backfill material)?		
Is the design in accordance with AS3725 and its commentary?		
Open Drains		
Is the shape of drain suitable for maintenance?		
Is the drain accessible from both sides and all-weather tracks provided?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Is the depth of floodways shown on cross-sections? Is the depth less than 1.5 metres?		
Were scour velocities and siltation both checked in determining longitudinal grades?		
Are grade control / drop structures fully documented?		
Has the low-flow pipe been provided in accordance with the Manual?		
Are outfall structures energy dissipators provided as required?		
Has the 300mm minimum freeboard been 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.		
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).		
Lot Filling Plans		
Are natural surface contours shown with 50 mm maximum intervals?		
Are design surface contours shown with 50 mm maximum intervals?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Are finished surface levels shown? Do all allotments have minimum 1 in 200 grade toward low point?		
Are 1%AEP flood levels shown on plans? Are all lots to be filled above this level?		
Is proposed fill in excess of 300mm clearly denoted on plans?		
Are material and compaction requirements, complying with the relevant Australian Standard, fully documented in the plans and specifications?		
Is the extent of lot filling, top and toe of batters and retaining walls all noted?		
Drainage Retardation and Treatment		
Are computations provided to verify the volume of the basin?		
Is erosion protection fully documented?		
Are inlet structures fully documented?		
Is the overflow identified and appropriate?		
Has the minimum freeboard been achieved?		
Do wetland plantings have alternative source of water for establishing plants and for periodic dry spells?		
Master Services Plans		
Do plans show numbered allotments, road reserves and road carriageways?		
Are street light types nominated for acceptance?		
Are ALL underground service alignments shown, including non-essential services such as gas, raw water and irrigation lines, fire hydrants, fire plugs and street trees?		
Are ALL major aboveground features shown such as street lights, power supply pillars, fencing, street trees, and landscaping etc?		
Landscaping Plans		
Is detailed irrigation layout plans provided showing valves, controllers, pipe material and sizes, alignments, nozzle details, and backflow devices?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Is the planting schedule included, including size of plants?		
Is the location of major plantings clearly shown?		
Are planting requirements documented including dimension of hole, root barrier, backfill, mulch, stakes, tree grates, tree guards, and stakes?		
Is street furniture detailed including type, colour, location and installation?		
Associated Documents		
If required, was a TMS prepared and accompanies this submission?		
If required, was a Road Safety Audit Report prepared and accompanies this submission?		
Is there a note provided for any deviations between the proposed design and the recommendations within the Road Safety Audit report?		
Are hydrological calculations 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.)		
Are hydraulic calculations provided for above and underground drainage, for major and minor storm events. (Method nominated and assumptions clearly stated. Roughness coefficients nominated)?		
Has there been a copy of geotechnical reports provided with the submission?		
Is the road pavement design provided with the submission?		
Are quality assurance sections included in the specification?		
Is a risk assessment report provided for drainage retardation and treatment Infrastructure?		
Are operation and maintenance (O&M) manuals provided with this submission?		
Are structural computations 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 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**	
DEVELOPER'S REPRESENTATIVE		**NUMBER OF PLANS IN SET**	

CHECKLIST #D3		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General		
Has detailed design approval been received from Council – if so note date?		
Is the final design is in accordance with the planning permit conditions and the endorsed plan, and physical design features incorporated on construction plans?		
Has the plan of subdivision been certified at the time of this submission?		
Have the appropriate consents been obtained from service authorities? List any consents received below: 25.3 25.4 25.5		
Plans		
Do the final plans reflect amendments required by Council under previous reviews?		
Other		
Is the Engineer's estimate provided with this submission?		
Are separate streetscaping and/or landscaping plans included?		

The plans, specifications and associated documents provided with this submission for final 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

Notice is given that the construction of the development detailed below is due to commence.

NAME OF COUNCIL TO WHOM NOTICE IS GIVEN			
DEVELOPMENT TITLE		**STAGE**	
PLANNING PERMIT NUMBER		**CONSULTANT'S REFERENCE**	
DESIGNER		**WORKS WITHIN ROAD RESERVE PERMIT NUMBER**	
DEVELOPER'S REPRESENTATIVE		**CONSTRUCTION ENGINEER**	
CONTRACTOR		**CONTRACTOR'S NOMINATED REPRESENTATIVE ON SITE**	
OTHER RELATED PARTIES INCLUDE		**PROPOSED DATE OF THE COMMENCEMENT OF WORKS**	

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		**DEVELOPER'S REPRESENTATIVE**	

CHECKLIST #D5		
THE FOLLOWING ITEMS HAVE BEEN COMPLETED	**Y / N / NA OR COMMENT**	**CONSTRUCTION ENGINEER'S INITIALS**
Are all road construction works complete?		
Are signs in place in accordance with the approval plans?		
Is linemarking complete?		
Are all drainage works complete, clean and ready for inspection?		
Are fencing works complete if required?		
Have pump stations 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).		
Are footpaths and kerb crossings complete?		
Are nature strips reinstated and in a tidy manner?		
Are all earthworks at the site completed?		
Have fire hydrants and fire plugs been installed and marked in accordance with fire authority's requirements?		
Are erosion protection works complete?		
Are litter traps complete?		
Is street lighting complete?		
Is landscaping complete?		
Have streets been swept?		
Have installation dates for any major traffic control items 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 E: LIST OF COUNCIL INSPECTIONS AND INSPECTION CHECKLISTS

LIST OF CHECKLISTS INCLUDED
LANDSCAPING
Pre-start meeting
Prior to landscaping inspection
Preliminary acceptance inspection
Final acceptance inspection
CIVIL WORKS
Pre-start meeting
Drainage inspection
Subgrade inspection
Subbase inspection
Kerb and channel pre-pour inspection
Base inspection prior to priming
Prior to wearing course being laid inspection
WSUD inspections
Acceptance of works inspection
Final acceptance of works inspection
WSUD asset handover inspection
QUALITY
Non-conformance report

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 Greater Bendigo City Council, Wellington Shire Council, Central Goldfields Shire Council, Baw Baw Shire Council, Moira Shire Council 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 Council, Central Goldfields Shire Council, Moira Shire Council and Pyrenees Shire Council only).

PRE-START MEETING CHECKLIST - LANDSCAPING

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Contact details between superintendent, Council and contractor been exchanged.	☐	☐	☐	
Has MOU for supervision responsibility been signed?	☐	☐	☐	
Copy of construction plans approved by Council available for viewing.	☐	☐	☐	
Check whether there is an approved environmental management plan and its 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 the contractors public liability certificate of currency been sighted and the traffic management plan accepted?	☐	☐	☐	
Have any special design requirements been considered?	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

PRIOR TO PLANTING – LANDSCAPING

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECKS BEEN COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Weeds removed.	☐	☐	☐	
Topsoiling in place.	☐	☐	☐	
Mulching of acceptable composition in place.	☐	☐	☐	
Watering system in place.	☐	☐	☐	
Civil Works complete. (i.e. outfall to wetlands, footpaths through parks etc)	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

PRELIMINARY ACCEPTANCE INSPECTION-LANDSCAPING

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Watering system turned on and demonstrated to operations.	☐	☐	☐	
Plantings in place and alive.	☐	☐	☐	
Mulching of acceptable composition 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?	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

FINAL ACCEPTANCE INSPECTION – LANDSCAPING

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	Yes	**No**	**Not Required**	
Plants alive and in place.	☐	☐	☐	
Trees staked and tied.	☐	☐	☐	
Islands and nature strips free of 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 NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

PRE-START MEETING CHECKLIST – CIVIL WORKS

SUBDIVISION FILE NUMBER	
PLANNING PERMIT NUM BER	
DATE OF MEETING	
NAME OF DEVELOPMENT AND STAGE	
LOCATION	
PERSONS PRESENT AT MEETING	
Principal (Developer)	
Principal (Developer's) Representative	
Superintendent / Consultant	
Construction Engineer	
Council Representative	
Principal Contractor	
CONTACT DETAILS – PHONE NUMBERS AND EMAIL	
Principal (Developer)	
Principal (Developer'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	

Date construction works should commence by (refer to contract and planning requirements)	
Time for the works to be completed (refer to contract) (month and year)	
Defects Liability Period (refer to the contract) (month and year) Roads and Drainage Works Landscaping Works Others as listed	
Maintenance Period (refer to the contract) (month and year) Roads and Drainage Works Landscaping Works Others as listed	
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 ACCEPTED BEFORE WORKS COMMENCE

Information Required	Provided	Accepted	Comments
Construction Management Plan	☐	☐	
Inspection and Test Plans	☐	☐	
Environmental Management Plan	☐	☐	
Traffic Management Plan	☐	☐	
Works Program	☐	☐	
Works Within Road Reserves Permit	☐	☐	
Relevant Insurance Certificates	☐	☐	
Site Induction	☐	N/A	

Nominated Working Hours	☐	☐	
Source of Pavement Materials	☐	☐	
Quality Plan	☐	☐	
Health and Safety Plan	☐	☐	
Coordination Plan	☐	☐	

PLANNING PERMIT CONDITIONS

Have the requirements of any planning permit conditions which include the words "prior to works commencing" been satisfied?	

ROLES AND RESPONSIBILITIES

All Parties

1. Provide economical, fit for purpose infrastructure to meet **Council** requirements as generally specified in the IDM.
2. Meet their obligations under law, common law and regulations.

Principal (Developer)

The Principal is responsible for:

1. 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 (unless otherwise agreed in writing by the Council – (Clause 2 of IDM)
2. nominating which of these parties will be appointed as their representative noting that the Superintendent is the preferred nominee where there is a contract in place to deliver the works.
3. delivering the development in accordance with the plans approved by Council.
4. lodging 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 accepted by Council) or cash and may be used for rectification of any and all design and construction defects. No expiry date should be noted on the on any bank guarantee. Where a cheque is lodged, it is only considered received after the bank has cleared the cheque.

   The minimum value of the guarantee is 5% of the total cost of roads, drainage and hard landscaping based on the priced Bill of Quantities. The guarantee is 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.

5. ensuring 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.
6. ensuring that all necessary and other permissions to undertake the Work are obtained, prior to the start of works.
7. ensuring 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.
8. ensuring that any testing required to enable Council's Engineering Department to ascertain whether assets that are to be vested in Council meet the IDM standards is undertaken and the results reported to Council, in an efficient and timely manner.
9. ensuring neighbouring properties are checked for pre-existing damage prior to works commencing.

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 Acceptance and evidence that the Plan of Subdivision has been certified.
3. Ensuring that all necessary consents 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 accepted by the Council Engineer, within 48 hours, or otherwise agreed, prior to providing written instruction to the Superintendent.
5. Provide Council with "As Constructed" plans prepared by a registered surveyor or qualified engineer and endorsed by the Clerk of Works (Construction Engineer). Council will expect the "As Constructed" Plans to be prepared in accordance with Appendix I: Information to be Shown of Plans of the IDM.

Construction Engineer

1 Supervision of the works on a regular basis to ensure that the Principal's requirements as specified in the plans approved by are satisfied.
2 Liaising with the Contractor to ensure that all of Council's preconstruction requirements have been met.
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 accepted 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. Council will expect the Superintendent to 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 to act as a clerk or inspector.
3. Council will expect the Developer to ensure that the Superintendent acts fairly at all times.

Contractor/s

1. Undertaking the Work in accordance with the provisions of the Contract (where applicable) and with the plans and specifications approved by Council.
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 inspections and for issuing acceptances or written notices of non-conformance with the approved plans to the Superintendent.
2 Liaising with the Developer's representative required changes outside the scope of work covered by the approved plans.
3 Confirming that Council's preconstruction requirements have been met, which satisfy Council's requirements, within 1 working week of receipt of all relevant information, unless otherwise agreed.
4 Undertaking 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 Ensuring that Council's Engineer responds to queries and request for information from the Developer's Representative within 48 hours, unless otherwise agreed.

7 Ensuring that Council's Engineer advises the Developer's Representative of the results of any inspection within one working day, unless otherwise agreed, of the following:

- acceptance, with or without conditions; OR
- non-acceptance and steps to be taken to secure the council's requirements; AND
- process for securing a further inspection where there is non-acceptance.

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 IN THE SPACE PROVIDED)

Developer	
Developer's Representative	
Superintendent / Consultant	
Construction Engineer	
Council Representative	
Contractor	

Consent to proceed to construction is granted **Yes** **No**

Signed Council Representative _____

Date _____

DRAINAGE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CATEGORY	CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
General	Have hold points and witness points been complied with?	☐	☐	☐	
Trenching					
	Is shoring and access in place?	☐	☐	☐	
Pipes					
	Is bedding of sufficient depth & compacted?	☐	☐	☐	
	Are any pipes sitting on collars causing 'beaming'?	☐	☐	☐	
	Has vertical/horizontal alignment been checked and found to be satisfactory?	☐	☐	☐	
	Is the direction of laying satisfactory? (i.e. collar on upstream end?)	☐	☐	☐	
	Is rubber ring jointing satisfactory?	☐	☐	☐	
	If flush jointed pipes have been accepted, rubber bands should be used at the joints. Are they in place and in sound condition?	☐	☐	☐	
	Have all house drains been connected to top of pipe with an acceptable connection?	☐	☐	☐	
	Are all pipes sound and not cracked.	☐	☐	☐	
	Are lifting hole bungs in place?	☐	☐	☐	
	Do the size of pipes, bedding materials and compaction conform to design? Has evidence been provided where applicable?	☐	☐	☐	
Back Filling					

CATEGORY	CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
	Has haunching and backfill material been provided and compacted as specified?	☐	☐	☐	
	Has any biofiltration backfill been provided as specified?	☐	☐	☐	
Pits					
	Has the base material is placed and compacted as required?	☐	☐	☐	
	Are inner and outer formworks and reinforcement in place?	☐	☐	☐	
	Are all collars outside the pits walls?	☐	☐	☐	
	Have all precast pits have been supplied and installed as per plan?	☐	☐	☐	
	Have all holes been mortared up for precast pits?	☐	☐	☐	
	Does the strength of concrete used to construct pits meet the requirements of the Manual?	☐	☐	☐	
Consent to proceed to next stage		☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

SUBGRADE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	CHECK COMPLETED			COMMENTS
	YES	NO	NOT REQUIRED	
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. Results presented to Council.	☐	☐	☐	
Service and drainage trenches backfilled with class 3 crushed rock and compacted satisfactorily.	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

SUB BASE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
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.	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

KERB & CHANNEL PRE-POUR INSPECTION - CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECKS COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Where matching with existing kerb & channel check level, alignment, condition and rectify as necessary.	☐	☐	☐	
Has a construction platform (part of sub base as per the design) been placed over subgrade?	☐	☐	☐	
Is the 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 12.7.10)	☐	☐	☐	
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 between kerb profiles identified and base prepared accordingly?	☐	☐	☐	
Is the width of bedding behind the kerb and channels at driveways adequate?	☐	☐	☐	
Underground services identified for kerb stamping.	☐	☐	☐	
Is the width between the back of kerbs correct?.	☐	☐	☐	
Check throat transitions at SEP's to ensure that they are adequate.	☐	☐	☐	

List any special design requirements that need to be considered.	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

FOOTPATH PRE-POUR INSPECTION – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECKS COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Where matching with existing footpath check level, alignment, condition and rectify as necessary.	☐	☐	☐	
Boxing in place and at correct level.	☐	☐	☐	
Bedding is compacted and to thickness as specified in the endorsed plan.	☐	☐	☐	
Reinforcement is in and sitting on chairs.	☐	☐	☐	
Expansion joints located, prepared and dowelled satisfactorily.	☐	☐	☐	
House drain, services and required conduits are in place.	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

KERB AND CHANNEL OR FOOTPATH POUR – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
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 the required tactile markers have been installed.	☐	☐	☐	
Check that the expansion joints are provided in accordance with the relevant standard drawing.	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

BASE INSPECTION (PRIOR TO PRIMING) – CIVIL WORKS

DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Proof roll passed with no soft spots.	☐	☐	☐	
Compaction test results submitted to Council. (100% modified as per the Manual Clause 12.7.10)	☐	☐	☐	
Depth of layer as per pavement design.	☐	☐	☐	
Shape is in accordance with endorsed plans and checked with string line.	☐	☐	☐	
Surface condition is clean, neither coarse nor fatty	☐	☐	☐	
Check papering is down.	☐	☐	☐	
Has a uniform surface been provided?	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

PRIOR TO WEARING COURSE BEING PLACED – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
Where matching with existing asphalt check level, alignment, joints and rectify as necessary.	☐	☐	☐	
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 asphalt on site check temperature of asphalt.	☐	☐	☐	
Consent to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

WSUD – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
GENERAL DURING CONSTRUCTION				
PRELIMINARY WORKS				
Erosion and sediment control plan adopted.	☐	☐	☐	
Traffic control measures in place.	☐	☐	☐	
Location matches plans.	☐	☐	☐	
Site protected from existing flows.	☐	☐	☐	
Required permits in place. List permits obtained below:	☐	☐	☐	
SWALES				
EARTHWORKS - SWALES				
Level bed of swale.	☐	☐	☐	
Batter slopes match design.	☐	☐	☐	
Longitudinal slope in design range (1% -4%).	☐	☐	☐	
Provision of shallow drainage for mild slopes.	☐	☐	☐	
Compaction process as designed.	☐	☐	☐	

CHECKLIST ITEMS	CHECK COMPLETED			COMMENTS
	YES	NO	NOT REQUIRED	
Appropriate topsoil. *Minimum depth of 150mm for turf 200mm for groundcovers/small shrubs*	☐	☐	☐	
STRUCTURAL COMPONENTS - SWALES				
Location and levels of pits as designed. (± 25mm)	☐	☐	☐	
Safety protection for structures provided.	☐	☐	☐	
Crossings locations as designed.	☐	☐	☐	
Pipe joints and connections as designed.	☐	☐	☐	
Concrete and reinforcement as designed?	☐	☐	☐	
Inlets appropriately installed.	☐	☐	☐	
Erosion protection installed at inlet.	☐	☐	☐	
Set down to correct level for flush kerbs.	☐	☐	☐	
VEGETATION - SWALES				
Stabilization immediately following earthworks.	☐	☐	☐	
Planting as designed. (species and densities)	☐	☐	☐	
Weed removal before stabilization.	☐	☐	☐	
COMMENTS				
Inspection 1 – Hard assets (i.e. pits/pipes) constructed. Date checked ……. **Inspection 2 – Planting about to be undertaken. Date checked …….** **Inspection 3 – Entering defects liability period. Date checked …….** **Inspection 4 – End defects liability period. Date checked …….**				
FINAL INSPECTION SWALES				
Confirm levels of inlets and outlets.	☐	☐	☐	
Traffic controls in place.	☐	☐	☐	
Confirm structural sizes (± 25mm of design levels).	☐	☐	☐	
Check batter slopes.	☐	☐	☐	
Vegetation is as designed.	☐	☐	☐	

CHECKLIST ITEMS	CHECK COMPLETED			COMMENTS
	YES	NO	NOT REQUIRED	
Check for even settling of soil (i.e. no significant depressions).	☐	☐	☐	
Inlet erosion protection working.	☐	☐	☐	
Construction generated sediment removed.	☐	☐	☐	
Maintenance access provided.	☐	☐	☐	
Free from weeds.	☐	☐	☐	
SEDIMENT POND / WETLAND				
EARTHWORKS – SEDIMENT PONDS / WETLANDS				
Integrity of banks acceptable.	☐	☐	☐	
Batter slopes match design.	☐	☐	☐	
Levels of base, banks and spillway match designs.	☐	☐	☐	
Compaction process as designed.	☐	☐	☐	
Rock or concrete base installed.	☐	☐	☐	
Maintenance access provided.	☐	☐	☐	
No groundwater intrusion occurring.	☐	☐	☐	
STRUCTURAL COMPONENTS – SEDIMENT POND / WETALNDS				
Location and levels of outlet as designed. (± 25mm)	☐	☐	☐	
Outlets protected from debris.	☐	☐	☐	
Safety protection for structures provided.	☐	☐	☐	
Pipe joints and connections match plans.	☐	☐	☐	
Concrete and reinforcement as designed.	☐	☐	☐	
Inlet pipes and headwalls at correct location. (± 25mm)	☐	☐	☐	
Energy dissipation and scour protection at inlet.	☐	☐	☐	
No seepage through banks.	☐	☐	☐	
Ensure spillway is level.	☐	☐	☐	
Maintenance drain provided.	☐	☐	☐	

CHECKLIST ITEMS	CHECK COMPLETED			COMMENTS
	YES	NO	NOT REQUIRED	
Collar installed on pipes.	☐	☐	☐	
VEGETATION – SEDIMENT PONDS / WETLANDS				
Stabilization immediately following earthworks.	☐	☐	☐	
Vegetation layout, species and densities as designed.	☐	☐	☐	
Weed removal prior to planting.	☐	☐	☐	
Provision for water level control during establishment.	☐	☐	☐	
Bird protection provided.	☐	☐	☐	
Bypass channel vegetated.	☐	☐	☐	
COMMENTS				
Inspection 1 – Hard assets (i.e. pits/pipes) constructed. **Date checked …….** **Inspection 2 – Planting about to be undertaken.** **Date checked …….** **Inspection 3 – Entering defects liability period.** **Date checked …….** **Inspection 4 – End defects liability period.** **Date checked …….**				
FINAL INSPECTION SEDIMENT POND / WETLANDS				
Confirm levels or inlets and outlets.	☐	☐	☐	
Confirm structural element sizes.	☐	☐	☐	
Check batter slopes.	☐	☐	☐	
Vegetation as designed.	☐	☐	☐	
Draining area for maintenance provided.	☐	☐	☐	
Check for uneven settling of banks.	☐	☐	☐	
Erosion protection working.	☐	☐	☐	
Construction generated sediment removed.	☐	☐	☐	
Maintenance access provided.	☐	☐	☐	
Public safety adequate.	☐	☐	☐	
Free from weeds.	☐	☐	☐	

POND / LAKE				
EARTHWORKS – POND / LAKE				
Integrity of banks acceptable.	☐	☐	☐	
Batter slopes match design.	☐	☐	☐	
Impermeable base provided.	☐	☐	☐	
Maintenance access provided.	☐	☐	☐	
Compaction process as designed.	☐	☐	☐	
Adequate topsoil provided at edges.	☐	☐	☐	
Levels of base, banks and spillway as designed.	☐	☐	☐	
No groundwater intrusion occurring.	☐	☐	☐	
Stabilisation using sterile grass.	☐	☐	☐	
STRUCTURAL COMPONENTS – POND / LAKE				
Location and levels of outlet as designed. (± 25mm)	☐	☐	☐	
Safety protection for structures provided.	☐	☐	☐	
Pipe joints and connections as designed.	☐	☐	☐	
Concrete and reinforcement as designed.	☐	☐	☐	
Inlets appropriately installed.	☐	☐	☐	
Erosion protection installed at inlet.	☐	☐	☐	
No seepage through banks occurring.	☐	☐	☐	
Spillway is level.	☐	☐	☐	
Maintenance drain provided.	☐	☐	☐	
Collar installed on pipes.	☐	☐	☐	
Outlet protected from debris.	☐	☐	☐	
VEGETATION – POND / LAKE				
Weeds removed prior to planting.	☐	☐	☐	
Vegetation as designed. (species and densities)	☐	☐	☐	
Provision for water level control during establishment period.	☐	☐	☐	
COMMENTS				

Inspection 1 – Hard assets (i.e. pits/pipes) constructed. **Date checked …….** **Inspection 2 – Planting about to be undertaken.** **Date checked …….** **Inspection 3 – Entering defects liability period.** **Date checked …….** **Inspection 4 – End defects liability period.** **Date checked …….**				
FINAL INSPECTION – POND / LAKE				
Confirm levels of inlets and outlets.	☐	☐	☐	
Confirm structural sizes. (± 25mm of design levels)	☐	☐	☐	
Check batter slopes.	☐	☐	☐	
Vegetation is as designed.	☐	☐	☐	
Erosion protection working.	☐	☐	☐	
No uneven settling of banks.	☐	☐	☐	
No evidence of litter or excessive debris.	☐	☐	☐	
Maintenance access provided.	☐	☐	☐	
Free from weeds.	☐	☐	☐	

BIORETENTION RAINGARDEN				
EARTHWORKS – BIORETENTION RAINGARDEN				
Level bed (if swale) / Correct shape (if basin).	☐	☐	☐	
Batter slopes match design.	☐	☐	☐	
Dimensions of bioretention area as plans.	☐	☐	☐	
Confirm surrounding soil type with design.	☐	☐	☐	
Liner provided.	☐	☐	☐	
Perforated pipe installed as designed.	☐	☐	☐	
Drainage layer media as designed.	☐	☐	☐	
Transition layer media matches plans.	☐	☐	☐	
Filter media specification checked and accepted.	☐	☐	☐	
Compaction process as designed.	☐	☐	☐	
Appropriate topsoil. (swale only)	☐	☐	☐	
STRUCTURAL COMPONENT – BIORETENTION RAINGARDEN				
Location and levels of pits as designed. (± 25mm)	☐	☐	☐	
Safety protection for structures provided.	☐	☐	☐	
Crossings locations as designed. (swale only)	☐	☐	☐	
Pipe joints and connections as designed.	☐	☐	☐	
Concrete and reinforcement as designed.	☐	☐	☐	
Inlets appropriately installed.	☐	☐	☐	
Erosion protection installed at inlet.	☐	☐	☐	
If on road, Set down at least 50mm below curb inlet.	☐	☐	☐	
VEGETATION – BIORETENTION RAINGARDEN				
Stabilization immediately following earthworks.	☐	☐	☐	
Stabilization immediately following earthworks.	☐	☐	☐	
Weed removal before stabilisation.	☐	☐	☐	
COMMENTS				

Inspection 1 – Hard assets (i.e. pits/pipes) constructed. **Date checked …….** **Inspection 2 – Planting about to be undertaken.** **Date checked …….** **Inspection 3 – Entering defects liability period.** **Date checked …….** **Inspection 4 – End defects liability period.** **Date checked …….**				
FINAL INSPECTION – BIORETENTION RAINGARDEN				
Confirm levels of inlets and outlets.	☐	☐	☐	
Traffic controls in place.	☐	☐	☐	
Confirm structural sizes.	☐	☐	☐	
Check batter slopes.	☐	☐	☐	
Vegetation as designed.	☐	☐	☐	
Check for uneven settling of soil.	☐	☐	☐	
Inlet erosion protection working.	☐	☐	☐	
Construction generated sediment removed.	☐	☐	☐	
Maintenance access provided.	☐	☐	☐	
Extended detention depth checked. *Depth between filter media and overflow weir correct*	☐	☐	☐	
Free from weeds.	☐	☐	☐	

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

ACCEPTANCE OF WORKS (PRELIMINARY) INSPECTION – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECKS COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
All construction works have been 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.	☐	☐	☐	

CHECKLIST ITEMS	CHECKS COMPLETED			COMMENTS
	YES	NO	NOT REQUIRED	
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.	☐	☐	☐	
Nature strips are 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 acceptable Council key.	☐	☐	☐	
EMP provisions are 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 present at the meeting or is a separate handover meeting required?	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

FINAL ACCEPTANCE INSPECTION (END OF DEFECTS PERIOD) – CIVIL WORKS

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECKS COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
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

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

ASSET HANDOVER – WSUD

SUBDIVISION FILE NUMBER	
DATE OF INSPECTION	
PERSONS PRESENT AT INSPECTION	
LOCATION/STAGE/SECTION	

CHECKLIST ITEMS	**CHECK COMPLETED**			**COMMENTS**
	YES	**NO**	**NOT REQUIRED**	
TREATMENT				
System appears to be working as designed visually.	☐	☐	☐	
No obvious signs of under-performance.	☐	☐	☐	
MAINTENANCE				
Maintenance plans have been provided for each asset.	☐	☐	☐	
Inspection and maintenance has been undertaken as per the maintenance plan.	☐	☐	☐	
Inspection and maintenance forms have been provided.	☐	☐	☐	
Assets have been inspected for defects.	☐	☐	☐	
ASSET INFORMATION				
Design checklist provided.	☐	☐	☐	
As constructed plans provided.	☐	☐	☐	
Copies of all required permits (both construction and operational) submitted.	☐	☐	☐	
Proprietary information provided.	☐	☐	☐	
Digital files (e.g. drawings, survey, models) provided.	☐	☐	☐	
Assets listed on asset register or database.	☐	☐	☐	
Were maintenance staff at the meeting or is a separate handover meeting required?	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE NAME	
COUNCIL REPRESENTATIVE SIGNATURE	
DEVELOPER REPRESENTATIVE NAME	
DEVELOPER REPRESENTATIVE SIGNATURE	

NON CONFORMANCE REPORT

DATE	
CONTRACTOR	
SUBDIVISION FILE NUMBER OR TPA	
NAME OF CONTRACT	
LOCATION	
CONTRACTOR NAME AND CONTACT DETAILS	
SIGNATURE OF CONTRACTOR	
COUNCIL REPRESENTATIVE	
SIGNATURE OF COUNCIL REPRESENTATIVE	

DETAILS OF NON CONFORMANCE	RELATIVE AUTHORITY CONTACTED	ACTION REQUIRED	ACTION TARGET DATE	DATE COMP	VERFICATION OF COMPLETION

ADDITIONAL COMMENTS

APPENDIX F: STANDARD DRAWINGS

IDM standard drawings.pdf

APPENDIX G: STANDARD S173 AGREEMENT

STANDARD S173 AGREEMENT FOR ON-SITE DETENTION

Councils may prepare and lodge S173 agreements for on-site detention at the cost of the Developer. Where Councils choose not to prepare such agreements it will the applicant's responsibility to do so.

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 each specified lot will be designed by a **Qualified Engineer** and be approved by the **Council** prior to construction. A copy 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 concurrently 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 by **Council** on completion of works.

3. They will maintain, and not modify without prior written agreement of **Council**, 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: CCTV ACCEPTANCE CRITERIA

The acceptance criteria for CCTV inspections is detailed below:

Structural Defects – Rigid Pipes

Defect/ Feature	Acceptance determination and explanation
Cracking (all forms)	Surface cracking is common in concrete and is not usually a concern since it is usually of limited extent and not related to structural failure. However, surface cracking that is exhaustive may indicate a problem with concrete quality and should be reported for the Council to review. Council will expect other types of cracking to be reported for Council review. These types of cracking are indicative of poor handling and/or unsatisfactory installation and/or overloading, and will normally be found unacceptable.
Breaking	Not acceptable
Displaced Joint	Not acceptable if joint displacement exceeds maximum specified by the acceptable code or standard for the pipe
Deformation	Not acceptable
Collapse	Not acceptable
Surface damage	Report and refer to Council for acceptance determination
Defective structural lining	Not acceptable
Soil visible	Not acceptable
Void visible	Not acceptable

Structural Defects – Flexible Pipes

Defect/ Feature	Acceptance determination and explanation
Cracking	Not acceptable
Deformation	Not acceptable
Collapse	Not acceptable
Displaced joint	Not acceptable if joint displacement exceeds maximum specified by the acceptable code or standard for the pipe.
Surface damage other	Report and refer to Council for acceptance determination
Soil visible	Not acceptable
Defective joint weld	Not acceptable

Service Defects – for all new installations – no defects permitted.

APPENDIX I: 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 relevant stage as applicable.
- Planning Permit Number 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 limit 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-sections 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 sections 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.
- 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, reserves 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, and other obstructions 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 1% AEP storm event.
- The hydraulic grade line in the inlet pipe/drain for both the minor storm event and the 1% AEP 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:

- Street trees.
- Drainage, treated/potable water, fire hydrants, fire plugs, raw water, sewer, communications, 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.
- Vehicle crossings (where known)

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 J: NOTES ON COUNCIL'S ENGINEERING PRINCIPLES

PRINCIPLE	Clause 1.5	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 9.4	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 the need for these facilities at the planning permit stage.
PRINCIPLE	Clause 9.4	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 concerned 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 accepted, 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 *	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 12.3.8	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 26.3	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.